Levin Landfill Annual Compliance Report July 2021 – June 2022 (as required by Resource Consents DP6009, DP6010, DP6011 and DP102259)

PREPARED FOR Horowhenua District Council | September 2022

We design with community in mind

Stantec

Revision Schedule

Rev No	Date	Description	Signature of Typed Name (documentation on file)			
			Prepared by	**Checked by**	**Reviewed by**	**Approved by**
0	30/09/22	Final Draft for Client	Finbar MacLeod	Phil Landmark	Jessica Grinter	Roger Hulme
1	06/10/22	Final	Finbar MacLeod	Phil Landmark	Jessica Grinter	Roger Hulme

Quality Statement

This document has been prepared for the benefit of Horowhenua District Council. No liability is accepted by this company or any employee or sub-consultant of this company with respect to its use by any other person.
This disclaimer shall apply notwithstanding that the report may be made available to Horowhenua District Council and other persons for an application for permission or approval to fulfil a legal requirement.

PROJECT MANAGER	PROJECT TECHNICAL LEAD
Roger Hulme	Phil Landmark

PREPARED BY Finbar MacLeod and Phil Landmark		30/09/2022
CHECKED BY Phil Landmark		04/09/2022
REVIEWED BY Jessica Grinter		05/09/2022
APPROVED FOR ISSUE BY Roger Hulme		06/10/2022

118 Fitzherbert Avenue, Palmerston North, 4410
PO Box 13-052, Armagh, Christchurch 8141
TEL +64 4 381 6700
STATUS Final | Project No 310103837

Executive Summary

Horowhenua District Council is required to carry out compliance monitoring for the Levin Landfill as part of Resource Consents DP6009, DP6010, DP6011 and DP102259. This report summarises the findings for the July 2021 to June 2022 annual monitoring period ('the reporting period'), including monitoring results for:

- Background groundwater condition;
- The landfill leachate pond;
- Groundwater bores around the new landfill and within the old leachate irrigation area;
- Shallow aquifers, down-gradient of the old landfill;
- Deep aquifer;
- Hokio Stream;
- Stormwater,
- Landfill gas and odour, and
- Bio-filter.

Monitoring results for other aspects of the landfill operations, such as sampling of the landfill gas flare and collection wells, are reported separately as per additional resource consent requirements.

Background Groundwater (Bores G1S, G1D)

The quality of the background groundwater up-hydraulic gradient from the landfill site is not subject to any resource consent conditions. However, for comparison purposes, both the ANZECC 2000 Livestock Drinking Water (LDW) trigger values and the Drinking Water Standards New Zealand (DWS NZ) guidelines were used to benchmark the quality of this upgradient groundwater. Samples from the shallow bore (G1S) exceeded the DWS NZ guidelines for aluminium and iron concentrations, and the median pH level was below the minimum threshold of the optimal range required by the DWS NZ guidelines. The DWS NZ guidelines for iron and manganese were exceeded within the deep bore (G1D). Samples collected from both G1S and G1D had annual median counts of faecal coliforms (measured as *E. coli*) above the Nil level of the DWS NZ guidelines. These results indicate a likely impact on groundwater from activities outside the landfill.

It is understood leachate has historically been irrigated in the area to the south-east of the site only (not in the south-west of the site). Bores D5, F2 and F3 may be considered representative of background groundwater quality due to their location outside of this previously irrigated area, and therefore have been subject to monitoring for compliance with relevant guidelines. Samples obtained from these bores during the reporting period did not exceed LDW trigger values or the DWS NZ guidelines.

Shallow Aquifer Down-gradient of Old Landfill (Bores E2S, B1, B2, B3, C1, C2, C2DS, G2S, Xs1, Xs2)

Median results in these bores, except bore C2, did not exceed the LDW trigger values in the 2021-2022 monitoring period, and therefore the hydraulically down-gradient bores, besides bore C2, complied with the resource consent conditions.

Two samples from Bore C2 exceeded the LDW trigger value for faecal coliforms (*E. coli*), though the annual median value was considerably less than that measured in the 2019-2020 reporting period which indicates a gradual improvement over time despite still exceeding the LDW trigger value.

Bores located immediately down-gradient of the old unlined landfill continue to show elevated concentrations of leachate indicators, namely ammoniacal nitrogen, chloride and boron, and conductivity, which are above background concentrations. This trend has been noted in previous annual reports. Bore G1S has been considered as representative of background groundwater conditions for this report.

Deep (Gravel) Aquifer (Bores E1D, C2DD, E2D, D3rd, Xd1)

Faecal coliforms (*E. coli*) were detected within all bores which intercept the deep aquifer, including the deep aquifer background bore. Although the annual median counts ranged between 2 and 11 CFU/100ml (which is a very low level of contamination), all are exceedances of the DWS NZ guidelines which require a non-detection (nil). The median concentration of manganese exceeded the DWS NZ guideline values (GV) at bores XD1, E2D, C2DD and D3rd. There were also marginal exceedances for Hardness (<10% above the DWSNZ MAV) and more significant exceedances for arsenic (almost double the trigger value) in two out of three samples obtained from bore D3rd during the reporting period. Concentrations for key indicators such as chloride and conductivity appeared to be slightly elevated above those observed in the 'background' bore G1D.

New Landfill and Irrigation Area (Bores D1, D2, D3rs, D4, D5, D6, E1S, F1, F2, F3)

None of the applicable LDW trigger values were exceeded in the bores around the new landfill and within the leachate irrigation area (up-gradient of the old landfill) during the 2020-2021 reporting period. Note that no irrigation of leachate has occurred on site since 2008. Elevated nitrate nitrogen, chloride and conductivity levels were observed in bores located hydraulically up-gradient and down-gradient of the leachate pond (bores D1 and D6), though the median concentration of nitrate-nitrogen appears to be decreasing slightly compared to last year.

Stormwater Impact Monitoring (Bores E1D, E1S, D2, D3rs, D4 and F3)

Based on the current understanding of groundwater flow directions, bores D3rs and F3 are hydraulically up-gradient of the stormwater soakage area, and bores E1D, E1S, D4 and D2 are hydraulically down-gradient. The results indicate that groundwater quality in the bores D3rs, F3, E1S, D4 and D2 is variable compared to that of the background bore G1S. Generally, ammoniacal-nitrogen and boron concentrations were higher in these bores, compared to G1S, whereas chloride and conductivity were lower. Median results from all bores complied with their relevant consent limits except for E1D which presented a faecal coliform exceedance – rendering it non-compliant.

It is noted that the suitability of bore G1S as a representation of background groundwater quality is to be confirmed following a review of groundwater flow directions once sufficient groundwater level data have been collected.

Mass Loading Evaluation

Overall, the concentrations predicted in the 2021-2022 mass contaminant load assessment show close agreement with actual monitoring results obtained for the downstream site (HS3) for all parameters, except for DRP, which had a median average concentration some 30% higher than the predicted range. While there appears to be a minor impact on Hokio Stream from leachate-impacted groundwater and surface water it is noted that the Hokio Stream is influenced strongly by its urban and rural catchments.

Hokio Stream (Surface Water Sampling Locations: HS1A, HS1, HS2, HS3)

Nitrate-N concentrations exceeded the consent limit (ANZECC AE (95%) trigger values) at HS1A, HS1, HS2, and HS3 during the reporting period. The ANZECC AE (95%) trigger values were not exceeded for any other parameters during the reporting period.

Tatana Drain

The median value for BOD concentration exceeded the ANZECC AE (95%) trigger value at site TD1.

Landfill Gas and Odour Monitoring

Methane was detected at low levels within selected monitoring bores in all four monitoring rounds in the 2021-2022 monitoring period, with the presence of hydrogen sulphide being recorded on two occasions. The results are provided by a third party who later confirmed the H_2S units were in ppm, rather than as a percentage, which has reduced the level of concern. Nevertheless, it is iterated that elevated results, particularly for H_2S, need to be taken very seriously, and appropriate precautions and health and safety measures need to be taken when sampling the groundwater bores and testing for gas.

Odour monitoring at the landfill boundary has been implemented in accordance with the Odour Management Plan. Nine odour inspections were undertaken during the reporting period with no further action being considered necessary. Inspections are required monthly and since they were not done, this represents a non-compliance. However, odour assessments were done in the four months that the landfill remained operational (i.e., from July 2021 to October 2021), during the reporting period.

Monthly surface methane emission monitoring is required over all temporary and capped areas of the landfill and at the bio-filter. HDC has engaged Envirowaste to do this testing and eleven monthly assessments were conducted (between July 2021 and May 2022). HDC is non-compliant in completing monthly surface emissions testing since the June 2022 report is missing. All assessments identified locations where methane concentrations exceeded the trigger level. All reports except for the May 2022 report stated that the locations were remediated using granular bentonite and water, and occasionally clay capping, and they were re-tested, with all but five locations subsequently meeting the required standards. These reports (excluding May 2022 report) indicated that additional soil cover was needed to remediate the five locations that failed the re-tests, but there is no follow up reporting to provide further re-test results. For the May 2022 report there was no contractor available to carry out remediation of the locations within 24 hours, where methane concentrations exceeded the trigger values, and so this also represents a non-compliance.

With the bio-filter being decommissioned in September 2021, testing at the bio-filter was not required after that date. However, for the operational period there were a range of inspections and maintenance requirements for the bio-filter. HDC complied with some of these but did not implement a daily visual check of the bio-filter, as well as monitoring and recording the pH of the filter bed media.

Collection of meteorological data from an on-site weather station has been undertaken through the reporting period. The on-site weather station allows weather data to be collected at 1-minute intervals, as stated in the consent conditions. The weather station was affected by moisture ingress which put it out of action between mid-July and mid-August, however the data gaps can be filled for this period by weather data from the old weather station located at 645 Hokio

Beach Road. The weather station has not been recording rainfall and relative humidity information correctly. Such information is missing for periods between December 2021 and June 2022. The weather station needs to be serviced to correct these errors.

Contents

List of Tables

List of Figures

Abbreviations

DWSNZ	Drinking Water Standards New Zealand
GVs	Guideline value
HDC	Horowhenua District Council
HRC	Horizons Regional Council
IANZ	International Accreditation New Zealand
LDW	ANZECC 2000 Livestock Drinking Water
MAVs	Maximum acceptable values
NLG	Neighbourhood Liaison Group
Stantec	Stantec New Zealand
SVOC	Semi-volatile organic compounds
VOC	Volatile organic compounds
WWTP	Wastewater Treatment Plant

1 Introduction

1.1 Background

Levin Landfill has been operating on the Hokio Beach Road site for over 50 years. The current resource consents for the new lined and old un-lined landfills were granted in 2002 and have been subject to two reviews since then. The latest review commenced in 2015 and was concluded in December 2019.

As consent holder for the discharge permits related to the activities that occur at the Levin Landfill, the Horowhenua District Council (HDC) is required to prepare and submit an Annual Report to Horizons Regional Council (HRC). Stantec New Zealand (Stantec) has been commissioned to prepare the Annual Report for HDC.

Table 1-1 summarises the reporting requirements and indicates where in this report the required information may be accessed. Appendix A details the consent conditions[1] that require reporting on annually. This consent is the operative consent for this reporting period.

Table 1-1: Summary of Consent Reporting Requirements

Discharge Permit & Condition No.	General Description	Section in the Annual Report
DP 6009 – condition 8	Special and hazardous waste disposal	Section 16
DP 6009 – condition 14	Condition of the old landfill	Section 11
DP 6009 – condition 35	Forward Annual Report to the NLG	Not applicable
DP 6010 – condition 5	Groundwater, surface water and leachate environmental monitoring	Sections 4, 5 and 4.6
DP 6010 – condition 11(d)	Contaminant mass load projections	Section 6
DP 6010 – condition 11(e)	Significance of contaminant mass load projections	Section 6
DP 6010 – condition 14	Refuse density	Section 10
DP 6010 – condition 15(f)	Remediation of the old landfill	Section 11
DP 6010 – condition 27	Leachate irrigation	Section 12
DP 6011 – condition 3	Odour investigations at landfill boundary	Section 8
DP 6011 – condition 5(a) and 8	Landfill gas monitoring in groundwater monitoring wells	Section 8
DP 6011 – condition 5(e), 5(g) and 8	Monthly methane surface monitoring of capped areas and bio-filter	Section 8
DP 6011 – condition 5(j)	Measure and record bio-filter parameters and maintain it	Section 8
DP 6011 – condition 5(p)	Meteorological data	Section 8
DP 102259 – condition 16	Stormwater monitoring	Section 7

1.2 Scope

This report is for the period of July 2021 to June 2022 (herewith referred to as 'the reporting period'). Stantec staff carried out an assessment of the monitoring results and have prepared this monitoring report.

Groundwater, surface water and gas sampling (of groundwater bores) is undertaken by Downer throughout the compliance year as required by the current consent conditions. Envirowaste is responsible for undertaking gas sampling across the landfill. Laboratory analyses have been undertaken by Eurofins ELS in Lower Hutt. ELS is an IANZ (International Accreditation New Zealand) approved laboratory for the tests conducted.

[1] Reviewed consent conditions as finalised on 19 December 2019.

2 Context

2.1 Geology and Hydrogeology

Local geology consists of dune sands at the surface with a wedge of coastal sand deposits (which thicken towards the coast) interlaid with gravels beneath. The sands are generally uniform, grey-brown, fine to medium grained. The overlying topsoil comprises of dark grey and brown fine-grained sand.

Between the site and Hokio Stream there is an area of developed pasture which is underlain by peats of unknown thickness. In recent years the owner of this land has been progressively filling the area with cleanfill, levelling and re-planting. Towards the coast there are areas of swamp. Excavations carried out on a property west of the site on Hokio Beach Road showed at least one metre of peat containing large logs.

Depressions between dunes show evidence of being below the winter water table in some areas. These areas generally are underlain by organic silts, peats or silty sands. To the south of the site some depressions appear to be permanently below the water table.

HRC hydrology staff have advised in the past that "the general confined groundwater flow direction is towards the west". A conceptual model of shallow groundwater in the general region of the landfill is shown in Figure 2-1. We recommend that a review of the groundwater flow directions around both landfill sites be undertaken to ensure that the interpretations based on this general understanding are still accurate.

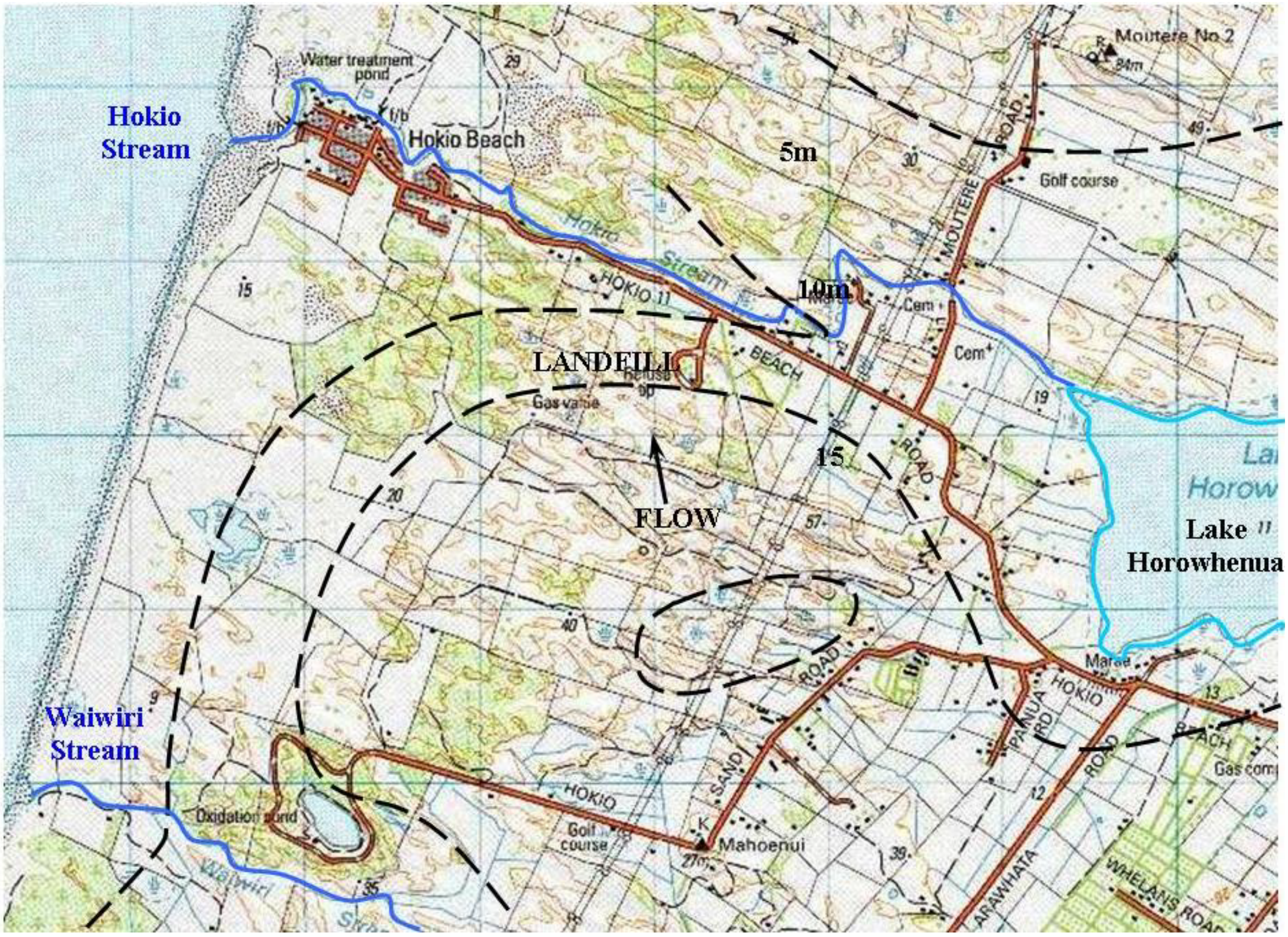


Figure 2-1 Shallow Groundwater Flow Direction

Shallow groundwater flow is in a northerly to westerly direction. Drainage patterns in the coastal strip are influenced by sand dune dominated topography. This considerably complicates the shallow groundwater flow pattern. While deeper aquifers will flow towards the coast, shallow groundwater flow will be affected by surface watercourses and topography. The sand aquifer is shallow and has low to moderate permeability. It contains lenses of peat from swamps overlain by aeolian sand deposits.

There are several private bores within a 1.5km radius of the site. Sampling of groundwater on a private property was last undertaken in March 2014. The results were made available to the property owners and Horizons Regional Council.

2.2 Timeline for Landfill Development

Key milestones in the history of the Levin Landfill are outlined as follows:

- 1970s – Old landfill accepting municipal solid waste.
- 1994 – Commenced installation of groundwater monitoring bores.
- 2002 – Resource consents granted for old, unlined landfill and new landfill operations on the site.
- May 2004 – New landfill commenced operation with Stage 1A.
- 2004 – 2008 – Leachate irrigated on site.
- 2008 – Stage 2 is constructed.
- May 2008 – Leachate irrigation ceased.
- 2009 – 2010 – Resource consent review process.
- 2009 – Four new groundwater monitoring bores installed (G1D; G1S; G2S, and D3r, as a replacement for bore D3)
- 2013 – Stage 3A is constructed.
- 2015 – Stage 3B is constructed.
- 2015 – Initiation of resource consent review process.
- 2016 – Biofilter is installed.
- 2017 – Stage 3C is constructed.
- 2017 – Landfill gas flare is commissioned.
- 2019 – Finalisation of resource consent review process.
- September 2021 – bio-filter was decommissioned and gas pipe from the leachate sump was connected to the main landfill gas pipe network that feeds the landfill gas flare.
- October 2021 – Cessation of disposal operations within the Stage 1A, 2 and 3 footprint area, with that area filled.
- 2022 – permanent capping of the whole landfill surface except for the east-facing front face which has a temporary capping, pending the decision to close the landfill or re-open it with construction of Stage 1B.

3 Monitoring Programme

The sampling program carried out in the 2021-2022 reporting period for discharge permits DP6009, DP6010 and DP102259 is summarised in the table in Appendix B.

Gas monitoring is carried out in July, October, January, and April each year at the groundwater bore locations, as per consent DP 6011. Additional gas emission sampling is carried out on the surface of the landfill, as per consent DP 6011.

Since January 2010, water samples collected from the groundwater boreholes have been tested for dissolved nutrients and metals rather than total concentrations. Dissolved metals are analysed for in samples from Hokio Stream and Tatana Property Drain. For simplicity, results from groundwater monitoring prior to January 2010 (when samples were tested for total metal and nutrient concentrations) have not been compared to the results from January 2010 onwards. Refer to the Site Plan in Appendix C for borehole locations.

3.1 Interpretation of Median Values and Ranges

The monitoring data collected over the 2021-2022 reporting period covered by this report are typically analysed in terms of median values, in comparison with the relevant guidelines or trigger values identified in the applicable discharge consent. It is important to note that due to the sampling programme schedule (Appendix B), some monitoring locations are sampled only once or twice each year (i.e., annual, or 6-monthly sampling) for specific parameters. In these cases, a single result or range has been presented for comparison with guidelines/trigger values, rather than a calculated median. This is because it is inappropriate to calculate median values where there are less than three data points available. Sampling frequencies for all parameters at each monitoring location have been included in the reporting tables, to provide context for the results and interpretation of trends.

All results have been rounded to two decimal places (2 d.p.) for conciseness and ease of interpretation, unless otherwise indicated.

3.2 Note regarding Interpretation of “Non-Detected” Results

For those chemical constituents that were found to be present in concentrations below laboratory detection limits during the reporting period, the results have been assumed to be 50% of the laboratory limit, and a median calculated on this basis. Where all results were below detection limits, the result has been reported as “ND” in the summary tables. 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 *E.coli* is 4 CFU/100mL. The resource consent requires that groundwater from the deep aquifer be compared against the NZ Drinking Water Standard (NZDWS) for compliance purposes. The standard for faecal coliforms is NIL (i.e., 0 CFU/100mL). Any value below 4 CFU/100mL has been considered ‘not detected’ whereas any value at or above this limit has been shown. This method has been applied in all instances where faecal coliforms are assessed for compliance against the NZDWS.

4 Groundwater Monitoring

4.1 Monitoring Rationale

From 1994 onwards groundwater monitoring bores have been installed at the Levin Landfill site to determine:

- The background groundwater quality.
- The direction of groundwater flow.
- Groundwater quality down-gradient of each of the two landfilling areas and other activities on site, such as the discontinued leachate irrigation area and the leachate pond.

There are presently 27 groundwater monitoring bores that are being sampled regularly, as required by the consent conditions.

No monitoring has been carried out within the old unlined landfill footprint. Measurement of actual effects at various distances down-gradient of the landfill and comparison with background groundwater quality provides the most relevant information to assess effects of the landfill on groundwater quality.

Leachate from the old unlined landfill migrates in a downward direction and will mix with groundwater which flows beneath the landfill area. The chemical composition of the groundwater is expected to be affected to a greater degree immediately down-gradient (hydraulically) of the old unlined landfill due to cumulative leachate loading.

The results of the 2021 – 2022 reporting period have been discussed in the following sections and have been grouped based on groundwater depth and the way in which bores have been grouped in the resource consent conditions. Shallow bores have also been grouped by their location relative to the old unlined landfill and new lined landfill.

The number of samples taken per site has varied through the monitoring period and thus this will affect the comparability of averages. Where this differs, it is noted. However, for reference purposes, a complete list of the number of samples per site can be found in Appendix D.

4.2 Description of Monitoring Bores

A Site Plan showing the location and depth of the monitoring bores has been included in Appendix C. The following description of the spatial relationship between the bores and the landfill areas is based on the assessment of groundwater movement performed in 2011. It is recommended that the groundwater flow rate and its direction around the site is reviewed to confirm that the understanding provided here remains accurate.

Deep Bores

Bore G1D is located hydraulically up-gradient of both the old and new landfills in the deep aquifer. The bore at the southeast corner of the site indicates background deep groundwater quality. Deep aquifer bore E1D is located to the west of the old, closed landfill, and deep aquifer bores C2DD and E2D are located hydraulically down-gradient from both the closed landfill and the new operational landfill. Bore Xd1 was installed at the end of 2020 at the north-western corner of the site, downgradient from bore E2D and so downgradient of both the closed landfill and the new operational landfill. Bore D3rd was installed in June 2021, together with bore D3rs, as a replacement for bore D3r which was located within the footprint of the proposed new stage 1B. It is hydraulically down-gradient from the (previously) operational landfill.

Shallow Bores

Bore G1S is located hydraulically up-gradient of both the old and new landfills in the shallow aquifer. The bore at the southeast corner of the site is representative of background shallow groundwater quality.

Bores D1, D2, D3rs (new replacement bore for bore D3r, installed in June 2021), D6 and E1S are located hydraulically up-gradient of the old unlined landfill. Therefore, they represent groundwater uninfluenced by leachate from the old landfill. These boreholes are located hydraulically down-gradient of the new landfill and irrigation areas. The new landfill is lined and has a leachate collection system which significantly reduces the potential for leachate to enter groundwater. Bores D4 and D5 are across or hydraulically up-gradient of the new lined landfill and the old, closed landfill and are away from any areas irrigated between 2004 and 2008. Sampling from D4 and D5 began in December 2004.

Bore F1 is located hydraulically down-gradient of the area where leachate from the lined landfill was irrigated in the south-east of the site. Bores F2 and F3 are in the vicinity of areas originally planned for leachate irrigation. Irrigation did not occur on the western side of the site and hence these bores can be used to represent background groundwater quality. Leachate has not been irrigated at the site since May 2008 at which time the pumping of leachate to the Levin Wastewater Treatment Plant (WWTP) began. It is most unlikely that the leachate will be irrigated to land in the future. Given that irrigation has not occurred over the past 12 years, the F-series bores are used as across-gradient bores for the lined landfill.

Bores B1, B2 and B3 are located on a line parallel to the northern-most extent of tipping for the unlined old landfill (refer to Site Plan, Appendix C). They are all within 50 metres of the old unlined landfill. The B series bores are on the down-gradient edge of the old landfill, with the age of adjacent fill reducing from sample location B1 to B3. Bore B3 is in the swampy area and, in the 2013 annual report, was suspected to be inadequately sealed because of high faecal coliform counts. However, the results for faecal coliforms at B3 have been stable since January 2016 – the largest count since this date being 96 CFU/100mL in January 2022.

The C series bores are located further hydraulically down-gradient from the old unlined landfill towards Hokio Beach Road (refer to Site Plan, Appendix C). Bore C1 is located hydraulically down-gradient of bore B1. It is adjacent to a peaty swamp area, which may affect its water quality. Bore C2 is in the vicinity of bores B2 and B3 but further hydraulically down-gradient of the old unlined landfill. It is located hydraulically down-gradient of a swampy area, which may also affect groundwater quality in this bore.

Bore C2DS, which is also down gradient of the old unlined landfill, is screened deeper than the other shallow bores within the coastal sands, although an influence from recharge through peats is still possible.

Bore E2S is located northwest of the old landfill to detect if there is any groundwater which contains leachate moving directly towards the nearest houses downstream of the site. This bore is across gradient to the west of the B and C series bores which are within the known plume.

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

Bores Xs1 and Xs2 were installed in late 2020 within the Hokio Beach Road reserve. Bore Xs1 is adjacent to Tatana's property and represents groundwater quality close to Hokio Stream. Bore Xs2 is hydraulically up-gradient from the old landfill site.

Bore D3r was replaced in July 2021 by two bores (D3rs and D3rd) located approximately 140 metres northwards of the old D3r bore. The replacement occurred since the old D3r bore was located within the footprint of the future Stage 1B of the landfill. Test results for the new bores have been included in this report.

4.3 Background Groundwater Results

Groundwater is collected from two background bores (G1S and G1D) situated hydraulically up-gradient from the new and old landfills to the southeast of the site (See Site Plan, Appendix C). These two bores were constructed in late 2009 to enable groundwater samples to be collected from the shallow and deep aquifers. Both bores were first sampled in January 2010. Results from bores F2, F3 and D5 can also be used to characterise background shallow groundwater quality.

The water quality results (medians) for the 2021-2022 sampling year from these background bores are presented in Table 4-1. Results for key indicators (ammoniacal-N, chloride, boron, and electrical conductivity) have been coloured to highlight more elevated values (with colour intensity increasing with concentration), to assist in identifying areas with potential contamination issues spatially across the site (i.e., west to east).

Water quality from the natural background water hydraulically up-gradient from the landfill site is not subject to any water quality limits in the existing resource consent. However, for comparison purposes, both the ANZECC Livestock Drinking Water trigger values (LDW) and the Drinking Water Standards of New Zealand (DWSNZ) maximum acceptable values (MAVs) and guideline values (GVs) for aesthetic determinants were used to benchmark the quality of water up-gradient from the landfill site.

Please note, there are differences between the numbers of samples taken at each site. For more information, please see Appendix D.

Table 4-1: Background monitoring bores median results (2021-2022 monitoring period)

Determinant		Units	DWSNZ (MAV) ANZECC LDW	D5	F2	F3	G1S	G1D
Leachate indicators								
Ammoniacal-N	mg/L	1.17		0.01	ND	ND	0.06	0.09
Boron	mg/L	1.4	5	0.04	0.04	0.02	ND	0.04
Chloride	mg/L	250*		28.8	22.95	18.6	104	31.6
Conductivity	mS/m			30.1	21.9	20.7	53.4	27.9
Faecal coliforms (*E. coli*)	CFU/100mL	NIL	100	ND	ND	ND	**39**	**29.5**
pH	-	7 to 8.5*	6 to 9	7.3	7.3	7.45	**6.8**	7.3
Suspended Solids	mg/l			ND	ND	14	95	ND
Phenol	mg/l			ND	ND	ND	ND	ND
VFA	mg/L			ND	ND	ND	ND	ND
TOC	mg/L			2.3	1.8	1.5	31.6	4.6
Alkalinity	mg $CaCO_3$/L			75	56	49	92	64
COD	mg/l			18.75	11.25	29	98	12.75
BOD	mg/L			ND	ND	ND	ND	ND
Nitrate-N	mg/L	11.3	90.3	1.42	0.27	1.12	0.01	ND
Sulphate	mg/L	250*	1000	18.7	10.2	5.48	6.28	19.6
Hardness	mg $CaCO_3$/L	200*		70	40	31	58	57
Calcium	mg/L		1000	12.2	6.66	4.77	11	8.98
Magnesium	mg/L			9.49	5.78	4.54	7.52	8.38
Potassium	mg/L			8.15	5.8	5.18	5.49	7.82
Sodium	mg/L	200*		30.1	26.4	25.7	82.8	30.2

Determinant		Units	DWSNZ (MAV)	ANZECC LDW	D5	F2	F3	G1S	G1D
DRP	mg/L				0.094	0.152	0.161	0.078	0.206
Aluminium	mg/L	0.1*	5		0.003	0.002	0.002	**0.122**	0.003
Arsenic	mg/L	0.01	0.1		0.001	0.001	0.002	0.002	0.002
Cadmium	mg/L	0.004	0.01		ND	ND	ND	ND	ND
Chromium	mg/L	0.05	1		ND	ND	ND	0.002	ND
Copper	mg/L	2	0.4#		0.0012	0.0018	0.0005	0.0068	0.0031
Iron	mg/L	0.2*			0.178	0.02	0.004	**3.425**	**1.21**
Lead	mg/L	0.01	0.1		ND	ND	ND	0.001	0.0006
Manganese	mg/L	0.4			0.0116	0.0116	ND	0.0704	0.0616
Mercury	mg/L				ND	ND	ND	0.0003	ND
Nickel	mg/L	0.08	1		ND	0.0003	ND	0.0014	ND
Zinc	mg/L	1.5*	20		ND	ND	ND	0.008	0.006

Note: * denotes guideline values for aesthetic determinants (G.V.), # copper trigger values range from 0.4 mg/L for sheep, up to 5 mg/L for poultry. “ND” indicates where faecal coliforms were not detected.
Bold red text – denotes an exceedance of the relevant DWSNZ standard.

ND indicates the value was below the laboratory detection limit.

For the 2021-2022 reporting period, the median faecal coliform counts for G1S and G1D exceeded the DWSNZ limit of nil – at 39 CFU/100mL and 29.5 CFU/100mL respectively. For these bores, such exceedances are relatively irregular – the last significant exceedance being in January 2018. For three out of the four times this parameter was sampled during the reporting period, faecal coliforms exceeded the consent limit – suggesting the median exceedance is not an anomaly.

For the 2021-2022 monitoring period, the median pH from the samples taken from the shallow borehole (G1S) was below the DWSNZ MAV range of 7 to 8.5, at 6.8 pH units. The pH recorded in this bore has been consistently low since monitoring began in 2010. The median pH values for the deeper borehole (G1D) and boreholes F2, F3 and D5 were within the DWSNZ MAV range and the LDW range.

The iron concentration at G1D was only sampled once during the reporting period, but at 1.21 mg/L, exceeded the DWSNZ MAV of 0.2 mg/L; this trend is consistent with historical data. The median concentration of iron at G1S was well above the DWSNZ MAV at 3.43 mg/L – like the previous reporting period’s median concentration of 3.5 mg/L. The 2019-2020 and 2018-2019 monitoring periods produced median concentrations of 6.03 mg/L and 13.1 mg/L – demonstrating an observable decrease in iron concentration at G1S. However, considering the most recent data, this trend appears to have slowed down. Continued monitoring can ensure whether this is indeed the case, and when G1S might be expected to meet the DWSNZ MAV for its iron concentration.

For the reporting period the median aluminium concentration at G1S was above the DWSNZ MAV (0.1 mg/L) with a concentration of 0.12 mg/L.

Key leachate parameters chloride and ammoniacal nitrogen recorded results below the relevant guideline values. The results demonstrate that G1S has by far the highest median concentration of chloride (104 mg/L), as well as the highest conductivity (median of 53.4 mS/m). The highest median concentration of ammoniacal nitrogen (0.06 mg/L) was found in G1D. D5, F2 and G1D shared the highest median concentration of boron – 0.04 mg/L – demonstrating that boron concentrations are relatively consistent across these bores.

4.4 Shallow Groundwater Results

This section discusses groundwater quality hydraulically up and down-gradient of the old unlined landfill footprint in the shallow unconfined aquifer (referred to as the ‘sand aquifer’). The D-series, F-series, E1S and G1S bores are all hydraulically up-gradient of the old landfill. In addition, bores D1, D2, D3rs, D6 and E1S are hydraulically upgradient of the old unlined landfill but down-gradient of the new lined landfill. These bores can therefore be used as ‘early detection’ bores for leachate breakouts from the new landfill. D1 and D6 bores are also located down-gradient of the leachate pond and therefore may provide some indication of leachate leakage from the pond.

The B-series, C-series, E2S and G2S bores are all hydraulically down-gradient of the old landfill and are therefore used to assess the impact from the old unlined landfill on groundwater.

The resource consent requires results from these bores to be compared against the LDW trigger values. The results from the reporting period for these bores are presented in Table 4-2 along with the shallow background bore results (G1S – from Table 4-1). Results for key indicators have been coloured to highlight more elevated values (with colour intensity increasing with concentration), to assist in identifying areas with potential contamination issues spatially across the site (i.e., west to east, and down-gradient to up-gradient). A complete table of results for the bores over the last 10 years is presented in Appendix E.

4.4.1 Groundwater Quality Hydraulically Up-Gradient of the Old Landfill

Bores hydraulically up-gradient of the old landfill include bores which are down-gradient of the new landfill.

None of the applicable ANZECC LDW trigger values were exceeded at groundwater bores up-gradient of the old landfill during the 2021-2022 reporting period. The results indicate that there is no leachate from the new lined landfill impacting on groundwater down-gradient of the landfill.

Concentrations of ammoniacal-N have been consistently elevated within bore D2 when compared to background bore G1S since monitoring began in both bores. A slight increasing trend has been continuing with fluctuations since 2015 – with April 2022 having the highest quarterly concentration of 0.6 mg/L since then. This trend will continue to be evaluated annually. Bore D2 is located down-gradient of the new landfill and therefore elevated concentrations of key leachate indicator parameters such as ammoniacal-N could indicate a break-out of leachate. It is noted however that the concentration of ammoniacal-N has been consistently elevated since monitoring began in 1997, seven years before the new landfill began operation.

Bore G1S exhibited a significant increase in median chloride concentration for this reporting period when compared with the 2020-2021 report: 104 mg/L against the previous median of 62.7 mg/L. However, this year’s median for chloride is relatively consistent with historical trends – excluding the 2020-2021 monitoring period. G1S also had the highest conductivity compared with other upgradient bores.

Bores D1 and D6 are both down-gradient of the leachate pond and were noted in the 2019-2020 annual report as having increased concentrations of nitrate-N since 2008. This increase slowed in October 2018 and, since then, has in fact shown a decreasing trend. The concentrations observed are discussed further in Section 4.7.2.

Bore F1 is located down-gradient of the leachate irrigation area and was observed to have slightly elevated concentrations of DRP during this reporting period. Irrigation ceased in 2008 and therefore it is considered unlikely these slightly elevated concentrations are a result of the discharge of leachate to land in this area. The concentration of DRP recorded in this bore has been mostly consistent since 2007.

Selected down-gradient bores were also analysed for volatile organic compounds (VOC) and semi-volatile organic compounds (SVOC) throughout the monitoring period 2021-2022. The range of concentrations detected above laboratory detection limits at each location are detailed in Table 4-3 and no exceedances of the ANZECC 2000 guideline were detected.

Please note, there are differences between the number of samples taken at each site. For more information, please see Appendix D.

Table 4-2: Groundwater hydraulically up-gradient of Old Landfill and down-gradient of new landfill: median or singular results (2021-2022 monitoring period).

Determinant	Units	ANZECC LDW	D5	E1S	D4	D2	D6	D1	F1	G1S
Leachate Indicators										
Ammoniacal-N	mg/L		0.01	0.19	0.24	0.58	ND	0.01	ND	0.06
Boron	mg/L	5	0.04	0.02	0.03	0.06	0.05	0.06	0.04	ND
Chloride	mg/L		28.8	26.7	35.95	40.4	19.1	27.75	44.25	104
Conductivity	mS/m		30.5	26.1	29.6	44.3	38.7	43.4	43.8	53.4
Faecal coliforms (*E. coli*)	CFU/100mL	100	3	2	49	26.95	9	2	2	39
pH	-	6 to 9	7.3	7.1	7.05	6.55	6.95	7.15	7	6.8
Suspended Solids	mg/l		ND	3	2.5	6	ND	ND	ND	95
Phenol	mg/l		ND	ND	ND	0.03	ND	0.03	ND	ND
VFA	mg/L		ND	ND	ND	ND	ND	ND	ND	ND
TOC	mg/L		2.3	7	3	16.1	1	1.3	6	31.6
Alkalinity	mg $CaCO_3$/L		75	82	70	162	90	109	141	92
COD	mg/l		18.75	21.5	17.5	27	ND	ND	24.5	98
BOD	mg/L		ND	ND	ND	ND	ND	ND	ND	ND
Nitrate-N	mg/L	90.3	1.42	ND	ND	0.01	15.2	9.26	0.6	0.01
Sulphate	mg/L	1000	18.7	3.58	12.9	0.04	5.48	9.85	2.97	6.28
Hardness	mg $CaCO_3$/L		70	61	56	123	96	90	123	58
Calcium	mg/L	1000	12.2	12.2	10	20.8	17.3	16.4	18.4	11
Magnesium	mg/L		9.49	7.48	7.47	17.2	12.8	11.9	18.8	7.52
Potassium	mg/L		8.15	6.6	6.76	10.9	8.35	9.42	8.66	5.49
Sodium	mg/L		30.1	27.95	33.15	36.9	26.3	33.5	40.6	82.8
DRP	mg/L		0.094	0.074	0.023	0.06	0.1	0.097	0.182	0.078

Determinant	Units	ANZECC LDW	D5	E1S	D4	D2	D6	D1	F1	G1S
Leachate Indicators										
Aluminium	mg/L	5	0.003	0.007	0.002	0.01	0.002	ND	0.002	0.122
Arsenic	mg/L	0.1	0.001	0.002	0.002	0.001	0.001	0.001	0.002	0.002
Cadmium	mg/L	0.01	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	mg/L	1	ND	ND	ND	ND	ND	ND	ND	0.002
Copper	mg/L	0.4[#]	0.0012	0.0009	0.0139	0.0006	0.0008	0.0014	0.003	0.0068
Iron	mg/L		0.178	5.145	0.555	8.09	0.011	0.006	ND	3.425
Lead	mg/L	0.1	ND	0.0008	ND	0.0003	ND	0.0003	ND	0.001
Manganese	mg/L		0.0116	0.25	0.1915	0.422	0.0013	0.0007	0.011	0.0704
Mercury	mg/L		ND	ND	ND	0.0003	ND	0.0003	ND	0.0003
Nickel	mg/L	1	ND	ND	ND	0.0003	ND	0.0003	0.0005	0.0014
Zinc	mg/L	20	ND	0.004	0.006	0.009	0.023	0.018	ND	0.008

Note: The counts for faecal coliforms should be used with caution as a high result for one sample will appear misleading as the other samples were not detected.

ND indicates the value was below the laboratory detection limit.

Table 4-3: VOCs detected in samples from bores hydraulically up-gradient of Old Landfill and down-gradient of new landfill, 2021-2022

Date	Determinant	Laboratory detection limit (from Eurofins-ELS) mg/L	ANZECC 2000 DGV (mg/L)	Detected concentrations at down-gradient bores (mg/L)						Common source/usage of determinant (from relevant ANZECC 2000 Volume 2, Section 8.3.7 technical briefs)
				D1	D3r (not sampled)	D4	D5	D6	F1	
20/04/2022	VOC-016 Toluene	0.0005	0.18	0.0009	-	ND	ND	0.002	ND	Hydrocarbon; fuel additives (vehicles)
20/04/2022	SVOC-072 Bis(2-ethylhexyl)adipate	0.0001	Not Listed	ND	-	ND	ND	ND	0.0001	Not Listed

Note: ND indicates the value was below the laboratory detection limit.

4.4.2 Groundwater Quality Hydraulically Down-Gradient of the Old Landfill

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

Results for all parameters were below the ANZECC LDW trigger values in the reporting period, within all bores except C2. Therefore, all bores hydraulically down-gradient of the old landfill except for C2 complied with the resource consent conditions.

For C2, all measured parameters except for faecal coliforms (measured as *E.coli*) were compliant with relevant standards. Faecal coliforms were only sampled three times during this period – yielding a median of 260 CFU/100mL, compared to the consent limit of 100 CFU/100mL. C2 was also the only down-gradient bore site where analysis of all required sampling parameters was not completed – only some parameters were tested for.

Results for key indicators in Table 4-4 have been coloured to highlight more elevated values (with colour intensity increasing with concentration), to assist in identifying areas with elevated contaminant concentrations indicating the presence of the leachate plume from the old landfill spatially across the site (i.e., west to east).
Elevated concentrations were observed as follows:

- Leachate indicator concentrations (ammoniacal-N, boron, chloride, and conductivity) were more elevated in the western-most down-gradient bores (B1, B2, B3, C2, and G2S) – akin to the 2020-2021 reporting period.
- Concentrations often varied significantly between the bores, although, bores E2S, G1S and XS2 yielded consistently lower results than the other sites. This indicates the leachate plume is **not** moving directly towards the nearest houses downstream of the site.

Please note, there are differences between the number of samples taken at each site. For more information, please see Appendix D.

Selected down-gradient bores were also analysed for volatile organic compounds (VOC) and semi-volatile organic compounds (SVOC) throughout the reporting period. Of the four detected substances, only one exceeded the guideline value - SVOC-029 Carbofuran, which exceeded the DGVs for 99^{th}, 95^{th} and 90^{th} percentile species protection against toxic effects. The range of concentrations detected above laboratory detection limits at each location are detailed in Table 4-5.

Table 4-4: Median or singular result for hydraulically down-gradient groundwater monitoring bores (2021-2022 monitoring period) – *bores listed L to R (west to east)*

Determinant	Units	ANZECC LDW	E2S	B3	XS1	C2	C2DS	B2	C1	B1	G2S	G1S	XS2
Leachate indicators													
Ammoniacal-N	mg/L		0.31	173.5	9.6	165	1.39	39.8	3.32	8.57	0.02	0.06	0.05
Boron	mg/L	5	0.02	1.2	0.27	1.49	0.74	2.03	0.92	1.36	0.99	ND	0.04
Chloride	mg/L		38.1	138	88.8	127	76.95	114.5	137	277.5	158	104	12.5
Conductivity	mS/m		33.2	248	113.7	238	121.5	195	101.5	189.5	125.5	53.4	17.4
Faecal coliforms (*E. coli*)	CFU/100mL	100	4	50	14	**260**	3	81	21	2	2	38	7
pH	-	6 to 9	7.8	7.2	6.6	7.2	7.05	6.95	6.9	6.95	7.35	6.8	6.9
Suspended Solids	mg/l		9	88	75		145	20	148	18	4	95	9
Phenol	mg/l		ND	ND	ND		ND	ND	0.03	ND	ND	ND	ND
VFA	mg/L		ND	ND	ND		ND	ND	ND	ND	ND	ND	ND
TOC	mg/L		2.4	55.1	25.7		23.8	32	22.8	31.2	9	31.6	2.2
Alkalinity	mg $CaCO_3$/L		82	1070	557		629	683	258	648	164	92	49
COD	mg/l		12.75	200.5	66	135	69.5	99.5	78	88.5	40	98	11.25
BOD	mg/L		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.45
Nitrate-N	mg/L	90.3	ND	0.05	0.03	0.05	0.05	44.25	0.05	4.79	ND	0.01	0.66
Sulphate	mg/L	1000	11	0.11	1.99		ND	8.99	37.2	3.31	5.8	6.28	7.49
Hardness	mg $CaCO_3$/L		77	280	418		553	675	209	385	81	58	43
Calcium	mg/L	1000	21.3	52.8	82.2		123	146	36.80	74.1	15.7	11	9.49
Magnesium	mg/L		5.84	35.9	50.2		59.5	75.3	28.4	48.6	10	7.52	4.78
Potassium	mg/L		6.28	120	20.3		14.9	67.7	17.7	20.3	9.45	5.49	3.83
Sodium	mg/L		28.8	138	99.5		95.5	124	94	283	96.4	82.8	14.2
DRP	mg/L		0.201	0.032	0.017		0.02	0.016	0.01	0.109	0.029	0.078	0.015

Determinant	Units	ANZECC LDW	E2S	B3	XS1	C2	C2DS	B2	C1	B1	G2S	G1S	XS2
Aluminum	mg/L	5	0.002	0.005	0.005	0.018	0.004	0.012	0.02	0.007	0.004	0.122	0.011
Arsenic	mg/L	0.5	0.001	0.024	ND		0.001	0.002	0.002	0.001	ND	0.002	ND
Cadmium	mg/L	0.01	ND	ND	ND		ND	ND	ND	ND	ND	ND	ND
Chromium	mg/L	1	ND	0.004	0.001		ND	ND	ND	0.002	ND	0.002	ND
Copper	mg/L	0.4	ND	0.0025	0.0004		0.0008	0.0041	0.0055	0.0185	0.008	0.0068	0.0008
Iron	mg/L		0.071	0.539	2.61		2.45	0.187	0.454	0.102	0.114	3.425	0.074
Lead	mg/L	0.1	ND	ND	0.0003	0.0004	ND	ND	0.0003	ND	ND	0.001	0.0003
Manganese	mg/L		0.2225	2.675	1.45	0.0554	1.825	3.885	0.2755	6.96	0.0921	0.0704	0.0731
Mercury	mg/L		ND	ND	0.0003	ND	ND	ND	0.0003	ND	ND	0.0003	0.0003
Nickel	mg/L	1	ND	0.0088	0.0015	0.0043	0.0021	0.0027	0.001	0.0044	0.0033	0.0014	0.0003
Zinc	mg/L	20	ND	0.006	0.002		0.002	0.017	0.004	0.046	ND	0.008	ND

Bold text – denotes an exceedance of the relevant ANZECC LDW standard.

ND indicates the value was below the laboratory detection limit.

Table 4-5 SVOCs and VOCs detected in samples from down-gradient groundwater bores, 2021-2022.

Date	Determinant	Laboratory detection limit (from Eurofins-ELS) mg/L	ANZECC 2000 DGV (mg/L)	Detected concentrations at down-gradient bores (mg/L)						Common source/usage of determinant (from relevant ANZECC 2000 Volume 2, Section 8.3.7 technical briefs)
				B3 (B3s)	C2 (not sampled)	G2s	B2	B1	XS1	
27/04/2022	SVOC-029 Carbofuran	0.001	0.00006 (99th percentile) 0.0012 (95th percentile) 0.004 (90th percentile) 0.015 (80th percentile)	**0.008**	-	ND	ND	ND	ND	Insecticide and nematicide
06/05/2022	SVOC-072 Bis(2-ethylhexyl)adipate	0.0001	Not Listed	ND	-	ND	ND	0.0002	ND	Not Listed

Date	Determinant	Laboratory detection limit (from Eurofins-ELS) mg/L	ANZECC 2000 DGV (mg/L)	Detected concentrations at down-gradient bores (mg/L)						Common source/usage of determinant (from relevant ANZECC 2000 Volume 2, Section 8.3.7 technical briefs)
				B3 (B3s)	C2 (not sampled)	G2s	B2	B1	XS1	
27/04/2022	VOC-003 Benzene	0.0005	0.6 (99th percentile) 0.95 (95th percentile) 1.3 (90th percentile) 2.0 (80th percentile)	0.0009	-	ND	ND	ND	ND	Adhesives, resins, pesticides, ink, industrial cleaners/degreasers, thinners and fuel additives.
27/04/2022	VOC-058 Chlorobenzene	0.0005	0.005 (99th percentile) 0.055 (95th percentile) 0.1 (90th percentile) 0.19 (80th percentile)	0.0021	-	ND	0.0045	ND	ND	Industrial solvents for waxes, gums, resins, rubbers, oil, asphalt, degreasing and intermediates for pesticides/herbicides

Note: ND indicates the value was below the laboratory detection limit.

4.4.3 Groundwater Quality Hydraulically Down-Gradient of the Old Irrigation Area

It is appropriate to use the F-series bores as cross-gradient monitoring bores for the lined landfill because irrigation has not occurred for the past 13 years. The monitoring record for these bores has been assessed in detail in the previous sections of this report (Section 4.3 (Bores F2 and F3) and Section 4.4.1 (Bore F1)).

The water quality results for the F series bores are slightly variable – F1 producing the largest concentrations of leachate indicators (conductivity, boron, chloride and ammoniacal nitrogen), though even these concentrations are not elevated, except for chloride. A median chloride concentration of 44.25 mg/L and conductivity of 43.8 mS/m was apparent in F1 – around twice that of both F2 and F3. Whilst the F series results are not elevated when compared against the background shallow groundwater quality up-gradient of the old landfill, the variability within the F series could be indicative of some influence on the shallow groundwater. It should be noted that no irrigation of leachate has occurred on the site since 2008.

4.5 Deep Gravel Aquifer Results

The resource consent requires results from gravel (deep) aquifers to be compared against the DWSNZ MAVs. A complete table of results for the gravel aquifer bores over the last 10 years is presented in Appendix E.

Median concentrations for parameters analysed during the reporting period for the six bores intercepting the gravel aquifer (XD1, E1D, C2DD, E2D and D3rd) are provided in Table 4-6.

Results for the background deep-bore G1D have also been included in Table 4-6 for comparison. This is the only background bore in the deep aquifer. Results for key indicators have been coloured to highlight more elevated values (with the highest being a darker shade) to assist in identifying areas with potential contamination issues spatially across the site (i.e., west to east, and down-gradient to up-gradient).

The DWSNZ MAVs (consent limits) were **exceeded** for five parameters as follows:

- Faecal coliforms were above the DWSNZ MAV of nil for:
  - XD1, at 5 CFU/100mL
  - E1D, at 11 CFU/100mL
  - D3rd, at 8 CFU/100mL
  - G1D, at 29.5 CFU/100mL
  - It is worth noting that faecal coliform counts (measured as *E. coli*) were noticeably varied between each of the quarterly samples, which is an unusual trend not typically seen in groundwater. Future results will be examined further to try and identify the cause.
- Hardness at D3rd; median of 220 mg CaCO3/L
- Arsenic at D3rd; median of 0.018 mg/L
- Iron at G1D; median of 1.21 mg/L was significantly larger than the DWSNZ MAV of 0.2 mg/L.
- Manganese:
  - In bores E2D and G1D, median of 0.4015 mg/L was marginally higher than the DWSNZ MAV of 0.4 mg/L.
  - In bores XD1, C2DD and D3rd, medians of 0.62 mg/L, 0.49 mg/L and 0.5 mg/L (respectively) were considerably greater than the DWSNZ MAV.

Please note, there are differences between the number of samples taken at each site. For more information, please see Appendix D.

Deep bores were also analysed for VOCs and SVOCs throughout the reporting period. Only one contaminant was detected within the deep bores, in April 2022; SVOC-072 Bis(2-ethylhexyl) adipate at 0.0001mg/L within D3rd (Table 4-7).

Table 4-6: Gravel aquifer median or singular results (2021-2022 monitoring period) – *bores listed L to R (west to east)*

Determinant	Units	DWSNZ (MAV)	XD1	E2D	E1D	C2DD	D3rd	G1D
Leachate Indicators								
Ammoniacal-N	mg/L	1.17	0.39	0.26	0.2	0.33	0.28	0.09
Boron	mg/L	1.4	0.06	0.06	0.06	0.07	0.05	0.04
Chloride	mg/L	250*	57.7	40.75	38.9	40.85	32	31.6
Conductivity	mS/m		54.1	44.5	45	41	53.1	27.9
Faecal coliforms (*E. coli*)	CFU/100mL	NIL	**5**	ND	**11**	ND	**8**	**29.5**
pH	-	7 to 8.5*	7.55	7.6	7.7	7.6	7.5	7.3
Suspended Solids	mg/l		72	2.5	7	115	206	2.5
Phenol	mg/l		ND	ND	ND	ND	ND	ND
VFA	mg/L		ND	ND	ND	ND	ND	ND
TOC	mg/L		4.6	3.1	3.7	4.8	5.9	4.6
Alkalinity	mg CaCO3/L		180	157	164	226	224	64
COD	mg/l		29	ND	12.25	17	18	12.75
BOD	mg/L		ND	ND	ND	ND	ND	ND
Nitrate-N	mg/L	11.3	ND	ND	ND	ND	0.11	ND
Sulphate	mg/L	250*	ND	ND	ND	0.02	ND	19.6
Hardness	mg CaCO3/L	200*	149	128	137	186	**220**	57
Calcium	mg/L		35.1	28.1	32.8	47.8	64.3	8.98
Magnesium	mg/L		15	13.9	13.2	16.2	14.5	8.38
Potassium	mg/L		5.32	7.31	5.75	7.87	7.52	7.82
Sodium	mg/L	200*	46.9	43	37.65	40.5	22.4	30.2
D.R. Phosphorus	mg/L		0.111	0.632	0.421	0.662	1.18	0.206

Determinant	Units	DWSNZ (MAV)	XD1	E2D	E1D	C2DD	D3rd	G1D
Aluminium	mg/L	0.1*	0.003	0.002	0.003	0.003	0.005	0.003
Arsenic	mg/L	0.01	ND	0.001	0.006	0.004	**0.018**	0.002
Cadmium	mg/L	0.004	ND	ND	ND	ND	ND	ND
Chromium	mg/L	0.05	ND	ND	ND	ND	ND	ND
Copper	mg/L	2	0.0004	ND	0.0009	0.0006	0.0011	0.0031
Iron	mg/L	0.2*	0.067	0.071	0.039	0.022	0.017	**1.21**
Lead	mg/L	0.01	0.0003	0.0007	0.0004	0.0003	ND	0.0006
Manganese	mg/L	0.4	**0.4915**	**0.4015**	0.236	**0.6225**	**0.498**	0.0616
Mercury	mg/L		0.0003	ND	ND	ND	ND	ND
Nickel	mg/L	0.08	0.0003	ND	ND	ND	ND	ND
Zinc	mg/L	1.5*	ND	0.004	ND	0.004	ND	0.006

Note: * denotes guideline values for aesthetic determinants (G.V.); **Bold red text** – denotes an exceedance of the DWSNZ.

ND indicates the value was below the laboratory detection limit.

Table 4-7: SVOC detected in sample from deep aquifer bores, 2021-2022. Only D3rd showed positive detection.

Date	Determinant	Laboratory detection limit (from Eurofins-ELS) mg/L	ANZECC 2000 DGV (mg/L)	Detected concentrations at down-gradient bores (mg/L)	Common source/usage of determinant (from relevant ANZECC 2000 Volume 2, Section 8.3.7 technical briefs)
				D3rd	
27/04/2022	SVOC-072 Bis(2-ethylhexyl)adipate	0.0001	Not Listed	**0.0001**	Not Listed

4.6 Leachate

The leachate pond has not been used to store leachate for several years. The leachate pumping system has been connected so that leachate is pumped to a manhole next to the leachate pond from where it is pumped to the Levin WWTP. Samples of leachate are now taken directly from the manhole next to the leachate pond.

The monitoring results for the leachate are **not subject to any specific limits in the resource consent**. However, typical leachate characteristics for Class 1-type landfills published by the Waste Management Institute of New Zealand (*Technical Guidelines for Disposal to Land*, August 2018, WasteMINZ) have been included to contextualise the observed state of the leachate (Table 4-7).

Table 4-7: Median or range of results for Leachate (2021-2022 monitoring period)

Determinant	Units	Typical Leachate Characteristics*	Leachate
Leachate indicators			
Ammoniacal-N	mg/L	3.4 -1,440	1,360
Boron	mg/L	0.54 – 20.1	6.24
Chloride	mg/L	45 – 2,584	1,090
Conductivity	mS/m	308 – 27,900	1,485
Faecal coliforms (*E. coli*)	CFU/100mL	-	450
pH	-	5.9 - 8.5	7.7
Suspended Solids	mg/l	-	107
Phenol	mg/l	-	ND
VFA	mg/L	-	25
TOC	mg/L	17.2 - 822	705
Alkalinity	mg CaCO3/L	264 – 6,820	6,630
COD	mg/l	84 – 5,090	4,290
BOD	mg/L	12 – 3,867	100
Nitrate-N	mg/L	-	0.5
Sulphate	mg/L	1 - 780	16.3
Hardness	mg CaCO3/L	-	496
Calcium	mg/L	20 – 600***	106
Magnesium	mg/L	40 – 350***	56.7
Potassium	mg/L	10 – 2,500**	676
Sodium	mg/L	50 – 4,000**	988
DRP	mg/L	-	14.8
Aluminium	mg/L	-	0.63
Arsenic	mg/L	0.005 – 1.60**	0.324
Cadmium	mg/L	0.0005 – 0.140**	0.001
Chromium	mg/L	0.005 – 50.4	0.739
Copper	mg/L	0.004 – 1.40**	0.01
Iron	mg/L	1.6 - 220	4.98
Lead	mg/L	0.001 – 0.42	0.0025

Determinant	Units	Typical Leachate Characteristics*	Leachate
Manganese	mg/L	0.03 – 45***	1.26
Mercury	mg/L	0.2 – 50***	**0.0014**
Nickel	mg/L	0.02 – 2.05**	0.109
Zinc	mg/L	0.009 – 24.2	0.062

Notes:
*for Class 1-type landfills, Table 5-5, p82, Technical Guidelines for Disposal to Land, WasteMINZ August 2018 (same as Table 4.2 of the CAE Landfill Guidelines 2000, but corrections made to Table 5-5 in line with Table 4.2).
**Data taken from Table 5-4, p81 of the same guideline, for determinants for which no differences in concentrations between the phases of landfill development could be observed in the table.
***Data taken from Table 5-4, p81 of the same guideline, for determinants during the methanogenic phase.

The median results (or observed ranges) for leachate were mostly within the typical leachate composition range for Class 1 landfills published in the *Technical Guidelines for Disposal to Land* (WasteMINZ, 2018). The only exception to this was the median value for mercury (shown in bold), which was **below the lower range** of 0.2 mg/L, with a concentration of 0.0014 mg/L. This is consistent with results observed in the previous reporting period.

Samples of leachate were collected and analysed for VOCs and SVOCs during the reporting period. One SVOC and 14 VOCs were detected from the samples and compared against the relevant ANZECC DGVs for toxicity in Table 4-8 below. Of these 15 results, only one result exceeded the DGVs. This related to SVOC-062 Naphthalene, which was detected at a concentration of 0.003 mg/L in April 2022: exceeding the DGV for 99th percentile species protection in the April (0.0025 mg/L).

Table 4-8 SVOCs and VOCs detected in samples of leachate, 2021-2022. Exceedances of the ANZECC 2000 default guidelines are in bold.

Date sampled	Determinant	Detected concentration (mg/L)	ANZECC 2000 default guideline value(s) for toxicants (percentile for species protection in brackets) (mg/L)	Common source/usage of determinant (from relevant ANZECC 2000 Volume 2, Section 8.3.7 technical briefs)
21/04/2022	SVOC-062 Naphthalene	0.003	0.0025 (99th percentile) 0.016 (95th percentile) 0.037 (90th percentile) 0.085 (80th percentile)	A Polycyclic Aromatic Hydrocarbon (PAH) found in runoff from road surfaces; generally produced from anthropogenic combustion processes
21/04/2022	VOC-001 1,2,4-Trimethylbenzene	0.002	Not defined	No brief available
21/04/2022	VOC-003 Benzene	0.0048	0.6 (99th percentile) 0.95 (95th percentile) 1.3 (90th percentile) 2.0 (80th percentile)	An aromatic hydrocarbon important in aromatic solvents used for adhesives, pesticides, cleaners/degreasers and fuel additives. A common industrial chemical intermediate.
21/04/2022	VOC-007 Naphthalene	0.0018	0.0025 (99th percentile) 0.016 (95th percentile) 0.037 (90th percentile) 0.085 (80th percentile)	A Polycyclic Aromatic Hydrocarbon (PAH) found in runoff from road surfaces; generally produced from anthropogenic combustion processes
21/04/2022	VOC-010 o-Xylene	0.0176	0.2 (99th percentile) 0.35 (95th percentile) 0.47 (90th percentile) 0.64 (80th percentile)	Hydrocarbon; used in aviation fuel and polyester manufacture.
21/04/2022	VOC-011 p-Isopropyltoluene	0.0058	Not defined	No brief available
21/04/2022	VOC-015 tert-Butylbenzene	0.0012	Not defined	No brief available

Date sampled	Determinant	Detected concentration (mg/L)	ANZECC 2000 default guideline value(s) for toxicants (percentile for species protection in brackets) (mg/L)	Common source/usage of determinant (from relevant ANZECC 2000 Volume 2, Section 8.3.7 technical briefs)
21/04/2022	VOC-016 Toluene	0.024	0.11 (99th percentile) 0.18 (95th percentile) 0.23 (90th percentile) 0.33 (80th percentile)	Hydrocarbon; fuel additives (vehicles)
21/04/2022	VOC-017 Total p,m Xylene, Ethylbenzene	0.0237	Not defined	No brief available
21/04/2022	VOC-028 1,2-Dichloroethane	0.0008	1.0 (99th percentile) 1.9 (95th percentile) 2.6 (90th percentile) 4.0 (80th percentile)	Volatile solvent commonly used as industrial solvents and products, dry-cleaning agents, anaesthetics, and household products.
21/04/2022	VOC-029 1,2-Dichloropropane	0.0007	0.6 (99th percentile) 0.9 (95th percentile) 1.2 (90th percentile) 1.8 (80th percentile)	Soil and grain fumigants, plastics, resins, rubbers, degreasers, and chemical intermediates.
21/04/2022	VOC-046 trans-1,3-Dichloropropene	0.0016	Not defined	Soil and grain fumigants, plastics, resins, rubbers, degreasers, and chemical intermediates.
21/04/2022	VOC-051 1,2,4-Trichlorobenzene	0.002	0.085 (99th percentile) 0.17 (95th percentile) 0.22 (90th percentile) 0.3 (80th percentile)	Industrial solvents for waxes, gums, resins, rubbers, oil, asphalt, degreasing and intermediates for pesticides/herbicides
21/04/2022	VOC-054 1,4-Dichlorobenzene	0.0008	0.04 (99th percentile) 0.06 (95th percentile) 0.075 (90th percentile) 0.1 (80th percentile)	Industrial solvents for waxes, gums, resins, rubbers, oil, asphalt, degreasing and intermediates for pesticides/herbicides
21/04/2022	VOC-058 Chlorobenzene (Monochlorobenzene)	0.0011	0.005 (99th percentile) 0.055 (95th percentile) 0.1 (90th percentile) 0.19 (80th percentile)	Industrial solvents for waxes, gums, resins, rubbers, oil, asphalt, degreasing and intermediates for pesticides/herbicides

4.7 Groundwater Quality Discussion

4.7.1 Background

Key trends observed in the bores which are representative of background groundwater quality during this reporting period, based on the monitoring results detailed in Section 4.3 above, included:

- Shallow background groundwater quality in G1S continues to be characterised by low pH.
- Faecal coliform counts were elevated above the consented limit (nil) in the deeper aquifer bores. However, the results were highly variable which is unusual in groundwater. While the median value from all results collected in the reporting period was consistent with historic median values (which also tended towards exceeding consent limits), it is possible that the median is being skewed by irregularities between the quarterly samples. Sometimes these irregularities can result from various factors, including environmental conditions on the day of sampling, sample quality issues (such as conditions during transit) amongst other factors. It is recommended that in future both a blind duplicate and a field blank sample are collected at Bore G1D and analysed for quality assurance and quality control (QA/QC) purposes, to rule out any human error.
- The iron concentrations measured in both G1S and G1D continue to fluctuate above the consent limit, however, that of G1S has decreased markedly since its peak in the 2019-2022 period. The presence of iron is likely due to hydrogeological conditions found at the site and is common in groundwater in this area.
- The aluminium concentration of G1S has decreased slightly since last year, however, is still slightly elevated above the consent limit.
- The sulphate concentration in bore G1S appears to have stabilised to within the historic range.

Historically (and within this report) bores G1S and G1D have been used to represent reference background conditions, for comparison with the down-gradient bores. It is noted however the D2, F5 and F3 bores are also screened up-gradient within the shallow aquifer and record lower concentrations of key leachate indicators. It is possible therefore that one or a combination of these bores may be more appropriate as a reference background.

4.7.2 Shallow Aquifer Hydraulically Up-Gradient of the Old Landfill

Key trends observed in the shallow aquifer bores up-gradient of the old landfill during this reporting period, based on the monitoring results detailed in Section 4.4.1 above, included:

- In previous years, concentrations of nitrate-nitrogen concentrations have been highest in bores D1 and D6. The median concentration of nitrate-nitrogen in bore D1 has decreased compared to the previous two reporting periods (Table 4-9). The median concentration in bore D6 has decreased compared to last year but is still 0.9 mg/L greater than the earlier 2019-2020 reporting period. These fluctuations are consistent with historical records.
- Concentrations for other leachate indicators such as chloride and ammoniacal nitrogen were relatively consistent with background concentrations and historic results. Boron was slightly elevated compared to background concentrations, but not significantly.

Table 4-9: Comparison of median nitrate-N concentrations in up-gradient bores with previous two reporting periods (2019-2020 and 2020-2021).

Reporting period	Median concentration of nitrate-N (mg/L) in up-gradient groundwater bores	
	D1	D6
2021/22	9.26	15.2
2020/21	10.44	18.95
2019/20	11.5	14.3

4.7.3 Shallow Aquifer Hydraulically Down-Gradient of the Old Landfill

Key trends observed in the shallow aquifer bores down-gradient of the old landfill during this reporting period, based on the monitoring results detailed in Section 4.4.2 above, included:

- Leachate indicators (such as chloride, ammoniacal-nitrogen and boron) were detected at elevated concentrations, particularly in bores B1, B2, B3, C2 and G2S. Boron is the only leachate indicator with an assigned consent limit (5 mg/L, ANZECC LDW), and this was not exceeded in any of the shallow aquifer down-gradient bores.
- The water quality samples from E2S are like those from the shallow aquifer hydraulically up-gradient of the site (D- and F-series bores, and G1S). Concentrations of landfill leachate indicators such as chloride and boron are much lower at E2S than at the other downgradient bore sites. It is therefore likely that this bore is not intercepting the leachate plume originating from the old unlined landfill.
- Bore C2 exceeded the consent limit for faecal coliforms. However, the median value was lower than that the maximum value measured last year.
- Bores B1, B3, B3, C2 and G2S all appear to be located and screened within the leachate plume. Whilst there has historically been some variability in the concentration of the key leachate indicators individually, when assessed as a whole, results indicate a slightly decreasing to stabilising trend in the indicators across these five bores.
- However, boron concentrations have been gradually increasing within bores B3 and C2 since monitoring began. This is also the case for ammoniacal-nitrogen within bore B3, Concentrations of both indicators have been stable since the 2018-2019 reporting period though they remain elevated compared to pre-2018 records.

It was recommended in the 2019-2020 annual report that groundwater levels were recorded at the same time as any scheduled groundwater quality monitoring events from October 2019 onwards, to enable further assessment of groundwater flow directions. Groundwater levels continue to be measured during monitoring events and typically show variations consistent with historic data. Levels measured in the 2021-2022 reporting year are generally within historical ranges for the hydraulically down-gradient bores, however, the annual median level at bore B3 was 0 mBGL (from three records of 0 mBGL and one of 0.26 mBGL taken throughout the year) and the annual median levels for bores C1 and C2 were 0.11 mBGL and 0.115 mBGL respectively.

4.7.4 Deep Gravel Aquifer

Key trends observed in the deep gravel aquifer bores during this reporting period, based on the monitoring results detailed in Section 4.5 above, included:

- Faecal coliforms were detected within all bores which intercept the deep gravel aquifer including the background deep bore (G1D). Although *E.coli* counts only ranged between 2 and 11 CFU/100mL, these results are still considered a non-compliance. Of all these bores, the background bore G1D had the highest count (29.5 CFU/100mL) which suggests that the observed exceedances are not related to the landfill.
- Bore D3rd also had levels of Hardness and Arsenic which were above consented limits, with annual median values of 220 mg and 0.018 mg $CaCO_3$/L respectively. This bore was only sampled three times throughout the monitoring period (instead of the required four). The consented limit for manganese was exceeded within bores XD1 (0.49 mg/L), E2D (0.4 mg/L), C2DD (0.62 mg/L) and D3rd (0.5 mg/L). The exceedances for bores C2DD and XD1 were consistent with historical data, however, the slight exceedance at E2D was abnormal in comparison with recent reporting periods.

4.7.5 Overall Groundwater Quality

Conductivity, boron, chloride and ammoniacal nitrogen are all indicators of the presence of landfill leachate in surface water and groundwater. These indicators were not generally observed at elevated concentrations hydraulically up-gradient of the old landfill, however chloride and conductivity (the latter inferred from elevated calcium and sulphate results) were elevated in several bores on the eastern side of the site. The four leachate indicator parameters have been graphically plotted for all groundwater bores and this is presented in Appendix F.

4.8 Leachate

Leachate monitoring results for this reporting period are within the range of data obtained from recent previous rounds. The concentrations observed for all parameters analysed are mostly within the range reported for Class 1 landfills in the *Land Disposal Guidelines*. Mercury is an exception to this trend, with a median value **below** the lower range of 0.2 mg/L observed elsewhere in New Zealand. This indicates that mercury is not of particular concern at the Levin Landfill.

15 SVOCs and VOCs were detected in leachate samples collected throughout the reporting period, however, of these, only one result (for naphthalene) exceeded the ANZECC 2000 DGV's for toxicity in freshwater.

5 Hokio Stream

5.1 Description of Sampling Locations

Hokio Stream is sourced from Lake Horowhenua (within the Lake Horowhenua Water Management Zone [Hokio sub-zone *Hoki_1b*], under Schedule A of the HRC One Plan (2014)) and flows through a rural farming area for much of its course. The stream passes through the Hokio Beach settlement near the coast and has a small estuary at its mouth. The Hokio Stream catchment forms a narrow band through the coastal dunes from Lake Horowhenua to the Tasman Sea. The length of the stream itself is approximately 8 km. The stream is associated with several areas of swampy ground throughout its length. These areas are generally covered in a thick growth of flax making the stream largely inaccessible in these regions but providing excellent cover and habitat for eels and whitebait. Hokio Stream is classified as having a stream order of four, with "warm, dry" climate and low elevation under the New Zealand River Environment Classification (REC2, NIWA 2010).

Stream samples were taken by grab sampling at sites HS1A, HS1, HS2 and HS3 (Figure 5-1) to investigate if landfill leachate present within the shallow groundwater down-gradient of the landfill is affecting the water quality of Hokio Stream. Sites HS1A and HS1 are situated up-stream of the old landfill, HS2 is situated alongside the old landfill and up-stream of the Tatana Property Drain discharge, and HS3 is located approximately 50m down-stream of the landfill site property boundary and the Tatana Property Drain discharge.

The physico-chemical conditions measured at HS1A and HS1 are assumed to be representative of the combined 'background' (i.e., originating from upstream of the landfill), while HS2 and HS3 include landfill discharge-related flows in the Hokio Stream. Since April 2020, sampling location HS1A has been monitored with the purpose of completely replacing sampling location HS1 after 24 months. Sampling location HS1A is located further upstream than HS1 and has been sampled to provide greater certainty in comparisons between upstream and downstream sites of the landfill.

Figure 5-1: Hokio Stream Sampling Locations (HS1A, HS1, HS2 and HS3)

5.2 Sampling Results

Selected water quality monitoring results recorded for the reporting period are presented in Table 5-1, and compared against the trigger value from Discharge Permit 6010 (Table C1). Results for the full suite of analytes are summarised in Table 5-2.A full dataset for Hokio Stream over the last 10 years is presented in Appendix E.

Water quality at all Hokio Stream locations complied with the consent trigger values for all determinands except for the following:

- HS2 – the maximum result for total ammoniacal-N was over three times greater than the trigger value
- HS1A – the annual median value for dissolved copper was equal to the consent trigger value, and therefore is considered a non-compliance (albeit a very minor one).
- Results for $scBOD_5$ across all sites appear to be non-compliant, however due to errors in laboratory report it is not possible to assess the results against the trigger values directly (see explanatory note below Table 5-1).

None of the trigger values were exceeded at HS3 during this reporting period, and when the last 24 samples have been analysed, as a whole (i.e., a median value of 24 results for each parameter) there are also no exceedances at this location, therefore further analysis of results is not required (as per the discharge permit). It is noted that for most of the parameters, 24 samples have been collected at HS3 since at least May 2020. There are some gaps in the dataset which mean that monthly samples may not have been consecutive, however this is mostly limited to July 2021 through September 2021, and January 2021 (Phenol and VFA only).

Table 5-1 Comparison of monitoring results for Hokio Stream locations with consent trigger values (Table C1, DP6010), 2021-2022 reporting period

Determinand	Units [a]	No. of samples per site	Consent trigger value (Table C1); g/m^3	HS1A	HS1	HS2	HS3
Total ammoniacal-N	g/m^3	9-10	Maximum ≤ 2.1	0.8	1.8	**7.7**	1.4
	g/m^3	9-10	Average ≤ 0.4	0.1	0.13	0.13	0.14
$ScBOD_5$ [b]	g/m^3	9-10	Monthly average ≤ 2	**3**[c]	**3**	**3**	**3**
Aluminium	g/m^3	9-10	0.055	0.026	0.02	0.018	0.024
Arsenic	g/m^3	9	0.024	0.001	ND	ND	ND
Cadmium	g/m^3	9-10	0.0002	ND	ND	ND	ND
Copper	g/m^3	9-10	0.0014	**0.0014**	0.0011	0.001	0.001
Lead	g/m^3	9	0.0034	ND	ND	ND	ND
Nickel	g/m^3		0.011	ND	ND	ND	ND
Zinc	g/m^3		0.008	0.002	0.002	0.002	0.002
Mercury	g/m^3		0.0006	ND	ND	ND	ND

Notes:
Red bold *indicates non-compliance with consent trigger values.*
Only annual maximum and average values are reported for total ammoniacal-N; monthly averages are reported for scBOD5, and annual medians are reported for all other parameters.
[a] reported in Appendix E with units as mg/L which is equivalent to g/m^3; this applies to all parameters in this table
[b] reported in Appendix E as "BOD"
[c] The laboratory detection limit stated in Eurofins laboratory reports for $scBOD_5$ is 1 g/m^3. However, the lab has been reporting 'non detected' results as "< 6 g/m^3". This is incorrect and makes it difficult to assess against the consent trigger values.

Table 5-2: Annual median for range of water quality results from Hokio Stream (2021-2022 reporting period)

Determinant	Units	No. of samples per site	HS1A	HS1	HS2	HS3
Leachate Indicators						
Ammoniacal-N	mg/L	9-10	0.06	0.1	0.13	0.13
Boron	mg/L	9-10	0.06	0.06	0.06	0.06
Chloride	mg/L	9-10	21.3	21.4	22.05	21.55
Conductivity	mS/m	9-10	21.6	21.8	22.3	22.4
Faecal coliforms (*E. coli*)	CFU/100mL	9-10	185	480	210	140
pH	-	9-10	7.55	7.6	7.4	7.45
Suspended Solids	mg/L	9	22.5	11	15	13
Phenol	mg/L	9	ND	ND	ND	ND
VFA	mg/L	9	ND	ND	ND	ND
TOC	mg/L	9	7.1	6.8	6.9	7.2
Alkalinity	mg CaCO3/L	9	52	55	52	53
COD	mg/L	9-10	29	34	30	40
BOD	mg/L	9-10	ND	ND	ND	ND
Nitrate-N	mg/L	9-10	0.45	0.33	0.4	0.35
Sulphate	mg/L	9	18.3	18.2	17.9	18.1
Hardness	mg CaCO3/L	9	60	62	63	59
Calcium	mg/L	9	13.2	13.5	13.7	13.1
Magnesium	mg/L	9	6.69	6.95	6.91	6.73

Determinant	Units	No. of samples per site	HS1A	HS1	HS2	HS3
Potassium	mg/L	9	3.34	3.7	3.47	3.75
Sodium	mg/L	9	17.4	17.4	17.9	18.6
DRP	mg/L	9	0.055	0.05	0.049	0.051
Aluminium	mg/L	9-10	0.026	0.02	0.018	0.024
Arsenic	mg/L	9	0.001	ND	ND	ND
Cadmium	mg/L	9	ND	ND	ND	ND
Chromium	mg/L	9	ND	ND	ND	ND
Copper	mg/L	9	0.0014	0.0011	0.001	0.001
Iron	mg/L	9	0.128	0.138	0.161	0.161
Lead	mg/L	9-10	ND	ND	ND	ND
Manganese	mg/L	9-10	0.0162	0.0161	0.0138	0.0201
Mercury	mg/L	9-10	ND	ND	ND	ND
Nickel	mg/L	9-10	ND	ND	ND	ND
Zinc	mg/L	9	0.002	0.002	0.002	0.002

Note: Where the number of samples collected was 3 or more, a median of all samples for the monitoring period is reported.

ND indicates the value was below the laboratory detection limit.

Ammoniacal-nitrogen, conductivity, chloride, and boron are used as indicators of the presence of leachate in Hokio Stream and have been monitored since 1994. On review of the historical records, it appears that all four parameters are relatively stable, and there is no clear increase or decrease at each of the locations over the long term. This is evident in Figure 5-3 to Figure 5-6 below.

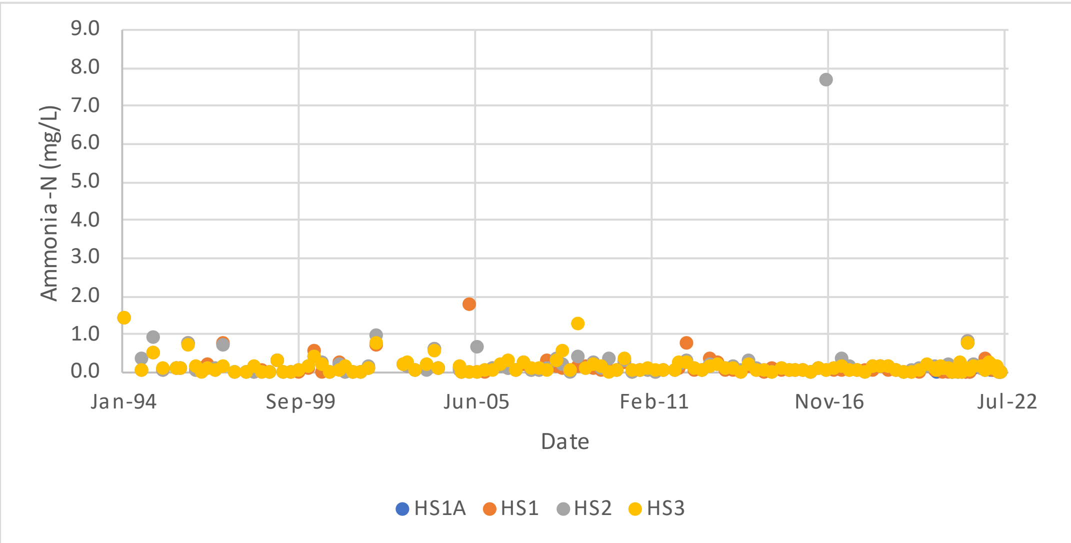


Figure 5-2: Ammoniacal-Nitrogen Concentrations measured in Hokio Stream, since 1994.

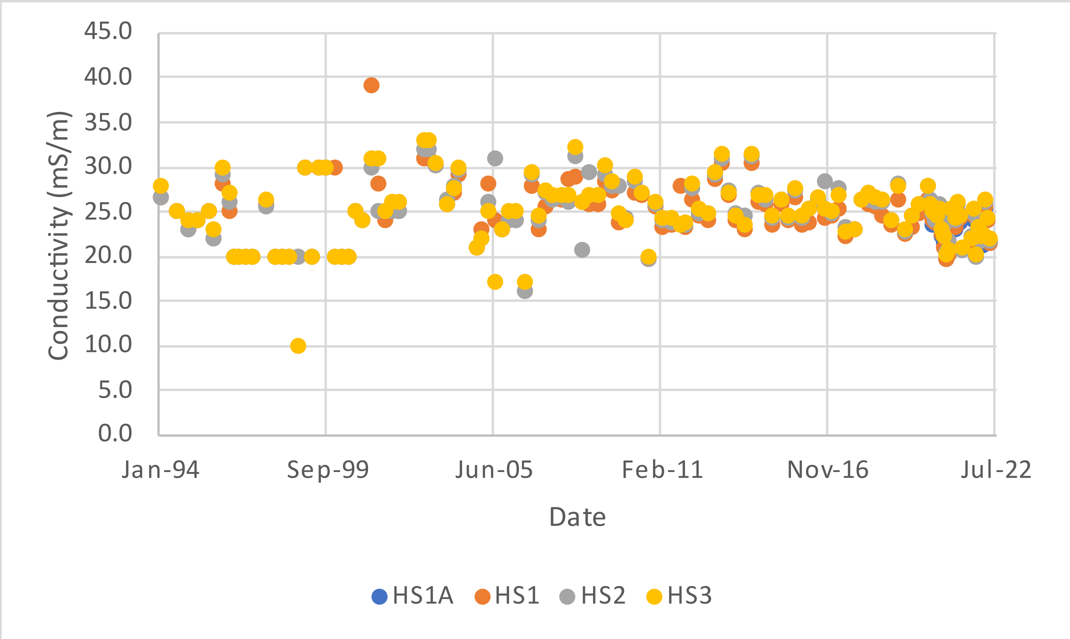


Figure 5-3 Conductivity measured in Hokio Stream since 1994.

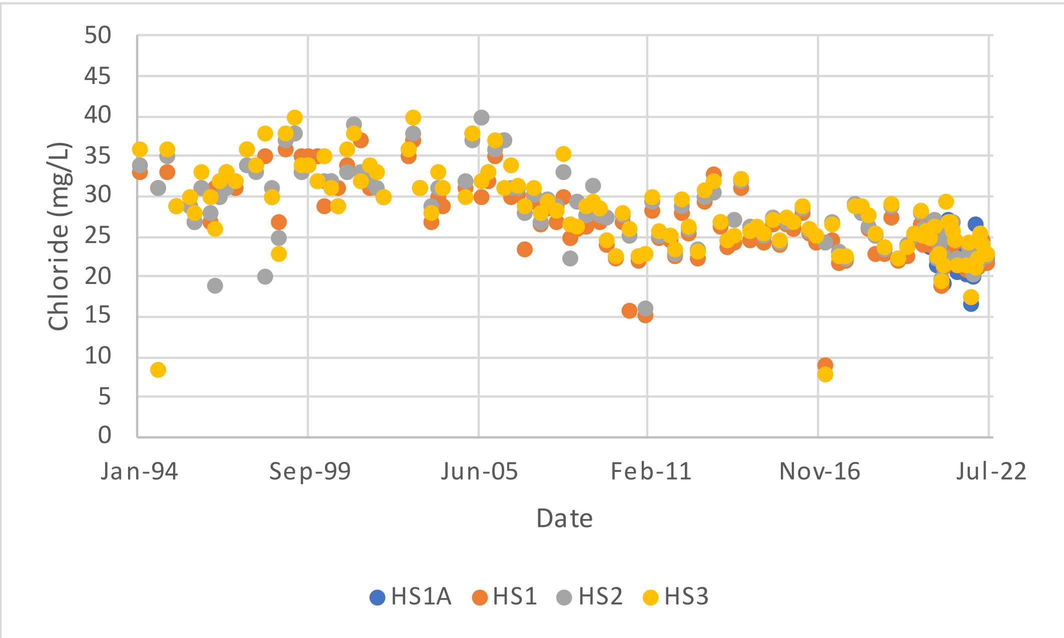


Figure 5-4 Chloride measured in Hokio Stream since 1994.

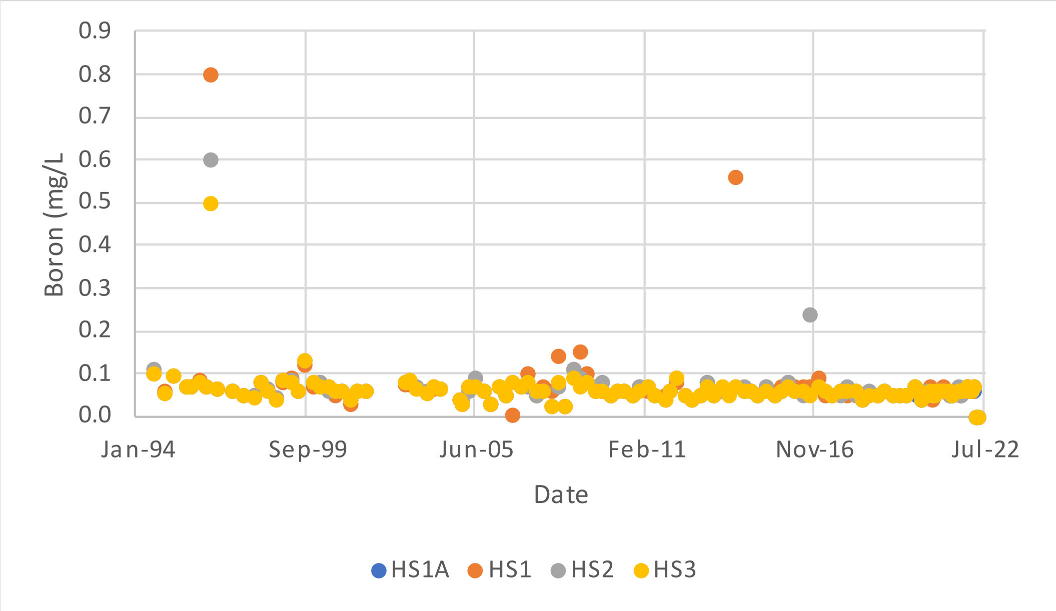


Figure 5-5 Boron measured in Hokio Stream since 1994.

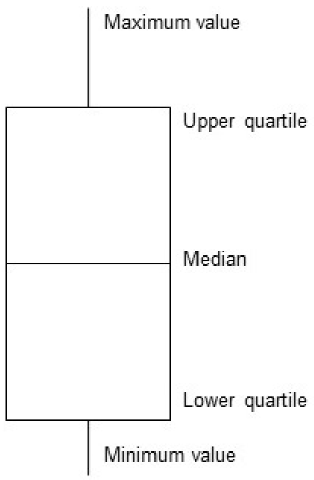
5.3 Surface Water Quality Analysis

Water quality trends at upstream monitoring locations within Hokio Stream upstream (HS1A and HS1) have been compared with those from downstream (HS3) of the landfill for selected contaminants based on samples collected over the ten-year period from July 2012 to June 2022 inclusive. The assessment has included generation of box plots (Figure 5-7 to Figure 5-10) to enable a visual assessment of the data. In summary, there is a minor increase in median conductivity, COD, suspended solids, chloride, and ammoniacal-N concentrations from HS1 (upstream) to HS3 (downstream). However, the opposite was observed for pH and faecal coliforms, with these parameters decreasing from HS1 to HS3.

Since April 2020, sampling location HS1A has been monitored with the purpose of replacing sampling location HS1 completely after 24 months. Sampling location HS1A is located further upstream than HS1 and has been sampled with the intention of providing greater certainty in comparisons between upstream and downstream sites of the landfill. Whilst results for HS1A have been included below for visual comparison to the other background location HS1, the clear variability between them is easily explained by a considerably shorter sampling period history for HS1A. Until the data record for HS1A can be matched to that of HS1 in terms of sample size and length of record, a balanced comparison cannot be made.

The following guide should be used to interpret the box plots in Figure 5-7 to Figure 5-10:[2]

[2] Plots were generated in Microsoft Excel and do not exclude possible outlying values.



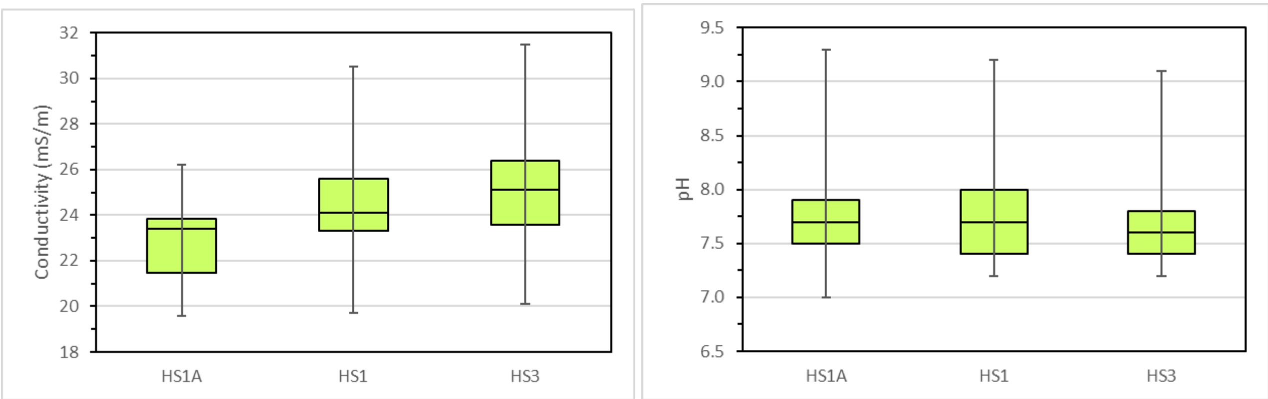


Figure 5-6 Box plots of water quality results (Conductivity and pH) for Hokio Stream sites HS1A, HS1 and HS3, 2012 – 2022.

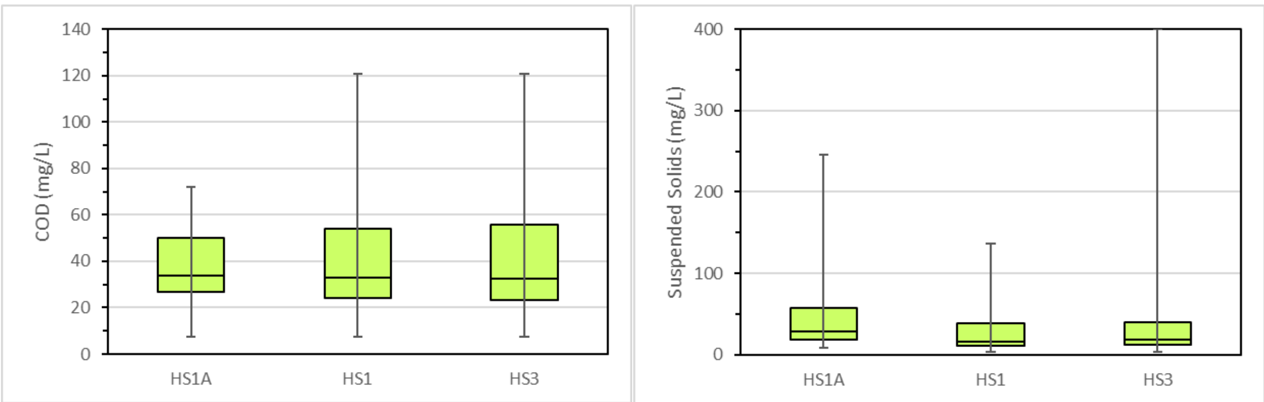
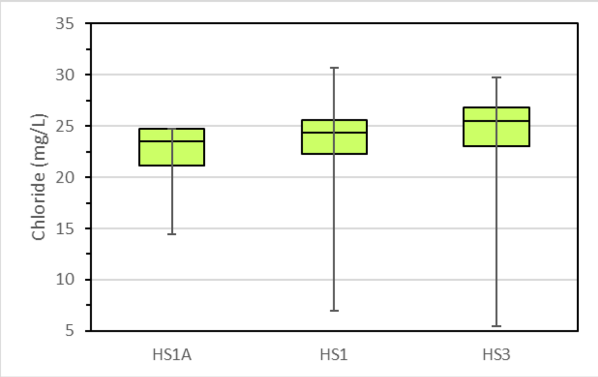


Figure 5-7 Box plots of water quality results (Chemical Oxygen Demand and Total Suspended Solids) for Hokio Stream sites HS1A, HS1 and HS3, 2012 – 2022.



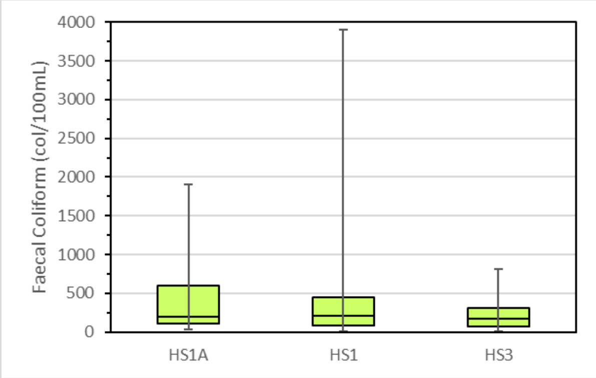


Figure 5-8 Box plots of water quality results (Chloride and Faecal Coliforms – *E. coli*) for Hokio Stream sites HS1A, HS1 and HS3, 2012 – 2022.

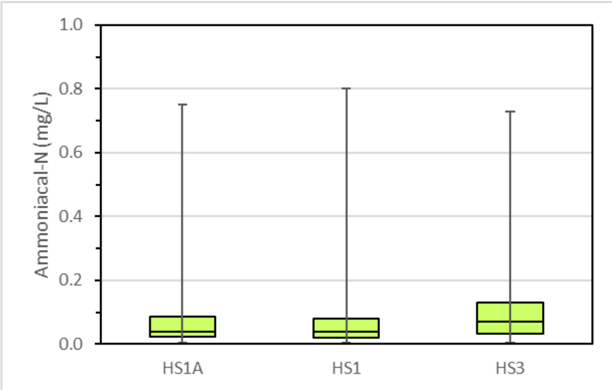


Figure 5-9 Box plots of water quality results (Ammoniacal-nitrogen) for Hokio Stream sites HS1A, HS1 and HS3, 2012 – 2022.

5.4 Tatana Property Drain

Stantec was commissioned by HDC in March 2015 to undertake a review of the water quality within a private drain located to the north of the Levin Landfill and to provide recommendations as to whether further monitoring and/or remediation was required. The report noted that water in the shallow drain was being impacted by landfill leachate within the vicinity of the unlined closed section of the landfill. The drain also interacts with the shallow groundwater aquifer, with groundwater emerging (daylighting) as surface water to the north of the landfill.

HRC subsequently requested that surface water in this drain along the Tatana property's boundary be monitored quarterly. Four sampling points were selected to represent upstream (SW1), midstream (SW2 & SW3) and downstream (SW4) flows at the Tatana property (see Figure 5-1).

The 2015 resource consent review (finalised in December 2019) changed the requirements for sampling the Tatana Drain. Subsequently, sampling at SW1, SW2 and SW4 was discontinued after January 2020, and only SW3 has continued to be sampled from April 2020. SW3 is now called "TD1".

5.4.1 Sampling Results

During the reporting period, samples were collected in from TD1 during every month except for September and August 2021. However, in July 2021 not all parameters were analysed. The median water quality results for all parameters met the consented trigger values (as per Table 5-3 below), except for total ammoniacal-N– indicated in **bold**, red lettering in Table 5-2.

Results for the full suite of analytes are summarised in Table 5-4. A full dataset for Tatana Drain over the last seven years is presented in Appendix E.

Table 5-3 Comparison of monitoring results for Tatana Property Drain with consent trigger values (Table C1, DP6010), 2021-2022 reporting period

Determinand	Units [a]	No. of samples	Consent trigger value (Table C1); g/m^3	SW3 (now TD1)
Total ammoniacal-N	g/m^3	10	Maximum ≤ 2.1	**57.8**
	g/m^3	10	Average ≤ 0.4	**3.25**
$ScBOD_5$ [b]	g/m^3	10	Monthly average ≤ 2	**3**[c]
Aluminium	g/m^3	10	0.055	0.023
Arsenic	g/m^3	9	0.024	0.002
Cadmium	g/m^3	9	0.0002	ND
Copper	g/m^3	9	0.0014	0.0007
Lead	g/m^3	10	0.0034	ND
Nickel	g/m^3	10	0.011	0.0013
Zinc	g/m^3	9	0.008	0.003
Mercury	g/m^3	10	0.0006	ND

Notes:
Red bold *indicates non-compliance with consent trigger values.*
Only annual maximum and average values are reported for total ammoniacal-N; monthly averages are reported for scBOD5, and annual medians are reported for all other parameters.
[a] *reported in Appendix E with units as mg/L which is equivalent to g/m^3; this applies to all parameters in this table*
[b] *reported in Appendix E as "BOD"*
[c] *The laboratory detection limit stated in Eurofins laboratory reports for $scBOD_5$ is 1 g/m^3. However, the lab has been reporting 'non detected' results as "< 6 g/m^3". This is incorrect and makes it difficult to assess against the consent trigger values.*

Table 5-4: Tatana's Property Drain median water quality results

Determinand	Units	No. of samples per site	SW3 (now TD1)
Leachate Indicators			
Ammoniacal-N	mg/L	10	0.65
Boron	mg/L	10	0.2
Chloride	mg/L	10	65
Conductivity	mS/m	10	50.8
Faecal coliforms (*E. coli*)	CFU/100mL	10	250
pH	-	10	7.2
Suspended Solids	mg/L	9	22
Phenol	mg/L	8	ND
VFA	mg/L	8	ND
TOC	mg/L	9	22.2
Alkalinity	mg $CaCO_3$/L	9	182
COD	mg/L	10	114
BOD	mg/L	10	3
Nitrate-N	mg/L	10	0.04
Sulphate	mg/L	9	1.5
Hardness	mg $CaCO_3$/L	9	133
Calcium	mg/L	9	25.1
Magnesium	mg/L	9	17

Determinand	Units	No. of samples per site	SW3 (now TD1)
Potassium	mg/L	9	17.7
Sodium	mg/L	9	53.8
DRP	mg/L	9	0.03
Aluminium	mg/L	10	0.023
Arsenic	mg/L	9	0.002
Cadmium	mg/L	9	ND
Chromium	mg/L	9	ND
Copper	mg/L	9	0.0007
Iron	mg/L	9	2.09
Lead	mg/L	10	0.0003
Manganese	mg/L	10	0.313
Mercury	mg/L	10	0.0003
Nickel	mg/L	10	0.0013
Zinc	mg/L	9	0.003

ND indicates the value was below the laboratory detection limit.

The Tatana Property drain appears to be intercepting an unknown volume of leachate-contaminated shallow groundwater, and then discharging this to the Hokio Stream. However, monitoring results indicate that the volume of leachate discharged to Hokio Stream is considerably less than previously recorded. Concentrations of the key leachate parameters (ammoniacal nitrogen, conductivity, and chloride) are generally higher within the Tatana Property drain than in groundwater hydraulically up-gradient of the old landfill, but considerably lower than groundwater down-gradient of the old landfill. No measured parameters exceeded the applicable guideline values for TD1.

A slight increase in ammoniacal-nitrogen, conductivity, and chloride was observed between sites HS1 (upstream) and HS3 (downstream) in Hokio Stream. The annual median concentrations of ammoniacal-nitrogen and conductivity increased between HS2 and HS3 (where the Tatana Property drain joins Hokio Stream) by a very small margin.

The HRC compliance audit report of the 2019 - 2020 annual report recommended further work be done to understand the effect of the old landfill on the Tatana Drain and Hokio Stream. In response to this, recommendations were provided in the 2020-2021 Annual Report for additional assessments to be done to determine correlations between wet weather events and sampling results for the Tatana Drain and Hokio Stream. Stantec understands that HDC has started to implement additional monitoring, but there is presently insufficient information to undertake any additional assessments. The outstanding information should be sought so that the additional assessments can be completed.

6 Mass Loading Evaluation for the Hokio Stream

This section summarises the consent requirements and assessment of effects of landfill leachate in respect of mass loading projections for the Hokio Stream.

Consent conditions 11(d) and 11(e) of the Discharge Permit 6010 require, respectively, that an evaluation of contaminant mass load projections for the discharge of parameters from the landfill to the Hokio Stream is undertaken annually and that the significance of the findings be determined. The relevant consent text is provided in Appendix A.

6.1 Background

A Mass Contaminant Loading Assessment was originally completed for Levin Landfill in April 2011. The modelling incorporated many simplifying assumptions and the conservative estimation of parameters, including:

- That all aquifer through-flow discharges to the Hokio Stream. This is considered unlikely but has been incorporated into the model to provide a worst-case assessment.
- A further assumed worst-case scenario, that no attenuation of contaminants occurs between the monitoring wells and the discharge point into the Hokio Stream.
- Estimation of input parameters, including hydraulic conductivity 'K', has been conservative.
- Full vertical mixing of contaminants in the aquifer has been assumed to the relevant depth of plume considered.
- A low flow of 174 L/s in the Hokio Stream has been assumed. This is significantly lower than the mean flow of approximately 900 L/s and therefore will generally provide a worst-case assessment.

In combination these assumptions mean that the predicted downstream concentrations are likely to be significantly higher than occurs in reality.

The assumptions underpinning the mass loading calculations have been reviewed to identify any other factors which may be influencing the observed changes in spatial patterns in the plume that are referred to in Section 4.4.2.

Further, for this monitoring period, some additional changes have been made to the mass loading assessment assumptions, as explained in the next section.

Since April 2020, sampling location HS1A has been monitored with the purpose of replacing sampling location HS1 after 24 months. Sampling location HS1A is located further upstream than HS1 and has been sampled to provide greater certainty in comparisons between upstream and downstream sites of the landfill. Whilst there is limited information from sampling location HS1A, the results for sampling location HS1A have been included by combining them with the results from sampling location HS1 to get average upstream concentrations of the relevant parameters.

6.2 Mass Loading Analysis Update

The input data to the model spreadsheet include groundwater quality within the leachate plume and upstream and downstream water quality within the Hokio Stream (HS1A and HS1 represent the water quality upstream of the landfill, and HS3 represents the water quality downstream). The data for the last five years were used to recalculate the input information which is summarised in Table 6-1. Medians over five years are considered appropriate to use, given that some parameters in the indicator list (e.g., sodium) are only tested once per year.

Bores B2, B3, C1, C2, C2DS, G2S and Xs1 have been used to represent the leachate plume in undertaking the mass loading analysis. Bore Xs1 has been included in the mass loading analysis this year to meet condition 11(d) of discharge permit 6010 which requires that the mass contaminant load projections be based, but not exclusively so, '…*on the monitoring data obtained for the "B", "C" and "X" series bores*…'. It is noted that bore G2S is likely to be at the edge of, or outside, the leachate plume and therefore may no longer be representative of the main body of the leachate plume.

As in previous years, the shallow groundwater 'background' concentration of contaminants was included in the calculation to determine if any changes in the Hokio Stream water quality are influenced by background concentrations of contaminants in shallow groundwater. As was done last year, for this annual report, bores, D5, F2, and F3 have been included as being representative of background water quality.

The median results for ammonia-N, boron, chloride, sodium, nitrate-N and DRP have been averaged for HS1 and HS1A for the past five years to represent the upstream results, with the median results for the same parameters over five years for HS3 representing the downstream results.

The results are shown in Table 6-1 with grey and orange shading of cells corresponding with a decrease and increase, respectively, of this year's results compared to last year's results. Four of the six parameters (ammoniacal-N, boron, nitrate-N and DRP) increased upstream, with sodium and chloride both decreasing.

In the downstream results (HS3), sodium and chloride also decreased this year, with ammoniacal-N and DRP increasing, but boron and nitrate-N staying the same.

For bores representing the background concentrations (D5, F2 and F3), the average of the median concentrations of boron and sodium increased, with the average of the median concentrations of ammoniacal-N, chloride and nitrate-N decreasing, and the average median concentration of DRP remaining the same.

For the bores representing the leachate plume (B2, B3, C1, C2, C2DS, G2S and Xs1), the maximum and median results from the last five years for the six selected parameters have been averaged and compared to the values used last year. Table 6-1 shows how the results have changed compared to last year. Mostly the results have decreased (shaded grey), and the only increases have been for:

- DRP, for average of maximum values, both including and excluding for background concentrations.
- Nitrate-N, for average of median values, both including and excluding for background concentrations.

Table 6-1: Updated Model Input Data 2017-2022

Site	Ammoniacal-N g/m³	Boron g/m³	Chloride g/m³	Sodium g/m³	Nitrate-N g/m³	DRP g/m³
Ave. of HS1A and HS1 (upstream) **5-year median**	0.04	0.06	23.5	18.9	0.42	0.018
HS3 (downstream) **5-year median**	0.09	0.06	24.5	20.3	0.46	0.024
D5, F2, F3 (background groundwater) **5-year median**	0.01	0.03	24.6	26.2	1.03	0.127
Bores representing leachate plume (B2, B3, C1, C2, C2DS, G2S, Xs1) **average of maximum values** (over 5-years)	70.99	1.53	320.7	197.6	22.29	0.058
Bores representing leachate plume (B2, B3, C1, C2, C2DS, G2S, Xs1) **average of median values** (over 5-years)	54.84	1.04	182.7	152.1	3.53	0.024
Bores representing leachate plume - average of maximum values (*removing background*)	70.96	1.49	283	167	19.84	-0.094*
Bores representing leachate plume - average of median values (*removing background*)	54.83	1.02	158.2	126	2.51	-0.103*

The median and maximum concentration of DRP when the background concentration is factored out gives a negative concentration (as indicated by results with an asterisk * in Table 6-1). Essentially this indicates that the background concentration of DRP is higher than that found in the leachate plume, which implies that leachate is not influencing the concentration of this parameter in groundwater down-gradient of the old landfill.

The plume width has been estimated as 300-500 m; this estimate has been retained within the mass contaminant loading model since 2014.

The predicted downstream concentrations of leachate indicators in the Hokio stream were calculated based on the average of maximum and median values from the leachate plume bores (B2, B3, C1, C2, C2DS, G2S and Xs1). The ranges of results obtained are presented in Table 6-2. For comparison, the median results for the upstream and downstream sample locations (average of HS1A and HS1 combined, and HS3) are also included in Table 6-2. The detailed mass contaminant loading calculations are included in Appendix G.

The predicted downstream concentrations at HS3 are similar, both when background concentrations are included and when they are excluded.

The predicted range of concentrations from the 2021-2022 mass contaminant load assessment shows close agreement with actual monitoring results obtained from HS3 for all parameters except for DRP, which has a median average concentration of 0.024g/m^3 which is some 30% higher than the predicted range of between 0.017 and 0.018g/m^3.

The concentrations obtained by sampling at the upstream site (combined HS1A and HS1) and the predicted concentrations for the downstream site (HS3) meet the ANZECC Freshwater DGV for 95th percentile species protection and the LDW trigger values for all parameters.

Actual concentrations at the upstream site (combined HS1A and HS1) and predicted concentrations for the downstream site (HS3) exceeded the ANZECC Lowland River DGVs for ammoniacal-N, nitrate-N and DRP.

Similarly. actual concentrations at the upstream site (combined HS1A and HS1) and predicted concentrations for the downstream site (HS3) exceeded the Horizons One Plan guideline values for nitrate-N and DRP.

The inference from these results is that the leachate contamination within the groundwater plume from the old landfill area is affecting the quality of water in the Hokio Stream to a minor extent only. By far the greatest contributions to the concentrations of measured parameters in the Hokio Stream are arising from sources unrelated to the old landfill and are in fact originating from upstream of the landfill site

The water quality of the Hokio Stream is influenced strongly by its urban and rural catchments. The actual and predicted results indicate that the impact from the Levin Landfill on the Hokio Stream is likely to be minimal within the wider catchment context.

Table 6-2: Predicted Leachate Impact on Hokio Stream 2021-2022

		Ammoniacal-N g/m^3	Boron g/m^3	Chloride g/m^3	Sodium g/m^3	Nitrate-N g/m^3	DRP g/m^3
Guideline values	**ANZECC 2000 DGVs for Freshwater (Table 3.3.10 Lowland River)**	**0.02**	**-**	**-**	**-**	**0.44**	**0.01**
	ANZECC 2000 DGVs for Freshwater (Table 3.4.1 95%ile protection)	0.9	0.37	-	-	-	-
	ANZECC LDW trigger values	NA	5	-	-	90.3	NA
	Horizons One Plan - Hokio Stream (Schedule E)	0.4	-	-	-	0.17 (SIN)	0.01
Predicted range of downstream concentration including background concentrations		**0.06 - 0.46**	0.06 – 0.07	23.55-25.24	18.91 – 19.92	0.42 **– 0.55**	**0.018**
Predicted range of downstream concentration excluding background concentrations		**0.06 – 0.46**	0.06 – 0.07	23.54 – 25.02	18.91 – 19.92	0.42 **– 0.53**	**0.017**
Actual 2017-2022 average median upstream concentration (HS1A and HS1)		**0.04**	0.06	23.5	18.9	0.42	**0.018**
Actual 2017-2022 average median downstream concentration (HS3)		**0.09**	0.06	24.5	20.3	**0.46**	**0.024**

Note: bold text indicates predicted or actual exceedances of the ANZECC Lowland River DGVs, red text indicates predicted or actual exceedance of the Horizons One Plan for the Hokio Stream. There were no predicted or actual exceedances of the ANZECC Livestock Drinking Water trigger values or the ANZECC toxicity 95%ile protection trigger values.

6.2.1 Current assumptions

The assumptions currently applied to calculate mass loads for contaminants from the landfill are summarised below.

Flow volume of Hokio Stream

A minimum flow of 174 L/s (15,034 m^3/day) is assumed in the Hokio Stream. This has been applied since 2011; the flow volume selected represents a conservative approach as it is significantly lower than the mean flow of 900 L/s.

Extent of the groundwater aquifer

Various combinations of aquifer width and depth are applied in the calculations as part of the sensitivity analysis; results are therefore reported as ranges.

The assumptions applied in each combination are depicted in Figure 6-1.

		Thickness (m)		
		5	10	15
Width (m)	300	1500	3000	4500
	400	2000	4000	6000
	500	2500	5000	7500

Figure 6-1 Assumptions for aquifer extent applied in mass load calculations (screenshot from model spreadsheet, 2021)

Hydraulic conductivity (*k*)

Mass load calculations assume a hydraulic conductivity of 0.00002 m/s (1.73 m/day) (this can range between 0.5 – 2.0 m/day based on field data collected in July 2012).

Hydraulic gradient (*i*)

A value of 0.0059 has been maintained since 2011. This was developed based on groundwater level monitoring undertaken between 2004 and 2010.

Background groundwater quality

Calculations have been run to account for background groundwater quality by removing loads from bores D2, F2 and F3 (as representative of 'background) from the calculations for 5-year averaged maximum and median values. A second series of calculations has been done including background groundwater quality which shows that there is minimal difference between including or excluding the background water quality concentrations of monitored parameters.

7 Stormwater Discharges

Condition 14 of Discharge Permit 102259 requires that annual monitoring to determine the effects of stormwater soakage on groundwater quality be carried out on site. This can be done in conjunction with the sampling of groundwater under Condition 15 of Discharge Permit 102259.

As shown in the Site Plan in Appendix C, stormwater is discharged to a central inter-dune depression located to the west of the access road leading to the lined landfill area. From here it soaks to groundwater. When groundwater levels are high in winter, water tends to pond in the inter-dune depression.

Based on the current understanding of groundwater flow directions, bores D3rs and F3 are hydraulically up-gradient of the stormwater soakage area, and bores E1D, E1S, D4 and D2 are hydraulically down-gradient. Therefore, an examination of whether the water quality in down-gradient bores is comparable to that of the up-gradient bores can provide an indication of any potential effects from stormwater discharges to the soakage area on groundwater. This comparison is provided in Table 7-1, which shows that:

- Overall, annual median concentrations for sodium, boron and iron were noticeably higher in groundwater bores down-gradient of the stormwater soakage area than they were at the up-gradient bores.
- Annual median concentrations for the remaining determinands were either similar or higher at the up-gradient bores compared with down-gradient bores.

The environmental monitoring results for the last 10 years are presented in Appendix E. Table 7-2 below summarises compliance for the 2021-2022 sampling period with the ANZECC 2000 LDW trigger values (consent limits) in accordance with Condition 18 of Discharge Permit 102259. Compliance is assessed using median values across the reporting period. There was a single non-compliance (for *E.coli*, within bore E1D) and this was notified to HRC in the applicable quarterly report.

A more detailed summary of these groundwater quality results can be found in section 4.

Table 7-1 Comparison of groundwater quality up-gradient of the stormwater soakage area, to down-gradient

Determinant	Units	Bores up-gradient of stormwater soakage area			Bores down-gradient of stormwater soakage area			Overall trend (up-gradient to down-gradient
		D3rs	F3	E1D	E1S	D4	D2	
pH	pH units	6.6	7.45	7.7	7.1	7.05	6.55	→
Conductivity	mS/m	19.8	20.7	45	26.1	29.6	44.3	→
Ammoniacal-N	mg/L	0.54	0.01	0.2	0.2	0.24	Not measured	→
Nitrate-N	mg/L	0.01	1.12	0.01	0.01	0.01	0.01	↘
Sodium	mg/L	20.8	25.7	37.65	27.95	33.15	36.9	↗
Boron	mg/L	0.05	0.02	0.06	0.02	0.03	0.06	→
Chloride	mg/L	17	18.6	38.9	26.7	35.95	40.4	↗
Iron	mg/L	16.6	0.004	0.04	5.15	0.56	8.09	↗

Table 7-2: Summary of Selected 2021-2022 Bore Results for Stormwater Consent

Borehole	ANZECC 2000 LDW	Comments
D3rs (background)	Complies	Nil
F3 (background)	Complies	Nil
E1D	Non-Compliant	Faecal Coliform Exceedance 11CFU/100mL against NIL
E1S	Complies	Nil
D4	Complies	Nil
D2	Complies	Nil

8 Landfill Gas and Odour Monitoring

The resource consent review that was concluded in December 2019 introduced new reporting requirements for landfill gas and odour monitoring under Discharge Permit 6011.

Condition 8F of Discharge Permit 6011 requires the Permit Holder to maintain a log of all other inspections, investigations and actions taken in accordance with all monitoring and odour inspection conditions of the consent. A summary is to be included in the Annual Report which follows under this section.

8.1 Odour Monitoring at Landfill Boundary

Condition 3 of Discharge Permit 6011 requires the Permit Holder to undertake monitoring at the landfill boundary for offensive odour or dust. This is to be in accordance with the methodology set out in the Odour Management Plan, as required under condition 5(m)(iii) of Discharge Permit 6011.

HDC has carried out nine odour assessments at the landfill boundary on eight different days during the reporting period. Whilst assessments were missed in the months of December 2021, February 2022, May 2022, and June 2022, (and this is therefore a non-compliance), odour assessments were conducted in the months that the landfill was operational (i.e., between July 2021 and October 2021).

A summary of the results is given in Table 8-1 below with the full set of results being attached in Appendix H. The location of the landfill boundary is seen in Figure 8-1 below.

Table 8-1: Summary of Odour Assessments at the Landfill Boundary for the period from 1 July 2021 to 30 June 2022

Date/time of assessment	Location - Wind direction(1)	Wind speed	Odour intensity	Odour character	General hedonic tone	Apparent source of odour	Action undertaken
05-07-21 8:52	E - From NW	3 - Gentle breeze	3 - Distinct	10 - Faecal, manure, sewer	No record	Next door stock	N/A
02-08-21 11:03	G - From NE	2 - Light breeze	2 - Weak	20 - Fresh rubbish	No record	Tip face fresh rubbish	N/A
20-09-21 13:55	D - From W	3 - Gentle breeze	1 - Very weak	4 - Herbal, green, cut grass	0 - Neutral	Grass and trees	N/A
19-10-21 14:05	E - From NW	3 - Gentle breeze	1 - Very weak	4 - Herbal, green, cut grass	0 - Neutral	Long grass	N/A
05-11-21 11:17	A - From S	1 - Light air	2 - Weak	1 - Fragrant	0 - Neutral	Long grass and flowers by gate. Could not detect any other odour	N/A
28-01-22 11:12	D - From W	1 - Light air	1 - Very weak	4 - Herbal, green, cut grass	0 - Neutral	Tree and grass	N/A
25-03-22 9:02	A - From S	4 - Moderate breeze	0 - No odour	N/A	0 - Neutral	N/A	N/A
25-03-22 9:37	A - From S	3 - Gentle breeze	3 - Distinct	4 - Herbal, green, cut grass	0 - Neutral	Pine trees, grass etc	N/A
29-04-22 13:50	E - From NW	4 - Moderate breeze	0 - No odour	N/A	0 - Neutral	N/A	N/A

NOTES: (1) The location of the assessment is based on Figure 5.1 of the Odour Management Plan which is reproduced as Figure 8.1 in this report.

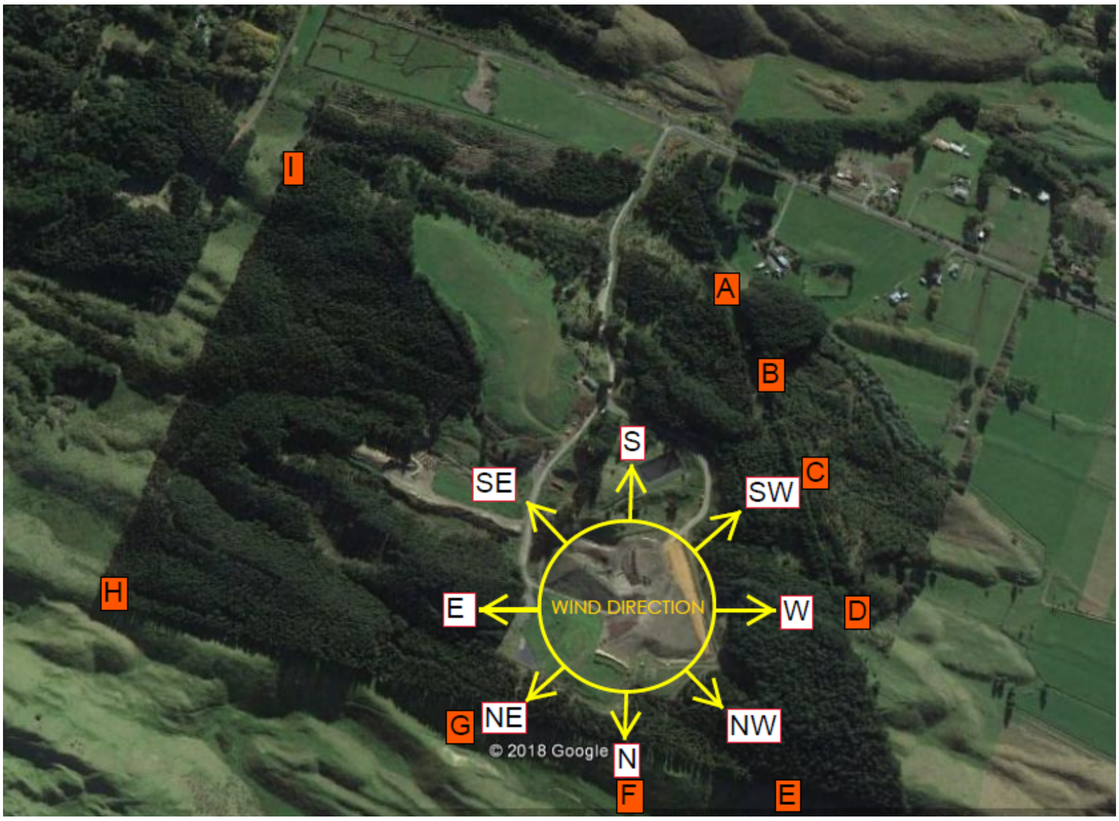


Figure 8-1 Location of Landfill Boundary Odour Assessments (Source: Figure 5.1 of the Odour Management Plan)

On two occasions no odour was detected at all. On five occasions the conclusions of the assessors were: "*I did detect odour and consider it would not be objectionable at any location for any duration or frequency*". For the remaining two occasions, the conclusions were: "*I did detect odour and consider it would not be objectionable, UNLESS it became continuous*".

Odours were detected during all four assessments that were conducted while the landfill was still operating (i.e., between 1 July 2021 and 31 October 2021), but on only one occasion was the apparent source identified as the tip face.

In all cases no further actions were proposed to be undertaken.

8.2 Gas Detection in Groundwater Monitoring Wells

Condition 5(a) of Discharge Permit 6011 requires landfill gas sampling to be undertaken at each bore on every occasion that groundwater sampling is carried out.

Landfill gas monitoring commenced in January 2010**. Low concentrations of methane (CH_4) were detected** during the July 2021, October 2021, January 2022, and April 2022 monitoring rounds. High concentrations of hydrogen sulphide (H^2S) were reported in July 2021 and April 2022, but subsequent investigations showed that the H_2S results should have been reported as "ppm" rather than as "%", which significantly reduced the severity of the results. **Very high levels of carbon dioxide (CO_2)** were detected in one bore in April 2022. A summary of these results is as follows:

- 9 June, 13 and 14 July 2021 – methane detected in low amounts in 14 of the groundwater bores. Highest recorded concentration was 0.55% in bore D6 – 10% of the lower explosive limit, not considered dangerous but reinforces the need for precautions to be taken when undertaking sampling. Hydrogen sulphide was reported to have a concentration at bore D5 of 0.05% (500 ppm), but subsequently revised to be 0.05ppm. The initial result caused alarm and was acted on appropriately and underlines the need for recording results appropriately, whilst also stresses the need of taking precautions when sampling.
- 7 October 2021 – methane detected in low amounts in 3 of the groundwater bores. Highest recorded level was 0.1%, again in D6 – deemed safe as below the lower explosive limit of 5%. H_2S was not detected in any bores in this sampling round.
- 17 January 2022 – methane detected in low amounts in 18 of the groundwater bores. Highest recorded concentration was 0.09% in G1D – deemed safe as well below explosive limit of 5%. H_2S was not detected in any bores in this sampling round.
- 5 and 7 April 2022 – methane detected in low amounts in 13 of the groundwater bores. Highest recorded level was 0.12% in C1 – deemed safe as well below explosive limit of 5%. Hydrogen sulphide of extremely high concentration

of 1% was recorded for bore Xs1, but subsequently revised to 1ppm. Very high concentration of carbon dioxide at bore B2 – 5.2%. The very high level of CO_2 endorses the need to take appropriate health and safety precautions when sampling the groundwater bores.

Refer to Appendix I for the gas monitoring results. We note that the results were collected by a third party on behalf of HDC, and in June 2022 it was reported that the H_2S readings were in ppm, rather than as a percentage, which reduces the level of concern.

It is recommended that gas detection results be provided to HDC and the party responsible for compiling the quarterly reports as soon as they are available, rather than waiting for the Annual Report. This has been acted on for the last four quarterly reports.

Whilst elevated results of H_2S (and possibly CO_2) have been shown to be on account of incorrect reporting (as a % instead of ppm), they cannot be ignored until this is proven, and appropriate action was taken by HDC to follow up on both occasions. It is recommended that site-based control measures for the protection of workers and any other visitors to the site against exposure to hazardous gas (including H_2S) are reviewed and amended where necessary.

8.3 Monitoring of Surface Emissions and Bio-filter

Condition 5(e) of Discharge Permit 6011 requires the Permit Holder to undertake monthly methane surface monitoring of the temporary and permanent capped areas of the landfill and the bio-filter.

The pipe feeding landfill gas from the leachate sump to the bio-filter bed was disconnected in September 2021. Since then, the gas from the leachate sump has been directed to the pipe network that feeds the landfill gas flare. This change has been agreed between HRC and HDC.

Condition 5(f) of Discharge Permit 6011 states that the levels which the surface concentrations of methane should not exceed. Any exceedance requires remedial action to be undertaken within 24 hours and retesting to be done within 24 hours of the remediation having been done.

HDC has engaged Envirowaste to undertake the surface emissions monitoring. During the monitoring period ten surface monitoring assessments were undertaken. As such, HDC has not fully complied with the resource consent conditions to monitor surface emissions monthly.

Table 8-2 summarises the surface emissions testing undertaken in the reporting year. The reports provided by Envirowaste for the testing are included in full in Appendix J.

Table 8-2: Summary of Surface Emissions Testing Carried Out at Levin Landfill

Date of Assessment	Methane results >200ppm	Compliance	Actions taken	Methane results on re-test	Compliance
20 July 2021	12 locations > 200ppm; CH_4 concentrations varied from 229 ppm to 746 ppm	No	Remediated areas using bentonite granules and water.	Vary from 33 ppm to 179 ppm	Yes
10 August 2021	18 locations > 200ppm; CH_4 concentrations varied from 243 ppm to 479 ppm	No	Remediated areas using bentonite granules and water.	Vary from 0 ppm to 274 ppm	Yes, except for one location
27 September 2021	13 locations > 200ppm; CH_4 concentrations varied from 248 ppm to 530 ppm	No	Remediated areas using bentonite granules and water.	Vary from 0 ppm to 142 ppm	Yes
22 October 2021	9 locations > 200ppm; CH_4 concentrations varied from 221 ppm to 418 ppm	No	Remediated areas using bentonite granules and water.	Vary from 45 ppm to 150 ppm	Yes
10 November 2021	8 locations > 200ppm; CH_4 concentrations varied from 211 ppm to 780 ppm	No	Remediated areas using bentonite granules and water.	Vary from 0 ppm to 140 ppm	Yes

Date of Assessment	Methane results >200ppm	Compliance	Actions taken	Methane results on re-test	Compliance
22 December 2021	8 locations > 200ppm; CH_4 concentrations varied from 227 ppm to 1,058 ppm	No	Remediated areas using bentonite granules and water, and clay capping.	Vary from 40 ppm to 129 ppm	Yes
18 January 2022	5 locations > 200ppm; CH_4 concentrations varied from 236 ppm to 1,410 ppm	No	Remediated areas using bentonite granules and water, and clay capping.	Vary from 0 ppm to 70 ppm	Yes, but no re-test results for Location 4
24 February 2022	8 locations > 200ppm; CH_4 concentrations varied from 236 ppm to 1,360 ppm	No	Remediated areas using bentonite granules and water and reconnect gas wells after topsoil placed.	Vary from 30 ppm to 148 ppm	Yes
30 March 2022	11 locations > 200ppm; CH_4 concentrations varied from 380 ppm to 1,380 ppm	No	Remediated areas using bentonite granules and water, and additional cover.	Vary from 38 ppm to 180 ppm. Location 6 exceeds 200ppm	Yes, but Location 6 required additional soil cover. No re-test thereafter.
27 April 2022	10 locations > 200ppm; CH_4 concentrations varied from 218 ppm to 502 ppm	No	Remediated areas using bentonite granules and water, and additional soil cover.	Vary from 52 ppm to 250 ppm	No, Location 6 at 250 ppm and Location 10 at 201 ppm. Additional soil cover needed and no re-test.
26 May 2022	9 locations > 200ppm; CH_4 concentrations varied from 243 ppm to 1,000 ppm	No	Reported that remediation will be decided by Council.	No re-testing results available.	No, remediation not done within 24 hours and no re-test results.

All the surface monitoring assessment reports summarised in Table 8-2 commented that there were patches of grass present that were over 400mm in length. These were across Stage 1 area (assumedly, the front face of the landfill). Best practice guidelines suggest that the grass length be less than 100mm to help the accuracy of the gas survey, and it is recommended that the landfill vegetation be mown regularly to keep the grass length down.

Surface emissions testing of the bio-filter was carried out in August 2021 and September 2021 with 0 ppm being recorded. The Envirowaste reports also record that testing of the bio-filter was done in November 2021, December 2021, January 2022, February 2022, March 2022, April 2022, and May 2022 after it had been disconnected, with 0 ppm being recorded.

Condition 5(j) of Discharge Permit 6011 sets out the requirements for monitoring and recording data at the bio-filter. As noted above, the bio-filter was disconnected in September 2021, with gas being directed to the pipe network connected to the landfill gas flare.

Table 8-3 below sets out a summary of the requirements and notes the extent to which compliance has been achieved from 1 July 2021 to September 2021, as reported by Council staff, when the bio-filter was decommissioned.

It is noted that during the July 2021 to September 2021 period, there were issues with the bio-filter fan which did not run consistently.

Table 8-3: Summary of Bio-filter Inspections and Maintenance undertaken between July 2021 – September 2021

Requirement	Comments	Compliance
Daily visual inspection	Not fully consistent. HDC staff carry out visual checks when on site and the Contractor does a visual check weekly.	No
Continuous display of fan discharge differential pressure	Differential pressure and moisture content available on SCADA.	Yes
Weekly monitoring and recording of the bio-filter bed moisture content	Done through SCADA telemetry	Yes
Weekly recording of pressure across the bio-filter bed	Done through SCADA telemetry	Yes
Weekly recording of the pH of the bio-filter media	Not implemented	No
Quarterly raking and loosening of bio-filter media	Commenced in August 2020	Unknown

8.4 Meteorological Data

Condition 5(p) of Discharge Permit 6011 requires the Permit Holder to collect meteorological data from an on-site weather station. Condition 5(q) requires the Permit Holder to provide that information to the Regional Council.

During the reporting period, weather data was collected from an on-site weather station which was installed in April 2021. Data were not recorded between Mid-July and mid-August 2021, when water ingress damaged the terminals causing incorrect readings. The weather station had to be sent away during this period to be repaired.

The weather station at 645 Hokio Beach Road has continued to operate, so weather data from this location were available for the period when the onsite weather station was being repaired. However, the data were at 15-minute intervals rather than the required 1-minute intervals, averaged to 10-minute time periods.

There is also a gap in the dataset between 9 April 2022 to 15 April 2022, due to issues with the data collection/analysis software licence. There are also several other occasional gaps of smaller time periods that were likely caused by weather-related power cuts.

The following data are required to be collected:

- wind direction and speed
- air temperature
- barometric pressure
- relative humidity
- rainfall.

In general, most of this information was collected correctly during the reporting period, but an examination of the monthly data files found some errors (data quality issues) in the dataset. For instance, the dataset indicates that no rain fell throughout the month of December 2021 (known to have been a wet month), and relative humidity was not recorded at all. In January 2022, the rainfall records are missing and there are gaps in the relative humidity records. No rainfall data were recorded in February 2022, April 2022, May 2022, or June 2022. Additionally, it appears that most of the data for March 2022 are missing.

It is recommended that Council gets the weather station checked to identify why rainfall and relative humidity data are not being properly recorded.

9 Monitoring Results Compliance

This section contains a summary of compliance (or otherwise) with the resource consent conditions for the landfill site. This summary should be considered in the context provided throughout this report, especially around the existing consent requirements for monitoring (i.e., where a single sample is required per year) and where non-compliance has been reported because of a low/marginal detection as opposed to a significantly elevated result.

9.1 Groundwater - Sand Aquifer

Consent conditions for the site (Discharge Permit 6010, Condition 11) require shallow groundwater quality to be compared with ANZECC 2000 LDW trigger values. During the reporting period, all bores except for bore C2 were compliant within this requirement.
Bore C2 had a faecal coliform count of 260 CFU/100mL compared to the consent limit of 100 CFU/100mL.

9.2 Groundwater - Gravel Aquifer

Condition 12 of Discharge Permit 6010 requires groundwater quality within the deeper gravel aquifer to be compared with DWSNZ MAVs.

Exceedances were recorded for five parameters in samples from bores monitoring the gravel aquifer during the reporting period, based on annual median values:

- Iron concentration in G1D
- Hardness in D3rd
- Arsenic concentration in D3rd
- Manganese concentration in XD1, E2D, C2DD and D3rd
- Faecal coliforms (as measured by *E. coli*) at bores XD1, E1D, G1D and D3rd

Historically, both iron and manganese concentrations have exceeded the DWSNZ MAVs and so those exceedances are not considered to be significant.

D3rd is a relatively new bore and was only measured three times during this reporting period, thus additional monitoring to determine whether these exceedances are significant is advised.

Faecal coliforms have rarely been elevated in the deep aquifer, so the fact that four bores exceeded the DWSNZ MAV of Nil is cause for concern. Furthermore, it means that XD1, E1D, G1D and D3rd were non-compliant this year.

SVOC-072 Bis(2-ethylhexl) adipate was found in very small concentrations in a sample from D3rd –at the laboratory detection limit of 0.0001 mg/L.

9.3 Surface Water – Hokio Stream and Tatana's Drain

Consent conditions for the site (Discharge Permit 6010, Condition 11) require that surface water quality in the Hokio Stream and Tatana Property Drain be compared with trigger values from Table C1.

Water quality within Hokio Stream was non-compliant for total ammoniacal-N at HS2, and dissolved copper at HS1A. At the Tatana Property Drain, samples from the SW3 (now TD1) monitoring sites showed an exceedance for total ammoniacal-N.

All samples collected from HS3 were compliant with all consent trigger values.

It is recognised that there is contamination of the groundwater arising from leachate from the old, closed landfill. However as determined from site observations, flows within the Tatana Property Drain are very minimal, particularly during the summer periods and whilst the drain is hydraulically connected to the Hokio Stream, the volume flow within the Tatana Drain is significantly less[3] than that of the Hokio Stream and any contamination within water discharged from the Tatana Property Drain r to the Hokio Stream will be rapidly diluted.

The significance of the ecological values of Tatana Property Drain has not been established, however the drain is known to have been developed by the owner of the property (i.e., it was not naturally existing) and is periodically cleaned out by the owner using an excavator. On that basis, the ecological values of the drain are likely to be low.

9.4 Stormwater

Groundwater bores E1D, E1S, D4 and D2 are currently understood to be located hydraulically down-gradient of the stormwater soakage area on the site, and groundwater quality in these bores was compared with the ANZECC 2000 LDW trigger values. There was one exceedance of the trigger values during the reporting period – faecal coliforms for E1D. Whilst it did not exceed the ANZECC LDW, it did exceed the DWSNZ limit of nil, at 11 CFU/100mL.

An assessment comparing up-gradient groundwater quality up-gradient to the stormwater soakage area to down-gradient groundwater quality found that concentrations of sodium, boron and iron were more elevated within the down-gradient bores than for the up-gradient bores.

---

[3] Flow in the Tatana Drain has been estimated to be between 10L/s and 50L/s, whereas the average flow reported in the Hokio Stream (September 1980 – June 1982) was 833L/s.

9.5 Landfill Gas and Odour Monitoring

Odour monitoring was carried out on nine occasions at the landfill boundary in accordance with the methodology described in the Odour Management Plan. No further action was considered necessary following the inspections.

Concentrations of methane, carbon dioxide, hydrogen sulphide and oxygen were monitored quarterly during the 2021-2022 monitoring period with elevated levels of methane and hydrogen-sulphide being measured on occasions (refer to Section 8-2). A copy of gas monitoring results is provided in Appendix I. The existing consent does not require assessment of the concentrations of landfill gases detected against any limits. However, given the potential for landfill gas emissions on the site (particularly of H_2S), it is stressed that sampling personnel must take specific health and safety precautions to avoid inhaling gases from the bores when measurements are being taken.

Monthly surface methane emissions monitoring is required over all temporary and capped areas of the landfill and at the bio-filter. The bio-filter was decommissioned in September 2021, and so no further monitoring of that facility was required thereafter. During the period from 1 July 2021 to September 2021, Council complied with the inspection and maintenance requirements of the bio-filter, except the daily visual inspections were not always conducted (Council staff inspected the bio-filter when on site and the contractor did it weekly), and weekly recording of the pH of the bio-filter material was not implemented. Additionally, the bio-filter fan did not run consistently, so there were periods when the bio-filter was not in use.

HDC has engaged Envirowaste to undertake this testing. Monthly surface emissions monitoring of areas that have been capped with temporary capping has been carried out on eleven occasions (from July 2021 to May 2022). On all occasions there were locations noted that had methane concentrations greater than 200 ppm. Except in May 2022, all locations were remediated with bentonite granules and water, and some has additional clay capping placed over them. All but five of the locations returned re-test results less than 200 ppm. Indications were given in the reports that these locations required additional clay capping, but no further re-test results were provided. No remediation was carried out in May 2022 which means HDC is non-compliant with its resource consent requirements for remediation within 24 hours, including for not providing reports for June 2022, and for not remediating and re-testing all locations that failed the original re-test after remediation.

HDC is required to collect meteorological data from an on-site weather station. This has been undertaken throughout the reporting period by a new weather station installed on-site in April 2021. The new weather station records data at 1-minute intervals, as required by the consent conditions.

However, the new weather station has experienced faults through moisture ingress, and it has had to be repaired. This has resulted in gaps of the weather observations from mid-July to mid-August. The old weather station at 645 Hokio Beach Road has been available to provide information through that period.

The rainfall and relative humidity data records are incomplete, with some data missing between December 2021 and June 2022.

10 Refuse Density

Condition 14 of Discharge Permit 6010 requires that the in-situ density of the waste be checked each year through an annual survey of the landfill. The compaction density is required to be between 600 and 800 kg/m^3 (0.6 – 0.8 tonnes/m^3).

The methodology used is essentially the same that has been used for previous compaction analyses. The evaluation was performed using waste quantity data obtained from weighbridge records and the corresponding volume of airspace used from surveys carried out in June 2020 and March 2022, which is an as-built record of the landfill following capping.

The clay capping has been subtracted from the as-built surface by estimating the average depth of clay over the front face, top and side slopes, to approximate the waste surface at the completion of filling. The volume occupied by waste disposal between the June 2020 survey and the end of disposal is estimated by comparing the two surveys. Additionally, due to the compaction of the landfill surface to place the clay capping, considerable settlement has occurred which is allowed for by ignoring the ”cut” quantities derived in the “cut and fill” modelling exercise.

Refuse disposal data for the assessment period from July 2020 to the end of October 2021, when waste disposal operations ceased, was provided by MidWest Disposals Ltd and Council. The volume of airspace used in the landfill was determined from the comparison of topographic surveys performed in June 2020 by Adamson Shaw Surveyors and the March 2022 as-built survey carried out by Goodman Contractors.

The topographic survey information is provided in Appendix K. The airspace consumed by refuse, daily cover, and other construction fill (but not clay capping) was approximately 36,750 m^3.

The results of the evaluation are summarised Table 10-1.

Table 10-1: Refuse Density 2012 – October 2021

Year	12-13	13-14	14-15	15-16	16-17	17 – 18	18 – 19	19 – 20	20 – 21[4]
Volume used (m^3)	37,799	44,058	37,962	36,599	30,004	39,192	32,437	58,287	36,750
Waste tonnage (tonnes)	32,784	38,141	35,834	36,981	29,894	36,420	30,160	38,132	46,924
Apparent density (tonnes/m^3)	0.87	0.87	0.94	1.01	1.00	0.93	0.93	0.65	1.28
Airspace rate of use (m^3/tonne)	1.15	1.16	1.06	0.99	1.00	1.08	1.08	1.53	0.78

The Apparent Density for the extended year from the beginning of July 2020 to the end of October 2021 was 1.28 tonnes/m^3 which is the highest compaction density achieved to date. This is not surprising given the compaction that has been applied to the landfill surface to compact the clay capping layer, and which would have resulted in considerable settlement of the waste surface.

The compaction density meets the consent requirement to be above 0.6 t/m^3.

Note that, whilst the consent condition provides for a range of compaction densities (i.e., between 0.6 and 0.8 t/m^3), achieving a compaction density more than this is beneficial and is best practice.

11 Old Landfill Remediation

Condition 15 of Discharge Permit 6010 required the old landfill (Area A) to be remediated by April 2011. The remediation was to encompass:

- Grading the landfill faces and cap to a final slope of between 1V: 3H and 1V: 4H
- Slope the final landfill surface to promote run-off to the outside of the footprint to prevent ponding on the landfill surface
- Ensure the landfill cap incorporates a layer of at least 700mm in thickness. Where extra material is required, it must be of clayey soil origin
- Establish grass or tussock vegetation on the capped landfill.

Condition 15(f) of Discharge Permit 6010 requires that the condition of the unlined landfill be reported annually, together with any maintenance carried out in the previous year.

The capping of the old landfill was carried out as outlined in the 2010 -2011 Levin Landfill Compliance Report. The old landfill area has good grass cover. The top of the old landfill had been used for stockpiling clay and topsoil materials that were subsequently used during the reporting period for capping and topsoiling the operational landfill.

After the clay and topsoil stockpiles had been removed, the top surface of the old landfill was re-shaped to fill in small hollows that had developed. The photographs on the following page show the state of the old, closed landfill on 08 March 2022.

To monitor settlement, ten monitoring points were originally established on top of the old landfill as part of the survey which was carried out in June 2014. The locations of the monitoring points are shown in Appendix L. Also shown is the extent of settlement estimated by comparing this year's survey information with that done last year.

Monitoring point IT6, which was located on a mound of clayey soil, had been previously destroyed with the clayey material being used elsewhere on site. It was reinstated in April 2022. Additionally, monitoring point IT8 could not be located last year but was found this year and subsequently surveyed.

Monitoring point IT7 has settled the most (301mm) since monitoring began, with monitoring point IT10 settling 224mm over the same period. Over this past year monitoring point IT7 settled the most (42mm) with monitoring point IT74 settling 35mm over the same period.

The greatest settlement has occurred at the southern end of the closed landfill, which is not surprising since this is the area where there have been truck movements bringing in clay and topsoil materials.

Settlement of the old landfill is to be expected as the underlying waste degrades.

---

[4] The period is 16 months, from 1 July 2020 to 31 October 2021.

The weekly site inspection sheets report from May 2022 that there is minor ponding occurring on the old, closed landfill. It is recommended that this be addressed as soon as possible.

Figure 11-1 Photographs taken on 08 March 2022 showing repairs made to the old landfill surface.

12 Leachate Irrigation

In 2004, the old landfill site stopped receiving waste and the first stage of the new lined landfill began operating on site. Initially leachate from the lined landfill was collected in a leachate pond and irrigated on site. Leachate irrigation to the area of pine trees to the south-east of the lined landfill was curtailed at the end of 2008 and leachate was recirculated to Stage 1A.

At the beginning of June 2009, a pipeline was extended from the leachate pond to the Levin WWTP, allowing leachate to be pumped directly to that facility. From June 2009 until December 2012 most of the leachate was pumped to the Levin WWTP with some leachate being re-circulated through Stage 1A (about 5m^3 per day when operating). Since January 2012 all leachate (about 50m^3 per day) has been pumped to the Levin WWTP.

Modifications made to the leachate pumping system allows leachate from the leachate pond to be pumped to a manhole located next to the leachate pond, from where it is pumped to the Levin WWTP. This allows leachate pumping to occur without having to fill up the leachate pond which was thought to be a possible source of odour.

13 Site Walkover Records

Condition 28 of Discharge Permit 6010 requires that the landfill be inspected for leachate breakout, settlement, and other adverse environmental effects at least once per month until such a time as discharge of refuse to the landfill ceases.

The current landfill is inspected weekly, and observations recorded on the Weekly Site Walkover Sheets. Because of the volume of reporting, the weekly records have not been attached to this report, but they can be made available to HRC on request, as stated in the resource consent conditions.

This past year, the reports may be split into three distinct periods, as follows:

- From 03 June 2021 to 09 October 2021, whilst waste disposal operations were still in progress, the weekly site inspections were carried out by Envirowaste staff. During this period, it was consistently reported that: potholes need repairing in the unsealed access road; there are cats and seagulls on site; the sign showing directions to the tip head has “faded”. It was occasionally reported that there is litter outside of the landfill cell and this is being collected on an ongoing basis.
- Following a 5 week break of no reporting, from 14 November 2021 to 30 April 2022, and after waste disposal operations had ceased with the clay cap construction being in progress, the weekly site inspections were carried out by a different Envirowaste staff member. The weekly inspection reports quite often noted the presence of gorse, and, with clay capping ensuing, erosion of the clay capping was noted on many occasions. During this period, it is noted that the section on “Leachate Breakout”, on the second page of the inspection checklist sheets, has not been included with the records. It is possible that that sheet has simply not been copied, or it may not have been completed. There was also a report missing between 17 April 2022 and 30 April 2022.
- From 5 May 2022, HDC staff have taken over the weekly site inspections. A leachate breakout is consistently noted on the western face of the landfill and a small area of ponding noted on the old landfill. These same comments have

continued through to the end of June 2022, it also being noted that the leachate breakout on the western face could not be remediated because of the saturated site conditions. With the flare being switched off on occasions, some odour (from landfill gas) has been noted on site. On 17 June 2022 it was noted that there was a slip on the newly capped landfill that needs to be remediated. On 1 July 2022 it was noted that there could be some flow of leachate to the stormwater soakage area from the breakout location.

The old landfill is surveyed for settlement as described in Section 11 of this report.

Under condition 28, site walkover records are required monthly and until such time as discharge of refuse to the landfill ceases. In that respect, HDC has met its consent obligations. However, it is noted that the reports have frequently identified the same problems (e.g., cats, seagulls, litter outside landfill area, gorse, leachate breakouts etc) without indicating how the problems are to be dealt with.

Whilst there may be circumstances which prevent HDC from immediately dealing with all these issues (e.g., saturated front face has made it impossible for the leachate breakout to be accessed), HDC should attempt to rectify what it can, and demonstrate what remedial action has been taken, which is a requirement of condition 29 of Discharge Permit 6010.

14 Vermin and Pest Control

Condition 5 of Discharge Permit 6009 requires that the landfill be regularly inspected for the presence of vermin, birds and other pests and that appropriate measures be taken to control them.

Through observation the operator is aware of the presence of feral cats. Whilst the landfill was operational, shooting of feral cats and seagulls had been carried out regularly. Bait stations have been used, and the operator was aware of the need to replace baits if there was more increased vermin activity.

An opportunity for feral cats and seagulls to scavenge in the waste for food scraps has been removed with the capping of the landfill. This has significantly reduced the seagull population and is likely to reduce the presence of feral cats too.

The weekly site inspections have occasionally identified pests which Council has dealt with as required.

15 Weed Control

Spaying of gorse took place at the Levin Landfill in July 2022, which is just outside of the reporting period.

16 Hazardous Waste Disposal

Hazardous waste is waste that poses a present or future threat to people or the environment because of one or more of the following characteristics:

- explosiveness
- flammability
- capacity to oxidise
- corrosiveness
- toxicity
- eco-toxicity

Envirowaste keeps a log of hazardous waste received which indicates that no loads of hazardous waste were received over the past year and HDC has confirmed that no applications were received for the disposal of hazardous waste. Refer to Appendix M which shows the blank log sheet.

17 Special Waste Disposal

17.1 Special Waste Permits

Six additional special waste permits were issued in the 2021 – 2022 reporting period.

Appendix M lists details of the special wastes for which permits were issued and provides a record of the special waste loads delivered to the landfill.

A total of 256.28 tonnes of special waste was disposed of during the 2021 – 2022 reporting period.

Mostly the special wastes consisted of spoiled or expired foodstuffs (e.g., liquorice and chicken), but also included treated wood shavings and inks.

17.2 Biosolids and Sludges

Table 17-1 lists the quantities of sludge and wastewater treatment plant screenings (i.e., biosolids) disposed of at the landfill during the monitoring period.

Table 17-1: Summary of Biosolids and Sludges Disposed at Levin Landfill in 2021 - 2022

Month	Sludge (tonnes)	Screenings (tonnes)
July 2021	96.99	1.70
August 2021	125.81	1.45
September 2021	94.24	2.75
October 2021	27.25	0.62
TOTAL	**344.29**	**6.52**

After waste disposal operations at the landfill were suspended at the end of October 2021, all sludge and screenings have been taken to Bonny Glen Landfill.

17.3 Liquid Wastes

No liquid waste was accepted at the Levin Landfill in 2021-2022, neither were any applications received for liquid waste disposal at the landfill in 2020-2021.

18 Landfill Development

Reporting on the development that has occurred at the landfill over the previous year and noting what is proposed for the coming year is not a requirement of the conditions of consent. However, it has been included in this Annual Report for information purposes.

The following developments occurred at the landfill site in the 2021-2022 reporting period:

- De-commissioning of the bio-filter.
- Capping, topsoiling, and grassing of the side slopes and completed top area of the landfill.
- Filling in of minor areas on the old, closed landfill where vehicle tracking had caused the ground surface to settle.
- Development activities proposed for 2022/2023 will depend entirely on the Council's decision regarding the future of the landfill.

Capping of the landfill was undertaken by Goodman Contractors during November 2021 to March 2022. With HDC still to determine the future of the landfill (i.e., whether to close it or to construct the next stage and keep it open), the decision was made to place a temporary capping on the front face of the landfill, where the next stage would abut. The whole of the rest of the landfill was capped with the full 700mm clay capping layer and was topsoiled and grassed.

Figure 18-1 on the following page shows approximately the areas of permanent and temporary capping. The access road has also not yet been capped to a permanent standard. It needed to remain open for access during the construction contract and may yet be used if the next landfill stage is constructed.

Permeability tests, as well as extensive compaction density tests, were conducted on the permanent capped areas. The permeability tests showed the clay capping has a permeability less than 1×10^{-7} m/s.

The temporary capping, which was not topsoiled and so did not become well vegetated on hydroseeding, has become rilled and eroded due to the significant rainfall events that occurred near the end of the capping contract. Placement of permanent capping over the top of it will address the problem, but in the meantime, it needs attention so as not to deteriorate further.

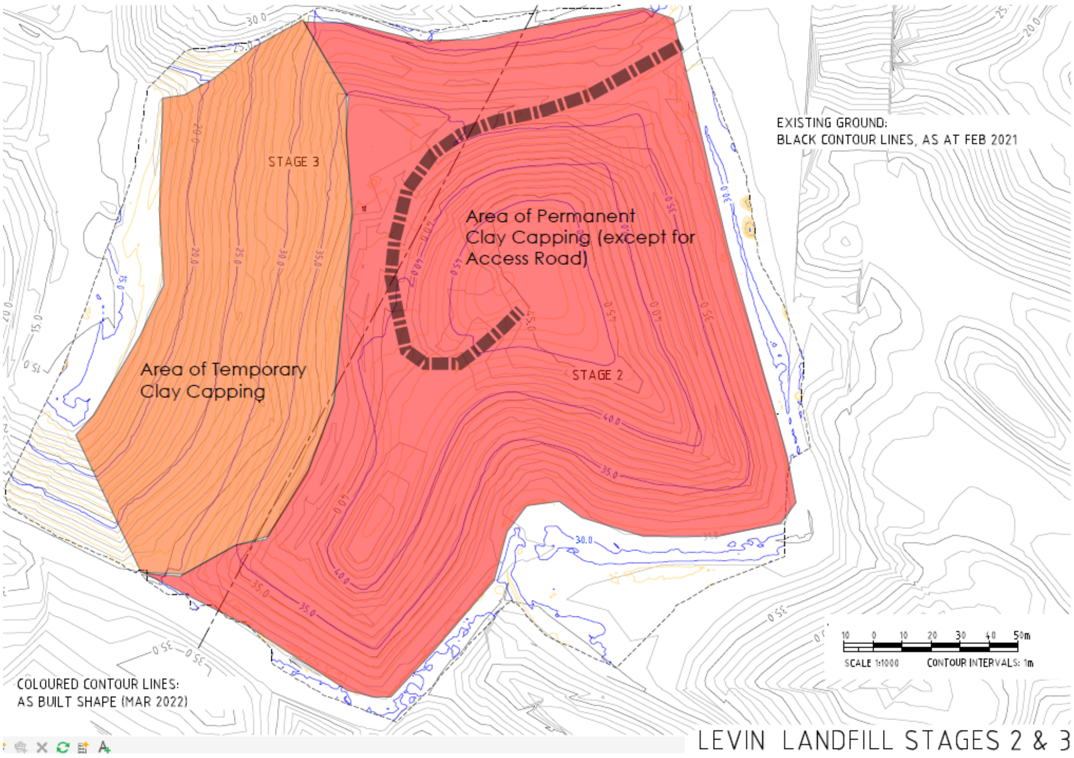


Figure 18-1 Plan showing areas of temporary and permanent capping on the landfill (Source: Stantec 2022)

19 Conclusions

HDC is required to carry out compliance monitoring as part of Resource Consents DP6009, DP6010, DP6011 and DP102259. This report summarises the findings from the July 2021 to June 2022 monitoring period.

During the reporting period, there was one exceedance (for nitrate N) observed in samples at sites HS1A, HS1, HS2, and HS3 in the Hokio Steam.

One SVOC and 14 VOCs were also detected at low levels in the leachate pond, with the ANZECC 2000 99th percentile trigger value for Naphthalene being exceeded.

Background groundwater quality in bore G1S is characterised by low pH levels and elevated chloride, iron, and aluminium concentrations in the shallow aquifer. Bore G1D also had elevated aluminium concentrations. Furthermore, faecal coliform counts for G1S and G1D exceeded the DWSNZ limit of nil. These exceedances are historically irregular – and multiple exceedances throughout this reporting period support the conclusion that such exceedances are not anomalies.

In bores hydraulically up-gradient of the old landfill and down-gradient of the new landfill, concentrations of leachate indicators were below ANZECC LDW trigger values for the reporting period. The results indicate that there is no leachate from the new lined landfill impacting on groundwater down-gradient of the landfill.

In bores situated hydraulically down-gradient of the old landfill, leachate indicators (such as chloride, ammoniacal-nitrogen, and boron) have been detected at elevated concentrations – particularly in bores B1, B2, B3, C2 and G2S (compared with lower concentrations at bore E2S, moderate at Xs1 and C2DS). Boron is the only leachate indicator with an assigned LDW trigger value (5 mg/L), and this was not exceeded in any of the shallow aquifer down-gradient bores. Bore C2 had an exceedance regarding faecal coliforms, which is considerably less than this parameter's peak in the 2019-2020 monitoring period, however, still an issue as it is thus deemed non-compliant with resource consent. Bores B1, B3, B3, C2 and G2S all appear to be located and screened within the leachate plume This leachate plume appears to have a confined radius northward and is not extending to the north-west and the north-east. The plume width is estimated at 300-500 m; a key model assumption which has been retained since 2014.
Groundwater quality observed down-gradient of the old irrigation area (F-series bores) was comparable to or better than the background shallow groundwater quality up-gradient of the old landfill during this reporting period. However, these monitoring results for these bores were variable which could be indicative of leaching within land hydraulically down-gradient of the old irrigation area.

Groundwater quality in the deep gravel aquifer bores was non-compliant with consented limits. Faecal coliform counts (measured as *E. coli*) exceeded the consent limit in bores XD1, E1D, G1D and D3rd. Faecal coliforms have rarely been elevated in the deep aquifer, so the fact that four bores were non-compliant is cause for concern. Hardness and arsenic levels were also non-compliant in bore D3rd.

As outlined in Section 6, mass load calculations were undertaken to predict a range of contaminant concentrations in the Hokio Stream for specific indicator parameters (ammoniacal-nitrogen, boron, chloride, sodium, nitrate-nitrogen and dissolved reactive phosphorus). The mass load calculation compares these predicted concentrations with median and maximum concentrations (averaged over five years) in the bores which are most representative of the leachate plume, these being bores B2, B3, C1, C2, C2DS, G2S, and Xs1. This year's assessment confirmed that the predicted concentrations show close agreement with the actual monitoring results obtained from HS3 for all parameters except for DRP, which has a median average concentration which is some 30% higher than the predicted range.

Samples collected at the upstream and downstream locations within Hokio Stream were generally compliant with the consent trigger values for all parameters, except for total-ammoniacal nitrogen at HS2 and dissolved copper at HS1. Actual concentrations at the upstream site and predicted concentrations for the downstream site exceeded the ANZECC Lowland River DGVs for ammoniacal-N, nitrate-N and DRP. Similarly. actual concentrations at the upstream site and predicted concentrations for the downstream site exceeded the Horizons One Plan guideline values for nitrate-N and DRP.

The inference from these results is that the leachate contamination within the groundwater plume from the old landfill area is affecting the quality of water in the Hokio Stream to a minor extent only. By far the greatest contributions to the concentrations of measured parameters in the Hokio Stream are arising from sources unrelated to the old landfill and are in fact originating from upstream of the landfill site. The water quality of the Hokio Stream is influenced strongly by its urban and rural catchments. The actual and predicted results indicate that the impact from the Levin Landfill on the Hokio Stream is likely to be minimal within the wider catchment context.

The drain on the Tatana Property appears to be intercepting a low level of leachate-contaminated shallow groundwater prior to discharging to the Hokio Stream. The key leachate parameters ammoniacal nitrogen, conductivity and chloride were generally greater in concentration within this drain than in the shallow groundwater bores which are screened in the leachate plume. There was some evidence for an increase in ammoniacal-nitrogen, conductivity, and chloride between sites HS1 And HS3.

Sodium, boron and iron were elevated in the down-gradient bores compared with up-gradient, however considering that groundwater quality in shallow bores down-gradient from the soakage area was not noticeably different to that observed in background bore G1S, it is likely that stormwater from the landfill is likely not impacting groundwater. Bore E1D had a median *E.coli* count that slightly exceeded the DWSNZ MAV of Nil, which therefore constituted a non-compliance.

The waste compaction that has been achieved over the sixteen months prior to 31 October 2022 has been assessed in this report. This assessment involved comparing the 2022 landfill as-built survey with the survey undertaken in June 2020 and taking account of the clay capping that has been placed on the landfill. The assessment shows compaction levels to be the highest they have ever been and easily meet the resource consent requirements. The very high level of compaction is on account of the settlement induced in the landfill with the compaction of the clay capping.

Monitoring of the old landfill shows that settlement is occurring, which is not unexpected. The clay and topsoil stockpiles on top of the old landfill were removed during the reporting period, and the top surface was graded to remove minor hollows. Weekly inspections have shown that there are still some areas where minor ponding is occurring, and these areas need to be filled and re-graded.

Odour monitoring at the landfill boundary has been implemented in accordance with the methodology described in the Odour Management Plan. No further action was considered necessary following the nine odour inspections undertaken during the reporting period.

Gas detection within the groundwater monitoring wells has been undertaken when groundwater has been sampled. The results show an indication of methane on occasions, with the presence of hydrogen sulphide being detected on two occasions. Whilst the results are provided by a third party and confirmation of the units used (i.e., either ppm or %) has not yet been verified, the results, particularly for H_2S need to be taken very seriously. Appropriate precautions and health and safety measures need to be taken when sampling the groundwater bores and testing for gas.

Monthly surface methane emissions monitoring is required over all temporary and capped areas of the landfill and at the bio-filter. HDC has engaged Envirowaste to do this testing and during the reporting period eleven monthly walkover assessments were conducted. As such, HDC is non-compliant with the consent condition that requires monthly testing of surface gas emissions. On all occasions for which surface emissions have been tested, locations have been identified on the landfill surface where the concentrations of methane have exceeded the allowable levels. On all occasions, except in May 2022, the surface has been remediated by sealing surface fissures with bentonite granules mixed with water and occasionally, by adding clay cover. Re-testing has shown the remediation to be successful on but five occasions. On these occasions the reports have indicated that additional soil cover is needed, but no further re-test information has been provided. In May 2022, no remediation was carried out within 24 hours at locations that had surface emissions more than 200ppm, due to Council not having resources available to do this work. This also makes HDC non-compliant for this resource consent requirement.

Whilst the bio-filter was in operation (July 2021 to September 2021) there were a range of inspections and maintenance requirements. HDC complied with some of these but did not implement a daily visual check of the bio-filter, as well as monitoring and recording the pH of the filter bed media.

HDC is required to collect meteorological data from an on-site weather station. This has been undertaken through the reporting period. A new weather station was installed at the landfill site office in early 2021 allowing weather data to be collected at 1-minute intervals, as stated in the consent conditions. The weather station was affected by moisture ingress which put it out of action between mid-July and mid-August. Weather observations from the old weather station at 645 Hokio Beach Road can fill the gap for this period. However, rainfall and relative humidity information is missing from the data derived from the new weather station from December 2021 to June 2022. The weather station needs to be serviced to correct these errors.

20 Recommendations

A series of recommendations are made below, which will improve the understanding of the impact of the landfill. Some of these recommendations have been carried over from last year's report and have been drawn from a memorandum[5] prepared by Stantec for HDC in response to HRC's request for an action plan to be prepared to deal with HRC's audit compliance report actions.

1. The 2020-2021 Annual Report recommended that additional assessments be undertaken to determine correlations between wet weather events and sampling results for the Tatana Property Drain and Hokio Stream. The following information is required to undertake the additional assessments.
   - Obtain a full rainfall record from the closest available weather station (if the landfill weather data is unsuitable) for the same sampling period where monthly sampling was conducted of the Hokio Stream and Tatana Drain (between April 2020 and June 2022).
   - Record by way of a subjective description the water levels in the Hokio Stream and Tatana Drain, when monthly sampling is carried out (e.g., stream flowing full; Tatana Drain is flowing "X" centimetres deep etc.).
   - Determine by survey the relative base level of the Hokio Stream and Tatana property drain at the monitoring locations so that the water levels can be interpreted.
   - Obtain information on flows within the Hokio Stream (this will also inform the assumptions that have been made for the mass contaminant load assessment).
   - Undertake a survey along the length of the Tatana Drain so that it can be modelled hydraulically, based on its channel profile and grade, and that a measure of the flow rate can be determined quarterly based on the depth of flow measured in the drain at TD1.
2. Review the suitability of bores used as reference background water quality monitoring locations.
3. Review the estimated width and direction of the leachate plume and check that the bores used in the mass balance calculations still provide a good representation of the leachate plume quality.
4. Review groundwater flow directions around both landfill sites to ensure that the interpretations in the annual report are still accurate.
5. Landfill gas monitoring records should include information about weather conditions on the date of each sampling event (including atmospheric pressure and ambient temperature), and units of measurement need to be clearly recorded. These records need to be provided to the party compiling the quarterly reports as soon as they become available.
6. Undertake to fill low-lying areas on the surface of the old landfill with clayey soil.

---

[5] "*Memorandum – Draft Plan for Actioning Horizon's Audit Compliance Report Actions*"; Memo prepared by Stantec for HDC, August 2021

Appendix

We design with community in mind

Appendix A Relevant consent conditions

Relevant Consent Conditions

The Annual Report is required to meet the following consent conditions:

- Discharge Permit 6009 – Discharge solid waste to land
    - ✓ Condition 8

      "The Permit Holder shall develop and implement a procedure for the landfill operator, such that potentially hazardous material, as listed in Annex 1 attached to and forming part of this permit, will not be accepted for disposal at the Levin landfill without specific authorization. The Operations Manager of the Horowhenua District Council, or some other designated person, is able at their discretion to accept quantities of such wastes. The waste shall be accompanied by a Hazardous Waste Manifest, as listed in Annex 1, which will form part of the permanent record and shall be reported by the Regional Council by 30 September each year for the term of this Permit.

    - ✓ Condition 14

      "The Permit holder shall submit an annual report to the Regional Council by 30 September each year for the duration of this Permit documenting the condition of the unlined landfill and any maintenance carried out during the previous year. The annual report shall address but not be limited to those aspects listed in Conditions 14(n) to 14(r) above. The annual report shall include a plan of the unlined landfill specifically documenting the shape of the closed landfill and any changes during the previous year related to Condition 14(q) [The annual report can be written in conjunction with the annual report required as part of Condition 15 (f) for Consent Number 6010]"

    - ✓ Condition 35 (b)

      "The Permit holder shall … Forward an annual report to members and to the Regional Council and the District Council"
- Discharge Permit 6010 – Discharge landfill leachate onto and into ground
    - ✓ Condition 5

      "The results of monitoring under Conditions 3 and 4 of this Permit shall be reported to the Regional Council by 30 September each year for the duration of this Permit"

    - ✓ Condition 11(d)

      "The Permit Holder shall annually review the data derived from the groundwater monitoring program and evaluate contaminant mass load projections for discharges from the landfill to the Hokio Stream. The contaminant mass load projections shall be based primarily, but not exclusively, on the monitoring data obtained for the "B", "C" and "X" series bores indicated in Table D of this discharge permit. The annual report required under Condition 5 shall include the following information:

      i. *A summary of the methodology used to calculate the mass load projections.*
      ii. *The calculated mass loads transported in the groundwater and comparable mass loads in the Hokio Stream.*
      iii. *An analysis of the implications of the mass load calculations with respect to ensuring discharges from the landfill would not result in a decline in the water quality in the Hokio Stream under Condition 3"*

- ✓ Condition 11 (e)

  “Should the groundwater parameters tested for under Condition 3 of this consent, and subsequent evaluation and indicative assessment of contaminant mass loads under Condition 11 (d) of this consent indicate that contaminants sourced from either the closed or active areas of the Levin Landfill are likely to result in a significant effect associated with the landfill leachate as identified through an investigation under Condition 3, then Condition 11(c) applies.

- ✓ Condition 14

  “In-situ refuse density shall be determined through annual calculation based on information derived from topographic surveys of the landfill and borrow areas, and from weighbridge records. The survey should be carried out within one month of the anniversary of the previous survey”

- ✓ Condition 15 (f)

  “The Permit holder shall submit an annual report to the Regional Council by 30 September each year for the duration of this Permit documenting the condition of the unlined landfill and any maintenance carried out during the previous year. The annual report shall address but not be limited to those aspects listed in Conditions 15(a) to (e) above. The annual report shall include a plan of the unlined landfill specifically documenting the shape of the closed landfill and any changes during the previous year. [The annual report can be written in conjunction with the annual report required as part of Condition 14 for Consent Number 6009]”

- ✓ Condition 27

  “The Permit holder shall keep a log of:

  a) The dates and times of leachate irrigation;

  b) The total volume of leachate irrigated daily;

  c) The volumes of leachate irrigated to specific areas;

  d) Weather and ground conditions during irrigation;

  e) Observations made during the weekly inspections of the pump, irrigation system;

  f) and irrigation areas; and

  g) Repairs and maintenance carried out on the irrigation system.

  Copies of this log shall be forwarded to the Regional Council’s Environmental Protection Manager on 28 February and 31 August of each year that the irrigation system is operated.

- Discharge Permit 6011 – Discharge landfill gas, odour and dust to air

  - ✓ Condition 5 (g)

    “The Permit shall include records of surface emission monitoring for methane must be included in the Annual Report required by Condition 39 of Discharge Permit 6009 and must also be provided to Manawatu-Wanganui Regional Council on request.

- ✓ Condition 8F

  "The Permit Holder shall maintain a log of all other inspections, investigations and actions taken in accordance with all monitoring and odour inspection conditions of this consent. The inspection and investigation log shall be made available to the Manawatu-Wanganui Regional Council on request and submitted in summary form in the Annual Report".

- Discharge Permit 102259 – Discharge stormwater to land and potentially to groundwater via ground soakage

  - ✓ Condition 16

    "The results of monitoring under Condition 14 of this permit shall be reported to Horizon Manawatu's Team Leader Compliance by 31 August each year for the duration of this Permit beginning 31 August 2003. The annual report shall be supplemented by the raw water quality analysis data being forwarded to the Regional Council as soon as practically possible following the receipt of laboratory analysis certificates".

Appendix B Monitoring programs

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

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

			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	D3rd(1)	C1	C2	C2ds	D4	B1	B2	B3s	E1s	E2s	D1(2)	D2(2)	D3rs(1,2)	D6(2)	G1s	G2s	Xs1	Xs2	D5(3)	F1(3)	F2(3)	F3(3)	HS1	HS1A	HS2	HS3	TD1	
Sep-21	Aug-21	Jul-21	I	I + SW	I	I	C	C	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	C + SW	I	I + SW	I	C	C	I	I	I	I + SW	Monthly Compre. To 03/2022	Monthly Compre. To 03/2022	Monthly Compre. To 03/2022	Monthly Compre. To 03/2022	I	Monthly Compre.
	Nov-21	Oct-21	I	I + SW	I	I	C	C	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	C + SW	I	I + SW	I	C	C	I	I	I	I + SW					C	A
	Feb-22	Jan-22	I	I + SW	I	I	C	C	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	C + SW	I	I + SW	I	C	C	I	I	I	I + SW					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 + A	C + A	Discontinue after 2 years, i.e. after March 2022	C	C	C	C	C + A
Sep-22	Aug-22	Jul-22	I	I + SW	I	I	I	C	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	C + SW	I	I + SW	I	I	I	I	I	I	I + SW		I	I	I	I	I
	Nov-22	Oct-22	I	I + SW	I	I	I	C	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	C + SW	I	I + SW	I	I	I	I	I	I	I + SW		C	C	C	C	C
	Feb-23	Jan-23	I	I + SW	I	I	I	C	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	C + SW	I	I + SW	I	I	I	I	I	I	I + SW		I	I	I	I	I
	May-23	Apr-23	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A		C	C	C	C	C
Sep-23	Aug-23	Jul-23	I	I + SW	I	I	I	I	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	I + SW	I	I + SW	I	I	I	I	I	I	I + SW		I	I	I	I	I
	Nov-23	Oct-23	I	I + SW	I	I	I	I	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	I + SW	I	I + SW	I	I	I	I	I	I	I + SW		C	C	C	C	C
	Feb-24	Jan-24	I	I + SW	I	I	I	I	I	I	I	I + SW	I	I	I	I + SW	I + SW	I	I + SW	I + SW	I	I + SW	I	I	I	I	I	I	I + SW		I	I	I	I	I
	May-24	Apr-24	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A	C + A		C	C	C	C	C

Measure groundwater level and sample all bores for CH_4, CO_2 and O_2 each time that groundwater is sampled (Condition 4a of DP 6011)

Notes:

(1) Replacement bore D3r consists of two nested piezometers that have been calledL D3rs and D3rd.
(2) See table below
(3) If irrigation re-commences then the annual sampling is to change from comprehensive + 3 times indicator to bi-annual comprehensive + indicator (Clause D of Condition 3, DP 6010) .
(4) See table below
(5) See table below
C Comprehensive list (see below)
I Indicator list (see below)
A Pesticide and SVOC analysis
SW Add sodium and iron analysis (for stormwater consent 102559)

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

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

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

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

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

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

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

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

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

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

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

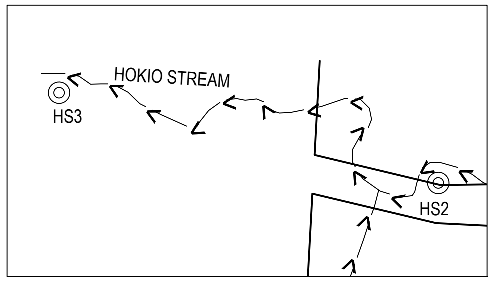
INDICATOR PARAMETER LIST (Table F, Condition 3, DP 6010)

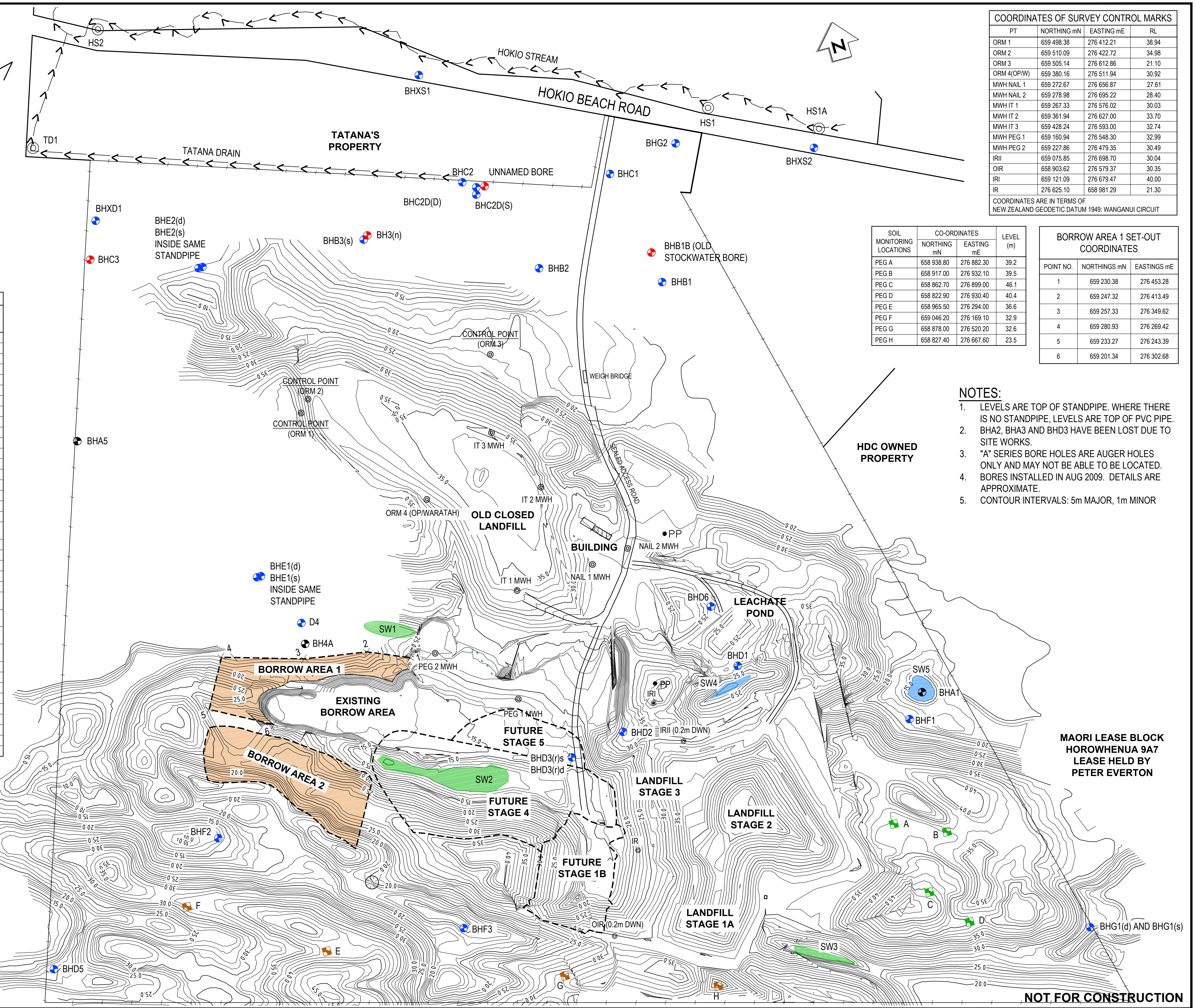
Characterising parameters	pH
	electrical conductivity (EC)
Oxygen demand	COD and $scBOD_5$
Nutrients*	NO3-N and NH4-N
Metals*	AL, Mn, Ni, Pb and Hg
Other elements	B and Cl
Biological+	E. coli

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

+ E. coli added from April 2019 sampling onwards

Appendix C Site plan





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

LEGEND

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

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

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

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

NOTES:

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

DO NOT SCALE - IF IN DOUBT, ASK

ORIGINAL SIZE A1

NOT FOR CONSTRUCTION

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

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

Stantec

Client:

HOROWHENUA DISTRICT COUNCIL
LEVIN LANDFILL

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

Status Stamp: FOR INFORMATION ONLY

Date Stamp: 24.09.21

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

Drawing No.: 310101088-19-001-G001

Rev.: E

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

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

Appendix D Number of samples per site

Determinants	B1	B2	B3	C1	C2	C2DD	C2DS	D1	D2	D3rs	D3rd	D4	D5	D6	E1S	E1D	E2S	E2D	F1	F2	F3	HS1A	HS1	HS2	HS3	Leachate Pond	G1S	G1D	G2S	TD1	XD1	XS1	XS2
Ammonia-N	4	4	4	4	3	4	4	4	4	3	3	4	4	4	4	4	4	4	4	4	4	10	9	10	10	8	4	4	4	10	4	4	4
Boron	4	4	4	4	3	4	4	4	4	3	3	4	4	4	4	4	4	4	4	4	4	10	9	10	10	8	4	4	4	10	4	4	4
Chloride	4	4	4	4	3	4	4	4	4	3	3	4	4	4	4	4	4	4	4	4	4	10	9	10	10	8	4	4	4	10	4	4	4
Conductivity	4	4	4	4	3	4	4	4	4	3	3	4	4	4	4	4	4	4	4	4	4	10	9	10	10	8	4	4	4	10	4	4	4
E.coli	4	4	4	4	3	4	4	4	4	3	3	4	4	4	4	4	4	4	4	4	4	9	8	9	9	8	4	4	4	9	4	4	4
pH	4	4	4	4	3	4	4	4	4	3	3	4	4	4	4	4	4	4	4	4	4	10	9	10	10	8	4	4	4	10	4	4	4
Suspended Solids	1	1	1	1	0	1	1	1	1	3	3	1	1	1	1	1	1	1	1	1	1	9	9	9	9	7	1	1	1	9	3	3	3
Phenol	1	1	1	1	0	1	1	1	1	3	3	1	1	1	1	1	1	1	1	1	1	7	7	7	7	7	1	1	1	7	2	2	2
VFA	1	1	1	1	0	1	1	1	1	3	3	1	1	1	1	1	1	1	1	1	1	7	7	7	7	7	1	1	1	7	2	2	2
TOC	1	1	1	1	0	1	1	1	1	3	3	1	1	1	1	1	1	1	1	1	1	9	9	9	9	7	1	1	1	9	3	3	3
Alkalinity	1	1	1	1	0	1	1	1	1	3	3	1	1	1	1	1	1	1	1	1	1	9	9	9	9	7	1	1	1	9	3	3	3
COD	4	4	4	4	3	4	4	4	4	3	3	4	4	4	4	4	4	4	4	4	4	10	9	10	10	8	4	4	4	10	4	4	4
scBOD	4	4	4	4	3	4	4	4	4	3	3	4	4	4	4	4	4	4	4	4	4	10	9	10	10	8	4	4	4	10	4	4	4
Nitrate-N	4	4	4	4	3	4	4	4	4	3	3	4	4	4	4	4	4	4	4	4	4	10	9	10	10	8	4	4	4	10	4	4	4
Sulphate	1	1	1	1	0	1	1	1	1	3	3	1	1	1	1	1	1	1	1	1	1	9	9	9	9	7	1	1	1	9	3	3	3
Hardness	1	1	1	1	0	1	1	1	1	3	3	1	1	1	1	1	1	1	1	1	1	9	9	9	9	7	1	1	1	9	3	3	3
Calcium	1	1	1	1	0	1	1	1	1	3	3	1	1	1	1	1	1	1	1	1	1	9	9	9	9	7	1	1	1	9	3	3	3
Magnesium	1	1	1	1	0	1	1	1	1	3	3	1	1	1	1	1	1	1	1	1	1	9	9	9	9	7	1	1	1	9	3	3	3
Potassium	1	1	1	1	0	1	1	1	1	3	3	1	1	1	1	1	1	1	1	1	1	9	9	9	9	7	1	1	1	9	3	3	3
Sodium	1	1	1	1	0	1	1	1	1	3	3	4	1	1	4	4	4	1	1	1	4	9	9	9	9	7	4	1	1	9	3	3	3
D.R. Phosphorus	1	1	1	1	0	1	1	1	1	3	3	1	1	1	1	1	1	1	1	1	1	9	9	9	9	7	1	1	1	9	3	3	3
Aluminium	4	4	4	4	3	4	4	4	4	3	3	4	4	4	4	4	4	4	4	4	4	10	9	10	10	8	4	4	4	10	4	4	4
Arsenic	1	1	1	1	0	1	1	1	1	3	3	1	1	1	1	1	1	1	1	1	1	9	9	9	9	7	1	1	1	9	3	3	3
Cadmium	1	1	1	1	0	1	1	1	1	3	3	1	1	1	1	1	1	1	1	1	1	9	9	9	9	7	1	1	1	9	3	3	3
Chromium	1	1	1	1	0	1	1	1	1	3	3	1	1	1	1	1	1	1	1	1	1	9	9	9	9	7	1	1	1	9	3	3	3
Copper	1	1	1	1	0	1	1	1	1	3	3	1	1	1	1	1	1	1	1	1	1	9	9	9	9	7	1	1	1	9	3	3	3
Iron	1	1	1	1	0	1	1	1	1	3	3	4	1	1	4	4	4	1	1	1	4	9	9	9	9	7	4	1	1	9	3	3	3
Lead		4	4	4	3	4	4	4	4	3	3	4	4	4	4	4	4	4	4	4	4	10	9	10	10	8	4	4	4	10	4	4	4
Manganese	4	4	4	4	3	4	4	4	4	3	3	4	4	4	4	4	4	4	4	4	4	10	9	10	10	8	4	4	4	10	4	4	4
Mercury	4	4	4	4	3	4	4	4	4	3	3	4	4	4	4	4	4	4	4	4	4	10	9	10	10	8	4	4	4	10	4	4	4
Nickel	4	4	4	4	3	4	4	4	4	3	3	4	4	4	4	4	4	4	4	4	4	10	9	10	10	8	4	4	4	10	4	4	4
Zinc	1	1	1	1	0	1	1	1	1	3	3	1	1	1	1	1	1	1	1	1	1	9	9	9	9	7	1	1	1	9	3	3	3

Appendix E Tabulated analysis results

B1 Monitoring Bore HDC Levin Landfill

Determinand		ANZECC STOCK	Median	Maximum	Annual Median	Apr-22	Jan-22	Oct-21	Jul-21	Apr-21	Jan-21	Oct-20	Jul-20	Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18
Water level	mBGL		1.0700	1.960	1.02	0.96	1.080	0.77	1.19	1.21	0.86	1.960	1.00	1.39	1.14	0.88	1.01	1.33	1.150	0.96	1.06
pH		6 to 9	6.9500	7.800	6.95	6.9	6.9	7.0	7.0	6.5	7.0	6.7	6.8	6.9	7.8	7.0	7.0	7.6	7.2	6.9	6.9
Suspended Solids	mg/l		3.0000	18.000	18	*18*				*3*	*3*			*3*				3	3		
Phenol	mg/L		0.0250	0.025	0.025	*0.025*				*0.025*				*0.025*				*0.005*	*0.025*		
VFA	mg/L		2.5000	52.000	2.5	2.5				*52.0*				*2.5*				3	3		
TOC	mg/L		20.0000	31.200	31.2	31.2				30.1	13.0			22.8				17.2	14.7		
Alkalinity	mg CaCO3/L		571.5000	681.000	648	648				681	393			624				519	309		
Conductivity	mS/m		183.0000	276.000	189.5	214	194	161	185	241	174	168	203	276	167	123	119	190	156	181	191
COD	mg/L		86.0000	118.000	88.5	114	85	77	92	118	63	90	87	60	69	87	58	102	92	71	49
BOD (scBOD frm Apr'20)	mg/L		1.5000	3.000	3	*3*	*3.0*	*1.5*	*3.0*	3.0	0.5	0.5	0.5	0.5				1	2		
Faecal C (Ecoli frm Apr'20)	col/100ml	100	2.0000	110.000	2	2	110	*2*	*2.0*	*4.0*	4	2	*2*	*2*	*20*	*40*	*2*	*2*	*2*		
Chloride	mg/L		287.0000	506.000	277.5	323	292	216	263	4	291	264	354	506	283	139	118	297	269	366	422
Nitrate-N	mg/L	90.3	5.4800	21.400	4.79	0.69	2.73	21.40	6.85	4.36	13.10	11.20	6.60	1.50	8.16	8.45	9.46	1.13	*3.16*	4.32	3.02
Sulphate	mg/L	1000	3.9150	47.000	3.31	3.3				3.20	4.52			2.85				9.8	47.0		
Ammonia-N	mg/L		9.9450	18.100	8.565	8.4	8.720	6.3	10.1	14.30	8.58	7.60	12.40	16.8	9.8	7.1	7.8	18.1	11.1	11.9	14.9
Hardness	mg CaCO3/L		468.0000	670.000	385	385				578	466			670				470	379		
Calcium	mg/L	1000	87.9000	122.000	74.1	74.1				112	85.0			122.0				91	67		
Magnesium	mg/L		60.2500	88.900	48.6	48.6				72.6	61.5			88.9				59.0	50.9		
Potassium	mg/L		21.8000	29.900	20.3	20.3				25.6	17.1			29.9				23.3	18.2		
Sodium	mg/L		143.0000	283.000	283	283				216	132			257	132	121	111	145	124	150	143
D.R. Phosphorus	mg/L		0.1045	0.115	0.109	0.109				0.115	0.099			0.105				0.104	0.099		
Aluminium	mg/L	5	0.0045	0.012	0.007	0.012	0.007	0.005	0.007	0.005	0.004	0.005	0.004	0.005	0.004	0.004	0.007	0.004	0.002	0.004	0.002
Arsenic	mg/L	0.5	0.0008	0.001	0.001	0.001				0.001	*0.0005*			*0.0010*				0.0005	0.0005		
Boron	mg/L	5	0.8600	1.720	1.36	1.72	1.340	0.93	1.38	1.47	0.83	0.69	1.07	1.20	0.53	0.56	0.64	0.89	0.49	0.41	0.35
Cadmium	mg/L	0.01	0.0001	0.000	0.0001	*0.0001*				*0.0001*	0.0001			0.0001				0.0003	0.0004		
Chromium	mg/L	1	0.0005	0.002	0.002	0.002				*0.0010*	*0.0005*			*0.0005*				0.0005	0.0005		
Copper	mg/L	0.4	0.0076	0.019	0.0185	0.0185				0.0116	0.0046			0.0094				0.0058	0.0055		
Iron	mg/L		0.0200	0.102	0.102	0.102				0.047	0.06			0.032	0.020	0.01	0.02	0.05	0.017	0.02	0.010
Lead	mg/L	0.1	0.0003	0.000	0.00025	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.0003*	*0.00025*
Manganese	mg/L		8.8150	17.500	6.96	5.6	6.950	6.97	8.5	12.60	9.07	9.84	10.70	17.5	8.56	5.97	6.2	11.00	8.3	9.9	10.40
Mercury	mg/L		0.0003	0.001	0.00025	0.00025	*0.00025*	*0.00025*	*0.00025*	*0.00050*	0.00	0.00	0.00	0.0							
Nickel	mg/L	1	0.0022	0.006	0.00435	0.0062	0.0046	0.0021	0.0041	0.0056	0.0023	0.0019	0.0028	0.0045	0.0019	0.0010	0.0013	0.0033	0.0017	0.0016	0.0014
Zinc	mg/L	20	0.0065	0.046	0.046	0.046				0.006	0.007			0.005				0.007	0.003		

If value is <, divide by 2 and make *italic*

B2 Monitoring Bore HDC Levin Landfill

Determinand		ANZECC STOCK	Median	Maximum	Annual Median	Apr-22	Jan-22	Oct-21	Jul-21	Apr-21	Jan-21	Oct-20	Jul-20	Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18
Water level	mBGL		1.35	1.65	1.195	1.14	1.25	0.98	1.49	1.38	1.07	1.32	1.13	1.65	1.45	1.21	1.4	1.61	1.46	1.30	1.41
pH		6 to 9	6.90	7.20	6.95	6.9	7.0	7.1	6.9	6.7	7.1	6.6	6.6	6.9	7.1	6.6	6.7	7.2	6.9	7.0	7.1
Suspended Solids	mg/l		6.00	29.00	20	20				29	3			*9*				3	3		
Phenol	mg/L		0.03	0.03	0.025	*0.025*				0.025				*0.025*				*0.025*	*0.025*		
VFA	mg/L		2.50	6.00	2.5	*2.5*				2.5				3				6	3		
TOC	mg/L		30.05	36.40	32	32.0				36.4	28.4			31.7				25.6	26.4		
Alkalinity	mg CaCO3/L		685.50	783.00	683	683				783	516			723				688	466		
Conductivity	mS/m		185.50	258.00	195	258	179	205	185	218	161	223	250	209	176	189	135	186	152	151	138
COD	mg/L		83.00	115.00	99.5	108	82	101	98	111	91	115	76	81	84	78	50	112	36	81	70
BOD (scBOD frm Apr'20)	mg/L		1.50	5.90	3	*3.0*	*3.0*	*1.5*	3.0	3.0	*0.5*	*0.5*	*5.9*	*0.5*				*2*	*2*		
Faecal C (Ecoli frm Apr'20)	col/100ml	100	3.00	1700.00	81	*2*	160	1700	*2.0*	*2.0*	*44.0*	8	2	2	*4*	*28*	*48*	*2*	*2*		
Chloride	mg/L		114.50	167.00	114.5	167	79.3	107	122	134	88	126.0	134	141.0	95	123	87.2	125.0	101	90.6	83.5
Nitrate-N	mg/L	90.3	32.05	133.00	44.25	108.00	33.70	54.80	27.30	17.00	37.6	94.4	133.0	21.8	44.20	34.7	30.4	4.0	16.9	18.40	16.50
Sulphate	mg/L	1000	11.00	45.70	8.99	8.99				3.2	13.00			8.9				19.6	45.7		
Ammonia-N	mg/L		43.15	77.50	39.8	67.6	46.1	25.8	33.5	77.5	28.4	42.7	30.7	51.6	43.8	45.5	21.4	55.2	43.6	32.6	30.0
Hardness	mg CaCO3/L		482.50	675.00	675	675				538	427			546				410	235		
Calcium	mg/L	1000	93.60	146.00	146	146.0				122.0	94			117.0				90.6	50.1		1.1
Magnesium	mg/L		51.60	75.30	75.3	75.3				56.3	46.9			61.6				44.6	25.6		
Potassium	mg/L		57.25	67.70	67.7	67.7				61.4	41.7			57.6				56.9	47.4		
Sodium	mg/L		115.00	132.00	124	124				105	119.0			115.0	100	103	85	132	130	122	114
D.R. Phosphorus	mg/L		0.03	0.04	0.016	0.016				0.025	0.041			0.021				0.029	0.035		
Aluminium	mg/L	5	0.01	0.03	0.0115	0.008	0.012	0.033	0.011	0.004	0.020	0.014	0.011	0.009	0.011	0.011	0.017	0.012	0.014	0.018	0.016
Arsenic	mg/L	0.5	0.00	0.01	0.002	0.002				0.004	0.001			0.006				0.003	0.003		
Boron	mg/L	5	1.66	2.37	2.025	2.33	2.18	1.87	1.67	2.37	1.77	1.69	1.65	1.69	1.02	1.37	0.92	1.20	1.07	0.78	0.93
Cadmium	mg/L	0.01	0.00	0.00	0.0001	*0.0001*				0.0001	*0.0001*			*0.0001*				*0.0001*	*0.0001*		
Chromium	mg/L	1	0.00	0.00	0.0005	0.001				0.001	0.001			0.001				0.001	0.001		
Copper	mg/L	0.4	0.00	0.00	0.0041	0.0041				0.0025	0.0039			0.0031				0.0018	0.0026		
Iron	mg/L		0.19	1.34	0.187	0.187				0.32	0.083			0.72	1.340	0.14	0.04	0.26	1.06	0.09	0.09
Lead	mg/L	0.1	0.00	0.00	0.00025	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Manganese	mg/L		3.15	5.22	3.885	5.22	3.44	4.33	2.5	3.2	2.41	5.02	4.77	4.33	3.43	3.14	2.27	2.72	1.93	2.06	1.17
Mercury	mg/L		0.00	0.00	0.00025	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	0.00	0.00	0.00							
Nickel	mg/L	1	0.00	0.00	0.0027	0.0027	0.0029	0.0026	0.0027	0.0031	0.0022	0.0026	0.0026	0.0030	0.0021	0.0018	0.0010	0.0018	0.0018	0.0027	0.0029
Zinc	mg/L	20	0.00	0.02	0.017	0.017				0.003	0.008			0.004				0.003	0.001		

B3 (B3s) Monitoring Bore HDC Levin Landfill

Determinand		ANZECC STOCK	Median	Maximum	Annual Median	Apr-22	Jan-22	Oct-21	Jul-21	Apr-21	Jan-21	Oct-20	Jul-20	Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18
Water level	mBGL		0.15	0.27	0	0.00	0.00	0.00	0.26	0.14	0.0	0.150	0.15	0.15	0.1	0.14	0.2	0.27	0.2	0	0
pH		6 to 9	7.00	7.50	7.2	7.0	7.1	7.3	7.5	7.1	7.2	7.0	7.0	7.1	7.0	6.9	7.1	7.0	6.9	6.8	6.9
Suspended Solids	mg/l		82.50	111.00	88	88				81	81			74				111	84		
Phenol	mg/L		0.03	0.03	0.025	0.025				0.025				0.025				0.025	0.025		
VFA	mg/L		2.50	6.00	2.5	2.5				2.5				3				6.0	2.5		
TOC	mg/L		64.50	72.70	55.1	55.1				61.6	53.0			70.6				72.7	67.4		
Alkalinity	mg CaCO3/L		1125.00	1290.00	1070	1070				1070	919			1180				1290	1280		
Conductivity	mS/m		270.00	324.00	248	270	231	242	254	265	246	261	291	288	254	270	294	324	318	319	297
COD	mg/L		205.00	624.00	200.5	186	131	215	369	100	150	211	198	213	150	119	221	624	199	310	249
BOD (scBOD frm Apr'20)	mg/L		3.00	7.00	3	3	3.0	3.0	3	3	7	1	3	3				3	3		
Faecal C (Ecoli frm Apr'20)	col/100ml	100	2.00	96.00	50	50	96.0	50	2.0	68.0	0.5	2	2	2	2	2	2	2	2		
Chloride	mg/L		173.00	238.00	138	174	122	114	154	166	159	159	162	194	172	177	179	213	219	238	200
Nitrate-N	mg/L	90.3	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.050	0.020	0.050	0.05	0.05	0.01	0.0	0.05
Sulphate	mg/L	1000	0.03	0.33	0.11	0.11				0.04	0.01			0.01				0.01	0.33		
Ammonia-N	mg/L		170.00	185.00	173.5	183.0	166.0	173.0	174.0	177	159	169	177	143	140	141	170	170	179	185	166
Hardness	mg CaCO3/L		387.50	517.00	280	280				300	229			509				517	475		
Calcium	mg/L	1000	74.10	105.00	52.8	52.8				58.5	45.0			89.7				105.0	98.6		
Magnesium	mg/L		46.20	69.20	35.9	35.9				37.2	28.2			69.2				61.8	55.2		
Potassium	mg/L		105.50	120.00	120	120.0				104.0	107			92				109	104		
Sodium	mg/L		152.00	178.00	138	138				127	122			152	129	141	157	170	155	178	158
D.R. Phosphorus	mg/L		0.03	0.04	0.032	0.032				0.034	0.031			0.031				0.043	0.044		
Aluminium	mg/L	5	0.01	0.01	0.005	0.005	0.005	0.004	0.005	0.005	0.006	0.006	0.006	0.007	0.005	0.003	0.003	0.007	0.004	0.004	0.003
Arsenic	mg/L	0.5	0.03	0.04	0.024	0.024				0.022	0.031			0.035				0.020	0.026		
Boron	mg/L	5	1.18	1.40	1.2	1.17	0.97	1.24	1.23	1.00	1.11	1.18	1.35	1.40	0.80	1.17	1.40	1.38	1.31	0.89	0.90
Cadmium	mg/L	0.01	0.00	0.00	0.0001	0.0001				0.0001	0.0001			0.0001				0.0001	0.0001		
Chromium	mg/L	1	0.00	0.01	0.004	0.004				0.004	0.004			0.005				0.005	0.005		
Copper	mg/L	0.4	0.00	0.01	0.0025	0.0025				0.0091	0.0009			0.0007				0.0027	0.0017		
Iron	mg/L		0.86	1.40	0.539	0.539				0.39	0.85			1.03	1.400	0.74	0.34	1.37	0.857	1.11	0.90
Lead	mg/L	0.1	0.00	0.00	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Manganese	mg/L		3.19	4.84	2.675	3.48	2.73	2.62	2.6	2.65	2.52	3.05	3.42	4.84	3.86	3.39	3.83	3.94	3.32	2.68	2.87
Mercury	mg/L		0.00	0.00	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00	0.00	0.00	0.00							
Nickel	mg/L	1	0.01	0.01	0.0088	0.0093	0.0075	0.0085	0.0091	0.0098	0.0072	0.0090	0.0118	0.0136	0.0106	0.0085	0.0101	0.0117	0.0126	0.0131	0.0113
Zinc	mg/L	20	0.00	0.01	0.006	0.006				0.001	0.002			0.001				0.003	0.001		

C1 Monitoring Bore HDC Levin Landfill

Determinand		ANZECC STOCK	Median	Maximum	Annual Median	Apr-22	Jan-22	Oct-21	Jul-21	Apr-21	Jan-21	Oct-20	Jul-20	Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18
Water level	mBGL		0.22	3.60	0.11	0.22	0.00	0.000	0.26	0.40	0.00	0.0	0.10	0.55	0.31	3.60	0.20	0.22	0.2	0	0
pH		6 to 9	6.75	7.50	6.9	6.8	6.8	7.500	7.0	6.7	6.8	6.6	6.7	6.7	7.0	6.6	6.6	6.8	6.9	6.7	6.4
Suspended Solids	mg/l		92.00	395.00	148	148				122	395			40				21	62		
Phenol	mg/L		0.03	0.03	0.025	0.025				0.025				0.025				0.025	0.025		
VFA	mg/L		2.50	2.50	2.5	2.5				2.5				2.5				3	3		
TOC	mg/L		15.60	22.80	22.8	22.8				17.2	14.4			16.6				13.8	14.6		
Alkalinity	mg CaCO3/L		260.00	287.00	258	258				281	287			249				262	222		
Conductivity	mS/m		121.50	150.00	101.5	101	102	113.000	100	107	114	146	132	127	143	127	145	116	99	132.0	150.0
COD	mg/L		63.00	285.00	78	85	82	74.000	43	56	285	81	54	54	76	85	70	45	36	51	48
BOD (scBOD frm Apr'20)	mg/L		3.00	3.00	3	3.0	3.0	3.000	3.0	3	3.0	0.5	0.5	1.0				2	3		
Faecal C (Ecoli frm Apr'20)	col/100ml	100	2.00	44.00	21	44	40.0	2.000	2.0	2.0	0.5	2.0	2	2	2	2	2	2	16		
Chloride	mg/L		205.00	298.00	137	146	108	152.000	128	129	181	283	237	217	252	244	283	193	156	239.0	298
Nitrate-N	mg/L	90.3	0.01	0.49	0.045	0.06	0.005	0.040	0.050	0.050	0.005	0.005	0.01	0.005	0.005	0.005	0.05	0.01	0.01	0.005	0.490
Sulphate	mg/L	1000	31.00	37.20	37.2	37.2				31.1	30.9			32.6				18.70	19.40		
Ammonia-N	mg/L		1.70	27.40	3.315	4.66	27.4	1.420	1.97	7.82	10.80	5.64	6.52	2.91	0.41	0.41	0.76	0.59	1.10	0.27	0.37
Hardness	mg CaCO3/L		231.50	306.00	209	209				231	232			306				261	196		
Calcium	mg/L	1000	44.00	52.20	36.8	36.8				43.7	44.3			52.2				49.4	36.4		
Magnesium	mg/L		29.50	42.60	28.4	28.4				29.5	29.5			42.6				33.4	25.5		
Potassium	mg/L		17.20	23.50	17.7	17.7				20.60	23.50			16.70				9.9	11.4		
Sodium	mg/L		122.00	190.00	94	94				95	112			122	157	151	137	119	116	145.0	190
D.R. Phosphorus	mg/L		0.01	0.02	0.011	0.011				0.015	0.013			0.011				0.016	0.020		
Aluminium	mg/L	5	0.01	0.04	0.016	0.038	0.019	0.009	0.013	0.012	0.008	0.018	0.007	0.009	0.005	0.006	0.010	0.005	0.014	0.007	0.002
Arsenic	mg/L	0.5	0.00	0.00	0.002	0.002				0.0010	0.0040			0.0005				0.0005	0.0005		
Boron	mg/L	5	0.67	1.17	0.92	0.95	1.17	0.890	0.84	0.64	0.74	0.72	0.69	0.57	0.47	0.62	0.69	0.45	0.57	0.48	0.50
Cadmium	mg/L	0.01	0.00	0.00	0.0001	0.00010				0.0001	0.0001			0.0001				0.0001	0.0001		
Chromium	mg/L	1	0.00	0.00	0.0005	0.0005				0.0005	0.0005			0.0005				0.0005	0.0005		
Copper	mg/L	0.4	0.00	0.01	0.0055	0.0055				0.0008	0.0003			0.0008				0.00120	0.00050		
Iron	mg/L		1.65	4.50	0.454	0.45				1.65	0.71			2.530	3.35	0.78	3.49	0.58	2.140	4.50	0.07
Lead	mg/L	0.1	0.00	0.00	0.00025	0.00025	0.00025	0.00025	0.00025	0.00060	0.00025	0.00025	0.00025	0.00025	0.0003	0.00025	0.00025	0.00025	0.00070	0.0003	0.0003
Manganese	mg/L		0.35	0.47	0.2755	0.272	0.3970	0.244	0.3	0.350	0.354	0.471	0.427	0.410	0.323	0.197	0.419	0.328	0.241	0.388	0.379
Mercury	mg/L		0.00	0.00	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.000	0.000	0.000	0.000							
Nickel	mg/L	1	0.00	0.00	0.001	0.0011	0.0018	0.0009	0.0009	0.0008	0.0008	0.0009	0.0009	0.0012	0.0009	0.0006	0.0007	0.0008	0.0007	0.0010	0.0008
Zinc	mg/L	20	0.00	0.00	0.004	0.004				0.001	0.001			0.001				0.003	0.001		

C2 Monitoring Bore HDC Levin Landfill

Determinand		ANZECC STOCK	Median	Maximum	Annual Median	Apr-22	Jan-22	Oct-21	Jul-21	Apr-21	Jan-21	Oct-20	Jul-20	Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18
Water level	mBGL		0.32	0.47	0.115	0.23	0.00	0.000	0.32	0.32	0.00	0.220	0.20	0.47	0.420	0.25	0.36	0.4	0.39	0.33	0
pH		6 to 9	7.00	7.40	7.2		7.1	7.200	7.3	7.0	7.4	6.9	6.9	7.2	6.9	7.0	7.1	7.1	7.0	6.8	7.0
Suspended Solids	mg/l		111.00	516.00						111	332			516				21	14		
Phenol	mg/L		0.03	0.03						0.025				0.025				0.025	0.025		
VFA	mg/L		2.50	2.50						2.5				2.5				2.5	2.5		
TOC	mg/L		45.60	48.30						45.2	39.0			45.6				47.2	48.3		
Alkalinity	mg CaCO3/L		899.00	968.00						871	899			818				968	939		
Conductivity	mS/m		252.00	372.00	238		243	238.000	228	263	250	239.0	245	346	372	298	242	296	320	324	252
COD	mg/L		135.00	472.00	135		196	135.000	132	175	135	129	105	127	157	113	141	472	244	145	115
BOD (scBOD frm Apr'20)	mg/L		3.00	22.00	3		5.9	3.000	3.0	3	22	1	6	3				3	3		
Faecal C (Ecoli frm Apr'20)	col/100ml	100	4.00	3900.00	260		260	300.000	2.0	4.0	1	2	2	ND	8	4	3900	1070	2		
Chloride	mg/L		212.00	524.00	127		187	126.000	127	215	201	161	212	492	524	368	170	292	377	366	210
Nitrate-N	mg/L	90.3	0.05	0.19	0.05		0.00	0.050	0.05	0.19	0.050	0.05	0.05	0.08	0.005	0.050	0.05	0.05	0.01	0.0	0.05
Sulphate	mg/L	1000	11.40	42.30						6.6	4.4			42.3				11.4	25.5		
Ammonia-N	mg/L		156.00	181.00	165		165.0	165.000	149.0	149	156	145	140	169	181	157	124	141	157	174	134
Hardness	mg CaCO3/L		236.00	293.00						227	223			277				236	293		
Calcium	mg/L	1000	51.40	61.40						47.6	46.9			54.7				51	61		
Magnesium	mg/L		26.30	34.00						26.3	25.6			34.0				26.0	32.4		
Potassium	mg/L		84.80	91.50						84.8	83.4			91.5				78	85		
Sodium	mg/L		218.00	295.00						189	166			291	256	206	183	262	295	230	187
D.R. Phosphorus	mg/L		0.02	0.03						0.016	0.026			0.013				0.024	0.021		
Aluminium	mg/L	5	0.02	0.04	0.018		0.017	0.023	0.018	0.018	0.016	0.015	0.014	0.041	0.024	0.007	0.018	0.013	0.011	0.006	0.010
Arsenic	mg/L	0.5	0.00	0.00						0.002	0.002			0.002				0.002	0.001		
Boron	mg/L	5	1.69	2.24	1.49		1.45	1.490	1.66	2.05	1.69	1.43	1.81	2.24	1.64	1.85	1.81	2.17	2.06	1.60	1.55
Cadmium	mg/L	0.01	0.00	0.00						0.0001	0.0001			0.0001				0.0001	0.0001		
Chromium	mg/L	1	0.00	0.00						0.002	0.002			0.002				0.002	0.002		
Copper	mg/L	0.4	0.00	0.00						0.0006	0.0006			0.0017				0.0005	0.0003		
Iron	mg/L		0.67	2.48						0.719	1.95			0.158	0.48	0.63	2.48	0.99	1.480	0.48	0.280
Lead	mg/L	0.1	0.00	0.00	0.0004		0.00040	0.00080	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Manganese	mg/L		0.06	0.09	0.0554		0.0832	0.05540	0.0411	0.0531	0.0516	0.0428	0.0402	0.0650	0.0820	0.0512	0.0524	0.0558	0.078	0.092	0.073
Mercury	mg/L		0.00	0.00	0.00025		0.00040	0.00025	0.00025	0.00025	0.0003	0.0003	0.0003	0.0003							
Nickel	mg/L	1	0.00	0.01	0.0043		0.0043	0.0049	0.0043	0.0053	0.0035	0.0039	0.0041	0.0017	0.0052	0.0033	0.0049	0.0060	0.0060	0.0054	0.0049
Zinc	mg/L	20	0.00	0.01						0.003	0.010			0.009				0.002	0.003		

C2DD Monitoring Bore HDC Levin Landfill (Deep)

Determinand		NZDW MAV	Median	Maximum	Annual Median	Apr-22	Jan-22	Oct-21	Jul-21	Apr-21	Jan-21	Oct-20	Jul-20	Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18
Water level	mBGL		2.51	3.73	2.49	2.65	2.370	2.4200	2.56	2.79	2.46	2.38	3.73	3.07	2.59	2.39	2.3	2.690	2.51	2.47	2.50
pH		7 to 8.5*	7.50	8.00	7.6	7.6	7.6	7.6000	7.6	7.3	7.6	7.4	7.6	7.7	8.0	7.4	7.4	7.4	7.4	7.4	7.3
Suspended Solids	mg/l		71.00	565.00	115	115				187	565			3				27	3		
Phenol	mg/L		0.03	0.03	0.025	0.025				0.025				0.025				0.025	0.025		
VFA	mg/L		2.50	2.50	2.5	2.5				2.5				2.5				2.5	2.5		
TOC	mg/L		4.10	5.50	4.8	4.8				5.5	4.0			4.2				3.9	4.0		
Alkalinity	mg CaCO3/L		197.00	226.00	226	226				200	221			194				186	192		
Conductivity	mS/m		53.15	62.40	55.55	57.0	53.0	55.8000	55.3	55.5	54.4	53.3	52.9	52.5	55.2	51.6	52.3	50.6	51.0	51.1	62.4
COD	mg/L		7.50	47.00	17	8	16.0	28.0000	18.0	26.0	7.5	34.0	7.5	7.5	7.5	8	8	7.5	8	47.0	23.0
BOD (scBOD frm Apr'20)	mg/L		0.50	3.00	2.95	0.5	3.0	2.9000	3.0	1.5	1.5	0.5	0.5	0.5				0.5	0.5		
Faecal C (Ecoli frm Apr'20)	col/100ml	NIL	2.00	46.00	2.95	2	46	4	2	2	2	2.0	2	2	2	2	2	2	2		2
Chloride	mg/L	250*	40.30	46.50	41	41.8	40	28.1000	42	41.3	46.0	38.8	40.4	40.5	41.0	38.2	38.2	37.7	37.7	39.0	46.5
Nitrate-N	mg/L	11.3	0.01	2.60	0.005	0.005	0.350	0.0000	0.01	0.005	0.005	0.005	2.600	0.005	0.005	0.005	0.005	0.005	0.01	0.01	0.01
Sulphate	mg/L	250*	0.02	0.04	0.02	0.02				0.04	0.01			0.03				0.02	0.02		
Ammonia-N	mg/L	1.17	0.33	0.37	0.33	0.33	0.01	0.3300	0.4	0.31	0.33	0.32	0.34	0.33	0.33	0.32	0.33	0.37	0.32	0.320	0.36
Hardness	mg CaCO3/L	200*	166.00	186.00	186	186				166	166			168				161	163		
Calcium	mg/L		42.50	47.80	47.8	47.8				42.6	42.1			43.8				41.5	42.4		
Magnesium	mg/L		14.35	16.20	16.2	16.2				14.4	14.7			14.3				13.9	13.7		
Potassium	mg/L		6.72	7.87	7.87	7.87				7.57	7.11			6.32				5.54	6.33		
Sodium	mg/L	200*	39.40	43.10	40.5	40.5				39.1	39.4			39.4	39.4	15.3	26.5	37.5	40.8	40.6	43.1
D.R. Phosphorus	mg/L		0.66	0.67	0.662	0.662				0.617	0.641			0.667				0.660	0.671		
Aluminium	mg/L	0.1*	0.00	0.02	0.0025	0.003	0.002	0.0030	0.001	0.001	0.003	0.023	0.001	0.001	0.001	0.001	0.006	0.002	0.001	0.006	0.003
Arsenic	mg/L	0.01	0.00	0.00	0.004	0.004				0.004	0.004			0.003				0.003	0.003		
Boron	mg/L	1.4	0.06	0.07	0.07	0.06	0.07	0.0700	0.07	0.06	0.07	0.06	0.06	0.07	0.07	0.06	0.05	0.06	0.06	0.05	0.07
Cadmium	mg/L	0.004	0.00	0.00	0.0001	0.0001				0.0001	0.0001			0.0001				0.0001	0.0001		
Chromium	mg/L	0.05	0.00	0.00	0.0005	0.0005				0.0005	0.0005			0.0005				0.0005	0.0005		
Copper	mg/L	2	0.00	0.00	0.0006	0.00060				0.00025	0.00025			0.00025				0.0003	0.0003		
Iron	mg/L	0.2*	0.02	0.04	0.022	0.022				0.02	0.03			0.024	0.040	0.02	0.01	0.02	0.017	0.03	0.010
Lead	mg/L	0.01	0.00	0.00	0.000325	0.00025	0.00050	0.00040	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Manganese	mg/L	0.4	0.63	0.74	0.6225	0.735	0.016	0.6040	0.6	0.742	0.662	0.627	0.631	0.583	0.701	0.624	0.488	0.533	0.5550	0.580	0.668
Mercury	mg/L		0.00	0.00	0.00025	0.00025	0.00025	0.00040	0.00025	0.00025	0.000	0.000	0.000	0.000							
Nickel	mg/L	0.08	0.00	0.00	0.00025	0.00025	0.00025	0.00040	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.0003	0.00025	0.00025	0.00025	0.00070
Zinc	mg/L	1.5*	0.00	0.00	0.004	0.004				0.004	0.001			0.001				0.001	0.001		

* = GV

C2DS Monitoring Bore HDC Levin Landfill (shallow)

Determinand		ANZECC STOCK	Median	Maximum	Annual Median	Apr-22	Jan-22	Oct-21	Jul-21	Apr-21	Jan-21	Oct-20	Jul-20	Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18
Water level	mBGL		2.47	3.69	2.53	2.72	2.530	2.53	2.30	2.88	2.5	2.12	3.69	2.430	2.30	2.1	2.51	2.44	2.26	2.20	2.73
pH		6 to 9	6.80	7.40	7.05	6.8	6.9	7.4	7.2	6.8	7.1	6.8	6.8	7.0	6.7	6.7	6.7	7.0	6.8	6.6	6.8
Suspended Solids	mg/l		98.50	145.00	145	145				95	102			52				104	56		
Phenol	mg/L		0.03	0.03	0.025	0.025				0.025				0.025				0.025	0.025		
VFA	mg/L		2.50	2.50	2.5	2.5				2.5				2.5				2.5	2.5		
TOC	mg/L		27.50	32.00	23.8	23.8				26.2	24.7			32.0				28.8	30.8		
Alkalinity	mg CaCO3/L		645.50	758.00	629	629				464	531			716				662	758		
Conductivity	mS/m		160.00	231.00	121.5	138	153	104	105	117	137	150	163	170	182	170	178	157	173	231	173
COD	mg/L		89.00	115.00	69.5	74	60	65	89	82	105	106	94	89	97	82	100	73	77	115	91
BOD (scBOD frm Apr'20)	mg/L		3.00	3.00	3	3.0	<6	3.0	3.0	3	3	1	1	3				3	3		
Faecal C (Ecoli frm Apr'20)	col/100ml	100	2.00	50.00	3	2	4	50	2.0	2.0	2.0	2	2	2	2	2	2	2	2		
Chloride	mg/L		110.00	142.00	76.95	87.4	96	50	67	81	118	122	109	125	124	111	133	110	109	142	110
Nitrate-N	mg/L	90.3	0.05	0.05	0.05	0.05	0.050	0.01	0.05	0.050	0.01	0.05	0.05	0.005	0.050	0.050	0.05	0.05	0.01	0.01	0.050
Sulphate	mg/L	1000	0.01	0.03	0.01	0.010				0.01	0.01			0.01				0.01	0.03		
Ammonia-N	mg/L		1.51	1.79	1.385	1.48	1.69	1.3	1.3	1.33	1.27	1.30	1.57	1.79	1.71	1.54	1.45	1.77	1.57	1.18	1.59
Hardness	mg CaCO3/L		560.50	606.00	553	553				406	465			589				568	606		
Calcium	mg/L	1000	127.50	144.00	123	123.0				108	121			134				132	144		
Magnesium	mg/L		58.75	61.70	59.5	59.5				33.2	39.3			61.7				58.0	59.9		
Potassium	mg/L		14.75	16.70	14.9	14.9				12.3	13.1			16.7				14.6	15.6		
Sodium	mg/L		108.00	166.00	95.5	95.5				100	105			115	108	105	132	104	113	166	141
D.R. Phosphorus	mg/L		0.03	0.12	0.02	0.020				0.025	0.029			0.122				0.070	0.029		
Aluminium	mg/L	5	0.00	0.01	0.0035	0.001	0.004	0.005	0.003	0.001	0.001	0.002	0.003	0.001	0.010	0.001	0.001	0.001	0.001	0.001	0.001
Arsenic	mg/L	0.5	0.00	0.00	0.001	0.001				0.002	0.003			0.003				0.001	0.002		
Boron	mg/L	5	0.86	1.39	0.74	0.74	0.59	0.74	0.87	0.85	0.86	0.94	1.39	0.87	0.52	0.89	1.01	0.82	0.86	0.79	0.64
Cadmium	mg/L	0.01	0.00	0.00	0.0001	0.0001				0.0001	0.0001			0.0001				0.0001	0.0001		
Chromium	mg/L	1	0.00	0.00	0.0005	0.0005				0.0005	0.0005			0.0005				0.0005	0.0005		
Copper	mg/L	0.4	0.00	0.00	0.0008	0.00080				0.00025	0.00025			0.00025				0.00025	0.00025		
Iron	mg/L		9.45	22.50	2.45	2.45				2.6	16.3			22.50	20.2	4.6	9.45	3.75	19.1	17.1	2.04
Lead	mg/L	0.1	0.00	0.00	0.00025	0.00025	0.00025	0.00060	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Manganese	mg/L		2.58	4.53	1.825	2.06	2.82	1.59	1.5	1.76	2.05	2.38	2.34	2.75	2.93	2.92	2.80	2.40	2.87	4.53	3.22
Mercury	mg/L		0.00	0.00	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00	0.00	0.00	0.00							
Nickel	mg/L	1	0.00	0.00	0.0021	0.0020	0.0022	0.0018	0.0025	0.0022	0.0018	0.0023	0.0029	0.0029	0.0026	0.0015	0.0023	0.0021	0.0023	0.0037	0.0027
Zinc	mg/L	20	0.00	0.00	0.002	0.002				0.001	0.001			0.001				0.001	0.001		

D1 Monitoring Bore HDC Levin Landfill

Determinand		ANZECC STOCK	Median	Maximum	Annual Median	Apr-22	Jan-22	Oct-21	Jul-21	Apr-21	Jan-21	Oct-20	Jul-20	Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18
Water level	mBGL		16.81	17.23	16.79	16.75	16.710	16.830	17.10	17.04	16.90	16.92	17.00	17.230	16.72	16.650	16.32	16.92	16.77	16.62	16.79
pH		6 to 9	6.80	7.80	7.15	7.4	6.8	6.900	7.8	6.7	6.7	6.6	6.7		7.6	6.8	6.7	6.8	6.8	6.6	6.7
Suspended Solids	mg/l		3.00	3.00	1.50	2				2	3							3	3		
Phenol	mg/L		0.03	0.03	0.03	0.025				0.025								0.025	0.025		
VFA	mg/L		2.50	6.00	2.50	2.5				2.5								2.5	6.0		
TOC	mg/L		1.30	1.40	1.30	1.3				1.3	1.2							1.1	1.4		
Alkalinity	mg CaCO3/L		133.00	151.00	109.00	109				133	143							114	151		
Conductivity	mS/m		48.90	60.20	43.40	37.4	42.5	45.400	44.3	48.4	48.2	49.6	48.9		46.6	52.3	51.9	52.4	58.2	60.2	56.4
COD	mg/L		7.50	37.00	7.50	8	7.5	7.500	7.50	21.0	7.5	7.5	15.0		7.5	8	7.5	7.5	7.5	37.0	7.5
BOD (scBOD frm Apr'20)	mg/L		1.50	3.00	3.00	3.0	3.0	1.500	3.0	0.5	0.5	0.5	0.5					1.5	1.5		
Faecal C (Ecoli frm Apr'20)	col/100ml	100	2.00	790.00	2.00	2.000	790.000	2.000	2.0	2	2.0	2	2		2	2	4	2	2		
Chloride	mg/L		32.40	41.80	27.75	17.2	24.1	31.400	32.4	27.2	32.7	28.2	28.9		30.3	36.1	36.9	32.4	36.9	36.6	41.8
Nitrate-N	mg/L	90.3	10.90	20.90	9.26	9.80	8.84	7.950	9.68	9.4	10.0	10.9	11.4		10.6	11.5	13.0	14.7	16.7	20.9	20.7
Sulphate	mg/L	1000	6.27	9.85	9.85	9.85				5.07	5.03							6.27	6.44		
Ammonia-N	mg/L		0.01	0.02	0.01	0.005	0.01	0.005	0.005	0.005	0.020	0.005	0.005		0.005	0.005	0.005	0.005	0.005	0.01	0.005
Hardness	mg CaCO3/L		135.00	153.00	90.00	90				139	131							135	153		
Calcium	mg/L	1000	25.00	29.10	16.40	16.4				25.9	24.4							25.0	29.1		
Magnesium	mg/L		17.50	19.50	11.90	11.9				18.0	17.0							17.5	19.5		
Potassium	mg/L		9.42	10.70	9.42	9.4				10.7	9.3							9.30	10.20		
Sodium	mg/L		42.10	54.20	33.50	34				43.2	43.1				39.4	14.2	23.5	41.1	54.2	44.9	43.1
D.R. Phosphorus	mg/L		0.10	0.10	0.10	0.097				0.100	0.098							0.092	0.084		
Aluminium	mg/L	5	0.00	0.01	0.0010	0.001	0.001	0.001	0.001	0.001	0.001	0	0.001		0.009	0.001	0.006	0.001	0.001	0.001	0.002
Arsenic	mg/L	0.5	0.00	0.00	0.0010	0.001				0.001	0.001							0.001	0.001		
Boron	mg/L	5	0.05	0.06	0.0550	0.04	0.06	0.060	0.05	0.05	0.06	0.05	0.050		0.05	0.050	0.02	0.02	0.05	0.02	0.04
Cadmium	mg/L	0.01	0.00	0.00	0.0001	0.0001				0.0001	0.0001							0.0001	0.0002		
Chromium	mg/L	1	0.00	0.00	0.0005	0.0005				0.0005	0.0005							0.0005	0.0005		
Copper	mg/L	0.4	0.00	0.00	0.0014	0.0014				0.00110	0.00025							0.00025	0.00025		
Iron	mg/L		0.01	4.66	0.0060	0.0060				0.00	0.00				0.020	0.005	4.660	0.003	0.015	0.01	0.005
Lead	mg/L	0.1	0.00	0.00	0.0003	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025		0.00025	0.00025	0.00025	0.00025	0.0003	0.0003	0.00025
Manganese	mg/L		0.00	0.22	0.0007	0.00070	0.00070	0.00100	0.00025	0.0003	0.0003	0.00025	0.000		0.00500	0.00025	0.21800	0.00025	0.0003	0.0003	0.0003
Mercury	mg/L		0.00	0.00	0.0003	0.00025	0.00025	0.00025	0.00025	0.0003	0.0003	0.00025	0.000								
Nickel	mg/L	1	0.00	0.00	0.0003	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025		0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Zinc	mg/L	20	0.00	0.02	0.0180	0.018				0.001	0.001							0.001	0.001		

D2 Monitoring Bore HDC Levin Landfill

Determinand		ANZECC STOCK	Median	Maximum	Annual Median	Apr-22	Jan-22	Oct-21	Jul-21	Apr-21	Jan-21	Oct-20	Jul-20	Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18
Water level	mBGL		21.46	21.68	21.41	21.33	21.26	21.490	21.59	21.68	21.40	21.58	21.6	21.7	21.35	21.250	21.60	21.50	21.37	21.24	21.4
pH		6 to 9	6.50	6.80	6.55	6.6	6.5	6.500	6.8	6.5	6.4	6.4	6.4	6.3	6.8	6.5	6.4	6.7	6.4	6.4	6.5
Suspended Solids	mg/l		8.50	17.00	6.00	6				10	3			17				10	7		
Phenol	mg/L		0.03	0.03	0.03	*0.025*				*0.025*				*0.025*				*0.025*	*0.025*		
VFA	mg/L		2.50	6.00	2.50	*2.5*				*2.5*				*2.5*				3	6		
TOC	mg/L		12.55	16.10	16.10	16.1				11.7	11.9			13.2				11.9	13.7		
Alkalinity	mg CaCO3/L		118.00	162.00	162.00	162				134	127			109				100	101		
Conductivity	mS/m		36.60	46.60	44.25	46.6	45.2	43.300	41.4	40.2	37.7	34.4	35.6	33.6	31.1	34.7	37.6	34.9	35.4	38.2	34.9
COD	mg/L		36.50	58.00	27.00	38	45	7.500	16	38	30	40	48	31	36	35	32	21	37	58	37
BOD (scBOD frm Apr'20)	mg/L		3.00	5.90	3.00	*3.0*	*3.0*	*3.000*	*5.9*	*<6*	*3.0*	*0.5*	*0.5*	*1.5*				2	3		
Faecal C (Ecoli frm Apr'20)	col/100ml	100	2.95	180.00	26.95	2	*180.0*	*50.000*	4	*8*	*1*	*2*	32	*2*	2	*2*	*20*	*2*	*8*		
Chloride	mg/L		36.80	44.90	40.40	43	42.8	38.000	33.5	33.0	35.6	31.5	34.6	32.8	32.9	35.2	42.1	39.0	41.3	44.9	41.6
Nitrate-N	mg/L	90.3	0.01	0.05	0.01	*0.005*	*0.005*	0.010	*0.000*	*0.005*	*0.01*	*0.02*	*0.005*	*0.005*	*0.050*	*0.050*	*0.005*	*0.005*	*0.005*	0.01	0.01
Sulphate	mg/L	1000	0.03	1.99	0.04	*0.04*				*0.01*	0.01			0.01				1.99	1.58		
Ammonia-N	mg/L		0.50	0.62	0.58	0.60	0.57	0.590	0.52	0.51	0.55	0.49	0.62	0.49	0.43	0.47	0.48	0.50	0.45	0.47	0.43
Hardness	mg CaCO3/L		90.00	123.00	123.00	123				100	91			87				87	89		
Calcium	mg/L	1000	15.90	20.80	20.80	20.8				17.6	16.4			15.4				14.6	15.2		
Magnesium	mg/L		12.30	17.20	17.20	17.2				13.7	12.1			11.8				12.3	12.3		
Potassium	mg/L		7.65	10.90	10.90	10.90				9.73	7.98			7.10				7.32	6.69		
Sodium	mg/L		31.50	39.20	36.90	36.5	39.2	37.200	36.6	31.4	31.3	30.60	32.6	32.6	26.0	7.8	20.4	27.6	29.3	31.6	32.1
D.R. Phosphorus	mg/L		0.04	0.06	0.06	0.055				0.036	0.055			0.038				0.039	0.032		
Aluminium	mg/L	5	0.01	0.03	0.01	0.007	0.005	0.006	0.017	0.004	0.013	0.015	*0.013*	0.014	0.026	0.004	0.001	0.014	0.012	0.015	0.014
Arsenic	mg/L	0.5	0.00	0.00	0.00	*0.0005*				0.001	0.001			0.001				0.001	0.001		
Boron	mg/L	5	0.05	0.07	0.06	0.06	0.05	0.070	0.05	0.05	0.07	0.06	0.04	*0.040*	0.05	*0.050*	*0.030*	0.02	0.03	0.02	*0.015*
Cadmium	mg/L	0.01	0.00	0.00	0.00	*0.0001*				*0.0001*	*0.0001*			*0.0001*				*0.0001*	*0.0001*		
Chromium	mg/L	1	0.00	0.00	0.00	*0.0005*				0.001	0.001			0.001				*0.0010*	*0.0005*		
Copper	mg/L	0.4	0.00	0.00	0.00	*0.00060*				*0.00025*	*0.00025*			*0.00025*				0.0003	0.0003		
Iron	mg/L		10.15	18.00	8.09	6.18	2.34	10.000	18.00	4.0	17.2	9.28	10.90	15.0	14.90	9.0	0.0	11.90	8.22	10.30	13.00
Lead	mg/L	0.1	0.00	0.00	0.00	*0.00025*	*0.00025*	0.0003	*0.00080*	*0.00025*	0.0003	*0.00280*	*0.00025*	*0.00025*	0.0014	*0.00025*	*0.00025*	0.0003	*0.00060*	0.0003	0.0003
Manganese	mg/L		0.33	0.47	0.42	0.466	0.433	0.411	0.410	0.362	0.314	0.317	0.3180	0.306	0.332	0.325	0.015	0.338	0.300	0.335	0.306
Mercury	mg/L		0.00	0.00	0.00	*0.00025*	*0.00025*	*0.00025*	*0.00040*	*0.00025*	0.000	0.000	0.0003	0.000							
Nickel	mg/L	1	0.00	0.00	0.00	*0.00025*	*0.00025*	*0.00025*	*0.00040*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Zinc	mg/L	20	0.01	0.01	0.01	0.009				0.005	0.001			0.005				0.006	0.007		

D3r (replaced by D3rs) Monitoring Bore HDC Levin Landfill

Determinand		ANZECC STOCK	Median	Maximum	Annual Median	Apr-22	Jan-22	Oct-21	Jul-21	Apr-21	Jan-21	Oct-20	Jul-20	Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18
Water level	mBGL		4.70	4.94						4.69	4.55	4.940	4.70	4.890	4.670	4.70	4.56	4.874	4.75	4.62	4.81
pH		6 to 9	6.80	7.20						6.8	6.7	6.7	6.8	7.0	7.2	6.8	6.8	6.9	6.8	6.7	6.8
Suspended Solids	mg/l		3.00	8.00						*3*	*4*			*3*				3	8		
Phenol	mg/L		0.03	0.03						*0.025*				*0.025*				*0.025*	*0.025*		
VFA	mg/L		2.50	6.00						*2.5*				*2.5*				*2.5*	*6.0*		
TOC	mg/L		3.00	3.10						3.0	3.0			3.1				2.9	2.6		
Alkalinity	mg CaCO3/L		56.00	57.00						55	55			56				56	57		
Conductivity	mS/m		22.10	53.60						22.3	21.7	22.1	21.8	21.4	22.0	22.0	23.0	53.6	22.1	24.3	27.3
COD	mg/L		7.50	40.00						*19.0*	8	*7.5*	*16.0*	*7.5*	*18.0*	8	*7.5*	*7.5*	8	40	*7.5*
BOD (scBOD frm Apr'20)	mg/L		0.50	3.00						*3.0*	*0.5*	*0.5*	*0.5*	*0.5*				*2*	*2*		
Faecal C (Ecoli frm Apr'20)	col/100ml	100	2.00	2.00						*2*	*1*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*		
Chloride	mg/L		22.10	23.30						20.9	23.3	22.1	22.1	21.7	22.0	21.8	21.6	22.7	22.4	22.2	22.5
Nitrate-N	mg/L	90.3	0.19	0.35						0.17	0.16	0.19	0.18	0.18	0.29	0.19	0.17	0.21	0.20	0.27	0.35
Sulphate	mg/L	1000	7.68	9.86						9.86	7.54			6.96				8.48	7.68		
Ammonia-N	mg/L		0.17	0.19						0.15	0.19	0.16	0.18	0.18	0.17	0.17	0.12	0.17	0.17	0.17	0.17
Hardness	mg CaCO3/L		36.00	36.00						36	36			34				35	36		
Calcium	mg/L	1000	6.99	7.17						7.07	6.98			6.81				7.2	7.0		
Magnesium	mg/L		4.44	4.49						4.44	4.44			4.19				4.24	4.49		
Potassium	mg/L		5.30	5.57						5.54	5.57			4.90				4.53	5.30		
Sodium	mg/L		25.30	27.30						24.8	25.50	25.30	25.7	27.3	25.1	8.8	21.3	26.1	25.9	23.3	25.3
D.R. Phosphorus	mg/L		0.02	0.02						0.017	0.020			0.015				0.016	0.013		
Aluminium	mg/L	5	0.00	0.00						*0.0010*	0.002	*0.001*	0.001	*0.001*	*0.002*	*0.001*	*0.003*	*0.001*	*0.001*	0.001	*0.001*
Arsenic	mg/L	0.5	0.01	0.01						0.007	0.008			0.011				0.004	0.007		
Boron	mg/L	5	0.03	0.04						*0.030*	0.03	0.04	0.03	*0.015*	0.03	*0.030*	0.03	0.02	0.03	0.02	0.03
Cadmium	mg/L	0.01	0.00	0.00						*0.0001*	*0.0001*			*0.0001*				*0.0001*	*0.0001*		
Chromium	mg/L	1	0.00	0.00						*0.0005*	*0.0005*			*0.0005*				*0.0005*	*0.0005*		
Copper	mg/L	0.4	0.00	0.00						*0.00025*	*0.00025*			*0.00025*				*0.00025*	*0.00025*		
Iron	mg/L		2.73	4.00						2.89	2.35	1.05	2.60	2.86	2.95	4.00	2.20	0.83	2.47	2.90	3.81
Lead	mg/L	0.1	0.00	0.00						*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Manganese	mg/L		0.18	0.24						0.177	0.179	0.184	0.166	0.176	0.193	0.201	0.160	0.171	0.189	0.228	0.244
Mercury	mg/L		0.00	0.00						*0.00025*	0.000	0.000	0.000	0.000							
Nickel	mg/L	1	0.00	0.00						*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*	*0.00025*
Zinc	mg/L	20	0.00	0.00						*0.001*	*0.001*			*0.001*				0.001	0.001		

D3rs Monitoring Bore HDC Levin Landfill

Determinand		ANZECC STOCK	Median	Maximum	Annual Median	Apr-22	Jan-22	Oct-21
Water level	mBGL		5.76	6.00	5.76	5.52	6.00	
pH		6 to 9	6.60	6.90	6.6	6.9	6.6	6.300
Suspended Solids	mg/l		3.00	12.00	3	*3*	*3.0*	12.000
Phenol	mg/L		0.03	0.03	0.025	*0.025*	0.025	0.025
VFA	mg/L		2.50	2.50	2.5	*2.5*	2.5	2.500
TOC	mg/L		23.90	25.50	23.9	25.5	20.9	23.900
Alkalinity	mg CaCO3/L		68.00	70.00	68	68	64	70.000
Conductivity	mS/m		19.80	21.70	19.8	19.80	18.9	21.700
COD	mg/L		62.00	119.00	62	119	*55.0*	*62.000*
BOD (scBOD frm Apr'20)	mg/L		3.00	3.00	3	*3*	*3.0*	*3.000*
Faecal C (Ecoli frm Apr'20)	col/100ml	100	2.00	500.00	2	*2.000*	*500.0*	*2.000*
Chloride	mg/L		17.00	32.00	17	17.0	16.7	32.000
Nitrate-N	mg/L	90.3	0.01	0.01	0.005	0.01	0.01	0.005
Sulphate	mg/L	1000	1.07	2.01	1.07	1.07	2.01	0.030
Ammonia-N	mg/L		0.54	0.63	0.54	0.63	0.53	0.540
Hardness	mg CaCO3/L		48.00	51.00	48	46	48	51.000
Calcium	mg/L	1000	12.00	13.40	12	10.90	12.00	13.400
Magnesium	mg/L		4.42	4.58	4.42	4.58	4.42	4.200
Potassium	mg/L		4.14	5.80	4.14	4.14	3.80	5.800
Sodium	mg/L		20.80	24.30	20.8	20.4	20.8	24.300
D.R. Phosphorus	mg/L		0.07	0.08	0.071	0.071	0.076	0.058
Aluminium	mg/L	5	0.07	0.07	0.065	*0.065*	0.073	*0.060*
Arsenic	mg/L	0.5	0.00	0.00	0.001	0.001	0.001	0.001
Boron	mg/L	5	0.05	0.05	0.05	0.04	0.05	0.050
Cadmium	mg/L	0.01	0.00	0.00	0.0001	*0.0001*	*0.0001*	0.000
Chromium	mg/L	1	0.00	0.00	0.004	*0.0040*	*0.0040*	0.004
Copper	mg/L	0.4	0.00	0.00	0.00025	*0.00090*	*0.00025*	0.000
Iron	mg/L		16.60	17.40	16.6	16.60	15.90	17.400
Lead	mg/L	0.1	0.00	0.00	0.00025	*0.00025*	*0.00025*	*0.00025*
Manganese	mg/L		0.36	0.51	0.363	0.331	0.363	0.512
Mercury	mg/L		0.00	0.00	0.00025	*0.00025*	*0.00025*	*0.00025*
Nickel	mg/L	1	0.00	0.00	0.0009	*0.00070*	*0.00090*	*0.00090*
Zinc	mg/L	20	0.01	0.01	0.005	*0.006*	*0.005*	0.002

D3rd Monitoring Bore HDC Levin Landfill

Determinand		ANZECC STOCK	Median	Maximum	Annual Median	Apr-22	Jan-22	Oct-21
Water level	mBGL		6.14	6.40	6.135	5.87	6.40	
pH		6 to 9	7.50	7.70	7.5	7.4	7.7	7.500
Suspended Solids	mg/l		206.00	551.00	206	*551*	*122.0*	206.000
Phenol	mg/L		0.03	0.03	0.025	*0.025*	0.025	0.025
VFA	mg/L		2.50	2.50	2.5	*2.5*	2.5	2.500
TOC	mg/L		5.90	7.20	5.9	7.2	5.6	5.900
Alkalinity	mg CaCO3/L		224.00	249.00	224	249	222	224.000
Conductivity	mS/m		53.10	53.50	53.1	53.50	53.0	53.100
COD	mg/L		18.00	28.00	18	18	*7.5*	*28.000*
BOD (scBOD frm Apr'20)	mg/L		3.00	3.00	3	*3*	*3.0*	*1.500*
Faecal C (Ecoli frm Apr'20)	col/100ml	100	8.00	12.00	8	*2.000*	*12.0*	*8.000*
Chloride	mg/L		32.00	32.40	32	32.4	32.0	21.800
Nitrate-N	mg/L	90.3	0.11	0.30	0.11	0.01	0.11	0.300
Sulphate	mg/L	1000	0.01	30.10	0.01	0.01	0.01	30.100
Ammonia-N	mg/L		0.28	0.40	0.28	0.40	0.28	0.040
Hardness	mg CaCO3/L		220.00	223.00	220	199	223	220.000
Calcium	mg/L	1000	64.30	64.70	64.3	57.80	64.70	64.300
Magnesium	mg/L		14.50	14.80	14.5	13.20	14.80	14.500
Potassium	mg/L		7.52	7.76	7.52	7.16	7.52	7.760
Sodium	mg/L		22.40	25.70	22.4	21.5	22.4	25.700
D.R. Phosphorus	mg/L		1.18	1.21	1.18	1.210	1.180	0.011
Aluminium	mg/L	5	0.01	0.02	0.005	*0.015*	0.002	*0.005*
Arsenic	mg/L	0.5	0.02	0.02	0.018	0.018	0.020	0.017
Boron	mg/L	5	0.05	0.05	0.05	0.04	0.05	0.050
Cadmium	mg/L	0.01	0.00	0.00	0.0001	*0.0001*	*0.0001*	0.000
Chromium	mg/L	1	0.00	0.00	0.0005	*0.0005*	*0.0005*	0.001
Copper	mg/L	0.4	0.00	0.00	0.0011	*0.00110*	*0.00120*	0.000
Iron	mg/L		0.02	0.03	0.017	0.01	0.02	0.028
Lead	mg/L	0.1	0.00	0.00	0.00025	*0.00025*	*0.00025*	*0.00025*
Manganese	mg/L		0.50	0.54	0.498	0.467	0.498	0.537
Mercury	mg/L		0.00	0.00	0.00025	*0.00025*	*0.00025*	*0.00025*
Nickel	mg/L	1	0.00	0.00	0.00025	*0.00025*	*0.00240*	*0.00025*
Zinc	mg/L	20	0.00	0.00	0.001	*0.001*	*0.001*	0.001

D4 Monitoring Bore HDC Levin Landfill

Determinand		ANZECC STOCK	Median	Maximum	Annual Median	Apr-22	Jan-22	Oct-21	Jul-21	Apr-21	Jan-21	Oct-20	Jul-20	Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18
Water level	mBGL		8.14	11.00	8.07	7.73	8.35	7.79000	8.40	7.98	7.8	8.28	8.10	8	8.700	8.010	8.41	11.00	8.12	7.99	8.2
pH		6 to 9	7.00	7.70	7.05	7.1	7.0	7.50000	7.0	7.0	7.2	6.8	6.9	7.1	7.7	7.1	6.9	7.1	7.0	6.8	7.0
Suspended Solids	mg/l		3.00	5.00	2.5	3				2	3			5				3	3		
Phenol	mg/L		0.03	0.03	0.025	0.025				0.025				0.025				0.025	0.025		
VFA	mg/L		2.50	25.00	2.5	2.5				25.0				2.5				2.5	2.5		
TOC	mg/L		2.70	3.50	3	3.0				3.5	3.3			2.4				2.1	1.9		
Alkalinity	mg CaCO3/L		60.00	70.00	70	70				65	65			55				53	52		
Conductivity	mS/m		30.25	34.40	29.6	29.4	29.8	29.60000	29.6	30.6	30.3	31.1	30.2	31.3	31.5	32.7	29.4	27.1	29.7	34.4	32.0
COD	mg/L		7.50	42.00	17.5	42.0	7.5	19.00000	16.0	7.5	7.5	7.5	7.5	7.5	7.5	8	7.5	8	7.5	20	7.5
BOD (scBOD frm Apr'20)	mg/L		1.50	3.00	3	3.0	3.0	1.50000	3.0	3.0	0.5	0.5	0.5	0.5				1.5	1.5		
Faecal C (Ecoli frm Apr'20)	col/100ml	100	2.00	260.00	49	96	260.0	2.00000	2	2	1	2	8	2	2	2	2	2	2		
Chloride	mg/L		44.10	58.00	35.95	36.3	38.3	35.50000	35.6	36.4	40.9	44.3	43.9	44.6	49.2	53.5	45.3	38.5	44.6	58.0	48.1
Nitrate-N	mg/L	90.3	0.01	0.01	0.005	0.005	0.005	0.00500	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.01	0.01	0.005
Sulphate	mg/L	1000	12.70	14.90	12.9	12.9				11.8	13.7			12.5				11.2	14.9		
Ammonia-N	mg/L		0.23	0.25	0.235	0.24	0.19	0.23000	0.25	0.24	0.25	0.25	0.22	0.21	0.21	0.23	0.22	0.23	0.22	0.24	0.22
Hardness	mg CaCO3/L		57.50	62.00	56	56				60	59			62				48	54		
Calcium	mg/L	1000	10.50	11.60	10	10.0				11.6	11.20			11.00				9.3	9.6		
Magnesium	mg/L		7.50	8.39	7.47	7.47				7.67	7.53			8.39				5.96	7.17		
Potassium	mg/L		6.28	6.76	6.76	6.76				6.09	6.47			6.62				4.64	6.06		
Sodium	mg/L		32.10	35.60	33.15	28.8	35.5	34.40000	31.9	29.2	33.4	32.0	33.4	31.7	31.4	33.7	32.2	29.1	32.8	35.6	31.5
D.R. Phosphorus	mg/L		0.02	0.03	0.023	0.023				0.021	0.025			0.016				0.021	0.023		
Aluminium	mg/L	5	0.00	0.00	0.0015	0.001	0.002	0.00100	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Arsenic	mg/L	0.5	0.00	0.00	0.002	0.002				0.003	0.003			0.004				0.0020	0.0030		
Boron	mg/L	5	0.03	0.12	0.03	0.030	0.03	0.12000	0.03	<0.03	0.040	0.04	0.08	0.040	0.015	0.03	0.040	0.02	0.02	0.040	0.015
Cadmium	mg/L	0.01	0.00	0.00	0.0001	0.0001				0.0001	0.0001			0.0001				0.0001	0.0001		
Chromium	mg/L	1	0.00	0.00	0.0005	0.0005				0.0005	0.0005			0.0005				0.0005	0.0005		
Copper	mg/L	0.4	0.00	0.01	0.0139	0.01390				0.00025	0.00025			0.00025				0.0003	0.0003		
Iron	mg/L		0.80	1.91	0.555	0.28	0.95	0.40000	0.71	1.54	1.590	0.43	0.38	1.51	0.83	0.77	1.91	0.15	0.833	0.91	0.35
Lead	mg/L	0.1	0.00	0.00	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Manganese	mg/L		0.19	0.21	0.1915	0.193	0.190	0.18800	0.21	0.209	0.202	0.201	0.180	0.189	0.175	0.175	0.181	0.151	0.1750	0.211	0.186
Mercury	mg/L		0.00	0.00	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.000	0.000	0.000	0.000							
Nickel	mg/L	1	0.00	0.00	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Zinc	mg/L	20	0.00	0.01	0.006	0.006				0.001	0.001			0.001				0.001	0.001		

D5 Monitoring Bore HDC Levin Landfill

Determinand		ANZECC STOCK	Median	Maximum	Annual Median	Apr-22	Jan-22	Oct-21	Jul-21	Apr-21	Jan-21	Oct-20	Jul-20	Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18
Water level	mBGL		9.77	10.23	9.715	9.31	9.97	9.460	10.23	9.59	9.49	10.075	9.62	9.93	9.76	9.755	9.8	9.9	9.8	9.67	9.85
pH		6 to 9	7.15	7.90	7.3	7.6	7.2	7.400	7.0	7.0	7.4	7.0	7.1	7.4	7.9	7.2	7.0	7.1	7.4	7.1	7.0
Suspended Solids	mg/l		2.75	3.00	1.5	2				2.0	3			3				3	3		
Phenol	mg/L		0.03	0.03	0.025	0.025				0.025				0.025				0.025	0.005		
VFA	mg/L		2.50	2.50	2.5	2.5				2.5				2.5				3	3		
TOC	mg/L		2.00	2.30	2.3	2.3				1.9	2.0			2.0				1.9	2.1		
Alkalinity	mg CaCO3/L		66.50	75.00	75	75				62	68			63				66	67		
Conductivity	mS/m		29.80	31.80	30.05	30.4	25.9	29.700	30.5	29.4	31.2	29.4	29.5	29.9	29.4	30.7	28.7	31.2	31.8	31.1	25.0
COD	mg/L		7.50	2820.00	18.75	30.0	8	7.500	2820.0	7.5	21.0	50.0	7.5	7.5	7.5	7.5	22.0	7.5	21.0	55	7.5
BOD (scBOD frm Apr'20)	mg/L		0.50	3.00	1	0.5	0.5	1.500	3.0	1.5	0.5	0.5	0.5	0.5				0.5	0.5		
Faecal C (Ecoli frm Apr'20)	col/100ml	100	2.00	48.00	3	2	48.0	4.000	2.0	2.0	0.5	2	2	2	2	2	4	2	2		
Chloride	mg/L		29.60	54.80	28.8	29.7	21.6	28.200	29.4	26.7	29.9	54.8	29.8	29.1	30.0	29.5	29.3	29.9	31.5	32.2	29.2
Nitrate-N	mg/L	90.3	1.26	2.79	1.42	0.72	2.79	1.500	1.34	1.73	0.84	1.64	1.44	1.18	1.34	1.15	1.45	1.03	0.86	0.97	1.07
Sulphate	mg/L	1000	21.75	28.30	18.7	18.7				16.0	22.5			21.0				24.20	28.30		
Ammonia-N	mg/L		0.01	0.02	0.0075	0.020	0.005	0.010	0.005	0.005	0.01	0.005	0.005	0.005	0.01	0.005	0.005	0.005	0.010	0.005	0.005
Hardness	mg CaCO3/L		68.00	72.00	70	70				61	69			64				67	72		
Calcium	mg/L	1000	11.95	12.70	12.2	12.2				10.3	12.4			11.1				11.70	12.70		
Magnesium	mg/L		9.19	9.72	9.49	9.49				8.61	9.34			8.86				9.03	9.72		
Potassium	mg/L		7.60	8.15	8.15	8.2				7.00	7.83			7.83				6.55	7.36		
Sodium	mg/L		32.10	36.80	30.1	30.1				28.3	32.4			32.5	29.4	33.0	36.8	32.1	33.1	27.6	23.1
D.R. Phosphorus	mg/L		0.10	0.10	0.094	0.094				0.104	0.093			0.096				0.100	0.084		
Aluminium	mg/L	5	0.00	0.00	0.003	0.001	0.004	0.002	0.004	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.003	0.001
Arsenic	mg/L	0.5	0.00	0.00	0.001	0.0010				0.001	0.001			0.001				0.0010	0.0010		
Boron	mg/L	5	0.03	0.06	0.04	0.03	0.06	0.040	0.04	0.03	0.03	0.030	0.030	0.040	0.030	0.015	0.015	0.030	0.015	0.015	0.015
Cadmium	mg/L	0.01	0.00	0.00	0.0001	0.0001				0.0001	0.0001			0.0001				0.0001	0.0001		
Chromium	mg/L	1	0.00	0.00	0.0005	0.0005				0.0005	0.0005			0.0005				0.0005	0.0005		
Copper	mg/L	0.4	0.00	0.00	0.0012	0.0012				0.0006	0.0014			0.0009				0.0005	0.0005		
Iron	mg/L		0.06	0.18	0.178	0.178				0.033	0.09			0.070	0.060	0.05	0.01	0.04	0.113	0.07	0.030
Lead	mg/L	0.1	0.00	0.00	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.0003	0.00025
Manganese	mg/L		0.01	0.07	0.0116	0.0671	0.0050	0.0161	0.007	0.0095	0.0185	0.0149	0.0060	0.0193	0.0148	0.0162	0.0035	0.0109	0.0203	0.0203	0.0078
Mercury	mg/L		0.00	0.00	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.0003	0.0003	0.0003	0.0003							
Nickel	mg/L	1	0.00	0.00	0.00025	0.00025	0.00025	0.0003	0.00025	0.00025	0.00025	0.00070	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.0003	0.00025
Zinc	mg/L	20	0.00	0.00	0.001	0.001				0.001	0.001			0.001				0.001	0.001		

D6 Monitoring Bore HDC Levin Landfill

Determinand		ANZECC STOCK	Median	Maximum	Annual Median	Apr-22	Jan-22	Oct-21	Jul-21	Apr-21	Jan-21	Oct-20	Jul-20	Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18
Water level	mBGL		16.40	16.62	16.425	16.32	16.43	16.420	16.59	16.59	16.49	16.50	15.30	16.620	16.23	16.22	16.38	16.5	16.4	16.2	16.38
pH		6 to 9	6.90	7.40	6.95	7.4	6.9	7.000	6.9	6.9	6.8	6.7	6.8	7.1	7.1	7.0	6.8	7.0	6.8	6.7	6.7
Suspended Solids	mg/l		2.75	3.00	1.5	2				2.0	3			3				3	3		
Phenol	mg/L		0.03	0.03	0.025	0.025				0.025				0.025				0.025	0.025		
VFA	mg/L		2.50	2.50	2.5	2.5				2.5				2.5				3	3		
TOC	mg/L		1.00	1.20	1	1.0				1.2	0.9			1.0				0.9	1.0		
Alkalinity	mg CaCO3/L		74.00	90.00	90	90				69	81			73				75	73		
Conductivity	mS/m		41.15	46.50	38.65	36.9	28.4	43.500	40.4	37.5	36.6	44.7	42.6	37.2	29.1	31.9	41.9	43.4	44.5	45.5	46.5
COD	mg/L		7.50	45.00	7.5	38.0	7.5	7.500	7.5	7.5	7.5	7.5	7.5	7.5	7.5	8	8	7.5	7.5	45.0	33.0
BOD (scBOD frm Apr'20)	mg/L		1.50	3.00	3	3.0	3.0	1.500	3.0	0.5	0.5	0.5	0.5	0.5				1.5	1.5		
Faecal C (Ecoli frm Apr'20)	col/100ml	100	2.00	830.00	9	16.000	830	2.000	2.0	2	24.0	2	2	240	2	2	2	2	2		
Chloride	mg/L		20.70	31.00	19.1	17.7	13.8	20.500	22.6	17.4	17.7	20.9	22.1	19.8	14.2	16.3	27.7	26.4	26.2	28.8	31.0
Nitrate-N	mg/L	90.3	17.20	23.90	15.2	14.20	10.30	16.200	17.50	16.6	16.7	21.2	23.9	16.9	11.1	11.7	17.7	21.7	22.9	23.8	22.9
Sulphate	mg/L	1000	5.17	28.10	5.48	5.5				28.10	5.54			4.34				4.82	4.85		
Ammonia-N	mg/L		0.01	0.05	0.005	0.005	0.005	0.010	0.005	0.005	0.050	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Hardness	mg CaCO3/L		96.50	104.00	96	96				97	92			95				104	101		
Calcium	mg/L	1000	17.90	18.50	17.3	17.3				17.8	17.5			18.0				18.5	18.5		
Magnesium	mg/L		12.80	13.20	12.8	12.8				12.8	11.7			12.3				13.1	13.2		
Potassium	mg/L		8.26	8.89	8.35	8.35				8.89	8.00			8.16				7.31	8.67		
Sodium	mg/L		31.80	40.90	26.3	26.3				30.8	31.8			33.9	26.7	9.7	24.8	37.9	38.4	40.9	38.9
D.R. Phosphorus	mg/L		0.10	0.10	0.1	0.100				0.098	0.099			0.101				0.093	0.094		
Aluminium	mg/L	5	0.00	0.02	0.002	0.001	0.004	0.003	0.001	0.001	0.001	0.001	0.001	0.003	0.001	0.001	0.016	0.001	0.001	0.001	0.001
Arsenic	mg/L	0.5	0.00	0.00	0.001	0.001				0.001	0.001			0.001				0.001	0.001		
Boron	mg/L	5	0.05	0.07	0.05	0.05	0.05	0.060	0.04	0.05	0.06	0.06	0.05	0.05	0.05	0.05	0.03	0.03	0.07	0.05	0.05
Cadmium	mg/L	0.01	0.00	0.00	0.0001	0.0001				0.0001	0.0001			0.0001				0.0001	0.0001		
Chromium	mg/L	1	0.00	0.01	0.0005	0.0005				0.0005	0.0005			0.0005				0.0005	0.0050		
Copper	mg/L	0.4	0.00	0.01	0.0008	0.0008				0.0006	0.00025			0.00570				0.00025	0.00025		
Iron	mg/L		0.01	14.20	0.011	0.01				0.0200	0.007			0.0025	0.0050	0.005	14.200	0.003	0.003	0.01	0.005
Lead	mg/L	0.1	0.00	0.00	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.0003	0.00025	0.00025	0.00025
Manganese	mg/L		0.00	0.37	0.0013	0.0011	0.00640	0.00150	0.0003	0.0018	0.00025	0.00025	0.001	0.00090	0.00025	0.00025	0.37200	0.0003	0.0003	0.0003	0.0003
Mercury	mg/L		0.00	0.00	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.000	0.00025							
Nickel	mg/L	1	0.00	0.01	0.00025	0.00025	0.00960	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Zinc	mg/L	20	0.00	0.02	0.023	0.023				0.002	0.001			0.004				0.001	0.001		

E1S Monitoring Bore HDC Levin Landfill

Determinand		ANZECC STOCK	Median	Maximum	Annual Median	Apr-22	Jan-22	Oct-21	Jul-21	Apr-21	Jan-21	Oct-20	Jul-20	Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18
Water level	mBGL		11.37	11.60	11.325	11.28	11.33	11.320	11.60	11.51	11.350	11.510	11.60	11.510	11.33	11.385	11.25	11.50	11.35	11.24	11.41
pH		6 to 9	7.10	7.60	7.1	7.4	7.1	7.100	7.1	6.9	6.9	6.8	7.0	7.2	7.1	7.0	6.9	7.6	7.3	6.8	7.1
Suspended Solids	mg/l		4.00	58.00	3	3				5	58			7				3	3		
Phenol	mg/L		0.03	0.03	0.025	0.025				0.025				0.025				0.025	0.025		
VFA	mg/L		2.50	2.50	2.5	2.5				2.5				2.5				3	3		
TOC	mg/L		5.80	7.00	7	7.0				6.4	6.6			5.2				3.7	3.7		
Alkalinity	mg CaCO3/L		69.00	82.00	82	82				70	77			68				61	58		
Conductivity	mS/m		26.65	27.40	26.1	26.5	25.3	26.400	25.8	26.7	25.7	27.4	26.4	27.1	26.6	26.9	26.7	26.7	26.4	26.9	26.9
COD	mg/L		18.50	40.00	21.5	24	40	7.500	19	25.0	18	19.0	19.0	7.5	19.0	7.5	7.5	25.0	7.5	7.5	7.5
BOD (scBOD frm Apr'20)	mg/L		1.50	5.90	3	3.0	3.0	1.500	3.0	3.0	1.5	0.5	5.9	0.5				1.5	1.5		
Faecal C (Ecoli frm Apr'20)	col/100ml	100	2.00	50.00	2	2.000	50.000	2.000	2.0	2.0	2.0	2	2	2	2	2	2	2	2		
Chloride	mg/L		28.70	35.60	26.7	26.7	26.9	26.700	26.6	26.1	28.5	27.8	28.7	28.7	29.7	30.0	30.7	33.5	33.6	35.6	35.1
Nitrate-N	mg/L	90.3	0.01	0.02	0.005	0.005	0.005	0.020	0.005	0.005	0.005	0.005	0.005	0.005	0.01	0.005	0.005	0.005	0.010	0.005	0.005
Sulphate	mg/L	1000	7.24	11.40	3.58	3.58				5.4	5.3			9.1				11.2	11.4		
Ammonia-N	mg/L		0.18	0.23	0.185	0.18	0.2	0.200	0.19	0.18	0.20	0.23	0.18	0.17	0.16	0.18	0.18	0.18	0.16	0.21	0.15
Hardness	mg CaCO3/L		57.00	61.00	61	61				59	55			59				52	52		
Calcium	mg/L	1000	10.80	12.20	12.2	12.2				11.6	10.60			11.00				9.56	9.19		
Magnesium	mg/L		7.17	7.62	7.48	7.48				7.19	7.04			7.62				6.76	7.14		
Potassium	mg/L		6.03	6.60	6.6	6.60				5.95	6.05			6.22				5.02	6.01		
Sodium	mg/L		27.55	30.00	27.95	27	30.0	28.400	27.5	26.0	27.60	26.80	29.2	28.9	25.8	9.5	22.9	28.1	29.3	28.2	25.9
D.R. Phosphorus	mg/L		0.06	0.07	0.074	0.074				0.059	0.068			0.053				0.054	0.065		
Aluminium	mg/L	5	0.01	0.02	0.007	0.007	0.007	0.007	0.007	0.004	0.016	0.007	0.009	0.006	0.006	0.001	0.002	0.002	0.006	0.003	0.003
Arsenic	mg/L	0.5	0.00	0.00	0.002	0.002				0.001	0.003			0.002				0.002	0.002		
Boron	mg/L	5	0.02	0.04	0.0225	0.015	0.04	0.030	0.02	0.02	0.030	0.015	0.02	0.030	0.015	0.015	0.040	0.015	0.02	0.015	0.015
Cadmium	mg/L	0.01	0.00	0.00	0.0001	0.0001				0.0001	0.0001			0.0001				0.0001	0.0001		
Chromium	mg/L	1	0.00	0.00	0.0005	0.0005				0.0005	0.0005			0.0005				0.0005	0.0005		
Copper	mg/L	0.4	0.00	0.00	0.0009	0.00090				0.0003	0.0011			0.0006				0.0005	0.0003		
Iron	mg/L		4.61	5.44	5.145	5.44	4.59	5.360	4.93	1.96	4.77	4.83	4.83	4.65	4.22	4.63	0.02	3.97	4.22	3.79	3.79
Lead	mg/L	0.1	0.00	0.01	0.00075	0.00050	0.00250	0.0007	0.00080	0.0003	0.00700	0.0018	0.00220	0.0005	0.0003	0.0023	0.0003	0.0009	0.0006	0.00080	0.0019
Manganese	mg/L		0.23	0.26	0.25	0.264	0.229	0.258	0.242	0.239	0.236	0.241	0.2290	0.243	0.219	0.242	0.035	0.209	0.219	0.208	0.192
Mercury	mg/L		0.00	0.00	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.000	0.000	0.0003	0.000							
Nickel	mg/L	1	0.00	0.00	0.00025	0.00025	0.00025	0.00025	0.00070	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Zinc	mg/L	20	0.00	0.00	0.004	0.004				0.001	0.002			0.001				0.001	0.001		

E1D Monitoring Bore HDC Levin Landfill

Determinand		NZDW MAV	Median	Maximum	Annual Median	Apr-22	Jan-22	Oct-21	Jul-21	Apr-21	Jan-21	Oct-20	Jul-20	Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18
Water level	mBGL		11.30	11.46	11.19	11.17		11.1900	11.46	11.41		11.390	11.32	11.38	11.25	11.165	11.33	11.43	11.27	11.14	11.27
pH		7 to 8.5*	7.65	8.10	7.7	7.7	7.7	7.8000	7.7	7.5	7.6	7.5	7.7	7.7	7.9	7.5	7.5	8.1	7.5	7.6	7.5
Suspended Solids	mg/l		8.00	50.00	7	7				9.0	50			3				3	27		
Phenol	mg/L		0.03	0.03	0.025	0.025				0.025				0.025				0.025	0.025		
VFA	mg/L		2.50	2.50	2.5	2.5				2.5				2.5				2.5	2.5		
TOC	mg/L		3.05	3.70	3.7	3.7				3.0	2.9			3.1				2.8	3.2		
Alkalinity	mg CaCO3/L		157.50	164.00	164	164				151	153			155				160	161		
Conductivity	mS/m		45.35	45.90	45	45.1	45.9	44.9000	43.6	44.7	44.7	44.9	44.3	45.5	45.8	45.9	45.2	45.7	45.6	45.5	45.5
COD	mg/L		12.25	75.00	12.25	8	17.0	7.5000	75	26.0	7.5	18.0	23	7.5	8	8	45.0	7.5	37	38	7.5
BOD (scBOD frm Apr'20)	mg/L		0.50	3.00	1	0.5	0.5	1.5000	3.0	1.5	1	1	1	1				2.0	0.5		
Faecal C (Ecoli frm Apr'20)	col/100ml	NIL	2.00	200.00	11	2.0000	20.0000	2.0000	200.0	2.0	2.0	2	2	2.0	2.0	2	2	2	2		
Chloride	mg/L	250*	39.10	40.40	38.9	38.5	39.3	38.2000	40.4	38.5	38.9	39.2	40.1	38.7	38.2	39.0	39.4	39.3	39.0	39.6	39.6
Nitrate-N	mg/L	11.3	0.01	0.01	0.005	0.005	0.005	0.0050	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Sulphate	mg/L	250*	0.01	0.01	0.01	0.01				0.01	0.01			0.01				0.01	0.01		
Ammonia-N	mg/L	1.17	0.20	0.28	0.195	0.2	0.20	0.1900	0.28	0.20	0.19	0.22	0.22	0.20	0.19	0.21	0.21	0.23	0.20	0.22	0.19
Hardness	mg CaCO3/L	200*	134.00	141.00	137	137				138	128			131				124	141		
Calcium	mg/L		32.20	34.70	32.8	32.8				32.6	31.1			31.8				28.7	34.7		
Magnesium	mg/L		12.85	13.80	13.2	13.2				13.8	12.3			12.4				12.6	13.1		
Potassium	mg/L		5.05	5.75	5.75	5.75				5.14	5.06			5.03				5.03	4.96		
Sodium	mg/L	200*	37.15	43.90	37.65	36.3	38.7	40.1000	36.6	37.2	35.5	36.0	37.1	36.5	37.2	14.7	43.9	35.9	39.6	37.3	42.0
D.R. Phosphorus	mg/L		0.40	0.42	0.421	0.421				0.390	0.419			0.411				0.391	0.395		
Aluminium	mg/L	0.1*	0.00	0.01	0.003	0.0010	0.005	0.0010	0.006	0.001	0.002	0.001	0.003	0.001	0.003	0.001	0.001	0.001	0.003	0.001	0.002
Arsenic	mg/L	0.01	0.01	0.01	0.006	0.006				0.007	0.007			0.007				0.007	0.008		
Boron	mg/L	1.4	0.06	0.06	0.055	0.05	0.06	0.0600	0.05	0.06	0.06	0.05	0.05	0.060	0.06	0.06	0.04	0.02	0.05	0.04	0.06
Cadmium	mg/L	0.004	0.00	0.00	0.0001	0.0001				0.0001	0.0001			0.0001				0.0001	0.0001		
Chromium	mg/L	0.05	0.00	0.00	0.0005	0.0005				0.0005	0.0005			0.0005				0.0005	0.0005		
Copper	mg/L	2	0.00	0.00	0.0009	0.00090				0.00025	0.00025			0.00025				0.00025	0.00025		
Iron	mg/L	0.2*	0.04	0.19	0.039	0.038	0.040	0.0300	0.19	0.02	0.03	0.03	0.02	0.030	0.050	0.04	0.05	0.04	0.036	0.05	0.11
Lead	mg/L	0.01	0.00	0.02	0.000375	0.00025	0.00050	0.00025	0.01510	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Manganese	mg/L	0.4	0.24	0.28	0.236	0.24	0.232	0.2360	0.280	0.240	0.226	0.240	0.226	0.248	0.274	0.258	0.235	0.241	0.229	0.256	0.252
Mercury	mg/L		0.00	0.00	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.000	0.000	0.000	0.000							
Nickel	mg/L	0.08	0.00	0.00	0.00025	0.00025	0.00025	0.00025	0.00070	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Zinc	mg/L	1.5*	0.00	0.00	0.0005	0.001				0.001	0.001			0.001				0.001	0.001		

* = GV

E2S Monitoring Bore HDC Levin Landfill

Determinand		ANZECC STOCK	Median	Maximum	Annual Median	Apr-22	Jan-22	Oct-21	Jul-21	Apr-21	Jan-21	Oct-20	Jul-20	Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18
Water level	mBGL		4.97	5.80	5.495	5.43	5.560	5.340	5.80	5.57	4.52	5.670	5.55	4.970	4.79	4.635	4.75	5.0	4.77	4.67	4.76
pH		6 to 9	7.60	7.90	7.8	7.6	7.8	7.900	7.8	7.7	7.8	7.5	7.4	7.6	7.9	7.7	7.4	7.5	7.4	7.4	7.5
Suspended Solids	mg/l		3.00	9.00	9	9				2.0	3			3				3	3		
Phenol	mg/L		0.03	0.03	0.025	0.025				0.025				0.025				0.025	0.025		
VFA	mg/L		2.50	6.00	2.5	2.5				2.5				2.5				2.5	6.0		
TOC	mg/L		2.90	3.30	2.4	2.4				3.3	2.9			2.9				2.7	3.1		
Alkalinity	mg CaCO3/L		145.50	150.00	82	82				85	145			146				149	150		
Conductivity	mS/m		43.80	44.90	33.15	32.4	33.7	33.200	33.1	35.5	43.8	36.5	43.8	44.9	44.5	44.8	44.2	44.5	44.5	44.6	35.0
COD	mg/L		7.50	54.00	12.75	18	8	54.000	7.5	16.0	18	7.5	7.5	7.5	27.0	7.5	7.5	7.5	8	7.5	7.5
BOD (scBOD frm Apr'20)	mg/L		1.50	3.00	3	3.0	3.0	1.500	3.0	1.5	0.5	0.5	0.5	0.5				1.5	1.5		
Faecal C (Ecoli frm Apr'20)	col/100ml	100	2.00	3200.00	4	4.000	3200.0	4.000	2.0	2	0.5	2	2	2	ND	2	2	2	2		
Chloride	mg/L		41.20	48.00	38.1	38.1	38	35.600	39.8	39.4	44.3	45.7	40.7	40.7	41.8	41.0	41.4	41.8	42.1	42.0	48.0
Nitrate-N	mg/L	90.3	0.01	0.01	0.005	0.005	0.010	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.01	0.005	0.005
Sulphate	mg/L	1000	3.78	14.10	11	11.0				14.10	0.01			0.01				0.01	7.54		
Ammonia-N	mg/L		0.28	0.36	0.31	0.30	0.29	0.360	0.32	0.33	0.28	0.33	0.26	0.25	0.25	0.26	0.25	0.27	0.25	0.26	0.28
Hardness	mg CaCO3/L		115.50	123.00	77	77				101	123			119				112	120		
Calcium	mg/L	1000	26.25	29.60	21.3	21.3				29.6	27.9			26.0				25.4	26.5		
Magnesium	mg/L		12.40	13.00	5.84	5.84				6.7	13.0			13.0				11.9	12.9		
Potassium	mg/L		6.05	6.46	6.28	6.28				5.62	6.17			6.46				5.45	5.93		
Sodium	mg/L		40.90	45.00	28.8	26.7	30.2	27.400	30.9	26.8	44.2	31.4	43.4	41.2	42.7	41.7	44.5	40.6	44.1	45.0	33.6
D.R. Phosphorus	mg/L		0.57	0.62	0.201	0.201				0.238	0.610			0.621				0.567	0.576		
Aluminium	mg/L	5	0.00	0.00	0.002	0.002	0.003	0.002	0.001	0.001	0.001	0.001	0.001	0.004	0.001	0.001	0.001	0.001	0.003	0.001	0.001
Arsenic	mg/L	0.5	0.00	0.00	0.001	0.0010				0.001	0.001			0.001				0.001	0.002		
Boron	mg/L	5	0.04	0.06	0.0225	0.030	0.04	0.015	0.02	0.02	0.06	0.02	0.05	0.050	0.04	0.05	0.050	0.02	0.05	0.04	0.02
Cadmium	mg/L	0.01	0.00	0.00	0.0001	0.0001				0.0001	0.0001			0.0001				0.0001	0.0001		
Chromium	mg/L	1	0.00	0.00	0.0005	0.0005				0.0005	0.0005			0.0005				0.0005	0.0005		
Copper	mg/L	0.4	0.00	0.00	0.00025	0.00025				0.00025	0.00025			0.00025				0.0003	0.0003		
Iron	mg/L		0.06	0.11	0.0705	0.081	0.060	0.110	0.04	0.064	0.02	0.03	0.06	0.047	0.030	0.02	0.05	0.06	0.070	0.09	0.06
Lead	mg/L	0.1	0.00	0.00	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.0003	0.00025	0.00025	0.0003	0.0015	0.00025	0.00025
Manganese	mg/L		0.33	0.41	0.2225	0.225	0.219	0.220	0.239	0.237	0.376	0.246	0.377	0.386	0.389	0.283	0.404	0.376	0.380	0.406	0.248
Mercury	mg/L		0.00	0.00	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.000	0.000	0.000	0.000							
Nickel	mg/L	1	0.00	0.00	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.0003	0.0003	0.0003	0.0003
Zinc	mg/L	20	0.00	0.01	0.001	0.001				0.002	0.001			0.003				0.001	0.011		

E2D Monitoring Bore HDC Levin Landfill

Determinand		NZDW MAV	Median	Maximum	Annual Median	Apr-22	Jan-22	Oct-21	Jul-21	Apr-21	Jan-21	Oct-20	Jul-20	Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18
Water level	mBGL		5.60	6.17	4.59	4.56	4.62	4.4400	4.90	4.78	5.4	4.77	6.17	5.79	5.70	5.58	5.7	5.8	5.69	5.62	5.69
pH		7 to 8.5*	7.60	8.00	7.6	7.6	7.5	7.6000	7.7	7.5	7.7	7.3	7.8	7.7	8.0	7.7	7.6	7.6	7.7	7.5	7.6
Suspended Solids	mg/l		7.50	14.00	2.5	3				7	8			14				3	11		
Phenol	mg/L		0.03	0.03	0.025	0.025				0.025				0.025				0.025	0.025		
VFA	mg/L		2.50	2.50	2.5	2.5				2.5				2.5				3	3		
TOC	mg/L		2.10	3.10	3.1	3.1				2.8	2.0			2.1				1.9	2.1		
Alkalinity	mg CaCO3/L		81.50	157.00	157	157				138	81			76				76	82		
Conductivity	mS/m		35.90	44.80	44.45	44.4	44.5	44.5000	44.2	44.4	34.7	44.8	36.4	35.4	34.6	34.4	34.8	34.9	36.7	35.2	35.0
COD	mg/L		7.50	41.00	7.5	7.5	7.5	7.5000	7.5	7.5	8	7.5	7.5	7.5	20	8	7.5	7.5	30	41	7.5
BOD (scBOD frm Apr'20)	mg/L		0.50	3.00	1	0.5	0.5	1.5000	3.0	0.5	0.5	0.5	0.5	0.5				2	1		
Faecal C (Ecoli frm Apr'20)	col/100ml	NIL	2.00	12.00	2	2	12.0	2.0000	2.0	4.0	0.5	2	2	2	2	2	2	2	2		
Chloride	mg/L	250*	46.60	50.50	40.75	40.8	41.3	40.6000	40.7	40.6	47.3	40.6	48.1	47.8	45.0	45.9	48.2	48.4	50.5	49.0	48.4
Nitrate-N	mg/L	11.3	0.01	0.01	0.005	0.005	0.005	0.0100	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.01	0.005	0.005
Sulphate	mg/L	250*	10.35	16.30	0.01	0.01				0.0	16.3			12.4				10.00	10.70		
Ammonia-N	mg/L	1.17	0.29	0.34	0.255	0.28	0.22	0.2500	0.3	0.25	0.29	0.26	0.30	0.30	0.29	0.29	0.30	0.34	0.34	0.30	0.29
Hardness	mg CaCO3/L	200*	92.00	128.00	128	128				121	81			83				75	101		
Calcium	mg/L		24.95	29.70	28.1	28.1				26.8	22.7			23.1				20.0	29.7		
Magnesium	mg/L		6.30	13.90	13.9	13.9				13.20	5.85			6.14				5.97	6.46		
Potassium	mg/L		5.54	7.31	7.31	7.31				6.67	5.34			5.67				5.40	5.11		
Sodium	mg/L	200*	30.00	43.00	43	43.0				40.9	28.4			30.2	30.0	10.9	27.2	28.1	31.0	32.5	26.0
D.R. Phosphorus	mg/L		0.21	0.63	0.632	0.632				0.624	0.202			0.198				0.148	0.218		
Aluminium	mg/L	0.1*	0.00	0.00	0.0015	0.002	0.003	0.0010	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.003	0.001	0.002
Arsenic	mg/L	0.01	0.00	0.00	0.001	0.001				0.001	0.001			0.001				0.0020	0.0005		
Boron	mg/L	1.4	0.02	0.07	0.06	0.01	0.06	0.0600	0.060	0.070	0.030	0.060	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.02	0.015
Cadmium	mg/L	0.004	0.00	0.00	0.0001	0.0001				0.0001	0.0001			0.0001				0.0001	0.0001		
Chromium	mg/L	0.05	0.00	0.00	0.0005	0.0005				0.0005	0.0005			0.0005				0.0005	0.0005		
Copper	mg/L	2	0.00	0.00	0.00025	0.00025				0.00025	0.00025			0.00025				0.0003	0.0003		
Iron	mg/L	0.2*	0.05	0.07	0.071	0.071				0.046	0.07			0.046	0.070	0.05	0.05	0.05	0.064	0.06	0.030
Lead	mg/L	0.01	0.00	0.00	0.000675	0.00110	0.00130	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.0003	0.00025
Manganese	mg/L	0.4	0.23	0.44	0.4015	0.438	0.393	0.3980	0.405	0.409	0.212	0.402	0.226	0.234	0.232	0.229	0.219	0.230	0.231	0.237	0.193
Mercury	mg/L		0.00	0.00	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.000	0.000	0.000	0.000							
Nickel	mg/L	0.08	0.00	0.00	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.0003	0.00025
Zinc	mg/L	1.5*	0.00	0.00	0.004	0.004				0.001	0.001			0.001				0.001	0.001		

* = GV

F1 Monitoring Bore HDC Levin Landfill

Determinand		ANZECC STOCK	Median	Maximum	Annual Median	Apr-22	Jan-22	Oct-21	Jul-21	Apr-21	Jan-21	Oct-20	Jul-20	Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18
Water level	mBGL		7.94	8.38	7.805	7.57	7.96	7.650	8.25	7.91	7.70	8.13	7.80	8.38	7.97	7.92	7.89	8.21	8.04	7.71	7.98
pH		6 to 9	7.00	7.90	7	7.5	7.0	7.000	6.8	6.9	7.2	6.9	6.9	7.6	7.8	6.8	7.9	7.6	7.2	6.8	6.8
Suspended Solids	mg/l		2.50	3.00	1.5	2				2.0	3.0			2.5				3	3		
Phenol	mg/L		0.03	0.03	0.025	0.025				0.025				0.025				0.025	0.005		
VFA	mg/L		2.50	2.50	2.5	2.5				2.5				2.5				2.5	2.5		
TOC	mg/L		5.45	6.20	6	6.0				5.1	4.8			5.5				6.2	5.4		
Alkalinity	mg CaCO3/L		130.50	144.00	141	141				113	115			131				144	130		
Conductivity	mS/m		47.30	52.30	43.8	42.4	41.1	45.200	47.8	48.5	47.8	47.5	47.4	46.6	43.4	42.4	46.8	47.2	48.0	50.6	52.3
COD	mg/L		23.50	47.00	24.5	47	7.5	21.000	28	26	28.0	7.5	26	16	7.5	8	30	18	8	40.0	28
BOD (scBOD frm Apr'20)	mg/L		0.50	3.00	1	0.5	0.5	1.500	3.0	1.5	0.5	0.5	0.5	0.5				0.5	0.5		
Faecal C (Ecoli frm Apr'20)	col/100ml	100	2.00	27.00	2	2	2.0	2.000	2.0	27.0	0.5	2	2	2	2	2	2	2	2		
Chloride	mg/L		49.50	74.00	44.25	41	44.1	44.400	48.2	61.0	57.8	28.5	48.7	49.4	51.0	51.8	49.6	48.2	57.6	74.0	50.9
Nitrate-N	mg/L	90.3	1.16	2.02	0.595	0.38	0.93	0.520	0.67	2.02	1.89	1.64	0.98	1.01	1.47	1.96	1.54	0.78	1.31	1.96	0.21
Sulphate	mg/L	1000	4.78	7.59	2.97	2.97				7.59	6.94			5.24				2.90	4.32		
Ammonia-N	mg/L		0.01	0.05	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.050	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.01	0.005
Hardness	mg CaCO3/L		125.00	130.00	123	123				130	125			125				121	128		
Calcium	mg/L	1000	18.50	19.70	18.4	18.4				19.0	18.6			18.3				17.4	19.7		
Magnesium	mg/L		19.10	19.90	18.8	18.8				19.9	19.1			19.2				18.8	19.1		
Potassium	mg/L		8.81	9.18	8.66	8.66				9.18	9.06			8.95				7.78	7.90		
Sodium	mg/L		41.50	46.60	40.6	40.6				41.9	43.0			42.9	38.4	14.3	30.7	39.5	46.4	41.5	46.6
D.R. Phosphorus	mg/L		0.17	0.18	0.182	0.182				0.155	0.169			0.172				0.171	0.160		
Aluminium	mg/L	5	0.00	0.01	0.002	0.001	0.001	0.003	0.005	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.003	0.001	0.001	0.003	0.001
Arsenic	mg/L	0.5	0.00	0.00	0.002	0.002				0.002	0.002			0.002				0.002	0.002		
Boron	mg/L	5	0.03	345.00	0.035	0.03	0.040	0.040	0.03	0	0.02	0.03	0.030	345.00	0.030	0.030	0.015	0.030	0.015	0.02	0.015
Cadmium	mg/L	0.01	0.00	0.00	0.0001	0.0001				0.0001	0.0001			0.0001				0.0001	0.0001		
Chromium	mg/L	1	0.00	0.00	0.0005	0.0005				0.0005	0.0005			0.0005				0.0005	0.0005		
Copper	mg/L	0.4	0.00	0.00	0.003	0.0030				0.0013	0.0029			0.0030				0.0021	0.0018		
Iron	mg/L		0.00	0.01	0.0025	0.0025				0.0025	0.003			0.0025	0.0050	0.005	0.005	0.003	0.003	0.01	0.005
Lead	mg/L	0.1	0.00	0.00	0.00025	0.00025	0.00025	0.000250	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.0003	0.00025
Manganese	mg/L		0.00	0.02	0.01095	0.0058	0.0044	0.0241	0.016	0.0038	0.0042	0.0053	0.0180	0.0044	0.0028	0.0030	0.0133	0.0040	0.0029	0.0028	0.0061
Mercury	mg/L		0.00	0.00	0.00025	0.00025	0.00025	0.000250	0.00025	0.00025	0.0003	0.0003	0.0003	0.0003							
Nickel	mg/L	1	0.00	0.00	0.000525	0.00025	0.00025	0.000800	0.0008	0.00025	0.00025	0.00025	0.0009	0.0003	0.00025	0.00025	0.0014	0.0006	0.00025	0.0003	0.0007
Zinc	mg/L	20	0.00	0.00	0.001	0.001				0.001	0.001			0.001				0.001	0.001		

F2 Monitoring Bore HDC Levin Landfill

Determinand		ANZECC STOCK	Median	Maximum	Annual Median	Apr-22	Jan-22	Oct-21	Jul-21	Apr-21	Jan-21	Oct-20	Jul-20	Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18
Water level	mBGL		2.97	5.27	2.82	2.51	3.00	2.640	3.21	2.76	2.67	3.100	3.77	3.110	5.270	5.27	2.87	3.00	2.87	2.74	2.94
pH		6 to 9	7.15	7.60	7.3	7.6	7.2	7.400	7.0	7.0	7.3	7.1	7.1	7.2	7.5	7.0	7.3	7.0	7.2	7.0	7.0
Suspended Solids	mg/l		2.75	3.00	1.5	1.5				3	3.0			3.0				3	3		
Phenol	mg/L		0.03	0.03	0.025	0.025				0.025				0.025				0.025	0.005		
VFA	mg/L		2.50	6.00	2.5	2.5				2.5				2.5				3	6		
TOC	mg/L		1.60	1.80	1.8	1.8				1.6	1.6			1.6				1.4	1.5		
Alkalinity	mg CaCO3/L		52.50	56.00	56	56				51	50			53				52	53		
Conductivity	mS/m		22.15	23.60	21.9	22.3	21.9	21.900	21.8	21.3	21.6	21.6	21.7	22.1	22.2	22.6	22.9	22.3	22.5	22.8	23.6
COD	mg/L		7.50	51.00	11.245	39	8	7.500	14.99	17.0	19.0	7.5	8	7.5	7.5	8	51.0	7.5	7.5	33.0	7.5
BOD (scBOD frm Apr'20)	mg/L		0.50	5.90	1	0.5	0.5	1.500	5.9	1.5	0.5	0.5	0.5	0.5				0.5	0.5		
Faecal C (Ecoli frm Apr'20)	col/100ml	100	2.00	3.90	2	2	1	2	4	2	2	2	2	2	2	2	2	2	2		
Chloride	mg/L		23.10	25.00	22.95	23.7	22.6	22.400	23	22.3	22.7	21.8	23.0	23.2	22.7	23.4	22.8	23.7	24.2	24.9	25.0
Nitrate-N	mg/L	90.3	0.45	1.19	0.265	0.25	0.28	0.280	0.13	0.18	0.25	0.47	0.43	0.33	0.55	0.73	0.74	0.57	0.66	1.00	1.19
Sulphate	mg/L	1000	9.46	10.20	10.2	10.20				9.49	9.1			9.0				10.1	9.4		
Ammonia-N	mg/L		0.01	0.01	0.005	0.005	0.005	0.005	0.000	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Hardness	mg CaCO3/L		38.50	40.00	40	40				38	36			37				39	39		
Calcium	mg/L	1000	6.17	6.66	6.66	6.66				5.81	5.74			6.01				6.32	6.40		
Magnesium	mg/L		5.57	5.78	5.78	5.78				5.59	5.17			5.41				5.55	5.64		
Potassium	mg/L		5.25	5.80	5.8	5.80				5.22	5.28			5.45				4.47	5.21		
Sodium	mg/L		25.60	28.20	26.4	26.4				26.3	25.6			26.1	24.7	23.6	23.8	25.6	28.1	28.2	22.1
D.R. Phosphorus	mg/L		0.14	0.15	0.152	0.152				0.132	0.136			0.148				0.146	0.142		
Aluminium	mg/L	5	0.00	0.00	0.002	0.002	0.002	0.002	0.003	0.001	0.001	0.001	0.001	0.002	0.001	0.002	0.002	0.001	0.001	0.003	0.001
Arsenic	mg/L	0.5	0.00	0.00	0.001	0.001				0.001	0.001			0.002				0.001	0.002		
Boron	mg/L	5	0.04	0.04	0.04	0.00	0.04	0.040	0.04	0.04	0.03	0.04	0.04	0.03	0.04	0.030	0.040	0.03	0.04	0.02	0.02
Cadmium	mg/L	0.01	0.00	0.00	0.0001	0.0001				0.0001	0.00			0.0001				0.0001	0.0001		
Chromium	mg/L	1	0.00	0.00	0.0005	0.0005				0.0005	0.0005			0.0005				0.0005	0.0005		
Copper	mg/L	0.4	0.00	0.00	0.0018	0.0018				0.0010	0.0018			0.0013				0.0009	0.0010		
Iron	mg/L		0.01	0.02	0.02	0.020				0.015	0.009			0.018	0.005	0.01	0.005	0.01	0.020	0.010	0.005
Lead	mg/L	0.1	0.00	0.00	0.00025	0.00025	0.00025	0.00025	0.00040	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Manganese	mg/L		0.00	0.04	0.0116	0.0205	0.002	0.0027	0.025	0.0139	0.0050	0.0017	0.0040	0.0360	0.0050	0.0017	0.0010	0.0088	0.0075	0.0036	0.0008
Mercury	mg/L		0.00	0.00	0.00025	0.00025	0.00025	0.00025	0.00040	0.00025	0.0003	0.0003	0.0003	0.0003							
Nickel	mg/L	1	0.00	0.00	0.000325	0.00070	0.00025	0.00025	0.00040	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.0003	0.00025
Zinc	mg/L	20	0.00	0.00	0.001	0.001				0.001	0.001			0.002				0.001	0.001		

F3 Monitoring Bore HDC Levin Landfill

Determinand		ANZECC STOCK	Median	Maximum	Annual Median	Apr-22	Jan-22	Oct-21	Jul-21	Apr-21	Jan-21	Oct-20	Jul-20	Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18
Water level	mBGL		5.37	6.60	5.375	4.85	5.35	5.400	5.67	5.17	5.07	5.56	6.60	5.43	2.83	2.83	5.45	5.44	5.31	5.19	5.38
pH		6 to 9	7.15	7.90	7.45	7.5	7.1	7.400	7.9	7.0	7.3	7.0	7.1	7.8	7.5	7.0	7.0	7.3	7.2	7.0	7.0
Suspended Solids	mg/l		4.50	40.00	14	14.0				3	40.0			3.0				3	6		
Phenol	mg/L		0.03	0.03	0.025	0.025				0.025				0.025				0.025	0.005		
VFA	mg/L		2.50	6.00	2.5	2.5				2.5				2.5				3	6		
TOC	mg/L		1.40	1.50	1.5	1.5				1.5	1.4			1.3				1.2	1.4		
Alkalinity	mg CaCO3/L		45.50	53.00	49	49				43	46			53				45	45		
Conductivity	mS/m		20.40	23.50	20.65	18.6	19.5	21.800	21.8	19.2	20.2	23.5	23.5	19.2	18.4	20.6	20.6	20.4	20.2	21.5	20.4
COD	mg/L		7.50	56.00	29	34.0	7.5	14.990	29.0	7.5	7.5	7.5	8	8	7.5	8	56.0	15.0	8	29	7.5
BOD (scBOD frm Apr'20)	mg/L		0.50	2.90	1	0.5	0.5	2.900	1.5	1.5	0.5	0.5	0.5	0.5				0.5	0.5		
Faecal C (Ecoli frm Apr'20)	col/100ml	100	2.00	16.00	3	4	0.5	4	2	16	1	2	2	2	2	2	2	2	2		
Chloride	mg/L		19.45	26.80	18.6	17.9	18	19.500	19.2	17.4	17.0	21.6	22.2	15.4	14.7	19.4	20.6	21.9	21.3	26.8	23.0
Nitrate-N	mg/L	90.3	1.17	2.37	1.12	1.08	1.36	1.090	1.15	1.53	2.37	2.05	1.55	1.11	1.19	1.93	1.52	0.88	0.74	0.97	0.82
Sulphate	mg/L	1000	7.71	11.80	5.48	5.48				8.39	6.9			7.0				11.80	10.70		
Ammonia-N	mg/L		0.01	0.01	0.005	0.005	0.005	0.000	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.01	0.005	0.005
Hardness	mg CaCO3/L		34.50	38.00	31	31				33	35			34				37	38		
Calcium	mg/L	1000	5.27	5.92	4.77	4.77				4.84	5.36			5.18				5.63	5.92		
Magnesium	mg/L		5.13	5.70	4.54	4.54				4.99	5.18			5.08				5.45	5.70		
Potassium	mg/L		4.99	5.18	5.18	5.180				4.93	5.03			5.11				4.62	4.95		
Sodium	mg/L		22.65	26.80	25.7	22	25.7	26.800	25.7	22.0	24.5	26.80	26.1	23.0	20.6	9.1	22.0	22.0	24.1	22.0	20.6
D.R. Phosphorus	mg/L		0.14	0.16	0.161	0.161				0.136	0.143			0.143				0.139	0.131		
Aluminium	mg/L	5	0.00	0.03	0.002	0.001	0.001	0.003	0.007	0.001	0.002	0.030	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Arsenic	mg/L	0.5	0.00	0.00	0.002	0.002				0.002	0.001			0.002				0.001	0.002		
Boron	mg/L	5	0.02	0.03	0.0175	0.015	0.030	0.020	0.02	0.015	0.02	0.015	0.020	0.015	0.030	0.015	0.015	0.015	0.015	0.015	0.015
Cadmium	mg/L	0.01	0.00	0.00	0.0001	0.0001				0.0001	0.0001			0.0001				0.0001	0.0001		
Chromium	mg/L	1	0.00	0.00	0.0005	0.0005				0.0005	0.0005			0.0005				0.0005	0.0005		
Copper	mg/L	0.4	0.00	0.00	0.0005	0.0005				0.0007	0.00140			0.00050				0.0003	0.0006		
Iron	mg/L		0.01	0.01	0.00375	0.0025	0.0050	0.000	0.005	0.0025	0.003	0.010	0.005	0.0025	0.0050	0.005	0.005	0.003	0.003	0.01	0.005
Lead	mg/L	0.1	0.00	0.00	0.00025	0.00025	0.00025	0.000400	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Manganese	mg/L		0.00	0.00	0.00025	0.00025	0.0003	0.000900	0.00025	0.00025	0.00070	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.0003	0.0003	0.00025
Mercury	mg/L		0.00	0.00	0.00025	0.00025	0.00025	0.000400	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025							
Nickel	mg/L	1	0.00	0.00	0.00025	0.00025	0.0003	0.000400	0.00025	0.00025	0.00050	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Zinc	mg/L	20	0.00	0.00	0.001	0.001				0.001	0.001			0.001				0.001	0.001		

HS1A (from Apr 2020) Hokio Stream Upstream

Determinand		ANZECC AE (95%)	Median	Maximum	Annual Median	Jun-22	May-22	Apr-22	Mar-22	Feb-22	Jan-22	Dec-21	Nov-21	Oct-21	Sep-21	Aug-21	Jul-21	Apr-21	Jan-21	Oct-20	Jul-20	Apr-20
pH		-	7.7	9.0	7.5	7.4	7.5	7.7	9.0	7.8	7.3	7.0	7.8	7.40			7.4	8.0	8.1	7.8	7.6	7.8
Suspended Solids	mg/l	-	23.0	160.0	14.5	6	11	11	27	9	29	46	<6	18.00				46	160	18	23	23
Phenol	mg/L	0.32	0.0	0.0	0.0			0.025	0.025	0.025	0.025	0.025	0.025	0.025				0.025	0.025	0.025	0.025	0.025
VFA	mg/L	-	2.5	2.5	2.5			2.5	2.5	2.5	2.5	2.5	2.5	2.50				2.5	<5	2.5	2.5	2.5
TOC	mg/L	-	7.7	14.4	7.1	6.1	7.2	6.8	8.1	6.7	8.3	10.8	7.1	5.30				9.6	14.4	8.3	7.2	8.1
Alkalinity	mg CaCO3/L	-	51.0	65.0	52.0	43	55	65	44	50	55	52	63	47.00				59	44	44	44	61
Conductivity	mS/m	-	22.3	26.2	21.7	21.5	23.9	25.2	21.3	21.8	22.6	19.9	24.1	21.40			20.6	23.0	20.3	22.3	23.4	26.2
COD	mg/L	-	31.0	72.0	31.0	34	31	27	26	33	34	72	31	17.00			18	51	49	35	27	24
BOD (scBOD frm Apr'20)	mg/L	2	3.0	3.0	3.0	3.00	3	3	3.0	3	3.0	3	3	3.00			3.0	3.0	1.5	0.5	1	0.5
Faecal C (Ecoli frm Apr'20)	col/100ml	-	195.0	1900.0	180.0	100		190	68	1700	200	1700	35	170.00			180	310	110	600	1900	320
Chloride	mg/L	-	22.4	26.7	22.2	22.4	23.6	25.0	22.0	26.7	20.0	16.8	23.6	20.40			20.6	23.3	19.2	21.6	25.3	26.6
Nitrate-N	mg/L	0.16	0.6	2.3	0.7	2.29	0.78	0.080	0.200	0.150	0.810	0.560	0.340	1.28			1.25	0.01	0.020	0.770	0.660	0.04
Sulphate	mg/L	-	18.2	20.6	18.3	18.5	16.8	16.00	20.0	18.3	16.3	14.4	19.7	20.60				9.8	14.4	19.4	20.0	18.1
Ammonia-N	mg/L	2.1	0.1	0.3	0.1	0.04	0.25	0.040	0.050	0.050	0.140	0.050	0.110	0.07			0.090	0.005	<0.01	0.020	0.090	0.03
Hardness	mg CaCO3/L	-	61.0	75.0	60.0	55	63	75	54	59	65	60	65	56.00				61	52	62	61	69
Calcium	mg/L	-	13.2	16.0	13.2	12.2	13.6	16.0	11.8	12.6	14.0	13.2	14.2	12.50				13.1	11.6	13.4	12.8	14.7
Magnesium	mg/L	-	6.9	8.6	6.7	6.05	7.13	8.6	6.02	6.69	7.39	6.60	7.28	6.02				6.90	5.6	7.0	6.9	7.85
Potassium	mg/L	-	3.2	9.6	3.3	3.13	3.88	3.29	2.62	9.59	3.58	4.34	3.00	3.34				2.88	2.92	2.79	3.17	3.27
Sodium	mg/L	-	18.3	22.6	17.4	17.1	19.9	21.9	17.2	17.4	18.0	14.6	21.3	17.10				20.0	17.0	18.7	18.5	22.6
D.R. Phosphorus	mg/L	-	0.0	0.3	0.0500	0.016	0.028	0.062	0.083	0.118	0.011	0.055	0.050	0.0160				0.3080	0.015	0.003	0.005	0.018
Aluminium	mg/L	0.055	0.0	0.0	0.0220	0.019	0.017	0.012	0.029	0.036	0.035	0.023	0.030	0.021			0.021	0.004	0.013	0.022	0.023	0.011
Arsenic	mg/L	0.024	0.0	0.0	0.0010	0.0005	0.0005	0.001	0.001	0.001	0.001	0.001	0.0010	0.0005				0.0040	0.0010	0.0005	0.0005	0.0005
Boron	mg/L	0.37	0.1	0.1	0.0600	0.05	0.05	0.06	0.06	0.06	0.07	0.06	0.05	0.06			0.05	0.06	0.06	0.06	0.04	0.06
Cadmium	mg/L	0.0002	0.0	0.0	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001				0.0001	<0.0002	0.0001	0.0001	0.0001
Chromium	mg/L	0.001	0.0	0.0	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005				0.0005	<0.001	0.0005	0.0005	0.0005
Copper	mg/L	0.0014	0.0	0.0	0.0013	0.0011	0.00025	0.00080	0.00110	0.00140	0.00130	0.00160	0.00210	0.0018				0.0012	0.00170	0.00160	0.00170	0.0008
Iron	mg/L	-	0.1	0.2	0.1070	0.072	0.068	0.167	0.107	0.157	0.135	0.128	0.075	0.091				0.011	0.058	0.065	0.036	0.019
Lead	mg/L	0.0034	0.0	0.0	0.0003	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025			0.00025	0.00025	<0.0005	0.00025	0.00025	0.00025
Manganese	mg/L	1.9	0.0	0.1	0.0187	0.0162	0.0306	0.0396	0.0097	0.0211	0.0950	0.0018	0.0296	0.00590			0.0112	0.0575	0.0043	0.0109	0.0099	0.0385
Mercury	mg/L	0.0006	0.0	0.0	0.0003	0.00025	0.00025	0.00025	0.00050	0.00025	0.00025	0.00025	0.00025	0.00025			0.00025	0.00025	<0.0005	0.00025	0.00025	0.00025
Nickel	mg/L	0.011	0.0	0.0	0.0003	0.0005	0.00025	0.00025	0.00050	0.00060	0.00025	0.00025	0.00025	0.00025			0.0003	0.00050	<0.0005	0.00025	0.00025	0.00025
Zinc	mg/L	0.008	0.0	0.0	0.0020	0.003	0.001	0.003	0.001	0.006	0.001	0.002	0.003	0.001				0.001	0.002	0.001	0.005	0.001

HS1 Hokio Stream Upstream

Determinand		ANZECC AE (95%)	Median	Maximum	Annual Median	Jun-22	May-22	Apr-22	Mar-22	Feb-22	Jan-22	Dec-21	Nov-21	Oct-21	Sep-21	Aug-21	Jul-21	Apr-21	Jan-21	Oct-20	Jul-20	Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18
pH		-	7.7	9.1	7.6000	7.6	7.5	7.7	8.9	7.6	7.3	7.2	7.7	7.40				8.0	8.8	7.8	7.6	7.7	7.8	8.1	7.9	8.2	9.1	7.7	7.4
Suspended Solids	mg/l	-	13.5	70.0	11.0000	6	11	11	16	8	16	3	7	11.00				42	57	18	21	39		36		70	3		8
Phenol	mg/L	0.32	0.0	0.0	0.0250			0.025	0.025	0.025	0.025	0.025	0.025	0.025				0.025		0.025	0.025	0.025		0.025		0.025	0.005		
VFA	mg/L	-	2.5	60.0	2.5000			2.5	2.5	2.5	2.5	2.5	2.5	2.50				2.5		2.5	2.5	2.5		60		6	2.5		6
TOC	mg/L	-	7.3	12.6	6.8000	5.9	7.2	6.6	7.3	6.3	8.4	11.3	6.8	5.60				9.6	12.6	8.0	7.1	7.9		6.9		9.7	7.6		5.4
Alkalinity	mg CaCO3/L	-	52.0	77.0	55.0000	45	55	65	45	49	55	57	63	47.00				60	48	44	44	61		49		77	57		46
Conductivity	mS/m	-	23.3	26.4	21.8000	21.5	24	25.6	21.6	21.6	22.7	21.8	24.5	21.60				23.3	20.2	22.5	23.8	26.4	24.9	23.3	22.6	26.4	23.4	24.5	25.6
COD	mg/L	-	34.0	100.0	34.0000	33	39	29	34	36	34	56	20	18.00				61	83	34	24	28	51	36	27	77	33	100	21
BOD (scBOD frm Apr'20)	mg/L	2	3.0	11.0	3.0000	3.00	3.0	3.0	3.0	3.00	3	3	3	3.00				3.0	11.0	0.5	1	0.5		3		7	2		1.5
Faecal C (Ecoli frm Apr'20)	col/100ml	-	350.0	3900.0	355.0000	100		900	480	580	3900	49	230	92.00				350	16	410	1500	830	810	190	210	550	56		16
Chloride	mg/L	-	22.8	27.4	21.5000	21.7	24.5	24.6	21.1	21.4	20.6	21.5	22.9	20.80				23.5	21.2	22.3	24.7	26.6	24.7	22.7	22.1	27.4	22.8	22.9	25.9
Nitrate-N	mg/L	0.16	0.5	2.2	0.4800	2.22	0.81	0.070	0.160	0.140	0.850	0.480	0.330	1.28				0.005	0.010	0.800	0.630	0.04	0.30	1.43	1.95	0.005	0.05	1.32	1.52
Sulphate	mg/L	-	17.9	23.8	17.9000	17.9	17.4	17.00	18.9	18.2	16.3	15.4	19.0	20.60				9.8	15.9	20.0	19.9	17.9		21.6		8.5	17.7		23.8
Ammonia-N	mg/L	2.1	0.1	0.4	0.1000	0.05	0.28	0.080	0.060	0.100	0.100	0.350	0.120	0.08				0.005	0.020	0.040	0.010	0.05	0.12	0.005	0.005	0.005	0.03	0.06	0.14
Hardness	mg CaCO3/L	-	63.0	72.0	62.0000	55	64	70	55	58	67	63	62	56.00				64	54	60	64	71		60		72	63		65
Calcium	mg/L	-	13.6	15.1	13.5000	12.2	13.7	15.0	11.9	12.2	14.3	13.8	13.5	12.50				13.8	11.8	12.9	13.6	15.1		12.9		15.0	13.4		14.6
Magnesium	mg/L	-	7.0	8.3	6.9500	6.06	7.22	7.92	6.07	6.55	7.48	6.98	6.95	6.02				7.19	6.08	6.81	7.31	8.03		6.81		8.30	7.22		6.98
Potassium	mg/L	-	3.3	4.9	3.7000	3.02	3.83	3.70	2.63	3.74	4.06	4.91	2.87	3.46				3.54	3.33	2.89	2.93	3.51		3.32		3.17	1.59		2.74
Sodium	mg/L	-	19.1	24.5	17.4000	17.1	20	20.7	17.4	16.7	18.1	16.6	20.0	17.00				21.5	17.7	18.3	20.7	23.3	18.0	19.9	14.8	24.5	21.2	19.1	21.7
D.R. Phosphorus	mg/L	-	0.0	0.3	0.0480	0.019	0.032	0.072	0.079	0.048	0.008	0.112	0.050	0.0160				0.306	0.0120	0.0025	0.003	0.019		0.0025		0.275	0.163		0.020
Aluminium	mg/L	0.055	0.0	0.1	0.0320	0.032	0.048	0.010	0.017	0.032	0.066	0.039	0.019	0.020				0.006	0.040	0.017	0.014	0.008	0.021	0.027	0.013	0.005	0.008	0.011	0.010
Arsenic	mg/L	0.024	0.0	0.0	0.0005	0.0005	0.0005	0.001	0.001	0.001	0.001	0.001	0.0005	0.000500				0.0040	0.0010	0.0005	0.0005	0.0005		0.0005		0.003	0.002		0.0005
Boron	mg/L	0.37	0.1	0.1	0.0600	0.05	0.05	0.07	0.06	0.06	0.07	0.06	0.05	0.06				0.07	0.06	0.07	0.04	0.07	0.05	0.05	0.05	0.06	0.05	0.05	0.04
Cadmium	mg/L	0.0002	0.0	0.0	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00010				0.0001	0.0001	0.0001	0.0001	0.0001		0.0001		0.0001	0.0001		0.0001
Chromium	mg/L	0.001	0.0	0.0	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005				0.0005	0.0005	0.0005	0.0005	0.0005		0.0005		0.0005	0.0005		0.0005
Copper	mg/L	0.0014	0.0	0.0	0.0011	0.0011	0.00025	0.00070	0.00100	0.00100	0.00120	0.00150	0.00200	0.00150				0.00170	0.00140	0.00170	0.00120	0.0009		0.0012		0.00025	0.0007		0.00025
Iron	mg/L	-	0.1	0.4	0.1200	0.098	0.07	0.138	0.105	0.173	0.357	0.215	0.120	0.096				0.047	0.035	0.041	0.032	0.011	0.05	0.068	0.07	0.107	0.076	0.05	0.058
Lead	mg/L	0.0034	0.0	0.0	0.0003	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025				0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Manganese	mg/L	1.9	0.0	0.1	0.0166	0.0166	0.0343	0.0494	0.0081	0.0161	0.1250	0.0019	0.0227	0.00500				0.0665	0.0040	0.0083	0.0100	0.0339	0.0404	0.0140	0.0182	0.0915	0.0094	0.0259	0.0299
Mercury	mg/L	0.0006	0.0	0.0	0.0003	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025				0.00025	0.00025	0.00025	0.00025	0.00025							
Nickel	mg/L	0.011	0.0	0.0	0.0003	0.0005	0.00025	0.0003	0.00025	0.00025	0.00060	0.00025	0.00025	0.00025				0.00070	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Zinc	mg/L	0.008	0.0	0.0	0.0020	0.003	0.001	0.001	0.001	0.003	0.009	0.006	0.002	0.001				0.002	0.001	0.001	0.001	0.001		0.001		0.001	0.001		0.001

HS2 Hokio Stream Beside Landfill

Determinand		ANZECC AE (95%)	Median	Maximum	Annual Median	Jun-22	May-22	Apr-22	Mar-22	Feb-22	Jan-22	Dec-21	Nov-21	Oct-21	Sep-21	Aug-21	Jul-21	Apr-21	Jan-21	Oct-20	Jul-20	Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18
pH		-	7.7	8.9	7.4000	7.4	7.4	7.7	8.6	7.5	7.2	7.3	7.7	7.30			7.3	7.8	8.2	7.8	7.6	7.7	7.8	7.9	7.7	7.9	8.9	7.5	7.4
Suspended Solids	mg/l	-	22.0	87.0	15.0000	33	9	12	16	10	26	6	25	15.00				49	87	20	29	24		31		66	3		8
Phenol	mg/L	0.32	0.0	0.0	0.0250			0.025	0.025	0.025	0.025	0.025	0.025	0.025				0.025		0.025	0.025	0.025		0.025		0.025	0.005		
VFA	mg/L	-	2.5	30.0	2.5000			2.5	2.5	2.5	2.5	2.5	2.5	2.50				2.5		2.5	2.5	2.5		30		6	2.5		2.5
TOC	mg/L	-	7.3	12.5	6.9000	5.6	7.1	6.5	6.9	6.6	8.2	10.5	6.9	6.90				9.2	12.5	7.9	7.7	7.6		6.7		9.5	7.4		5.5
Alkalinity	mg CaCO3/L	-	53.0	79.0	52.0000	44	56	70	47	50	59	52	65	50.00				60	54	47	45	65		52		79	59		48
Conductivity	mS/m	-	23.9	28.1	22.2500	21.7	24.2	26.0	22.3	21.7	23.7	20.0	24.8	22.20			20.8	24.0	21.6	23.0	23.9	27.9	25.7	24.5	22.8	28.1	23.9	26.1	26.1
COD	mg/L	-	31.0	92.0	30.0000	26	51	29	39	42	26	42	27	31.00			16	57	77	31	22	21	48	29	31	86	29	92	24
BOD (scBOD frm Apr'20)	mg/L	2	3.0	10.0	3.0000	3.00	3	3	3	3	3	3	3	3.00			3.0	3.0	10.0	0.5	1	0.5		3		8	2		2
Faecal C (Ecoli frm Apr'20)	col/100ml	-	210.0	910.0	210.0000	50		910	270	410	140	60	730	180.00			210	330	190	210	400	790	650	190	160	450	150		120
Chloride	mg/L	-	23.7	28.8	22.2000	22.5	23.9	25.2	21.9	21.8	20.4	17.5	23.7	22.20			22.2	25.0	22.6	22.4	25.2	28.0	25.2	24.0	22.3	28.8	23.6	25.3	26.3
Nitrate-N	mg/L	0.16	0.6	2.3	0.6150	2.27	0.79	0.090	0.190	0.170	0.800	0.440	0.360	1.25			1.27	0.01	0.110	0.780	0.710	0.08	0.30	1.47	2.02	0.005	0.08	1.32	1.53
Sulphate	mg/L	-	17.9	23.8	17.9000	18.4	16.8	15.7	18.9	17.9	16.2	14.3	18.9	20.00				10.0	15.3	19.4	19.2	17.3		21.4		8.4	17.8		23.8
Ammonia-N	mg/L	2.1	0.1	0.3	0.1250	0.07	0.26	0.110	0.100	0.140	0.210	0.040	0.140	0.11			0.17	0.03	0.010	0.080	0.090	0.14	0.16	0.10	0.02	0.01	0.04	0.14	0.14
Hardness	mg CaCO3/L	-	63.0	75.0	63.0000	57	65	74	58	60	67	63	64	58.00				63	58	60	61	74		63		75	68		65
Calcium	mg/L	-	13.7	15.9	13.7000	12.5	13.9	15.9	12.7	12.8	14.3	13.7	13.9	12.80				13.6	12.6	12.9	13.1	15.9		13.5		15.8	14.5		14.7
Magnesium	mg/L	-	7.0	8.6	6.9100	6.21	7.28	8.27	6.38	6.83	7.64	6.91	7.08	6.24				7.02	6.38	6.77	6.96	8.35		7.04		8.58	7.57		6.94
Potassium	mg/L	-	3.4	4.5	3.4700	3.15	3.91	3.45	2.76	3.47	3.76	4.45	3.10	3.90				2.92	3.90	2.96	3.09	3.62		3.32		3.40	1.65		2.8
Sodium	mg/L	-	19.8	25.4	17.9000	17.5	20.3	21.0	17.8	17.5	18.4	15.3	21.1	17.90				20.1	19.2	18.4	19.8	24.3	17.4	20.1	15.0	25.4	21.8	20.6	21.5
D.R. Phosphorus	mg/L	-	0.0	0.3	0.0480	0.024	0.03	0.069	0.085	0.048	0.023	0.065	0.049	0.0210				0.304	0.013	0.003	0.006	0.020		0.0025		0.266	0.171		0.022
Aluminium	mg/L	0.055	0.0	0.0	0.0205	0.033	0.021	0.011	0.016	0.029	0.020	0.023	0.014	0.01			0.024	0.003	0.022	0.020	0.015	0.007	0.023	0.027	0.013	0.003	0.008	0.012	0.009
Arsenic	mg/L	0.024	0.0	0.0	0.0005	0.0005	0.0005	0.001	0.001	0.001	0.001	0.001	0.0005	0.0005				0.0040	0.0010	0.0005	0.0005	0.0005		0.0005		0.003	0.002		0.0005
Boron	mg/L	0.37	0.1	0.1	0.0600	0.05	0.05	0.07	0.06	0.06	0.07	0.06	0.05	0.07			0.05	0.06	0.06	0.06	0.04	0.07	0.05	0.05	0.05	0.06	0.05	0.06	0.04
Cadmium	mg/L	0.0002	0.0	0.0	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001				0.0001	0.0001	0.0001	0.0001	0.0001		0.0001		0.0001	0.0001		0.0001
Chromium	mg/L	0.001	0.0	0.0	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005				0.0005	0.0005	0.0005	0.0005	0.0005		0.004		0.0005	0.0005		0.0005
Copper	mg/L	0.0014	0.0	0.0	0.0010	0.0009	0.0005	0.00080	0.00080	0.00100	0.00100	0.00170	0.00280	0.0015				0.0015	0.00160	0.00150	0.00120	0.0016		0.0014		0.00025	0.0007		0.00025
Iron	mg/L	-	0.1	0.2	0.1510	0.105	0.075	0.169	0.095	0.206	0.161	0.174	0.071	0.151				0.011	0.056	0.043	0.049	0.010	0.05	0.077	0.07	0.051	0.093	0.06	0.062
Lead	mg/L	0.0034	0.0	0.0	0.0003	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025			0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Manganese	mg/L	1.9	0.0	0.1	0.0156	0.0152	0.0382	0.0360	0.0103	0.0160	0.1170	0.0068	0.0315	0.0116			0.0083	0.0600	0.0036	0.0139	0.0150	0.0420	0.0424	0.0252	0.0199	0.105	0.0110	0.0466	0.0357
Mercury	mg/L	0.0006	0.0	0.0	0.0003	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025			0.00025	0.00025	0.00025	0.00025	0.00025	0.00025							
Nickel	mg/L	0.011	0.0	0.0	0.0003	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00060	0.00060	0.00025			0.00025	0.00050	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Zinc	mg/L	0.008	0.0	0.0	0.0020	0.001	0.003	0.001	0.001	0.002	0.001	0.007	0.011	0.003				0.001	0.002	0.001	0.001	0.001		0.001		0.001	0.001		0.001

HS3 Hokio Stream Downstream

Determinand		ANZECC AE (95%)	Median	Maximum	Annual Median	Jun-22	May-22	Apr-22	Mar-22	Feb-22	Jan-22	Dec-21	Nov-21	Oct-21	Sep-21	Aug-21	Jul-21	Apr-21	Jan-21	Oct-20	Jul-20	Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18
pH		-	7.7	8.8	7.5500	7.6	7.6	7.7	8.5	7.5	7.3	7.2	7.9	7.400			7.4	7.6	8.2	7.7	7.7	7.6	7.7	7.8	7.7	7.9	8.8	7.4	7.4
Suspended Solids	mg/l	-	17.0	67.0	13.0000	6	8	12	24	13	19	12	15	13.000				40	49	19	20	21		34		67	3		11
Phenol	mg/L	0.32	0.0	0.0	0.0250			0.025	0.025	0.025	0.025	0.025	0.025	0.025				0.025		0.025	0.025	0.025		0.025		0.025	0.005		
VFA	mg/L	-	2.5	30.0	2.5000			2.5	2.5	2.5	2.5	2.5	2.5	2.500				2.5		2.5	2.5	2.5		30		9	2.5		6
TOC	mg/L	-	7.3	10.7	7.2000	5.7	7.2	6.5	7.2	6.0	8.4	10.7	7.3	5.600				9.0	10.4	8.0	6.7	7.8		6.8		9.0	7.4		5.6
Alkalinity	mg CaCO3/L	-	52.0	78.0	53.0000	45	56	68	50	51	58	53	68	50.000				59	47	46	48	65		51		78	59		49
Conductivity	mS/m	-	24.2	27.8	22.4000	22	24.3	26.4	22.6	22.2	23.2	20.1	25.3	22.000			20.9	24.3	20.7	23.0	24.7	27.8	25.9	24.5	23.1	27.8	24.1	26.2	26.6
COD	mg/L	-	37.5	107.0	39.0000	31	38	40	37	40	57	63	51	26.000			8	69	69	32	25	23	53	27	31	107	31	82	24
BOD (scBOD frm Apr'20)	mg/L	2	3.0	9.0	3.0000	3.0	3	3	3.0	3.000	3	3	3	3.000			3.0	3.0	7.0	0.5	1	0.50		3		9	1		2
Faecal C (Ecoli frm Apr'20)	col/100ml	-	195.0	580.0	150.0000	200		150	280	410	100	130	58	68.000			190	330	120	310	350	410	580	200	190	310	140		65
Chloride	mg/L	-	23.7	29.1	22.0000	22.9	24.1	25.5	22.4	21.2	21.5	17.5	24.4	21.400			21.6	26.8	21.5	22.5	25.6	28.3	25.5	23.7	22.4	29.1	23.7	25.5	27.7
Nitrate-N	mg/L	0.16	0.5	2.3	0.5800	2.27	0.8	0.110	0.200	0.170	0.800	0.340	0.360	1.270			1.27	0.01	0.070	0.790	0.630	0.09	0.31	1.46	2.09	0.005	0.09	1.34	1.54
Sulphate	mg/L	-	18.0	23.6	18.1000	18.2	16.8	15.6	18.9	18.1	16.6	13.6	18.7	20.500				10.3	15.5	19.5	19.3	17.5		21.2		8.5	17.9		23.6
Ammonia-N	mg/L	2.1	0.1	0.3	0.1300	0.09	0.27	0.140	0.100	0.190	0.250	0.020	0.150	0.120			0.12	0.07	0.010	0.060	0.110	0.09	0.18	0.04	0.005	0.005	0.05	0.13	0.15
Hardness	mg CaCO3/L	-	64.0	76.0	59.0000	57	70	76	59	59	67	56	68	57.000				59	55	62	65	73		63		72	68		68
Calcium	mg/L	-	13.6	16.4	13.1000	12.4	15	16.4	13.1	12.7	14.3	12.3	15.0	12.700				12.8	11.9	13.5	13.7	15.8		13.5		15.4	14.8		15.3
Magnesium	mg/L	-	7.2	8.4	6.7300	6.24	7.9	8.44	6.51	6.73	7.58	6.15	7.49	6.060				6.58	6.02	6.99	7.35	8.20		7.14		8.23	7.59		7.29
Potassium	mg/L	-	3.5	4.4	3.7500	3.31	4.27	3.76	2.78	3.24	3.88	4.38	3.40	3.750				3.17	3.56	3.09	3.15	3.64		3.62		3.53	1.70		2.84
Sodium	mg/L	-	19.2	24.8	18.6000	17.3	21.8	21.6	18.6	17.3	18.7	13.7	22.5	17.300				19.2	18.0	19.1	20.8	23.8	18.5	20.4	15.6	24.8	21.6	20.9	22.6
D.R. Phosphorus	mg/L	-	0.0	0.3	0.0490	0.019	0.03	0.076	0.088	0.051	0.034	0.052	0.049	0.0230				0.301	0.012	0.003	0.005	0.024		0.0050		0.268	0.176		0.024
Aluminium	mg/L	0.055	0.0	0.0	0.0235	0.029	0.018	0.010	0.025	0.029	0.024	0.022	0.023	0.016			0.027	0.002	0.029	0.022	0.014	0.005	0.014	0.034	0.014	0.012	0.007	0.013	0.010
Arsenic	mg/L	0.024	0.0	0.0	0.0005	0	0.0005	0.001	0.001	0.001	0.001	0.001	0.0005	0.0005				0.0040	0.0010	0.0005	0.0005	0.0005		0.0005		0.003	0.002		0.0005
Boron	mg/L	0.37	0.1	0.1	0.0600	0.05	0.06	0.07	0.06	0.06	0.07	0.06	0.06	0.060			0.05	0.06	0.06	0.06	0.04	0.07	0.05	0.05	0.05	0.06	0.05	0.05	0.04
Cadmium	mg/L	0.0002	0.0	0.0	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001				0.0001	0.0001	0.0001	0.0001	0.0001		0.0001		0.0001	0.0001		0.0001
Chromium	mg/L	0.001	0.0	0.0	0.0005	0	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.001				0.0005	0.0005	0.0010	0.0005	0.0005		0.0005		0.0005	0.0005		0.0005
Copper	mg/L	0.0014	0.0	0.0	0.0010	0.0013	0.00025	0.00080	0.00060	0.00100	0.00090	0.00160	0.00180	0.0016				0.0010	0.00140	0.00150	0.00120	0.0030		0.0017		0.00025	0.0007		0.00025
Iron	mg/L	-	0.1	0.2	0.1140	0.108	0.078	0.161	0.090	0.211	0.173	0.192	0.110	0.114				0.013	0.060	0.069	0.046	0.021	0.04	0.106	0.09	0.044	0.101	0.06	0.081
Lead	mg/L	0.0034	0.0	0.0	0.0003	0.0003	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025			0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Manganese	mg/L	1.9	0.0	0.1	0.0222	0.0209	0.0349	0.0381	0.0141	0.0167	0.0456	0.0020	0.0380	0.0235			0.0123	0.0610	0.0032	0.0176	0.0190	0.0406	0.0475	0.0279	0.0239	0.0921	0.0125	0.0494	0.0375
Mercury	mg/L	0.0006	0.0	0.0	0.0003	0.0003	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025			0.00025	0.00025	0.00025	0.00025	0.00025	0.00025							
Nickel	mg/L	0.011	0.0	0.0	0.0003	0.0007	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025			0.0003	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.0005	0.00025	0.00025	0.00025	0.00025
Zinc	mg/L	0.008	0.0	0.0	0.0020	0.004	0.001	0.001	0.001	0.003	0.001	0.010	0.002	0.002				0.001	0.001	0.001	0.003	0.001		0.001		0.001	0.001		0.001
Horizons One Plan Standard	NH4													0.400	0.400	0.400	0.400	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
ANZECC Stock Drinking Water G	Feacs													100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Leachate Pond
(sampled at pump station as of 2017)

Determinand		Typical Leachate*	Median	Maximum	Annual Median	Apr-22	Mar-22	Feb-22	Jan-22	Dec-21	Nov-21	Oct-21	Sep-21	Aug-21	Jul-21	Apr-21	Jan-21	Oct-20	Jul-20	Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18
pH		5.9 - 8.5	7.7000	8.0000	7.7000	7.7	7.9	7.7	7.8	7.7	7.6	7.80			7.6	8	8	8	8	8	8	8	8	8	8	8	7
Suspended Solids	mg/l		82.0000	194.0000	107.0000	171	107	67	61	194	114	30.00				48.000	57.00	92.00	150.00	35.00		40.000		136.000	72.00		106.00
Phenol	mg/L		0.0250	0.2500	0.0250	0.080	0.060	0.025	0.03	0.025	0.025	0.220				0.0		0	0	0.3		0		0	0		
VFA	mg/L		25.0000	140.0000	25.0000	30	58	17	21	25.0	25	25.00				140		13	36	3		12		45	15		6
TOC	mg/L	17.2 - 822	664.5000	820.0000	705.0000	805	742	604	729	624	705	602.00				741	582	596	592	804		530		820	753		385
Alkalinity	mg CaCO3/L	264 - 6820	6365.0000	7570.0000	6630.0000	7570	6990	6630	6740	6180	6250	5280.00				6740	5680	5870	5490	6750		4950		7260.0	6480		3270
Conductivity	mS/m	264 - 27900	1355.0000	1700.0000	1485.0000	1700	1610	1540	1530	1340.0	1440	1260.00			930	1620	1330	1360	135	1610	1430	1210	1350	2	1530	1290	860
COD	mg/L	84 - 5090	2755.0000	6320.0000	4290.0000	5930	5150	3570	6320	2510	5010	2720.00			1730	4650	3880	2650	2470	2330	2220	2270	3690	3680	2790	2220	2030
BOD (scBOD frm Apr'20)	mg/L	Dec-67	110.0000	172.0000	100.0000	139	105	93	124	112	82	95.00			70	149	172	67	73	98		146		146	137		110
Faecal C (Ecoli frm Apr'20)	col/100ml		500.0000	320000.0000	450.0000	50	50	4000	400	2700	2	640.00			500	500	45500	24	65000	24	12	96	2000	1000	100		320000
Chloride	mg/L	100 – 5000**	1040.0000	1310.0000	1090.0000	1310	1220	1120	1140	1020	1060	962.00			876	1240.00	1200.00	973.00	1010.00	1210.00	1010.00	857.00	1010.00	1290.00	1140.00	834.00	654.00
Nitrate-N	mg/L		0.5000	17.1000	0.5000	0.50	0.50	0.50	0.50	0.50	0.50	0.50			17.10	0	1	1	12	0.3	0.5	0.1	1	0	0	0	2
Sulphate	mg/L	1 - 780	54.6500	216.0000	16.3000	36.3	18.3	13.2	11.9	13	16.3	69.50				35	55	76	216	55		86		137	88		193
Ammonia-N	mg/L	3.4 -1440	1250.0000	1640.0000	1360.0000	1640	1530	1410	1540	1230	1310	1070.00			720	1500	1120	1130	1140	1450	1270	1010	1100	1620	1320	1140	616
Hardness	mg CaCO3/L		509.0000	620.0000	496.0000	530	521	483	530	479	496	440.00				480	436	497	577	522		414.0		607	578		620
Calcium	mg/L		107.0000	157.0000	106.0000	112	110.0	100	106.0	105.0	109.0	99.60				101.0	93.7	108.0	131.0	106.0		85.3		119.0	113.0		157.0
Magnesium	mg/L		56.0500	74.7000	56.7000	60.7	59.6	56.7	64.1	52.3	54.2	46.50				55	49	55	60.60	62		49		75	72		55
Potassium	mg/L		657.5000	803.0000	676.0000	787	718	667	725	585	676	556.00				803	645	642	625	648		555		750	698		463
Sodium	mg/L		932.0000	1140.0000	988.0000	1120	1030	967	988	806	1010	818.00				1010.0	811.00	847.00	625.00	993.0	815.00	738.00	932.0	1140.0	1020.0	799.00	562.00
D.R. Phosphorus	mg/L		13.0500	17.9000	14.8000	17.9	16.3	14.8	16.0	13.10	13.3	12.30				14.300	15.100	8.740	8.730	13.000		9.040		11.900	11.700		4.570
Aluminium	mg/L		0.5760	0.8540	0.6285	0.854	0.835	0.576	0.741	0.512	0.620	0.637			0.327	0.795	0.576	0.541	0.402	0.586	0.506	0.307	0.186	0.683	0.780	0.461	0.276
Arsenic	mg/L	45 - 2584	0.3415	0.5040	0.3240	0.371	0.416	0.324	0.359	0.220	0.277	0.318				0.36	0.31	0.25	0.31	0.39		0.31		0.40	0.50		0.37
Boron	mg/L		6.0100	8.0300	6.2350	6.87	7.29	5.86	6.87	5.51	5.92	6.55			4.57	6.8900	6.0500	6.6400	5.5700	5.6900	5.9700	5.3400	7.0500	8.0300	6.6200	5.5000	5.7400
Cadmium	mg/L		0.0002	0.0100	0.0010	0.0010	0.0001	0.0010	0.0010	0.0001	0.0010	0.0001				0.010	0.000	0.000	0.0001	0.001		0.000		0.000	0.001		0.000
Chromium	mg/L	30 – 1600**	0.6380	0.9300	0.7390	0.838	0.866	0.648	0.739	0.576	0.930	0.529				0.6930	0.5980	0.5760	0.5060	0.7090		0.2080		0.6280	0.666		0.3010
Copper	mg/L	0.005 – 50.4	0.0129	0.0290	0.0100	0.0100	0.0233	0.0080	0.0066	0.0082	0.0271	0.0174				0.01	0.01	0.01	0.03	0.01		0.00		0.01	0.02		0.02
Iron	mg/L		4.7300	6.2600	4.9800	4.97	6.26	4.88	5.08	4.98	5.09	4.45				4.6400	4.2100	4.7300	4.41000	5.2500	4.4200	2.5300	4.7000	6.1800	6.180	4.1000	2.6600
Lead	mg/L	1.6 - 220	0.0025	0.0250	0.0025	0.0025	0.0023	0.0025	0.0025	0.0043	0.0025	0.0033			0.0027	0.03	0.00	0.00	0.0028	0.00	0.00	0.001	0.00	0.00	0.01	0.002	0.00
Manganese	mg/L		1.1400	1.4700	1.2600	1.30	1.30	1.22	1.34	1.10	1.18	1.33			1.08	1.28000	1.03000	1.09000	1.13000	1.0400	1.15	0.852	1.22	1.11	1.47	0.893	1.04
Mercury	mg/L		0.0003	0.0250	0.0014	0.00250	0.00025	0.00250	0.00250	0.00025	0.00250	0.00025			0.00025	0.025	0.000	0.000	0.00025	0.003							
Nickel	mg/L		0.1100	0.1410	0.1090	0.141	0.112	0.106	0.124	0.1030	0.122	0.100			0.0743	0.137	0.109	0.107	0.111	0.125	0.107	0.073	0.123	0.126	0.140	0.095	0.082
Zinc	mg/L	0.001 – 0.42	0.0705	0.1720	0.0620	0.078	0.038	0.049	0.045	0.080	0.062	0.073				0.1	0.057	0.076	0.119	0.068		0.039		0.049	0.148		0.172

* for Class 1-type landfills, Table 5-5, p79, Technical Guidelines for Disposal to Land,, WasteMINZ April 2016.

G1S

Determinand		ANZECC STOCK	Median	Maximum	Annual Median	Apr-22	Jan-22	Oct-21	Jul-21	Apr-21	Jan-21	Oct-20	Jul-20	Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18
Water level	mBGL		14.3050	14.5300	14.1500	13.98	14.32	13.9500	14.47	14.29	14.35	14.38	14.30	14.52	14.21	14.11	14.32	14.530	14.31	14.13	14.25
pH		6 to 9	6.6000	7.0000	6.8000	6.9	6.7	7.0000	6.6	6.7	6.9	6.6	6.6	6.9	6.6	6.5	6.3	6.4	6.3	6.2	6.1
Suspended Solids	mg/l		22.0000	95.0000	95.0000	95				49.0	41			3				3	3		
Phenol	mg/L		0.0250	0.0250	0.0250	0.025				0.025				0.025				N/a	0.005		
VFA	mg/L		2.5000	2.5000	2.5000	2.5				2.5				2.5				N/a	3		
TOC	mg/L		32.0000	45.7000	31.6000	31.6				32.4	45.7			38.4				11.0	10.2		
Alkalinity	mg CaCO3/L		63.5000	92.0000	92.0000	92				69	91			58				40	24		
Conductivity	mS/m		65.8000	181.0000	53.3500	53.6	46.2	53.2000	53.5	39.6	37.2	44	66	66	82	122	126.0	136.0	181.0	129.0	167.0
COD	mg/L		95.0000	125.0000	98.0000	97	104	99.0000	63	91	125	105	74	99	107	43	58	111.0	93	61	44
BOD (scBOD frm Apr'20)	mg/L		3.0000	5.9000	3.0000	3.0	3.0	3.0000	5.9	3.0	3.0	0.5	0.5	0.5				2	3		
Faecal C (Ecoli frm Apr'20)	col/100ml	100	2.0000	300.0000	39.0000	28	300	50	4	2	2	2	2	16	2	2	2	2	2		
Chloride	mg/L		134.5000	513.0000	104.0000	102.0	72	106.0000	119	66	46	59	139	130	156	276	330	362	513.0	300.0	420.0
Nitrate-N	mg/L	90.3	0.0500	1.2700	0.0125	0.01	0.005	0.0300	0.02	0.03	0.01	0.05	0.07	0.06	0.05	0.05	0.25	0.30	1.27	0.26	0.36
Sulphate	mg/L	1000	20.0400	1920.0000	6.2800	6.28				6.3	3.3			33.8				60.9	1920.0		
Ammonia-N	mg/L		0.0500	0.0900	0.0550	0.06	0.06	0.0500	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.05	0.06	0.08	0.05	0.05	0.09
Hardness	mg CaCO3/L		58.5000	373.0000	58.0000	58				41	39			59				214	373		
Calcium	mg/L	1000	11.0500	73.9000	11.0000	11.00				7.6	7.6			11.1				43.0	73.9		
Magnesium	mg/L		7.5650	45.7000	7.5200	7.52				5.34	4.9			7.6				25.9	45.7		
Potassium	mg/L		5.7100	13.2000	5.4900	5.49				3.93	4.0			5.9				10.10	13.20		
Sodium	mg/L		97.6000	170.0000	82.8000	92.2	74.6	85.1000	81	69.6	67	70	101	94	117	170	151	144	156.0	136.0	136.0
D.R. Phosphorus	mg/L		0.0570	0.0780	0.0780	0.078				0.071	0.072			0.038				0.022	0.043		
Aluminium	mg/L	5	0.0950	0.1940	0.1215	0.122	0.173	0.1210	0.077	0.138	0.194	0.157	0.075	0.137	0.113	0.021	0.013	0.014	0.013	0.018	0.005
Arsenic	mg/L	0.5	0.0020	0.0020	0.0020	0.002				0.002	0.002			0.002				0.0010	0.0010		
Boron	mg/L	5	0.0150	0.0200	0.0150	0.015	0.015	0.0150	0.02	0.015	0.015	0.015	0.020	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015
Cadmium	mg/L	0.01	0.0001	0.0002	0.0001	0.0001				0.0001	0.0001			0.0001				0.0001	0.0002		
Chromium	mg/L	1	0.0015	0.0030	0.0020	0.002				0.002	0.0030			0.0010				0.0005	0.0005		
Copper	mg/L	0.4	0.0074	0.0113	0.0068	0.0068				0.0080	0.0113			0.0086				0.0025	0.0018		
Iron	mg/L		4.2650	19.3000	3.4250	3.63	4.24	3.2200	2.68	2.89	3.67	3.34	4.29	3.5	4.6	7.4	8.3	14.8	19.300	9.41	11.30
Lead	mg/L	0.1	0.0003	0.0014	0.0010	0.00050	0.00140	0.00140	0.00040	0.00025	0.0003	0.00025	0.00025	0.00025	0.00060	0.00025	0.00025	0.00025	0.00025	0.0003	0.00025
Manganese	mg/L		0.1070	0.4150	0.0704	0.0671	0.0744	0.0737	0.055	0.0461	0.061	0.176	0.078	0.064	0.136	0.176	0.180	0.269	0.415	0.2120	0.2860
Mercury	mg/L		0.0003	0.0004	0.0003	0.00025	0.00025	0.00025	0.00040	0.00025	0.000	0.000	0.000	0.000							
Nickel	mg/L	1	0.0013	0.0020	0.0014	0.0018	0.0015	0.0013	0.0007	0.0016	0.0020	0.0016	0.0012	0.0016	0.0020	0.0007	0.0007	0.0010	0.0012	0.0008	0.0009
Zinc	mg/L	20	0.0025	0.0080	0.0080	0.008				0.001	0.002			0.003				0.002	0.004		

G1D

Determinand		NZDW MAV	Median	Maximum	Annual Median	Apr-22	Jan-22	Oct-21	Jul-21	Apr-21	Jan-21	Oct-20	Jul-20	Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18
Water level	mBGL		14.78	15.85	14.7	14.51	14.89	14.4700	15.00	14.81	14.5	14.810	14.75	15.05	14.80	14.64	14.65	15.85	14.89	14.68	14.38
pH		7 to 8.5*	7.20	7.70	7.3	7.0	7.4	7.4000	7.2	7.1	7.2	7.0	7.2	7.7	7.2	7.2	7.0	7.6	7.4	7.0	7.1
Suspended Solids	mg/l		2.75	22.00	2.5	3				2.0	22			3				3	3		
Phenol	mg/L		0.03	0.03	0.025	0.025				0.025				0.025				N/a	0.005		
VFA	mg/L		2.50	6.00	2.5	2.5				2.5				3				N/a	6.0		
TOC	mg/L		2.00	4.60	4.6	4.6				1.9	1.8			2.0				2.0	2.1		
Alkalinity	mg CaCO3/L		59.50	64.00	64	64				58	56			59				63	60		
Conductivity	mS/m		28.15	30.80	27.9	28.8	27.6	27.5000	28.2	28.1	27.6	28.1	27.9	28.3	28.0	28.0	28.6	28.6	29.1	29.6	30.8
COD	mg/L		7.50	63.00	12.75	30.0000	8	7.5000	18.0	7.5	19.0	7.5	8	8	7.5	8	63.0	17.0	7.5	28.0	7.5
BOD (scBOD frm Apr'20)	mg/L		0.50	3.00	1	3.0	0.5	1.5000	0.5	3.0	0.5	0.5	0.5	0.5				1.5	3.0		
Faecal C (Ecoli frm Apr'20)	col/100ml	NIL	2.00	110.00	29.5	110	9	50	2	2	2	2	2	2	2	2	2	2	2		
Chloride	mg/L	250*	31.80	36.50	31.6	34.0	30.9	31.0000	32	31.5	30.7	31.7	33.0	31.5	31.5	31.9	31.5	32.7	33.1	34.6	36.5
Nitrate-N	mg/L	11.3	0.01	0.29	0.005	0.290	0.005	0.0050	0.005	0.005	0.005	0.005	0.005	0.005	0.01	0.005	0.005	0.005	0.11	0.005	0.005
Sulphate	mg/L	250*	19.85	1790.00	19.6	19.6				19.5	18.2			20.1				20.2	1790.0		
Ammonia-N	mg/L	1.17	0.10	0.11	0.09	0.11	0.1	0.0900	0.1	0.09	0.10	0.10	0.10	0.10	0.09	0.10	0.09	0.10	0.07	0.10	0.11
Hardness	mg CaCO3/L	200*	52.00	57.00	57	57				56	51			50				49	53		
Calcium	mg/L		8.21	8.98	8.98	8.98				8.35	8.05			7.83				8.06	8.72		
Magnesium	mg/L		7.54	8.50	8.38	8.4				8.50	7.45			7.51				6.97	7.57		
Potassium	mg/L		6.05	7.82	7.82	7.82				6.07	6.02			6.27				5.58	5.77		
Sodium	mg/L	200*	32.00	37.70	30.2	30				31.0	30.7			32.0	32.0	37.7	19.0	31.7	34.1	34.4	33.5
D.R. Phosphorus	mg/L		0.05	0.31	0.206	0.206				0.034	0.047			0.030				0.047	0.314		
Aluminium	mg/L	0.1*	0.00	0.02	0.0025	0.0040	0.001	0.0010	0.009	0.001	0.006	0.001	0.001	0.002	0.001	0.001	0.001	0.004	0.020	0.003	0.001
Arsenic	mg/L	0.01	0.00	0.00	0.002	0.002				0.002	0.003			0.003				0.003	0.003		
Boron	mg/L	1.4	0.04	0.05	0.04	0.04	0.04	0.0400	0.05	0.04	0.04	0.040	0.04	0.04	0.05	0.015	0.050	0.04	0.04	0.02	0.015
Cadmium	mg/L	0.004	0.00	0.00	0.0001	0.0001				0.0001	0.0001			0.0001				0.0001	0.0002		
Chromium	mg/L	0.05	0.00	0.00	0.0005	0.0005				0.0005	0.0005			0.0005				0.0005	0.0005		
Copper	mg/L	2	0.00	0.00	0.0031	0.00310				0.00025	0.00080			0.00025				0.00025	0.00060		
Iron	mg/L	0.2*	0.65	2.43	1.21	1.210				0.68	0.53			0.440	0.70	0.19	1.49	0.65	2.430	0.22	0.190
Lead	mg/L	0.01	0.00	0.00	0.0006	0.00060	0.00060	0.00025	0.00210	0.00050	0.00090	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.0003	0.0003	0.00025
Manganese	mg/L	0.4	0.06	0.07	0.0616	0.0637	0.0604	0.0628	0.060	0.0641	0.0627	0.0616	0.0670	0.0703	0.0645	0.0580	0.0650	0.0616	0.0654	0.0688	0.0589
Mercury	mg/L		0.00	0.00	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.0003	0.0003	0.0003	0.0003							
Nickel	mg/L	0.08	0.00	0.00	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Zinc	mg/L	1.5*	0.00	0.01	0.006	0.006				0.001	0.001			0.001				0.001	0.003		

* = GV

G2S

Determinand		ANZECC STOCK	Median	Maximum	Annual Median	Apr-22	Jan-22	Oct-21	Jul-21	Apr-21	Jan-21	Oct-20	Jul-20	Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18
Water level	mBGL		2.16	2.55	2.055	2.11	2.00	1.900	2.31	2.36	1.87	1.800	2.11	2.55	2.38	2.15	2.18	2.51	2.25	2.26	2.06
pH		6 to 9	7.00	7.80	7.35	7.8	7.4	7.300	6.7	6.8	7.2	7.2	7.2	7.0	6.9	7.0	6.6	7.1	6.9	6.7	6.7
Suspended Solids	mg/l		3.25	8.00	4	4				2	3.5			8.0				3	3		
Phenol	mg/L		0.03	0.03	0.025	0.025				0.025				0.025				N/a	0.005		
VFA	mg/L		2.50	2.50	2.5	2.5				2.5				2.5				N/a	3		
TOC	mg/L		11.90	15.60	9	9.0				1.4	10.9			15.6				14.6	12.9		
Alkalinity	mg CaCO3/L		352.50	523.00	164	164				276	287			427				523	418		
Conductivity	mS/m		166.00	267.00	125.5	61	122	129.000	222	133	155	235	104	190	267	133	186	177	200.0	131.0	189
COD	mg/L		56.50	148.00	40	45	35	7.500	89	66	38	66	40	53	69	22	90	80	148	60	36
BOD (scBOD frm Apr'20)	mg/L		0.50	3.00	1	0.5	0.5	1.500	3.0	3.0	0.5	0.5	0.5	0.5				3	3		
Faecal C (Ecoli frm Apr'20)	col/100ml	100	2.00	4.00	2	4.000	0.500	2.000	2.0	2.000	2.000	2	2	2	2	2	2	2	2		
Chloride	mg/L		278.50	616.00	158	82	153	163.000	481	227	311	584	136	323	616	194	327	246	376	160	332
Nitrate-N	mg/L	90.3	0.01	0.05	0.005	0.01	0.005	0.005	0.050	0.050	0.005	0.050	0.01	0.005	0.005	0.005	0.050	0.005	0.01	0.005	0.01
Sulphate	mg/L	1000	3.48	5.86	5.8	5.80				5.51	3.48			5.86				1.07	2.79	0.0	
Ammonia-N	mg/L		0.02	0.06	0.015	0.01	0.01	0.060	0.0	0.02	0.02	0.005	0.02	0.020	0.02	0.005	0.01	0.01	0.01	0.005	0.060
Hardness	mg CaCO3/L		282.00	415.00	81	81				237	260			304				312	415		
Calcium	mg/L	1000	56.40	91.60	15.7	15.7				44.3	51.8			61.0				66.5	91.6		
Magnesium	mg/L		33.50	45.10	10	10.0				30.6	31.6			36.8				35.4	45.1		
Potassium	mg/L		24.25	35.00	9.45	9.5				18.0	23.5			25.5				25.0	35.0		
Sodium	mg/L		224.00	281.00	96.4	96				156	185			272	281	187	224	244	250	178	248
D.R. Phosphorus	mg/L		0.02	0.03	0.029	0.029				0.017	0.018			0.018				0.024	0.013		
Aluminium	mg/L	5	0.00	0.01	0.004	0.004	0.003	0.004	0.005	0.003	0.003	0.001	0.003	0.003	0.001	0.004	0.001	0.001	0.003	0.004	0.001
Arsenic	mg/L	0.5	0.00	0.00	0.0005	0.0005				0.0005	0.0005			0.0005				0.0005	0.0005		
Boron	mg/L	5	0.97	1.27	0.985	0.60	0.92	1.090	1.05	1.02	0.84	0.95	1.06	1.21	1.15	0.57	0.98	1.27	0.95	0.73	0.66
Cadmium	mg/L	0.01	0.00	0.00	0.0001	0.0001				0.0001	0.0001			0.0001				0.0001	0.0001		
Chromium	mg/L	1	0.00	0.00	0.0005	0.0005				0.0005	0.0005			0.0005				0.0005	0.0005		
Copper	mg/L	0.4	0.01	0.01	0.008	0.0080				0.0065	0.0039			0.0010				0.0080	0.0046		
Iron	mg/L		0.11	0.44	0.114	0.114				0.169	0.03			0.032	0.080	0.12	0.44	0.05	0.187	0.05	0.130
Lead	mg/L	0.1	0.00	0.00	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Manganese	mg/L		0.13	0.42	0.0921	0.050	0.076	0.108	0.2720	0.160	0.119	0.2010	0.084	0.215	0.416	0.0928	0.1630	0.133	0.171	0.0586	0.0879
Mercury	mg/L		0.00	0.00	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.000	0.0003	0.000	0.000							
Nickel	mg/L	1	0.00	0.00	0.0033	0.0018	0.0036	0.0031	0.0035	0.0034	0.0031	0.0026	0.0036	0.0046	0.0038	0.0033	0.0042	0.0043	0.0039	0.0040	0.0029
Zinc	mg/L	20	0.00	0.01	0.001	0.001				0.002	0.001			0.006				0.001	0.001		

Tatana extra sampling TD1 (Formerly SW3 prior to Apr 2020)

Determinand		ANZECC STOCK	Median	Maximum	Annual Median	Jun-22	May-22	Apr-22	Mar-22	Feb-22	Jan-22	Dec-21	Nov-21	Oct-21	Jul-21	Apr-21	Oct-20	Jul-20	Apr-20	Jan-20	Oct-19	Jul-19	Apr-19	Jan-19	Oct-18	Jul-18
pH		6 to 9	7.200	8.0000	7.1500	7.1000	6.6	6.800	7.800	8.000	6.8	6.7	7.9	7.2	7.1	7.2	7.4	7	7.1	7.7	7.8	7.2	7.3	7.2	7.4	7.2
Suspended Solids	mg/l		26.000	2190.0000	22.0000	43.0000	2190	94	21.000	19.000	111	22	112	15		61	66		284	14	131	19	6	26	8	3
Phenol	mg/L		0.025	0.0250	0.0250			0.025	0.025	0.025	0.025	0.025	0.025	0.025		0.025	0.025		0.0250							
VFA	mg/L		2.500	6.0000	2.5000			2.500	2.500	2.500	2.500	2.500	2.500	2.500		3	6.000		6.0000							
TOC	mg/L		24.750	70.2000	22.2000	25.1000	50.6	15.000	22.200	3.200	70.200	19.400	24.400	28.100		25.5	44.500		23.8000							
Alkalinity	mg CaCO3/L		152.500	684.0000	182.0000	62.0000	98	104.000	407.000	192.000	262.000	92.000	125.000	182.000		154	684.000		151.0000							
Conductivity	mS/m		63.100	192.0000	50.8000	30.2000	30.4	41.000	105.000	59.800	76	28	42	60	40	63.1	192.0	184.0	55.7	91.1	63.3	52.4	93	74	83.1	85.3
COD	mg/L		113.000	562.0000	114.0000	107.0000	275	115.000	52.000	123.000	291	113	468	98	81	50	354	562	75	92	124	109	271	43	152	49
BOD (scBOD frm Apr'20)	mg/L		3.000	21.0000	3.0000	3.0000	3	3.000	3.000	3.000	6	7	3	3	3	3	1	3	3	21	17	3	3	3	12	8.0
Faecal C (Ecoli frm Apr'20)	col/100ml	100	250.000	7500.0000	250.0000	50.0000		50.000	1000.000	300.000	2200	1100	50	200	48	38	40	7500	140	380	250	380	2000			
Chloride	mg/L		72.300	321.0000	65.0000	43.3000	24.6	56.000	87.300	68.400	82.5	26.2	50.8	71.8	62	77.3	177.0	321.0	69	101.0	72	69	172	79	103	119.0
Nitrate-N	mg/L	90.3	0.240	5.9900	0.0400	1.5100	0.005	0.030	0.050	0.005	0.005	0.06	0.005	0.39	0.08	3.8000	0.24	1.21	0.01	5.99	0.26	0.19	0.57	0.65	3.63	4.58
Sulphate	mg/L	1000	3.080	8.1500	1.5000	7.1300	2.59	5.440	0.490	1.500	0.13	8.15	0.97	3.57		6.26	0.620		6.7100							
Ammonia-N	mg/L		4.610	57.8000	0.6450	0.1800	0.76	0.120	14.800	5.930	5.98	0.66	0.45	0.53	0.6	0.04	57.8	43.2	4.6	10.9	6.4	3.6	4.2	10.3	7.6	8.0
Hardness	mg CaCO3/L		124.000	405.0000	133.0000	67.0000	86	89.000	296.000	133.000	208	81	91	139		137	405.000		115.0000							
Calcium	mg/L	1000	23.650	81.6000	25.1000	12.9000	22.2	17.300	72.800	25.100	42.3	17.1	17.8	26.8		26.2	81.600		21.1000							
Magnesium	mg/L		16.000	48.7000	17.0000	8.5000	7.46	11.100	27.700	17.000	24.9	9.26	11.4	17.4		17.3	48.700		15.0000							
Potassium	mg/L		16.600	49.2000	17.7000	7.1600	7.34	8.620	23.600	17.700	39.9	10.4	10.7	19.1		22.0	49.200		15.5000							
Sodium	mg/L		52.550	134.0000	53.8000	30.4000	21.8	45.500	64.700	53.800	70	20.1	46.5	59.4		57.6	134.000		51.3000							
D.R. Phosphorus	mg/L		0.029	0.0570	0.0300	0.0340	0.013	0.043	0.027	0.049	0.028	0.03	0.057	0.017		0.044	0.014		0.0240							
Aluminium	mg/L	5	0.022	0.0710	0.0225	0.0710	0.049	0.023	0.004	0.021	0.022	0.018	0.028	0.025	0.064	0.010	0.009	0.022	0.0090							
Arsenic	mg/L	0.5	0.002	0.0070	0.0020	0.0010	0.001	0.0005	0.002	0.002	0.007	0.002	0.002	0.002		0.001	0.001		0.0010							
Boron	mg/L	5	0.200	1.3500	0.2000	0.0150	0.04	0.100	0.360	0.220	0.27	0.08	0.18	0.3	0.110	0.27	1.350	0.810	0.1800							
Cadmium	mg/L	0.01	0.000	0.0001	0.0001	0.0001	0.0001	0.0001	0.000	0.000	0.0001	0.0001	0.0001	0.0001		0.0001	0.000		0.0001							
Chromium	mg/L	1	0.001	0.0010	0.0005	0.0005	0.0005	0.0005	0.001	0.001	0.001	0.0005	0.0005	0.0005		0.0005	0.001		0.0005							
Copper	mg/L	0.4	0.001	0.0017	0.0007	0.0007	0.0006	0.00025	0.002	0.000	0.0007	0.001	0.0012	0.0006		0.00025	0.001		0.0003							
Iron	mg/L		1.120	2.8400	2.0900	1.3300	0.692	1.320	0.146	1.560	2.84	2.28	2.43	2.09		0.16	0.31		1.26	0.26	1.12	1.49	0.57	0.50	0.45	0.28
Lead	mg/L	0.1	0.000	0.0003	0.0003	0.0003	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.000	0.000	0.0003							
Manganese	mg/L		0.200	1.2700	0.3125	0.2310	0.337	0.0120	0.767	0.121	1.27	0.468	0.472	0.157	0.09	0.017	0.936	0.360	0.2000	0.179	0.446	0.117	0.030	0.104	0.284	0.1200
Mercury	mg/L		0.000	0.0003	0.0003	0.0003	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.000	0.000	0.0003							
Nickel	mg/L	1	0.001	0.0039	0.0013	0.0007	0.0006	0.0005	0.0018	0.0015	0.0025	0.0007	0.001	0.002	0.0011	0.0015	0.004	0.003	0.0009							
Zinc	mg/L	20	0.003	0.0090	0.0030	0.0030	0.003	0.002	0.003	0.003	0.005	0.009	0.002	0.005		0.001	0.003		0.0010							
TKN	mg/L		10.000	14.4000																14.4	10.0	6.0	7.2	12.9	9.5	12.3
Nitrite-N	mg/L		0.080	0.5900																0.59	0.03	0.03	0.07	0.11	0.25	0.08
Total Nitrogen	mg/L		11.800	18.8000																18.8	8.8	6.7	7.5	11.8	13.1	13.4

Xd1

Determinand		ANZECC STOCK	Median	Maximum	Annual Median	Apr-22	Jan-22	Oct-21	Jul-21	Apr-21	Mar-21
Water level	mBGL		2.5200	3.0800	2.6650	2.5200	2.81	2.44	3.08	2.29	
pH		6 to 9	7.5500	7.7000	7.5500	7.5000	7.6	7.5	7.6	7.5	7.7
Suspended Solids	mg/l		55.0000	146.0000	72.0000	146.0000	38.0	72		9	
Phenol	mg/L		0.0250	0.0250	0.0250	0.0250		0.025		0.025	
VFA	mg/L		2.5000	2.5000	2.5000	2.5000		2.5		2.5	
TOC	mg/L		4.6500	4.8000	4.6000	4.8000	4.2	4.6		4.7	
Alkalinity	mg CaCO3/L		178.0000	184.0000	180.0000	176.0000	184	180		162	
Conductivity	mS/m		54.1000	54.3000	54.1000	54.3000	54	54	54	54	54
COD	mg/L		29.0000	36.0000	29.0000	27.0000	23	31	34	20	36
BOD (scBOD frm Apr'20)	mg/L		2.2500	5.9000	3.0000	3.0000	5.9	1.5	3.0	1.5	0.5
Faecal C (Ecoli frm Apr'20)	col/100ml	100	3.0000	16.0000	5.0000	8.0000	16	2	2	4	2
Chloride	mg/L		58.0500	62.7000	57.7000	56.9000	58	63	57	58	60
Nitrate-N	mg/L	90.3	0.0050	0.0050	0.0050	0.0050	0.000	0.01	0.01	0.01	0.01
Sulphate	mg/L	1000	0.0100	13.4000	0.0100	13.4000	0.01	0.0		0.0	
Ammonia-N	mg/L		0.3700	0.3900	0.3850	0.3600	0.39	0.4	0.4	0.4	0.1
Hardness	mg CaCO3/L		155.0000	167.0000	149.0000	149.0000	161	149		167	
Calcium	mg/L	1000	36.6000	39.1000	35.1000	35.1000	38.1	35.0		39.1	
Magnesium	mg/L		15.5000	16.7000	15.0000	14.9000	16.0	15.0		16.7	
Potassium	mg/L		5.3200	5.4700	5.3200	5.3200	5.5	5.3		5.3	
Sodium	mg/L		47.3000	50.0000	46.9000	46.9000	48	45		50	
D.R. Phosphorus	mg/L		0.1100	0.1180	0.1110	0.0760	0.111	0.118		0.109	
Aluminium	mg/L	5	0.0025	0.0070	0.0025	0.0020	0.004	0.003	0.001	0.001	0.007
Arsenic	mg/L	0.5	0.0005	0.0005	0.0005	0.0005	0.0000	0.001		0.001	
Boron	mg/L	5	0.0600	0.0700	0.0550	0.0500	0.06	0.05	0.07	0.06	0.06
Cadmium	mg/L	0.01	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001		0.0001	
Chromium	mg/L	1	0.0005	0.0005	0.0005	0.0005	0.0000	0.001		0.001	
Copper	mg/L	0.4	0.0003	0.0008	0.0004	0.0008	0.0004	0.0003		0.0003	
Iron	mg/L		0.0690	0.0950	0.0670	0.0950	0.067	0.05		0.07	
Lead	mg/L	0.1	0.0003	0.0004	0.0003	0.0003	0.00040	0.00025	0.00025	0.00025	0.00025
Manganese	mg/L		0.4915	0.5010	0.4915	0.4990	0.497	0.5	0.5	0.5	0.5
Mercury	mg/L		0.0003	0.0004	0.0003	0.0003	0.00040	0.00025	0.00025	0.00025	0.00025
Nickel	mg/L	1	0.0003	0.0011	0.0003	0.0003	0.0004	0.0003	0.0003	0.0003	0.0011
Zinc	mg/L	20	0.0010	0.0080	0.0010	0.0080	0.001	0.001		0.001	

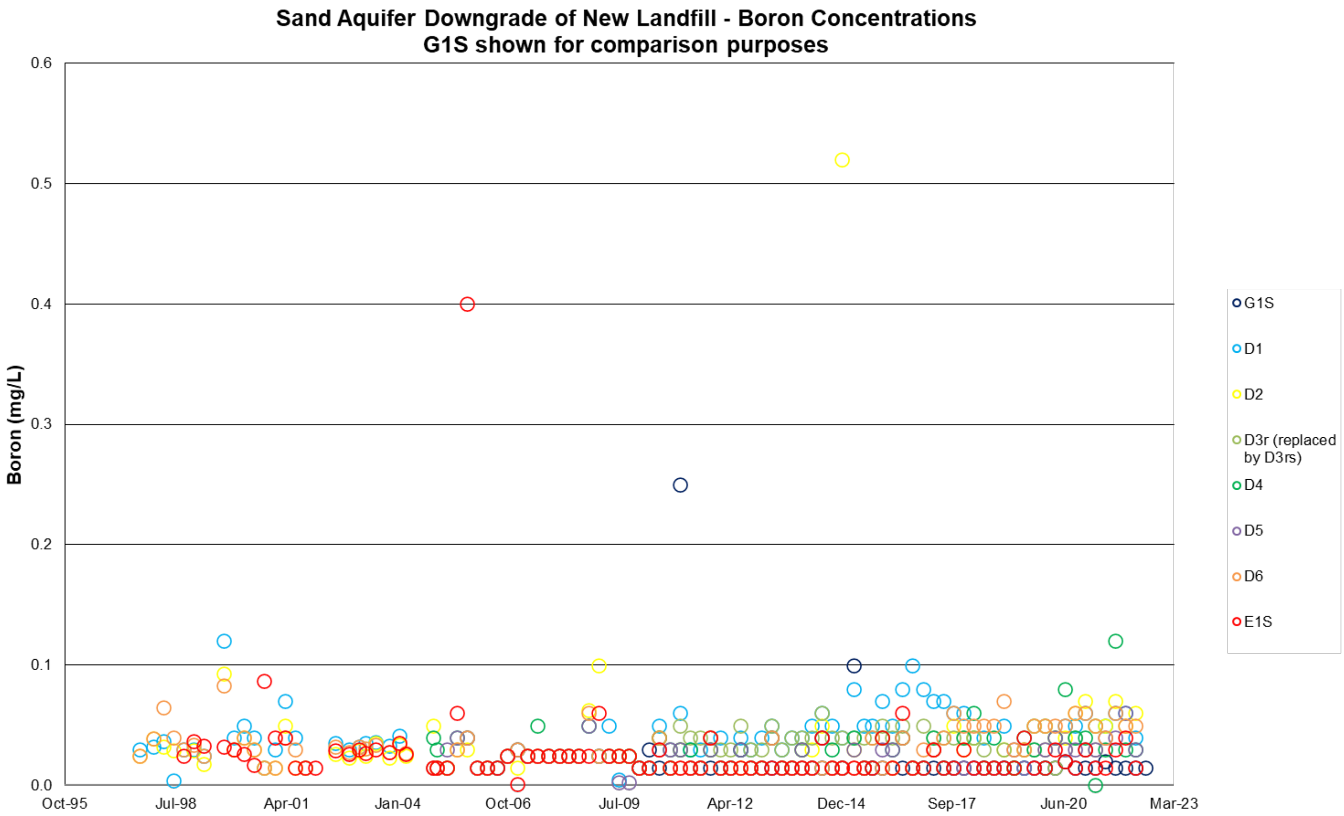
Xs1

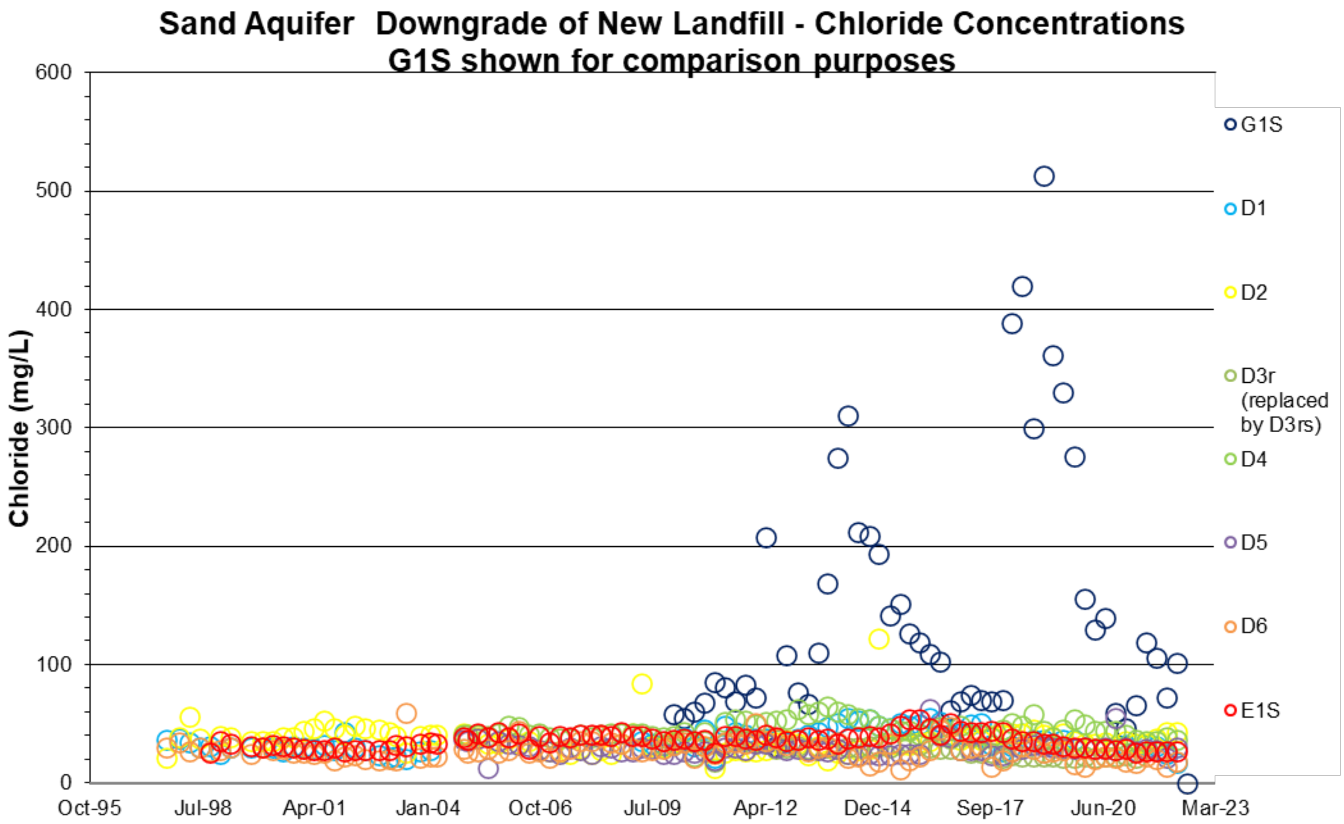
Determinand		ANZECC STOCK	Median	Maximum	Annual Median	Apr-22	Jan-22	Oct-21	Jul-21	Apr-21	Mar-21
Water level	mBGL		0.4900	0.8200	0.4800	0.73	0.03	0.47	0.49	0.82	
pH		6 to 9	6.6500	7.2000	6.6000	6.8	6.6	6.5	6.6	6.7	7.2
Suspended Solids	mg/l		75.0000	82.0000	75.0000	75	*79.0*	45		43	82
Phenol	mg/L		0.0250	0.0250	0.0250	*0.025*		0.025		0.025	0.025
VFA	mg/L		2.5000	2.5000	2.5000	*2.50*		2.5		2.5	2.5
TOC	mg/L		25.5000	26.5000	25.7000	25.5	26.5	25.7		24.8	2.4
Alkalinity	mg CaCO3/L		551.0000	569.0000	557.0000	557	569	331		513	551
Conductivity	mS/m		135.5000	139.0000	113.7000	137	136	87	91	139	135
COD	mg/L		71.5000	91.0000	66.0000	91	26	68	64	75	82
BOD (scBOD frm Apr'20)	mg/L		3.0000	74.0000	3.0000	*3*	*74.0*	3.0	3.0	3.0	3
Faecal C (Ecoli frm Apr'20)	col/100ml	100	5.0000	99.9990	14.0000	*2.00*	100	8	20	2	2
Chloride	mg/L		117.5000	125.0000	88.8000	123	124	53	55	112	125
Nitrate-N	mg/L	90.3	0.0275	0.0500	0.0275	*0.05*	*0.000*	0.01	0.05	0.05	0.005
Sulphate	mg/L	1000	3.0900	29.7000	1.9900	1.53	1.99	29.7		3.1	4.67
Ammonia-N	mg/L		8.2850	11.2000	9.5950	7.88	8.69	11.2	10.5	3.2	3.11
Hardness	mg CaCO3/L		435.0000	457.0000	418.0000	418	449	273		435	457
Calcium	mg/L	1000	90.3000	97.1000	82.2000	82.2	97.1	69.3		90.3	93.5
Magnesium	mg/L		50.9000	54.2000	50.2000	51.5	50.2	24.1		50.9	54.2
Potassium	mg/L		20.3000	24.4000	20.3000	24.40	20.3	12.2		23.5	19.1
Sodium	mg/L		99.5000	103.0000	99.5000	103	100	45		92	102
D.R. Phosphorus	mg/L		0.0210	0.0930	0.0170	0.017	0.015	0.025		0.093	
Aluminium	mg/L	5	0.0040	0.0100	0.0050	0.003	0.004	0.006	0.010	0.004	0.003
Arsenic	mg/L	0.5	0.0005	0.0010	0.0005	*0.0005*	*0.0000*	0.001		0.001	0.0005
Boron	mg/L	5	0.4800	0.5900	0.2700	0.56	0.45	0.09	0.09	0.59	0.51
Cadmium	mg/L	0.01	0.0001	0.0001	0.0001	*0.0001*	*0.0001*	0.0001		0.0001	0.0001
Chromium	mg/L	1	0.0010	0.0010	0.0010	0.001	*0.0010*	0.001		0.001	0.001
Copper	mg/L	0.4	0.0004	0.0009	0.0004	*0.00090*	0.0004	0.0003		0.0003	0.0009
Iron	mg/L		2.6100	16.4000	2.6100	0.80	2.710	2.61		16.40	1.63
Lead	mg/L	0.1	0.0003	0.0004	0.0003	*0.00025*	*0.00040*	0.00025	0.00025	0.00025	0.00025
Manganese	mg/L		1.1110	1.6000	1.4500	0.922	1.300	1.6	1.6	0.8	0.884
Mercury	mg/L		0.0003	0.0004	0.0003	*0.00025*	*0.00040*	0.00025	0.00025	0.00025	0.00025
Nickel	mg/L	1	0.0023	0.0027	0.0015	0.0022	0.0027	0.0006	0.0008	0.0024	0.0025
Zinc	mg/L	20	0.0020	0.0040	0.0020	*0.004*	*0.002*	0.001		0.001	0.004

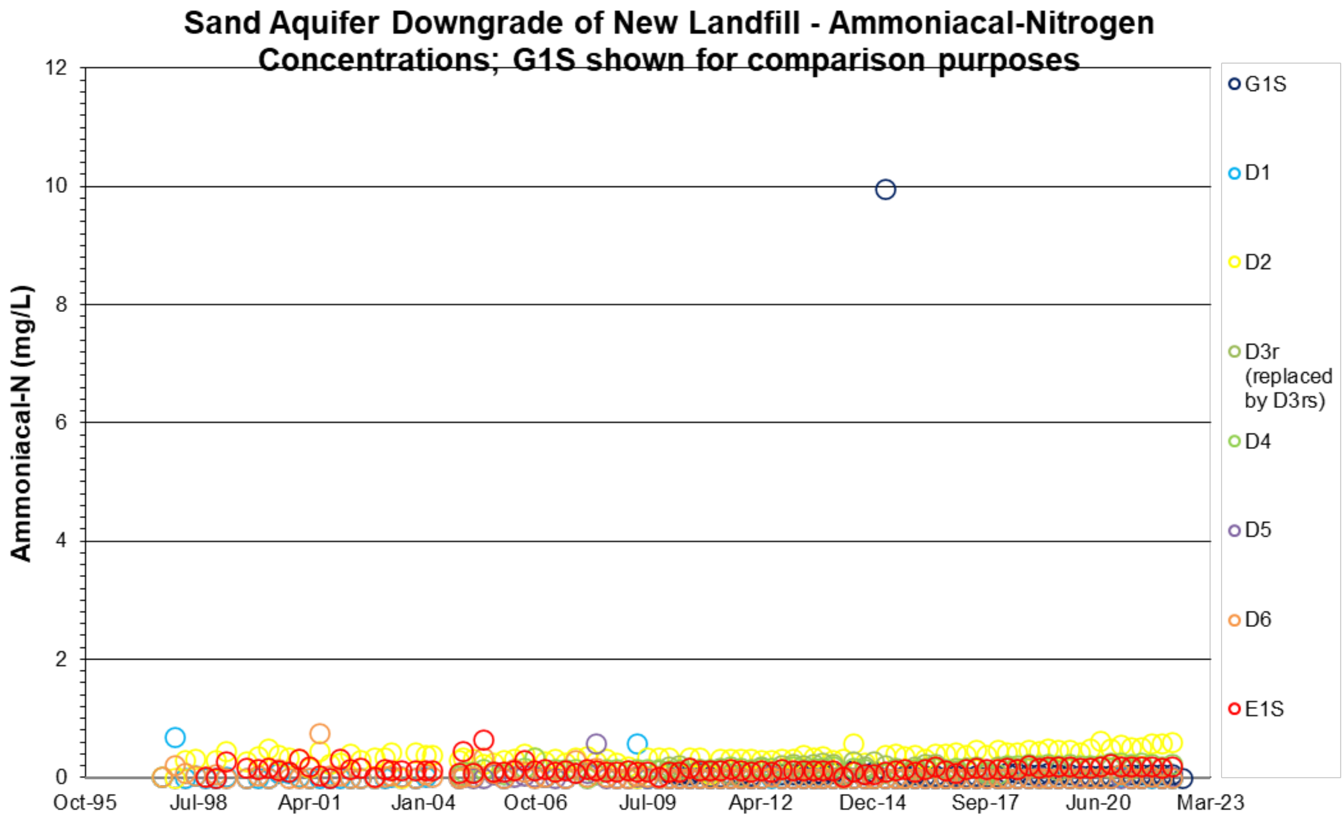
Xs2

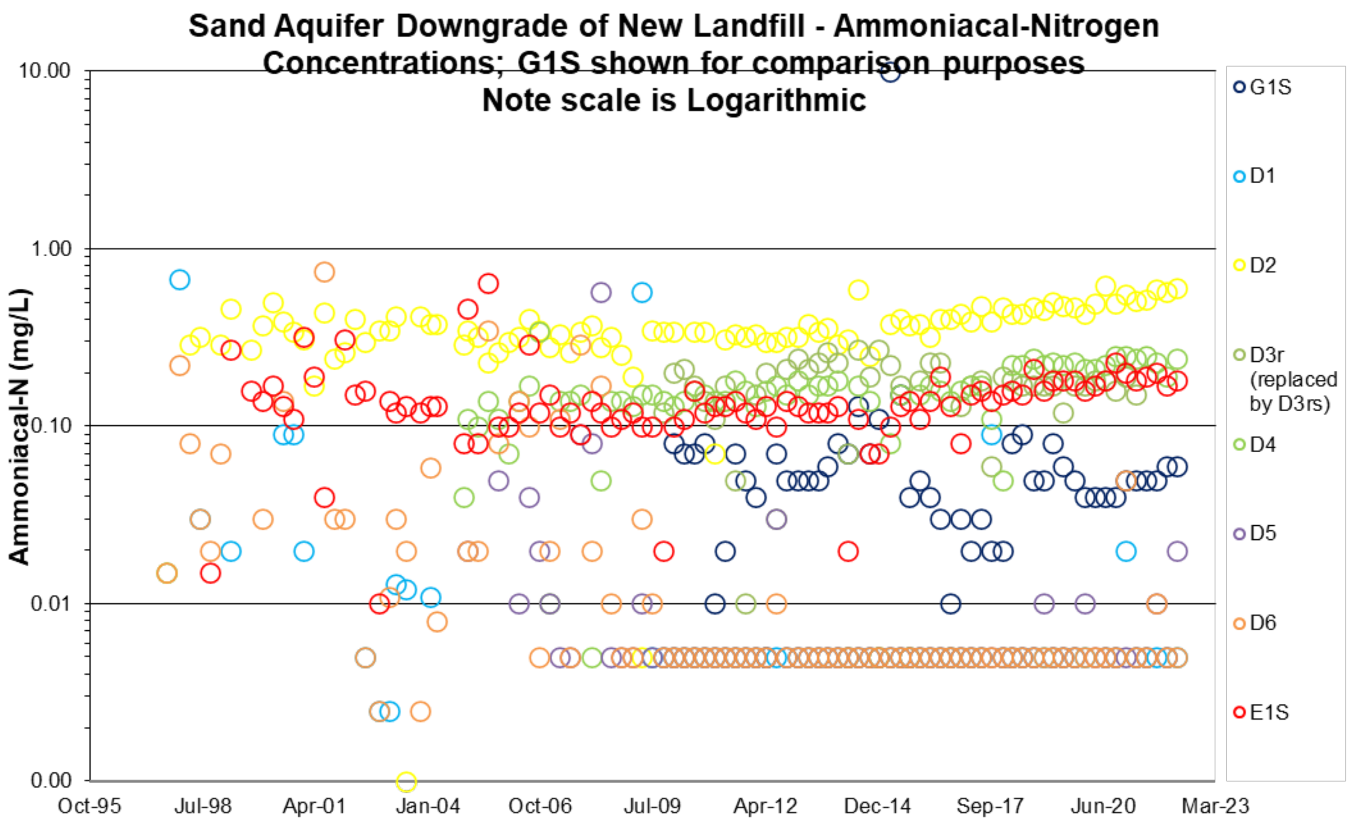
Determinand		ANZECC STOCK	Median	Maximum	Annual Median	Apr-22	Jan-22	Oct-21	Jul-21	Apr-21	Mar-21
Water level	mBGL		2.5800	2.5800	2.3350	2.58	2.04	2.3	2.37	2.77	
pH		6 to 9	7.0000	7.0000	6.9000	7.0	7.1	6.8	6.8	0007	6.9
Suspended Solids	mg/l		9.0000	9.0000	9.0000	9	*27.0*	7		0017	8
Phenol	mg/L		0.0250	0.0250	0.0250	*0.025*		0.025		0000	0.025
VFA	mg/L		2.5000	2.5000	2.5000	*2.50*		2.5		0003	2.5
TOC	mg/L		2.4000	2.4000	2.2000	2.4	2.0	2.2		0003	24.7
Alkalinity	mg CaCO3/L		54.0000	54.0000	49.0000	54	48	49		0058	8
Conductivity	mS/m		18.2000	18.2000	17.4000	18.2	16	16.6	21.2	0022	21.4
COD	mg/L		37.0000	37.0000	11.2450	*37*	15	7.5	7.5	0073	7.5
BOD (scBOD frm Apr'20)	mg/L		15.0000	15.0000	4.4500	*15*	*5.9*	3	3	0002	1.5
Faecal C (Ecoli frm Apr'20)	col/100ml	100	2.0000	2.0000	7.0000	2	31	2	12	0016	2
Chloride	mg/L		12.4000	12.4000	12.5000	12.4	13	11.5	18	0021	21.7
Nitrate-N	mg/L	90.3	0.8800	0.8800	0.6550	0.88	*0.660*	0.65	0.37	0	0.58
Sulphate	mg/L	1000	7.4900	7.4900	7.4900	7.5	7.42	9.02		13	13.7
Ammonia-N	mg/L		0.0300	0.0300	0.0500	0.03	0.01	0.1	0.07	0	0.02
Hardness	mg CaCO3/L		46.0000	46.0000	43.0000	46	43	41		54	52
Calcium	mg/L	1000	9.8200	9.8200	9.4900	9.8	9.5	8.7		11	10.8
Magnesium	mg/L		5.2900	5.2900	4.7800	5.29	4.7	4.78		6.45	6.08
Potassium	mg/L		4.3600	4.3600	3.8300	4.36	3.8	3.31		3.94	3.88
Sodium	mg/L		16.1000	16.1000	14.2000	16.1	14	14.2		17.6	17.6
D.R. Phosphorus	mg/L		0.0150	0.0150	0.0150	0.015	0.022	0.015		0.023	0.018
Aluminium	mg/L	5	0.0130	0.0130	0.0105	0.013	0.006	0.008	0.015	0.007	0.008
Arsenic	mg/L	0.5	0.0005	0.0005	0.0005	*0.0005*	*0.0000*	0.0005		0.0005	0.0005
Boron	mg/L	5	0.0400	0.0400	0.0400	0.04	0.04	0.015	0.06	0.04	0.04
Cadmium	mg/L	0.01	0.0001	0.0001	0.0001	*0.0001*	*0.0001*	0.0001		0.0001	0.0001
Chromium	mg/L	1	0.0005	0.0005	0.0005	*0.0005*	*0.0000*	0.0005		0.0005	0.0005
Copper	mg/L	0.4	0.0014	0.0014	0.0008	0.0014	0.0008	0.0007		0.0008	0.0015
Iron	mg/L		0.0740	0.0740	0.0740	0.074	0.050	0.158		0.111	0.219
Lead	mg/L	0.1	0.0003	0.0003	0.0003	*0.00025*	*0.00040*	0.00025	0.00025	0.00025	0.00025
Manganese	mg/L		0.0737	0.0737	0.0731	0.074	0.049	0.0725	0.107	0.106	0.131
Mercury	mg/L		0.0003	0.0003	0.0003	*0.00025*	*0.00040*	0.00025	0.00025	0.00025	0.00025
Nickel	mg/L	1	0.0003	0.0003	0.0003	*0.00025*	0.0004	0.00025	0.00025	0.00025	0.0008
Zinc	mg/L	20	0.0050	0.0050	0.0010	0.005	*0.001*	0.001		0.004	0.006

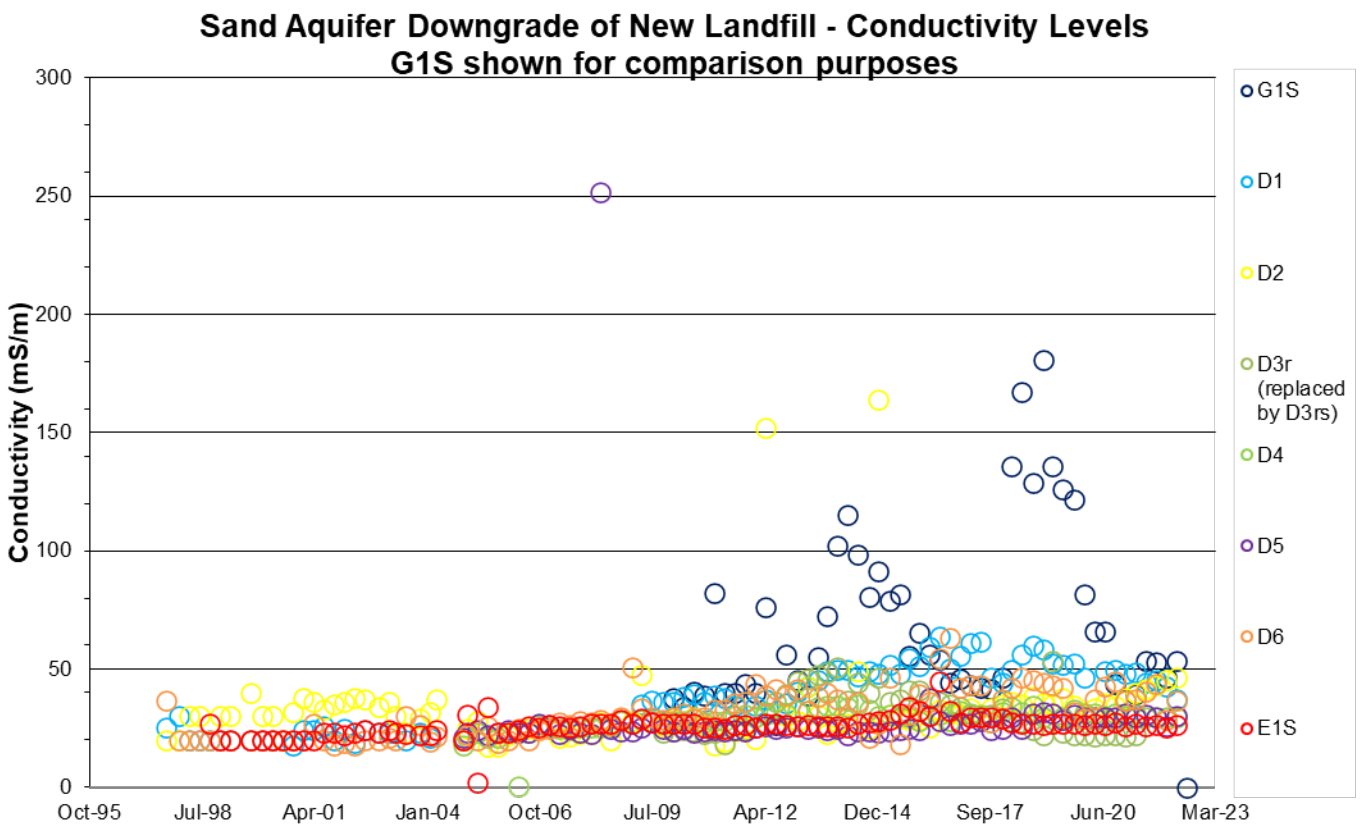
Appendix F Leachate indicator graphs

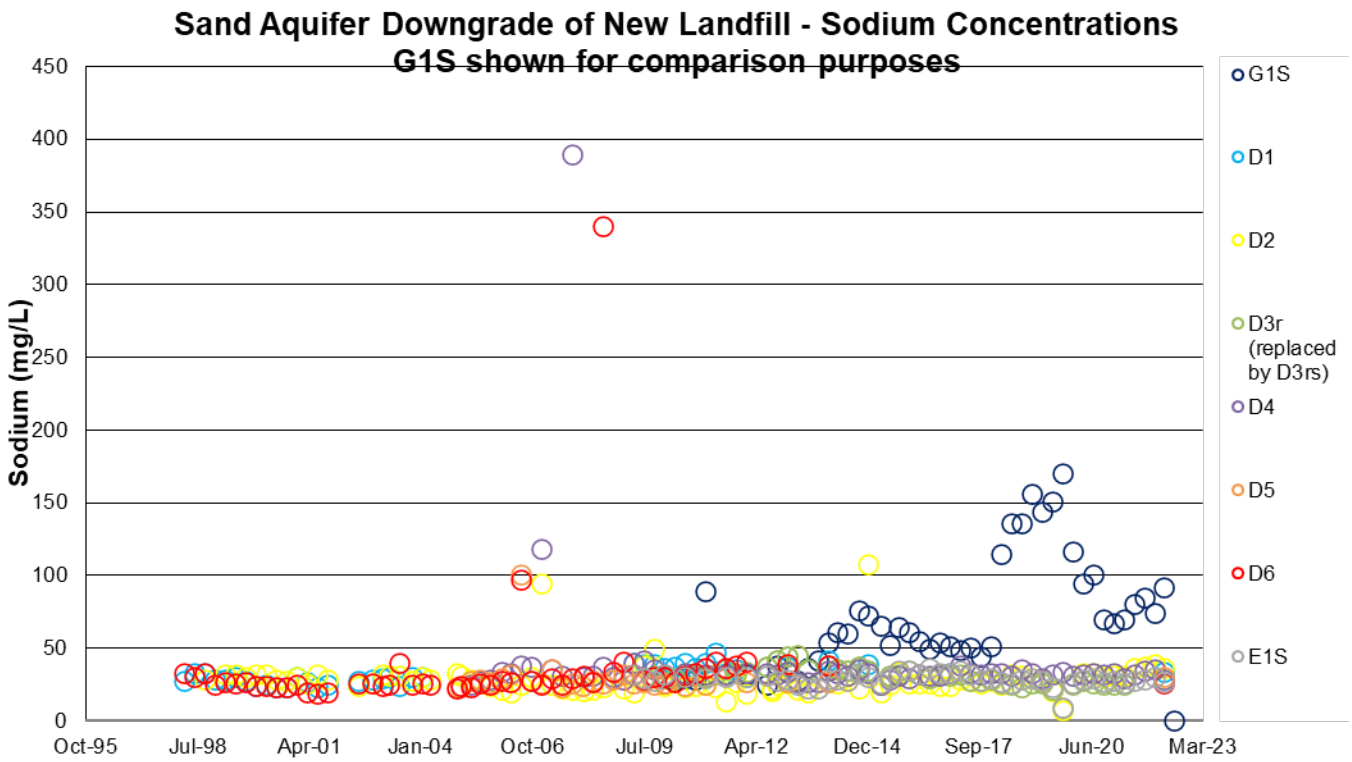

Sand Aquifer Downgrade of New Landfill - Boron Concentrations
G1S shown for comparison purposes
Boron (mg/L)
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
G1S
D1
D2
D3r (replaced by D3rs)
D4
D5
D6
E1S

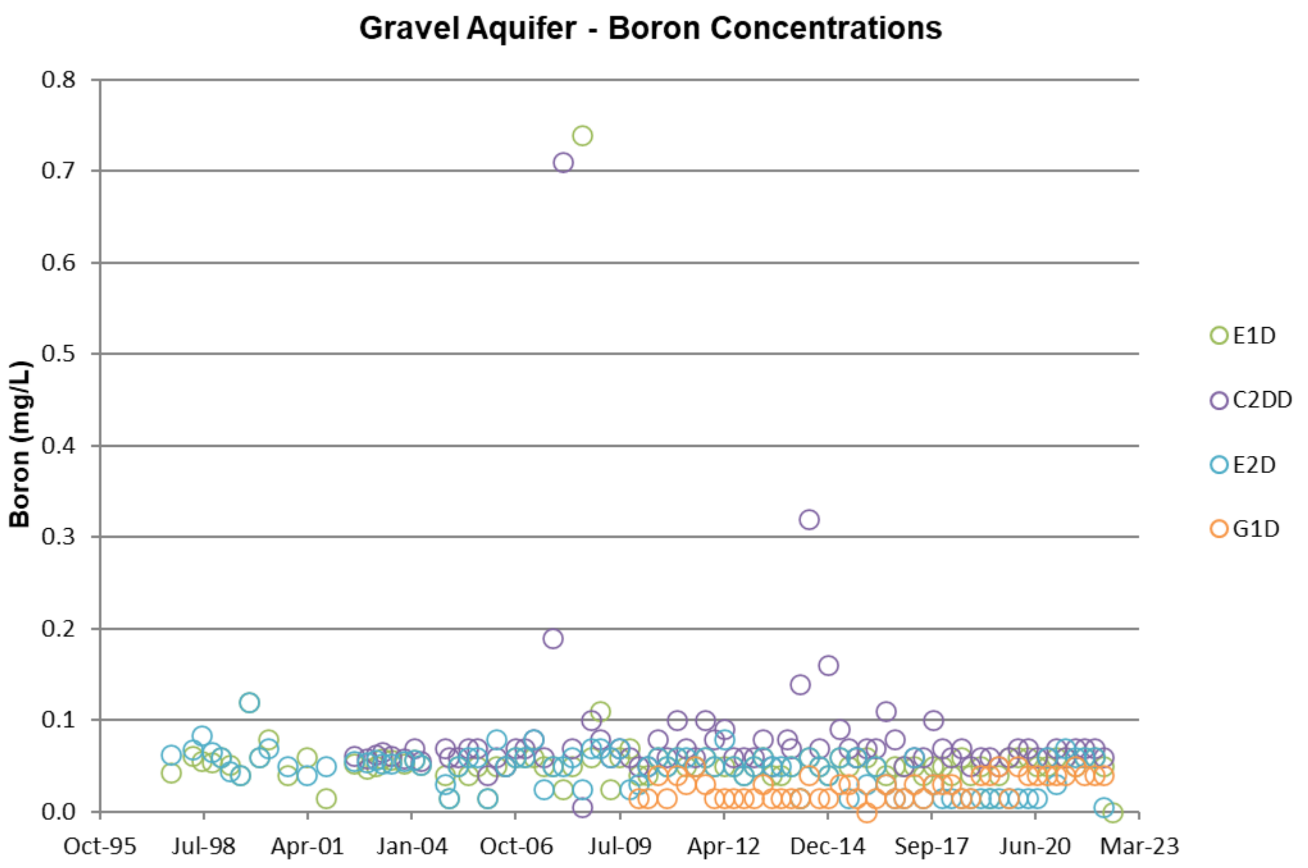

Sand Aquifer Downgrade of New Landfill - Chloride Concentrations
G1S shown for comparison purposes
Chloride (mg/L)
600
500
400
300
200
100
0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
G1S
D1
D2
D3r (replaced by D3rs)
D4
D5
D6
E1S

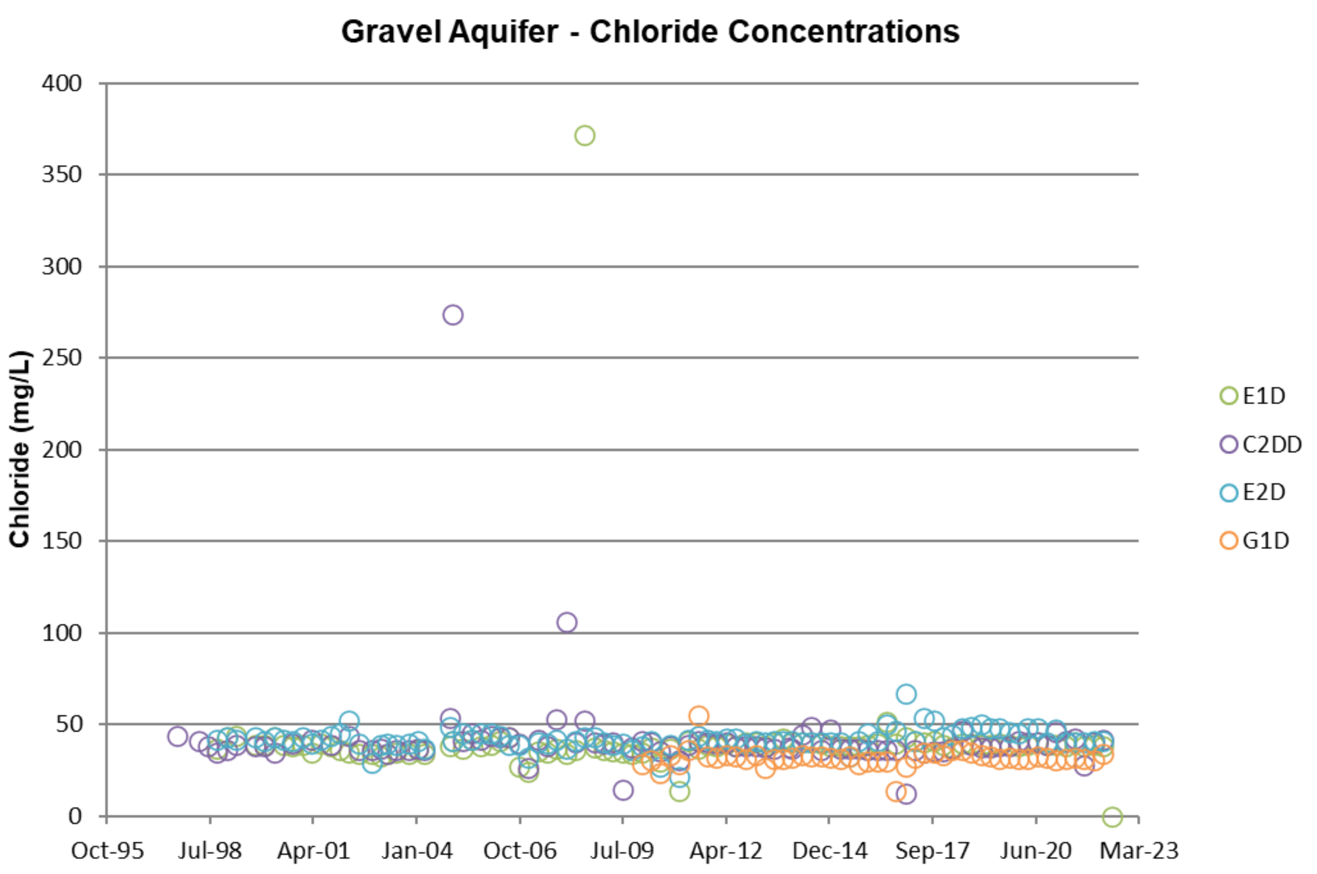

Sand Aquifer Downgrade of New Landfill - Ammoniacal-Nitrogen Concentrations; G1S shown for comparison purposes
Ammoniacal-N (mg/L)
0
2
4
6
8
10
12
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
G1S
D1
D2
D3r (replaced by D3rs)
D4
D5
D6
E1S

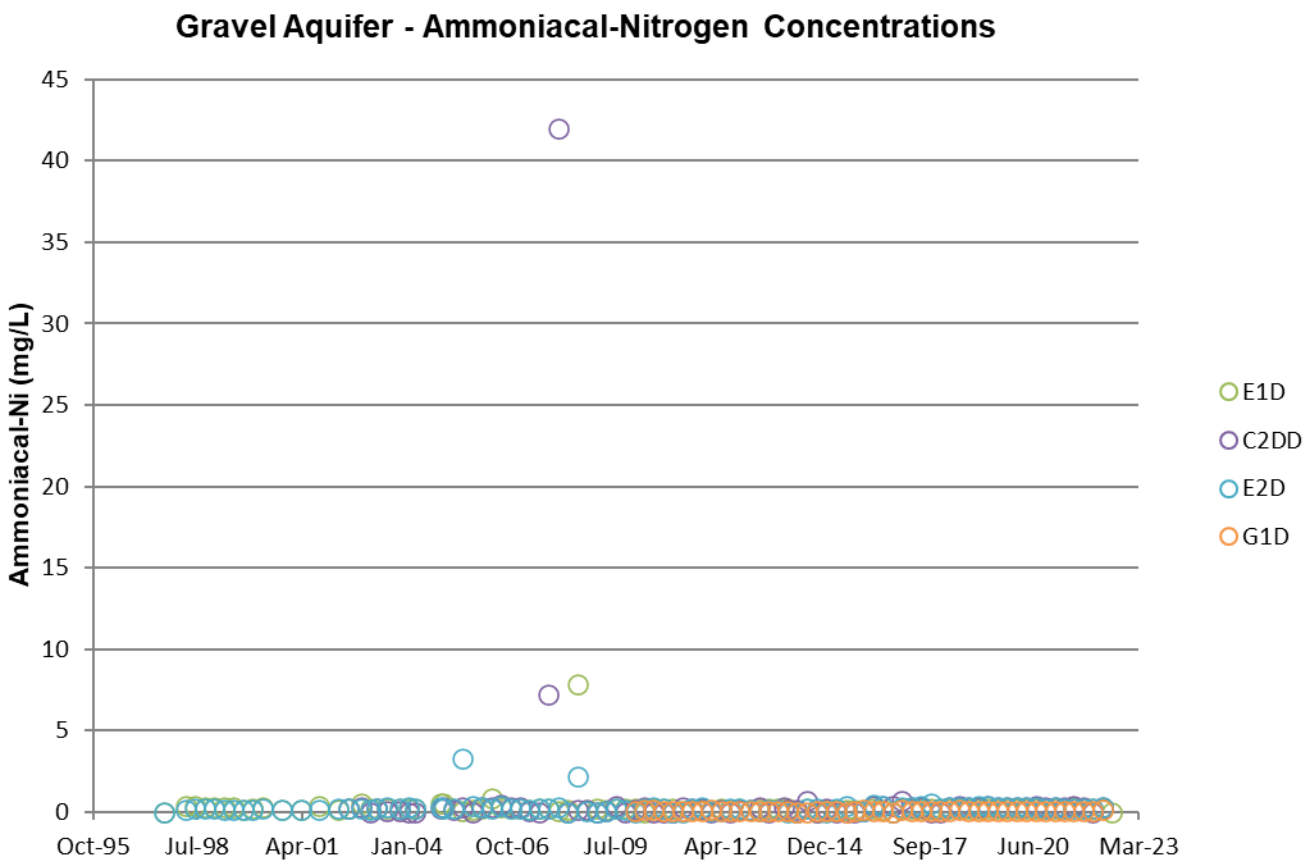

Sand Aquifer Downgrade of New Landfill - Ammoniacal-Nitrogen Concentrations; G1S shown for comparison purposes
Note scale is Logarithmic
Ammoniacal-N (mg/L)
0.00
0.01
0.10
1.00
10.00
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
G1S
D1
D2
D3r (replaced by D3rs)
D4
D5
D6
E1S

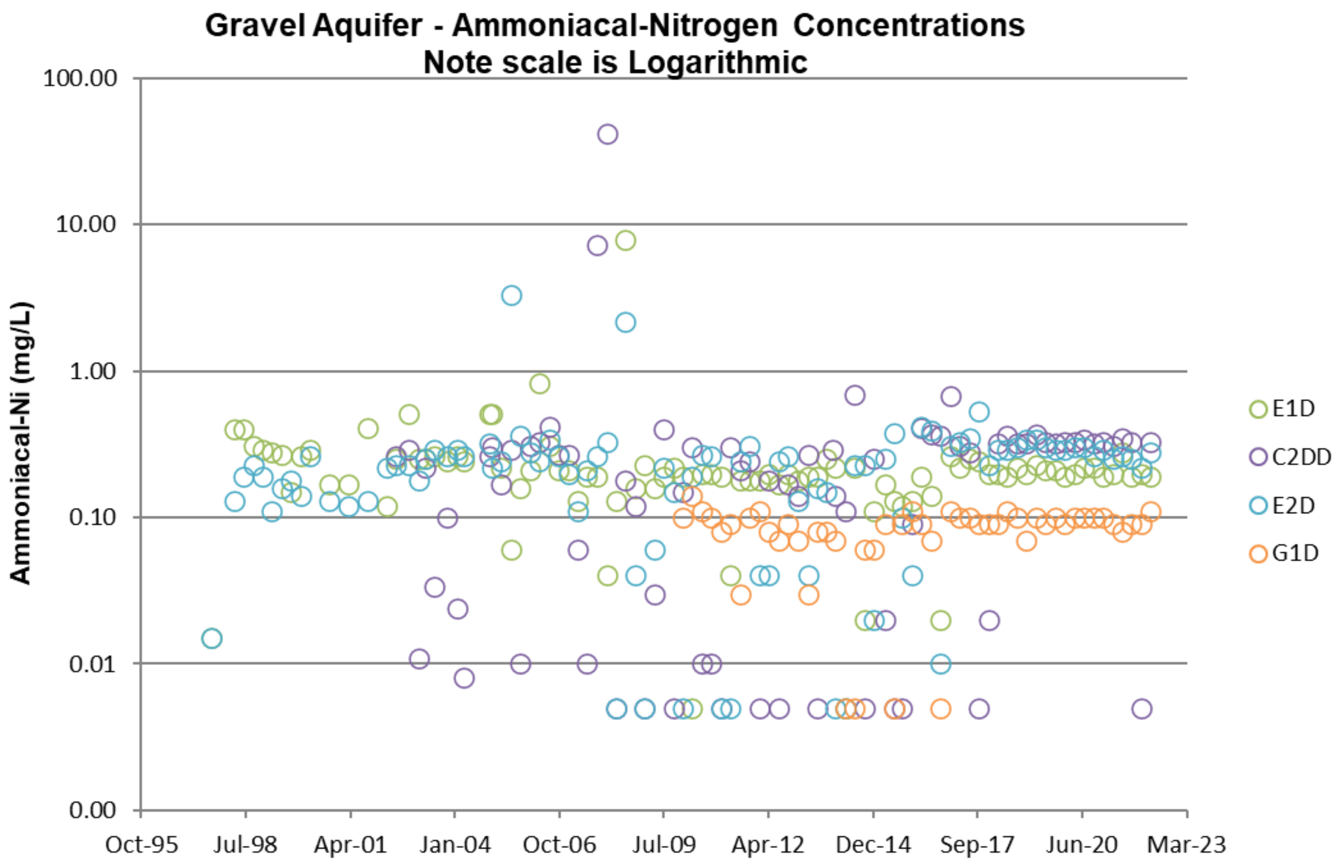

Sand Aquifer Downgrade of New Landfill - Conductivity Levels
G1S shown for comparison purposes
Conductivity (mS/m)
0
50
100
150
200
250
300
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
G1S
D1
D2
D3r (replaced by D3rs)
D4
D5
D6
E1S

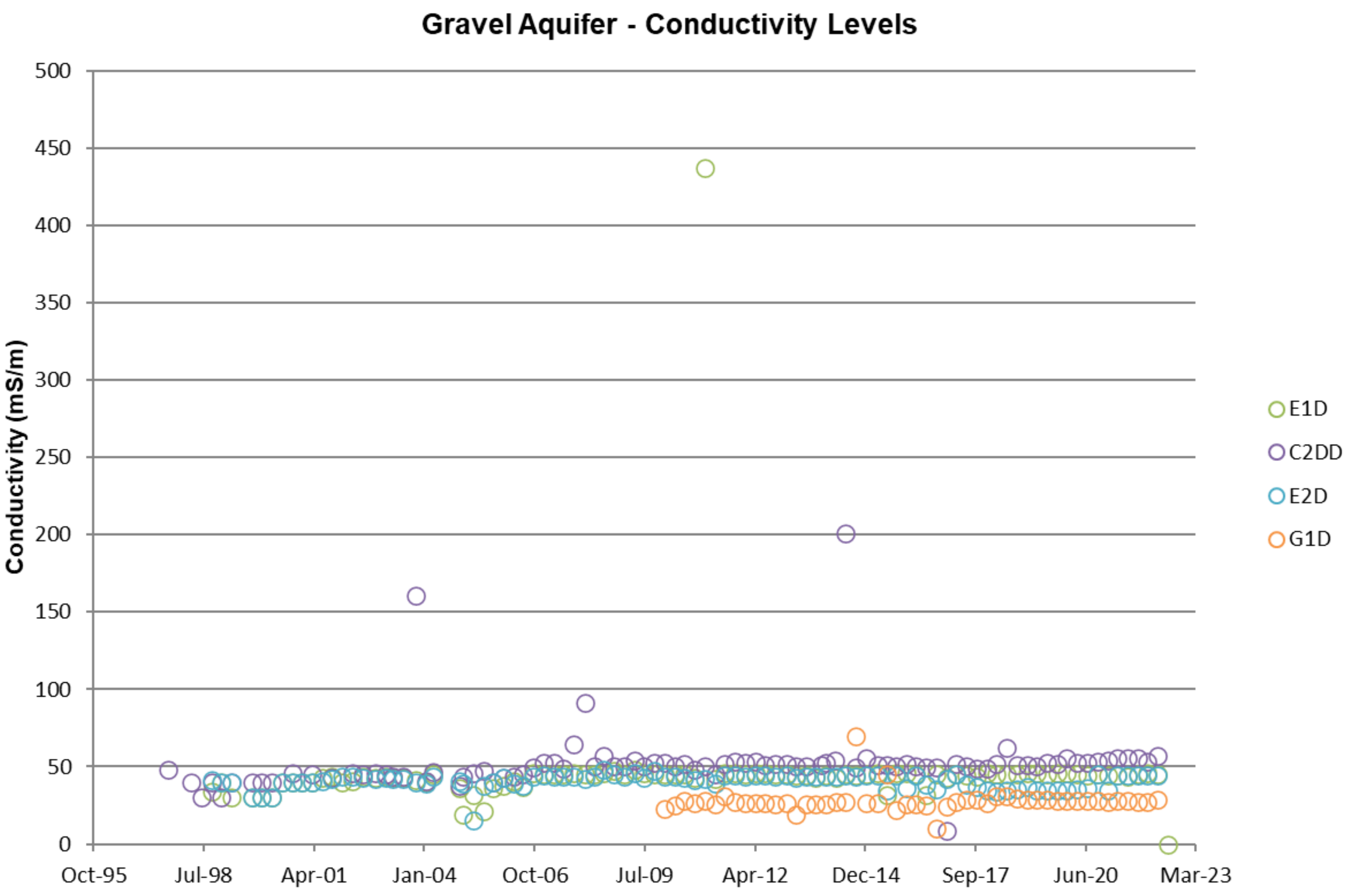

Sand Aquifer Downgrade of New Landfill - Sodium Concentrations
G1S shown for comparison purposes
Sodium (mg/L)
0
50
100
150
200
250
300
350
400
450
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
G1S
D1
D2
D3r (replaced by D3rs)
D4
D5
D6
E1S

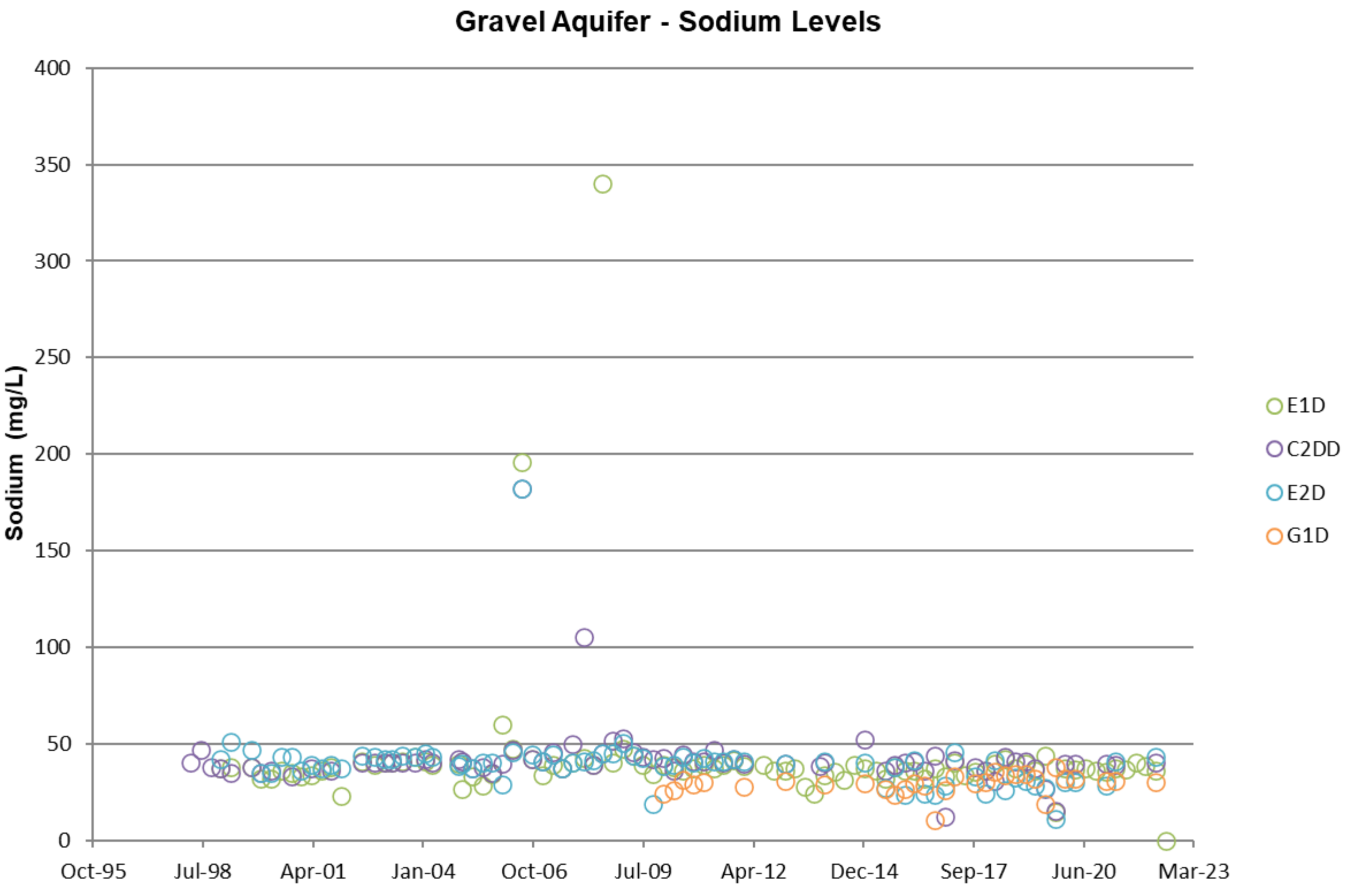

Gravel Aquifer - Boron Concentrations
Boron (mg/L)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D

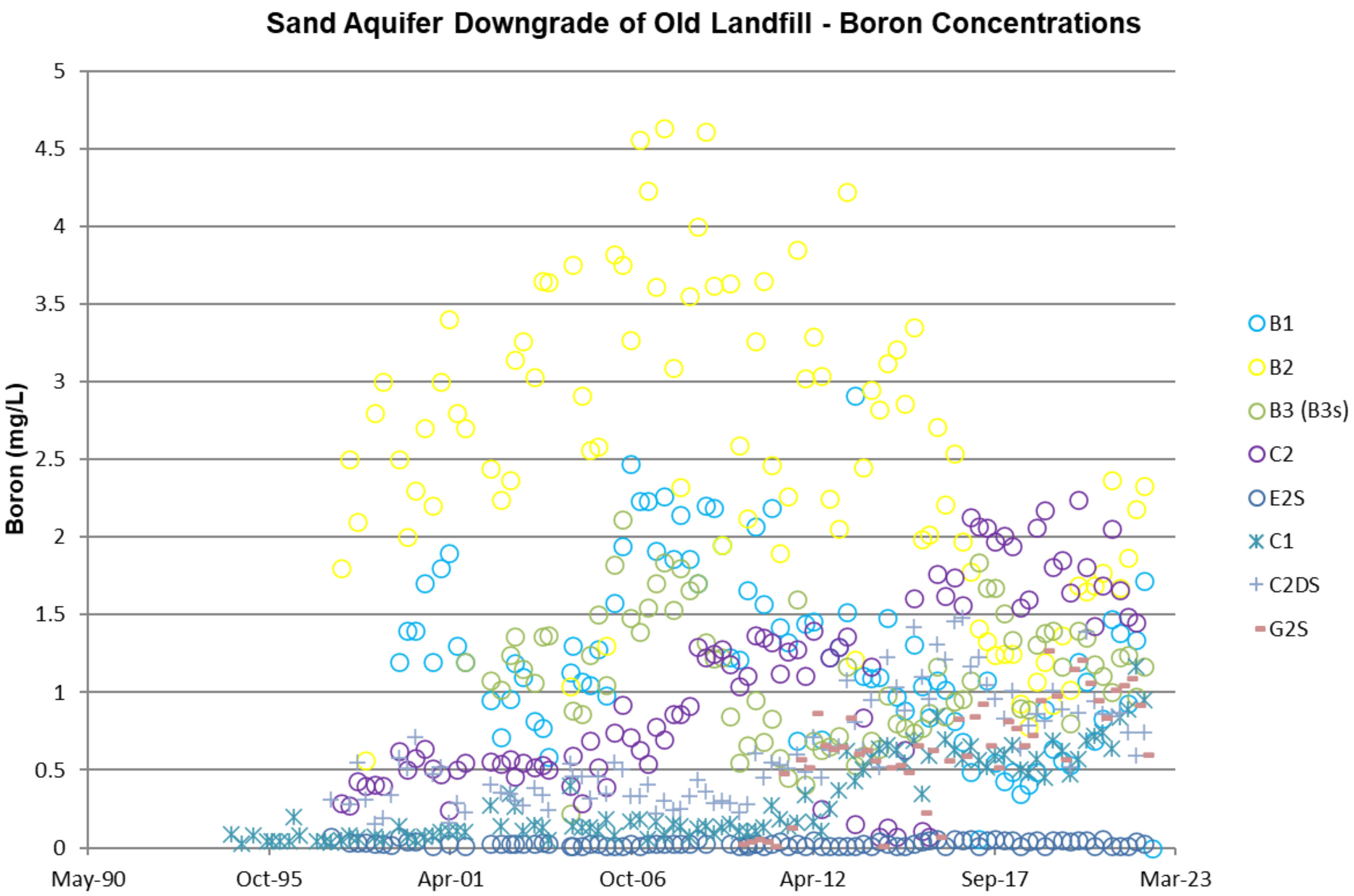

Gravel Aquifer - Chloride Concentrations
Chloride (mg/L)
400
350
300
250
200
150
100
50
0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D

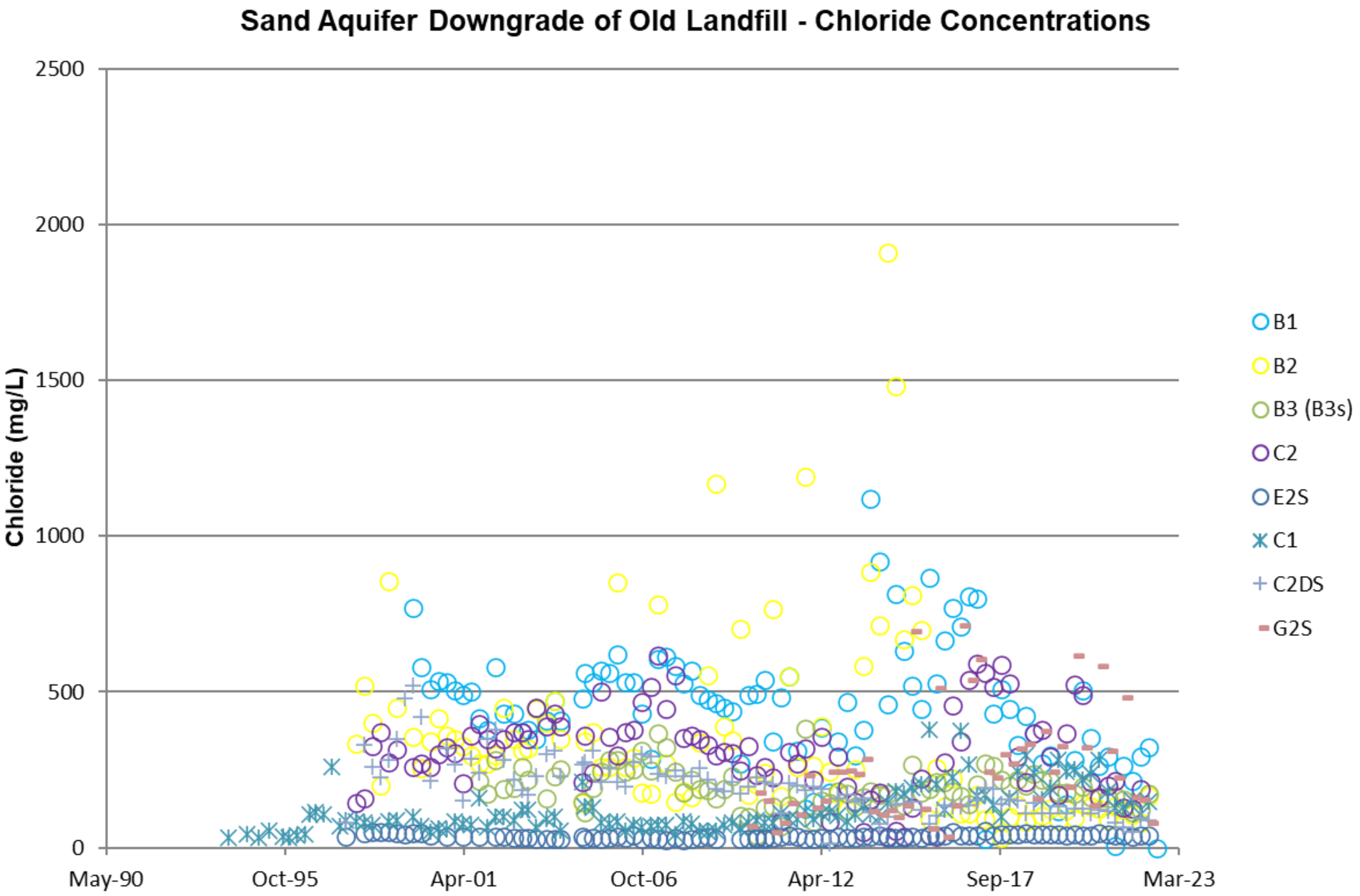

Gravel Aquifer - Ammoniacal-Nitrogen Concentrations
Ammoniacal-Ni (mg/L)
45
40
35
30
25
20
15
10
5
0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D

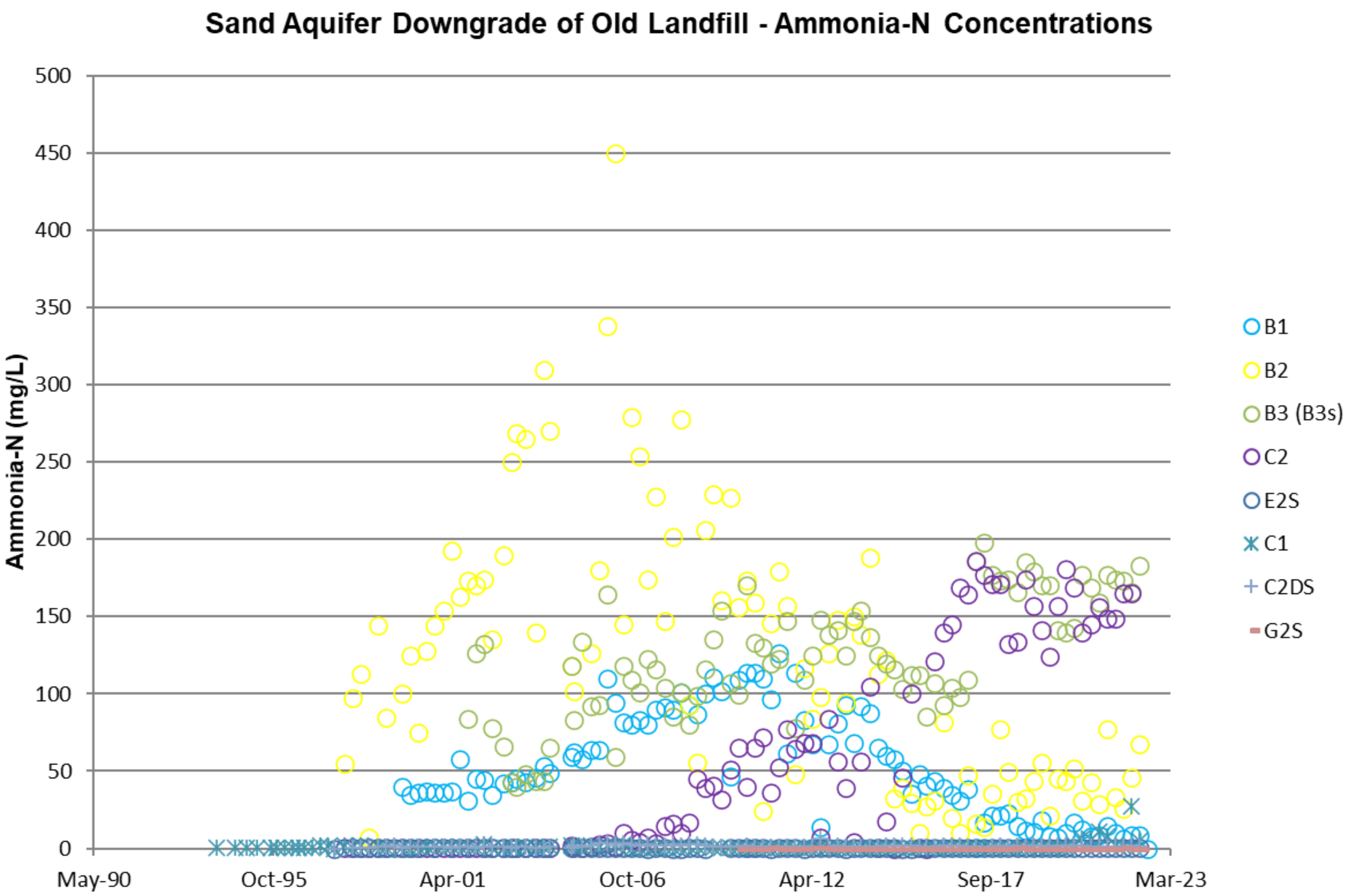

Gravel Aquifer - Ammoniacal-Nitrogen Concentrations
Note scale is Logarithmic
Ammoniacal-Ni (mg/L)
100.00
10.00
1.00
0.10
0.01
0.00
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D

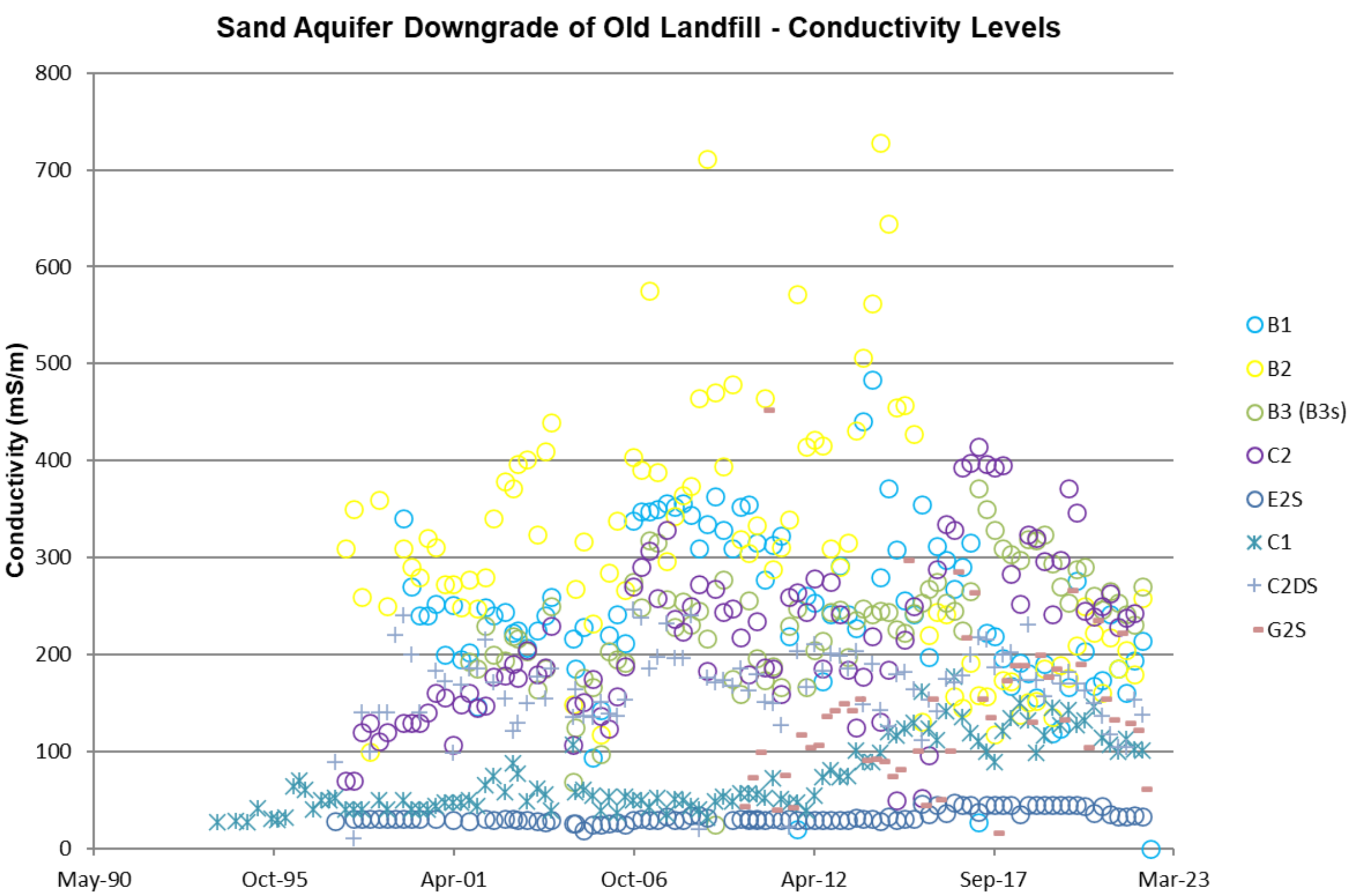

Gravel Aquifer - Conductivity Levels
Conductivity (mS/m)
500
450
400
350
300
250
200
150
100
50
0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D

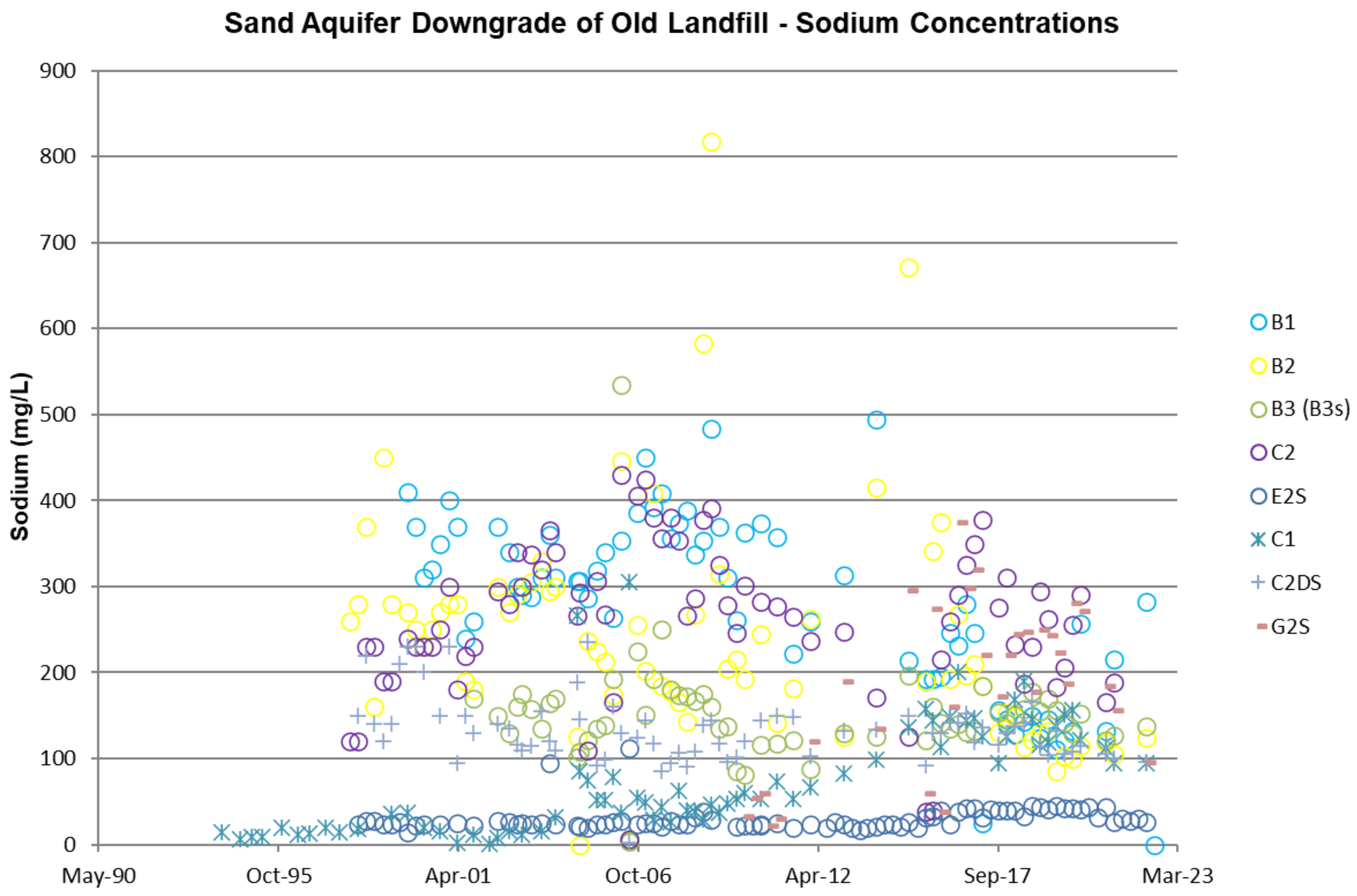

Gravel Aquifer - Sodium Levels
Sodium (mg/L)
400
350
300
250
200
150
100
50
0
Oct-95
Jul-98
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
E1D
C2DD
E2D
G1D


Sand Aquifer Downgrade of Old Landfill - Boron Concentrations
Boron (mg/L)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
May-90
Oct-95
Apr-01
Oct-06
Apr-12
Sep-17
Mar-23
B1
B2
B3 (B3s)
C2
E2S
C1
C2DS
G2S

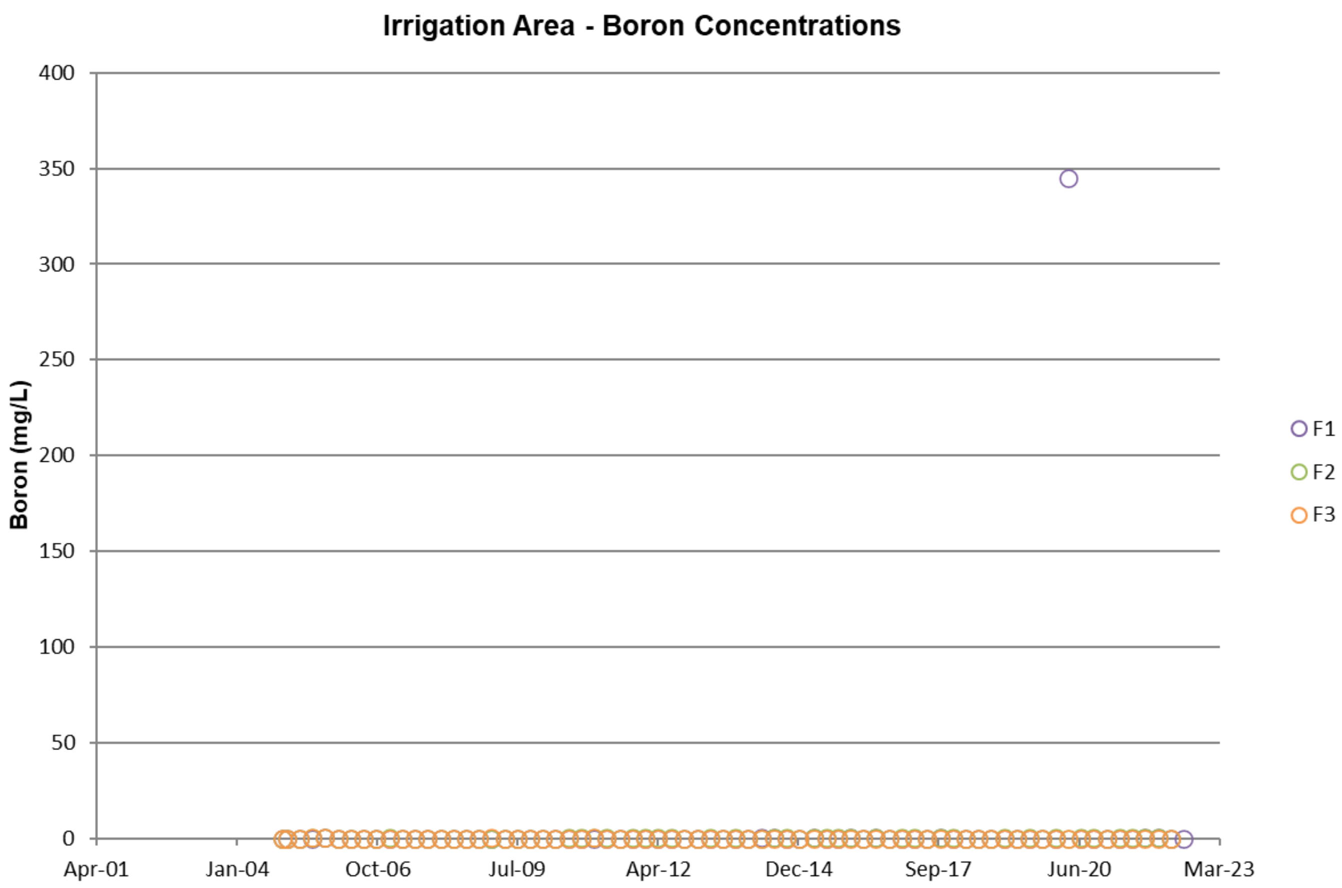

Sand Aquifer Downgrade of Old Landfill - Chloride Concentrations
Chloride (mg/L)
2500
2000
1500
1000
500
0
May-90
Oct-95
Apr-01
Oct-06
Apr-12
Sep-17
Mar-23
B1
B2
B3 (B3s)
C2
E2S
C1
C2DS
G2S


Sand Aquifer Downgrade of Old Landfill - Ammonia-N Concentrations
Ammonia-N (mg/L)
0
50
100
150
200
250
300
350
400
450
500
May-90
Oct-95
Apr-01
Oct-06
Apr-12
Sep-17
Mar-23
B1
B2
B3 (B3s)
C2
E2S
C1
C2DS
G2S

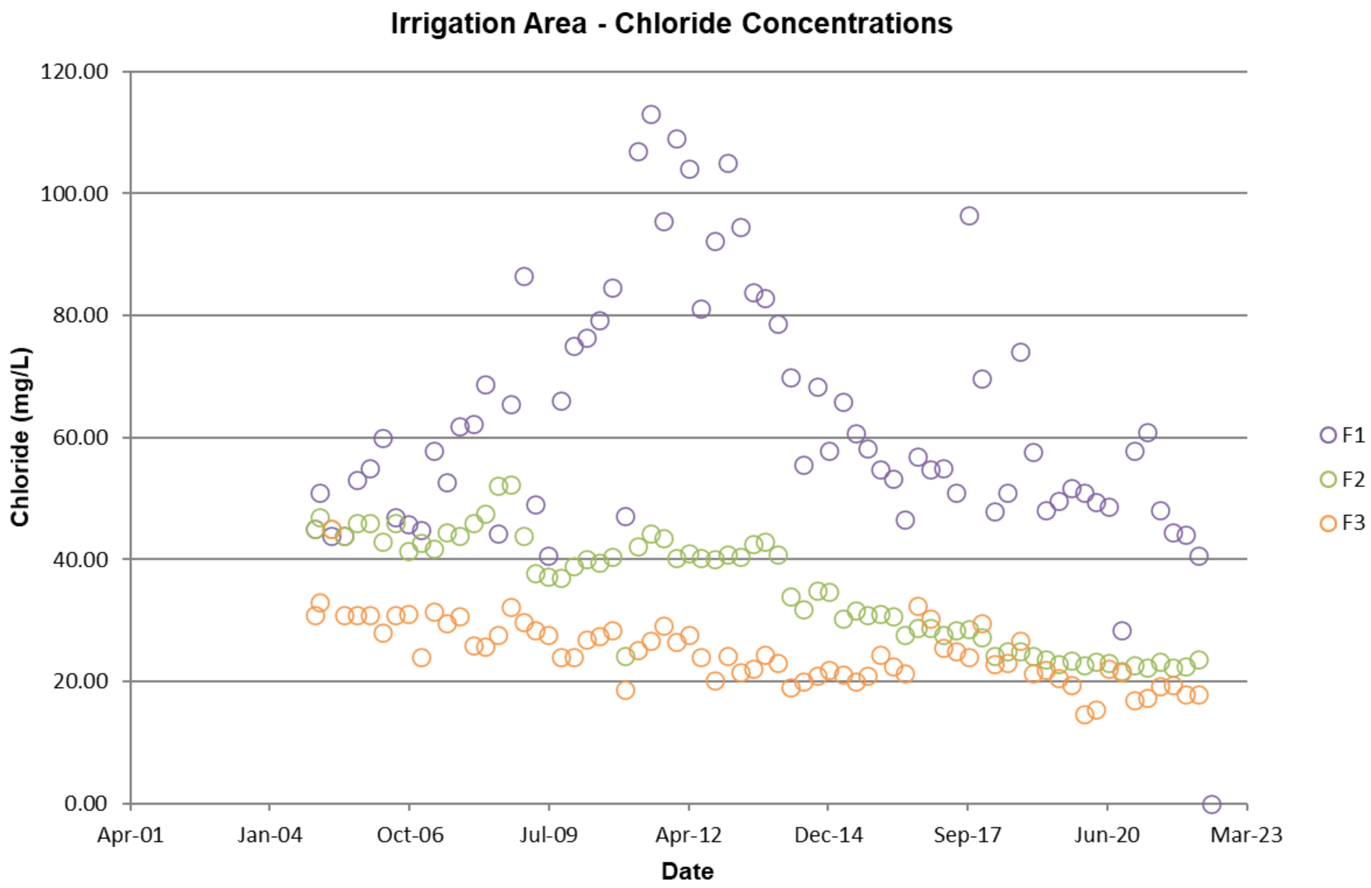

Sand Aquifer Downgrade of Old Landfill - Conductivity Levels
Conductivity (mS/m)
0
100
200
300
400
500
600
700
800
May-90
Oct-95
Apr-01
Oct-06
Apr-12
Sep-17
Mar-23
B1
B2
B3 (B3s)
C2
E2S
C1
C2DS
G2S



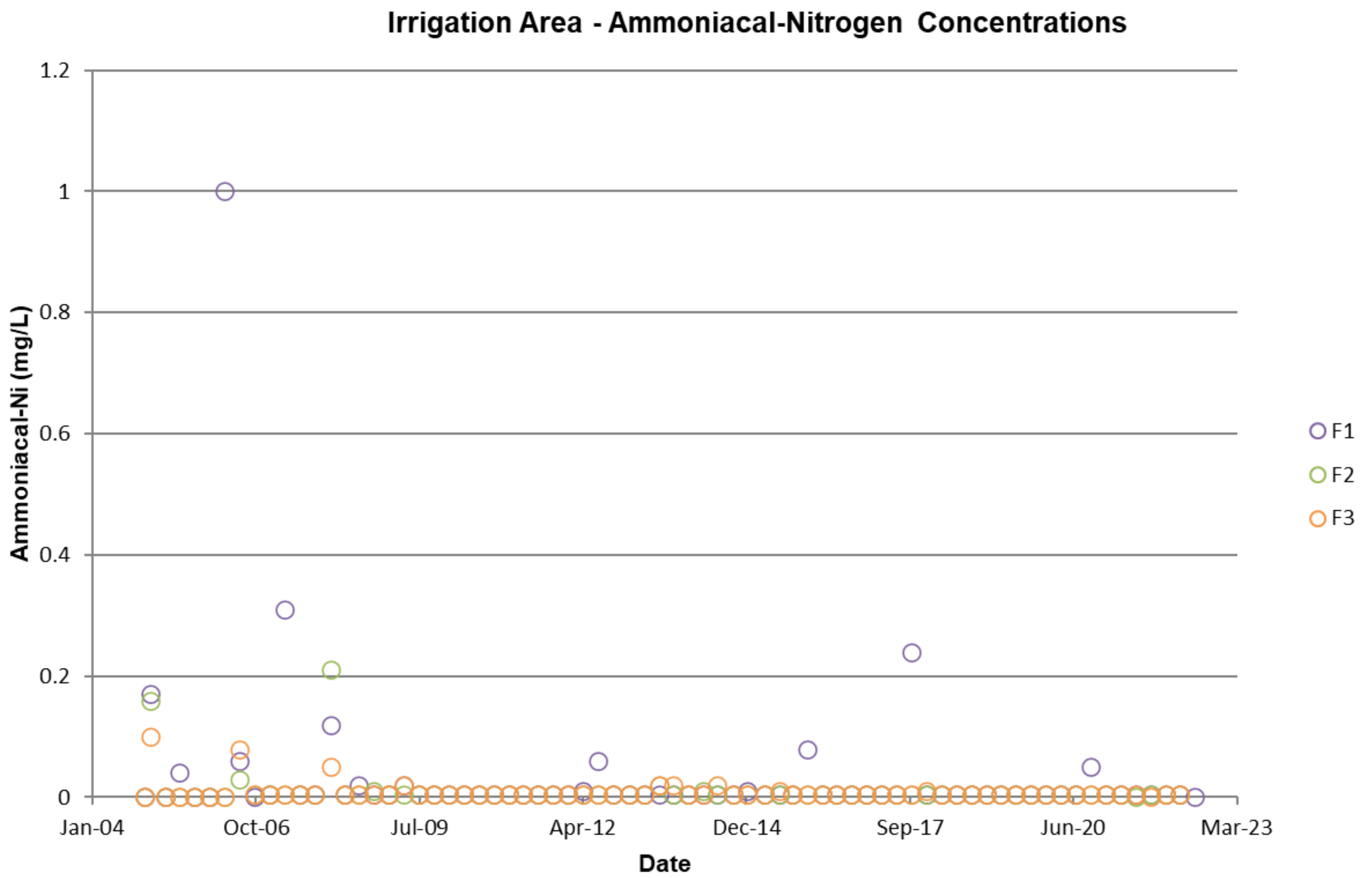
Sand Aquifer Downgrade of Old Landfill - Sodium Concentrations
Sodium (mg/L)
900
800
700
600
500
400
300
200
100
0
May-90
Oct-95
Apr-01
Oct-06
Apr-12
Sep-17
Mar-23
B1
B2
B3 (B3s)
C2
E2S
C1
C2DS
G2S



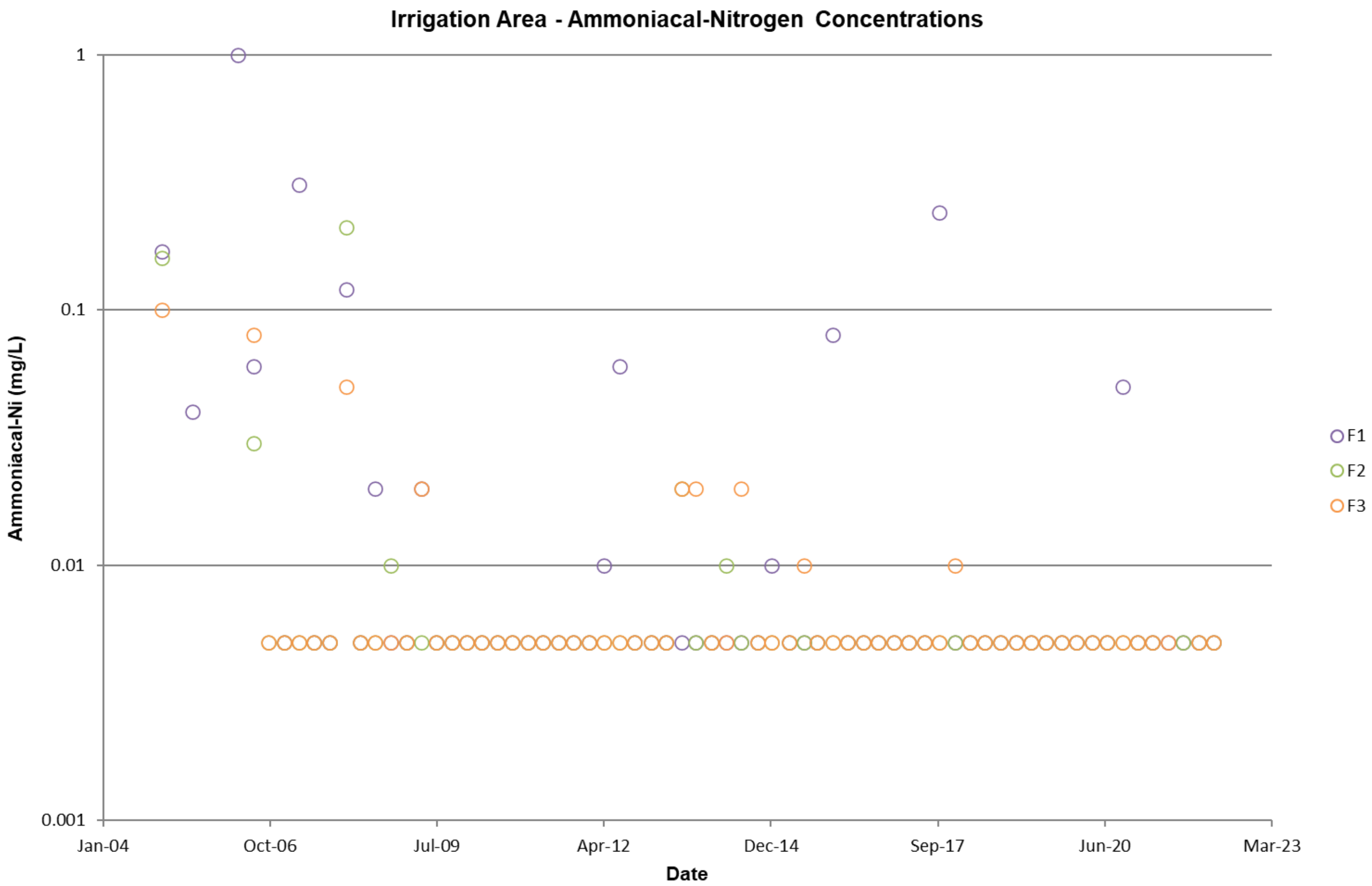
Irrigation Area - Boron Concentrations
Boron (mg/L)
400
350
300
250
200
150
100
50
0
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
F1
F2
F3

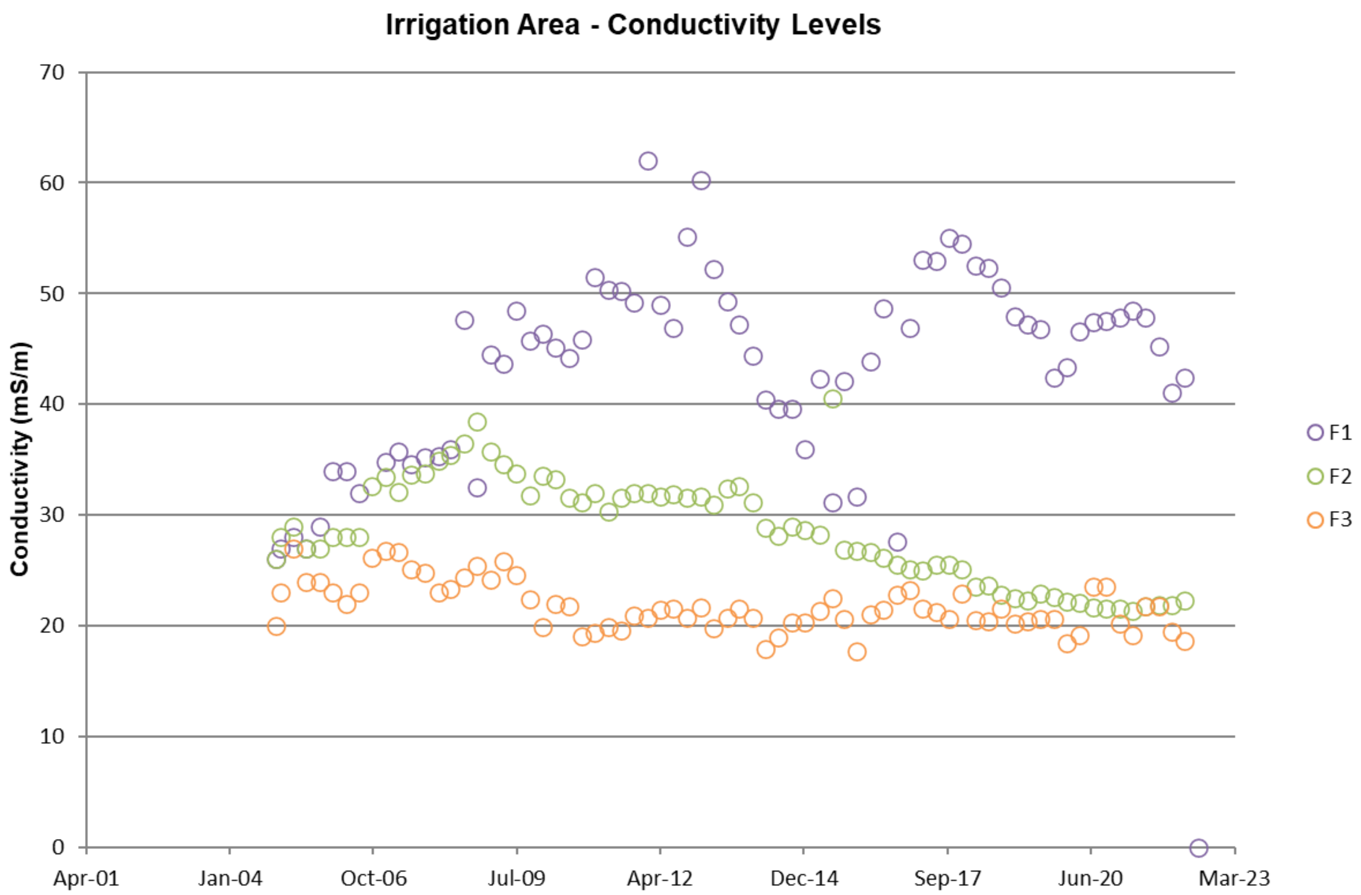


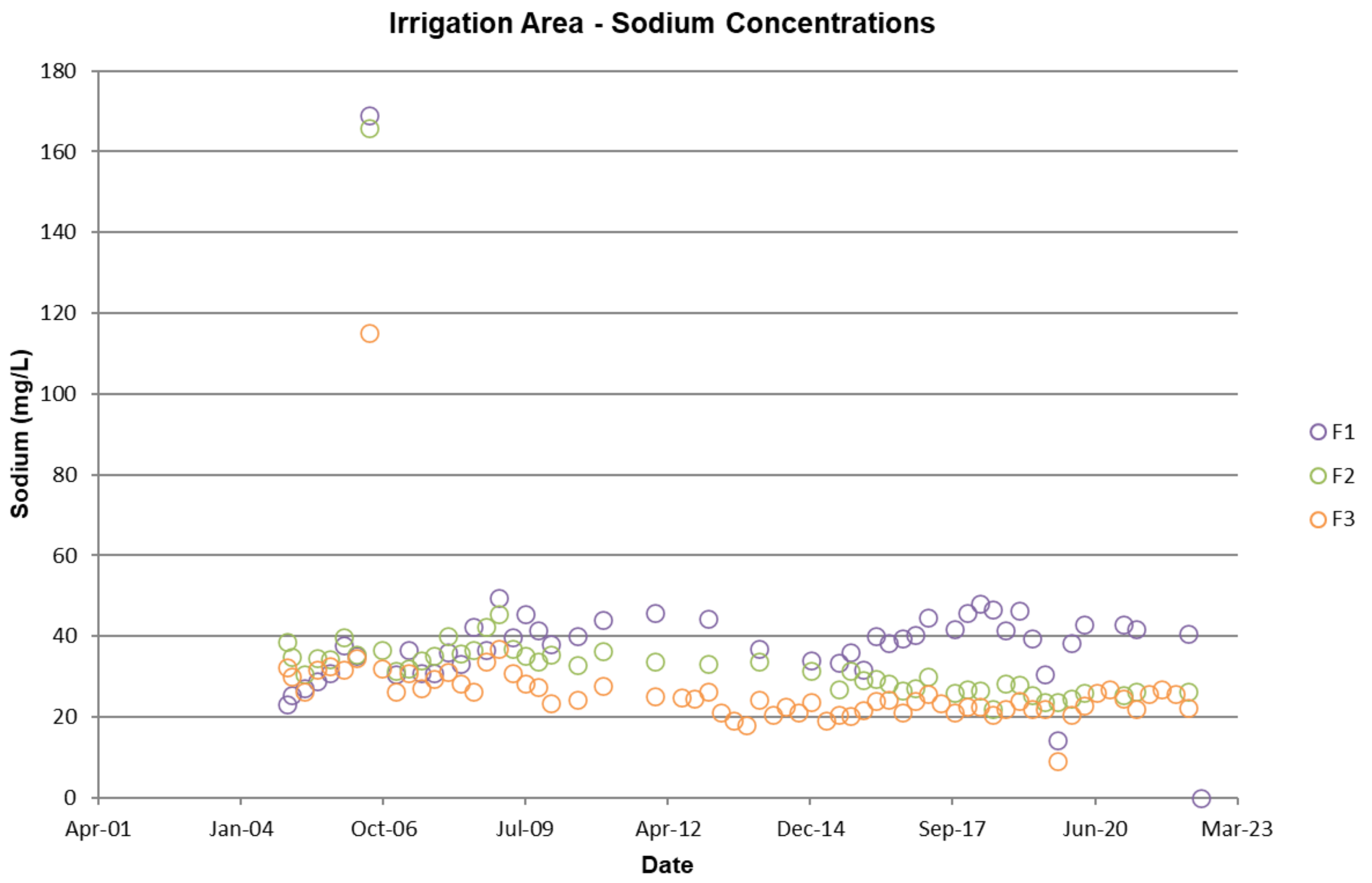
Irrigation Area - Chloride Concentrations
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Chloride (mg/L)
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
Date
F1
F2
F3



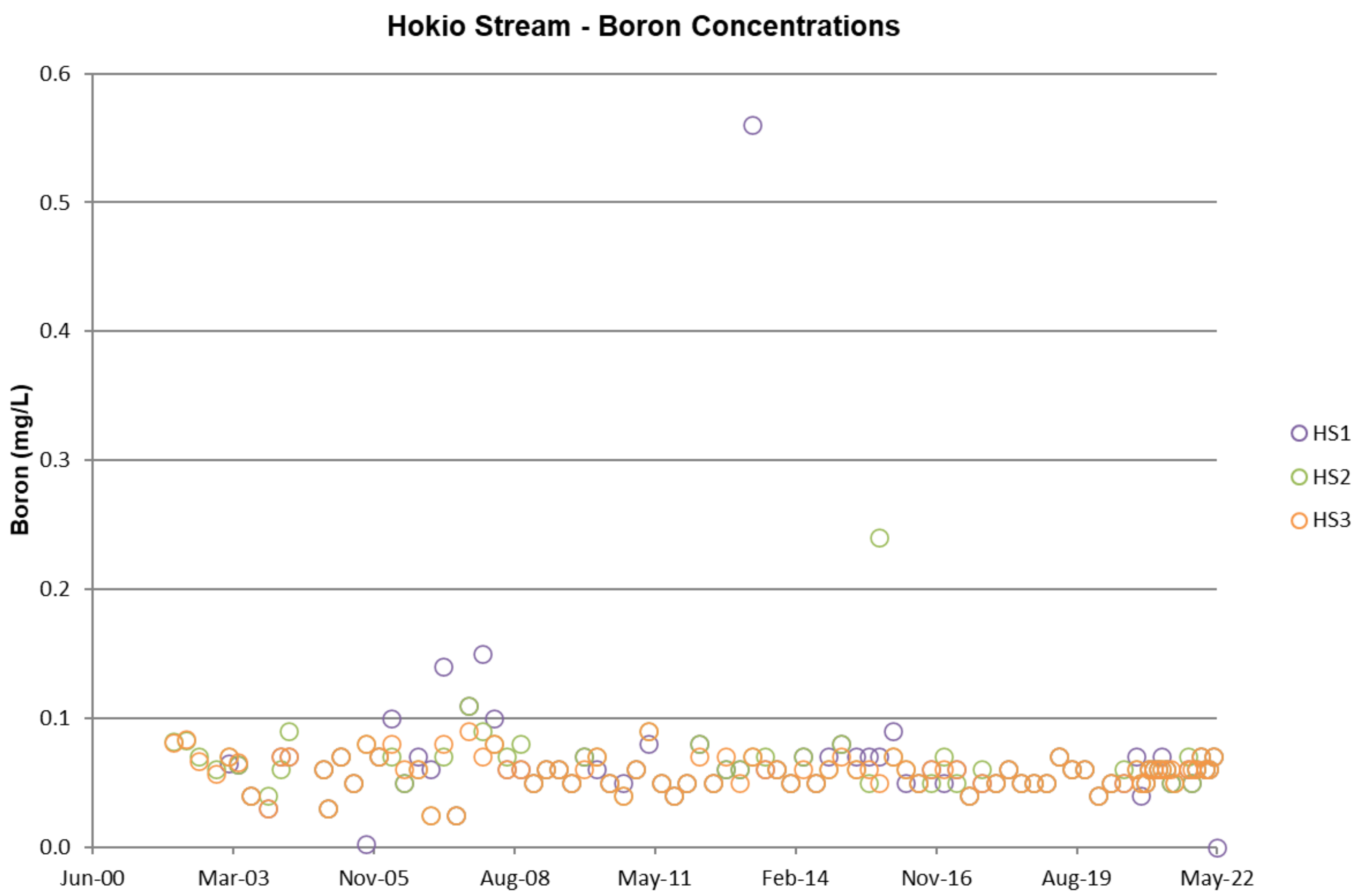
Irrigation Area - Ammoniacal-Nitrogen Concentrations
1.2
1
0.8
0.6
0.4
0.2
0
Ammoniacal-Ni (mg/L)
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
Date
F1
F2
F3


Irrigation Area - Ammoniacal-Nitrogen Concentrations
1
0.1
0.01
0.001
Ammoniacal-Ni (mg/L)
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
Date
F1
F2
F3

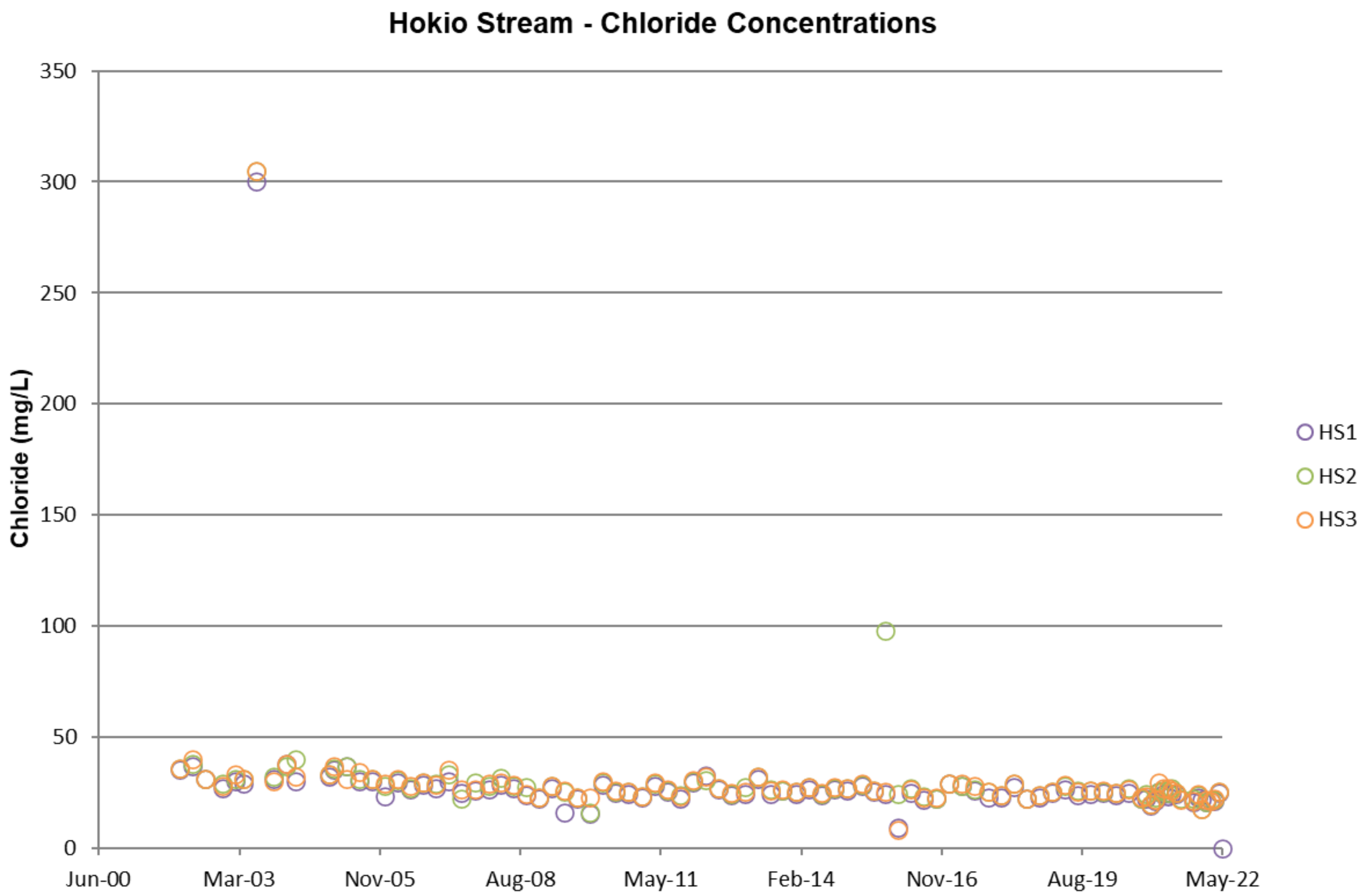

Irrigation Area - Conductivity Levels
70
60
50
40
30
20
10
0
Conductivity (mS/m)
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
F1
F2
F3

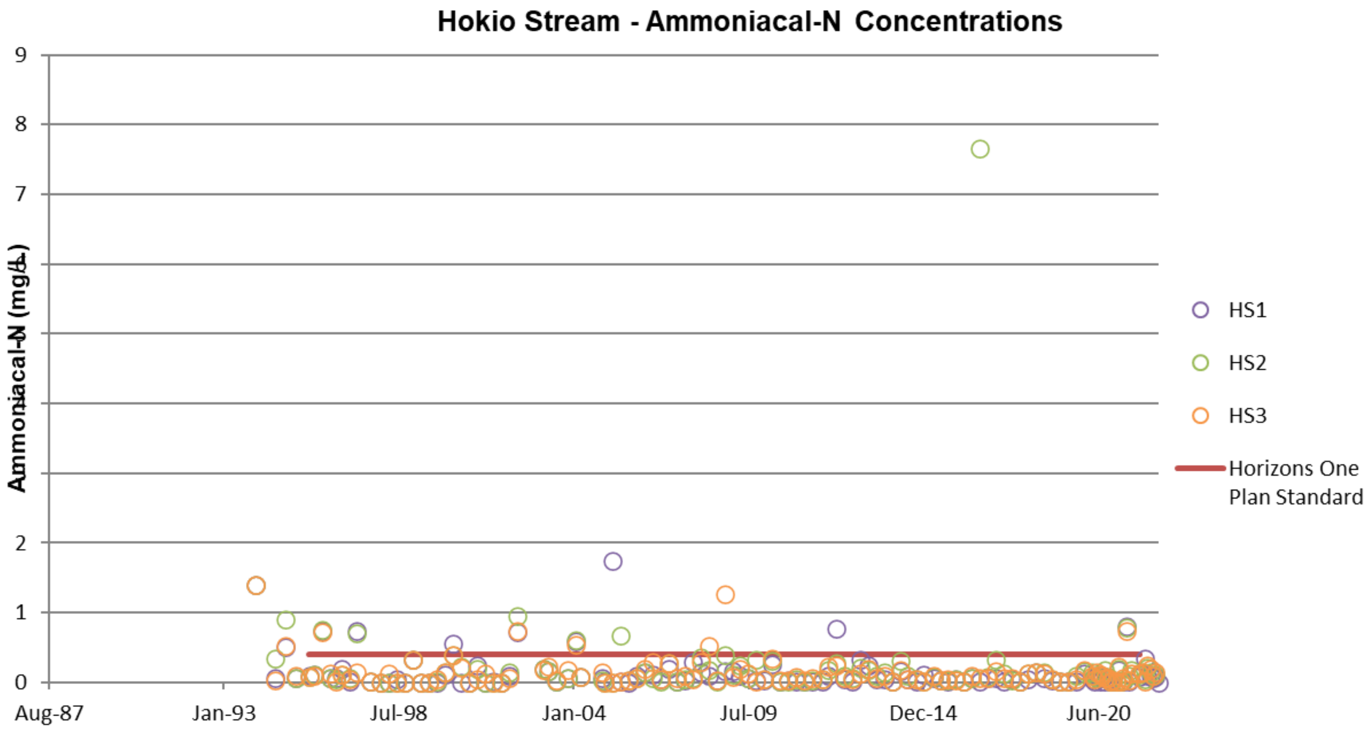


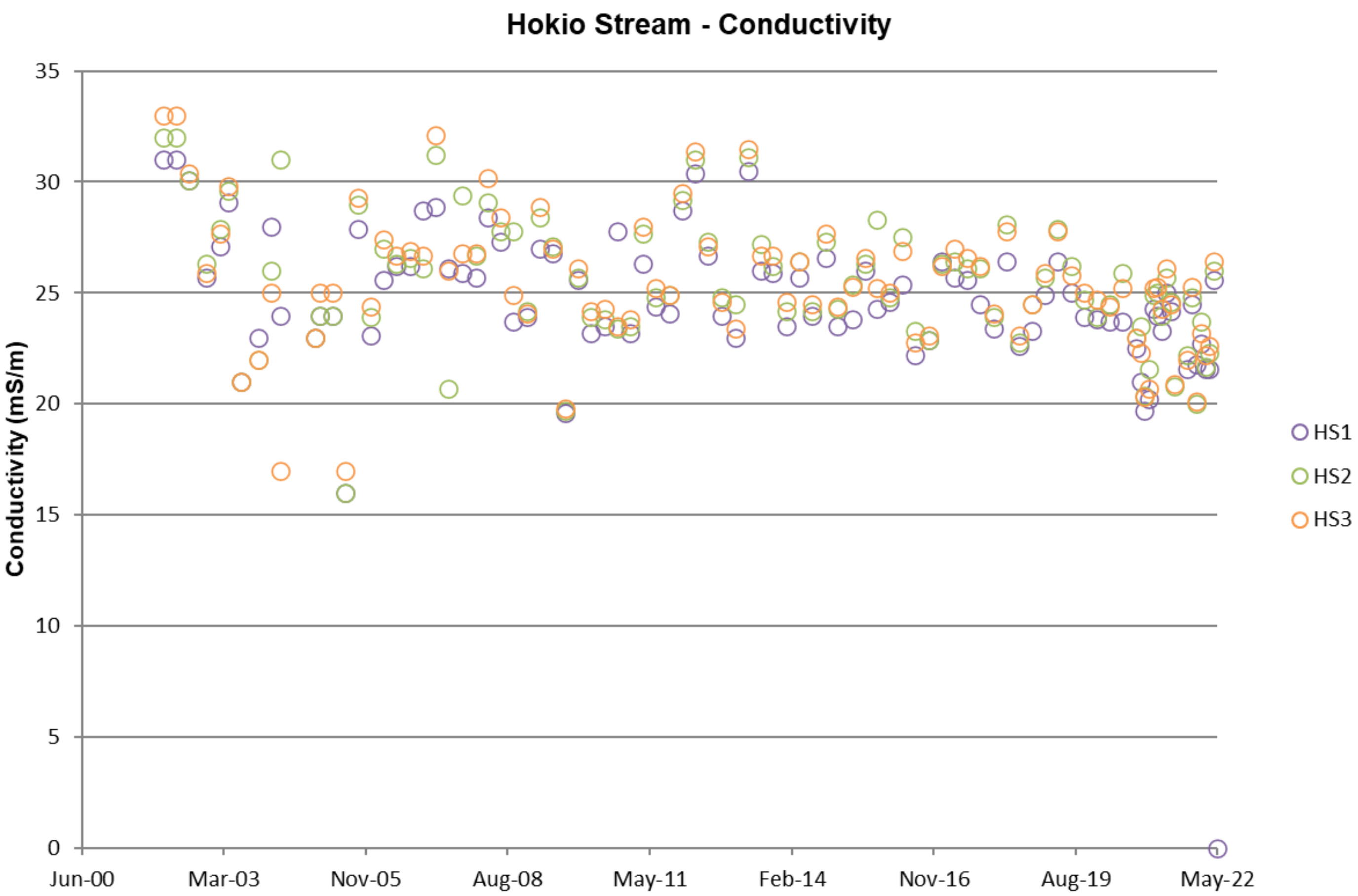
Irrigation Area - Sodium Concentrations
Sodium (mg/L)
0
20
40
60
80
100
120
140
160
180
Apr-01
Jan-04
Oct-06
Jul-09
Apr-12
Dec-14
Sep-17
Jun-20
Mar-23
Date
F1
F2
F3



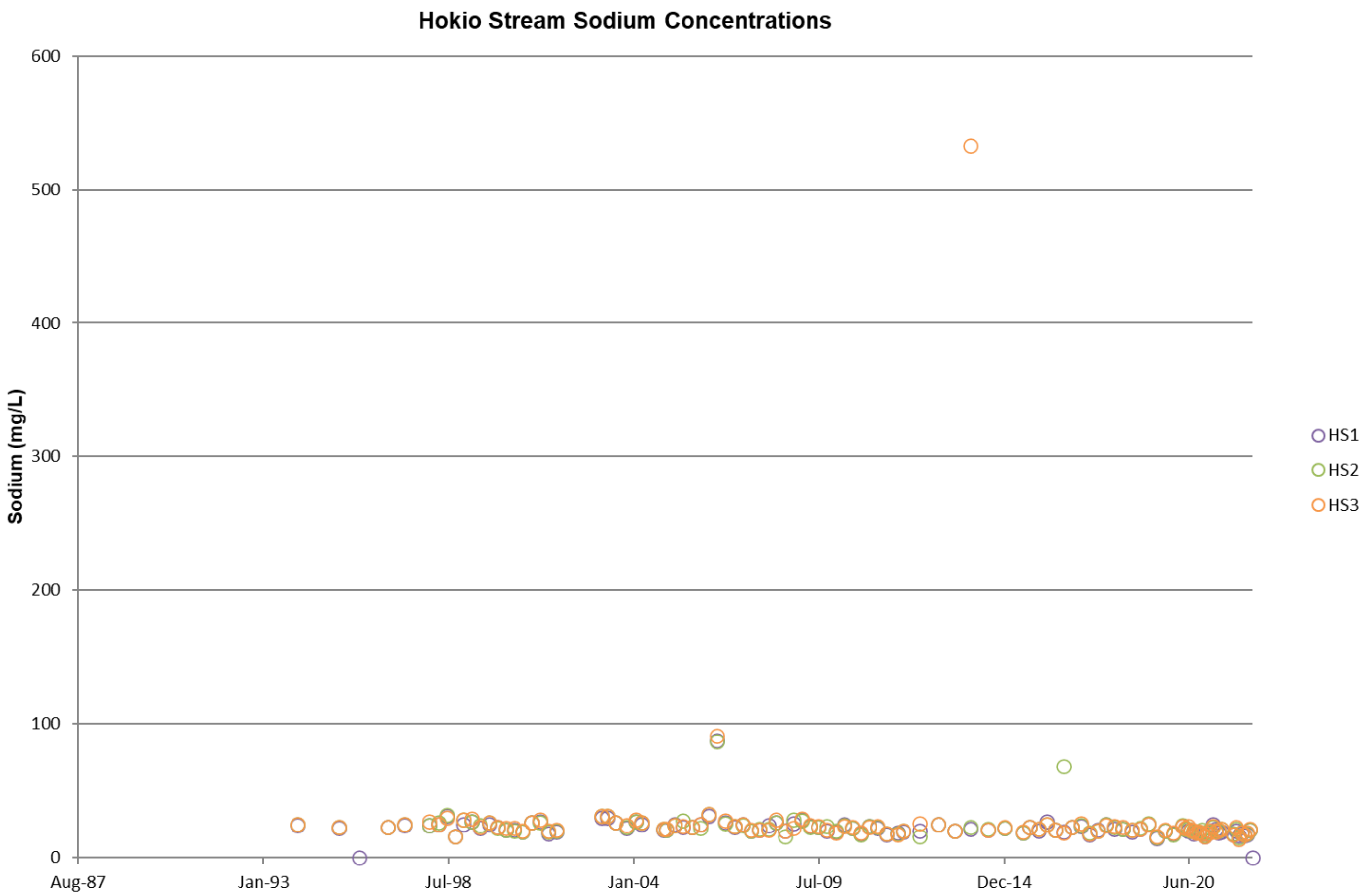
Hokio Stream - Boron Concentrations
Boron (mg/L)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
Jun-00
Mar-03
Nov-05
Aug-08
May-11
Feb-14
Nov-16
Aug-19
May-22
HS1
HS2
HS3


Hokio Stream - Chloride Concentrations
Chloride (mg/L)
350
300
250
200
150
100
50
0
Jun-00
Mar-03
Nov-05
Aug-08
May-11
Feb-14
Nov-16
Aug-19
May-22
HS1
HS2
HS3


Hokio Stream - Ammoniacal-N Concentrations
Ammoniacal-N (mg/L)
9
8
7
2
1
0
Aug-87
Jan-93
Jul-98
Jan-04
Jul-09
Dec-14
Jun-20
HS1
HS2
HS3
Horizons One Plan Standard



Hokio Stream - Conductivity
Conductivity (mS/m)
35
30
25
20
15
10
5
0
Jun-00
Mar-03
Nov-05
Aug-08
May-11
Feb-14
Nov-16
Aug-19
May-22
HS1
HS2
HS3



Hokio Stream Sodium Concentrations
Sodium (mg/L)
600
500
400
300
200
100
0
Aug-87
Jan-93
Jul-98
Jan-04
Jul-09
Dec-14
Jun-20
HS1
HS2
HS3

Appendix G Mass contaminant load calculations

LEVIN LANDFILL MASS CONTAMINANT LOAD CALCULATIONS

DOWN-GRADIENT BORES
B2, B3, C1, C2, C2DS, G2S, Xs1

Aquifer Thickness x Depth (W x D)

		Thickness (m)		
		5	10	15
Width (m	300	1500	3000	4500
	400	2000	4000	6000
	500	2500	5000	7500

Hydraulic Conductivity (K)

0.00002 m/s = 1.73 m/day — Assume range from 0.5 to 2m/day

0.5 1 2 — Based on field data collected July 2012

Hydraulic Gradient (i)

Assume = 0.0059

Concentration of Analytes in g/m3 (=C from B2, B3, C1, C2, C2DS, G2S and Xs1) - **excluding background**

	NH4 - N	Boron	Chloride	Sodium	Nitrate - N	DRP
Average of max. values last 5 years	70.981	1.485	283.048	166.971	19.841	-0.094
Average of median values last 5 years	54.831	1.015	158.164	125.976	2.509	-0.103

Discharge Volume (Q = W x D x K X i) in m3/day

K→

W x D ↓		0.5	1	2
1500		4.4	8.9	17.7
4000		11.8	23.6	47.2
7500		22.1	44.3	88.5

Mass Load (Q x C) in kg/day

DOWN-GRADIENT BORES
B2, B3, C1, C2, C2DS, G2S and Xs1
Excludes background

	W x D	C				
NH4-N	1500	70.98		0.31	0.63	1.26
		54.83		0.24	0.49	0.97
	4000	70.98		0.84	1.68	3.35
		54.83		0.65	1.29	2.59
	7500	70.98		1.57	3.14	6.28
		54.83		1.21	2.43	4.85
Boron	1500	1.485		0.007	0.013	0.026
		1.015		0.004	0.009	0.018
	4000	1.485		0.018	0.035	0.070
		1.015		0.012	0.024	0.048
	7500	1.485		0.033	0.066	0.131
		1.015		0.022	0.045	0.090
Chloride	1500	283.0		1.25	2.50	5.01
		158.2		0.70	1.40	2.80
	4000	283.0		3.34	6.68	13.36
		158.2		1.87	3.73	7.47
	7500	283.0		6.26	12.52	25.05
		158.2		3.50	7.00	14.00
Sodium	1500	167.0		0.74	1.48	2.96
		126.0		0.56	1.11	2.23
	4000	167.0		1.97	3.94	7.88
		126.0		1.49	2.97	5.95
	7500	167.0		3.69	7.39	14.78
		126.0		2.79	5.57	11.15
Nitrate N	1500	19.8414		0.09	0.18	0.35
		2.5089		0.0111	0.0222	0.0444
	4000	19.8414		0.23	0.47	0.94
		2.5089		0.0296	0.0592	0.1184
	7500	19.8414		0.44	0.88	1.76
		2.508929		0.056	0.111	0.222
DRP	1500	-0.094		-0.0004	-0.0008	-0.0017
		-0.103		-0.0005	-0.0009	-0.0018
	4000	-0.094		-0.0011	-0.0022	-0.0045
		-0.103		-0.0012	-0.0024	-0.0049
	7500	-0.094		-0.0021	-0.0042	-0.0084
		-0.103		-0.0023	-0.0046	-0.0091

SURFACE WATER (HOKIO STREAM) **Without Background**
HS1 and HS3

From Results data spreadsheet
Average of HS1A and HS1 (values in g/m3)

	NH4 - N	Boron	Chloride	Sodium	Nitrate N	DRP
max. values last 5 years	0.775	0.070	28.100	23.750	2.515	0.348
median values last 5 years	0.040	0.060	23.500	18.875	0.420	0.018

HS3 (values in g/m3)

	NH4 - N	Boron	Chloride	Sodium	Nitrate N	DRP
max. values last 5 years	0.730	0.070	29.300	24.800	2.690	0.391
median values last 5 years	0.090	0.060	24.500	20.300	0.455	0.024

Hokio Stream Characteristics

Minimum flow = **q** =	174	L/s	=	15034	m3/day

	Conc (u/s)	**q** x **C** (u/s)
NH4-N	0.04	0.60
Boron	0.06	0.90
Chloride	23.5	353.29
Sodium	18.875	283.76
Nitrate N	0.42	6.31
DRP	0.0175	0.26

Q + q = Combined Flow

W x D ↓	K→	0.5	1	2
1500		15038.0	15042.5	15051.3
4000		15045.4	15057.2	15080.8
7500		15055.7	15077.9	15122.1

Calculated Concentration Downstream, in Hokio Stream
Without background

NH4-N	1500	70.98		0.06	0.08	0.12
		54.83		0.06	0.07	0.10
	4000	70.98		0.10	0.15	0.26
		54.83		0.08	0.13	0.21
	7500	70.98		0.14	0.25	0.46
		54.83		0.12	0.20	0.36
Boron	1500	1.485		0.06	0.06	0.06
		1.015		0.06	0.06	0.06
	4000	1.485		0.06	0.06	0.06
		1.015		0.06	0.06	0.06
	7500	1.485		0.06	0.06	0.07
		1.014524		0.06	0.06	0.07
Chloride	1500	283.0		23.58	23.65	23.81
		158.2		23.54	23.58	23.66
	4000	283.0		23.70	23.91	24.31
		158.2		23.61	23.71	23.92
	7500	283.0		23.88	24.26	25.02
		158.2		23.70	23.90	24.29
Sodium	1500	167.0		18.92	18.96	19.05
		126.0		18.91	18.94	19.00
	4000	167.0		18.99	19.11	19.34
		126.0		18.96	19.04	19.21
	7500	167.0		19.09	19.31	19.74
		126.0		19.03	19.19	19.50
Nitrate N	1500	19.8414		0.43	0.43	0.44
		2.5089		0.42	0.42	0.42
	4000	19.8414		0.44	0.45	0.48
		2.5089		0.42	0.42	0.43
	7500	19.8414		0.45	0.48	0.53
		2.5089		0.42	0.43	0.43
DRP	1500	-0.094		0.017	0.017	0.017
		-0.103		0.017	0.017	0.017
	4000	-0.094		0.017	0.017	0.017
		-0.103		0.017	0.017	0.017
	7500	-0.094		0.017	0.017	0.017
		-0.103		0.017	0.017	0.017

Parameter	Min	Max
NH4-N	0.06	0.46
Boron	0.06	0.07
Chloride	23.54	25.02
Sodium	18.91	19.74
Nitrate N	0.42	0.53
DRP	0.017	0.017

LEVIN LANDFILL MASS CONTAMINANT LOAD CALCULATIONS

DOWN-GRADIENT BORES
B2, B3, C1, C2, C2DS, G2S, Xs1

Aquifer Thickness x Depth (W x D)

		Thickness (m)		
		5	10	15
Width (m	300	1500	3000	4500
	400	2000	4000	6000
	500	2500	5000	7500

Hydraulic Conductivity (K)

0.00002 m/s = 1.73 m/day — Assume range from 0.5 to 2m/day

0.5 1 2 — Based on field data collected July 2012

Hydraulic Gradient (i)

Assume = 0.0059

Concentration of Analytes in g/m3 (=C from B2, B3, C1, C2, C2DS, G2S and Xs1) - **including background**

	NH4 - N	Boron	Chloride	Sodium	Nitrate - N	DRP
Average of max. values last 5 years	70.993	1.529	320.714	197.571	22.291	0.058
Average of median values last 5 years	54.836	1.043	182.714	152.143	3.534	0.024

Discharge Volume (Q = W x D x K X i) in m3/day

W x D ↓	K→	0.5	1	2
1500		4.4	8.9	17.7
4000		11.8	23.6	47.2
7500		22.1	44.3	88.5

Mass Load (Q x C) in kg/day

DOWN-GRADIENT BORES
B2, B3, C1, C2, C2DS, G2S and Xs1
Includes background

	W x D	C				
NH4-N	1500	70.99	Max.	0.31	0.63	1.26
		54.84	Med.	0.24	0.49	0.97
	4000	70.99	Max.	0.84	1.68	3.35
		54.84	Med.	0.65	1.29	2.59
	7500	70.99	Max.	1.57	3.14	6.28
		54.84	Med.	1.21	2.43	4.85
Boron	1500	1.529	Max.	0.007	0.014	0.027
		1.043	Med.	0.005	0.009	0.018
	4000	1.529	Max.	0.018	0.036	0.072
		1.043	Med.	0.012	0.025	0.049
	7500	1.529	Max.	0.034	0.068	0.135
		1.043	Med.	0.023	0.046	0.092
Chloride	1500	320.7	Max.	1.42	2.84	5.68
		182.7	Med.	0.81	1.62	3.23
	4000	320.7	Max.	3.78	7.57	15.14
		182.7	Med.	2.16	4.31	8.62
	7500	320.7	Max.	7.10	14.19	28.38
		182.7	Med.	4.04	8.09	16.17
Sodium	1500	197.6	Max.	0.87	1.75	3.50
		152.1	Med.	0.67	1.35	2.69
	4000	197.6	Max.	2.33	4.66	9.33
		152.1	Med.	1.80	3.59	7.18
	7500	197.6	Max.	4.37	8.74	17.49
		152.1	Med.	3.37	6.73	13.46
Nitrate N	1500	22.2914	Max.	0.10	0.20	0.39
		3.5339	Med.	0.02	0.03	0.06
	4000	22.2914	Max.	0.26	0.53	1.05
		3.5339	Med.	0.04	0.08	0.17
	7500	22.2914	Max.	0.49	0.99	1.97
		3.5339	Med.	0.08	0.16	0.31
DRP	1500	0.058	Max.	0.000	0.001	0.001
		0.024	Med.	0.000	0.000	0.000
	4000	0.058	Max.	0.001	0.001	0.003
		0.024	Med.	0.000	0.001	0.001
	7500	0.058	Max.	0.001	0.003	0.005
		0.024	Med.	0.001	0.001	0.002

SURFACE WATER (HOKIO STREAM) **Includes background**
HS1 and HS3

From Results data spreadsheet
Average of HS1A and HS1 (values in g/m3)

	NH4 - N	Boron	Chloride	Sodium	Nitrate N	DRP
max. values last 5 years	0.775	0.070	28.100	23.750	2.515	0.348
median values last 5 years	0.040	0.060	23.500	18.875	0.420	0.018

HS3 (values in g/m3)

	NH4 - N	Boron	Chloride	Sodium	Nitrate N	DRP
max. values last 5 years	0.730	0.070	29.300	24.800	2.690	0.391
median values last 5 years	0.090	0.060	24.500	20.300	0.455	0.024

Hokio Stream Characteristics

Minimum flow = **q** = 174 L/s = 15034 m3/day

	Conc (upstream = u/s)	**q** x **C** (u/s) in kg/day
NH4-N	0.04	0.60
Boron	0.06	0.90
Chloride	23.5	353.29
Sodium	18.875	283.76
Nitrate N	0.42	6.31
DRP	0.0175	0.26

Q + q = Combined Flow (m3/day)

W x D ↓ / K→		0.5	1	2
1500		15038.0	15042.5	15051.3
4000		15045.4	15057.2	15080.8
7500		15055.7	15077.9	15122.1

Calculated Concentration Downstream, in Hokio Stream
Accounting for background

NH4-N	1500	70.99		0.06	0.08	0.12	Min	0.06
		54.84		0.06	0.07	0.10	Max	0.46
	4000	70.99		0.10	0.15	0.26		
		54.84		0.08	0.13	0.21		
	7500	70.99		0.14	0.25	0.46		
		54.84		0.12	0.20	0.36		
Boron	1500	1.529		0.06	0.06	0.06	Min	0.06
		1.043		0.06	0.06	0.06	Max	0.07
	4000	1.529		0.06	0.06	0.06		
		1.043		0.06	0.06	0.06		
	7500	1.529		0.06	0.06	0.07		
		1.043		0.06	0.06	0.07		
Chloride	1500	320.7		23.59	23.67	23.85	Min	23.55
		182.7		23.55	23.59	23.69	Max	25.24
	4000	320.7		23.73	23.97	24.43		
		182.7		23.62	23.75	24.00		
	7500	320.7		23.94	24.37	25.24		
		182.7		23.73	23.97	24.43		
Sodium	1500	197.6		18.93	18.98	19.09	Min	18.91
		152.1		18.91	18.95	19.03	Max	19.92
	4000	197.6		19.02	19.16	19.43		
		152.1		18.98	19.08	19.29		
	7500	197.6		19.14	19.40	19.92		
		152.1		19.07	19.27	19.65		
Nitrate N	1500	22.2914		0.43	0.43	0.45	Min	0.42
		3.5339		0.42	0.42	0.42	Max	0.55
	4000	22.2914		0.44	0.45	0.49		
		3.5339		0.42	0.42	0.43		
	7500	22.2914		0.45	0.48	0.55		
		3.5339		0.42	0.43	0.44		
DRP	1500	0.0579		0.018	0.018	0.018	Min	0.018
		0.0240		0.018	0.018	0.018	Max	0.018
	4000	0.0579		0.018	0.018	0.018		
		0.0240		0.018	0.018	0.018		
	7500	0.0579		0.018	0.018	0.018		
		0.0240		0.018	0.018	0.018		

Appendix H Odour assessments

Created	Entry Number	User	Gps Coordinates	Location - Wind direction	Reason for investigation	Wind speed	Cloud cover	Temperature	Odour detection	Odour intensity	Odour character	General hedonic tone
05-07-21 8:52	120000	Yvette Falloon	-40.610716, 175.216377	E - From NW	Proactive	3 - Gentle breeze	6 - Mostly cloudy	4 - Cold	Yes	3 - Distinct	10 - Faecal, manure, sewer	Not reported
02-08-21 11:03	120995	Dorothy Zeng	-40.610385, 175.210654	G - From NE	Proactive	2 - Light breeze	1 - Sunny	4 - Cold	Yes	2 - Weak	20 - Fresh rubbish	Not reported
20-09-21 13:55	122799	Dorothy Zeng	-40.609749, 175.216656	D - From W	Proactive	3 - Gentle breeze	6 - Mostly cloudy	4 - Cold	Yes	1 - Very weak	4 - Herbal, green, cut grass	0 - Neutral
19-10-21 14:05	123898	Yvette Falloon	-40.61082, 175.216728	E - From NW	Proactive	3 - Gentle breeze	2 - Mostly sunny	2 - Mild	Yes	1 - Very weak	4 - Herbal, green, cut grass	0 - Neutral
05-11-21 11:17	124541	Yvette Falloon	-40.602719, 175.214093	A - From S	Proactive	1 - Light air	6 - Mostly cloudy	3 - Cool	Yes	2 - Weak	1 - Fragrant	0 - Neutral
28-01-22 11:12	129410	Dorothy Zeng	-40.610226, 175.213664	D - From W	Proactive	1 - Light air	1 - Sunny	1 - Warm	Yes	1 - Very weak	4 - Herbal, green, cut grass	0 - Neutral
25-03-22 9:02	131421	Yvette Falloon	-40.602824, 175.214058	A - From S	Proactive	4 - Moderate breeze	8 - Overcast	3 - Cool	No	0 - No odour		
25-03-22 9:37	131427	Yvette Falloon	-40.603842, 175.213504	A - From S	Proactive	3 - Gentle breeze	8 - Overcast	3 - Cool	Yes	3 - Distinct	4 - Herbal, green, cut grass	0 - Neutral
29-04-22 13:50	132738	Yvette Falloon	-40.610846, 175.2167	E - From NW	Proactive	4 - Moderate breeze	1 - Sunny	3 - Cool	No	0 - No odour		

Created	Apparent source of odour	Further Details	Conclusion	Action undertaken	Problem status	By (name)	Time assessment finished	Picture
05-07-21 8:52	Next door stock	Can smell the farm next door and pine trees. No odour related to the landfill.	I did detect odour and consider it would not be objectionable, UNLESS it became continuous	N/A	Not applicable	Y Falloon, X Zeng	8:57	120000_Picture_156998_20210705-0852.jpg
02-08-21 11:03	Tip face fresh rubbish	NE boundary adjoins farmland lots, so some distance from residential households.	I did detect odour and consider it would not be objectionable, UNLESS it became continuous	N/A	Not applicable	D Zeng	11:08 AM	120995_Picture_156998_20210802-1103.jpg
20-09-21 13:55	Grass and trees	N/A	I did detect odour and consider it would not be objectionable at any location for any duration or frequency	N/A	Not applicable	D Zeng	2:02 PM	122799_Picture_156998_20210920-1355.jpg
19-10-21 14:05	Long grass	N/A	I did detect odour and consider it would not be objectionable at any location for any duration or frequency	N/A	Not applicable	Yvette Falloon, Dorothy Zeng	14:10	123898_Picture_156998_20211019-1405.jpg
05-11-21 11:17	Long grass and flowers by gate. Could not detect any other odour	Taken from the landfill gate on Hokio Beach Road.	not be objectionable at any location for any duration or frequency	N/A	Not applicable	Y Falloon	11:22	
28-01-22 11:12	Tree and grass	N/A	I did detect odour and consider it would not be objectionable at any location for any duration or frequency	N/A	Not applicable		11:17 AM	
25-03-22 9:02	N/A	Assessment taken from landfill gate	I did not detect any odour	N/A	Not applicable	Y Falloon	9:07	131421_Picture_156998_20220325-0902.jpg
25-03-22 9:37	Pine trees, grass etc		I did detect odour and consider it would not be objectionable at any location for any duration or frequency	N/A	Not applicable	Y Falloon	9:42	131427_Picture_156998_20220325-0937.jpg
29-04-22 13:50	N/A	Flare has been inconsistently on and off for the past week. No odour detected at boundary.	I did not detect any odour	N/A		Y Falloon, D Zeng	14:00	132738_Picture_156998_20220429-1350.jpg

Appendix I Gas sampling

Created	Entry Number	User	Gps Coords.	Borehole	Methane (% CH_4)	Carbon Dioxide (% CO_2)	Hydrogen Sulphide (% H_2S)	Oxygen (% O_2)	Gas flow rate	Nitrogen	Carbon Monoxide (CO)	Gas pressure	Barometric pressure	Temp.	Weather conditions	Wind speed m/s	Air temp. °C
15-10-15 14:03	840	Peter Giddins		Levin Landfill: Levin B1	0	0	0	20.5							Breeze	1.3	15
15-10-15 14:03	841	Peter Giddins		Levin Landfill: Levin B2	0	0	0	20.4									
15-10-15 14:03	842	Peter Giddins		Levin Landfill: Levin B3s	0	0	0	20.3									
15-10-15 14:03	843	Peter Giddins		Levin Landfill: Levin C1	0	0	0	20.5									
15-10-15 14:03	844	Peter Giddins		Levin Landfill: Levin C2	0	0	0	20.4									
15-10-15 14:03	845	Peter Giddins		Levin Landfill: Levin C2dd	0	0	0	20.5									
15-10-15 14:03	846	Peter Giddins		Levin Landfill: Levin C2ds	0	0	0	20.3									
15-10-15 14:03	847	Peter Giddins		Levin Landfill: Levin D1	0	0	0	20.4									
15-10-15 14:03	848	Peter Giddins		Levin Landfill: Levin D2	0	0	0	20.3									
15-10-15 14:03	849	Peter Giddins		Levin Landfill: Levin D3	0	0	0	20.5									
15-10-15 14:03	850	Peter Giddins		Levin Landfill: Levin D4	0	0	0	20.4									
15-10-15 14:03	851	Peter Giddins		Levin Landfill: Levin D5	0	0	0	20.3									
15-10-15 14:03	852	Peter Giddins		Levin Landfill: Levin D6	0	0	0	20.4									
15-10-15 14:03	853	Peter Giddins		Levin Landfill: Levin E1d	0	0	0	20.3									
15-10-15 14:03	854	Peter Giddins		Levin Landfill: Levin E1s	0	0	0	20.4									
15-10-15 14:03	855	Peter Giddins		Levin Landfill: Levin E2d	0	0	0	20.4									
15-10-15 14:03	856	Peter Giddins		Levin Landfill: Levin E2s	0	0	0	20.4									
15-10-15 14:03	857	Peter Giddins		Levin Landfill: Levin F1	0	0	0	20.4									
15-10-15 14:03	858	Peter Giddins		Levin Landfill: Levin F2	0	0	0	20.3									
15-10-15 14:03	859	Peter Giddins		Levin Landfill: Levin F3	0	0	0	20.5									
15-10-15 14:03	860	Peter Giddins		Levin Landfill: Levin G1d	0	0	0	20.3									
15-10-15 14:03	861	Peter Giddins		Levin Landfill: Levin G1s	0	0	0	20.4									
15-10-15 14:03	862	Peter Giddins		Levin Landfill: Levin G2s	0	0	0	20.5									
28-01-16 8:22	25636	Marcus Coley		Levin Landfill: Levin B1	0	0	0	20.9									
28-01-16 8:22	25637	Marcus Coley		Levin Landfill: Levin B2	0	0	0	20.9									
28-01-16 8:22	25638	Marcus Coley		Levin Landfill: Levin B3s	0	0	0	20.9									
28-01-16 8:22	25639	Marcus Coley		Levin Landfill: Levin C1	0	0	0	20.7									
28-01-16 8:22	25640	Marcus Coley		Levin Landfill: Levin C2	0	0	0	20.9									
28-01-16 8:22	25641	Marcus Coley		Levin Landfill: Levin C2dd	0	0	0	20.9									
28-01-16 8:22	25642	Marcus Coley		Levin Landfill: Levin C2ds	0	0	0	20.9									
28-01-16 8:22	25643	Marcus Coley		Levin Landfill: Levin C3	0	0	0	20.9									
28-01-16 8:22	25644	Marcus Coley		Levin Landfill: Levin D1	0	0	0	20.9									
28-01-16 8:22	25645	Marcus Coley		Levin Landfill: Levin D2	0	0	0	20.9									
28-01-16 8:22	25646	Marcus Coley		Levin Landfill: Levin D2	0	0	0	20.9									
28-01-16 8:22	25647	Marcus Coley		Levin Landfill: Levin D3	0	0	0	20.9									
28-01-16 8:22	25648	Marcus Coley		Levin Landfill: Levin D3r	0	0	0	20.5									
28-01-16 8:22	25649	Marcus Coley		Levin Landfill: Levin D4	0	0	0	20.9									
28-01-16 8:22	25650	Marcus Coley		Levin Landfill: Levin D5	0	0	0	20.9									
28-01-16 8:22	25651	Marcus Coley		Levin Landfill: Levin D6	0	0	0	20.9									
28-01-16 8:22	25652	Marcus Coley		Levin Landfill: Levin E1d	0	0	0	20.9									
28-01-16 8:22	25653	Marcus Coley		Levin Landfill: Levin E1s	0	0	0	20.9									
28-01-16 8:22	25654	Marcus Coley		Levin Landfill: Levin E2d	0	0	0	20.9									
28-01-16 8:22	25655	Marcus Coley		Levin Landfill: Levin E2s	0	0	0	20.9									
28-01-16 8:22	25656	Marcus Coley		Levin Landfill: Levin F1	0	0	0	20.9									
28-01-16 8:22	25657	Marcus Coley		Levin Landfill: Levin F2	0	0	0	20.9									
28-01-16 8:22	25658	Marcus Coley		Levin Landfill: Levin F3	0	0	0	20.9									
28-01-16 8:22	25659	Marcus Coley		Levin Landfill: Levin G1d	0	0	0	20.9									
28-01-16 8:22	25660	Marcus Coley		Levin Landfill: Levin G1s	0	0	0	20.9									

28-01-16 8:22	25661	Marcus Coley		Levin Landfill: Levin G2s	0	0	0	20.9										
19-04-16 14:59	18651	Adrian Parkes		Levin Landfill: Levin B1	0	0	0	21										
19-04-16 15:01	18652	Adrian Parkes		Levin Landfill: Levin B2	0	0	0	21										
19-04-16 15:01	18653	Adrian Parkes		Levin Landfill: Levin B3s	0	0	0	20.9										
19-04-16 15:03	18654	Adrian Parkes		Levin Landfill: Levin C1	0	0	0	21.1										
19-04-16 15:04	18655	Adrian Parkes		Levin Landfill: Levin C2	0	0	0	21										
19-04-16 15:05	18656	Adrian Parkes		Levin Landfill: Levin C2dd	0	0	0	21.1										
19-04-16 15:05	18657	Adrian Parkes		Levin Landfill: Levin C2ds	0	0	0	21										
19-04-16 15:06	18658	Adrian Parkes		Levin Landfill: Levin D1	0	0	0	20.9										
19-04-16 15:10	18659	Adrian Parkes		Levin Landfill: Levin D2	0	0	0	21										
19-04-16 15:11	18660	Adrian Parkes		Levin Landfill: Levin D3r	0	0	0	21										
19-04-16 15:12	18661	Adrian Parkes		Levin Landfill: Levin D4	0	0	0	20.9										
19-04-16 15:12	18662	Adrian Parkes		Levin Landfill: Levin D5	0	0	0	21										
19-04-16 15:13	18663	Adrian Parkes		Levin Landfill: Levin D6	0	0	0	20.9										
19-04-16 15:14	18664	Adrian Parkes		Levin Landfill: Levin E1d	0	0	0	21										
19-04-16 15:14	18665	Adrian Parkes		Levin Landfill: Levin E1s	0	0	0	21										
19-04-16 15:17	18666	Adrian Parkes		Levin Landfill: Levin E2s	0	0	0	21										
19-04-16 15:18	18667	Adrian Parkes		Levin Landfill: Levin E2d	0	0	0	21										
19-04-16 15:36	18670	Adrian Parkes		Levin Landfill: Levin F1	0	0	0	20.9										
19-04-16 15:37	18672	Adrian Parkes		Levin Landfill: Levin F2	0	0	0	20.9										
19-04-16 15:37	18673	Adrian Parkes		Levin Landfill: Levin F3	0	0	0	20.9										
19-04-16 15:42	18678	Adrian Parkes		Levin Landfill: Levin G1d	0	0	0	20.9										
19-04-16 15:43	18680	Adrian Parkes		Levin Landfill: Levin G1s	0	0	0	21										
19-04-16 15:44	18682	Adrian Parkes		Levin Landfill: Levin G2s	0	0	0	21.1										
20-07-16 13:25	25561	Marcus Coley		Levin Landfill: Levin B1	0	0	0	20.9										
20-07-16 13:25	25562	Marcus Coley		Levin Landfill: Levin B2	0	0	0	19.9										
20-07-16 13:25	25563	Marcus Coley		Levin Landfill: Levin B3s	0	0	0	20.9										
20-07-16 13:25	25564	Marcus Coley		Levin Landfill: Levin C1	0	0	0	20.9										
20-07-16 13:25	25565	Marcus Coley		Levin Landfill: Levin C2	0	0	0	20.8										
20-07-16 13:25	25566	Marcus Coley		Levin Landfill: Levin C2dd	0	0	0	20.9										
20-07-16 13:25	25567	Marcus Coley		Levin Landfill: Levin C2ds	0	0	0	20.9										
20-07-16 13:25	25568	Marcus Coley		Levin Landfill: Levin C3	0	0	0	20.9										
20-07-16 13:25	25569	Marcus Coley		Levin Landfill: Levin D1	0	0	0	20.9										
20-07-16 13:25	25570	Marcus Coley		Levin Landfill: Levin D2	0	0	0	20.9										
20-07-16 13:25	25571	Marcus Coley		Levin Landfill: Levin D3	0	0	0	20.9										
20-07-16 13:25	25572	Marcus Coley		Levin Landfill: Levin D3r	0	0	0	20.9										
20-07-16 13:25	25573	Marcus Coley		Levin Landfill: Levin D4	0	0	0	20.9										
20-07-16 13:25	25574	Marcus Coley		Levin Landfill: Levin D5	0	0	0	20.9										
20-07-16 13:25	25575	Marcus Coley		Levin Landfill: Levin D6	0	0	0	20.9										
20-07-16 13:25	25576	Marcus Coley		Levin Landfill: Levin E1d	0	0	0	20.9										
20-07-16 13:25	25577	Marcus Coley		Levin Landfill: Levin E1s	0	0	0	20.9										
20-07-16 13:25	25578	Marcus Coley		Levin Landfill: Levin E2d	0	0	0	20.9										
20-07-16 13:25	25579	Marcus Coley		Levin Landfill: Levin E2s	0	0	0	20.9										
20-07-16 13:25	25580	Marcus Coley		Levin Landfill: Levin F1	0	0	0	20.9										
20-07-16 13:25	25581	Marcus Coley		Levin Landfill: Levin F2	0	0	0	20.7										
20-07-16 13:25	25582	Marcus Coley		Levin Landfill: Levin F3	0	0	0	20.9										
20-07-16 13:25	25583	Marcus Coley		Levin Landfill: Levin G1d	0	0	0	20.9										
20-07-16 13:25	25584	Marcus Coley		Levin Landfill: Levin G1s	0	0	0	20.9										
20-07-16 13:25	25585	Marcus Coley		Levin Landfill: Levin G2s	0	0	0	20.9										
19-10-16 15:23	31437	Marcus Coley		Levin Landfill: Levin B1	0	0	0	20.9										

19-10-16 15:23	31438	Marcus Coley		Levin Landfill: Levin B3s	3	0	0	5.1									
19-10-16 15:23	31439	Marcus Coley		Levin Landfill: Levin B2	3	0	0	5.1									
19-10-16 15:23	31440	Marcus Coley		Levin Landfill: Levin B3s	0	0	0	20.9									
19-10-16 15:23	31441	Marcus Coley		Levin Landfill: Levin C1	0	0	0	20.9									
19-10-16 15:23	31442	Marcus Coley		Levin Landfill: Levin C2	3	0	0	19.8									
19-10-16 15:23	31443	Marcus Coley		Levin Landfill: Levin C2dd	0	0	0	20.6									
19-10-16 15:23	31444	Marcus Coley		Levin Landfill: Levin C2ds	0	0	0	20.6									
19-10-16 15:23	31445	Marcus Coley		Levin Landfill: Levin D1	0	0	0	20.9									
19-10-16 15:23	31446	Marcus Coley		Levin Landfill: Levin D2	0	0	0	20.5									
19-10-16 15:23	31447	Marcus Coley		Levin Landfill: Levin D3	1	0	0	20.4									
19-10-16 15:23	31448	Marcus Coley		Levin Landfill: Levin D4	0	0	0	20.9									
19-10-16 15:23	31449	Marcus Coley		Levin Landfill: Levin D5	0	0	0	20.9									
19-10-16 15:23	31450	Marcus Coley		Levin Landfill: Levin D6	0	0	0	20.9									
19-10-16 15:23	31451	Marcus Coley		Levin Landfill: Levin E1d	0	0	0	20.9									
19-10-16 15:23	31452	Marcus Coley		Levin Landfill: Levin E1s	0	0	0	20.9									
19-10-16 15:23	31453	Marcus Coley		Levin Landfill: Levin E2d	0	0	0	20.9									
19-10-16 15:23	31454	Marcus Coley		Levin Landfill: Levin E2s	0	0	0	20.9									
19-10-16 15:23	31455	Marcus Coley		Levin Landfill: Levin F1	0	0	0	20.9									
19-10-16 15:23	31456	Marcus Coley		Levin Landfill: Levin F1	0	0	0	20.9									
19-10-16 15:23	31457	Marcus Coley		Levin Landfill: Levin F2	0	0	0	20.9									
19-10-16 15:23	31458	Marcus Coley		Levin Landfill: Levin F3	0	0	0	20.9									
19-10-16 15:23	31459	Marcus Coley		Levin Landfill: Levin G1d	0	0	0	20.9									
19-10-16 15:23	31460	Marcus Coley		Levin Landfill: Levin G2s	0	0	0	20.9									
19-10-16 15:23	31461	Marcus Coley		Levin Landfill: Levin G2s	0	0	0	20.9									
24-01-17 14:58	36748	Mal Rolston		Levin Landfill: Levin B1	0	0	0	20.9									
24-01-17 14:58	36749	Mal Rolston		Levin Landfill: Levin B2	0	0	0	20.9									
24-01-17 14:58	36750	Mal Rolston		Levin Landfill: Levin B3s	0	0	0	20.9									
24-01-17 14:58	36751	Mal Rolston		Levin Landfill: Levin C1	0	0	0	20.9									
24-01-17 14:58	36752	Mal Rolston		Levin Landfill: Levin C2	0	0	0	20.9									
24-01-17 15:00	36753	Mal Rolston		Levin Landfill: Levin C2dd	0	0	0	20.7									
24-01-17 15:00	36754	Mal Rolston		Levin Landfill: Levin C2ds	0	0	0	20.9									
24-01-17 15:00	36755	Mal Rolston		Levin Landfill: Levin D1	0	0	0	20.9									
24-01-17 15:00	36756	Mal Rolston			0	0	0	20.7									
24-01-17 15:00	36757	Mal Rolston		Levin Landfill: Levin D3	0	0	0	20.9									
24-01-17 15:00	36758	Mal Rolston		Levin Landfill: Levin D4	0	0	0	20.9									
24-01-17 15:05	36759	Mal Rolston		Levin Landfill: Levin D5	0	0	0	20.9									
24-01-17 15:05	36760	Mal Rolston		Levin Landfill: Levin D6	0	0	0	20.9									
24-01-17 15:05	36761	Mal Rolston		Levin Landfill: Levin D6	0	0	0	20.9									
24-01-17 15:05	36762	Mal Rolston		Levin Landfill: Levin E1d	0	0	0	20.9									
24-01-17 15:05	36763	Mal Rolston		Levin Landfill: Levin E1s	0	0	0	20.9									
24-01-17 15:05	36764	Mal Rolston		Levin Landfill: Levin E2s	0	0	0	20.8									
24-01-17 15:05	36765	Mal Rolston		Levin Landfill: Levin E2d	0	0	0	20.7									
24-01-17 15:05	36766	Mal Rolston		Levin Landfill: Levin F1	0	0	0	20.7									
24-01-17 15:05	36767	Mal Rolston		Levin Landfill: Levin F2	0	0	0	20.8									
24-01-17 15:05	36768	Mal Rolston		Levin Landfill: Levin G1d	0	0	0	20.9									
24-01-17 15:05	36769	Mal Rolston		Levin Landfill: Levin G1s	0	0	0	20.9									
24-01-17 15:05	36770	Mal Rolston		Levin Landfill: Levin G2s	0	0	0	20.9									
19-05-17 15:07	45413	Jonathon Sinclair		Levin Landfill: Levin B1	0	20.9	0	0									
19-05-17 15:07	45414	Jonathon Sinclair		Levin Landfill: Levin B2	0	20.9	0	0									
19-05-17 15:07	45415	Jonathon Sinclair		Levin Landfill: Levin B3s	0	20.9	0	0									

19-05-17 15:07	45416	Jonathon Sinclair		Levin Landfill: Levin C1	0	20.9	0	0									
19-05-17 15:07	45417	Jonathon Sinclair		Levin Landfill: Levin C2	0	20.8	0	0									
19-05-17 15:07	45418	Jonathon Sinclair		Levin Landfill: Levin C2dd	0	20.6	0	0									
19-05-17 15:07	45419	Jonathon Sinclair		Levin Landfill: Levin C2ds	0	20.9	0	0									
19-05-17 15:07	45420	Jonathon Sinclair		Levin Landfill: Levin C2ds	0	20.9	0	0									
19-05-17 15:07	45421	Jonathon Sinclair		Levin Landfill: Levin D1	0	20.9	0	0									
19-05-17 15:07	45422	Jonathon Sinclair		Levin Landfill: Levin D2	0	20.9	0	0									
19-05-17 15:07	45423	Jonathon Sinclair		Levin Landfill: Levin D3	0	20.9	0	0									
19-05-17 15:07	45424	Jonathon Sinclair		Levin Landfill: Levin D4	0	20.8	0	0									
19-05-17 15:07	45425	Jonathon Sinclair		Levin Landfill: Levin D5	0	20.9	0	0									
19-05-17 15:07	45426	Jonathon Sinclair		Levin Landfill: Levin D6	0	20.9	0	0									
19-05-17 15:07	45427	Jonathon Sinclair		Levin Landfill: Levin E1d	0	20.9	0	0									
19-05-17 15:07	45428	Jonathon Sinclair		Levin Landfill: Levin E1s	0	20.9	0	0									
19-05-17 15:07	45429	Jonathon Sinclair		Levin Landfill: Levin E2s	0	20.7	0	0									
19-05-17 15:07	45430	Jonathon Sinclair		Levin Landfill: Levin E2d	0	20.9	0	0									
19-05-17 15:07	45431	Jonathon Sinclair		Levin Landfill: Levin F1	0	20.9	0	0									
19-05-17 15:07	45432	Jonathon Sinclair		Levin Landfill: Levin F1	0	20.9	0	0									
19-05-17 15:07	45433	Jonathon Sinclair		Levin Landfill: Levin F2	0	20.6	0	0									
19-05-17 15:07	45434	Jonathon Sinclair		Levin Landfill: Levin F3	0	20.8	0	0									
19-05-17 15:07	45435	Jonathon Sinclair		Levin Landfill: Levin G1d	0	20.9	0	0									
19-05-17 15:07	45436	Jonathon Sinclair		Levin Landfill: Levin G1s	0	20.9	0	0									
19-05-17 15:07	45437	Jonathon Sinclair		Levin Landfill: Levin G2s	0	20.9	0	0									
17-10-17 12:06	58320	Paul Hayward		Levin Landfill: Levin G1d	0	0	0	20.8									
17-10-17 12:10	58322	Paul Hayward		Levin Landfill: Levin G1s	0	0	0	20.8									
17-10-17 12:23	58324	Paul Hayward		Levin Landfill: Levin F1	0	0	0	20.9									
17-10-17 12:30	58315	Paul Hayward		Levin Landfill: Levin D6	0	0	0	20.9									
17-10-17 12:39	58319	Paul Hayward		Levin Landfill: Levin E2s	0	0	0	20.8									
17-10-17 12:44	58318	Paul Hayward		Levin Landfill: Levin E2d	0	0	0	20.8									
17-10-17 12:47	58307	Paul Hayward		Levin Landfill: Levin C2ds	0	0	0	20.9									
17-10-17 12:48	58304	Paul Hayward		Levin Landfill: Levin C1	0	0	0	20.9									
17-10-17 12:49	58306	Paul Hayward		Levin Landfill: Levin C2dd	0	0	0	20.9									
17-10-17 12:52	58305	Paul Hayward		Levin Landfill: Levin C2	0	0	0	20.9									
17-10-17 12:55	58302	Paul Hayward		Levin Landfill: Levin B2	0	0	0	20.9									
17-10-17 13:00	58323	Paul Hayward		Levin Landfill: Levin G2s	0	0	0	20.9									
17-10-17 13:02	58303	Paul Hayward		Levin Landfill: Levin B3s	0	0	0	20.8									
17-10-17 13:05	58301	Paul Hayward		Levin Landfill: Levin B1	0	0	0	20.9									
17-10-17 22:35	58316	Paul Hayward		Levin Landfill: Levin E1d	0	0	0	20.8									
17-10-17 22:37	58317	Paul Hayward		Levin Landfill: Levin E1s	0	0	0	20.8									
17-10-17 22:41	58314	Paul Hayward		Levin Landfill: Levin D4	0	0	0	20.9									
17-10-17 22:59	58327	Paul Hayward		Levin Landfill: Levin D5	0	0	0	20.9									
17-10-17 23:12	58313	Paul Hayward		Levin Landfill: Levin D3	0	0	0	20.8									
17-10-17 23:26	58325	Paul Hayward		Levin Landfill: Levin F3	0	0	0	20.9									
17-10-17 23:35	58326	Paul Hayward		Levin Landfill: Levin F2	0	0	0	20.9									
17-10-17 23:50	58311	Paul Hayward		Levin Landfill: Levin D2	0	0	0	20.9									
17-10-17 23:57	58309	Paul Hayward		Levin Landfill: Levin D1	0	0	0	20.9									
16-01-18 11:05	62371	Jonathon Sinclair		Levin Landfill: Levin B1	0	21	0	0									
16-01-18 11:05	62372	Jonathon Sinclair		Levin Landfill: Levin B2	0	20.9	0	0									
16-01-18 11:05	62373	Jonathon Sinclair		Levin Landfill: Levin B3s	0	20.9	0	0									
16-01-18 11:05	62374	Jonathon Sinclair		Levin Landfill: Levin C1	0	20.8	0	0									
16-01-18 11:05	62375	Jonathon Sinclair		Levin Landfill: Levin C2	0	21	0	0									

16-01-18 11:05	62377	Jonathon Sinclair		Levin Landfill: Levin C2dd	0	21	0	0									
16-01-18 11:05	62378	Jonathon Sinclair		Levin Landfill: Levin C2ds	0	20.9	0	0									
16-01-18 11:05	62379	Jonathon Sinclair		Levin Landfill: Levin D1	0	20.9	0	0									
16-01-18 11:05	62380	Jonathon Sinclair		Levin Landfill: Levin D2	0	20.9	0	0									
16-01-18 11:05	62381	Jonathon Sinclair		Levin Landfill: Levin D3	0	20.9	0	0									
16-01-18 11:05	62382	Jonathon Sinclair		Levin Landfill: Levin D3r	0	20.9	0	0									
16-01-18 11:05	62383	Jonathon Sinclair		Levin Landfill: Levin D4	0	20.9	0	0									
16-01-18 11:05	62384	Jonathon Sinclair		Levin Landfill: Levin D5	0	20.9	0	0									
16-01-18 11:05	62385	Jonathon Sinclair		Levin Landfill: Levin D6	0	20.8	0	0									
16-01-18 11:05	62386	Jonathon Sinclair		Levin Landfill: Levin E1d	0	20.8	0	0									
16-01-18 11:05	62387	Jonathon Sinclair		Levin Landfill: Levin E1s	0	20.8	0	0									
16-01-18 11:05	62395	Jonathon Sinclair		Levin Landfill: Levin E2s	0	20.9	0	0									
16-01-18 11:16	62396	Jonathon Sinclair		Levin Landfill: Levin E2d	0	20.9	0	0									
16-01-18 11:16	62397	Jonathon Sinclair		Levin Landfill: Levin F1	0	20.9	0	0									
16-01-18 11:16	62398	Jonathon Sinclair		Levin Landfill: Levin F2	0	20.8	0	0									
16-01-18 11:16	62399	Jonathon Sinclair		Levin Landfill: Levin F3	0	20.9	0	0									
16-01-18 11:16	62401	Jonathon Sinclair		Levin Landfill: Levin G1d	0	20.9	0	0									
16-01-18 11:16	62402	Jonathon Sinclair		Levin Landfill: Levin G1s	0	20.9	0	0									
16-01-18 11:16	62403	Jonathon Sinclair		Levin Landfill: Levin G2s	0	20.9	0	0									
12-04-18 10:00	66150	Paul Hayward		Levin Landfill: Levin G1d	0	0	0	20.9							Sunny Bree	1.45	15.7
12-04-18 10:10	66151	Paul Hayward		Levin Landfill: Levin G1s	0	0	0	20.4							Sunny Bree	1.45	15.7
12-04-18 10:30	66147	Paul Hayward		Levin Landfill: Levin F1	0	0	0	20.4							Sunny Bree	1	15
12-04-18 10:45	66137	Paul Hayward		Levin Landfill: Levin D1	0	0	0	20.9							Sunny ,Bree	1.25	20
12-04-18 10:55	66138	Paul Hayward		Levin Landfill: Levin D2	0	0	0	20.7							Overcast ,B	2.34	17.9
12-04-18 11:15	66142	Paul Hayward		Levin Landfill: Levin D6	0	0	0	20.1							Overcast ,B	0.85	19.3
12-04-18 11:25	66139	Paul Hayward		Levin Landfill: Levin D3	0	0	0	20.9							Overcast ,St	0	19.1
12-04-18 11:35	66148	Paul Hayward		Levin Landfill: Levin F3	0	0	0	20.1							Overcast St	0	16.5
12-04-18 11:45	66149	Paul Hayward		Levin Landfill: Levin F2	0	0	0	20.9							Overcast St	0	15
12-04-18 12:05	66140	Paul Hayward		Levin Landfill: Levin D4	0	0	0	21							Overcast ,B	1.54	15.5
12-04-18 12:05	66146	Paul Hayward		Levin Landfill: Levin E2d	0	0	0	20.9							Overcast ,St	0	15.5
12-04-18 12:10	66145	Paul Hayward		Levin Landfill: Levin E2s	0	0	0	20.9							Overcast ,St	0	15.5
12-04-18 12:15	66143	Paul Hayward		Levin Landfill: Levin E1d	0	0	0	20.9							Overcast ,St	0	15
12-04-18 12:20	66144	Paul Hayward		Levin Landfill: Levin E1s	0	0	0	21							Overcast ,St	0	15
12-04-18 12:55	66125	Paul Hayward		Levin Landfill: Levin B2	0	0	0	17.5							Overcast. B	1.55	16.9
12-04-18 13:15	66126	Paul Hayward		Levin Landfill: Levin B3s	0	0	0	21							Overcast. St	0	14.9
12-04-18 13:25	66129	Paul Hayward		Levin Landfill: Levin C2	0	0	0	15.4							Overcast. B	1.3	15.9
12-04-18 13:30	66135	Paul Hayward		Levin Landfill: Levin C2dd	0	0	0	20.8							Overcast. St	0	15.4
12-04-18 13:35	66136	Paul Hayward		Levin Landfill: Levin C2ds	0	0	0	20.9							Overcast St	0	14.8
12-04-18 13:45	66124	Paul Hayward		Levin Landfill: Levin B1	0	0	0	20.5							Overcast. B	1.3	15
12-04-18 14:05	66152	Paul Hayward		Levin Landfill: Levin G2s	0	0	0	20.7							Cloudy Bre	4.27	15.4
12-04-18 14:15	66127	Paul Hayward		Levin Landfill: Levin C1	0	0	0	18.2							Overcast. B	1.27	15.5
12-04-18 14:30	66141	Paul Hayward		Levin Landfill: Levin D5	0	0	0	20.9							Overcast ,B	2.6	19
03-07-18 12:40	70316	Craig Columb		Levin Landfill: Levin G1s	0	0	0	21.1					1024		Fine	0.9	11.8
03-07-18 12:45	70305	Craig Columb		Levin Landfill: Levin G1d	0	0	0	21					1024		Fine	0.9	11.8
03-07-18 13:25	70226	Craig Columb		Levin Landfill: Levin F1	0	0	0	21					1024		Fine	0	11.9
03-07-18 13:35	70215	Craig Columb		Levin Landfill: Levin D1	0	0	0	21.1					1024		Fine	0.3	13.2
03-07-18 13:40	70216	Craig Columb		Levin Landfill: Levin D2	0	0	0	20.9					1024		Fine	0.5	13
03-07-18 14:00	70221	Craig Columb		Levin Landfill: Levin D6	0	0	0	20.9					1024		Fine	0	13.4
03-07-18 14:15	70301	Craig Columb		Levin Landfill: Levin F3	0	0	0	21					1024		Fine	0	11.8
03-07-18 14:20	70297	Craig Columb		Levin Landfill: Levin F2	0	0	0	20.5					1024		Fine	0.1	12.2

03-07-18 14:45	70217	Craig Columb		Levin Landfill: Levin D3r	0	0	0	20.9					1024		Fine	0	12
03-07-18 15:00	70209	Craig Columb		Levin Landfill: Levin B1	0	0	0	20.3					1024		Fine	0.4	12
04-07-18 14:25	70220	Craig Columb		Levin Landfill: Levin D5	0	0	0	20.9					1024		Fine	0.3	13
04-07-18 14:40	70218	Craig Columb		Levin Landfill: Levin D4	0	0	0	20.9					1024		Fine	0	13.1
04-07-18 14:45	70222	Craig Columb		Levin Landfill: Levin E1d	0	0	0	20.9					1024		Fine	0	12.3
04-07-18 14:50	70223	Craig Columb		Levin Landfill: Levin E1s	0	0	0	20.9					1024		Fine	0	12.3
04-07-18 15:00	70211	Craig Columb		Levin Landfill: Levin C1	0	0	0	18.9					1024		Fine	0.8	11.7
04-07-18 15:10	70317	Craig Columb		Levin Landfill: Levin G2s	0	0	0	20.9					1024		Fine	2.6	13
05-07-18 9:00	70225	Craig Columb		Levin Landfill: Levin E2d	0	0	0	21					1024		Fine	0.2	7.8
05-07-18 9:05	70224	Craig Columb		Levin Landfill: Levin E2s	0	0	0	20.9					1024		Fine	0.2	7.8
05-07-18 9:25	70210	Craig Columb		Levin Landfill: Levin B3s	0	0	0	21.2					1024		Fine	0	6
05-07-18 9:35	70214	Craig Columb		Levin Landfill: Levin C2ds	0	0	0	20.9					1024		Fine	0	5.7
05-07-18 9:40	70213	Craig Columb		Levin Landfill: Levin C2dd	0	0	0	20.9					1024		Fine	0	5.7
05-07-18 9:50	70212	Craig Columb		Levin Landfill: Levin C2	0	0	0	19					1024		Fine	0.5	7.7
08-10-18 8:15	74612	Peter Giddins		Levin Landfill: Levin Landfill Leachate	0	0	0	20.6							Fine,no wind		9
08-10-18 8:30	74603	Peter Giddins		Levin Landfill: Levin D6	0.05	0.06	0	20.4							Fine,no wind		
08-10-18 8:50	74599	Peter Giddins		Levin Landfill: Levin D2	0	0.16	0	19.6							Fine,no wind		10
08-10-18 9:05	74598	Peter Giddins		Levin Landfill: Levin D1	0	0.08	0	20.9							Fine,no wind		10
08-10-18 9:25	74615	Peter Giddins		Levin Landfill: Levin G1s	0	0.06	0	20.9							Fine,light north easterl		10
08-10-18 9:40	74613	Peter Giddins		Levin Landfill: Levin G1d	0.07	0.05	0	20.6							Fine,light north easterl		10
08-10-18 9:55	74609	Peter Giddins		Levin Landfill: Levin F1	0.01	0.05	0	20.7							Fine,no wind		11.5
08-10-18 10:50	74611	Peter Giddins		Levin Landfill: Levin F2	0	0.45	0	19.5							Fine,no wind		10
08-10-18 11:10	74610	Peter Giddins		Levin Landfill: Levin F3	0	0.04	0	21							Fine,no wind		11.5
08-10-18 11:25	74600	Peter Giddins		Levin Landfill: Levin D3	0	0.7	0	19.1							Fine,light north easterl		12
08-10-18 11:40	74602	Peter Giddins		Levin Landfill: Levin D5	0	0.04	0	21.1							Fine,no wind		14
08-10-18 12:00	74601	Peter Giddins		Levin Landfill: Levin D4	0	0.08	0	21							Fine,light north easterl		14.5
08-10-18 12:15	74604	Peter Giddins		Levin Landfill: Levin E1d	0.02	0.08	0	20.9							Fine,light north easterl		14
08-10-18 12:25	74605	Peter Giddins		Levin Landfill: Levin E1s	0	0.05	0	21							Fine,light north easterl		14
08-10-18 12:30	74607	Peter Giddins		Levin Landfill: Levin E2d	0.04	0.07	0	20							Fine,light north easterl		14.5
08-10-18 12:40	74606	Peter Giddins		Levin Landfill: Levin E2s	0	0.07	0	21.1							Fine,light north easterl		14
08-10-18 13:10	74593	Peter Giddins		Levin Landfill: Levin B3s	0	0.03	0								Fine,no wind		16
08-10-18 13:25	74595	Peter Giddins		Levin Landfill: Levin C2	0	0.23	0	19.7							Fine,light westerly		16.5
08-10-18 13:35	74596	Peter Giddins		Levin Landfill: Levin C2dd	0	0.12	0	21							Fine,light westerly		16
08-10-18 13:45	74597	Peter Giddins		Levin Landfill: Levin C2ds	0	0.26	0	21							Fine,light westerly		16.5
08-10-18 13:50	74592	Peter Giddins		Levin Landfill: Levin B2	0	0.3	0	20.4							Fine,no wind		15.5
08-10-18 14:00	74591	Peter Giddins		Levin Landfill: Levin B1	0.04	0.78	0	20.4							Fine		15
08-10-18 14:20	74594	Peter Giddins		Levin Landfill: Levin C1	0.03	0.05	0	19.6							Fine,no wind		16.5
08-10-18 14:35	74616	Peter Giddins		Levin Landfill: Levin G2s	0.01	0.19	0	20.4							Fine,light westerly		17
07-01-19 0:00	81009	Paul Hayward		Levin Landfill: Levin C1	0	0.02	0	19.8							cloudy and still		20
07-01-19 0:10	81029	Paul Hayward		Levin Landfill: Levin G2s	0.01	0.16	0	19.3							sunny and still		21
07-01-19 8:10	81026	Paul Hayward		Levin Landfill: Levin Landfill Leachate	0	0.01	0	20.4							overcast and still		18
07-01-19 8:25	81018	Paul Hayward		Levin Landfill: Levin D6	0	0.002	0	20.3							cloudy and light north		18
07-01-19 8:40	81027	Paul Hayward		Levin Landfill: Levin G1d	0	0	0	20.5							overcast and light east		17
07-01-19 8:45	81028	Paul Hayward		Levin Landfill: Levin G1s	0	0	0	20.8							overcast and light east		17
07-01-19 9:00	81023	Paul Hayward		Levin Landfill: Levin F1	0	0.01	0	20.8							overcast and still		19
07-01-19 9:05	81024	Paul Hayward		Levin Landfill: Levin F3	0	0	0	20.2							overcast and still		19
07-01-19 9:10	81013	Paul Hayward		Levin Landfill: Levin D1	0	0.05	0	20.1							cloudy and still		20
07-01-19 9:25	81014	Paul Hayward		Levin Landfill: Levin D2	0	0.17	0	19.9							cloudy and still		20
07-01-19 9:50	81025	Paul Hayward		Levin Landfill: Levin F2	0	0.01	0	20.3							overcast and still		20

07-01-19 10:40	81015	Paul Hayward		Levin Landfill: Levin D3	0	0	0	20.5							cloudy and still	20
07-01-19 11:00	81017	Paul Hayward		Levin Landfill: Levin D5	0	0.002	0	20.4							cloudy and light north	20
07-01-19 11:20	81016	Paul Hayward		Levin Landfill: Levin D4	0	0	0	20.6							cloudy and still	20
07-01-19 11:30	81020	Paul Hayward		Levin Landfill: Levin E1s	0	0.02	0	20.8							cloudy and light north	20
07-01-19 11:40	81019	Paul Hayward		Levin Landfill: Levin E1d	0	0.01	0	20.7							cloudy and light north	20
07-01-19 11:50	80986	Paul Hayward		Levin Landfill: Levin B1	0.03	0.7	0	20							Cloudy , dry and still	20
07-01-19 13:15	81022	Paul Hayward		Levin Landfill: Levin E2d	0	0.04	0	20.4							sunny and still	21
07-01-19 13:24	81021	Paul Hayward		Levin Landfill: Levin E2s	0	0.05	0	20.4							sunny and still	21
07-01-19 13:35	81008	Paul Hayward		Levin Landfill: Levin B3s	0	0.02	0	19.8							sunny , breeze	20
07-01-19 13:45	81010	Paul Hayward		Levin Landfill: Levin C2	0	0.07	0	20.3							sunny and still	21
07-01-19 13:55	81011	Paul Hayward		Levin Landfill: Levin C2dd	0	0.05	0	20.5							sunny and noth east br	20
07-01-19 14:05	81012	Paul Hayward		Levin Landfill: Levin C2ds	0	0.2	0	20.6							sunny and no breeze	20
07-01-19 14:15	81007	Paul Hayward		Levin Landfill: Levin B2	0.02	0.28	0	20							sunny , north east bree	20
14-03-19 9:21	82156	Peter Giddins			67	32	2960	0								
03-04-19 8:10	82940	Peter Giddins		Levin Landfill: Levin Landfill Leachate	0.02	0.03	0	21							Fine,no wind	15
03-04-19 8:20	82931	Peter Giddins		Levin Landfill: Levin D6	0.01	0.04	0	21.2							Fine,no wind	15
03-04-19 8:26	82929	Peter Giddins		Levin Landfill: Levin D4	0	0.07	0	20.8							Sunny,no wind	16
03-04-19 8:30	82942	Peter Giddins		Levin Landfill: Levin G1s	0	0.05	0	21.1							Sunny,light N/E	15
03-04-19 8:35	82941	Peter Giddins		Levin Landfill: Levin G1d	0.02	0.04	0	20.8							Sunny,light N/E	15
03-04-19 8:50	82937	Peter Giddins		Levin Landfill: Levin F1	0	0.01	0	20.9							Fine,no wind	15
03-04-19 9:05	82925	Peter Giddins		Levin Landfill: Levin D1	0	0.11	0	21							Sunny,light easterly	15
03-04-19 9:15	82927	Peter Giddins		Levin Landfill: Levin D2	0	0.18	0	20.9							Sunny,no wind	16
03-04-19 9:25	82928	Peter Giddins		Levin Landfill: Levin D3	0.02	0.05	0	20.2							Sunny,no wind	16
03-04-19 10:00	82938	Peter Giddins		Levin Landfill: Levin F3	0	0.1	0	28.8							Overcast,no wind	15
03-04-19 10:20	82939	Peter Giddins		Levin Landfill: Levin F2	0	0.1	0	20.6							Overcast,no wind	15
03-04-19 10:45	82930	Peter Giddins		Levin Landfill: Levin D5	0	0.08	0	20.8							Overcast,no wind	15
03-04-19 11:10	82933	Peter Giddins		Levin Landfill: Levin E1s	0	0.05	0	20.7							Overcast,no wind	16
03-04-19 11:20	82932	Peter Giddins		Levin Landfill: Levin E1d	0	0.04	0	20.8							Overcast,no wind	16
03-04-19 12:00	82909	Peter Giddins		Levin Landfill: Levin B1	0	0.25	0	19.8							Overcast,no wind	19
03-04-19 12:10	82919	Peter Giddins		Levin Landfill: Levin C1	0	0.07	0	19.8							Overcast,no wind	19
03-04-19 12:55	82936	Peter Giddins		Levin Landfill: Levin E2d	0	0.1	0	20.3							Overcast,no wind	19
03-04-19 13:04	82934	Peter Giddins		Levin Landfill: Levin E2s	0	0.06	0	20.4							Overcast,no wind	19
03-04-19 13:15	82924	Peter Giddins		Levin Landfill: Levin C2ds	0	0.14	0	20.4							Overcast,no wind	19
03-04-19 13:25	82923	Peter Giddins			0	0.12	0	20.5							Overcast,no wind	19
03-04-19 13:35	82922	Peter Giddins		Levin Landfill: Levin C2	0	0.28	0	20.4							Overcast,no wind	19
03-04-19 13:50	82913	Peter Giddins		Levin Landfill: Levin B3s	0	0.04	0	20.5							Overcast,no wind	19
03-04-19 14:00	82911	Peter Giddins		Levin Landfill: Levin B2	0	2.35	0	18.1							Overcast,no wind	19
03-04-19 14:10	82943	Peter Giddins		Levin Landfill: Levin G2s	0	0.07	0	19.9							Overcast,no wind	19
11-07-19 0:10	87619	Peter Giddins		Levin Landfill: Levin D4	0	0.05	0	20.5							Overcast,dry and still	15
11-07-19 9:00	87627	Peter Giddins		Levin Landfill: Levin F1	0.06	0.05	0	20.9							Overcast,dry and still	12
11-07-19 9:20	87635	Peter Giddins		Levin Landfill: Levin G1s	0.01	0.04	0	20.5							Overcast,dry and still	12
11-07-19 9:25	87634	Peter Giddins		Levin Landfill: Levin G1d	0.09	0.04	0	20.4							Overcast,dry and still	12
11-07-19 9:45	87616	Peter Giddins		Levin Landfill: Levin D1	0	0.09	0	20.1							Overcast,dry and still	12
11-07-19 9:55	87617	Peter Giddins		Levin Landfill: Levin D2	0	0.19	0	20							overcast,dry and still	12
11-07-19 10:10	87621	Peter Giddins		Levin Landfill: Levin D6	0	0.04	0	20.2							Overcast,dry and still	13
11-07-19 10:15	87633	Peter Giddins			0.01	0.02	0	21.2							Overcast,dry and still	13
11-07-19 11:10	87630	Peter Giddins		Levin Landfill: Levin F3	0	0.05	0	20.1							Overcast,dry and still	14
11-07-19 11:20	87618	Peter Giddins		Levin Landfill: Levin D3	0	0.09	0	20.2							Overcast,dry and still	14
11-07-19 11:50	87620	Peter Giddins		Levin Landfill: Levin D5	0	0.07	0	20							Overcast,dry and still	14

11-07-19 12:20	87623	Peter Giddins		Levin Landfill: Levin E1s	0	0.04	0	20.1							Overcast,dry and still		15
11-07-19 12:35	87622	Peter Giddins		Levin Landfill: Levin E1d	0	0.06	0	20.1							Overcast,dry and still		15
11-07-19 13:05	87607	Peter Giddins		Levin Landfill: Levin B1	0	0.28	0	19.8									
11-07-19 13:15	87626	Peter Giddins		Levin Landfill: Levin E2d	0	0.12	0	20							Overcast,dry and still		14
11-07-19 13:20	87624	Peter Giddins		Levin Landfill: Levin E2s	0	0.07	0	20							Overcast,dry and still		15
11-07-19 13:35	87615	Peter Giddins		Levin Landfill: Levin C2ds	0	0.2	0	19.7							Overcast,dry and still		15
11-07-19 13:40	87614	Peter Giddins		Levin Landfill: Levin C2dd	0	0.13	0	19.8							Overcast,dry and still		15
11-07-19 13:45	87612	Peter Giddins		Levin Landfill: Levin C2	0	0.11	0	19.7							Overcast,dry and still		15
11-07-19 13:50	87610	Peter Giddins		Levin Landfill: Levin B3s	0	0.05	0	20							Overcast,dry and still		15
11-07-19 13:55	87609	Peter Giddins		Levin Landfill: Levin B2	0.01	2.68	0	19							Overcast,dry and still		12
11-07-19 14:10	87611	Peter Giddins		Levin Landfill: Levin C1	0	0.05	0	19.9							Overcast,dry and still		15
11-07-19 14:40	87637	Peter Giddins		Levin Landfill: Levin G2s	0.02	0.31	0	19.4							Overcast,dry and still		15
11-07-19 22:55	87628	Peter Giddins		Levin Landfill: Levin F2	0	0.05	0	20.1							Overcast,dry and still		14
03-10-19 8:10	94186	Peter Giddins		Levin Landfill: Levin F1	0	0	0	21							Fine and sunny		13
03-10-19 8:20	94191	Peter Giddins		Levin Landfill: Levin G1d	0	0	0	21.1							Fine and sunny		13
03-10-19 8:30	94192	Peter Giddins		Levin Landfill: Levin G1s	0	0	0	21.1							Fine and sunny		13
03-10-19 8:45	94174	Peter Giddins		Levin Landfill: Levin D2	0.01	0	0	20.9							Fine and sunny		13
03-10-19 9:00	94173	Peter Giddins		Levin Landfill: Levin D1	0	0	0	21							Fine and sunny		13
03-10-19 9:10	94190	Peter Giddins		Levin Landfill: Levin Landfill Leachate	0	0	0	21.1							Fine and sunny		13
03-10-19 9:15	94178	Peter Giddins		Levin Landfill: Levin D6	0	0	0	21.1							Fine and sunny		13
03-10-19 9:25	94188	Peter Giddins		Levin Landfill: Levin F2	0	0	0	20.9							Fine and sunny		13
03-10-19 9:40	94187	Peter Giddins		Levin Landfill: Levin F3	0	0	0	21.1							Fine and sunny		13
03-10-19 10:20	94175	Peter Giddins		Levin Landfill: Levin D3	0.02	0	0	20.3							Fine and sunny		14
03-10-19 10:45	94177	Peter Giddins		Levin Landfill: Levin D5	0.01	0	0	21.1							Fine and sunny		13
03-10-19 11:05	94176	Peter Giddins		Levin Landfill: Levin D4	0	0	0	20.9							Fine and sunny		14
03-10-19 11:10	94181	Peter Giddins		Levin Landfill: Levin E1s	0	0	0	20.9							Fine and sunny		14
03-10-19 11:15	94180	Peter Giddins		Levin Landfill: Levin E1d	0	0	0	20.9							Fine and sunny		14
03-10-19 11:30	94163	Peter Giddins		Levin Landfill: Levin B1	0.01	0	0	20.6							Fine and sunny		14
03-10-19 11:35	94169	Peter Giddins		Levin Landfill: Levin C1	0	0	0	0							Fine and sunny. Bore f		15
03-10-19 11:40	94193	Peter Giddins		Levin Landfill: Levin G2s	0.02	0	0	20.7							Fine and sunny		14
03-10-19 12:45	94170	Peter Giddins		Levin Landfill: Levin C2	0.07	0	0	15.9							Fine and sunny		14
03-10-19 12:50	94171	Peter Giddins		Levin Landfill: Levin C2dd	0.02	0	0	20.6							Fine and sunny		15
03-10-19 12:55	94172	Peter Giddins		Levin Landfill: Levin C2ds	0.02	0	0	20.7							Fine and sunny		15
03-10-19 13:00	94185	Peter Giddins		Levin Landfill: Levin E2d	0	0	0	21							Fine and sunny		15
03-10-19 13:05	94183	Peter Giddins		Levin Landfill: Levin E2s	0	0	0	20.9							Fine and sunny		15
03-10-19 13:10	94167	Peter Giddins		Levin Landfill: Levin B3s	0.02	0	0	19.8							Fine and sunny		15
03-10-19 13:20	94165	Peter Giddins		Levin Landfill: Levin B2	0.03	0	0	19							Fine and sunny		15
03-10-19 23:40	94194	Peter Giddins		Levin Landfill: Levin G2s				20.7									
07-01-20 8:08	97362	Paul Hayward		Levin Landfill: Levin G2s	0	0.06	0	21						16	fine , still		
07-01-20 8:20	97363	Paul Hayward		Levin Landfill: Levin C1	0	0.05	0	21							Fine , Still		16
07-01-20 8:35	97364	Paul Hayward		Levin Landfill: Levin E2d	0	0.05	0	20.8							Fine , Still		17
07-01-20 8:35	97365	Paul Hayward		Levin Landfill: Levin E2s	0	0.06	0	20.7							Fine , Still		17
07-01-20 8:57	97366	Paul Hayward		Levin Landfill: Levin C2	0	0.06	0	20.5							Fine , Still		17
07-01-20 9:00	97367	Paul Hayward		Levin Landfill: Levin C2dd	0	0.15	0	20.7							Fine , Still		17
07-01-20 9:10	97368	Paul Hayward		Levin Landfill: Levin C2dd	0	0.1	0	20.9							Fine , Still		17
07-01-20 9:23	97369	Paul Hayward		Levin Landfill: Levin B3s	0	0.03	0	20.9							Fine , Still		17
07-01-20 9:28	97370	Paul Hayward		Levin Landfill: Levin B2	0	0.07	0	20.8							Fine , Still		17
07-01-20 9:28	97371	Paul Hayward		Levin Landfill: Levin B1	0	0.13	0	20.6							Fine , Still		17
07-01-20 10:10	97372	Paul Hayward		Levin Landfill: Levin E1d	0	0.03	0	20.6							Fine , Still		17

07-01-20 10:12	97373	Paul Hayward		Levin Landfill: Levin E1s	0.01	0.03	0	20.6							Fine , Still		17
07-01-20 10:23	97375	Paul Hayward		Levin Landfill: Levin D4	0.08	0.03	0	20.8							Fine , Still		17
07-01-20 10:23	97376	Paul Hayward		Levin Landfill: Levin D5	0	0.04	0	20.9							Fine , Still		17
07-01-20 10:42	97377	Paul Hayward		Levin Landfill: Levin D3r	0.08	0.01	0	20.1							Fine , Still		17
07-01-20 10:50	97378	Paul Hayward		Levin Landfill: Levin F3	0	0.05	0	21.08							Fine , Still		17
07-01-20 11:06	97379	Paul Hayward		Levin Landfill: Levin F2	0	0.05	0	22							Fine , Still		17
07-01-20 11:06	97380	Paul Hayward		Levin Landfill: Levin F2	0	0.05	0	22							Fine , Still		17
07-01-20 11:15	97381	Paul Hayward		Levin Landfill: Levin F1	0	0.02	0	21.1							Fine , Still		17
07-01-20 11:28	97382	Paul Hayward		Levin Landfill: Levin D2	0.05	0.11	0	20.6							Fine , Still		17
07-01-20 11:40	97383	Paul Hayward		Levin Landfill: Levin D1	0	0.04	0	20.8							Fine , Still		17
07-01-20 11:40	97384	Paul Hayward		Levin Landfill: Levin D6	0	0.03	0	20.7							Fine , Still		17
07-01-20 12:35	97385	Paul Hayward		Levin Landfill: Levin G1s	0	0.04	0	21.2							Fine , Still		17
07-01-20 12:40	97386	Paul Hayward		Levin Landfill: Levin G1d	0	0.05	0	21							Fine , Still		17
31-03-20 8:44	100301	Paul Hayward		Levin Landfill: Levin G1d	0	0.03	0	20.9							sunny , dry		15
31-03-20 8:48	100302	Paul Hayward		Levin Landfill: Levin G1s	0	0.05	0	21							sunny , dry		15
31-03-20 9:00	100298	Paul Hayward		Levin Landfill: Levin F1	0	0.03	0	21.2							sunny , dry		15
31-03-20 9:12	100287	Paul Hayward		Levin Landfill: Levin D2	0	0.07	0	20.9							sunny , dry		16
31-03-20 9:25	100286	Paul Hayward		Levin Landfill: Levin D1	0	0.08	0	20.7							sunny , dry		16
31-03-20 9:32	100292	Paul Hayward		Levin Landfill: Levin D6	0	0.04	0	20.6							sunny , dry		16
31-03-20 9:45	100288	Paul Hayward		Levin Landfill: Levin D3	0	0.03	0	20.7							sunny , dry		16
31-03-20 9:50	100299	Paul Hayward		Levin Landfill: Levin F3	0	0.02	0	21							sunny , dry		16
31-03-20 10:00	100300	Paul Hayward		Levin Landfill: Levin F2	0	0.05	0	21.3							sunny , dry		16
31-03-20 10:10	100293	Paul Hayward		Levin Landfill: Levin E1d	0	0.04	0	21.5							sunny , dry		16
31-03-20 10:15	100294	Paul Hayward		Levin Landfill: Levin E1s	0	0.03	0	21.6							sunny , dry		16
31-03-20 10:22	100290	Paul Hayward		Levin Landfill: Levin D4	0	0.08	0	21.6							sunny , dry		16
31-03-20 10:35	100291	Paul Hayward		Levin Landfill: Levin D5	0	0.06	0	21.5							sunny , dry		16
31-03-20 11:25	100296	Paul Hayward		Levin Landfill: Levin E2d	0	0.04	0	21.1							sunny , dry		17
31-03-20 11:30	100295	Paul Hayward		Levin Landfill: Levin E2s	0	0.04	0	21.2							sunny , dry		16
31-03-20 11:40	100281	Paul Hayward		Levin Landfill: Levin B3s	0	0.04	0	21.5							sunny , dry		17
31-03-20 11:55	100283	Paul Hayward		Levin Landfill: Levin C2	0	0.05	0	21.5							sunny , dry		17
31-03-20 12:00	100284	Paul Hayward		Levin Landfill: Levin C2dd	0	0.08	0	21.4							sunny , dry		17
31-03-20 12:10	100285	Paul Hayward		Levin Landfill: Levin C2ds	0	0.18	0	21.2							sunny , dry		17
31-03-20 12:15	100280	Paul Hayward		Levin Landfill: Levin B2	0	0.13	0	21.3							sunny , dry		17
31-03-20 12:25	100279	Paul Hayward		Levin Landfill: Levin B1	0	0.08	0	21.2						17	sunny , dry		
31-03-20 12:35	100282	Paul Hayward		Levin Landfill: Levin C1	0	0.07	0	20.7							sunny , dry		17
31-03-20 12:44	100303	Paul Hayward		Levin Landfill: Levin G2s	0	0.03	0	20.6							sunny , dry		15
06-07-20 14:20	103962	Peter Giddins		Levin Landfill: Levin B1	0	0.73	0	20.3							wet		
06-07-20 14:24	103963	Peter Giddins		Levin Landfill: Levin B2	0	0.29	0	20.8							wet		
06-07-20 14:25	103964	Peter Giddins		Levin Landfill: Levin B3s	0	0	0	20.3							cloudy		
06-07-20 14:26	103965	Peter Giddins		Levin Landfill: Levin C1	0	1.28	0	20.5							wet		
06-07-20 14:27	103966	Peter Giddins		Levin Landfill: Levin C2	0	0	0	21.2							cloudy		
06-07-20 14:27	103967	Peter Giddins		Levin Landfill: Levin C2dd	0	0.08	0	21.2							cloudy		
06-07-20 14:28	103968	Peter Giddins		Levin Landfill: Levin C2ds	0	0.41	0	21							cloudy		
06-07-20 14:29	103969	Peter Giddins		Levin Landfill: Levin D1	0	0.12	0	21							cloudy		
06-07-20 14:30	103970	Peter Giddins		Levin Landfill: Levin D2	0	0.19	0	20.9							cloudy		
06-07-20 14:31	103971	Peter Giddins		Levin Landfill: Levin D3	0.01	0.03	0	20.9							cloudy		
06-07-20 14:32	103972	Peter Giddins		Levin Landfill: Levin D4	0.07	0.09	0	20.8							cloudy		
06-07-20 14:33	103973	Peter Giddins		Levin Landfill: Levin D5	0.05	0.09	0	20.8							sunny		
06-07-20 14:33	103975	Peter Giddins		Levin Landfill: Levin D6	0	0.08	0	21.1							sunny		
06-07-20 14:34	103976	Peter Giddins		Levin Landfill: Levin E1d	0.02	0	5	0	20.8						sunny		

06-07-20 14:34	103977	Peter Giddins		Levin Landfill: Levin E1s	0.07	0.06	0	20.8							cloudy		
06-07-20 14:38	103978	Peter Giddins		Levin Landfill: Levin E2d	0	0.06	0	21.3							sunny		
06-07-20 14:40	103979	Peter Giddins		Levin Landfill: Levin E2s	0	0.02	0	21							sunny		
06-07-20 14:41	103980	Peter Giddins		Levin Landfill: Levin F1	0	0.03	0	21							sunny		
06-07-20 14:42	103981	Peter Giddins		Levin Landfill: Levin F3	0.1	0.04	0	20.9							sunny		
06-07-20 14:43	103982	Peter Giddins		Levin Landfill: Levin F2	0.03	0.05	0	20.9							sunny		
06-07-20 14:44	103983	Peter Giddins		Levin Landfill: Levin G1d	0.06	0.03	0	20.9							raining		
06-07-20 14:44	103984	Peter Giddins		Levin Landfill: Levin G1s	0.13	0.03	0	20.9							raining		
06-07-20 14:45	103985	Peter Giddins		Levin Landfill: Levin G2s	0.01	0.01	0	21							raining		
01-10-20 13:34	110046	Bianca Mella		Levin Landfill: Levin B1	0.06	0	0	20.7							sunny		
01-10-20 13:35	110047	Bianca Mella		Levin Landfill: Levin B2	0.04	0.67	0	19.4							sunny		
01-10-20 13:36	110048	Bianca Mella		Levin Landfill: Levin B3s	0.07	0	0	20.9							sunny		
01-10-20 13:37	110049	Bianca Mella		Levin Landfill: Levin C1	0.02	0	0	20.9							sunny		
01-10-20 13:37	110050	Bianca Mella		Levin Landfill: Levin C2	0.01	0.04	0	21							sunny		
01-10-20 13:40	110051	Bianca Mella		Levin Landfill: Levin C2dd	0	0.15	0	20.9							sunny		
01-10-20 13:41	110052	Bianca Mella		Levin Landfill: Levin C2ds	0.03	0.08	0	20.7							sunny		
01-10-20 13:42	110054	Bianca Mella		Levin Landfill: Levin D1	0	0.16	0	20.2							sunny		
01-10-20 13:44	110055	Bianca Mella		Levin Landfill: Levin D2	0	0.3	0	20.3							sunny		
01-10-20 13:44	110056	Bianca Mella		Levin Landfill: Levin D3	0	0.33	0	20.4							sunny		
01-10-20 13:45	110057	Bianca Mella		Levin Landfill: Levin D4	0.04	0	0	21.3							sunny		
01-10-20 13:46	110058	Bianca Mella		Levin Landfill: Levin D5	0	0.12	0	20.6							sunny		
01-10-20 13:46	110059	Bianca Mella		Levin Landfill: Levin D6	0	0.12	0	20.3							sunny		
01-10-20 13:47	110060	Bianca Mella		Levin Landfill: Levin E1d	0	0	0	21.6							sunny		
01-10-20 13:47	110061	Bianca Mella		Levin Landfill: Levin E1s	0	0	0	21.5							sunny		
01-10-20 13:48	110062	Bianca Mella		Levin Landfill: Levin E2s	0.01	0	0	20.5							sunny		
01-10-20 13:49	110063	Bianca Mella		Levin Landfill: Levin E2d	0.08	0	0	20.3							sunny		
01-10-20 13:49	110064	Bianca Mella		Levin Landfill: Levin F1	0	0.07	0	21.2							sunny		
01-10-20 13:50	110065	Bianca Mella		Levin Landfill: Levin F3	0	0.11	0	20.6							sunny		
01-10-20 13:51	110066	Bianca Mella		Levin Landfill: Levin F2	0	0.09	0	20.9							sunny		
01-10-20 13:52	110067	Bianca Mella		Levin Landfill: Levin G1d	0	0.03	0	20.8							sunny		
01-10-20 13:52	110068	Bianca Mella		Levin Landfill: Levin G1s	0	0.04	0	20.6							sunny		
01-10-20 13:53	110069	Bianca Mella		Levin Landfill: Levin G2s	0.07	0.03	0	19.9							sunny		
05-01-21 19:46	113433	Elysia Butler		Levin Landfill: Levin B1	0.62	0.13	0	20.6							Sunny		18
05-01-21 19:50	113434	Elysia Butler		Levin Landfill: Levin B2	0.71	0.16	0	20.4							Sunny		18
05-01-21 19:51	113435	Elysia Butler		Levin Landfill: Levin B3s	0.09	0.03	0	21							Sunny		18
05-01-21 19:52	113436	Elysia Butler		Levin Landfill: Levin C1	0.08	0.23	0	20.8							Sunny		18
05-01-21 19:53	113437	Elysia Butler		Levin Landfill: Levin C2	0.73	21.5	0	21.5							Sunny		18
05-01-21 19:54	113438	Elysia Butler		Levin Landfill: Levin C2dd	0.16	0.1	0	21.3							Sunny		18
05-01-21 19:55	113439	Elysia Butler		Levin Landfill: Levin C2ds	0.17	0.08	0	21.1							Sunny		18
05-01-21 19:56	113440	Elysia Butler		Levin Landfill: Levin D1	0.65	0	0	20.5							Sunnny		21
05-01-21 19:57	113441	Elysia Butler		Levin Landfill: Levin D2	0	0.28	0	21							Sunny		21
05-01-21 19:58	113442	Elysia Butler		Levin Landfill: Levin D3	0.94	0.03	0	203							Sunny		21
05-01-21 19:59	113443	Elysia Butler		Levin Landfill: Levin D4	0.95	0.04	0	20.9							Sunny		21
05-01-21 20:00	113444	Elysia Butler		Levin Landfill: Levin D5	0.04	0.04	0	20.9							Sunny		21
05-01-21 20:01	113445	Elysia Butler		Levin Landfill: Levin D6	0.7	0.6	0	21.1							Sunny		21
05-01-21 20:03	113446	Elysia Butler		Levin Landfill: Levin E1d	0.69	0.04	0	21.1							Sunnny		21
05-01-21 20:04	113447	Elysia Butler		Levin Landfill: Levin E1s	0.84	0.05	0	21.1							Sunny		21
05-01-21 20:05	113448	Elysia Butler		Levin Landfill: Levin E2s	0	0.09	0	21							Sunny		18
05-01-21 20:06	113449	Elysia Butler		Levin Landfill: Levin E2d	0	0.14	0	20.4							Sunny		18
05-01-21 20:07	113450	Elysia Butler		Levin Landfill: Levin F1	0.75	0	0	20.7							Sunny		21

05-01-21 20:08	113451	Elysia Butler		Levin Landfill: Levin F2	0.45	0.02	0	20.6							Sunny		21
05-01-21 20:09	113452	Elysia Butler		Levin Landfill: Levin F3	0.91	0.02	0	20.5							Sunny		21
05-01-21 20:11	113453	Elysia Butler		Levin Landfill: Levin G1d	0.24	0.07	0	20.9							Sunny		21
05-01-21 20:12	113454	Elysia Butler		Levin Landfill: Levin G1s	0.49	0.07	0	20.9							Sunny		21
05-01-21 20:12	113455	Elysia Butler		Levin Landfill: Levin G2s	0.09	0.6	0	20.7							Sunny		18
02-03-21 7:53	115271	Peter Giddins		Levin Landfill: Levin Xd1	0	0.06	0	20.8						17			
02-03-21 9:21	115272	Peter Giddins		Levin Landfill: Levin Xs2	0	0.03	0	20.9									17
02-03-21 10:10	115273	Peter Giddins		Levin Landfill: Levin Xs1	0.04	0.08	0	21									19
08-04-21 11:30	118950	Elysia Butler		Levin Landfill: Levin G2s	0	0.03	0	20.8									20
08-04-21 11:42	118915	Elysia Butler		Levin Landfill: Levin B1	0	0.11	0	20.5									19
08-04-21 11:52	118946	Elysia Butler		Levin Landfill: Levin Landfill Leachate	0	0.05	0	20.7									20
08-04-21 12:00	118929	Elysia Butler		Levin Landfill: Levin D6	0	0.1	0	20.3									20
08-04-21 12:28	118943	Elysia Butler		Levin Landfill: Levin F1	0	0.05	0	21									18
08-04-21 12:55	118947	Elysia Butler		Levin Landfill: Levin G1d	0	0.05	0	20.4									18
08-04-21 13:00	118949	Elysia Butler		Levin Landfill: Levin G1s	0	0.13	0	20.5									18
08-04-21 13:12	118922	Elysia Butler		Levin Landfill: Levin D1	0	0.15	0	20.1									20
08-04-21 13:20	118923	Elysia Butler		Levin Landfill: Levin D2	0.02	0.36	0	19.3									19
08-04-21 13:40	118945	Elysia Butler		Levin Landfill: Levin F2	0	0.45	0	20.2									19
08-04-21 13:50	118944	Elysia Butler		Levin Landfill: Levin F3	0	0.08	0	20.8									19
08-04-21 14:00	118925	Elysia Butler		Levin Landfill: Levin D3	0	0.06	0	20.8									19
08-04-21 14:20	118927	Elysia Butler		Levin Landfill: Levin D5	0	0.14	0	20.8									19
08-04-21 14:30	118926	Elysia Butler		Levin Landfill: Levin D4	0	0.09	0	20.8									19
08-04-21 14:35	118939	Elysia Butler		Levin Landfill: Levin E1s	0	0.06	0	20.9									19
08-04-21 14:45	118930	Elysia Butler		Levin Landfill: Levin E1d	0	0.12	0	20.8									19
08-04-21 14:55	118918	Elysia Butler		Levin Landfill: Levin C1	0	0.71	0	20.3									21
09-04-21 12:50	118942	Elysia Butler		Levin Landfill: Levin E2d	0	0.02	0	20.8									20
09-04-21 13:15	118921	Elysia Butler		Levin Landfill: Levin C2ds	0	0.13	0	20.4									20
09-04-21 13:20	118920	Elysia Butler		Levin Landfill: Levin C2dd	0	0.08	0	20.5									20
09-04-21 13:25	118919	Elysia Butler		Levin Landfill: Levin C2	0	0	0	20.5									21
09-04-21 13:35	118916	Elysia Butler		Levin Landfill: Levin B2	0	4.24	0	14.5									20
09-04-21 14:55	118940	Elysia Butler		Levin Landfill: Levin E2s	0	0.03	0	20.8									20
12-04-21 8:25	118953	Elysia Butler		Levin Landfill: Levin Xs2	0	0.05	0	20.7									18
12-04-21 9:05	118951	Elysia Butler		Levin Landfill: Levin Xs1	0	0.02	0	20.9									19
12-04-21 10:30	118954	Elysia Butler		Levin Landfill: Levin Xd1	0	0	0	20.8									18
09-06-21 13:05	118917	Elysia Butler		Levin Landfill: Levin B3s	0	0	0	20.6									20
13-07-21 9:34	121548	Adrian Parkes		Levin Landfill: Levin B1	0.21	0.13	0	20.6						7			
13-07-21 9:36	121549	Adrian Parkes		Levin Landfill: Levin B2	0	0.08	0	17.7									7
13-07-21 9:38	121550	Adrian Parkes		Levin Landfill: Levin B3s	0.1	0.05	0	21									7
13-07-21 9:39	121551	Adrian Parkes		Levin Landfill: Levin C1	0.19	0.07	0	18.9									10
13-07-21 9:41	121553	Adrian Parkes		Levin Landfill: Levin C2	0.11	0.05	0	21									7
13-07-21 9:42	121555	Adrian Parkes		Levin Landfill: Levin C2dd	0.03	0.04	0	20.7									7
13-07-21 9:43	121556	Adrian Parkes		Levin Landfill: Levin C2ds	0	0.06	0	20.7									7
13-07-21 9:44	121557	Adrian Parkes		Levin Landfill: Levin D1	0.1	0.06	0	21.3									11
13-07-21 9:46	121558	Adrian Parkes		Levin Landfill: Levin D2	0.03	0.05	0	20.9									10
13-07-21 9:48	121559	Adrian Parkes		Levin Landfill: Levin D3											Concreted.		
13-07-21 9:51	121562	Adrian Parkes		Levin Landfill: Levin D6	0.55	0	0	20.4									10
13-07-21 9:55	121567	Adrian Parkes		Levin Landfill: Levin E2s	0.05	0.11	0	20.9									6
13-07-21 9:59	121569	Adrian Parkes		Levin Landfill: Levin E2s	0.05	0.11	0	20.9									6
13-07-21 10:00	121570	Adrian Parkes		Levin Landfill: Levin E2d	0.05	0.11	0	20.9									6

13-07-21 10:01	121571	Adrian Parkes		Levin Landfill: Levin F3	0.03	0	0	21									10
13-07-21 10:12	121576	Adrian Parkes		Levin Landfill: Levin G2s	0.44	0.13	0	20.9									10
14-07-21 9:49	121560	Adrian Parkes		Levin Landfill: Levin D4	0	0.08	0	21									5
14-07-21 9:50	121561	Adrian Parkes		Levin Landfill: Levin D5	0	0	0.05	21.2									7
14-07-21 9:53	121563	Adrian Parkes		Levin Landfill: Levin E1d	0	0.02	0	20.1									5
14-07-21 9:54	121564	Adrian Parkes		Levin Landfill: Levin E1s	0	0.03	0	20.2									5
14-07-21 10:05	121572	Adrian Parkes		Levin Landfill: Levin F1	0	0.03	0	21.1									10
14-07-21 10:07	121573	Adrian Parkes		Levin Landfill: Levin F2	0	0.05	0	20.9									7
14-07-21 10:09	121574	Adrian Parkes		Levin Landfill: Levin G1d	0	0.02	0	20.7									5
14-07-21 10:11	121575	Adrian Parkes		Levin Landfill: Levin G1s	0	0.02	0	20.9									5
14-07-21 10:14	121577	Adrian Parkes		Levin Landfill: Levin Xs1	0	0.11	0	20.6									10
14-07-21 10:15	121578	Adrian Parkes		Levin Landfill: Levin Xs2	0.19	0.22	0	20.1									10
14-07-21 10:16	121579	Adrian Parkes		Levin Landfill: Levin Xd1	0	0.06	0	20.6									10
07-10-21 11:49	124147	Ethan Pollock		Levin Landfill: Levin D1	0	0.19	0	20.3									15
07-10-21 11:51	124148	Ethan Pollock		Levin Landfill: Levin D2	0	0.3	0	20.3									15
07-10-21 11:53	124149	Ethan Pollock		Levin Landfill: Levin D4	0	0.1	0	20.5									16
07-10-21 11:54	124150	Ethan Pollock		Levin Landfill: Levin D5	0	0.1	0	20.5									16.6
07-10-21 11:55	124151	Ethan Pollock		Levin Landfill: Levin D6	0	0.05	0	20.6									14.9
07-10-21 11:56	124152	Ethan Pollock		Levin Landfill: Levin E1d	0	0.06	0	20.5									16
07-10-21 11:57	124153	Ethan Pollock		Levin Landfill: Levin E1s	0	0.04	0	20.5									16
07-10-21 11:57	124154	Ethan Pollock		Levin Landfill: Levin E1s	0	0.04	0	20.5									16
07-10-21 11:58	124155	Ethan Pollock		Levin Landfill: Levin E2s	0	0.09	0	20.3									16
07-10-21 12:01	124156	Ethan Pollock		Levin Landfill: Levin E2d	0	0.1	0	20.3									16
07-10-21 12:01	124157	Ethan Pollock		Levin Landfill: Levin F1	0	0.08	0	20.8									14.9
07-10-21 12:55	124158	Ethan Pollock		Levin Landfill: Levin F1	0	0.08	0	20.8									14.9
07-10-21 12:56	124159	Ethan Pollock		Levin Landfill: Levin F2	0	0.61	0	18.6									17.2
07-10-21 12:57	124162	Ethan Pollock		Levin Landfill: Levin F3	0	0.15	0	20.6									15
07-10-21 12:58	124163	Ethan Pollock		Levin Landfill: Levin G1d	0.03	0	0	21.5									16.7
07-10-21 12:59	124164	Ethan Pollock		Levin Landfill: Levin G1s	0	0	0	21.4									16.7
07-10-21 13:01	124165	Ethan Pollock		Levin Landfill: Levin G2s	0	1.42	0	18.2									18.5
07-10-21 13:02	124166	Ethan Pollock		Levin Landfill: Levin Xs1	0	0.03	0	20.1									19.5
07-10-21 13:03	124167	Ethan Pollock		Levin Landfill: Levin Xs2	0.02	0	0	21.1									15.6
07-10-21 13:04	124168	Ethan Pollock		Levin Landfill: Levin Xd1	0.1	0.23	0	21									19
07-10-21 14:45	123430	Peter Giddins		Levin Landfill: Levin B1	0	0.44	0	19.2							Overcast		17.9
07-10-21 14:47	123431	Peter Giddins		Levin Landfill: Levin B2	0	8.12	0	1.5							Overcast		17.8
07-10-21 14:50	123432	Peter Giddins		Levin Landfill: Levin B3s	0	0.05	0	20.3							Overcast		16.5
07-10-21 14:52	123434	Peter Giddins		Levin Landfill: Levin C1	0	0.17	0	19.5							Overcast		18
07-10-21 14:54	123435	Peter Giddins		Levin Landfill: Levin C2	0	0.03	0	20.1							Overcast		17.4
07-10-21 14:57	123438	Peter Giddins		Levin Landfill: Levin C2dd	0	0.22	0								Overcast		17.4
07-10-21 15:18	123440	Peter Giddins		Levin Landfill: Levin C2ds	0	0.58	0	19.8							Overcast		17.4
17-01-22 14:10	128913	Nandu Anand		Levin Landfill: Levin G1d	0.09	0.05	0	21.6							Sunny		18
17-01-22 14:12	128914	Nandu Anand		Levin Landfill: Levin G1s	0.07	0.05	0	21.7							Sunny		18
17-01-22 14:13	128915	Nandu Anand		Levin Landfill: Levin G2s	0	0.2	0	20.3							Sunny		18
17-01-22 14:14	128916	Nandu Anand		Levin Landfill: Levin D5	0	20.9	0	20.9							SUNNY		18
17-01-22 14:15	128917	Nandu Anand		Levin Landfill: Levin F1	0.05	0.05	0	21.9							SUNNY		18
17-01-22 14:16	128918	Nandu Anand		Levin Landfill: Levin F2	0.04	0.14	0	19.9							SUNNY		18
17-01-22 14:17	128919	Nandu Anand		Levin Landfill: Levin F3	0.04	0.05	0	20.3							SUNNY		18
17-01-22 14:18	128920	Nandu Anand		Levin Landfill: Levin C2dd	0.01	0.19	0	20.9							SUNNY		18
17-01-22 14:18	128921	Nandu Anand		Levin Landfill: Levin E1d	0.01	0.04	0	21							SUNNY		18
17-01-22 14:19	128922	Nandu Anand		Levin Landfill: Levin E2d	0.01	0.06	0	20.7							SUNNY		18

17-01-22 14:20	128923	Nandu Anand		Levin Landfill: Levin D1	0	0.07	0	20.8							SUNNY		18
17-01-22 14:21	128930	Nandu Anand		Levin Landfill: Levin D2	0.05	0.29	0	20.8							SUNNY		18
17-01-22 14:22	128931	Nandu Anand		Levin Landfill: Levin D3rd	0.02	0.03	0	20.6							SUNNY		18
17-01-22 14:23	128939	Nandu Anand		Levin Landfill: Levin D3rs	0.02	0.03	0	20.9							SUNNY		18
17-01-22 14:24	128940	Nandu Anand		Levin Landfill: Levin D6	0	0.05	0	20.6							SUNNY		18
17-01-22 14:25	128945	Nandu Anand		Levin Landfill: Levin E1s	0	0.04	0	21							SUNNY		18
17-01-22 14:26	128946	Nandu Anand		Levin Landfill: Levin E2s	0.05	0.06	0	20.7							SUNNY		18
17-01-22 14:26	128947	Nandu Anand		Levin Landfill: Levin D4	0.01	0.04	0	21							SUNNY		18
17-01-22 14:27	128948	Nandu Anand		Levin Landfill: Levin C2	0.01	0.11	0	21							SUNNY		18
17-01-22 14:28	128949	Nandu Anand		Levin Landfill: Levin C2ds	0.03	0.38	0	20.7							SUNNY		18
17-01-22 14:29	128950	Nandu Anand		Levin Landfill: Levin B1	0	0.45	0	20.4							SUNNY		18
17-01-22 14:30	128951	Nandu Anand		Levin Landfill: Levin B2	0	1.5	0	19.7							SUNNY		18
17-01-22 14:30	128952	Nandu Anand		Levin Landfill: Levin B3s	0.04	0.04	0	21							SUNNY		18
17-01-22 14:31	128953	Nandu Anand		Levin Landfill: Levin Xs1	0.01	0.03	0	20.8							SUNNY		18
17-01-22 14:32	128954	Nandu Anand		Levin Landfill: Levin Xs2	0	0.17	0	20.5							SUNNY		18
17-01-22 14:32	128955	Nandu Anand		Levin Landfill: Levin Xd1	0.01	0.04	0	21							SUNNY		18
05-04-22 13:12	132043	Peter Giddins		Levin Landfill: Levin Xs2	0.05	0.13	0	20.7							Fine		21
05-04-22 13:25	132044	Peter Giddins		Levin Landfill: Levin G2s	0.06	0.45	0	20.2							Fine		21
07-04-22 0:30	132085	Peter Giddins		Levin Landfill: Levin C2	0.01	0.08	0	20.3							fine		17
07-04-22 0:45	132088	Peter Giddins		Levin Landfill: Levin C2ds	0	0.14	0	20.1							fine		16
07-04-22 1:15	132092	Peter Giddins		Levin Landfill: Levin Xs1	0.01	0.73	1	18.7							fine		17
07-04-22 8:00	132084	Peter Giddins		Levin Landfill: Levin C1	0.12	0.07	0	21.3							fine		15
07-04-22 8:10	132089	Peter Giddins		Levin Landfill: Levin B1	0.08	0.4	0	21							fine		15
07-04-22 8:20	132073	Peter Giddins		Levin Landfill: Levin F1	0.01	0.07	0	21							fine		15
07-04-22 8:35	132070	Peter Giddins		Levin Landfill: Levin G1d	0	0.05	0	20.6							fine		16
07-04-22 8:42	132071	Peter Giddins		Levin Landfill: Levin G1s	0	0.04	0	20.5							fine		16
07-04-22 9:00	132076	Peter Giddins		Levin Landfill: Levin D1	0	0.12	0	20.1							fine		16
07-04-22 9:12	132077	Peter Giddins		Levin Landfill: Levin D2	0	0.22	0	19.9							fine		16
07-04-22 9:20	132080	Peter Giddins		Levin Landfill: Levin D6	0	0.06	0	20.1							fine		16
07-04-22 9:30	132074	Peter Giddins		Levin Landfill: Levin F2	0	0.58	0	19.9							fine		16
07-04-22 9:39	132075	Peter Giddins		Levin Landfill: Levin F3	0	0.08	0	20.5							fine		16
07-04-22 9:50	132078	Peter Giddins		Levin Landfill: Levin D3rd	0	0.06	0	20.6							fine		16
07-04-22 9:55	132079	Peter Giddins		Levin Landfill: Levin D3rs	0.02	0.09	0	20.6							fine		16
07-04-22 11:00	132072	Peter Giddins		Levin Landfill: Levin D5	0.01	0.11	0	20.2							fine		16
07-04-22 11:10	132083	Peter Giddins		Levin Landfill: Levin D4	0	0.1	0	20.4							fine		16
07-04-22 11:20	132081	Peter Giddins		Levin Landfill: Levin E1s	0	0.07	0	20.5							fine		16
07-04-22 11:25	132067	Peter Giddins		Levin Landfill: Levin E1d	0	0.08	0	20.5							fine		16
07-04-22 11:37	132069	Peter Giddins		Levin Landfill: Levin E2d	0.04	0.12	0	20							fine		16
07-04-22 11:45	132082	Peter Giddins		Levin Landfill: Levin E2s	0.07	0.18	0	20							fine		16
07-04-22 12:00	132091	Peter Giddins		Levin Landfill: Levin B3s	0.03	0.05	0	20.4							fine		17
07-04-22 12:40	132066	Peter Giddins		Levin Landfill: Levin C2dd	0.07	0.18	0	20.1							fine		17
07-04-22 13:00	132090	Peter Giddins		Levin Landfill: Levin B2	0	5.2	0	15							fine		16
07-04-22 23:49	132093	Peter Giddins		Levin Landfill: Levin Xd1	0	0.1	0	20.4							fine		16
10-06-22 13:50	134495	Adrian Parkes		Levin Landfill: Levin Xs1	0.09	0.05	0	21.2							Retested Following H2S Level Concerns from April being 1%, but Actual Measurement is in		
06-07-22 2:33	137484	Peter Giddins		Levin Landfill: Levin D6	0	0.04	0	21									14
06-07-22 13:35	137468	Peter Giddins		Levin Landfill: Levin G1s	0	0.04	0	21.2									14
06-07-22 14:00	137472	Peter Giddins		Levin Landfill: Levin F1	0	0.03	0	20.9									14
06-07-22 14:12	137479	Peter Giddins		Levin Landfill: Levin D1	0	0.14	0	20.5									13
06-07-22 14:40	137483	Peter Giddins		Levin Landfill: Levin D3rs	0.06	0.11	0	20.9									14

06-07-22 14:41	137480	Peter Giddins		Levin Landfill: Levin D2	0.05	0.74	0	20.2									14
06-07-22 14:45	137482	Peter Giddins		Levin Landfill: Levin D3rd	0	0.06	0	21									14
06-07-22 14:55	137473	Peter Giddins		Levin Landfill: Levin F2	0	0.1	0	20.5									14
06-07-22 15:00	137474	Peter Giddins		Levin Landfill: Levin F3	0	0.03	0	21									14
06-07-22 15:15	137490	Peter Giddins		Levin Landfill: Levin C1	Water level at surface - no gas sampling could occur.										Bore at ground level no gas sample taken		
06-07-22 15:20	137470	Peter Giddins		Levin Landfill: Levin G2s	0	1	0	20.5									14
07-07-22 8:50	137471	Peter Giddins		Levin Landfill: Levin D5	0.09	0.04	0	20.9									5
07-07-22 9:20	137488	Peter Giddins		Levin Landfill: Levin D4	0.14	0	0	20.1									5
07-07-22 9:27	137485	Peter Giddins		Levin Landfill: Levin E1s	0.01	0.06	0	20.9									5
07-07-22 9:30	137477	Peter Giddins		Levin Landfill: Levin E1d	0	0.05	0	20.9									5
07-07-22 9:45	137493	Peter Giddins		Levin Landfill: Levin B1	0.05	0.4	0	20.7									5
07-07-22 9:55	137491	Peter Giddins		Levin Landfill: Levin C2	Water level at surface - no gas sampling could occur.										Bore at ground level no gas sample taken		
07-07-22 10:00	137476	Peter Giddins		Levin Landfill: Levin C2dd	0.13	0.44	0	20.8									5
07-07-22 10:05	137492	Peter Giddins		Levin Landfill: Levin C2ds	0.1	0.28	0	20.8									5
07-07-22 10:15	137478	Peter Giddins		Levin Landfill: Levin E2d	0.21	0.22	0	19.5									5
07-07-22 10:15	137500	Peter Giddins		Levin Landfill: Levin E2d	0.32	0.39	0	20.2									5
07-07-22 10:20	137486	Peter Giddins		Levin Landfill: Levin E2s	0.26	0.23	0	20									5
07-07-22 10:30	137496	Peter Giddins		Levin Landfill: Levin B3s	Water level at surface - no gas sampling could occur.										Bore at ground level no gas sample taken		
07-07-22 10:45	137494	Peter Giddins		Levin Landfill: Levin B2	0.32	3.6	0	17.1									5
07-07-22 11:00	137498	Peter Giddins		Levin Landfill: Levin Xs1	0.22	0.63	0	21.4									5
07-07-22 11:21	137499	Peter Giddins		Levin Landfill: Levin Xs2	0.01	0.23	0	20.8									5
06-08-22 13:33	137467	Peter Giddins		Levin Landfill: Levin G1d	0	0.06	0	20.9									14

Appendix J Surface emissions reports

SURFACE EMISSIONS MONITORING REPORT

Quality Information

Project Name Title:	Surface Emission Monitoring –July 2021
Subtitle:	Levin Landfill
Date:	20th July 2021
Monitored and authored by:	Shanka Samarathunge
Reviewed:	Michael McDonnell

Authorised for issue by Michael McDonnell

Michael McDonnell
Landfill Manager

Contents

Purpose

To monitor landfill surface emissions in compliance with Air Discharge Permit 330/1 Condition 5. This survey provides a qualitative assessment of landfill gas emissions from the landfill surface.

1.0 Procedure

A Gas-Rover detector by Bascom-Turner was used by EnviroWaste Services Limited to assess levels of emissions of methane. The instantaneous surface emission monitoring was done in accordance with the EnviroWaste standard operating procedure for all Landfills.

2.0 Details of this survey

The monitoring was carried out on the 20th July starting at 08.15 a.m. and Table 2 below details the readings from the survey.

3.0 Climate

The weather conditions prior to and during the survey are summarised and recorded in Table 1 comparing the resource consent requirements and the EnviroWaste standard operating procedure (SOP).

Table 1: Guidelines, resource consent requirements and the actual survey conditions.

	Resource consent requirements None ***Note:** *Favourable weather conditions*	**SOP Guidelines**	**Actual**	**Comments**
Average wind speed	*Less than 25km/h, ideally 5-10km/h	Less than 15km/h ideally less than10km/h.	Average wind speed during the survey was 1.28 km/h	-
Rainfall	*0.5mm in 48hours	Less than 0.5mm having fallen in 2 days prior.	There was 1.54mm of rain on the 19th July 2021 at 2.09am 30 hours before the survey.	-
Landfill surface grass height	-	Less than 100 mm	Patches of grass greater than 400mm across stage 1 area.	Weed-eating and mowing grass is recommended for a more accurate survey
Landfill surface	-	Relatively dry.	Relatively dry.	-
Atmospheric pressure	-	Ideally declining atmospheric pressure after several days of high pressure.	Pressure gradually inclined prior to the survey from 974.94 hpa to 989.50 hpa, and gradually inclined during the survey period up to 996.27 hpa	-

4.0 Results

The results of the survey are plotted on the attached drawing. Details of readings above 200ppm are in Table 1.

5.0 Attachments

- Tables 1 and 2 of results.
- Site plan showing locations of notable results before and after remediation.
- Appendices 1 and 2 Climate conditions – graphical format.

6.0 Methane readings and locations

Table 2: Highest Methane readings recorded at localised survey area

Marker	> 200 ppm	Site Photographs	Comments, location and description	Action Required	Close Out Comments	Retest result
1	448ppm		bare soil cover	Bentonite and water		64 ppm

2	335ppm		bare soil cover	Bentonite and water		33 ppm
3	286ppm		bare soil cover	Bentonite and water		<200 ppm

4	746ppm		bare soil cover	Bentonite and water		<200 ppm
5	613ppm		bare soil cover	Bentonite and water		<200 ppm

6	626ppm		bare soil cover	Bentonite and water		<200 ppm
7	736ppm		bare soil cover	Bentonite and water	2 bags of bentonite. 	127ppm

8	305ppm		bare soil cover	Bentonite and water	2 bags of bentonite 	179ppm

9	531ppm		bare soil cover	Bentonite and water	1 Bag of bentonite 	58ppm
10	229ppm		bare soil cover	Bentonite and water	1 Bag of bentonite 	146ppm

11	645ppm		bare soil cover	Bentonite and water	8.5 bags of bentonite, emissions were still above 500ppm  Clay cover over area 	43ppm

12	521ppm	 	bare soil cover	Bentonite and water	1.5 bags of bentonite 	71ppm

Surface Emissions Map for temporary cover

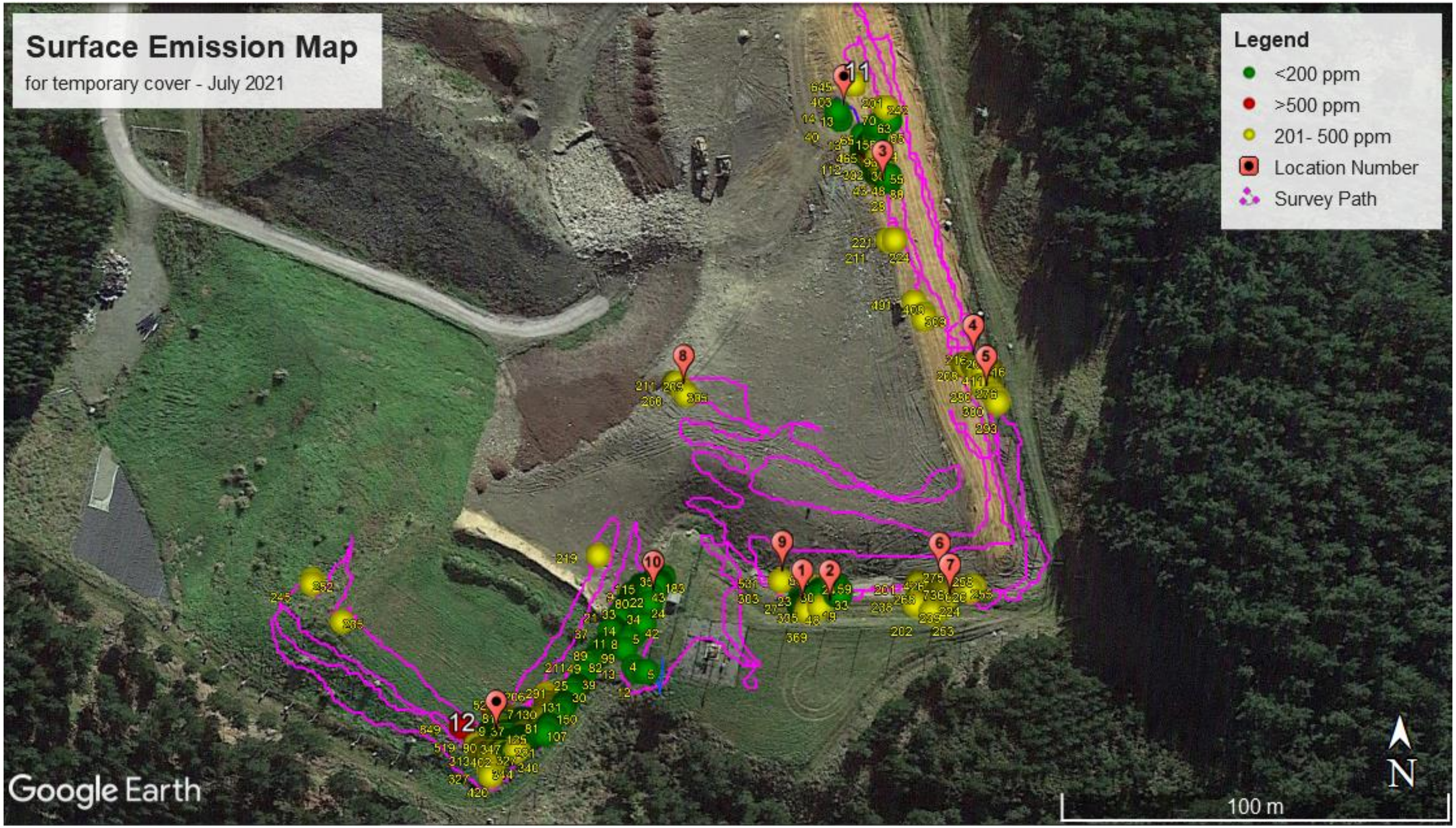


Figure 1: Map showing Levin Landfill surface emissions survey 27th May 2021, areas in red> 500ppm, areas in Yellow 500 ppm - 201 ppm areas in green>200ppm.

Appendix 1: Weather conditions preceding the survey.

The last rain recorded by a Levin weather station was 1.54mm ending at 2.09 a.m on 19th July 2021, 30 hours before the survey according to website https://www.wunderground.com/dashboard/pws/ILEVIN22/table/2021-07-20/2021-07-20/daily,.

Weather History for ILEVIN22

Weekly Mode | July | 18 | 2021 | View

Previous | Next

Summary

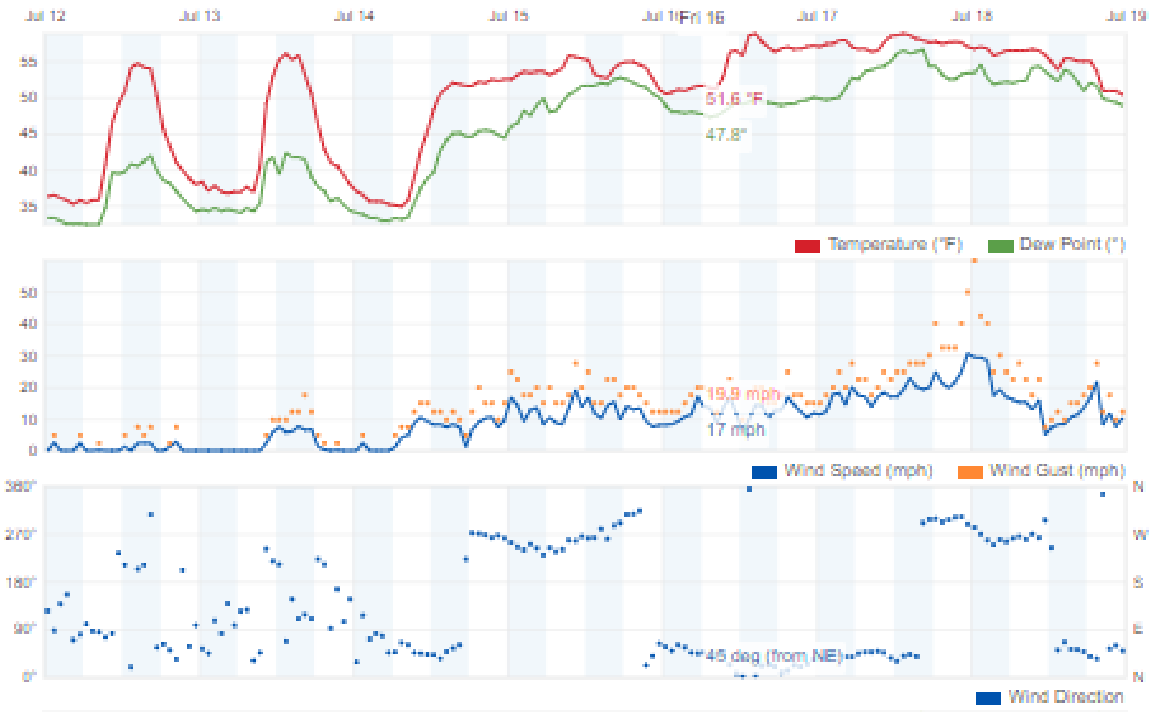
July 12, 2021 - July 18, 2021

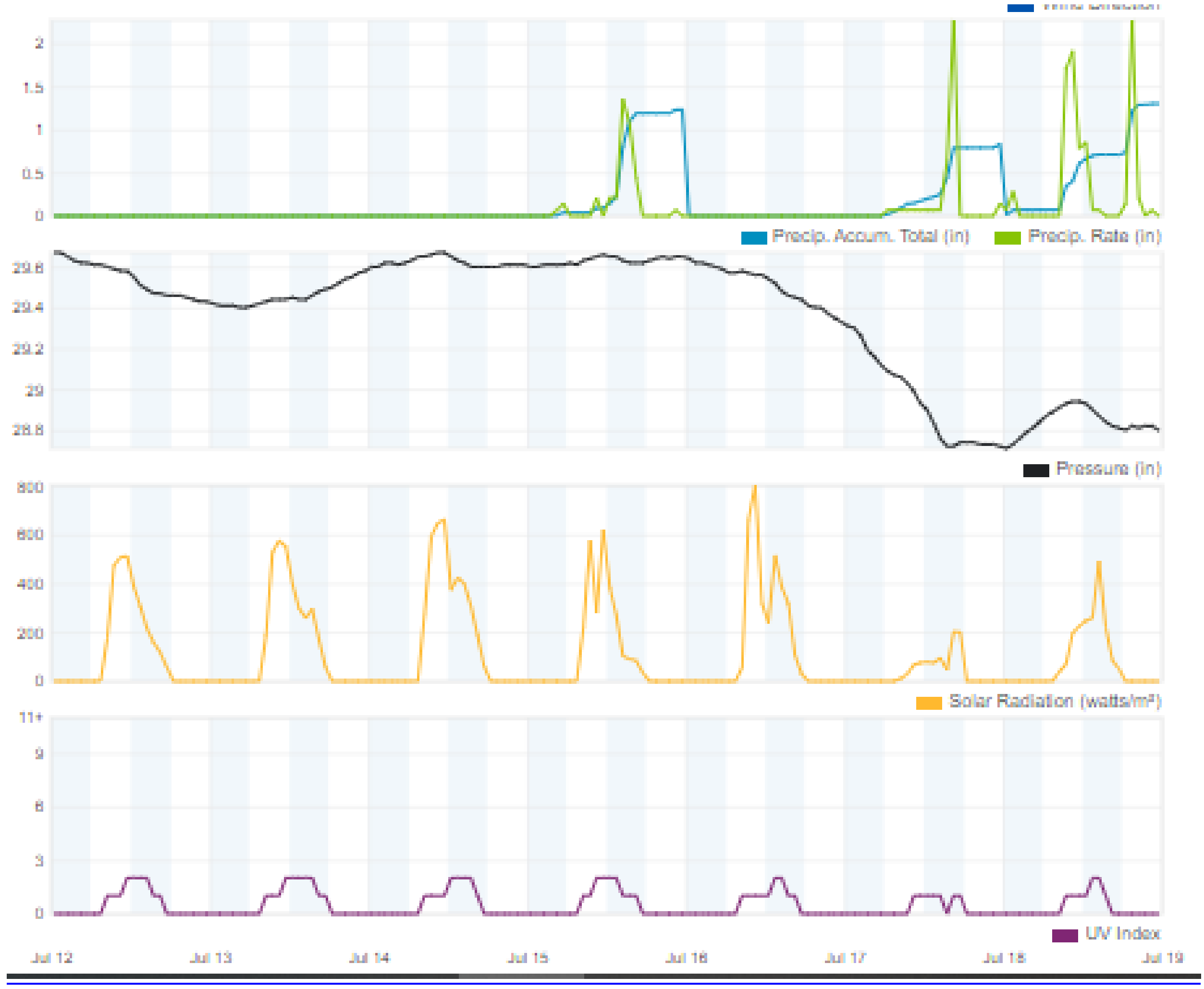
	High	Low	Average
Temperature	58.3 °F	34.2 °F	48.7 °F
Dew Point	56.7 °F	31.5 °F	44.8 °F
Humidity	87 %	43 %	83 %
Precipitation	3.38 in	--	--

	High	Low	Average
Wind Speed	30.8 mph	0.0 mph	4.0 mph
Wind Gust	58.9 mph	--	6.2 mph
Wind Direction	--	--	SE
Pressure	28.87 in	28.66 in	--

Graph | Table

July 12, 2021 - July 18, 2021




2
1.5
1
0.5
0
Precip. Accum. Total (in)
Precip. Rate (in)
29.6
29.4
29.2
29
28.8
Pressure (in)
800
600
400
200
0
Solar Radiation (watts/m²)
11+
9
6
3
0
UV Index
Jul 12
Jul 13
Jul 14
Jul 15
Jul 16
Jul 17
Jul 18
Jul 19

Appendix 2:

Weather conditions during the days of survey on the 20th July displayed below. There was no rainfall during the survey. Graph retrieved from https://www.metservice.com/towns-cities/locations/levin/past-weather

Weather History for ILEVIN22

Daily Mode | July | 20 | 2021 | View

Previous | Next

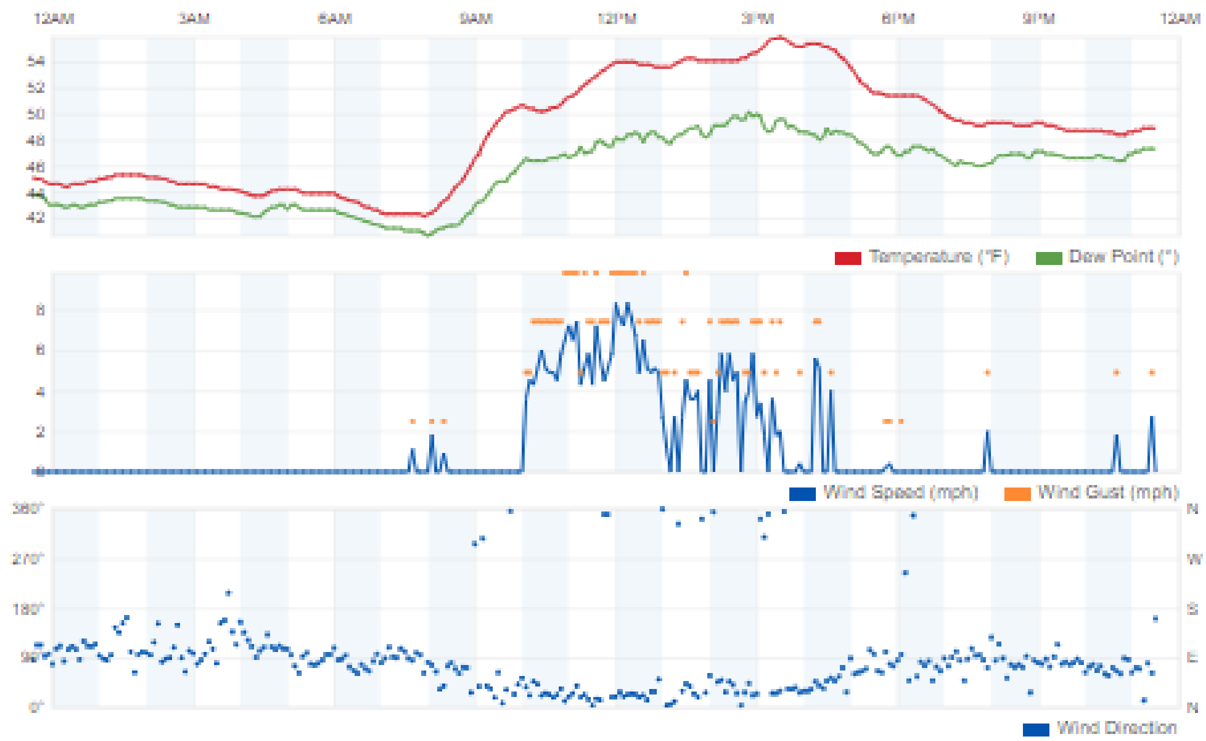
Summary
July 20, 2021

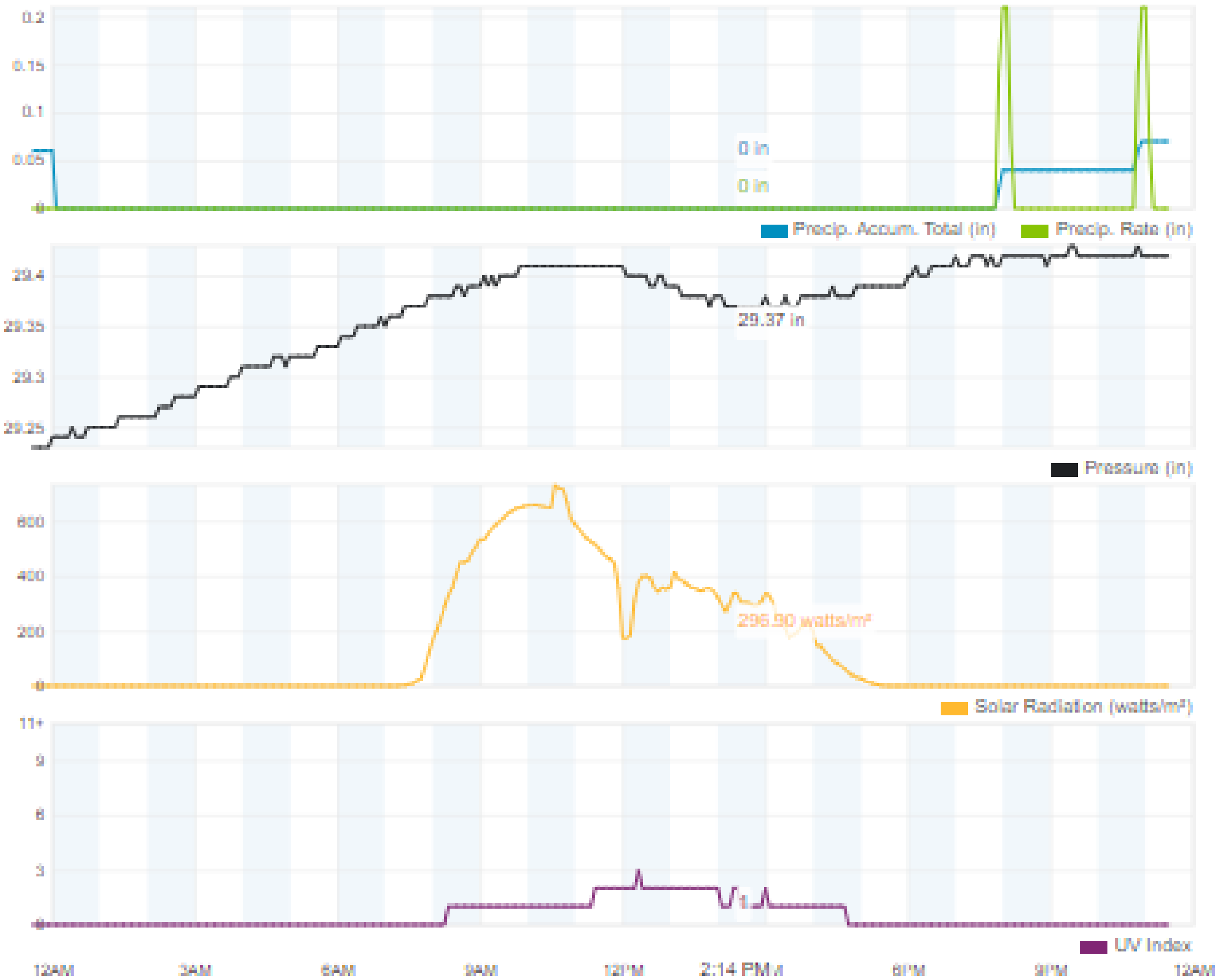
	High	Low	Average
Temperature	55.9 °F	42.1 °F	48.7 °F
Dew Point	50.2 °F	40.5 °F	45.3 °F
Humidity	96 %	74 %	88 %
Precipitation	0.07 in	--	--

	High	Low	Average
Wind Speed	8.3 mph	0.0 mph	0.8 mph
Wind Gust	8.8 mph	--	0.9 mph
Wind Direction	--	--	NNE
Pressure	29.43 in	29.21 in	--

Graph | Table

July 20, 2021





0.2
0.15
0.1
0.05
0
0 in
0 in
Precip. Accum. Total (in)
Precip. Rate (in)
29.4
29.35
29.3
29.25
29.37 in
Pressure (in)
600
400
200
0
296.90 watts/m²
Solar Radiation (watts/m²)
11+
9
6
3
0
UV Index
12AM
3AM
6AM
9AM
12PM
2:14 PM
6PM
9PM
12AM

SURFACE EMISSIONS MONITORING REPORT

Quality Information

Project Name Title:	Surface Emission Monitoring –August 2021
Subtitle:	Levin Landfill
Date:	10th August 2021
Monitored and authored by:	Shanka Samarathunge
Reviewed:	Michael McDonnell

Authorised for issue by Michael McDonnell

Michael McDonnell
Landfill Manager

Contents

Purpose

To monitor landfill surface emissions in compliance with Air Discharge Permit 330/1 Condition 5. This survey provides a qualitative assessment of landfill gas emissions from the landfill surface.

1.0 Procedure

A Gas-Rover detector by Bascom-Turner was used by EnviroWaste Services Limited to assess levels of emissions of methane. The instantaneous surface emission monitoring was done in accordance with the EnviroWaste standard operating procedure for all Landfills.

2.0 Details of this survey

The monitoring was carried out on the 10th August starting at 08.40 a.m. Table 2 below details the readings from the survey.

3.0 Climate

The weather conditions prior to and during the survey are summarised and recorded in Table 1 comparing the resource consent requirements and the EnviroWaste standard operating procedure (SOP).

Table 1: Guidelines, resource consent requirements and the actual survey conditions.

	Resource consent requirements None *****Note: *Favourable weather conditions*	**SOP Guidelines**	**Actual**	**Comments**
Average wind speed	*Less than 25km/h, ideally 5-10km/h	Less than 15km/h ideally less than10km/h.	Average wind speed during the survey was 1.3 Km/h	-
Rainfall	*0.5mm in 48hours	Less than 0.5mm having fallen in 2 days prior	0.34 mm rainfall at 12.00am on 10th August 2021	-
Landfill surface grass height	-	Less than 100 mm	Patches of grass greater than 400mm across North Eastern face in temporary cover	Weed-eating and mowing grass is recommended for a more accurate survey
Landfill surface	-	Relatively dry	Relatively dry and few low lying areas with considerable moisture content in soil cover	Inland flow of water created high moisture content in low lying areas, especially bottom parts of the covers
Atmospheric pressure	-	Ideally declining atmospheric pressure after several days of high pressure	Pressure inclined during the survey from 30.19 in to 30.24 in	Pressure inclined from 08th August 2021 up to survey date

4.0 Results

The results of the survey are plotted on the attached drawing. Details of readings above 200ppm are in Table 2.

5.0 Attachments

- Tables 1 of results.
- Site plan showing locations of notable results before remediation.
- Appendices 1 and 2 Climate conditions – graphical format.

6.0 Methane readings and locations

Table 2: Highest Methane readings recorded at localised survey area

Marker	> 200 ppm	Site Photographs	Comments, location and description	Action Required	Close Out Comments	Retest result
1	368ppm		Grass cover, closer to mulch / temporary cover in North Eastern face	Bentonite and water	1 bag of Bentonite and water 	0ppm
2	346ppm		Closer to mulch / temporary cover and in bare soil cover	Bentonite and water	2 bags of Bentonite and water 	118ppm

3	276ppm		In previous bentonite remediation	Bentonite and water	1 bag of Bentonite and water 	42ppm
4	411ppm		Bare soil cover	Bentonite and water	4 bags of Bentonite and water 	48ppm
5	437ppm		Bare soil cover in North Eastern face	Bentonite and water	2 bags of Bentonite and water 	130ppm

6	309ppm		Clay/dried grass cover in North Eastern face.	Bentonite and water	2 bag of Bentonite and water 	46ppm
7	479ppm		Clay/dry grass cover in North Eastern face	Bentonite and water	1 bag of Bentonite and water 	167ppm

8	253ppm		Clay cover at the edge of the North Eastern face	Bentonite and water	1 bag of Bentonite and water 	143ppm
9	383ppm		Clay cover, closer to south eastern faces clay bund	Bentonite and water	2 bag of Bentonite and water 	17ppm

10	328ppm		Next to previous bentonite area, closer to clay bund in North Eastern face	Bentonite and water	1 bag of bentonite and water. 	55ppm
11	243ppm		Clay cover and previous bentonite cover, edge of South face and North Eastern face	Bentonite and water	1 bag of bentonite and water 	110ppm

12	293ppm		Clay cover in the upper edge of Southern face	Bentonite and water	Added 2 bags of bentonite and water 	94ppm
13	399ppm		Clay cover in upper South Western face, closer to clay bund	Bentonite and water	1bags of bentonite and water. 	139ppm
14	284ppm		Clay cover at the edge of the South Western and South Easter face	Bentonite and water	1 bag of bentonite and water 	135ppm

15	377ppm		Clay/gravel cover in upper Western face, closer to clay bund	Bentonite and water	1 bag of bentonite and water 	141ppm
16	361ppm		Clay/gravel cover in upper Western face, closer to clay bund	Bentonite and water	1 bag of bentonite and water 	159ppm

17	423ppm		Clay/ gravel cover in upper Western face, closer to clay bund	Bentonite and water	1 bag of bentonite and water 	99ppm
18	428ppm		Clay/gravel cover in upper Western face, closer to clay bund	Bentonite and water	1 bag of bentonite and water 	274ppm (close to current fill)
-	The bio filter showed no emissions 0ppm for the area, the GPS was not recording for the bio filter inspection.					

Levin Landfill temporary cap

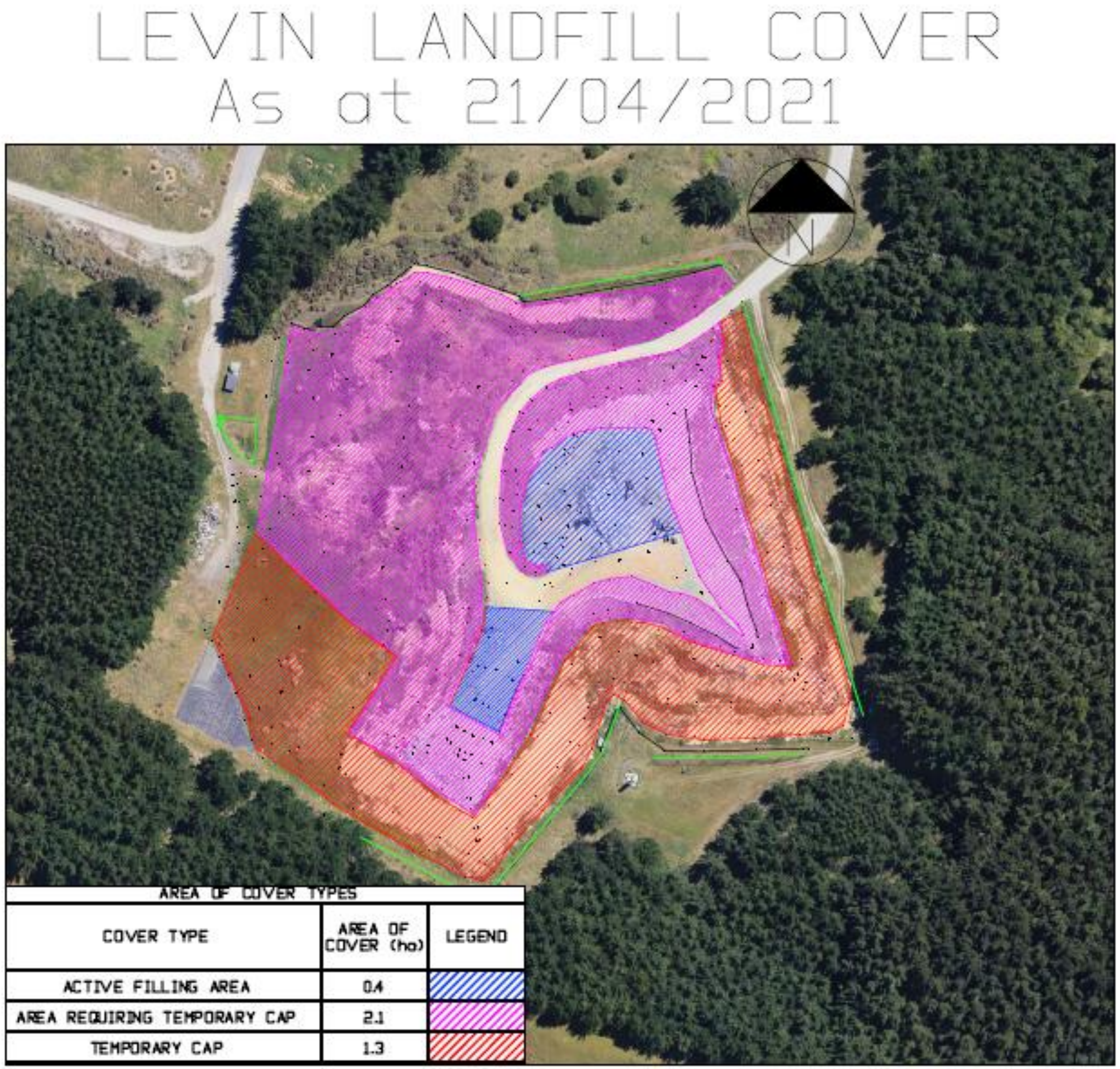


Figure 1: Map of Levin Landfill showing areas with temporary capping. (Aerial photo Feb 2021).

Surface Emissions Map for temporary cover

Figure 1: Map showing Levin Landfill surface emissions survey 10th August 2021, areas in Green >200ppm.

Appendix 1: Weather conditions preceding the survey.

The last rain recorded by a Levin weather station was 0.34mm ending at 12.00 a.m. on the 10th August, 8 hours and 40 minutes before the survey according to website (retrieved August 19st, 2021, https://www.metservice.com/towns-cities/locations/levin/past-weather

Appendix 2:

Weather conditions during the survey on the 10th August displayed below. There was no rainfall during the survey. Graph retrieved August 19th, 2021 from https://www.wunderground.com/dashboard/pws/ILEVIN26/graph/2021-08-10/2021-08-10/daily

Daily Mode | August | 10 | 2021

Next

Previous

View

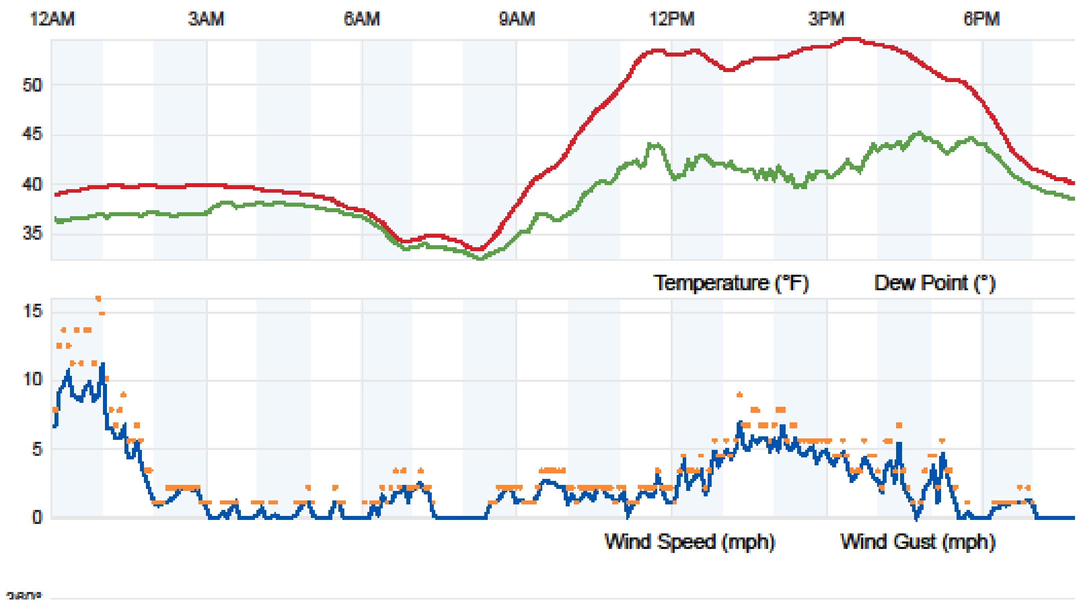
Summary
August 10, 2021

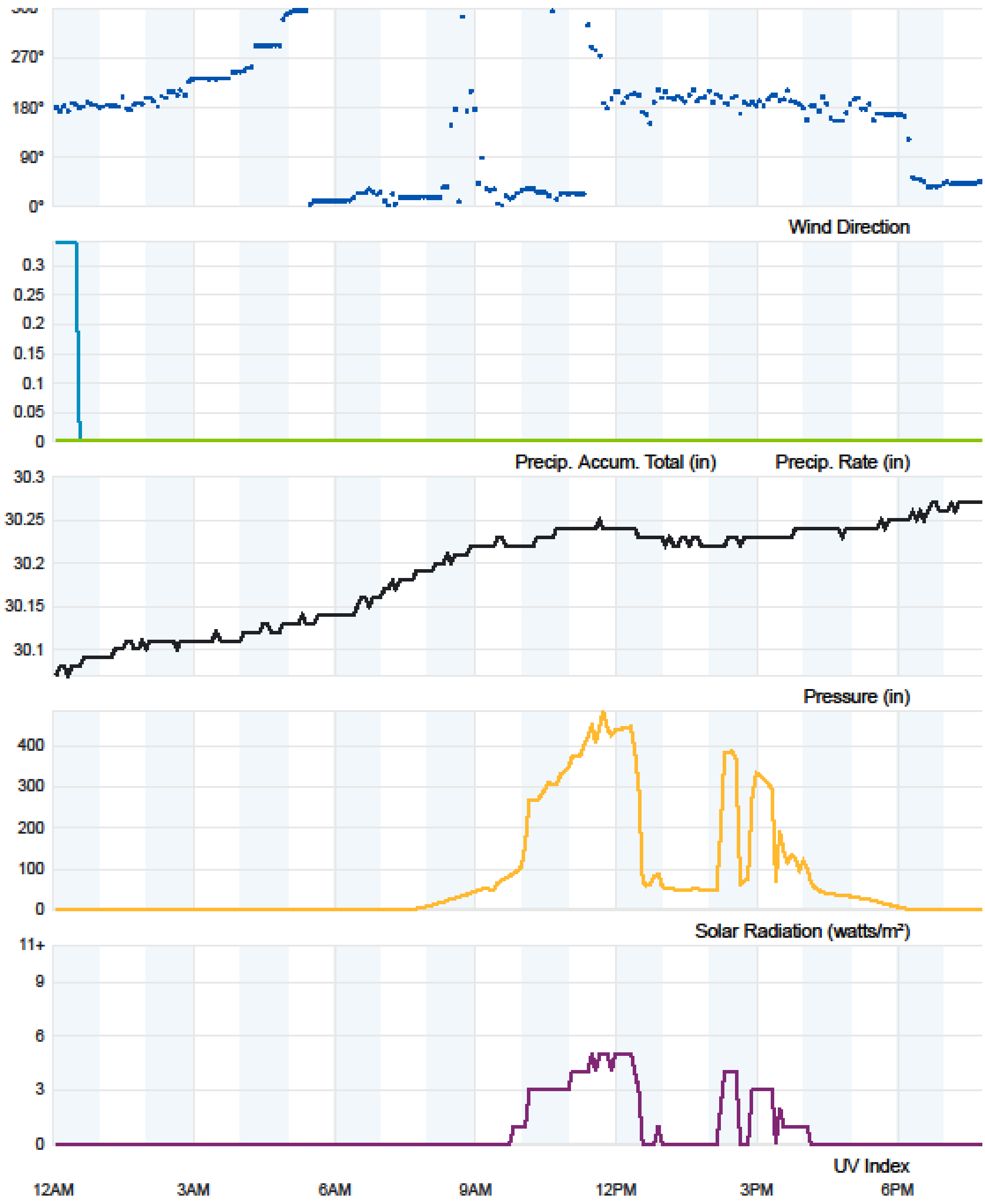
	High	Low	Average
Temperature	54.5 °F	33.3 °F	43.7 °F
Dew Point	45.1 °F	32.2 °F	38.4 °F
Humidity	98 %	56 %	83 %
Precipitation	0.00 in	--	--

	High	Low	Average
Wind Speed	11.2 mph	0.0 mph	1.3 mph
Wind Gust	15.9 mph	--	1.8 mph
Wind Direction	--	--	South
Pressure	30.30 in	30.06 in	--

Graph | Table

August 10, 2021





Our Apps (/download)

About Us (/about/our-company)

Contact (/about/contact-us)

SURFACE EMISSIONS MONITORING REPORT

Quality Information

Project Name Title:	Surface Emission Monitoring
Subtitle:	Levin Landfill
Date:	27th September 2021
Monitored and authored by:	Shanka Samarathunge
Reviewed:	Michael McDonnell

Authorised for issue by Michael McDonnell

Michael McDonnell
Landfill Manager

Contents

Purpose

To monitor landfill surface emissions in compliance with Air Discharge Permit 330/1 Condition 5. This survey provides a qualitative assessment of landfill gas emissions from the landfill surface.

1.0 Procedure

A Gas-Rover detector by Bascom-Turner was used by EnviroWaste Services Limited to assess levels of emissions of methane. The instantaneous surface emission monitoring was done in accordance with the EnviroWaste standard operating procedure for all Landfills.

2.0 Details of this survey

The monitoring was carried out on the 27th September starting at 08.30 a.m. Table 2 below details the readings from the survey.

3.0 Climate

The weather conditions prior to and during the survey are summarised and recorded in Table 1 comparing the resource consent requirements and the EnviroWaste standard operating procedure (SOP).

Table 1: Guidelines, resource consent requirements and the actual survey conditions.

	Resource consent requirements None *****Note: *Favourable weather conditions*	**SOP Guidelines**	**Actual**	**Comments**
Average wind speed	*Less than 25km/h, ideally 5-10km/h	Less than 15km/h ideally less than10km/h	Average wind speed during the survey was 1.00km/h.	-
Rainfall	*0.5mm in 48hours	Less than 0.5mm having fallen in 2 days prior	There was 0.7mm of rain on the 23rd 4.14 pm, 88 hours before the survey	-
Landfill surface grass height	-	Less than 100 mm	Patches of grass greater than 400mm across stage 1 area	Weed-eating and mowing grass is recommended for a more accurate survey
Landfill surface	-	Relatively dry	Relatively dry	-
Atmospheric pressure	-	Ideally declining atmospheric pressure after several days of high pressure	Pressure was declining from 25th September to survey date and inclined during the survey on the 27th September	-

4.0 Results

The results of the survey are plotted on the attached drawing. Details of readings above 200ppm are in Table 2.

5.0 Attachments

- Tables 1 and 2 of results.
- Site plan showing locations of notable results before and after remediation.
- Appendices 1 and 2 Climate conditions – graphical format.

6.0 Methane readings and locations

Table 2: Highest Methane readings recorded at localised survey area

Marker	> 200 ppm	Site Photographs	Comments, location and description	Action Required	Close Out Comments	Retest result
1	275ppm		bare soil cover along the edge of Southern and North Eastern faces	Bentonite and water	1 bag of Bentonite and water 	14ppm
2	397ppm		bare soil cover along the edge of Southern and North Eastern faces	Bentonite and water	1 bag of Bentonite and water 	90ppm

3	430ppm		bare soil cover in Southern faces closer to North Eastern face edge	Bentonite and water	1 bag of Bentonite and water 	0ppm
4	430ppm		Upper Southern face closer to previous remediation	Bentonite and water	1 bag of Bentonite and water 	142ppm

5	330ppm		Bare soil cover and in previous remediation in North eastern face	Bentonite and water	2 bag of Bentonite and water 	130ppm
6	468ppm		Bare soil cover and in North eastern face	Bentonite and water	1 bag of Bentonite and water 	118ppm

7	512ppm		Eroded face in Previous remediation on upper North Eastern face.	Bentonite and water	1 bag of Bentonite and water 	70ppm
8	330ppm		Closer to soil bund in North Eastern face	Bentonite and water	1 bag of Bentonite and water 	68ppm

9	360ppm		Eroded face closer to soli bund in North Eastern face	Bentonite and water	2 bag of Bentonite and water 	98ppm
10	530ppm		Closer to shed in South Eastern face	Bentonite and water	1 bags of bentonite and water. 	117ppm

11	328ppm		Clay cover in edge of South Western face and South Eastern face	Bentonite and water	1 bag of bentonite and water 	141ppm
12	248ppm		Bare soil cover and eroded face in upper South Eastern face	Bentonite and water	Remediated with 1 bags of bentonite and water 	104ppm

13	487ppm		Eroded area in upper South eastern face	Bentonite and water	2 bags of bentonite and water. 	107ppm
-	The bio filter showed no emissions 0ppm for the area, the GPS was not recording for the bio filter inspection.					

Levin Landfill temporary cap

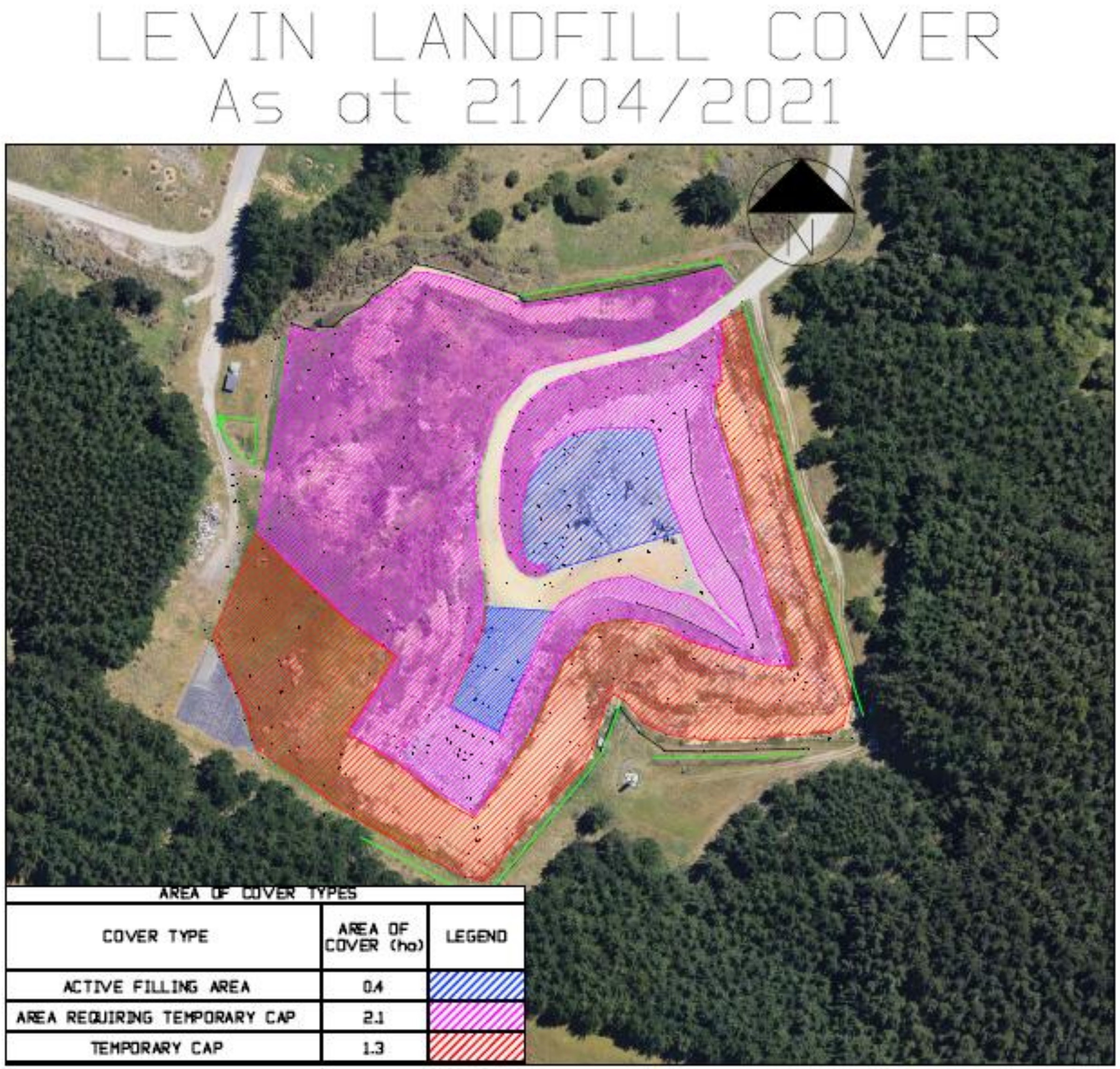


Figure 1: Map of Levin Landfill showing areas with temporary capping. (Aerial photo Feb 2021).

Surface Emissions Map for temporary cover

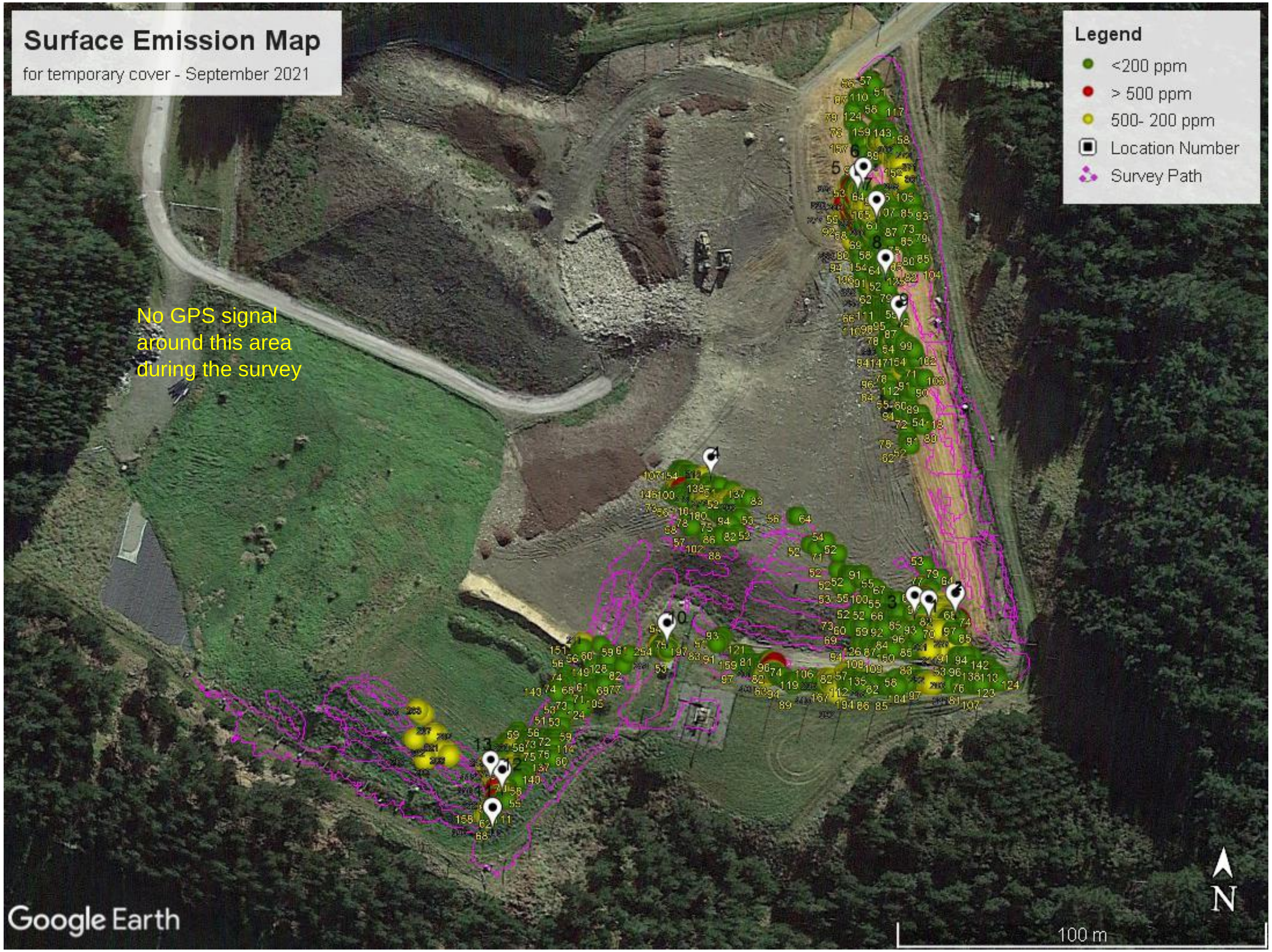


Figure 1: Map showing Levin Landfill surface emissions survey 27th September 2021

Appendix 1: Weather conditions preceding the survey.

The last rain recorded by a Levin weather station was 0.7mm ending at 04.14pm on the 23rd September according to website (retrieved October 7th, 2021 https://www.wunderground.com/dashboard/pws/ILEVIN22/graph/2021-09-27/2021-09-27/daily), 88 hours before the survey.

Previous Weekly Mode September 26 2021 View Next

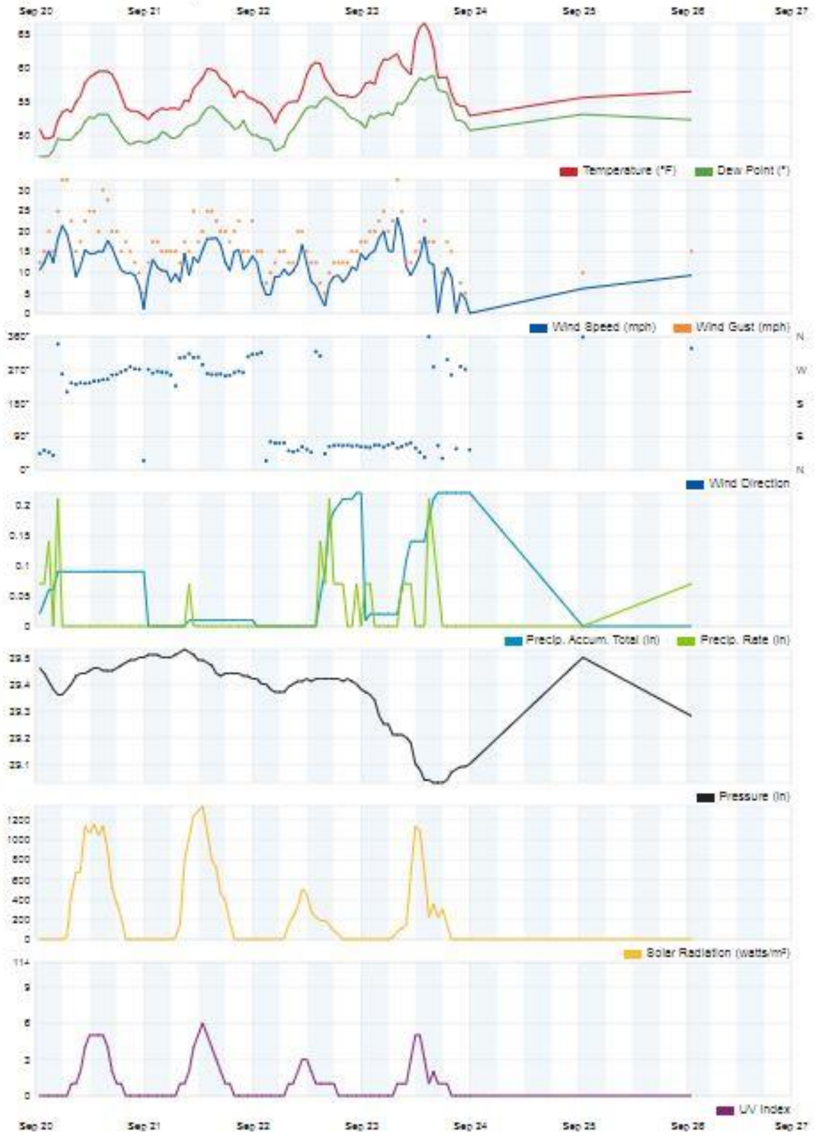
Summary
September 20, 2021 - September 26, 2021

	High	Low	Average
Temperature	66.8 °F	48.0 °F	56.0 °F
Dew Point	58.8 °F	41.7 °F	51.0 °F
Humidity	94 %	68 %	84 %
Precipitation	0.56 in	--	--

	High	Low	Average
Wind Speed	23.3 mph	0.0 mph	4.3 mph
Wind Gust	32.4 mph	--	6.7 mph
Wind Direction	--	--	SSE
Pressure	29.53 in	29.00 in	--

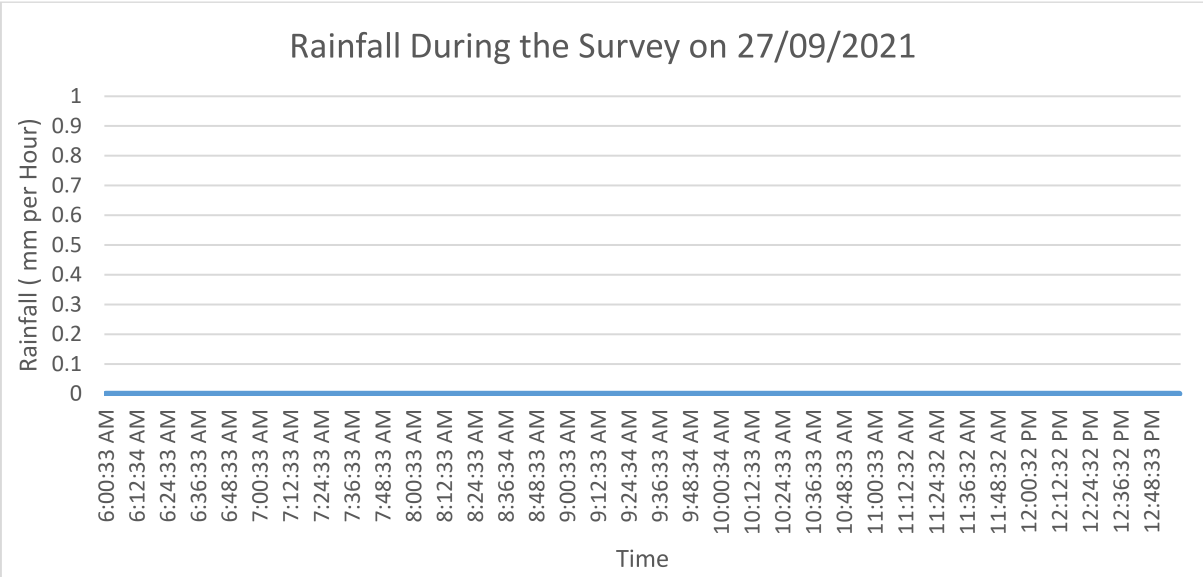
Graph Table

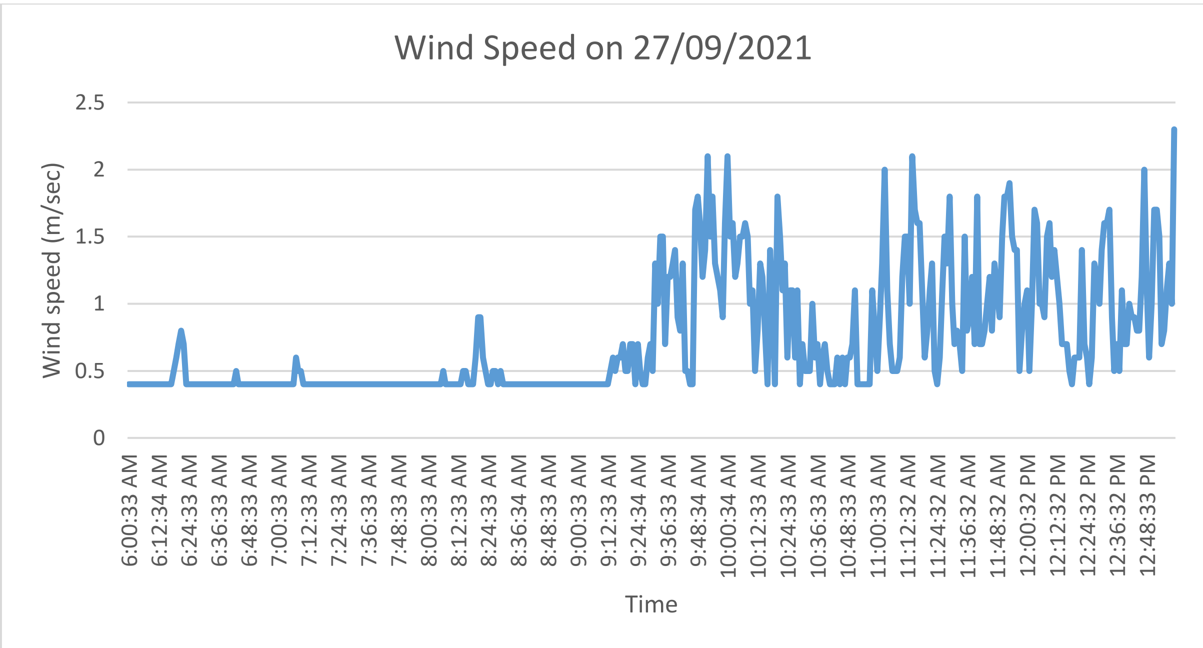
September 20, 2021 - September 26, 2021

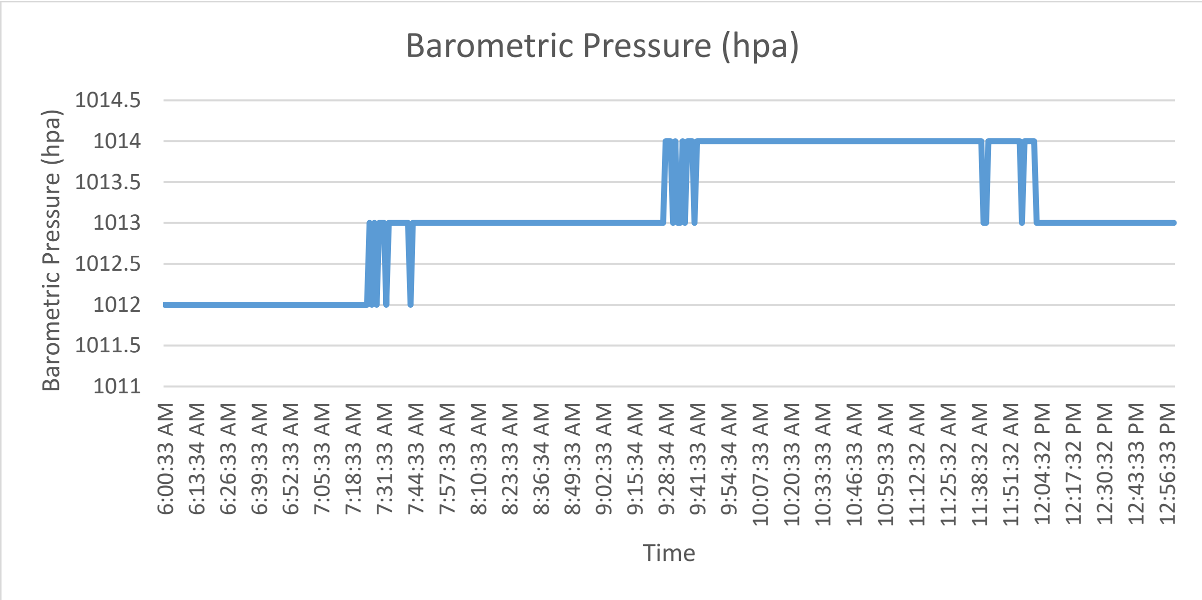


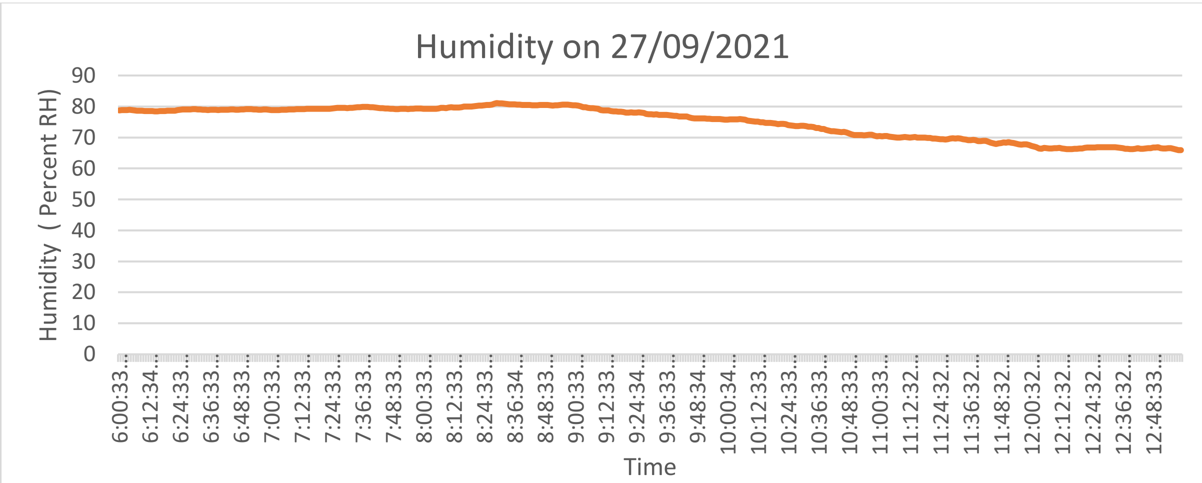
Appendix 2:

Weather conditions during the days of survey on the 27th May displayed below. There was no rainfall during the survey and Weather data from Levin Landfill weather station.






Barometric Pressure (hpa)
Barometric Pressure (hpa)
1014.5
1014
1013.5
1013
1012.5
1012
1011.5
1011
6:00:33 AM
6:13:34 AM
6:26:33 AM
6:39:33 AM
6:52:33 AM
7:05:33 AM
7:18:33 AM
7:31:33 AM
7:44:33 AM
7:57:33 AM
8:10:33 AM
8:23:33 AM
8:36:34 AM
8:49:33 AM
9:02:33 AM
9:15:34 AM
9:28:34 AM
9:41:33 AM
9:54:34 AM
10:07:33 AM
10:20:33 AM
10:33:33 AM
10:46:33 AM
10:59:33 AM
11:12:32 AM
11:25:32 AM
11:38:32 AM
11:51:32 AM
12:04:32 PM
12:17:32 PM
12:30:32 PM
12:43:33 PM
12:56:33 PM
Time


Humidity on 27/09/2021
Humidity (Percent RH)
90
80
70
60
50
40
30
20
10
0
6:00:33…
6:12:34…
6:24:33…
6:36:33…
6:48:33…
7:00:33…
7:12:33…
7:24:33…
7:36:33…
7:48:33…
8:00:33…
8:12:33…
8:24:33…
8:36:34…
8:48:33…
9:00:33…
9:12:33…
9:24:34…
9:36:33…
9:48:34…
10:00:34…
10:12:33…
10:24:33…
10:36:33…
10:48:33…
11:00:33…
11:12:32…
11:24:32…
11:36:32…
11:48:32…
12:00:32…
12:12:32…
12:24:32…
12:36:32…
12:48:33…
Time

SURFACE EMISSIONS MONITORING REPORT

Quality Information

Project Name Title:	Surface Emission Monitoring
Subtitle:	Levin Landfill
Date:	22nd October 2021
Monitored and authored by:	Shanka Samarathunge
Reviewed:	Darnelle Nugent-O'Leary

Contents

Purpose

To monitor landfill surface emissions in compliance with Air Discharge Permit 330/1 Condition 5. This survey provides a qualitative assessment of landfill gas emissions from the landfill surface.

1.0 Procedure

A Gas-Rover detector by Bascom-Turner was used by EnviroWaste Services Limited to assess levels of emissions of methane. The instantaneous surface emission monitoring was done in accordance with the EnviroWaste standard operating procedure for all Landfills.

2.0 Details of this survey

The monitoring was carried out on the 22nd October starting at 08.00 a.m. Table 2 below details the readings from the survey.

3.0 Climate

The weather conditions prior to and during the survey are summarised and recorded in Table 1 comparing the resource consent requirements and the EnviroWaste standard operating procedure (SOP).

Table 1: Guidelines, resource consent requirements and the actual survey conditions.

	Resource consent requirements None *****Note: *Favourable weather conditions*	**SOP Guidelines**	**Actual**	**Comments**
Average wind speed	*Less than 25km/h, ideally 5-10km/h	Less than 15km/h ideally less than10km/h	Average wind speed during the survey was 3.27 km/h.	-
Rainfall	*0.5mm in 48hours	Less than 0.5mm having fallen in 2 days prior	There was no rainfall within 72 hours prior to the survey.	-
Landfill surface grass height	-	Less than 100 mm	Patches of grass greater than 400mm across stage 1 area	Weed-eating and mowing grass is recommended for a more accurate survey
Landfill surface	-	Relatively dry	Relatively dry	-
Atmospheric pressure	-	Ideally declining atmospheric pressure after several days of high pressure	Pressure was inclining from 19th October up to survey date and during the survey period pressure declined from 1031 hpa to 1029 hpa, on 22nd October	-

4.0 Results

The results of the survey are plotted on the attached drawing. Details of readings above 200ppm are in Table 2.

5.0 Attachments

- Tables 1 and 2 of results.
- Site plan showing locations of notable results before and after remediation.
- Appendices 1 and 2 Climate conditions – graphical format.

6.0 Methane readings and locations

Table 2: Highest Methane readings recorded at localised survey area

Marker	> 200 ppm	Site Photographs	Comments, location and description	Action Required	Close Out Comments	Retest result
1	263ppm		Bare soil cover in the edge of South Eastern and North Eastern faces	Bentonite and water	1 bag of Bentonite and water 	45ppm
2	390ppm		Previous remediation and part of the eroded soil cover in the edge of South Eastern and North Eastern faces	Bentonite and water	1 bag of Bentonite and water 	60ppm

3	229ppm		Previous remediation and eroded soil cover closer to mulch in South Eastern face	Bentonite and water	2 bags of Bentonite and water 	150ppm
4	240ppm		Previous remediation closer to clay bund in North Eastern face	Bentonite and water	2 bags of Bentonite and water 	107ppm

5	221ppm		Previous remediation in North Eastern face	Bentonite and water	1 bag of Bentonite and water 	117ppm
6	380ppm		Previous remediation in North Eastern face	Bentonite and water	1 bag of Bentonite and water 	118ppm

7	418ppm		Eroded face and part of previous remediation on North Eastern face.	Bentonite and water	1 bag of Bentonite and water 	107ppm
8	225ppm		Previous remediation and part of soil cover	Bentonite and water	1 bag of Bentonite and water 	65ppm

9	262ppm		Eroded bare soil cover closer to soli bund in North Eastern face	Bentonite and water	1 bag of Bentonite and water 	45ppm

Levin Landfill temporary cap

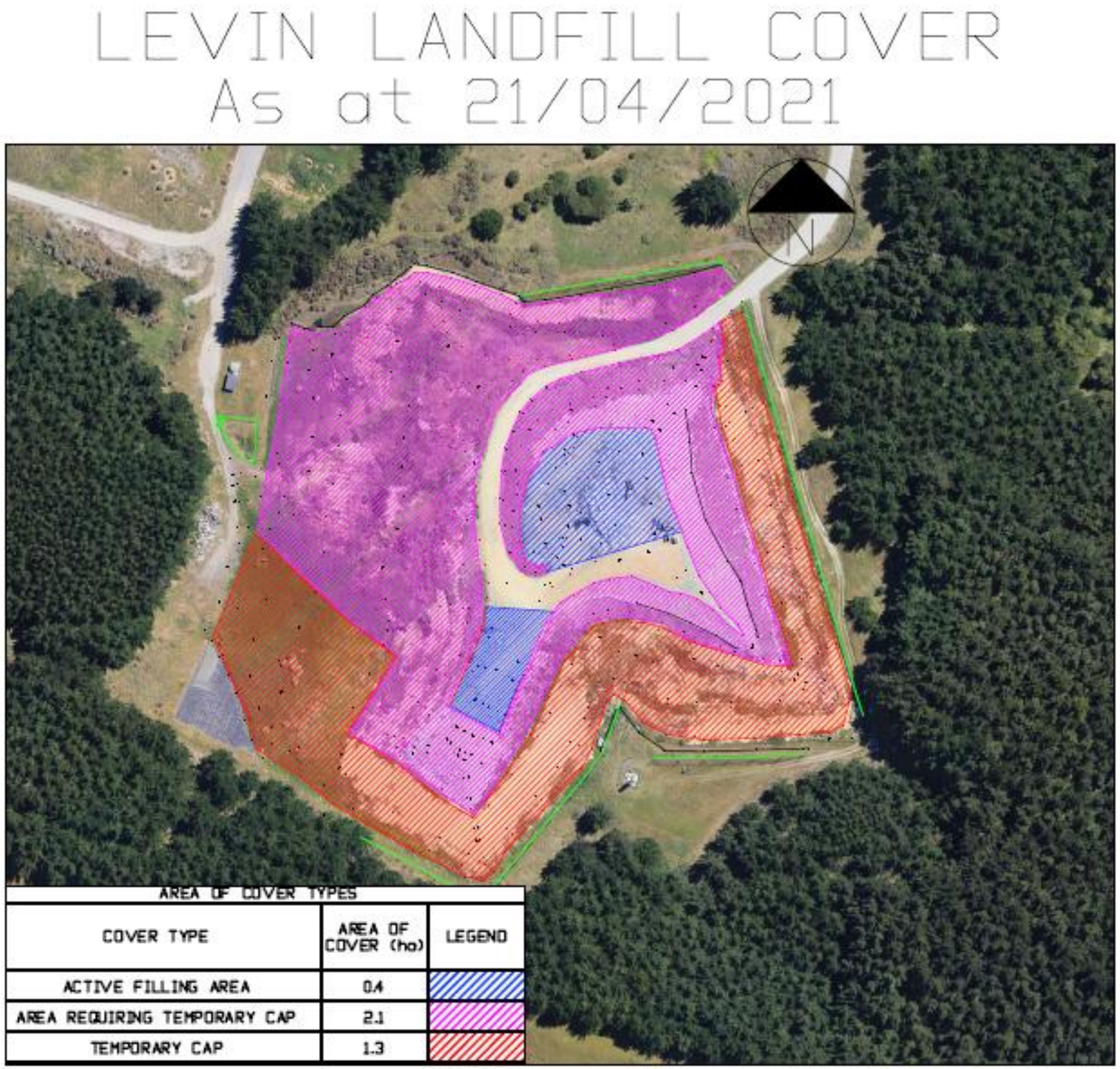


Figure 1: Map of Levin Landfill showing areas with temporary capping. (Aerial photo Feb 2021).

Surface Emissions Map for temporary cover

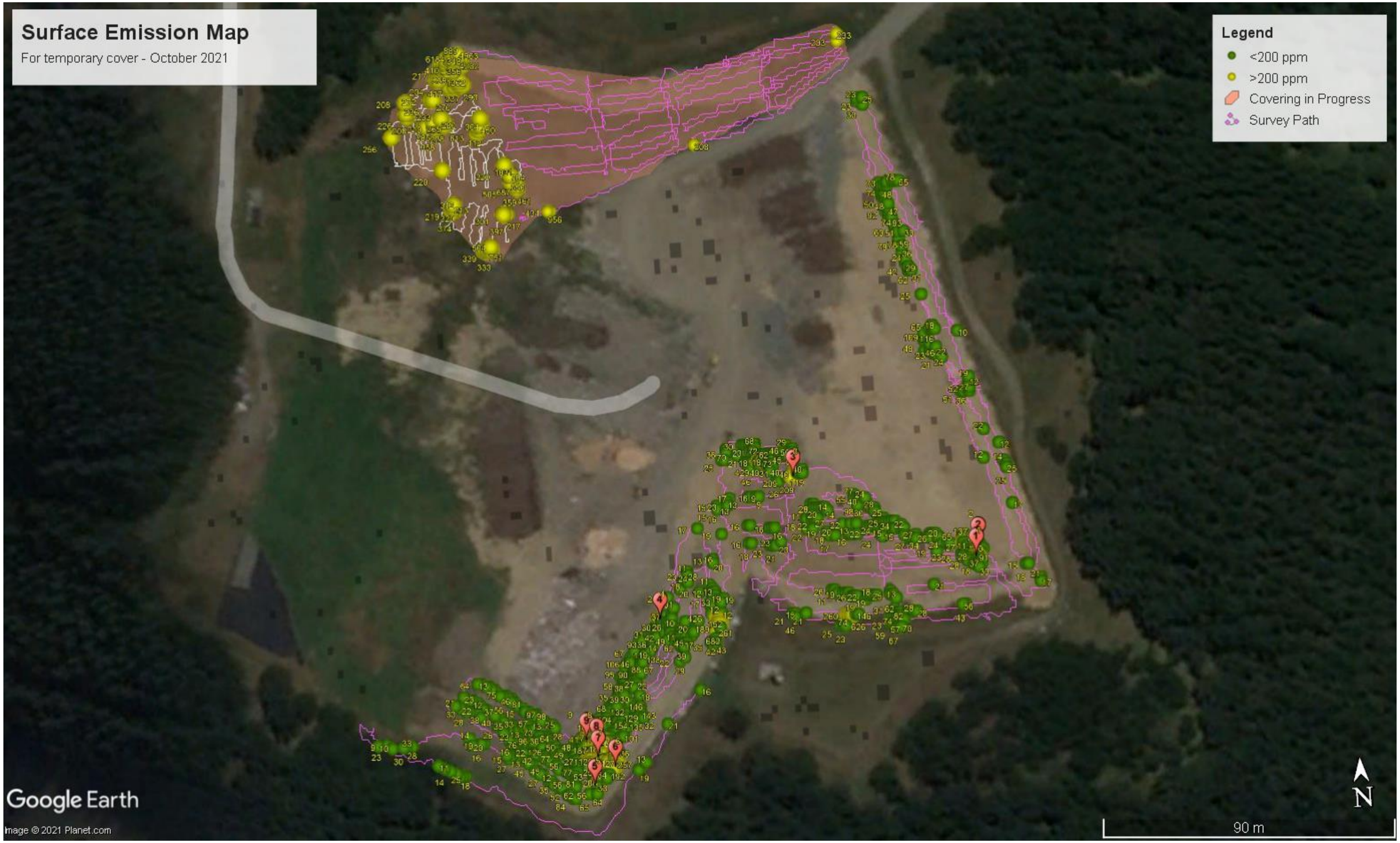
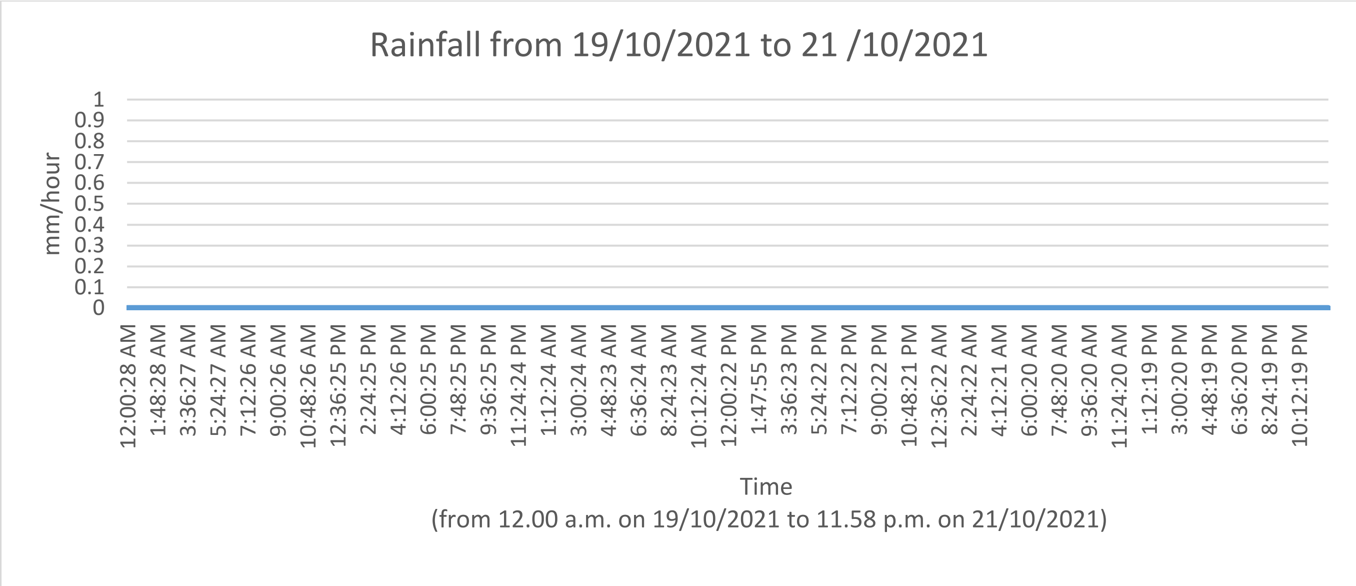
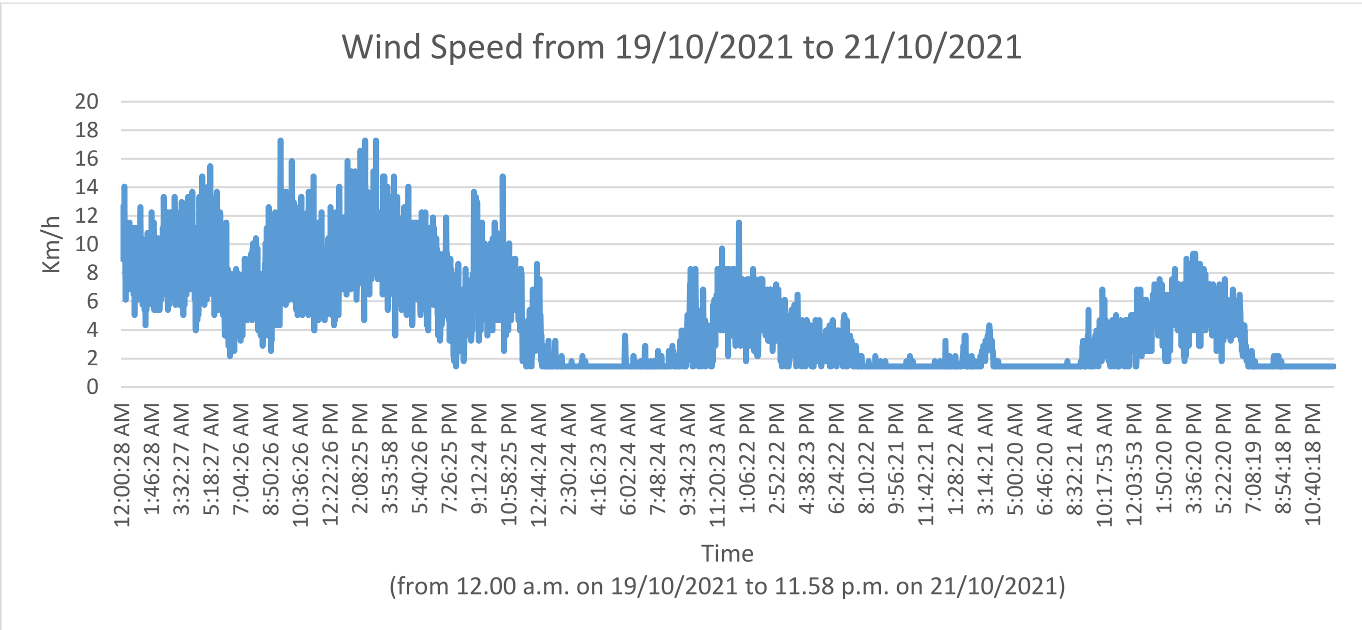


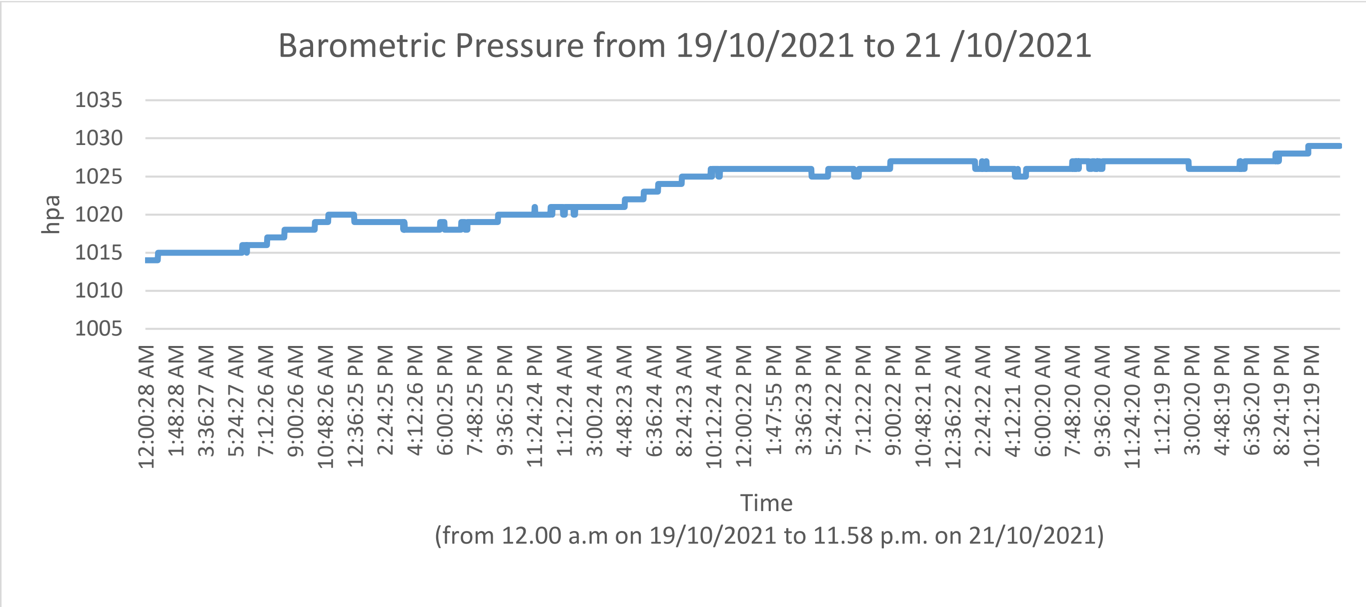
Figure 1: Map showing Levin Landfill surface emissions survey 22nd October 2021

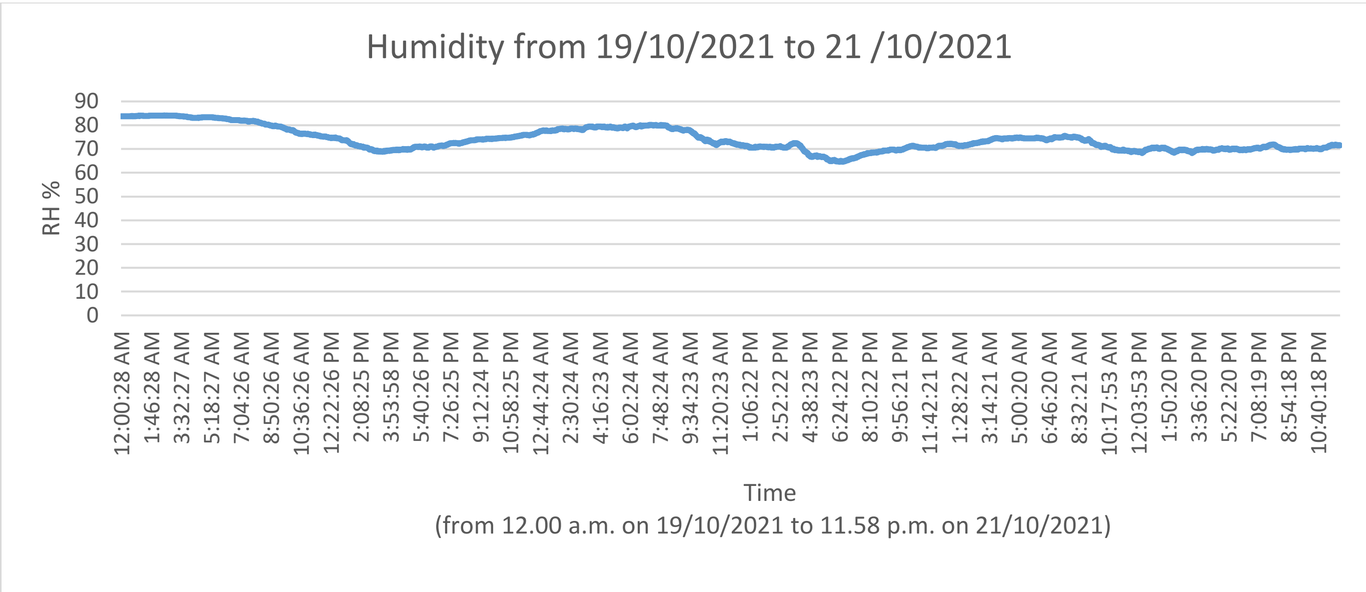
Appendix 1: Weather conditions preceding the survey.

Weather condition prior to the survey displayed below. There was no rainfall recorded during the period from 19/10/2021 to 22/10/2021, 72 hours prior to the survey. Weather data from Levin landfill weather station.



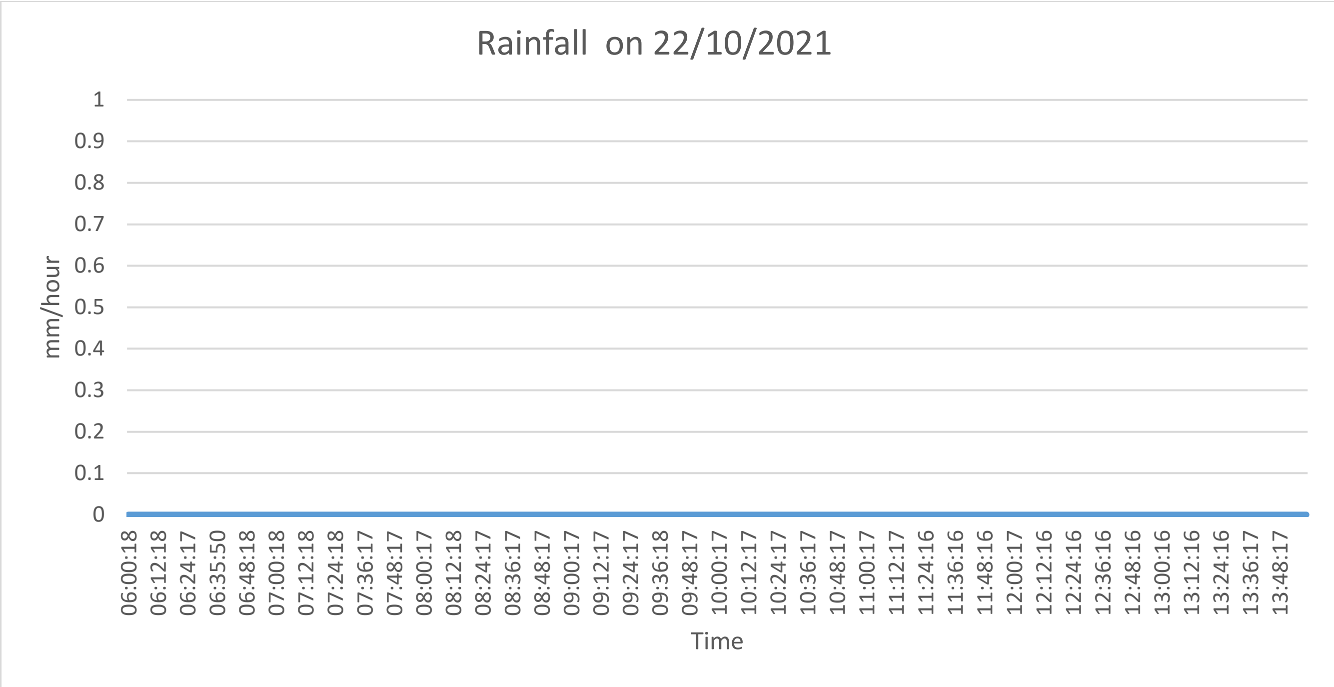


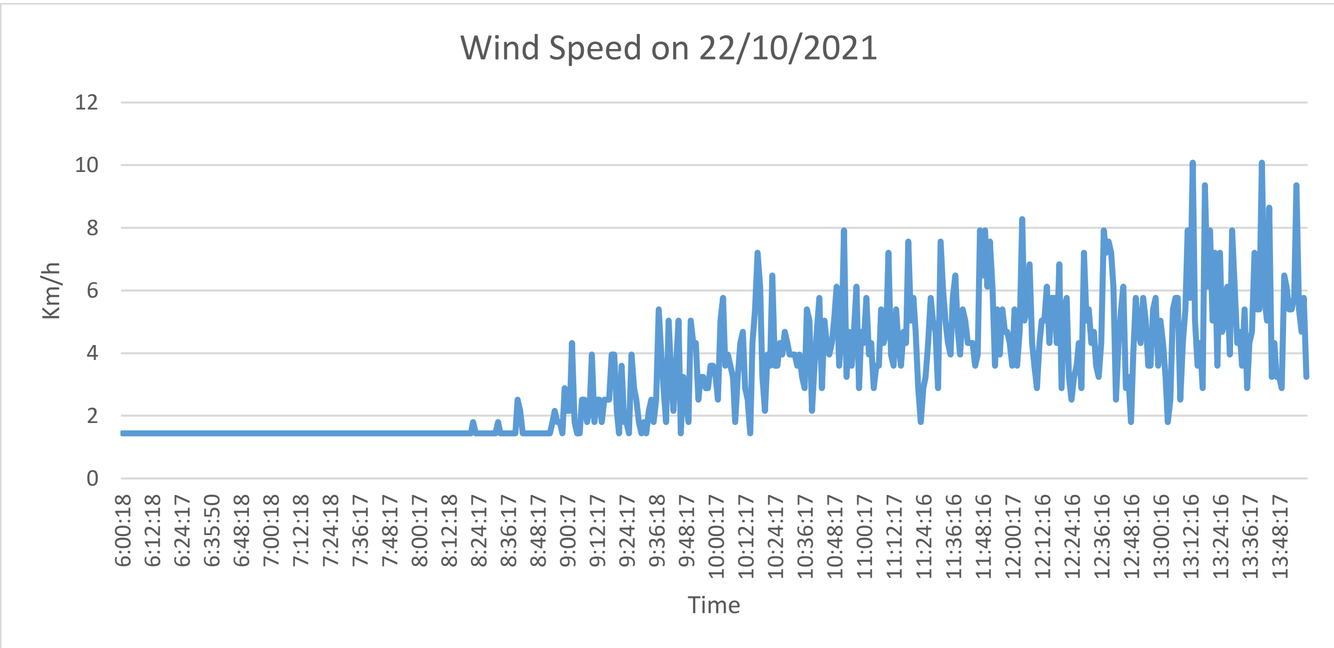

Barometric Pressure from 19/10/2021 to 21 /10/2021
hpa
1035
1030
1025
1020
1015
1010
1005
12:00:28 AM
1:48:28 AM
3:36:27 AM
5:24:27 AM
7:12:26 AM
9:00:26 AM
10:48:26 AM
12:36:25 PM
2:24:25 PM
4:12:26 PM
6:00:25 PM
7:48:25 PM
9:36:25 PM
11:24:24 PM
1:12:24 AM
3:00:24 AM
4:48:23 AM
6:36:24 AM
8:24:23 AM
10:12:24 AM
12:00:22 PM
1:47:55 PM
3:36:23 PM
5:24:22 PM
7:12:22 PM
9:00:22 PM
10:48:21 PM
12:36:22 AM
2:24:22 AM
4:12:21 AM
6:00:20 AM
7:48:20 AM
9:36:20 AM
11:24:20 AM
1:12:19 PM
3:00:20 PM
4:48:19 PM
6:36:20 PM
8:24:19 PM
10:12:19 PM
Time
(from 12.00 a.m on 19/10/2021 to 11.58 p.m. on 21/10/2021)

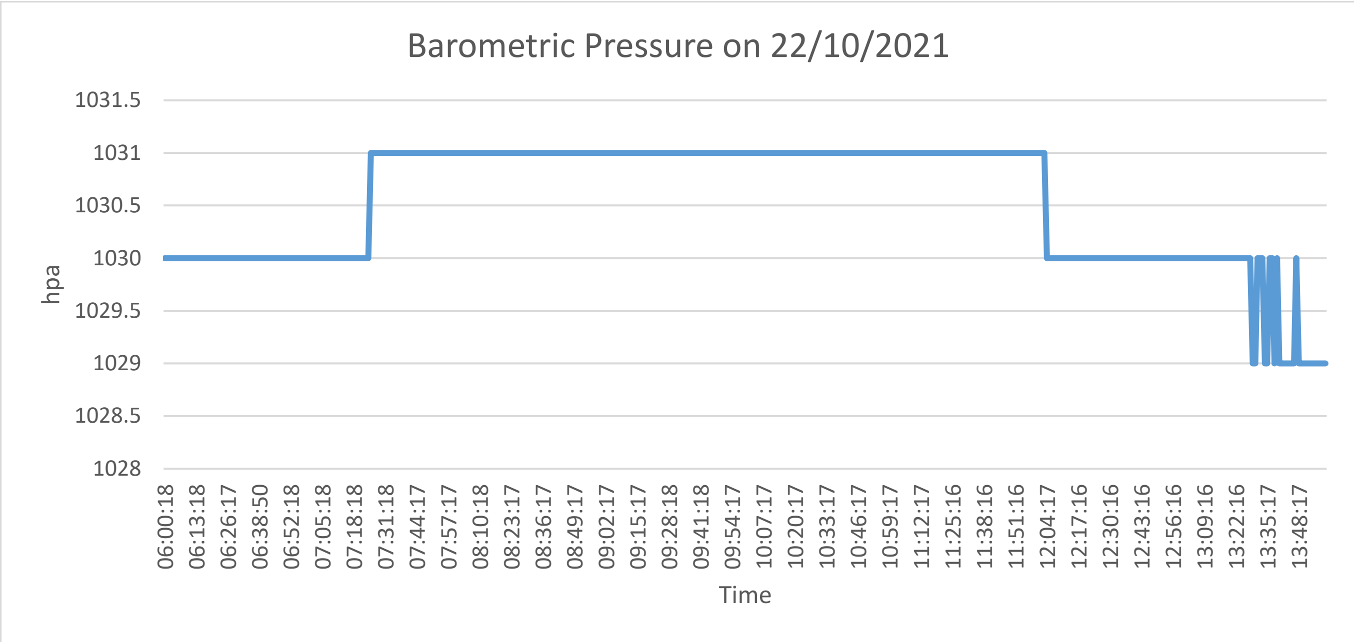

Humidity from 19/10/2021 to 21 /10/2021
RH %
90
80
70
60
50
40
30
20
10
0
12:00:28 AM
1:46:28 AM
3:32:27 AM
5:18:27 AM
7:04:26 AM
8:50:26 AM
10:36:26 AM
12:22:26 PM
2:08:25 PM
3:53:58 PM
5:40:26 PM
7:26:25 PM
9:12:24 PM
10:58:25 PM
12:44:24 AM
2:30:24 AM
4:16:23 AM
6:02:24 AM
7:48:24 AM
9:34:23 AM
11:20:23 AM
1:06:22 PM
2:52:22 PM
4:38:23 PM
6:24:22 PM
8:10:22 PM
9:56:21 PM
11:42:21 PM
1:28:22 AM
3:14:21 AM
5:00:20 AM
6:46:20 AM
8:32:21 AM
10:17:53 AM
12:03:53 PM
1:50:20 PM
3:36:20 PM
5:22:20 PM
7:08:19 PM
8:54:18 PM
10:40:18 PM
Time
(from 12.00 a.m. on 19/10/2021 to 11.58 p.m. on 21/10/2021)

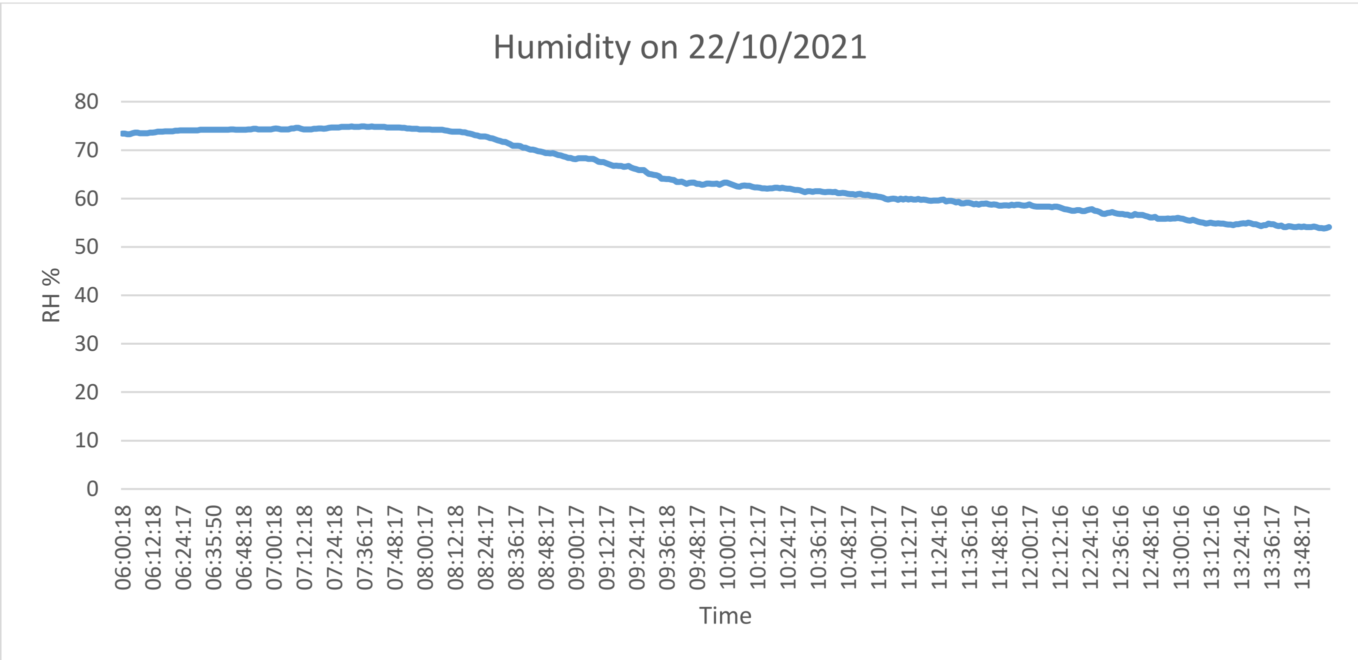
Appendix 2:

Weather conditions during the day of survey on the 22ndOctober displayed below. There was no rainfall during the survey and the weather data from Levin Landfill weather station.






Barometric Pressure on 22/10/2021
hpa
1031.5
1031
1030.5
1030
1029.5
1029
1028.5
1028
Time


Humidity on 22/10/2021
RH %
80
70
60
50
40
30
20
10
0
Time

SURFACE EMISSIONS MONITORING REPORT

Quality Information

Project Name Title:	Surface Emission Monitoring
Subtitle:	Levin Landfill
Date:	10th November 2021
Monitored and authored by:	Shanka Samarathunge
Reviewed:	Darnelle Nugent-O'Leary

Contents

Purpose

To monitor landfill surface emissions in compliance with Air Discharge Permit 330/1 Condition 5. This survey provides a qualitative assessment of landfill gas emissions from the landfill surface.

1.0 Procedure

A Gas-Rover detector by Bascom-Turner was used by EnviroWaste Services Limited to assess levels of emissions of methane. The instantaneous surface emission monitoring was done in accordance with the EnviroWaste standard operating procedure for all Landfills.

2.0 Details of this survey

The monitoring was carried out on the 10th November starting at 08.00 a.m. Table 2 below details the readings from the survey.

3.0 Climate

The weather conditions prior to and during the survey are summarised and recorded in Table 1 comparing the resource consent requirements and the EnviroWaste standard operating procedure (SOP).

Table 1: Guidelines, resource consent requirements and the actual survey conditions.

	Resource consent requirements None *****Note: *Favourable weather conditions*	**SOP Guidelines**	**Actual**	**Comments**
Average wind speed	*Less than 25km/h, ideally 5-10km/h	Less than 15km/h ideally less than10km/h	Average wind speed during the survey was 0.0578 km/h.	-
Rainfall	*0.5mm in 48hours	Less than 0.5mm having fallen in 2 days prior	No rainfall within 72 hours prior to the survey	-
Landfill surface grass height	-	Less than 100 mm	Patches of grass greater than 400mm across stage 1 area	Weed-eating and mowing grass is recommended for a more accurate survey
Landfill surface	-	Relatively dry	Relatively dry	-
Atmospheric pressure	-	Ideally declining atmospheric pressure after several days of high pressure	Declined pressure from 1016 hpa to 1012 hpa and increased up to 1017 hpa prior to the survey Stabilized pressure around 1014 hpa during the survey period	-

4.0 Results

The results of the survey are plotted on the attached drawing. Details of readings above 200ppm are in Table 2.

5.0 Attachments

- Tables 1 and 2 of results.
- Site plan showing locations of notable results before and after remediation.
- Appendices 1 and 2 Climate conditions – graphical format.

6.0 Methane readings and locations

Table 2: Highest Methane readings recorded at localised survey area

Marker	> 200 ppm	Site Photographs	Comments, location and description	Action Required	Close Out Comments	Retest result
1	380ppm		Edge of the clay cover in North Eastern face. Noticed high readings randomly within 200-1000 ppm range	Bentonite and water	5 bags of Bentonite and water Additional 500mm of clay cover will be added on this face within next 7 days 	Clay coverin g in progres s
2	286ppm		Partially covered area with visible rubbish in the marked areas in North Eastern face	Bentonite and water	2 bags of Bentonite and water 500mm clay cover will be added in this face within next 7 days 	45ppm

3	480ppm		Crack in the soil cover along the compactor track in North Eastern face	Bentonite and water	1 bag of Bentonite and water 	67ppm
4	780ppm		Crack in the soil cover along the compactor track in North Eastern face	Bentonite and water	1 bag of Bentonite and water 	140ppm

5	331ppm		Crack in the soil cover along the compactor track, interface of North Eastern and Southern faces	Bentonite and water	2 bags of Bentonite and water 	140ppm
6	760ppm		Crack in the soil cover along the compactor track, interface of North Eastern and Southern faces	Bentonite and water	2 bags of Bentonite and water 	76ppm

7	211ppm		Previous remediation and in a part of soil cover in South Eastern face	Bentonite and water	1 bag of Bentonite and water. Rearranged the surface of the previous Bentonite cover 	0ppm
8	271ppm		Previous remediation in South Eastern face	Bentonite and water	1 bag of Bentonite and water 	107ppm
-	The bio filter showed no emissions 0ppm for the area.					

Levin Landfill temporary cap

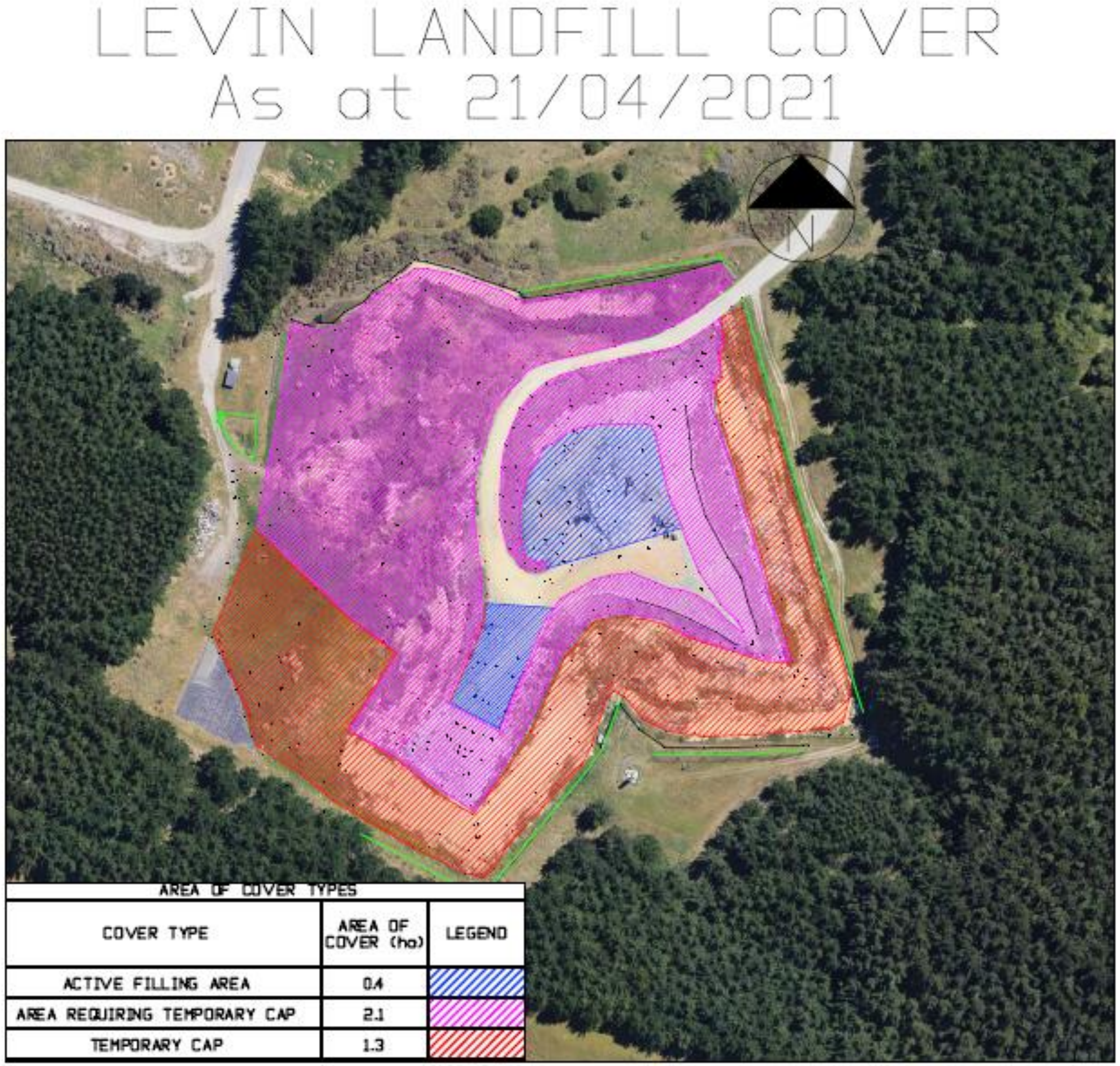


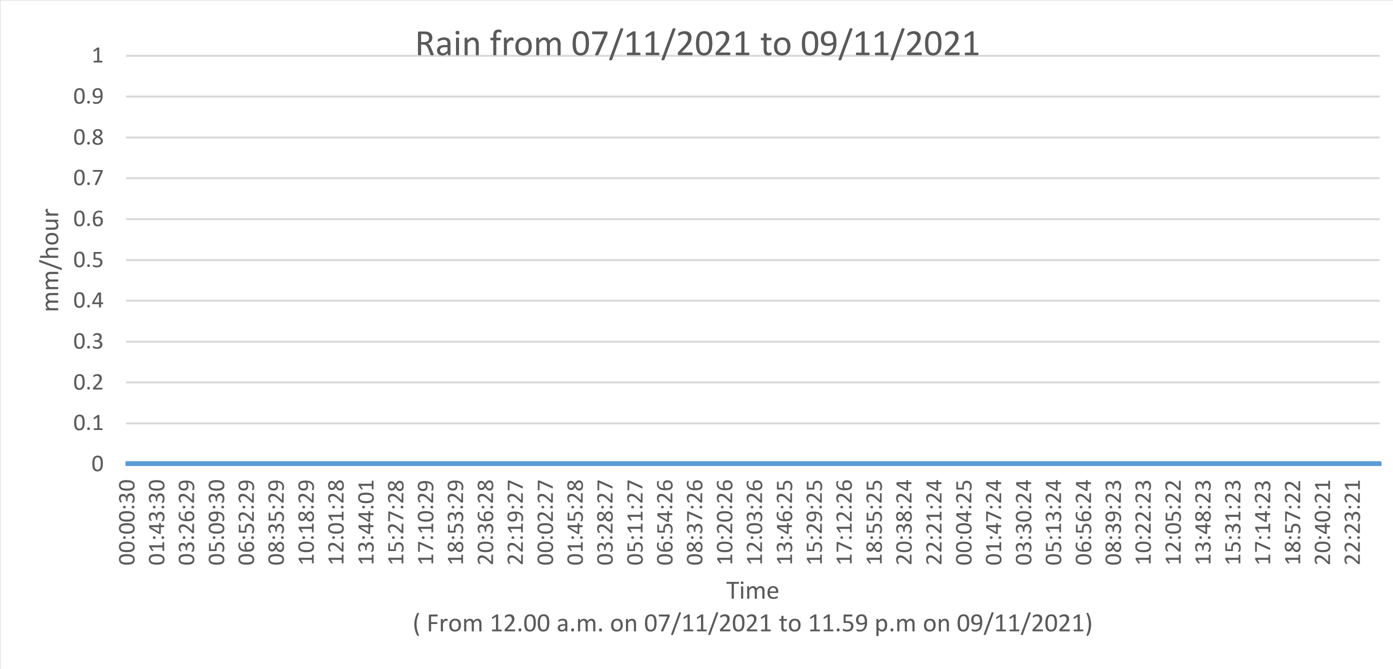
Figure 1: Map of Levin Landfill showing areas with temporary capping. (Aerial photo Feb 2021).

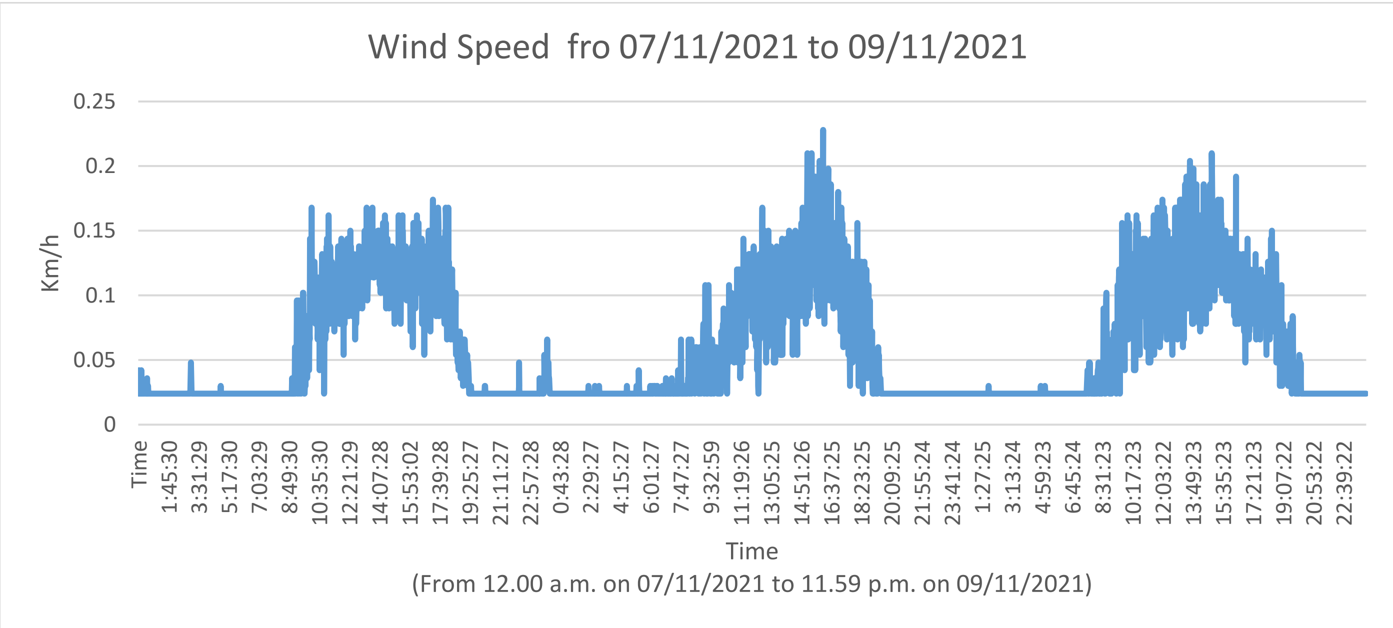
Surface Emissions Map for temporary cover

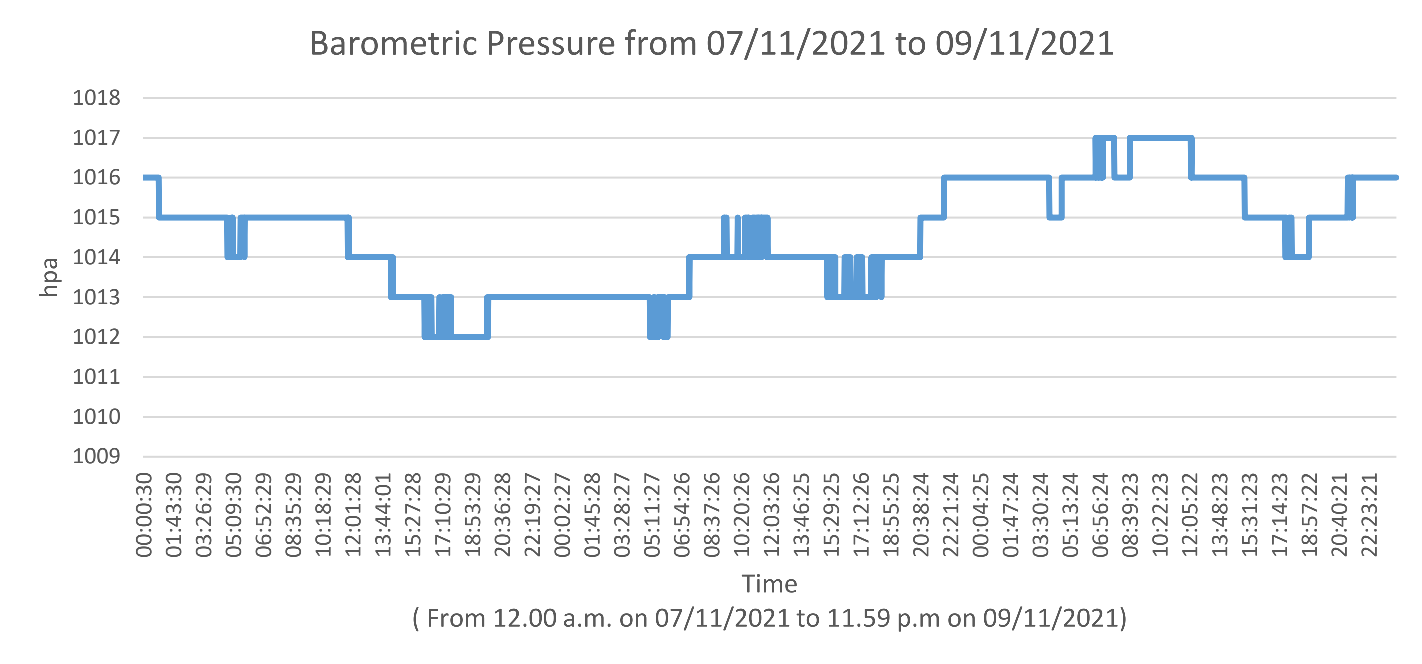
Figure 1: Map showing Levin Landfill surface emissions survey 10th November 2021

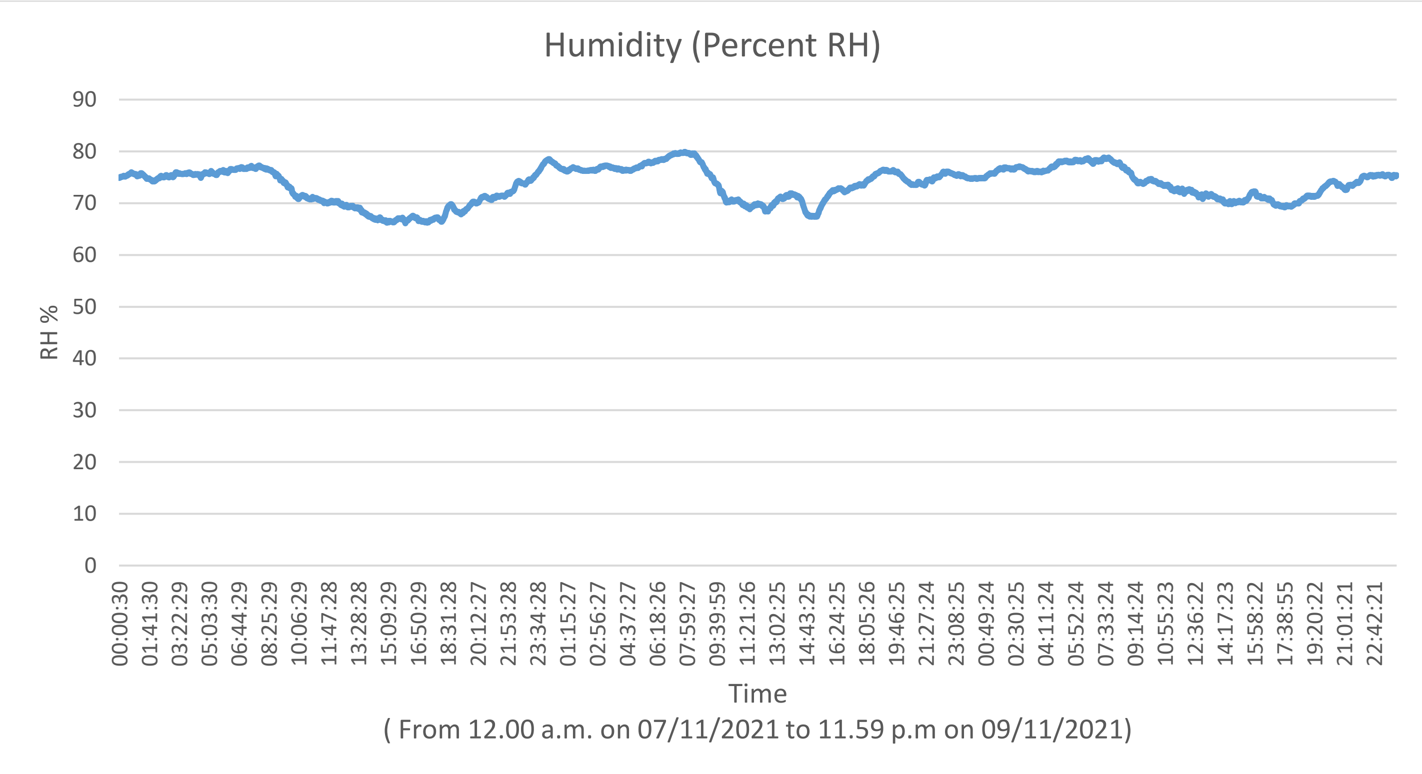
Appendix 1: Weather conditions preceding the survey.

Weather condition prior to the survey is displayed below. There was no rainfall recorded during the period from 07/11/2021 to 09/11/2021, 72 hours prior to the survey. Weather data extracted from the database of Levin landfill weather station.



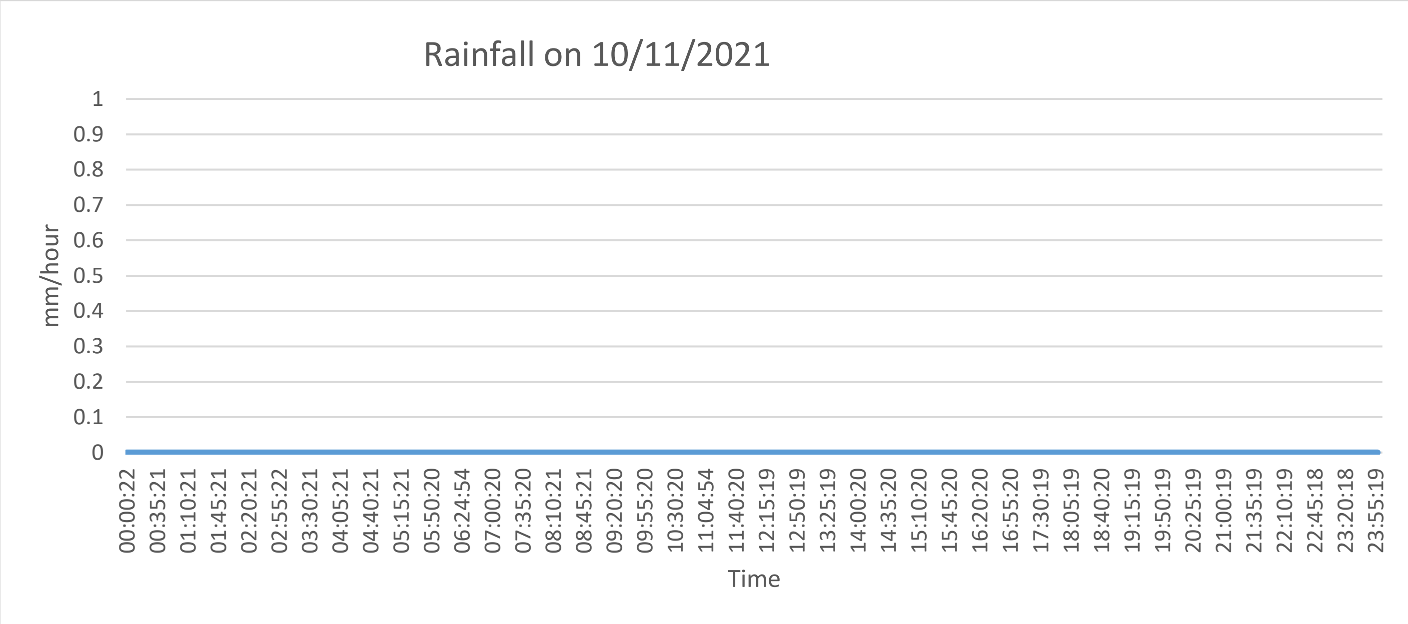


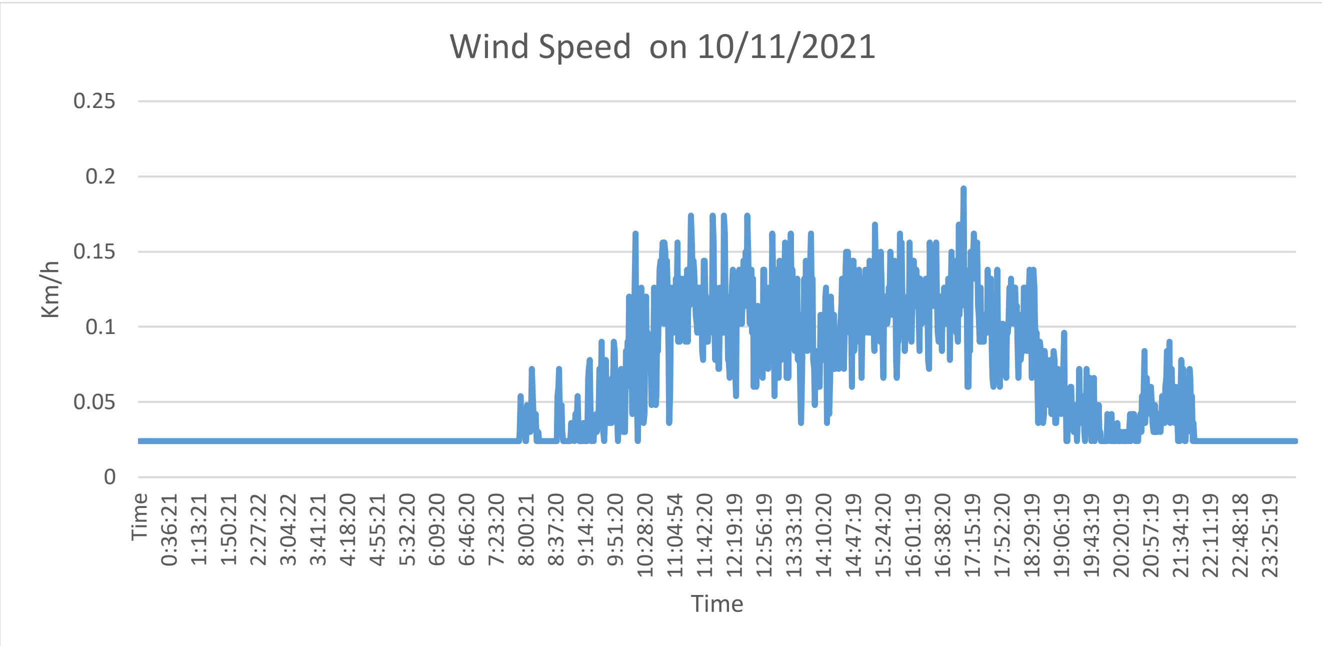

Barometric Pressure from 07/11/2021 to 09/11/2021
hpa
1018
1017
1016
1015
1014
1013
1012
1011
1010
1009
Time
(From 12.00 a.m. on 07/11/2021 to 11.59 p.m on 09/11/2021)

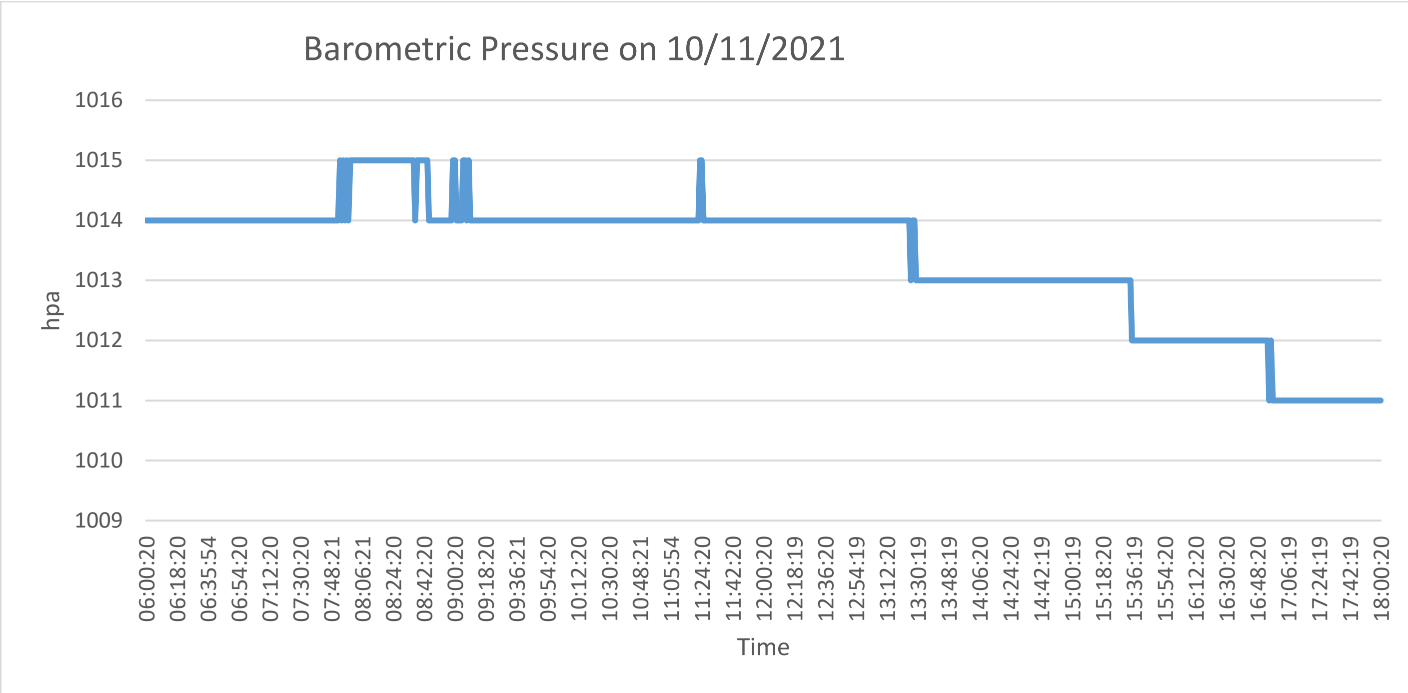

Humidity (Percent RH)
RH %
90
80
70
60
50
40
30
20
10
0
Time
(From 12.00 a.m. on 07/11/2021 to 11.59 p.m on 09/11/2021)

Appendix 2:

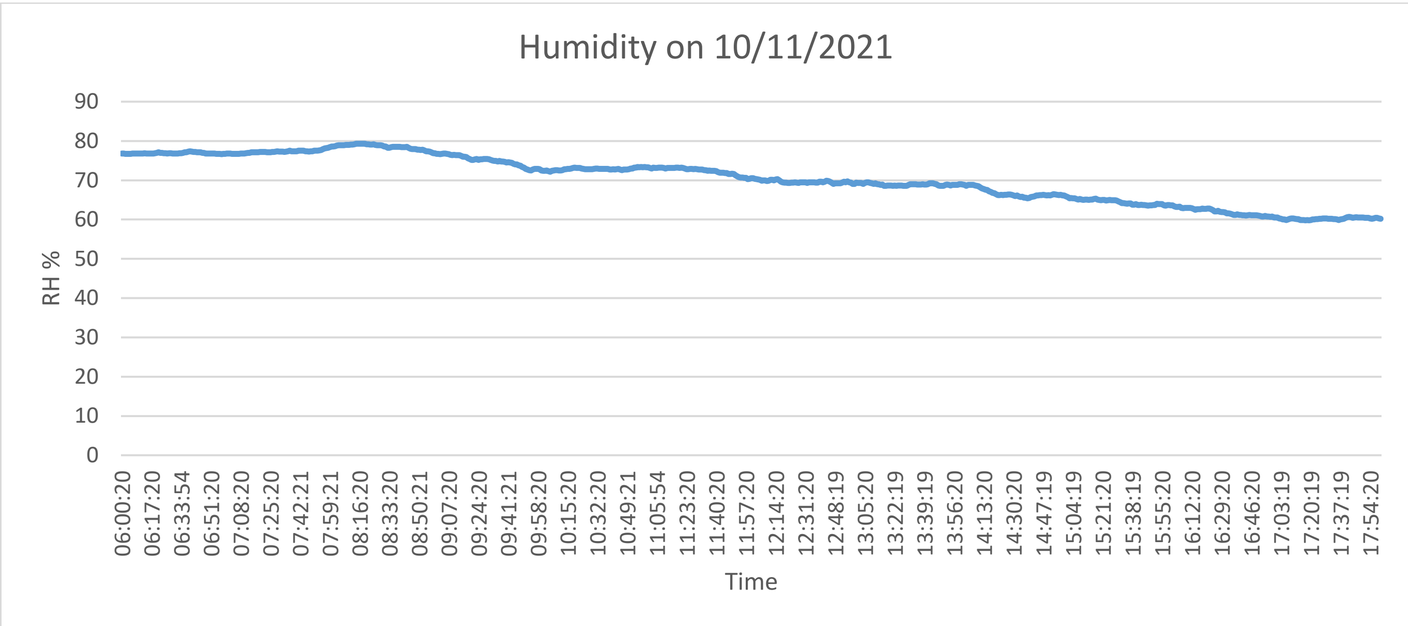
Weather conditions during the day of survey on the 10th November 2021 is displayed below. There was no rainfall during the survey and the weather data extracted from the database of Levin Landfill weather station.







Barometric Pressure on 10/11/2021
hpa
1016
1015
1014
1013
1012
1011
1010
1009
06:00:20
06:18:20
06:35:54
06:54:20
07:12:20
07:30:20
07:48:21
08:06:21
08:24:20
08:42:20
09:00:20
09:18:20
09:36:21
09:54:20
10:12:20
10:30:20
10:48:21
11:05:54
11:24:20
11:42:20
12:00:20
12:18:19
12:36:20
12:54:19
13:12:20
13:30:19
13:48:19
14:06:20
14:24:20
14:42:19
15:00:19
15:18:20
15:36:19
15:54:20
16:12:20
16:30:20
16:48:20
17:06:19
17:24:19
17:42:19
18:00:20
Time



Humidity on 10/11/2021
RH %
90
80
70
60
50
40
30
20
10
0
06:00:20
06:17:20
06:33:54
06:51:20
07:08:20
07:25:20
07:42:21
07:59:21
08:16:20
08:33:20
08:50:21
09:07:20
09:24:20
09:41:21
09:58:20
10:15:20
10:32:20
10:49:21
11:05:54
11:23:20
11:40:20
11:57:20
12:14:20
12:31:20
12:48:19
13:05:20
13:22:19
13:39:19
13:56:20
14:13:20
14:30:20
14:47:19
15:04:19
15:21:20
15:38:19
15:55:20
16:12:20
16:29:20
16:46:20
17:03:19
17:20:19
17:37:19
17:54:20
Time

SURFACE EMISSIONS MONITORING REPORT

Quality Information

Project Name Title:	Surface Emission Monitoring – December 2021
Subtitle:	Levin Landfill
Date:	22nd December 2021
Monitored and authored by:	Shanka Samarathunge
Reviewed:	Darnelle Nugent-O'Leary

Contents

Purpose
To monitor landfill surface emissions in compliance with Air Discharge Permit 330/1 Condition 5. This survey provides a qualitative assessment of landfill gas emissions from the landfill surface.

1.0 Procedure
A Gas-Rover detector by Bascom-Turner was used by EnviroWaste Services Limited to assess levels of emissions of methane. The instantaneous surface emission monitoring was done in accordance with the EnviroWaste standard operating procedure for all Landfills.

2.0 Details of this survey
The monitoring was carried out on the 22nd December starting at 09.00 a.m. Table 2 below details the readings from the survey.

3.0 Climate
The weather conditions prior to and during the survey are summarised and recorded in Table 1 comparing the resource consent requirements and the EnviroWaste standard operating procedure (SOP).

Table 1: Guidelines, resource consent requirements and the actual survey conditions.

	Resource consent requirements None *****Note: *Favourable weather conditions*	**SOP Guidelines**	**Actual**	**Comments**
Average wind speed	*Less than 25km/h, ideally 5-10km/h	Less than 15km/h ideally less than10km/h	Average wind speed during the survey was 11.26 km/h.	-
Rainfall	*0.5mm in 48hours	Less than 0.5mm having fallen in 2 days prior	1.78mm rainfall within 22.5 hours prior to the survey	-
Landfill surface grass height	-	Less than 100 mm	Patches of grass greater than 400mm along the bottom part of stage 1 area	Weed-eating and mowing grass is recommended for a more accurate survey
Landfill surface	-	Relatively dry	Relatively dry	-
Atmospheric pressure	-	Ideally declining atmospheric pressure after several days of high pressure	Declined pressure from 1006.77 hpa to 995.93 hpa prior to the survey and Slightly fluctuated pressure between 996.61 – 994.92 hpa during the survey period	-

4.0 Results

The results of the survey are plotted on the attached drawing. Details of readings above 200ppm are in Table 2.

5.0 Attachments

- Tables 1 and 2 of results.
- Site plan showing locations of notable results before and after remediation.
- Appendices 1 and 2 Climate conditions – graphical format.

6.0 Methane readings and locations

Table 2: Highest Methane readings recorded at localised survey area

Marker	> 200 ppm	Site Photographs	Comments, location and description	Action Required	Close Out Comments	Retest result
1	520ppm		Crack in eroded soil surface in North Eastern face	Bentonite and water	1 bag of Bentonite and water. Additional 500mm of clay cover will be added to this face by Goodmans. 	57ppm

2	1058ppm		Highly eroded face, rill erosion extending 1m along the slope on clay cover in North Eastern face	Bentonite and water or soil cover	Used Soil, 2 bags of Bentonite and water 500mm clay cover will be added to this face by Goodmans 	129ppm
3	890ppm		Highly eroded face, rill erosion extending 1.5m along the slope on clay cover in North Eastern face	Bentonite and water or soil cover	Used Soil, 4 bags of Bentonite and water 500mm clay cover will be added to this face by Goodmans 	100ppm

4	227ppm		Crack in the soil cover, an eroded face in North Eastern face	Bentonite and water	1 bag of Bentonite and water 	50ppm
5	789ppm		Highly eroded face, rill erosion extending 1.0m along the slope on clay cover in North Eastern face	Bentonite and water	2 bags of Bentonite and water 	100ppm

6	760ppm		Previous remediation and part of soil cover in the NE and SW interface	Bentonite and water	1bags of Bentonite and water 	40ppm
7	386ppm		Crack in soil cover on the upper part of the SW face	Bentonite and water	1 bag of Bentonite and water. Rearranged the surface of the previous Bentonite cover 	57ppm

8	225ppm		Previous remediation and in soil cover on South Eastern face	Bentonite and water	1 bag of Bentonite and water 	119ppm
-	The bio filter showed no emissions 0ppm for the area and GPS was not recorded for the bio filter inspection.					

Levin Landfill temporary cap

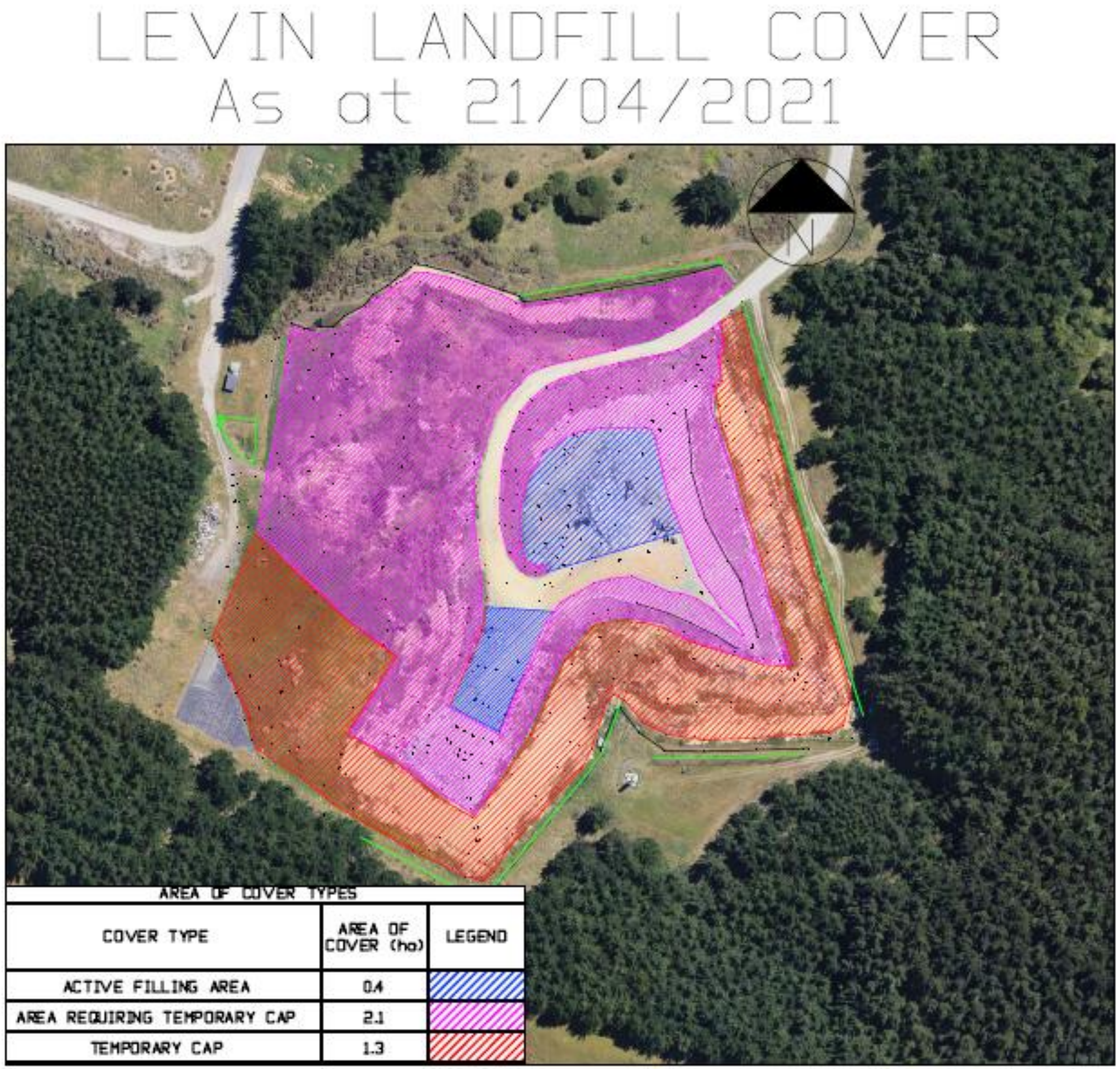


Figure 1: Map of Levin Landfill showing areas with temporary capping. (Aerial photo Feb 2021).

Surface Emissions Map for temporary cover

Figure 1: Map showing Levin Landfill surface emissions survey 22nd December 2021

Appendix 1: Weather conditions preceding the survey.

The last rainfall recorded by a Levin Weather station was 1.78mm at 10.59 a.m. on 21st December 2021, 22 hours before the survey according to the website (retrieved on January 05th 2022) https://www.wunderground.com/dashboard/pws/ILEVIN22/graph/2021-12-26/2021-12-26/weekly .

Weather History for ILEVIN22

Previous | Weekly Mode | December | 26 | 2021 | View | Next

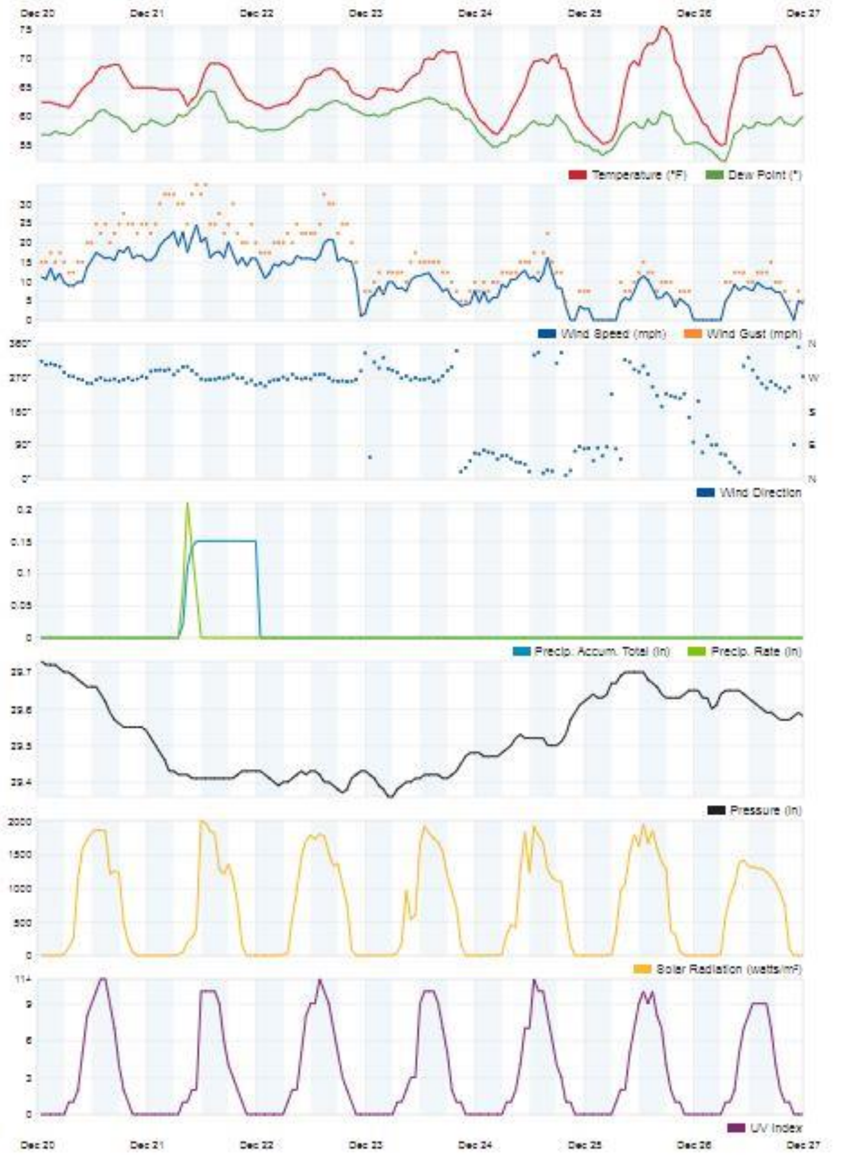
Summary
December 20, 2021 - December 26, 2021

	High	Low	Average
Temperature	75.8 °F	53.3 °F	64.5 °F
Dew Point	64.4 °F	51.1 °F	57.8 °F
Humidity	86 %	60 %	80 %
Precipitation	0.16 in	--	--

	High	Low	Average
Wind Speed	24.8 mph	0.0 mph	4.4 mph
Wind Gust	34.8 mph	--	7.0 mph
Wind Direction	--	--	WSW
Pressure	29.73 in	29.35 in	--

Graph | Table

December 20, 2021 - December 26, 2021



Appendix 2:

Weather conditions during the day of survey on the 22nd December 2021 is displayed below. There was no rainfall during the survey and the data retrieved on 05/01/2022 from https://www.wunderground.com/dashboard/pws/ILEVIN22/graph/2021-12-22/2021-12-22/daily

Weather History for ILEVIN22

Previous | Daily Mode | December | 22 | 2021 | View | Next

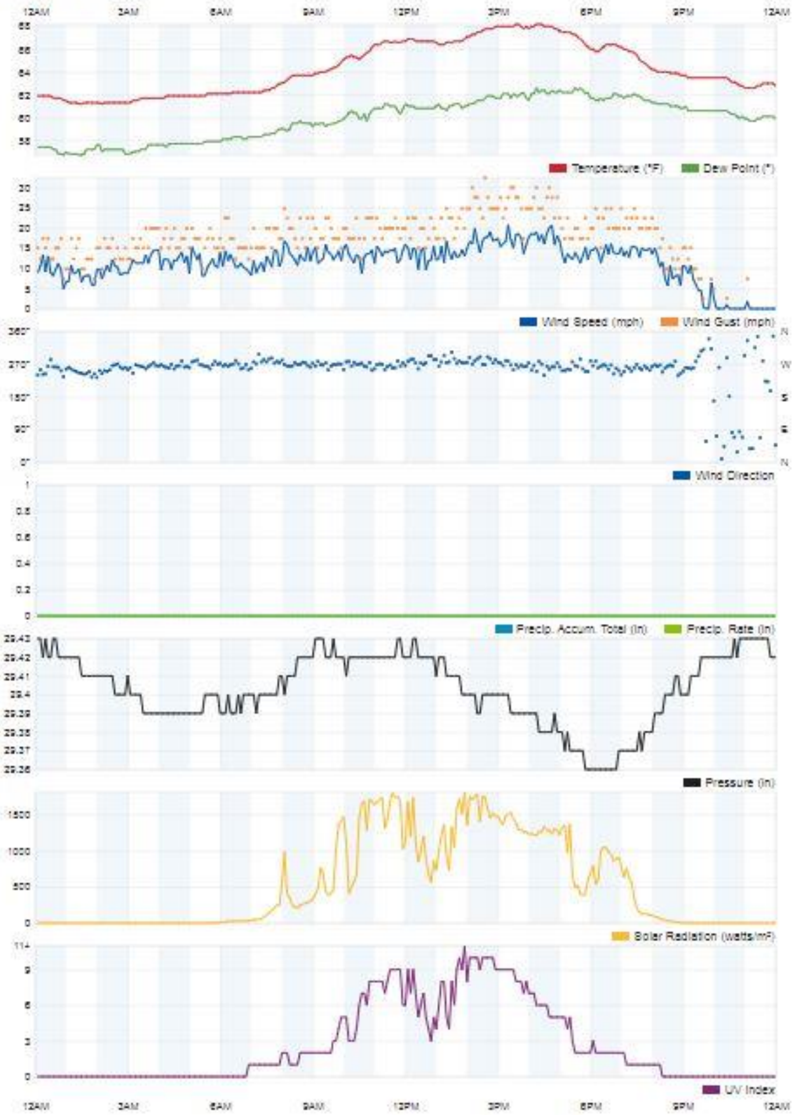
Summary
December 22, 2021

	High	Low	Average
Temperature	68.2 °F	61.2 °F	64.3 °F
Dew Point	62.8 °F	58.6 °F	59.7 °F
Humidity	91 %	78 %	85 %
Precipitation	0.00 in	--	--

	High	Low	Average
Wind Speed	20.8 mph	0.0 mph	7.2 mph
Wind Gust	32.4 mph	--	11.0 mph
Wind Direction	--	--	West
Pressure	29.43 in	29.36 in	--

Graph | Table

December 22, 2021



SURFACE EMISSIONS MONITORING REPORT

Quality Information

Project Name Title:	Surface Emission Monitoring – January 2022
Subtitle:	Levin Landfill
Date:	18th January 2022
Monitored and authored by:	Shanka Samarathunge
Reviewed:	Darnelle Nugent-O'Leary

Contents

Purpose

To monitor landfill surface emissions in compliance with Air Discharge Permit 330/1 Condition 5. This survey provides a qualitative assessment of landfill gas emissions from the landfill surface.

1.0 Procedure

A Gas-Rover detector by Bascom-Turner was used by EnviroWaste Services Limited to assess levels of emissions of methane. The instantaneous surface emission monitoring was done in accordance with the EnviroWaste standard operating procedure for all Landfills.

2.0 Details of this survey

The monitoring was carried out on the 18th January starting at 11.00 a.m. Table 2 below details the readings from the survey.

3.0 Climate

The weather conditions prior to and during the survey are summarised and recorded in Table 1 comparing the resource consent requirements and the EnviroWaste standard operating procedure (SOP).

Table 1: Guidelines, resource consent requirements and the actual survey conditions.

	Resource consent requirements None *****Note: *Favourable weather conditions*	**SOP Guidelines**	**Actual**	**Comments**
Average wind speed	*Less than 25km/h, ideally 5-10km/h	Less than 15km/h ideally less than10km/h	Average wind speed during the survey was 2.25 km/h.	-
Rainfall	*0.5mm in 48hours	Less than 0.5mm having fallen in 2 days prior	0mm in the 48 hours prior to the survey. 1.77mm rainfall within 128 hours prior to the survey	-
Landfill surface grass height	-	Less than 100 mm	Patches of grass greater than 400mm along the bottom part of stage 1 area	
Landfill surface	-	Relatively dry	Relatively dry	-
Atmospheric pressure	-	Ideally declining atmospheric pressure after several days of high pressure	Inclined pressure from 995.25 hpa to 996.27 hpa prior to the survey and Slightly fluctuated pressure between 999.32 – 996.27 hpa during the survey period	-

4.0 Results

The results of the survey are plotted on the attached drawing. Details of readings above 200ppm are in Table 2.

5.0 Attachments

- Tables 1 and 2 of results.
- Site plan showing locations of notable results before and after remediation.
- Appendices 1 and 2 Climate conditions – graphical format.

6.0 Methane readings and locations

Table 2: Highest Methane readings recorded at localised survey area

Marker	> 200 ppm	Site Photographs	Comments, location and description	Action Required	Close Out Comments	Retest result
1	236ppm		Crack in soil cover in North Eastern face. Random readings around 400 ppm. Gas wells are not connected to the flare due to new covering.	Bentonite and water	1 bag of Bentonite and water. 	0ppm
2	1410 ppm		Interface/ bottom edge of the two faces in Northern and Western faces. Random high readings around 2100 ppm	Soil/clay cover (requested to the council to arrange remediation)	Remediated by the contractors for the request of the council 	70 ppm

3	346ppm		Crack in clay cover in upper Western face	Bentonite and water	1 bag of Bentonite and water 	0ppm
4	318ppm		Crack in the soil cover in western face, the fracture extending either sides of up and down.	Soil/clay cover (requested to the council to arrange remediation)	1 bag of Bentonite and water added as primary remediation. Waiting for the additional soil covering 	

5	286ppm		Crack in the soil cover in western face	Bentonite and water	1 bag of Bentonite and water 	0ppm
-	The bio filter showed no emissions 0ppm for the area and GPS was not recorded for the bio filter inspection.					

Levin Landfill temporary cap

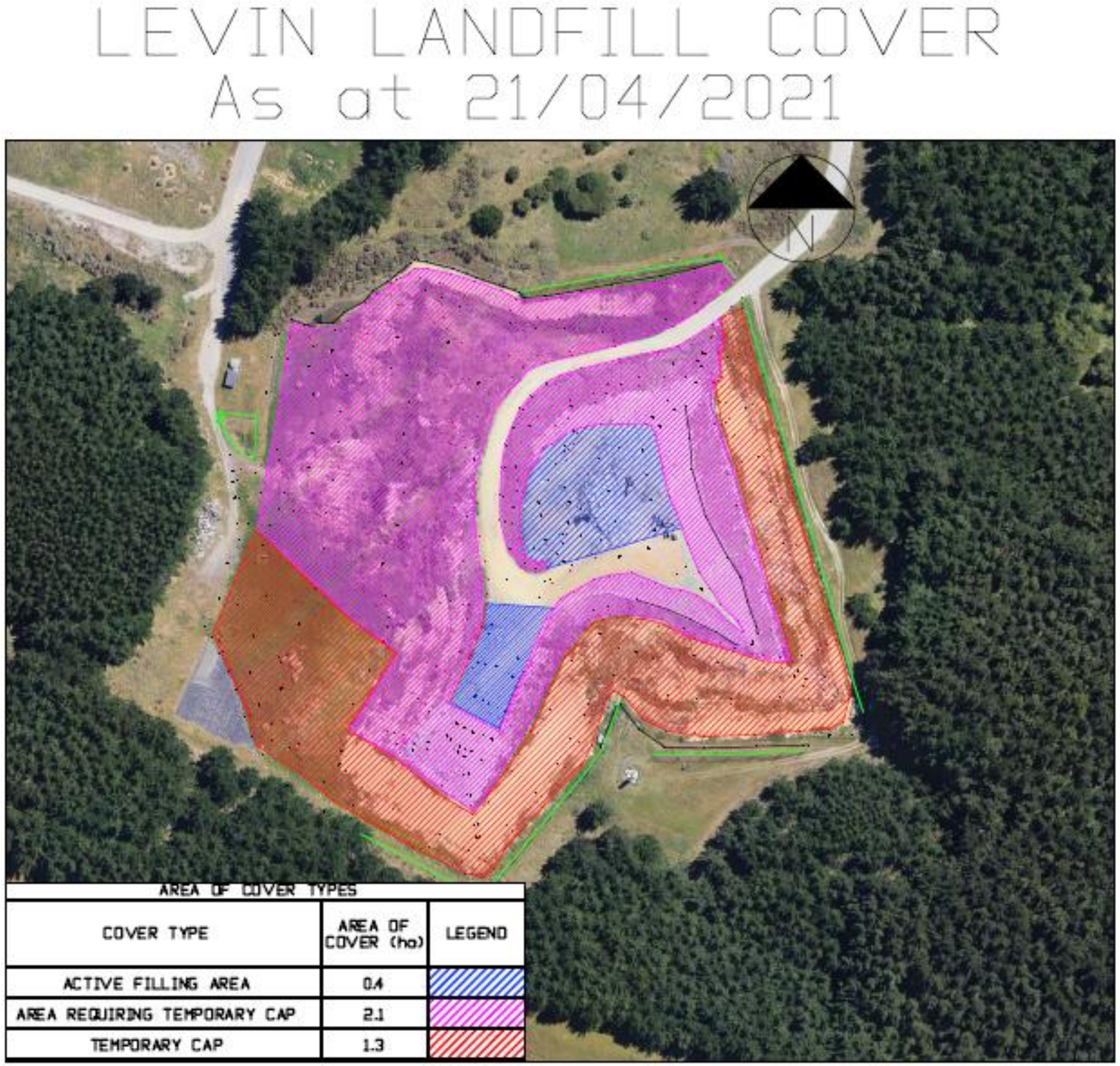


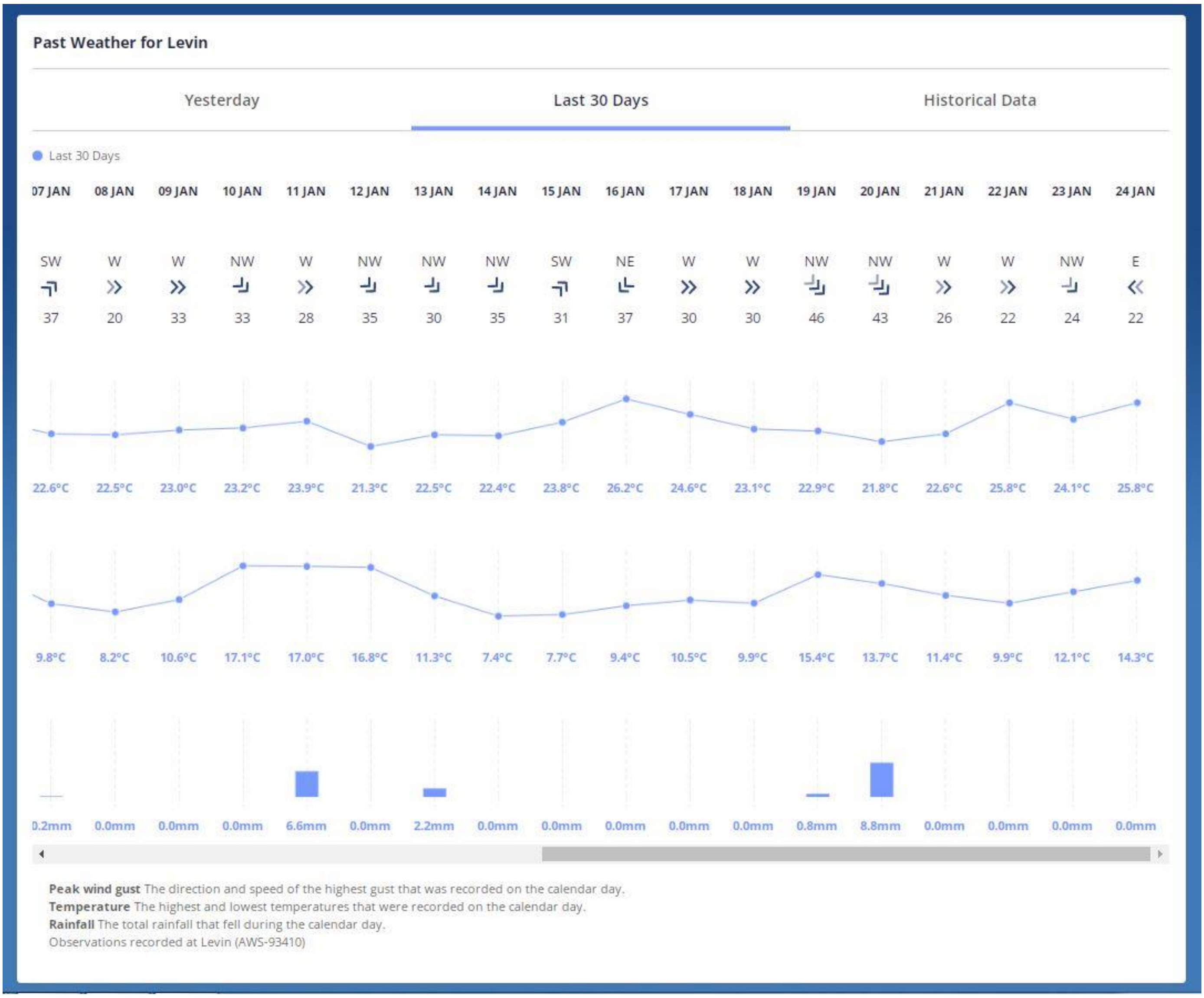
Figure 1: Map of Levin Landfill showing areas with temporary capping. (Aerial photo Feb 2021).

Surface Emissions Map for temporary cover

Figure 1: Map showing Levin Landfill surface emissions survey 18th January 2022

Appendix 1: Weather conditions preceding the survey.

The last rainfall recorded by a Levin Weather station was 1.77mm at 02.49 a.m. on 13th January 2022, 128 hours before the survey according to the website (retrieved on January 25th 2022)



Appendix 2:

Weather conditions during the day of survey on the 18th January 2022 is displayed below. There was no rainfall during the survey and the data retrieved on 25/01/2022 from https://www.wunderground.com/dashboard/pws/ILEVIN22/graph/2022-01-18/2022-01-18/daily

Weather History for ILEVIN22

Previous | Daily Mode | January | 18 | 2022 | View | Next

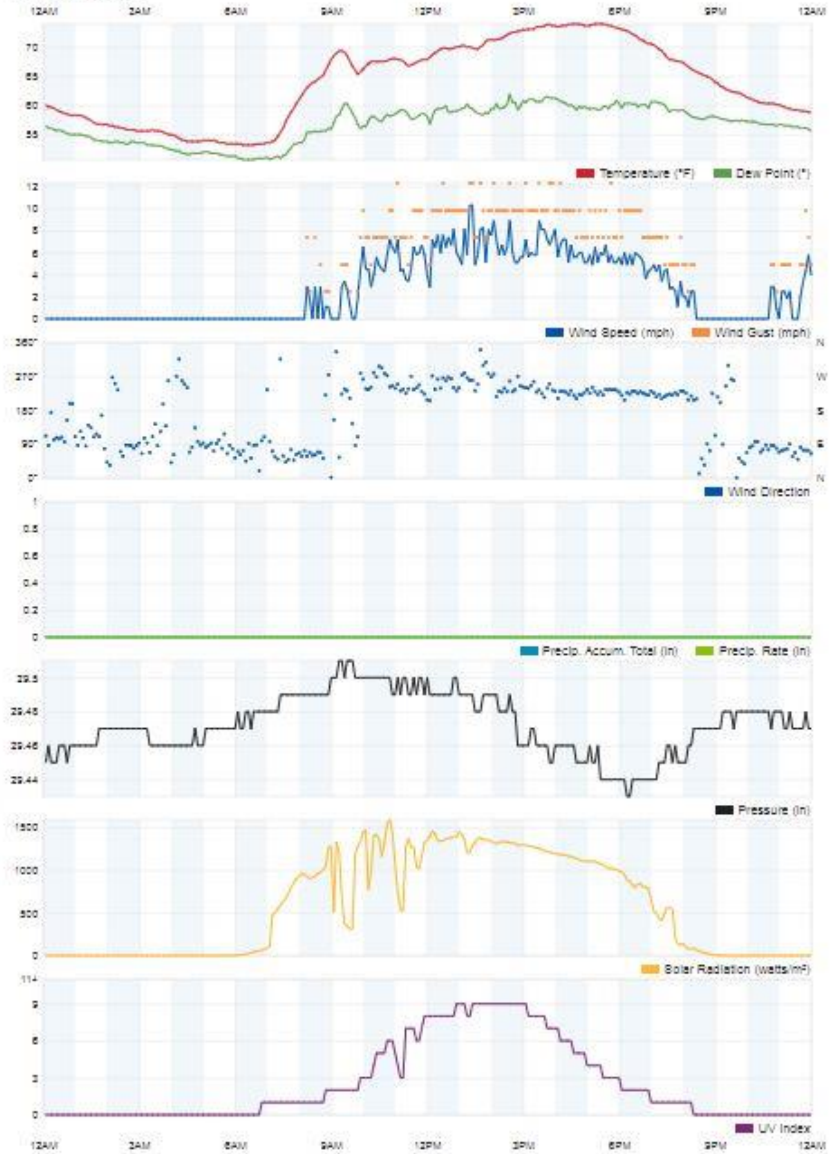
Summary
January 18, 2022

	High	Low	Average
Temperature	73.9 °F	53.2 °F	63.9 °F
Dew Point	61.9 °F	50.4 °F	56.2 °F
Humidity	93 %	67 %	77 %
Precipitation	0.00 in	--	--

	High	Low	Average
Wind Speed	10.3 mph	0.0 mph	1.4 mph
Wind Gust	12.3 mph	--	2.6 mph
Wind Direction	--	--	
Pressure	29.51 in	29.42 in	--

Graph | Table

January 18, 2022



SURFACE EMISSIONS MONITORING REPORT

Quality Information

Project Name Title:	Surface Emission Monitoring – February 2022
Subtitle:	Levin Landfill
Date:	24th February 2022
Monitored and authored by:	Shanka Samarathunge
Reviewed:	Darnelle Nugent-O'Leary and Peter Sharpe

Contents

Purpose
To monitor landfill surface emissions in compliance with Air Discharge Permit 330/1 Condition 5. This survey provides a qualitative assessment of landfill gas emissions from the landfill surface.

1.0 Procedure
A Gas-Rover detector by Bascom-Turner was used by EnviroWaste Services Limited to assess levels of emissions of methane. The instantaneous surface emission monitoring was done in accordance with the EnviroWaste standard operating procedure for all Landfills.

2.0 Details of this survey
The monitoring was carried out on the 24th February starting at 8.30 a.m. Table 2 below details the readings from the survey.

3.0 Climate
The weather conditions prior to and during the survey are summarised and recorded in Table 1 comparing the resource consent requirements and the EnviroWaste standard operating procedure (SOP).

Table 1: Guidelines, resource consent requirements and the actual survey conditions.

	Resource consent requirements None ***Note:** *Favourable weather conditions*	**SOP Guidelines**	**Actual**	**Comments**
Average wind speed	*Less than 25km/h, ideally 5-10km/h	Less than 15km/h ideally less than10km/h	Average wind speed during the survey was 1.93 km/h.	-
Rainfall	*0.5mm in 48hours	Less than 0.5mm having fallen in 2 days prior	1.77mm in the 26 hours prior to the survey.	-
Landfill surface grass height	-	Less than 100 mm	Patches of grass greater than 400mm along the North Eastern face	
Landfill surface	-	Dry	Relatively dry	-
Atmospheric pressure	-	Ideally declining atmospheric pressure after several days of high pressure	Inclined pressure from 1005.08 hpa to 1014.56 hpa prior to the survey and dropped at the final quarter of the survey to 1010.83 hpa	-

4.0 Results

The results of the survey are plotted on the attached drawing. Details of readings above 200ppm are in Table 2.

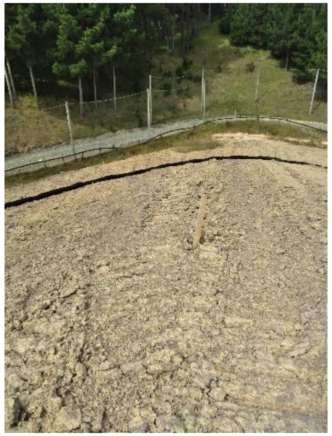
5.0 Attachments

- Tables 1 and 2 of results.
- Site plan showing locations of notable results before and after remediation.
- Appendices 1 and 2 Climate conditions – graphical format.

6.0 Methane readings and locations

Table 2: Highest Methane readings recorded at localised survey area

Marker	> 200 ppm	Site Photographs	Comments, location and description	Action Required	Close Out Comments	Retest result
1	236ppm		Fracture in soil cover in North Eastern face. Gas wells are not connected to the flare due to activities of Goodman's soil covering.	Reconnect Gas wells after adding top soil cover Bentonite and water if necessary	Connected the wells after Goodman's top soil cover 	30ppm
2	445ppm		Fracture in bare soil cover, top edge of the North Eastern face. Closer to disconnected Gas well from main line	Bentonite and water Reconnect Gas wells after adding top soil cover	Bentonite and water, newly added top soil cover 	52 ppm

3	317ppm		Fracture in clay cover in edge of North eastern face and Southern face	Bentonite and water	Newly added top soil cover 	76ppm
4	1360ppm		Well base of LVNW006, around bentonite cover	Reconnect Gas wells after adding top soil cover Bentonite and water	Reconnected the well and top soil cover has been added around the well base. 	148 ppm

5	716ppm		Crack in the soil cover in western face, closer to 63mm gas line	Reconnect surrounding Gas wells after adding top soil cover Bentonite and water	7 bag of Bentonite and water 	60 ppm to 144ppm
6	800ppm		Set factures in bare soil cover, 1m x4 m area in between two previous remediation in western face	Additional soil cover Bentonite and water	Added 6 bags of bentonite along the fractured surface and re compacted the previous remediation. Need additional soil cove. Having readings around 280 ppm in southern side 	114 ppm

7	480ppm		Well base of LVNW009, around bentonite cover	Reconnect Gas wells after adding top soil cover Bentonite and water	Reconnected the well and top soil cover has been added around the well base. 	138ppm
8	760ppm		Well base of LVNW006, around bentonite cover	Reconnect Gas wells after adding top soil cover Bentonite and water	Reconnected the well and top soil cover has been added around the well base. 	70ppm
-	The bio filter showed no emissions 0ppm for the area and GPS was not recorded for the bio filter inspection.					

Surface Emissions Map for final cover and temporary cover

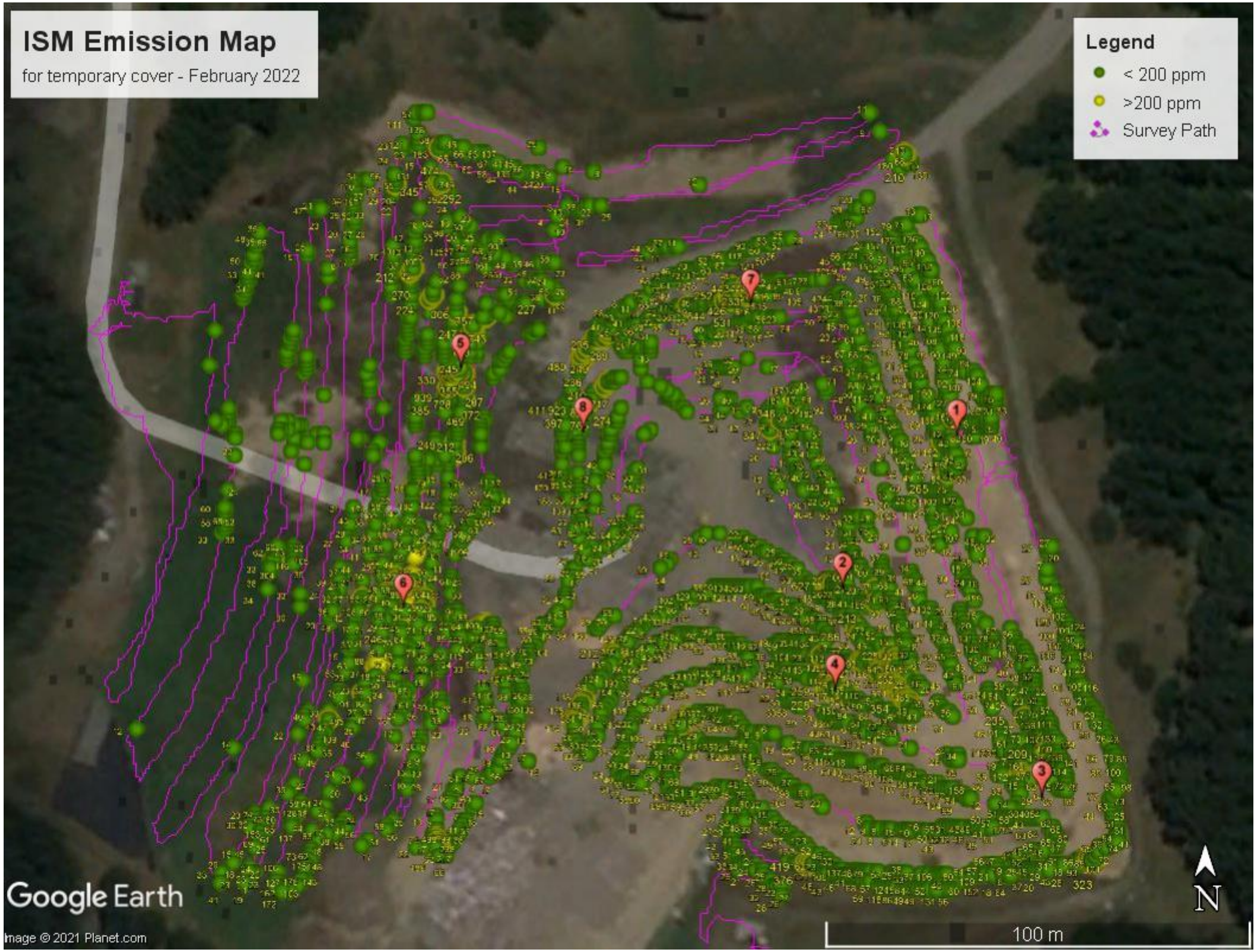


Figure 1: Map showing Levin Landfill surface emissions survey 24th February 2022

Surface emissions map of the higher emissions over 200ppm

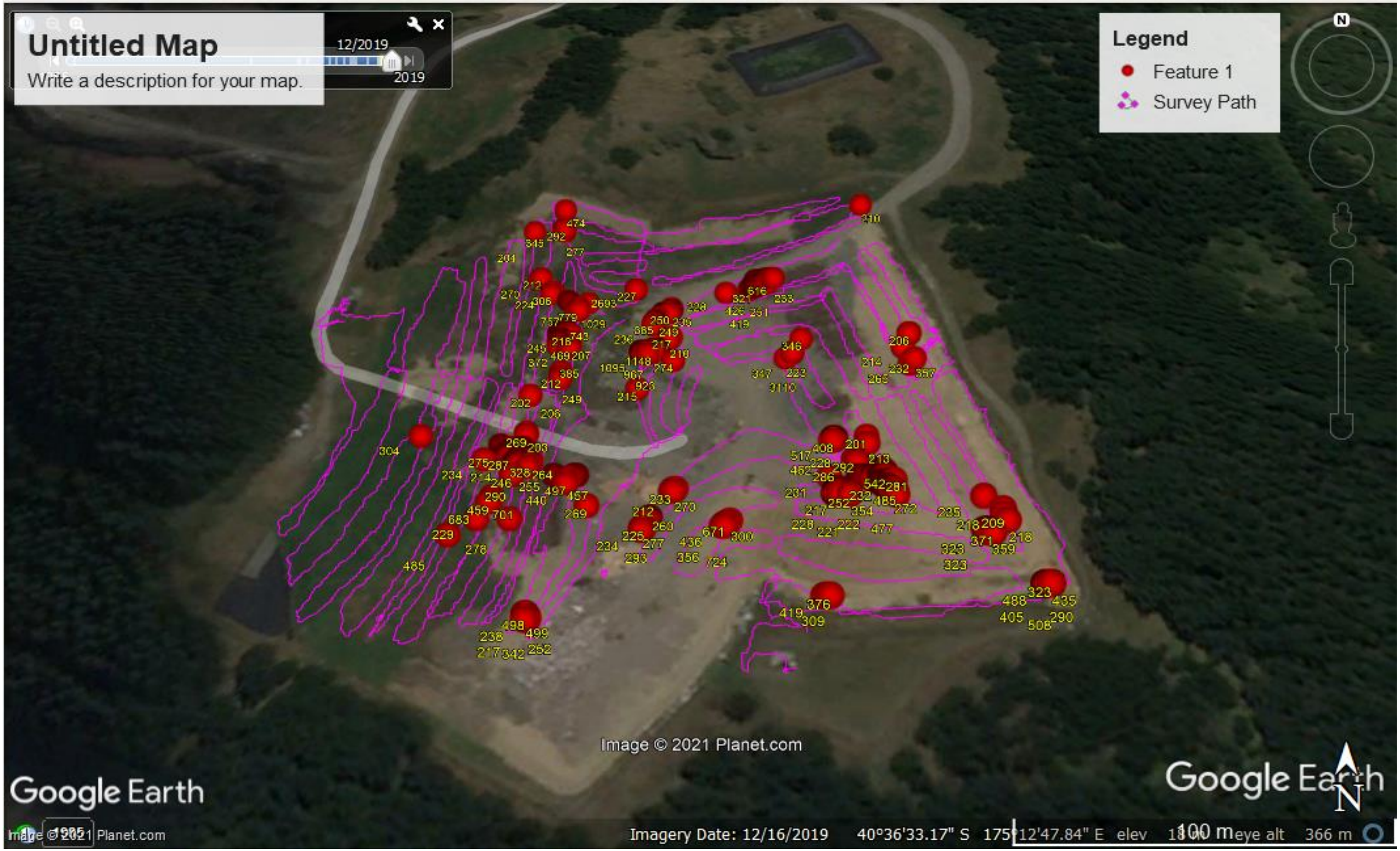


Figure 1: Levin Landfill emissions over 200ppm.

Appendix 1: Weather conditions preceding the survey.

The last rainfall recorded by a Levin Weather station was 1.77mm at 06.14 a.m. on 23rd February 2022, 26 hours before the survey according to the website (retrieved on March 13th 2022) https://www.wunderground.com/dashboard/pws/ILEVIN22/graph/2022-02-24/2022-02-24/weekly.

Weather History for ILEVIN22

Previous | Weekly Mode | February | 27 | 2022 | View | Next

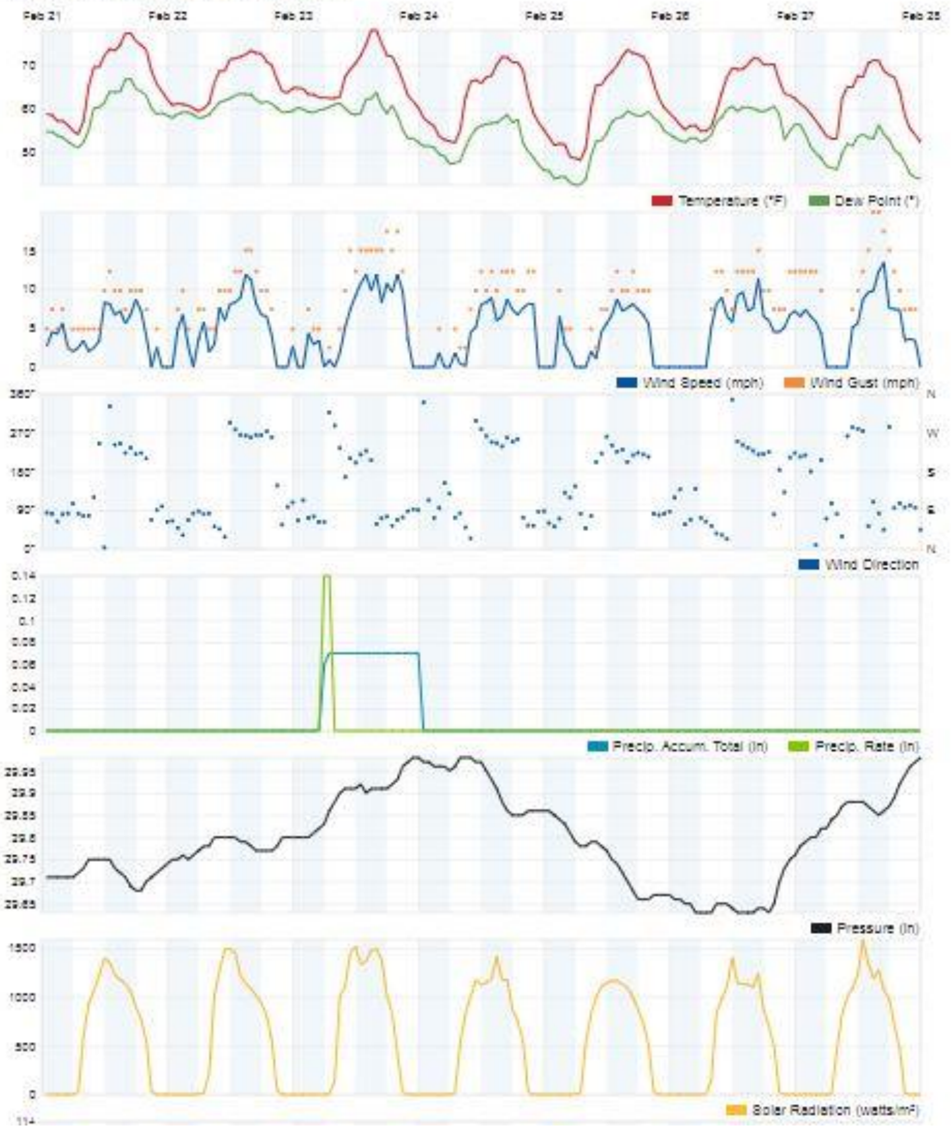
Summary
February 21, 2022 - February 27, 2022

	High	Low	Average
Temperature	78.1 °F	47.6 °F	63.3 °F
Dew Point	66.9 °F	40.6 °F	64.3 °F
Humidity	95 %	46 %	73 %
Precipitation	0.07 in	--	--

	High	Low	Average
Wind Speed	13.4 mph	0.0 mph	1.3 mph
Wind Gust	18.8 mph	--	2.4 mph
Wind Direction	--	--	SSW
Pressure	29.98 in	29.61 in	--

Graph | Table

February 21, 2022 - February 27, 2022



Appendix 2:

Weather conditions during the day of survey on the 23rd february 2022 is displayed below. There was no rainfall during the survey and the data retrieved on 13/03/2022 from https://www.wunderground.com/dashboard/pws/ILEVIN22/graph/2022-02-24/2022-02-24/daily

Weather History for ILEVIN22

Previous | Daily Mode | February | 24 | 2022 | View | Next

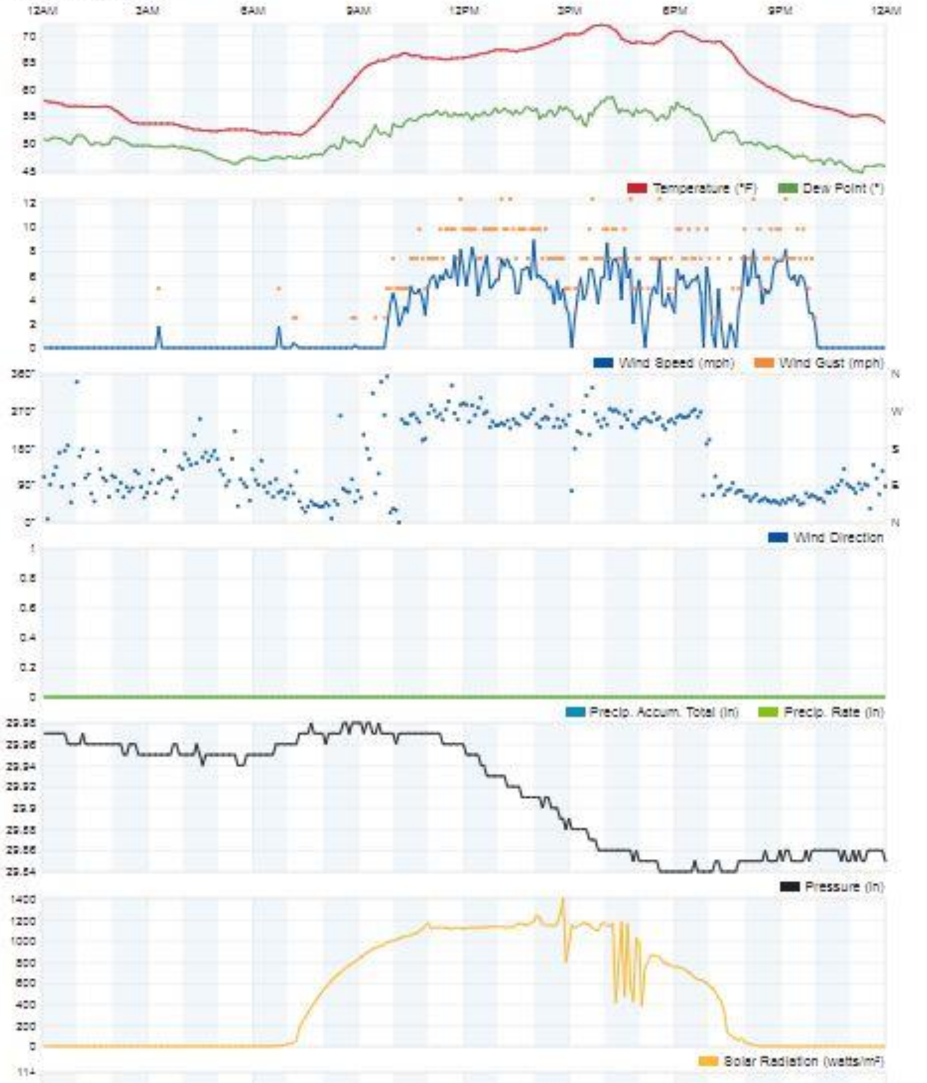
Summary
February 24, 2022

	High	Low	Average
Temperature	72.0 °F	51.4 °F	61.1 °F
Dew Point	58.8 °F	43.7 °F	50.8 °F
Humidity	87 %	47 %	68 %
Precipitation	0.00 in	--	--

	High	Low	Average
Wind Speed	8.9 mph	0.0 mph	1.2 mph
Wind Gust	12.3 mph	--	2.2 mph
Wind Direction	--	--	WNW
Pressure	29.96 in	29.83 in	--

Graph | Table

February 24, 2022



SURFACE EMISSIONS MONITORING REPORT

Quality Information

Project Name Title:	Surface Emission Monitoring
Subtitle:	Levin Landfill
Date:	30th March 2022
Monitored and authored by:	Shanka Samarathunge
Reviewed:	Peter Sharpe

Contents

Purpose

To monitor landfill surface emissions in compliance with Air Discharge Permit 330/1 Condition 5. This survey provides a qualitative assessment of landfill gas emissions from the landfill surface.

1.0 Procedure

A Gas-Rover detector by Bascom-Turner was used by EnviroWaste Services Limited to assess levels of emissions of methane. The instantaneous surface emission monitoring was done in accordance with the EnviroWaste standard operating procedure for all Landfills.

2.0 Details of this survey

The monitoring was carried out on the 30th March starting at 9.30 a.m. Table 2 below details the readings from the survey.

3.0 Climate

The weather conditions prior to and during the survey are summarised and recorded in Table 1 comparing the resource consent requirements and the EnviroWaste standard operating procedure (SOP).

Table 1: Guidelines, resource consent requirements and the actual survey conditions.

	Resource consent requirements None *****Note: *Favourable weather conditions*	**SOP Guidelines**	**Actual**	**Comments**
Average wind speed	*Less than 25km/h, ideally 5-10km/h	Less than 15km/h ideally less than10km/h	Average wind speed during the survey was 0.8046 km/h.	-
Rainfall	*0.5mm in 48hours	Less than 0.5mm having fallen in 2 days prior	1.78 mm on 25/03/2022,125 hours prior to the survey.	-
Landfill surface grass height	-	Less than 100 mm	Patches of grass greater than 400mm along the North Eastern face	
Landfill surface	-	Dry	Relatively dry	-
Atmospheric pressure	-	Ideally declining atmospheric pressure after several days of high pressure	Declined pressure from 1015 hpa to 1002.56 hpa prior to the survey and Slight increase during the survey to 1004.40 hpa	-

4.0 Results

The results of the survey are plotted on the attached drawing. Details of readings above 200ppm are in Table 2.

5.0 Attachments

- Tables 1 and 2 of results.
- Site plan showing locations of notable results before and after remediation.
- Appendices 1 and 2 Climate conditions – graphical format.

6.0 Methane readings and locations

Table 2: Highest Methane readings recorded at localised survey area

Marker	> 200 ppm	Site Photographs	Comments, location and description	Action Required	Close Out Comments	Retest result
1	485ppm		LVNW 008 well base, high reading closer to the edge of the base. Random high readings around 700 ppm	Bentonite and water	Used 4 bentonite bags and water 	118ppm
2	1380ppm		LVNW 007 well base	Bentonite and water	Used 6 Bentonite bags and water 	98 ppm

3	580ppm		LVNW 006 well base, Random high readings around 1500 ppm	Bentonite and water	Used 1 Bentonite bag and water. Also restructured the previous bentonite cover. 	144ppm
4	380ppm		Crack in bare soil cover in the interface of Western and North Western faces	Bentonite and water	Used 1 Bentonite bag and water 	38 ppm
5	380ppm		In previous remediation and part of soil crack next to remediation	Bentonite and water	Used 1 Bentonite bag and water. Also restructured the previous bentonite cover. 	70ppm

6	870ppm		Well base of LVNW 04 in Western face	Additional soil cover Bentonite and water	Added 1 bags of bentonite and compacted the previous remediation. Need additional soil cove. Having random readings around 250 ppm 	250ppm
7	800ppm		Well base of LVNW003, in previous remediation	Additional soil cover Bentonite and water	Added 1 bags of bentonite and compacted the previous remediation. Need additional soil cove. Having random readings around 200 ppm 	176ppm
8	600ppm		Soil fracture in upper Western face and part of the previous remediation	Additional soil cover Bentonite and water	Added 1 bags of bentonite and compacted the previous remediation. Need additional soil cove. Having random readings around 200 ppm 	160ppm

9	386ppm		Soil fracture in upper Western face and closer to the previous remediation	Additional soil cover Bentonite and water	Added 1 bags of bentonite and compacted the previous remediation. Need additional soil cove. 	133ppm
10	600ppm		Well base of LVNW003 - 06, in previous remediation	Bentonite and water	Used 1 Bentonite bag and water. Restructured the previous bentonite cover. 	180ppm
11			Well base of LVNW - 009, in previous remediation	Bentonite and water	Used 2 Bentonite bag and water. Restructured the previous bentonite cover 	176ppm
-	The bio filter showed no emissions 0ppm for the area.					

Surface Emissions Map for temporary cover

Figure 1: Map showing Levin Landfill surface emissions survey 30th March 2022

Appendix 1: Weather conditions preceding the survey.

The last rainfall recorded by a Levin Weather station was 1.78mm at 03.54 a.m. on 25th March 2022, 125 hours before the survey according to the website (retrieved on 06/04/2022) https://www.wunderground.com/dashboard/pws/ILEVIN22/graph/2022-02-24/2022-02-24/weekly.

Weather History for ILEVIN22

Weekly Mode | April | 3 | 2022 | View

Previous

Next

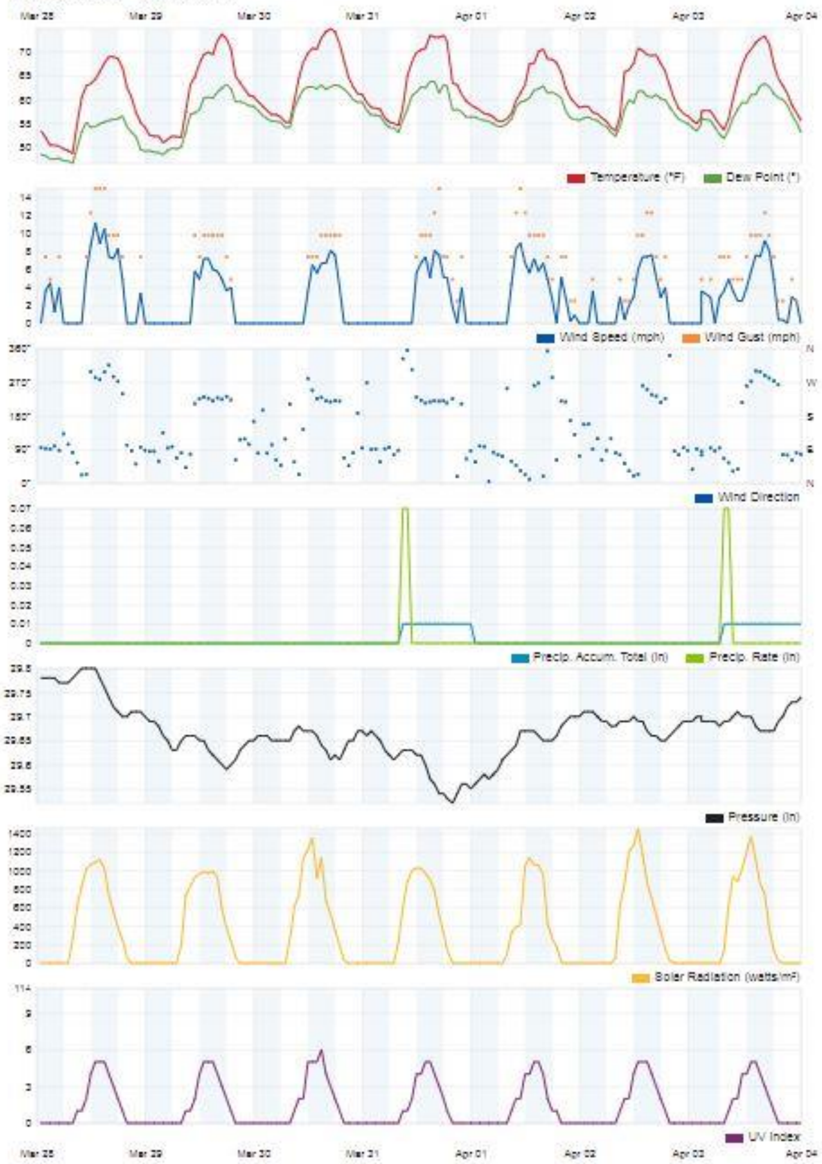
Summary
March 28, 2022 - April 3, 2022

	High	Low	Average
Temperature	74.8 °F	48.2 °F	61.1 °F
Dew Point	63.7 °F	48.2 °F	58.0 °F
Humidity	97 %	66 %	84 %
Precipitation	0.02 in	--	--

	High	Low	Average
Wind Speed	11.2 mph	0.0 mph	0.7 mph
Wind Gust	16.0 mph	--	1.4 mph
Wind Direction	--	--	SSW
Pressure	29.80 in	29.52 in	--

Graph | Table

March 28, 2022 - April 3, 2022



Appendix 2:

Weather conditions during the day of survey on the 30th March 2022 is displayed below. There was no rainfall during the survey and the data retrieved on 06/04/2022 from https://www.wunderground.com/dashboard/pws/ILEVIN22/graph/2022-02-24/2022-02-24/daily

Weather History for ILEVIN22

Previous | Daily Mode | March | 30 | 2022 | View | Next

Summary

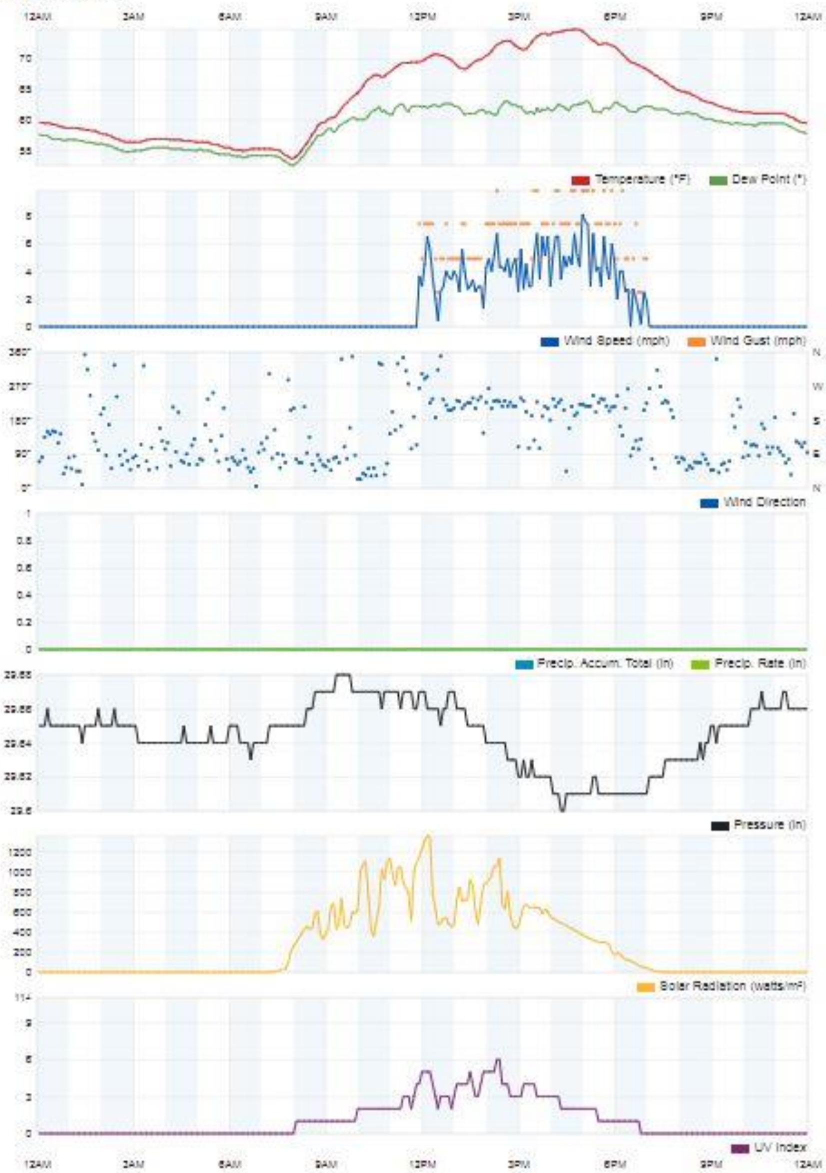
March 30, 2022

	High	Low	Average
Temperature	74.8 °F	53.8 °F	63.5 °F
Dew Point	63.0 °F	52.6 °F	58.8 °F
Humidity	96 %	61 %	86 %
Precipitation	0.00 in	--	--

	High	Low	Average
Wind Speed	8.1 mph	0.0 mph	0.6 mph
Wind Gust	9.8 mph	--	1.1 mph
Wind Direction	--	--	SW
Pressure	29.68 in	29.60 in	--

Graph | Table

March 30, 2022



SURFACE EMISSIONS MONITORING REPORT

Quality Information

Project Name Title:	Surface Emission Monitoring
Subtitle:	Levin Landfill
Date:	27th April 2022
Monitored and authored by:	Shanka Samarathunge
Reviewed:	Peter Sharpe

Contents

Purpose
To monitor landfill surface emissions in compliance with Air Discharge Permit 330/1 Condition 5. This survey provides a qualitative assessment of landfill gas emissions from the landfill surface.

1.0 Procedure
A Gas-Rover detector by Bascom-Turner was used by EnviroWaste Services Limited to assess levels of emissions of methane. The instantaneous surface emission monitoring was done in accordance with the EnviroWaste standard operating procedure.

2.0 Details of this survey
The monitoring was carried out on the 27th April starting at 10.00 a.m. Table 2 below details the readings from the survey.

3.0 Climate
The weather conditions prior to and during the survey are summarised and recorded in Table 1 comparing the resource consent requirements and the EnviroWaste standard operating procedure (SOP).

Table 1: Guidelines, resource consent requirements and the actual survey conditions.

	Resource consent requirements None *****Note: *Favourable weather conditions*	**SOP Guidelines**	**Actual**	**Comments**
Average wind speed	*Less than 25km/h, ideally 5-10km/h	Less than 15km/h ideally less than10km/h	Average wind speed during the survey was 1.77 km/h.	-
Rainfall	*0.5mm in 48hours	Less than 0.5mm having fallen in 2 days prior	3.3 mm on 19/05/2022,193 hours prior to the survey.	-
Landfill surface grass height	-	Less than 100 mm	Patches of grass greater than 400mm along the North Eastern face	-
Landfill surface	-	Dry	Relatively dry	-
Atmospheric pressure	-	Ideally declining atmospheric pressure after several days of high pressure	Slight increased pressure from 1000.67 hpa to 1002.70 hpa prior to the survey and gradual increase during the survey up to 1016.25 hpa	-

4.0 Results

The results of the survey are plotted on the attached drawing. Details of readings above 200ppm are in Table 2.

5.0 Attachments

- Tables 1 and 2 of results.
- Site plan showing locations of notable results before and after remediation.
- Appendices 1 and 2 Climate conditions – graphical format.

6.0 Methane readings and locations

Table 2: Highest Methane readings recorded at localised survey area

Marker	> 200 ppm	Site Photographs	Comments, location and description	Action Required	Close Out Comments	Retest result
1	433ppm		LVNW 008 well base in previous remediation	Bentonite and water	Used 1 bentonite bags and water. Rearranged the previous remediation 	52ppm
2	407ppm		LVNW 007 well base, in bare soil cover	Bentonite and water	Used 2 Bentonite bags, soil and water. 	141 ppm

3	502ppm		LVNW 006 well base in bare soil cover	Bentonite and water	Used 2 Bentonite bag and water. Also restructured the previous bentonite cover. 	164ppm
4	438ppm		LVNW 009 well base and noticed random high readings around 1000ppm	Bentonite and water	Used 1 Bentonite bag and water. Also restructured the previous bentonite cover. 	121 ppm
5	297ppm		Well Base of LVNW03- 06, bottom part of the remediation	Bentonite and water	Used 1 Bentonite bag and water. Also restructured the previous bentonite cover. 	120ppm

6	255ppm		Previous remediation next to 63mm line in Western face, closer to LVNW03- 04	Additional soil cover Bentonite and water	Used 1 bags of bentonite and compacted the previous remediation. Random high readings over 200ppm 	250ppm
7	501ppm		Well base of LVNW003 -04, in the bottom edge of previous remediation	Bentonite and water	re compacted the previous remediation and water. 	190ppm
8	283ppm		Well base of LVNW003 -03, in previous remediation	Bentonite and water	Added 1 bags of bentonite and. Having random high readings > 200 ppm 	160ppm

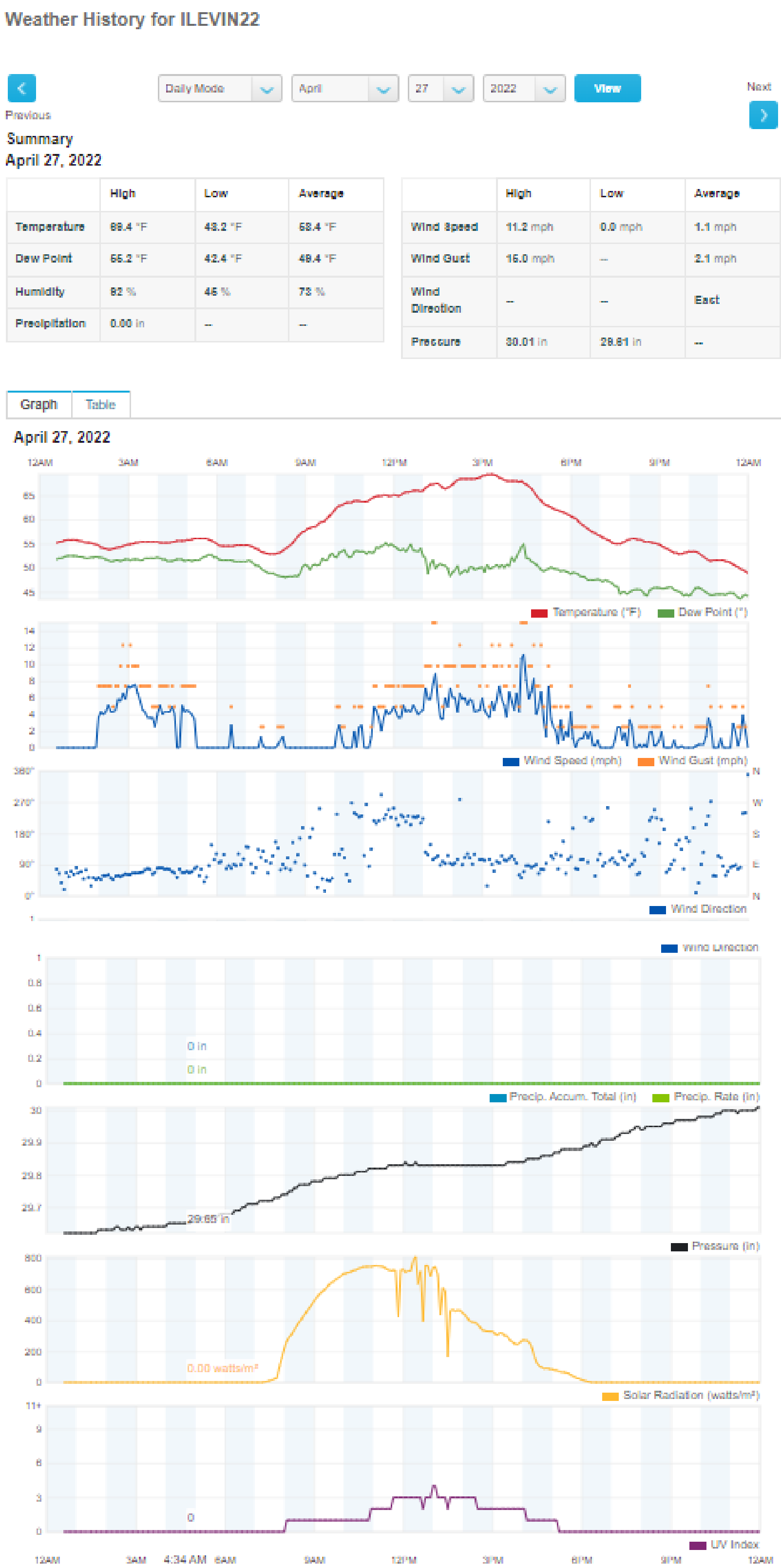
9	400ppm		Fracture in bare soil cover in upper Western face	Bentonite and water	Added 1 bags of bentonite. Need additional soil cove. 	196ppm
10	218ppm		Fractured area in Western face around previous remediation	Bentonite and water	Used 1 Bentonite bag and water. High readings around 200ppm can observe this area. Need additional clay cover 	201ppm
-	The bio filter showed no emissions 0ppm for the area.					

Surface Emissions Map for temporary cover

Figure 1: Map showing Levin Landfill surface emissions survey 27th April 2022

Appendix 1: Weather conditions preceding the survey

The last rainfall recorded by a Levin Weather station was 3.3mm at 08.04 a.m. on 19th April 2022, 193 hours before the survey according to the website (retrieved on 17/05/ 2022) https://www.wunderground.com/dashboard/pws/ILEVIN22/graph/2022-04-25/2022-04-25/weekly.


Weather History for ILEVIN22

Daily Mode | April | 27 | 2022 | View

Previous | Next

Summary
April 27, 2022

	High	Low	Average
Temperature	69.4 °F	48.2 °F	58.4 °F
Dew Point	55.2 °F	42.4 °F	49.4 °F
Humidity	92 %	46 %	73 %
Precipitation	0.00 in	--	--

	High	Low	Average
Wind Speed	11.2 mph	0.0 mph	1.1 mph
Wind Gust	16.0 mph	--	2.1 mph
Wind Direction	--	--	East
Pressure	30.01 in	29.61 in	--

Graph | Table

April 27, 2022

Appendix 2:

Weather conditions during the day of survey on the 30th March 2022 is displayed below. There was no rainfall during the survey and the data retrieved on 17/05/2022 from https://www.wunderground.com/dashboard/pws/ILEVIN22/graph/2022-04-27/2022-04-27/daily

Weather History for ILEVIN22

Weekly Mode | May | 1 | 2022 | View

Previous

Next

Summary

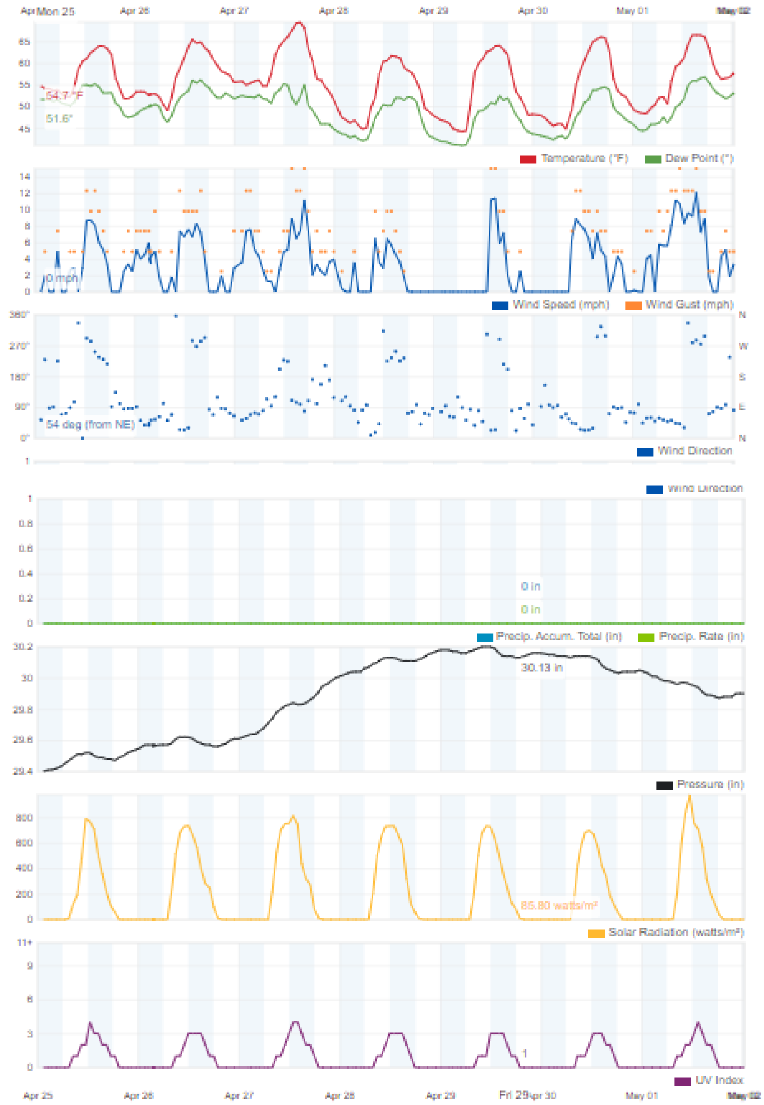
April 25, 2022 - May 1, 2022

	High	Low	Average
Temperature	69.4 °F	43.3 °F	55.0 °F
Dew Point	58.8 °F	40.1 °F	48.4 °F
Humidity	94 %	45 %	78 %
Precipitation	0.00 in	--	--

	High	Low	Average
Wind Speed	12.1 mph	0.0 mph	0.9 mph
Wind Gust	16.0 mph	--	1.5 mph
Wind Direction	--	--	ENE
Pressure	30.20 in	29.39 in	--

Graph | Table

April 25, 2022 - May 1, 2022



SURFACE EMISSIONS MONITORING REPORT

Quality Information

Project Name Title:	Surface Emission Monitoring
Subtitle:	Levin Landfill
Date:	26th May 2022
Monitored and authored by:	Shanka Samarathunge
Reviewed:	Peter Sharpe

Contents

Purpose

To monitor landfill surface emissions in compliance with Air Discharge Permit 330/1 Condition 5. This survey provides a qualitative assessment of landfill gas emissions from the landfill surface.

1.0 Procedure

A Gas-Rover detector by Bascom-Turner was used by EnviroWaste Services Limited to assess levels of emissions of methane. The instantaneous surface emission monitoring was done in accordance with the EnviroWaste standard operating procedure.

2.0 Details of this survey

The monitoring was carried out on the 26th May starting at 10.00 a.m. Table 2 below details the readings from the survey.

3.0 Climate

The weather conditions prior to and during the survey are summarised and recorded in Table 1 comparing the resource consent requirements and the EnviroWaste standard operating procedure (SOP).

Table 1: Guidelines, resource consent requirements and the actual survey conditions.

	Resource consent requirements None *****Note: *Favourable weather conditions*	**SOP Guidelines**	**Actual**	**Comments**
Average wind speed	*Less than 25km/h, ideally 5-10km/h	Less than 15km/h ideally less than10km/h	Average wind speed during the survey was 0.64 km/h.	-
Rainfall	*0.5mm in 48hours	Less than 0.5mm having fallen in 2 days prior	51 mm on 20/05/2022,142 hours prior to the survey.	-
Landfill surface grass height	-	Less than 100 mm	Patches of grass greater than 400mm along the bottom North Eastern face	-
Landfill surface	-	Dry	Relatively dry	-
Atmospheric pressure	-	Ideally declining atmospheric pressure after several days of high pressure	Slightly decreased pressure from 1001.01 hpa on 24/05/2022 to 1002.70 hpa on 25/05/2022 prior to the survey and gradual increase during the survey up to 1014.56 hpa	-

4.0 Results

The results of the survey are plotted on the attached drawing. Details of readings above 200ppm are in Table 2.

5.0 Attachments

- Tables 1 and 2 of results.
- Site plan showing locations of notable results before and after remediation.
- Appendices 1 and 2 Climate conditions – graphical format.

6.0 Methane readings and locations

Table 2: Highest Methane readings recorded at localised survey area

Marker	> 200 ppm	Site Photographs	Comments, location and description	Action Required	Close Out Comments	Retest result
1	1000ppm		LVNW 008 well base in previous remediation	Remediation will decide by the council	Remediations will commence by the Council	N/A
2	636ppm		LVNW 007 well base, in previous remediation	Remediation will decide by the council	Remediations will commence by the Council	N/A
3	480ppm		LVNW 006 well base, towards to the 63mm line	Remediation will decide by the council	Remediations will commence by the Council	N/A

4	406ppm		LVNW3- 06 well base	Remediation will decide by the council	Remediations will commence by the Council	N/A
5	480ppm		Well Base of LVNW03- 04, top and bottom parts of the remediation	Remediation will decide by the council	Remediations will commence by the Council	N/A
6	800ppm		Well base of LVNW003 -03	Remediation will decide by the council	Remediations will commence by the Council	N/A

7	243ppm		Soil fracture in Western face upper edge	Remediation will decide by the council	Remediations will commence by the Council	N/A
8	760ppm		Fracture in a area with previous remediations in upper Western face	Remediation will decide by the council	Remediations will commence by the Council	N/A
9	445ppm		Fracture in bare soil cover in upper Western face	Remediation will decide by the council	Remediations will commence by the Council	N/A
-	The bio filter showed no emissions 0ppm for the area.					

Surface Emissions Map for temporary cover

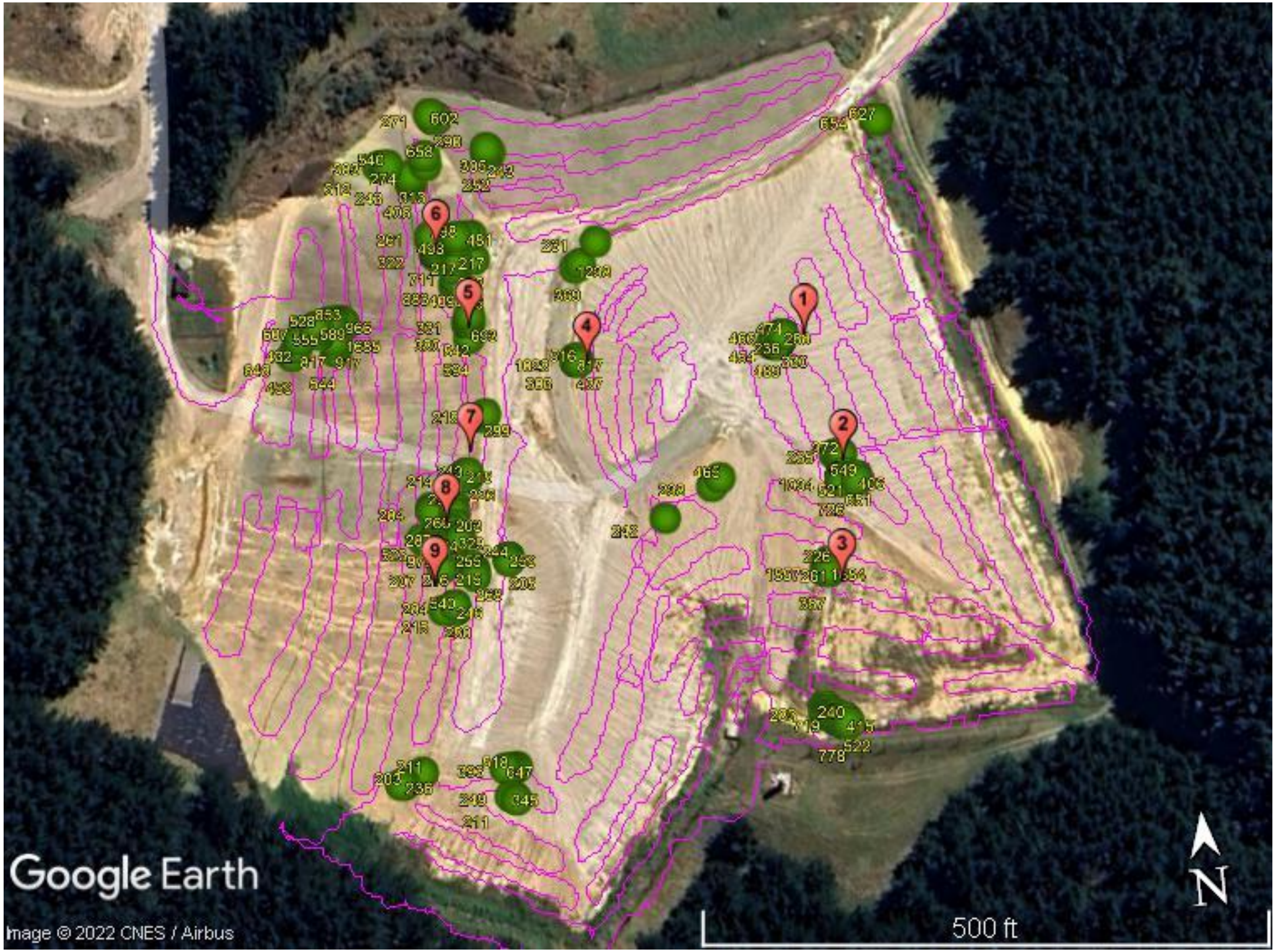


Figure 1: Map showing Levin Landfill surface emissions survey 26th May 2022

Appendix 1: Weather conditions preceding the survey

The last rainfall recorded by a Levin Weather station was 51mm at 10.00 a.m. on 20th May 2022, 142 hours before the survey according to the website (retrieved on 04/07/ 2022) https://www.wunderground.com/dashboard/pws/ILEVIN22/graph/2022-05-26/2022-05-26/weekly

Weather History for ILEVIN22

Weekly Mode | May | 29 | 2022 | View

Previous Next

Summary

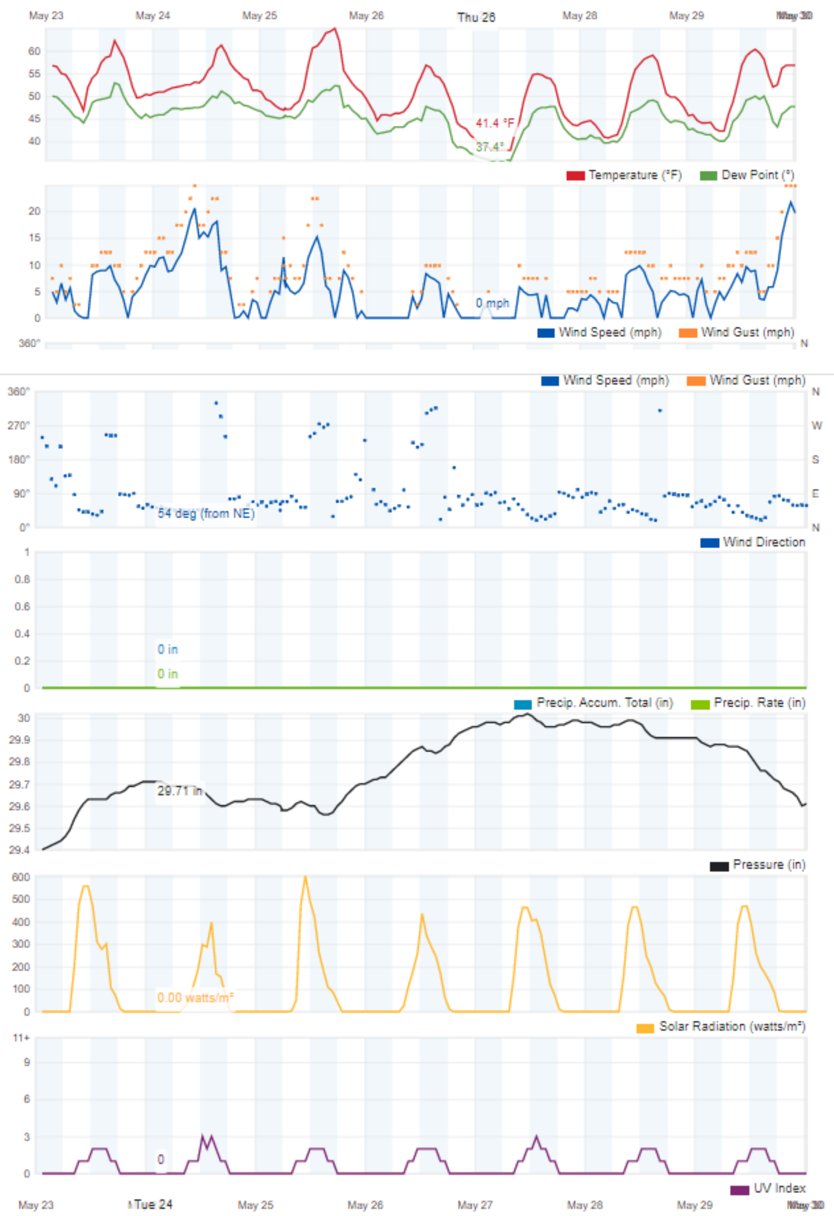
May 23, 2022 - May 29, 2022

	High	Low	Average
Temperature	64.9 °F	37.2 °F	50.2 °F
Dew Point	52.9 °F	35.1 °F	44.3 °F
Humidity	96 %	49 %	81 %
Precipitation	0.00 in	--	--

	High	Low	Average
Wind Speed	21.7 mph	0.0 mph	2.2 mph
Wind Gust	24.8 mph	--	3.1 mph
Wind Direction	--	--	ESE
Pressure	30.02 in	29.38 in	--

Graph Table

May 23, 2022 - May 29, 2022



ISM Report for May 2022

Weather History for ILEVIN22

Weekly Mode | May | 22 | 2022 | View

Previous

Next

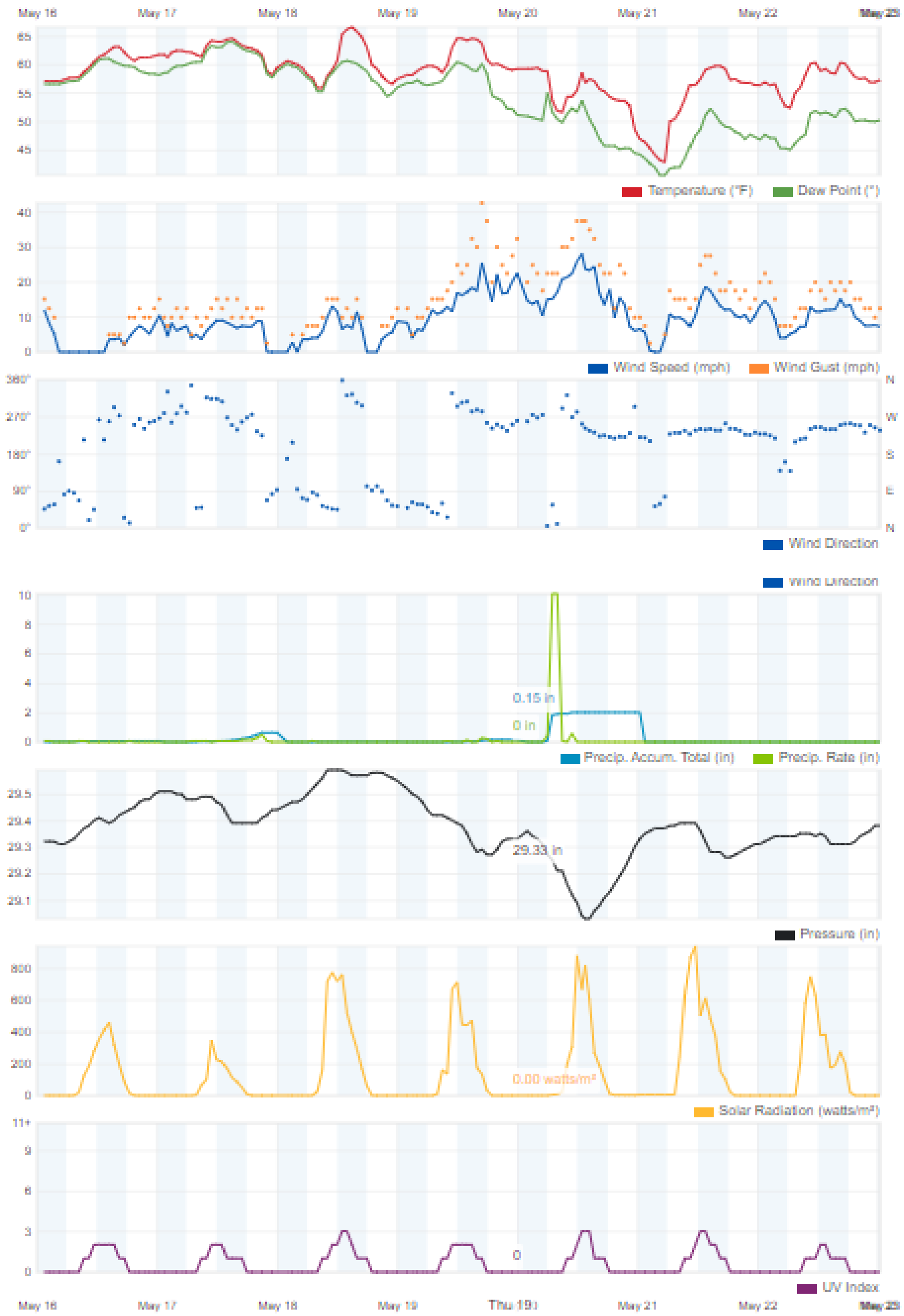
Summary
May 16, 2022 - May 22, 2022

	High	Low	Average
Temperature	66.8 °F	42.1 °F	57.8 °F
Dew Point	64.0 °F	37.8 °F	53.3 °F
Humidity	98 %	60 %	85 %
Precipitation	2.88 in	--	--

	High	Low	Average
Wind Speed	23.0 mph	0.0 mph	3.8 mph
Wind Gust	42.5 mph	--	6.2 mph
Wind Direction	--	--	SSW
Pressure	29.58 in	28.99 in	--

Graph | Table

May 16, 2022 - May 22, 2022



Appendix 2:

Weather conditions during the day of survey on the 26th May 2022 is displayed below. There was no rainfall during the survey and the data retrieved on 17/05/2022 from
https://www.wunderground.com/dashboard/pws/ILEVIN22/graph/2022-05-26/2022-05-26/daily

Daily Mode | May | 26 | 2022 | View

Previous | Next

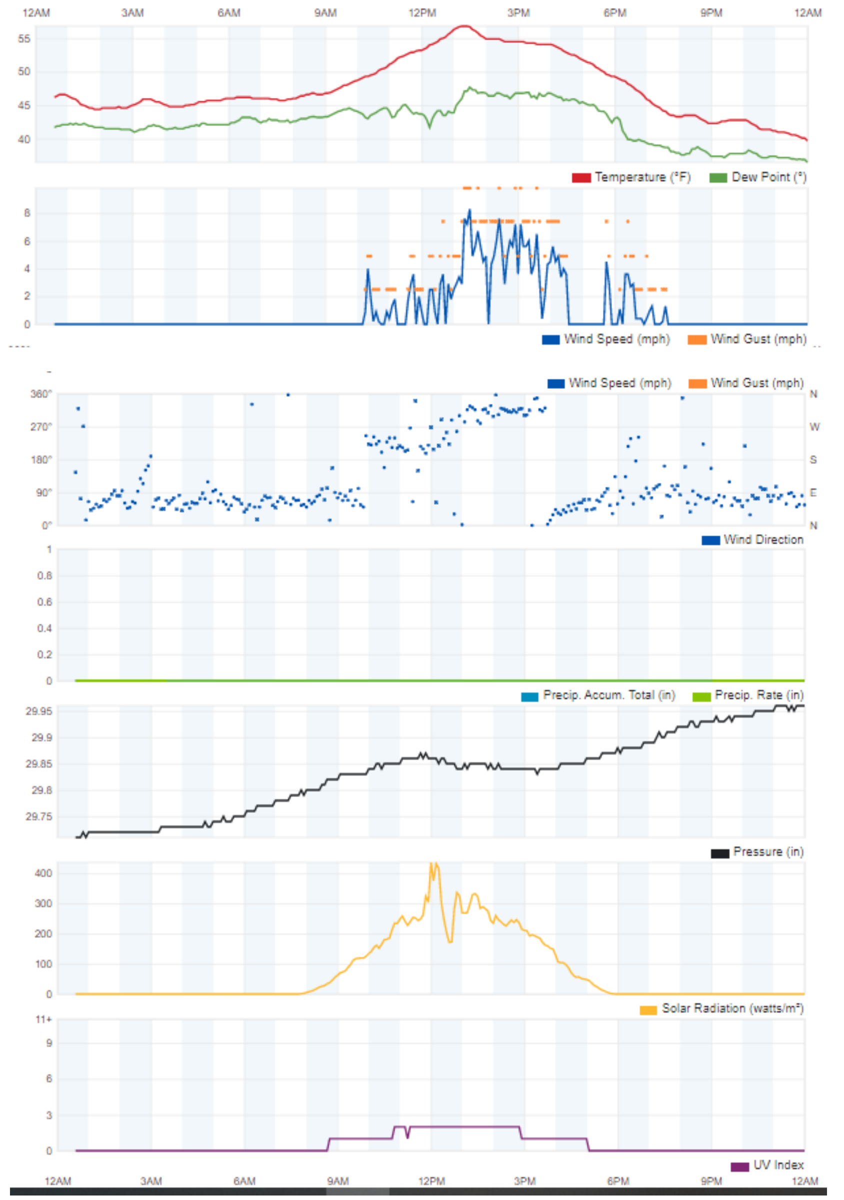
Summary
May 26, 2022

	High	Low	Average
Temperature	56.8 °F	39.4 °F	47.6 °F
Dew Point	47.7 °F	36.1 °F	42.0 °F
Humidity	90 %	60 %	81 %
Precipitation	0.00 in	--	--

	High	Low	Average
Wind Speed	8.3 mph	0.0 mph	0.4 mph
Wind Gust	9.8 mph	--	0.7 mph
Wind Direction	--	--	NW
Pressure	29.96 in	29.70 in	--

Graph | Table

May 26, 2022



Appendix K Survey plan

GOODMANS

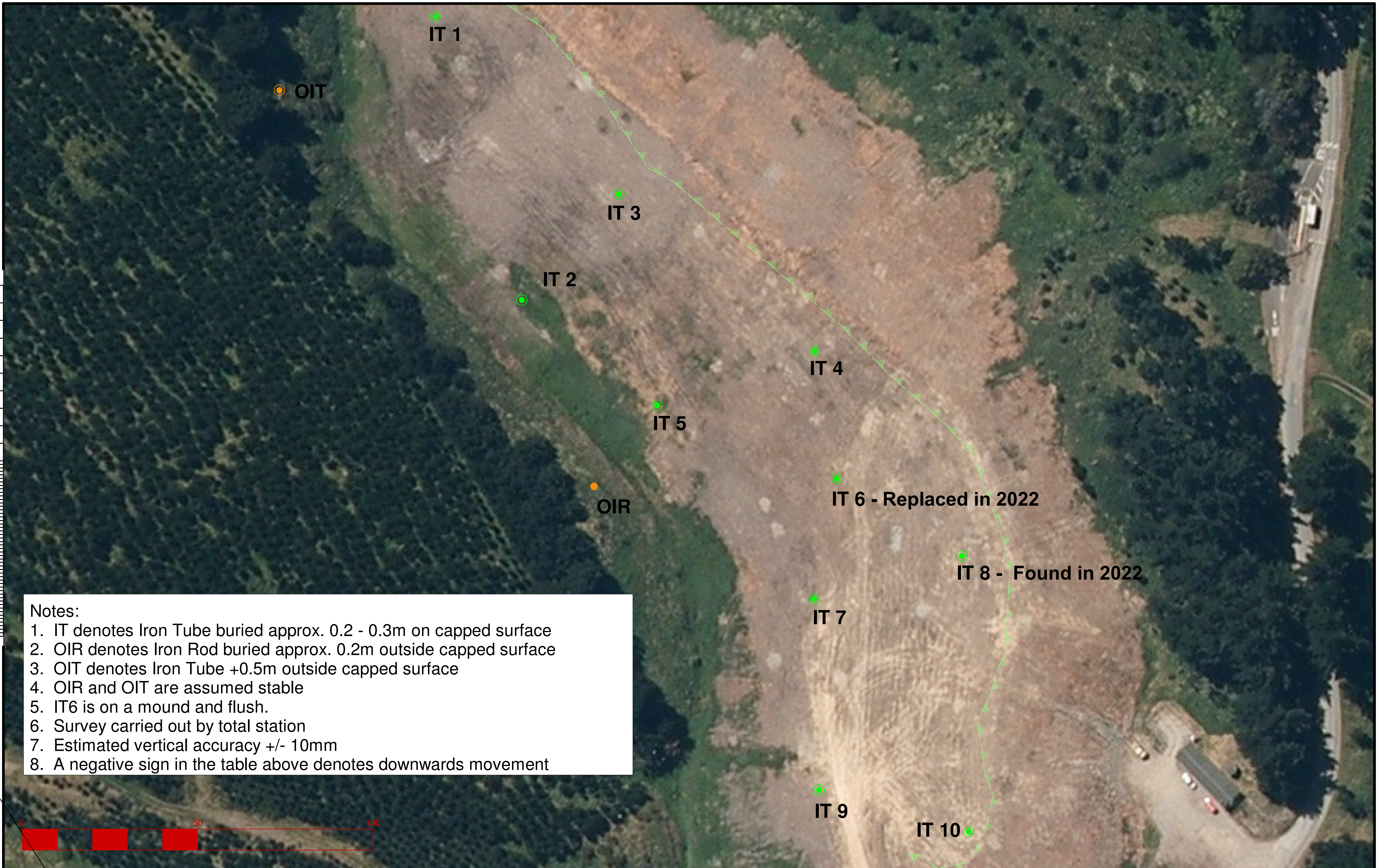
Levin Landfill Capping
Finished Contours
Drone flight on 30 March 2022

NOTES:
1 Contour Interval 1m
2
3
4

PLOT NO:	SHEET:	REV: A

SURVEYOR: AW
DRAWN: AW
SCALE: 1:1000 (A3)
DATE: 13 April 2022

Appendix L Settlement monitoring points



Notes:
1. IT denotes Iron Tube buried approx. 0.2 - 0.3m on capped surface
2. OIR denotes Iron Rod buried approx. 0.2m outside capped surface
3. OIT denotes Iron Tube +0.5m outside capped surface
4. OIR and OIT are assumed stable
5. IT6 is on a mound and flush.
6. Survey carried out by total station
7. Estimated vertical accuracy +/- 10mm
8. A negative sign in the table above denotes downwards movement

ORIGINAL SIZE A3 0 10 20 30 40 50 60 70 80 90 100 DO NOT SCALE - IF IN DOUBT, ASK

CAD Ref : Old Levin Landfill 30 June 2015 - Settlement Plan

REV	AMENDMENTS	DATE	INIT

SCALES 1:1000

FIELDBOOK

	BY	DATE
SURVEYED	RLB	14-15
DESIGNED		
DRAWN	RLB	7/15
CHECKED		
APPROVED		

OLD LEVIN LANDFILL SETTLEMENT MONITORING

Status Stamp: FOR REVIEW

Date Stamp: 30/09/2022

Job No.	Sheet No.	Rev.
310103837	1 of 1	0

01-07-14

276456.677	659519.166	99.545	IT 1
276481.279	659438.353	99.473	IT 2
276508.959	659468.520	101.087	IT 3
276564.804	659423.807	101.909	IT 4
276519.814	659408.359	100.738	IT 5
276564.514	659353.123	101.346	IT 7
276606.806	659365.397	102.689	IT 8
276566.047	659298.621	101.190	IT 9
276608.720	659286.741	101.843	IT 10

26-07-21

276456.622	659519.171	99.483	IT 1
276481.264	659438.342	99.407	IT 2
276508.923	659468.516	100.956	IT 3
276564.782	659423.803	101.944	IT 4
276519.820	659408.370	100.657	IT 5
276564.514	659353.130	101.087	IT 7
			IT 8
276566.067	659298.661	101.017	IT 9
276608.758	659286.755	101.615	IT 10

29-04-22

276456.653	659519.151	99.462	IT 1
276481.278	659438.346	99.390	IT 2
276508.928	659468.519	100.927	IT 3
276564.800	659423.810	101.909	IT 4
276519.829	659408.369	100.630	IT 5
276571.258	659387.917	101.821	IS 6 NEW
276564.553	659353.164	101.045	IT 7
276606.803	659365.446	102.500	IT 8
276566.114	659298.692	100.989	IT 9
276608.812	659286.795	101.619	IT 10

Movement: 29/04/2022 - 26/7/2021

dmE	dmN	dmZ	Code	Notes
0.031	-0.020	-0.021	IT 1	
0.014	0.004	-0.017	IT 2	
0.005	0.003	-0.029	IT 3	
0.018	0.007	-0.035	IT 4	
0.009	-0.001	-0.027	IT 5	
			IS 6 NEW	New spike placed
0.039	0.034	-0.042	IT 7	
			IT 8	
0.047	0.031	-0.028	IT 9	
0.054	0.040	0.004	IT 10	

Movement: 29/04/2022 - 01/7/2014

dmE	dmN	dmZ	Code	Notes
-0.024	-0.015	-0.083	IT 1	
-0.001	-0.007	-0.083	IT 2	
-0.031	-0.001	-0.160	IT 3	
-0.004	0.003	0.000	IT 4	
0.015	0.010	-0.108	IT 5	
			IS 6 NEW	New spike placed
0.039	0.041	-0.301	IT 7	
-0.003	0.049	-0.189	IT 8	
0.067	0.071	-0.201	IT 9	
0.092	0.054	-0.224	IT 10	

Appendix M Special waste log

REF	Date Received	Disposal Date	Type of Waste	Source of Waste	Carted By	Volume of Waste	RM8 Ref	RM8 Link
30062021	30-06-21	01-07-21	Redundant Packaging	RJ's Licorice	Waste Management	10 Tonne	**D21/128863**	Waste Management - Solid Waste - Levin Landfill Operations - Special Waster Permit 30062021 - Redundant Packaging - RJ's Licorice - For Disposal 1 July 2021
3082021	30-07-21	03-08-21	Redundant Packaging	RJ's Licorice	Waste Management	5530 kg	**D21/128405**	Waste Management - Solid Waste - Levin Landfill Operations - Special Waste Permit 3082021 - Waste Management Ltd - RJ's Licorice - Redundant Packaging - For Disposal 3 August 2021
4082021	02-08-21	04-08-21	Redundant Packaging (Plastic and Cardboard)	RJ's Licorice	Waste Management	10 Tonne	**D21/129057**	Waste Management - Solid Waste - Levin Landfill Operations - Special Waster Permit 4082021 - Redundant Packaging - RJ'S Licorice - Waste Management Ltd - For Disposal 4 August 2021
5082021	04-08-21	05-08-21	Redundant Packaging (Plastic and Cardboard)	RJ's Licorice	Waste Management	10 Tonne	**D21/129071**	Waste Management - Solid Waste - Levin Landfill Operations - Special Waste Permit 5082021 - Redundant Packaging - RJs Licorice - Waste Management Ltd - For Disposal 5 August 2021
6082021	04-08-21	06-08-21	Redundant Packaging (Plastic and Cardboard)	RJ's Licorice	Waste Management	10 Tonne	**D21/129078**	Waste Management - Solid Waste - Levin Landfill Operations - Special Waste Permit 6082021 - Redundant Packaging - RJ's Licorice - Waste Management Ltd - For Disposal 6 August 2021
24082021	12-08-21	25-08-21	Dead Chickens	Tegel Foods	Envirowaste	$3m^3$	**D21/122808**	Waste Management - Solid Waste - Levin Landfill - Special Waste Permit - Dead Chickens - Envirowaste - Richard Darton - 24 August 2021

From November 2021 Levin Landfill stopped accepting waste, pending the final decision on the landfills future.

Ongoing Permits
- RJ's Licorice (Permit: 2015-6)
- Techlam Treated Shavings (Permit: 29-May-2019)
- Oji Fibre Ink Sludge (DW1141717)
- Screenings
- Levin WWTP

Date	Waste Type	Tonnes	Source of Waste	Location in which material was placed
02-07-21	Sludge	10.48	Levin Waste Water Treatment Plant	Co-disposed
05-07-21	Sludge	10.67	Levin Waste Water Treatment Plant	Co-disposed
08-07-21	Sludge	10.56	Levin Waste Water Treatment Plant	Co-disposed
12-07-21	Sludge	10.41	Levin Waste Water Treatment Plant	Co-disposed
19-07-21	Sludge	8.5	Levin Waste Water Treatment Plant	Co-disposed
22-07-21	Sludge	9.46	Levin Waste Water Treatment Plant	Co-disposed
26-07-21	Sludge	14.86	Levin Waste Water Treatment Plant	Co-disposed
28-07-21	Sludge	13.25	Levin Waste Water Treatment Plant	Co-disposed
30-07-21	Sludge	8.8	Levin Waste Water Treatment Plant	Co-disposed
07-07-21	Screenings	0.29	Foxton Waste Water Treatment Plant	Co-disposed
14-07-21	Screenings	0.42	Foxton Waste Water Treatment Plant	Co-disposed
28-07-21	Screenings	0.31	Foxton Waste Water Treatment Plant	Co-disposed
21-07-21	Screenings	0.68	Foxton Waste Water Treatment Plant	Co-disposed
02-08-21	Sludge	10.27	Levin Waste Water Treatment Plant	Co-disposed
04-08-21	Sludge	8.57	Levin Waste Water Treatment Plant	Co-disposed
06-08-21	Sludge	11.11	Levin Waste Water Treatment Plant	Co-disposed
09-08-21	Sludge	12.28	Levin Waste Water Treatment Plant	Co-disposed
11-08-21	Sludge	11.53	Levin Waste Water Treatment Plant	Co-disposed
13-08-21	Sludge	9.54	Levin Waste Water Treatment Plant	Co-disposed
16-08-21	Sludge	8.46	Levin Waste Water Treatment Plant	Co-disposed
18-08-21	Sludge	13.68	Levin Waste Water Treatment Plant	Co-disposed
20-08-21	Sludge	6.1	Levin Waste Water Treatment Plant	Co-disposed
23-08-21	Sludge	10.35	Levin Waste Water Treatment Plant	Co-disposed
25-08-21	Sludge	9.46	Levin Waste Water Treatment Plant	Co-disposed
30-08-21	Sludge	14.46	Levin Waste Water Treatment Plant	Co-disposed
25-08-21	Screenings	0.13	Foxton Waste Water Treatment Plant	Co-disposed
04-08-21	Screenings	0.29	Foxton Waste Water Treatment Plant	Co-disposed
18-08-21	Screenings	0.5	Foxton Waste Water Treatment Plant	Co-disposed
11-08-21	Screenings	0.53	Foxton Waste Water Treatment Plant	Co-disposed
01-09-21	Sludge	8.36	Levin Waste Water Treatment Plant	Co-disposed
06-09-21	Sludge	12.06	Levin Waste Water Treatment Plant	Co-disposed
08-09-21	Sludge	10.28	Levin Waste Water Treatment Plant	Co-disposed
13-09-21	Sludge	12.2	Levin Waste Water Treatment Plant	Co-disposed
15-09-21	Sludge	8.63	Levin Waste Water Treatment Plant	Co-disposed
20-09-21	Sludge	10.57	Levin Waste Water Treatment Plant	Co-disposed
22-09-21	Sludge	8.29	Levin Waste Water Treatment Plant	Co-disposed
27-09-21	Sludge	11.39	Levin Waste Water Treatment Plant	Co-disposed
29-09-21	Sludge	12.46	Levin Waste Water Treatment Plant	Co-disposed
01-09-21	Screenings	0.3	Foxton Waste Water Treatment Plant	Co-disposed
29-09-21	Screenings	0.77	Foxton Waste Water Treatment Plant	Co-disposed
08-09-21	Screenings	0.37	Foxton Waste Water Treatment Plant	Co-disposed
15-09-21	Screenings	1.31	Foxton Waste Water Treatment Plant	Co-disposed
04-10-21	Sludge	6.47	Levin Waste Water Treatment Plant	Co-disposed
06-10-21	Sludge	9.38	Levin Waste Water Treatment Plant	Co-disposed
13-10-21	Sludge	11.4	Levin Waste Water Treatment Plant	Co-disposed
06-10-21	Screenings	0.62	Foxton Waste Water Treatment Plant	Co-disposed

Please Note: From the end of August 2021 some sludge loads were taken to Bonny Glen Landfill due to capacity at Levin Landfill. Sludge loads to Levin were capped at 2 per week and Friday load went to Bonny Glen. Because of this records in this spreadsheet will not match with total sludge records in the monthly tonnage spreadsheet.

From November 2022 all sludge was taken to Bonny Glen Landfill under the 'Virtual Levin Landfill' Agreement.

Permit Date	Delivery Date	Permit Reference	Permit Holder	Type of Waste	Source of Waste	Estimated Volume of Waste	Approved by	CM9 Reference	Permit Link (CM9)	Links to additional documentation

CREATING COMMUNITIES

Communities are fundamental. Whether around the corner or across the globe, they provide a foundation, a sense of belonging. That's why at Stantec, we always **design with community in mind**.

We care about the communities we serve—because they're our communities too. We're designers, engineers, scientists, and project managers, innovating together at the intersection of community, creativity, and client relationships. Balancing these priorities results in projects that advance the quality of life in communities across the globe.

New Zealand offices:
Alexandra, Auckland, Balclutha, Christchurch, Dunedin, Gisborne, Greymouth, Hamilton, Hastings, Napier, Nelson, Palmerston North, Queenstown, Tauranga, Wellington, Whangārei

Stantec Building, Level 15, 10 Brandon Street, Wellington, 6011
PO Box 13-052, Armagh, Christchurch, 8141
New Zealand: +64 4 381 6700 | www.stantec.com