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Southern Landfill Annual Monitoring Report - Water Quality Review, June 2016 to May 2019

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Client: Wellington City Council

Co No.: N/A

Prepared by

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			Name/Position	Signature
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Table of Contents

List of Tables

1.0 Introduction

1.1 Terms of Reference

This report has been prepared for Wellington City Council (WCC) by AECOM New Zealand Limited (AECOM). It presents a summary and interpretation of surface water and groundwater monitoring results obtained by WCC at the Southern Landfill (SLF), Wellington, as required under conditions 25, 26 and 27 and 28 of Resource Consent Number WGN940045 (01) (SLF consent). This report takes account of surface water and groundwater monitoring data obtained over the three year period June 2016 to May 2019 and includes a description of the following:

- When sampling events took place;
- Main trends in the data for each sampling event; and
- Likely reasons for 'significant' changes observed in the data between monitoring events.

This report forms an addendum to the 2019 Annual Monitoring report prepared by WCC for Greater Wellington Regional Council (GWRC) as required under condition 29 of the SLF consent.

1.2 SLF Consent Conditions 25, 26, 27 and 28

A summary of the requirements under SLF consent conditions 25, 26, 27 and 28 are provided below. The parameters included in the compliance monitoring are considered to be contaminants of concern for the landfill.

Condition 25:

Monthly monitoring of bores BH2A, BH2B, BH3A (subsequently replaced by BH103A) and BH3B (subsequently replaced by BH103B) and Careys Gully Stream upstream (Upstr Surface Water 1) and downstream (Dstr Surface Water 2) of the landfill for the following parameters:

- pH,
- Conductivity,
- Ammonia as Nitrogen (NH_4-N),
- Faecal Coliforms,
- 5-day Biochemical Oxygen Demand (BOD_5),
- Iron; and
- Manganese.

Condition 26:

Six monthly monitoring of bores BH2A, BH2B, BH3A (BH103A) and BH3B (BH103B) and Careys Gully Stream upstream (Upstr Surface Water 1) and downstream (Dstr Surface Water 2) of the landfill for the following parameters:

- Chlorides,
- Nitrate as Nitrogen,
- Aluminium,
- Boron,
- Arsenic,
- Copper,
- Lead,

- Zinc,
- Nickel,
- Chromium,
- Cadmium; and
- Dissolved Reactive Phosphorous (DRP).

Condition 27:

Six monthly monitoring of Careys Gully Stream upstream (Upstr Surface Water 1) and downstream (Dstr Surface Water 2) of the landfill for the following parameters;

- Freshwater macroinvertebrates; and
- Determination of a Macroinvertebrate Community Index (MCI) value.

Condition 28:

Monthly monitoring of groundwater pressure (groundwater levels) in bores BH2A, BH2B, BH3A (BH103A), BH3B (BH103B), BH4 and BH5.

1.3 Monitoring Locations

The monitoring locations as pictured in the SLF consent are shown by Map 1, presented in **Appendix A**. The monitoring locations are also shown in Figure 3-1 in **Appendix A**, taken from Montgomery Watson New Zealand Limited report Southern Landfill Surface and Groundwater Monitoring Report, June 2001 (MW, 2001), prepared for WCC and by Figure 1 from URS New Zealand Limited (now AECOM) (2013)[1]. Figure 3-1also shows the location of additional bores, including BH6 located on the edge of the active landfill near BH4 and BH5. Bores BH4 and BH5 are shown as 'destroyed'. In 2001 MW noted that bores BH4 and BH5 were destroyed by landfill development and were replaced in April 2000 by BH6, in agreement with GWRC. Bore BH6 was sampled in general accordance with condition 25 and 26 except during the April 2017 and the October 2018 to May 2018 monitoring periods, as samples which were unable to be collected owing to landslip debris covering the bore[2]. Surface water sampling locations Upstr Surface Water 1 and Dstr Surface Water 2 are also labelled CAREUS and CAREDS, respectively. CAREDS (new) is also shown. It was reported by MW (2001) that CAREDS (new) was established in October 2000 after completion of the stormwater tunnel diversion and that it replaces CAREDS/Dstr Surface Water 2.

1.4 Replacement Bore Installation

In April 2013, two new bores (BH103A and BH103B) were installed to replace the existing bores BH3A and BH3B, which were decommissioned. The installation details of these bores were reported to WCC by URS (now AECOM) in May 2013[1]. As these two new bores were installed in equivalent locations and to equivalent depths as the previous bores (BH103A to 6 m and BH103B to10 m), the consent conditions outlined above in relation to bores BH3A and BH3A were transferred to the two new bores BH103A and BH103B, respectively. Bores BH3A and BH3B were decommissioned by grouting to ground surface. As this report covers the period June 2016 to May 2019 any reference to historical bores BH3A and BH3B have been removed.

[1] Southern Landfill Replacement Monitoring Bores: Bore Completion Report. Report prepared for Wellington City Council, ref 42787950, dated 23 May 2013.
[2] It would appear that there is no requirement under the SLF consent for the sampling of this monitoring bore, except that groundwater pressure data should be collected

1.5 Data Sources

Surface water and groundwater monitoring data for the SLF are obtained by Environmental Laboratory Services (ELS) under contract to WCC. This review by AECOM is based directly on the monitoring information provided to AECOM by WCC (July 2010 to June 2011) and from ELS (July 2011 to May 2019), mainly in the form of excel format workbooks prepared by ELS and (previously) by WCC. AECOM has completed a high level review of the results in order to identify any errors.

2.0 Compliance Summary

2.1 Groundwater Monitoring

Compliance with SLF consent requirements for groundwater monitoring between June 2016 and May 2019 is summarised in **Table 1**. Data tables for each bore, including monitoring dates, are presented in **Appendix B**.

Table 1 Summary of Groundwater Monitoring Results against Consent Requirements

Bore	Resource Consent Requirements			Compliance Summary
	Condition	Monitoring Parameters	Frequency	
BH2A BH2B BH3A (BH103A) BH3B (BH103B)	25	• pH • Conductivity • NH_4-N • Faecal Coliforms • BOD_5 • Iron • Manganese	Monthly	• Fully compliant. • Since June/July 2013 samples have been analysed monthly for chemical oxygen demand; although this is not required by the consent.
BH2A BH2B BH3A (BH103A) BH3B (BH103B)	26	• Chlorides • Nitrate-Nitrogen • Aluminium • Boron • Arsenic • Copper • Lead • Zinc • Nickel • Chromium • Cadmium • Dissolved Reactive Phosphorus	Six Monthly	• Fully compliant.
BH2A BH2B BH3A (BH103A) BH3B (BH103B) BH4 BH5 (BH6)	28	• Groundwater pressure	Monthly	• Generally compliant. • Bore BH6 was substituted for bore BH4 and bore BH5 in April 2000. • Groundwater gauging between June and September 2012 is recorded following the purge of the well only. From October 2012 pre-purge water levels are recorded. • Bore BH6 has not been gauged from October 2018 onwards (bore not accessible as covered by debris from landslip).

2.2 Surface Water Monitoring

Compliance with SLF consent requirements for surface water monitoring between June 2016 and May 2019 is summarised in **Table 2**. Data tables for each sampling location, including monitoring dates, are presented in **Appendix B**.

Table 2 Summary of Surface Water Monitoring Results against Consent Requirements

Surface Water	Resource Consent Requirements			Compliance Summary
	Condition	Monitoring Parameters	Frequency	
Upstr Surface Water 1 and Dstr Surface Water 2	25	• pH • Conductivity • NH4-N • Faecal Coliforms • BOD5 • Iron • Manganese	Monthly	• Generally compliant. • Upstr Surface Water 1 not sampled October 2016 (obstruction to sampling location).
Upstr Surface Water 1 and Dstr Surface Water 2	26	• Chlorides • Nitrate-Nitrogen • Aluminium • Boron • Arsenic • Copper • Lead • Zinc • Nickel • Chromium • Cadmium • Dissolved Reactive Phosphorus	Six Monthly	• Generally compliant. • Dstr Surface Water 2 June 2018 sample not analysed for faecal coliforms. • Nitrate-nitrogen is being analysed on a monthly basis; although this is not required by the consent.
Upstr Surface Water 1 and Dstr Surface Water 2	27	• Freshwater macro invertebrates • Determination of a MCI value	Six Monthly	• Fully compliant.

3.0 Monitoring Results

3.1 Groundwater Levels

Groundwater gauging data are presented in the data tables for each bore, included as **Appendix B**. Results are summarised in **Table 3**. In summary:

- Groundwater levels were recorded at their lowest over the summer period November 2017 through April 2018.
- This short-term trend in groundwater levels extended for a longer period (until February 2019) in bore BH103B.

Table 3 Summary of Depth to Groundwater Measurements (June 2016 to May 2019)

Bore	Depth to Groundwater (m btoc)	
	Minimum	Maximum
BH2A	1.4	3.5
BH2B	1.2	2.6
BH103A	3.5	4.9
BH103B	4.5	5.5
BH6	0.4	2.0

Note: m btoc - metres below top of casing (of bore). * - BH6 not gauged from October 2018 onwards as the bore was not accessible (covered by debris from a landslip).

3.2 Groundwater Analyses

Compliance monitoring results for bores BH2A, BH2B, BH103A and BH103B are summarised in **Table 4** through **Table 7**. Full results are presented in **Appendix B**. Time series graphs of individual constituents for each monitoring bore are presented in **Appendix C**. In summary:

- Contaminants of concern have been recorded within each of the bores over the compliance monitoring period.
- Spikes in concentrations of contaminants of concern were recorded across all sample locations over the compliance monitoring period. The greatest numbers of spikes were recorded as part of the December 2017 and February 2018 compliance monitoring events.
- Greater variability in contaminant concentrations have been observed in bores BH103A and BH103B than bores BH2A and BH2B.
- Faecal coliforms have been periodically recorded at all locations.
- A comparison of water quality recorded across the bores indicates that recorded concentrations of key contaminants of concern such as ammoniacal nitrogen, BOD_5, faecal coliforms, and dissolved manganese are elevated in bore BH103B (and BH103A to a lesser extent).
- Based on a visual analysis of the time series graphs:
  - No significant short-term trends in contaminant concentrations were recorded over the compliance monitoring period.
  - The following parameters illustrate potentially increasing long-term trends (entire dataset), with recent concentrations generally recorded higher than historical values:
    - BH2A: electrical conductivity and phosphorous.
    - BH2B: electrical conductivity and manganese.

  - BH3A: pH.
  - BH3B: BOD_5.
- The following parameters illustrate potentially decreasing long-term trends:
  - BH2A: nitrate-nitrogen.
  - BH2B: nitrate-nitrogen.
  - BH3A: electrical conductivity and faecal coliforms.
  - BH3B: electrical conductivity, manganese, and aluminium.

Table 4 Summary of Groundwater Quality Results for Bore BH2A (June 2016 through May 2019)

Parameter	Recorded Concentration		Comment
	Median	Maximum	
Ammonia Nitrogen	0.01	0.04	• Generally less than the MDL. • Spike recorded – February and June 2018.
BOD_5 – Total	1	6	• Generally less than the MDL. • Spike recorded – November 2018.
Conductivity at 25°C (mS/m)[3]	86.3	106	• Spike recorded – September 2018.
Faecal Coliforms (cfu/100ml)	1	84	• Generally less than MDL. • Spike recorded – February 2018 and March 2019.
Manganese - Dissolved	0.0152	0.645	• Spike recorded – February 2018, September 2018 and May 2019.
Aluminium – Dissolved	0.02	0.005	• Generally less than the MDL. • Spike recorded – December 2017.
Chloride	94.6	101	• Spike recorded – December 2017.
Copper - Dissolved	0.0005	0.0012	• Spike recorded – December 2017 and June 2018.
Dissolved Reactive Phosphorus	0.02	0.041	• Spike recorded – June 2018.
Nickel - Dissolved	0.0009	0.0014	• Spike recorded – December 2017.
Nitrate – Nitrogen	2.14	3.7	• Slight decreasing trend to December 2017. • Spike recorded – June 2018.
Zinc - Dissolved	0.002	0.006	• Spike recorded – December 2017.

Note: * – trend relative to the compliance monitoring period June 2016 through May 2019. All values g/m^3 unless otherwise noted; mS/m – milli siemens per metre, cfu/100ml – colony forming units per 100 millilitres. The following parameters have been removed from the table as recorded concentrations were generally below the MDL over the monitoring period and/or no significant change/trends in contaminant concentrations were recorded – iron (dissolved), pH, arsenic (dissolved), boron (dissolved), cadmium (dissolved), chromium (dissolved), and lead (dissolved).

[3].

Table 5 Summary of Groundwater Quality Results for Bore BH2B (June 2016 through May 2019)

Parameter	Recorded Concentration		Comment
	Median	Maximum	
Ammonia Nitrogen	0.01	0.07	• Generally less than MDL. • Spike recorded – February 2018.
BOD_5 – Total	1	6	• Generally less than MDL. • Spike recorded – November 2018.
Conductivity at 25°C (mS/m)	107	120	• Period low in June 2018.
Faecal Coliforms (cfu/100ml)	1	36	• Generally less than the MDL. • Spike recorded - February 2018.
Manganese - Dissolved	0.2595	1.43	• Spike recorded – February 2018.
pH (pH units)	6.7	8	• Spike recorded – May 2019.
Copper - Dissolved	0.0005	0.0039	• Generally less than MDL. • Slight increase – December 2017. • Spike identified – June 2018.
Nickel - Dissolved	0.00155	0.003	• Slight increase – December 2017.
Zinc - Dissolved	0.0025	0.003	• Generally less than MDL. • Spike identified – December 2017. • No trend.

Note: * – trend relative to the compliance monitoring period June 2016 through May 2019. All values g/m^3 unless otherwise noted; mS/m – milli siemens per metre, cfu/100ml – colony forming units per 100 millilitres. The following parameters have been removed from the table as recorded concentrations were generally below the MDL over the monitoring period and/or no significant change/trends in contaminant concentrations were recorded – iron (dissolved), aluminium (dissolved), arsenic (dissolved), boron (dissolved), cadmium (dissolved), chloride, chromium (dissolved), dissolved reactive phosphorus, lead (dissolved), and nitrate nitrogen.

Table 6 Summary of Groundwater Quality Results for Bore BH103A (June 2016 through May 2019)

Parameter	Recorded Concentration		Comment
	Median	Maximum	
Ammonia Nitrogen	0.01	0.42	• Spike recorded – October 2017 and March 2019.
BOD_5 – Total	1	8	• Generally less than the MDL. • Spike recorded – March 2017.
Conductivity at 25°C (mS/m)	71.85	126	• Spike recorded – December 2017. • Slight decreasing trend.
Faecal Coliforms (cfu/100ml)	3	90	• Spike recorded – March 2017, September 2018, October 2018 and April 2019.
Manganese - Dissolved	0.0135	0.662	• Spike recorded – January 2017, October 2017, December 2017 and March 2019.
pH (pH units)	6.55	7	-
Chloride	90.55	146	• Variable concentrations recorded.
Copper - Dissolved	0.00135	0.0031	• Variable concentrations recorded.
Dissolved Reactive Phosphorus	0.0405	0.043	• Variable concentrations recorded.
Nickel - Dissolved	0.00095	0.003	• Variable concentrations recorded.
Nitrate – Nitrogen	2.08	2.51	• Variable concentrations recorded.

Note: * – trend relative to the compliance monitoring period June 2016 through May 2019. All values g/m^3 unless otherwise noted; mS/m – milli siemens per metre, cfu/100ml – colony forming units per 100 millilitres. The following parameters have been removed from the table as recorded concentrations were generally below the MDL over the monitoring period and/or no significant change/trends in contaminant concentrations were recorded – iron (dissolved), aluminium (dissolved), cadmium (dissolved), chromium (dissolved), lead (dissolved), and zinc (dissolved).

Table 7 Summary of Groundwater Quality Results for Bore BH103B (June 2016 through May 2019)

Parameter	Recorded Concentration		Comment
	Median	Maximum	
Ammonia Nitrogen	2.105	3.41	• Variable concentrations recorded.
BOD_5 – Total	3.5	14	• Variable concentrations recorded.
Conductivity at 25°C (mS/m)	155.5	176	• Variable concentrations recorded.
Faecal Coliforms (cfu/100ml)	2	130	• Spike recorded – January 2018.
Manganese – Dissolved	8.825	11.2	• Variable concentrations recorded.
pH (pH units)	6.7	7	• Variable concentrations recorded.
Arsenic - Dissolved	0.007	0.01	• Variable concentrations recorded.
Boron - Dissolved	0.37	0.56	• Variable concentrations recorded.
Chloride	162	181	• Variable concentrations recorded.
Copper - Dissolved	0.00055	0.0075	• Spike recorded - December 2017.
Dissolved Reactive Phosphorus	0.0235	0.029	• Variable concentrations recorded.
Nickel - Dissolved	0.0038	0.0056	• Variable concentrations recorded.
Nitrate – Nitrogen	0.1	1.01	• Spike recorded – June 2018.
Zinc - Dissolved	0.004	0.03	• Spike recorded – December 2017.

Note: * – trend relative to the compliance monitoring period June 2016 through May 2019. All values g/m^3 unless otherwise noted; mS/m – milli siemens per metre, cfu/100ml – colony forming units per 100 millilitres. The following parameters have been removed from the table as recorded concentrations were generally below the MDL over the monitoring period and/or no significant change/trends in contaminant concentrations were recorded – iron (dissolved), aluminium (dissolved), cadmium (dissolved), chromium (dissolved), and lead (dissolved).

3.3 Surface Water Sampling

Compliance monitoring results for surface water samples are presented in **Table 9**. Full results are presented in **Appendix B**. Time series graphs of individual constituents for the upstream and downstream monitoring locations of Carey's Stream are presented in **Appendix C**. In summary:

- When comparing analytical results for the upstream and downstream monitoring location, contaminants of concern have generally been recorded at higher concentrations in the downstream monitoring location.
- Although recorded concentrations are variable across the period, based on a visual analysis of the time series graphs, general increasing trends in contaminant concentrations have been recorded in the downstream monitoring location for the following parameters:
  - Electrical conductivity.
  - Ammoniacal nitrogen.
  - BOD_5.
  - Iron.
  - Manganese.
- In December 2018 boron was recorded in the downstream sample location at a concentration which exceeded the ANZG[4] for the protection of 95% of freshwater species. With the exception of this one exceedance all other metals were recorded at concentrations below the ANZG at this sample location.
- Faecal coliforms have been regularly recorded within both upstream and downstream locations. Elevated concentrations were recorded in the downstream monitoring location in July 2018, October 2018 and April 2019.
- Based on the median MCI values recorded for upstream and downstream of the landfill the quality of the stream would is categorised as "good"[5].

[4] National Water Quality Management Strategy: Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 2018 (ANZG). Freshwater Trigger Values for Protection of Species (Level of Protection 95%).
[5] Stark and Maxted (2007)[5] provide the following interpretation of New Zealand MCI results: "excellent – clean water" >120, "good - doubtful quality or possible mild pollution" 100-119, "fair - probable moderate pollution" 80-99, "poor - probable severe pollution" <80. Based on the median.

Table 8 Summary of Carey's Gully Surface Water Sampling Results (June 2016 to May 2019)

Parameter	Upstream Concentrations		Downstream Concentrations	
	Median	Maximum	Median	Maximum
Ammonia – Nitrogen	0.01	0.01	0.49	1.08
BOD_5 – Total	1	6	2	11
Conductivity at 25°C (mS/m)	23.5	27.5	37.75	79.5
Faecal Coliforms (cfu/100ml)	36	280	20	10,000
Iron – Acid Soluble	0.01	1.65	0.07	2.03
Manganese - Acid Soluble	0.0017	0.0336	0.3275	1.11
pH (pH units)	7.7	7.9	7.7	8.1
Aluminium - Acid Soluble	0.0125	0.031	0.0135	0.039
Arsenic - Acid Soluble	0.001	0.001	0.001	0.002
Boron - Acid Soluble	0.03	0.03	0.045	0.38
Cadmium - Acid Soluble	0.0002	0.0002	0.0002	0.0002
Chloride	42.85	47.4	53.4	86.2
Chromium - Acid Soluble	0.001	0.001	0.001	0.001
Copper - Acid Soluble	0.0005	0.0005	0.0005	0.0005
Dissolved Reactive Phosphorus	0.0115	0.013	0.0125	0.016
Lead - Acid Soluble	0.0005	0.0005	0.0005	0.0005
Nickel - Acid Soluble	0.0005	0.0005	0.00065	0.002
Nitrate – Nitrogen	0.32	0.51	0.96	1.85
Zinc - Acid Soluble	0.002	0.008	0.002	0.002
MCI	113	136	105	113

Note: All values g/m^3 unless otherwise noted; mS**/m –** milli siemens per metre**,** cfu **–** colony forming units per 100 millilitres. MCI – Macroinvertebrate Community Index;

4.0 Discussion

Compliance monitoring was completed in general accordance with resource consent requirements over the period June 2016 through May 2019.

Groundwater levels were measured between approximately 1.4 to 2.1 m throughout the compliance monitoring period. No significant trends in groundwater level change were recorded over the compliance monitoring period; however, groundwater levels were recorded at their lowest from November 2017 through April 2018.

Based on recorded concentrations of key contaminants of concern such as ammoniacal nitrogen, BOD_5, faecal coliforms, and manganese there is evidence that current or historic activities at the Carey's Gully Complex may have impacted the groundwater at the toe of the landfill.

Individual spikes in contaminant concentrations were recorded across all sample bore locations over the compliance monitoring period. For some analytes the recorded concentrations were orders of magnitude above historical maximums. Owing to the variability in the recorded concentrations no significant short-term trends in contaminant concentrations recorded over the compliance monitoring period.

The greatest numbers of spikes were recorded as part of the December 2017 and February 2018 compliance monitoring events. This correlates to lower recorded groundwater levels and may be a contributing factor to the concentrations recorded. Another factor to consider is the proximity of the bores to the stream, and the potential for surface water infiltration to occur at these locations.

Based on recorded concentrations of ammoniacal nitrogen, faecal coliforms, iron, and manganese there is evidence to suggest that current or historic activities at the Carey's Gully Complex may have impacted the stream at the toe of the landfill. With the exception of boron (one sample) and ammoniacal nitrogen (seven sample), no exceedances of the ANZG for the protection of 95% of freshwater species were recorded.

Results collected over the course of the compliance monitoring period indicate potentially increasing trends in contaminant concentrations for a range of parameters including electrical conductivity, ammoniacal nitrogen, BOD_5, iron, and manganese. There is the potential for activities, other than the landfill, to be contributing to surface water quality. These activities should be considered when evaluating the results of surface water quality down gradient of the landfill.

5.0 Limitations

This conclusion and all information in this Report are provided strictly in accordance with and subject to the following limitations and recommendations:

a. This Report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by AECOM for use of any part of this Report in any other context.

b. This conclusion is based solely on the information and findings contained in this Report.

c. This conclusion is based solely on the scope of work agreed between AECOM and Wellington City Council and described in section 1 ("Introduction") of this Report. Specifically, no soil sampling or drilling / excavation activity has been undertaken by AECOM as part of the investigations referred to in this Report.

d. This Report has been prepared for the sole benefit of Wellington City Council and neither the whole nor any part of this Report may be used or relied upon by any party other than Wellington City Council.

e. This Report is dated 27 August 2019 and is based on the information reviewed from June 2016 to May 2019 AECOM accepts no responsibility for any events arising from any changes in site conditions or in the information reviewed that have occurred after the completion of the site monitoring.

f. The investigations carried out for the purposes of the Report have been undertaken, and the Report has been prepared, in accordance with normal prudent practice and by reference to applicable environmental regulatory authority and industry standards, guidelines and assessment criteria in existence at the date of this Report.

g. Where this Report indicates that information has been provided to AECOM by third parties, AECOM has made no independent verification of this information except as expressly stated in the Report. AECOM assumes no liability for any inaccuracies in or omissions to that information.

h. Except as specifically stated above, AECOM makes no warranty, statement or representation of any kind concerning the suitability of the site for any purpose or the permissibility of any use, development or re-development of the site.

i. Use, development or re-development of the site for any purpose may require planning and other approvals and, in some cases, environmental regulatory authority and accredited site auditor approvals. AECOM offers no opinion as to whether the current use has any or all approvals required, is operating in accordance with any approvals, the likelihood of obtaining any approvals for development or redevelopment of the site, or the conditions and obligations which such approvals may impose, which may include the requirement for additional environmental works.

j. AECOM makes no determination or recommendation regarding a decision to provide or not to provide financing with respect to the site.

k. Except as required by law, no third party may use or rely on, this Report unless otherwise agreed by AECOM in writing. Where such agreement is provided, AECOM will provide a letter of reliance to the agreed third party in the form required by AECOM.

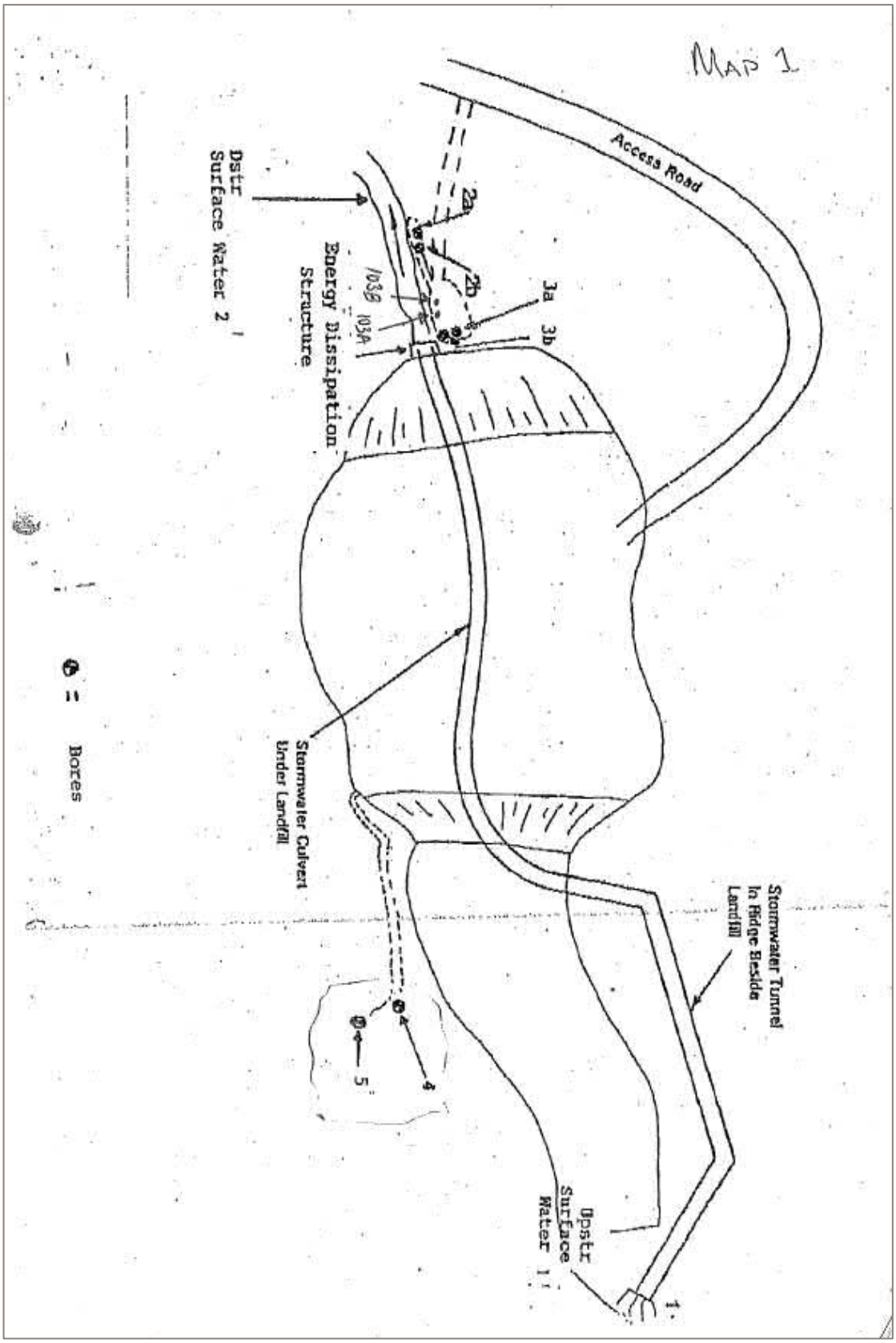
l. To the extent permitted by law, AECOM expressly disclaims and excludes liability for any loss, damage, cost or expenses suffered by any third party relating to or resulting from the use of, or reliance on, any information contained in this Report. AECOM does not admit that any action, liability or claim may exist or be available to any third party.

Appendix A

Figures

Appendix A Figures

Map 1



MW 2001 Figure 3-1 Location of surface water and groundwater monitoring sites

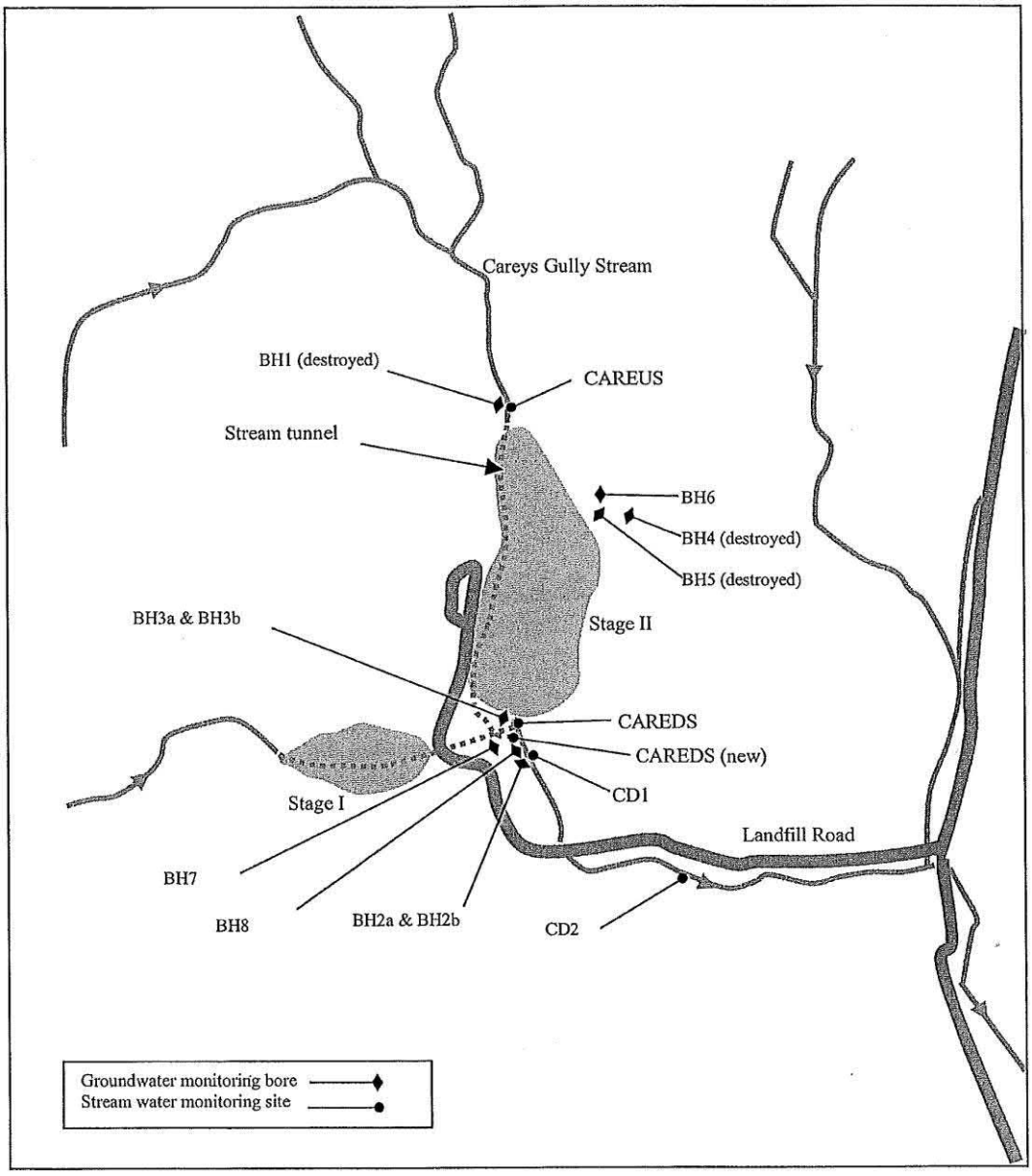


Figure 1 Wellington City Council Southern Landfill – Monitoring Well Location Plan

Appendix B

Data Tables

Appendix B Data Tables

Condition	Description	Measure	24/06/2016	13/07/2016	11/08/2016	20/09/2016	10/10/2016	22/11/2016	15/12/2016	11/01/2017	14/02/2017	29/03/2017	21/04/2017	16/05/2017
26	Aluminium - Dissolved	g/m³	0.002						0.002					
25	Ammonia Nitrogen	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
26	Arsenic - Dissolved	g/m³	0.001						0.001					
25	BOD5 - Total	g/m³	1	1	1	1	1	1	1	1	1	1	1	1
26	Boron - Dissolved	g/m³	0.11						0.13					
26	Cadmium - Dissolved	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	24	16	15	15	15	25	17	15	15	15	17	15
26	Chloride	g/m³	89.3						95.5					
26	Chromium - Dissolved	g/m³	0.001						0.001					
Other	Comments		Clear floating solids	Clear floating solids	Clear floating solids	Clear floating solids	Clear floating solids	Clear, floating solids	Clear floating solids	Clear floating solids	Clear, floating solids	Clear	Clear, floating solids	Clear, floating solids
25	Conductivity at 25°C	mS/m	83.3	82.5	83.4	82.6	83.7	83	86.3	87.6	86.3	86.9	82.7	84.8
26	Copper - Dissolved	g/m³	0.0005						0.0005					
26	Dissolved Reactive Phosphorus	g/m³	0.021						0.022					
25	Faecal Coliforms	cfu/100ml	1	1	1	1	1	2	1	1	1	1	1	1
25	Iron - Dissolved	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
26	Lead - Dissolved	g/m³	0.0005						0.0005					
25	Manganese - Dissolved	g/m³	0.0161	0.016	0.0129	0.0047	0.0048	0.0062	0.0103	0.014	0.0144	0.0103	0.0038	0.0039
26	Nickel - Dissolved	g/m³	0.0009						0.001					
26	Nitrate - Nitrogen	g/m³	2.24						2.23					
25	pH		6.8	6.7	6.9	6.7	7	6.7	6.8	6.8	6.9	6.7	6.6	6.7
Other	Water Level of Bore	Metres	1.8	1.9	1.8	2.3	1.8	2.4	1.9	1.8	1.9	1.7	1.5	1.9
Other	Weather - 24 hr		Some Rain	No Rain	No Rain	No Rain	No Rain	No Rain	Some Rain	No Rain	No Rain	No Rain	No Rain	No Rain
26	Zinc - Dissolved	g/m³	0.002						0.004					

Condition	Description	Measure	22/06/2017	17/07/2017	18/08/2017	21/09/2017	18/10/2017	27/11/2017	21/12/2017	26/01/2018	27/02/2018	21/03/2018	17/04/2018	29/05/2018
26	Aluminium - Dissolved	g/m³	0.002						0.005					
25	Ammonia Nitrogen	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.04	0.01	0.01	0.01
26	Arsenic - Dissolved	g/m³	0.001						0.001					
25	BOD5 - Total	g/m³	1	1	1	1	1	1	1	1	1	1	1	1
26	Boron - Dissolved	g/m³	0.14						0.12					
26	Cadmium - Dissolved	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	54	15	15	15	15	25	15	52	37	15	15	15
26	Chloride	g/m³	93.7						101					
26	Chromium - Dissolved	g/m³	0.001						0.001					
Other	Comments		Clear, floating solids	Clear, floating solids	Clear, floating solids	Clear	Clear, floating solids	Clear, floating solids	Clear/misty grey	Clear and floating solids		Clear	Clear	Clear
25	Conductivity at 25°C	mS/m	85	84.5	85.3	87.3	89.1	90.6	90.7	90.8	43.2	88.3	87.9	87.3
26	Copper - Dissolved	g/m³	0.0005						0.0012					
26	Dissolved Reactive Phosphorus	g/m³	0.018						0.018					
25	Faecal Coliforms	cfu/100ml	1	1	1	1	1	1	1	1	18	1	1	1
25	Iron - Dissolved	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
26	Lead - Dissolved	g/m³	0.0005						0.0005					
25	Manganese - Dissolved	g/m³	0.0049	0.004	0.0032	0.0041	0.0031	0.0067	0.0508	0.0308	0.645	0.034	0.0371	0.0328
26	Nickel - Dissolved	g/m³	0.0009						0.0014					
26	Nitrate - Nitrogen	g/m³	2.05						1.81					
25	pH		6.8	7	7	6.8	6.7	6.7	6.6	6.8	6.4	6.8	6.8	6.7
Other	Water Level of Bore	Metres	1.8	1.7	1.8	1.7	1.8	2.2	2.5	2.2	3.5	2.2	2.4	1.5
Other	Weather - 24 hr				No Rain	Some Rain	No Rain	No Rain	No Rain	Some Rain	No Rain	Some Rain	Some Rain	
26	Zinc - Dissolved	g/m³	0.002						0.006					

Condition	Description	Measure	29/06/2018	24/07/2018	28/08/2018	28/09/2018	30/10/2018	13/11/2018	13/12/2018	10/01/2019	25/02/2019	27/03/2019	23/04/2019	29/05/2019
26	Aluminium - Dissolved	g/m³	0.004						0.002					
25	Ammonia Nitrogen	g/m³	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
26	Arsenic - Dissolved	g/m³	0.001						0.001					
25	BOD5 - Total	g/m³	1	1	1	1	1	6	1	1	1	1	1	1
26	Boron - Dissolved	g/m³	0.12						0.12					
26	Cadmium - Dissolved	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	22	15	26	25	15	19	29	15	15	15	18	24
26	Chloride	g/m³	59.2						99					
26	Chromium - Dissolved	g/m³	0.001						0.001					
Other	Comments		Clear	Clear	Clear, floating solids	Clear		Clear	Clear		Clear			
25	Conductivity at 25°C	mS/m	64.7	74.4	88.8	106	89.6	87.7	88.3	88.6	85.4	87.2	85.8	84.9
26	Copper - Dissolved	g/m³	0.0012						0.0005					
26	Dissolved Reactive Phosphorus	g/m³	0.041						0.019					
25	Faecal Coliforms	cfu/100ml	1	1	1	4	3	1	1	1	1	96	12	1
25	Iron - Dissolved	g/m³	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
26	Lead - Dissolved	g/m³	0.0005						0.0005					
25	Manganese - Dissolved	g/m³	0.0018	0.0128	0.0271	0.235	0.0287	0.03	0.0267	0.0342	0.0299	0.0345	0.0207	0.219
26	Nickel - Dissolved	g/m³	0.0009						0.0007					
26	Nitrate - Nitrogen	g/m³	3.7						1.96					
25	pH		6.4	7.1	6.7	7	6.8	6.6	6.7	6.7	6.7	6.8	6.9	7.1
Other	Water Level of Bore	Metres	1.8	1.5	1.8	1.8	1.7	1.7	1.5	1.8	1.7	1.6	1.4	1.7
Other	Weather - 24 hr		No Rain	Some Rain	Some Rain	No Rain	Some Rain	No Rain	No Rain	No Rain	No Rain	Much Rain	Much Rain	No Rain
26	Zinc - Dissolved	g/m³	0.002						0.002					

Notes:
Values in red were reported below the detection limit.

SOUTHERN LANDFILL - BH2B MONITORING RESULTS

Condition	Description	Measure	24/06/2016	13/07/2016	11/08/2016	20/09/2016	10/10/2016	22/11/2016	15/12/2016	11/01/2017	14/02/2017	29/03/2017	21/04/2017	16/05/2017
26	Aluminium - Dissolved	g/m³	0.002						0.002					
25	Ammonia Nitrogen	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
26	Arsenic - Dissolved	g/m³	0.001						0.001					
25	BOD5 - Total	g/m³	1	1	1	1	1	1	1	1	1	1	1	1
26	Boron - Dissolved	g/m³	0.16						0.2					
26	Cadmium - Dissolved	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	25	21	15	15	15	31	19	15	15	15	20	15
26	Chloride	g/m³	107						117					
26	Chromium - Dissolved	g/m³	0.001						0.001					
Other	Comments		Clear floating solids	Clear floating solids	Clear floating solids	Clear floating solids	Clear floating solids	Clear, floating solids	Clear floating solids	Clear, floating solids	Clear, floating solids	Clear	Clear, floating solids	Clear, floating solids
25	Conductivity at 25°C	mS/m	110	106	106	100	106	100	119	120	120	110	107	110
26	Copper - Dissolved	g/m³	0.0005						0.0005					
26	Dissolved Reactive Phosphorus	g/m³	0.019						0.021					
25	Faecal Coliforms	cfu/100ml	1	1	1	1	1	1	1	1	1	1	1	1
25	Iron - Dissolved	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
26	Lead - Dissolved	g/m³	0.0005						0.0005					
25	Manganese - Dissolved	g/m³	0.245	0.228	0.244	0.167	0.2	0.191	0.285	0.319	0.324	0.219	0.195	0.252
26	Nickel - Dissolved	g/m³	0.0019						0.001					
26	Nickel - Acid Soluble	g/m³												
26	Nitrate - Nitrogen	g/m³	1.16						2.23					
25	pH		6.7	6.8	7.2	6.7	6.9	7	6.8	7.1	6.9	6.7	6.6	6.6
Other	Water Level of Bore	Metres	1.5	1.5	1.4	1.3	1.4	1.5	1.9	1.7	1.9	1.5	1.2	1.6
Other	Weather - 24 hr		Some Rain	No Rain	No Rain	No Rain	No Rain	No Rain	Some Rain	No Rain	No Rain	Some Rain	No Rain	No Rain
26	Zinc - Dissolved	g/m³	0.002						0.003					

Condition	Description	Measure	22/06/2017	17/07/2017	18/08/2017	21/09/2017	18/10/2017	27/11/2017	21/12/2017	26/01/2018	27/02/2018	21/03/2018	17/04/2018	29/05/2018
26	Aluminium - Dissolved	g/m³	0.002						0.002					
25	Ammonia Nitrogen	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.07	0.01	0.01	0.01
26	Arsenic - Dissolved	g/m³	0.001						0.001					
25	BOD5 - Total	g/m³	1	1	1	1	1	1	1	1	1	1	1	1
26	Boron - Dissolved	g/m³	0.21						0.17					
26	Cadmium - Dissolved	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	15	15	15	15	15	17	15	21	57	17	15	15
26	Chloride	g/m³	108						109					
26	Chromium - Dissolved	g/m³	0.001						0.001					
Other	Comments		Clear, floating solids	Clear, floating solids	Clear, floating solids	Clear	Clear, floating solids	Clear, floating solids	Clear/misty grey	Clear, floating solids	Cloudy	Clear	Clear	Clear
25	Conductivity at 25°C	mS/m	107	111	113	107	112	109	106	108	43	111	105	105
26	Copper - Dissolved	g/m³	0.0005						0.0009					
26	Dissolved Reactive Phosphorus	g/m³	0.017						0.017					
25	Faecal Coliforms	cfu/100ml	1	1	1	1	3	1	1	1	36	1	1	1
25	Iron - Dissolved	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
26	Lead - Dissolved	g/m³	0.0005						0.0005					
25	Manganese - Dissolved	g/m³	0.273	0.287	0.323	0.271	0.252	0.217	0.171	0.403	1.43	0.398	0.275	0.273
26	Nickel - Dissolved	g/m³	0.002						0.003					
26	Nickel - Acid Soluble	g/m³												
26	Nitrate - Nitrogen	g/m³	1.08						1.05					
25	pH		6.7	6.8	6.8	6.8	7	6.7	6.6	6.8	6.5	6.7	6.8	6.7
Other	Water Level of Bore	Metres	1.4	1.3	1.3	1.3	1.3	1.6	1.7	1.6	2.5	1.6	1.3	2
Other	Weather - 24 hr				No Rain	Some Rain	No Rain	No Rain	No Rain	Some Rain	Some Rain	Some Rain	Some Rain	
26	Zinc - Dissolved	g/m³	0.002						0.012					

Condition	Description	Measure	29/06/2018	24/07/2018	28/08/2018	28/09/2018	30/10/2018	13/11/2018	13/12/2018	10/01/2019	25/02/2019	27/03/2019	23/04/2019	29/05/2019
26	Aluminium - Dissolved	g/m³	0.002						0.002					
25	Ammonia Nitrogen	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
26	Arsenic - Dissolved	g/m³	0.001						0.001					
25	BOD5 - Total	g/m³	1	1	1	1	1	6	1	1	1	1	1	1
26	Boron - Dissolved	g/m³	0.06						0.17					
26	Cadmium - Dissolved	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	25	15	24	22	15	15	23	18	15	17	15	15
26	Chloride	g/m³	32.1						108					
26	Chromium - Dissolved	g/m³	0.001						0.001					
Other	Comments		Clear	Clear	Clear, floating solids	Clear		Clear	Clear		Clear			
25	Conductivity at 25°C	mS/m	41.3	91.4	107	89.2	107	106	107	106	91.6	109	108	104
26	Copper - Dissolved	g/m³	0.0039						0.0005					
26	Dissolved Reactive Phosphorus	g/m³	0.012						0.017					
25	Faecal Coliforms	cfu/100ml	1	1	1	1	1	1	1	1	1	1	1	1
25	Iron - Dissolved	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
26	Lead - Dissolved	g/m³	0.0005						0.0005					
25	Manganese - Dissolved	g/m³	0.0059	0.0018	0.266	0.0208	0.272	0.293	0.244	0.253	0.404	0.322	0.293	0.0129
26	Nickel - Dissolved	g/m³	0.0007						0.0012					
26	Nitrate - Nitrogen	g/m³	1.59						1.03					
25	pH		6.8	6.9	6.6	7.2	7.1	6.7	6.7	7	6.5	6.7	7.1	8
Other	Water Level of Bore	Metres	1.3	1.2	1.5	1.4	1.3	1.5	1.8	1.7	1.4	1.4	1.4	1.5
Other	Weather - 24 hr		No Rain	Some Rain	Some Rain	No Rain	Some Rain	No Rain	No Rain	No Rain	Some Rain	Much Rain	Much Rain	No Rain
26	Zinc - Dissolved	g/m³	0.003						0.002					

Notes:
Values in red were reported below the detection limit.

SOUTHERN LANDFILL - BOREHOLE BH103A MONITORING RESULTS

Condition	Description	Measure	24/06/2016	13/07/2016	12/08/2016	20/09/2016	11/10/2016	22/11/2016	15/12/2016	11/01/2017	14/02/2017	29/03/2017	21/04/2017	17/05/2017
26	Aluminium - Dissolved	g/m³	0.01						0.006					
25	Ammonia Nitrogen	g/m³	0.01	0.11	0.01	0.01	0.01	0.01	0.01	0.13	0.01	0.01	0.01	0.01
26	Arsenic - Dissolved	g/m³	0.001						0.001					
25	BOD5 - Total	g/m³	1	1	1	1	1	1	6	1	1	8	1	1
26	Boron - Dissolved	g/m³	0.13						0.17					
26	Cadmium - Dissolved	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	29	32	15	15	15	32	45	21	15	24	26	21
26	Chloride	g/m³	69.7						84.6					
26	Chromium - Dissolved	g/m³	0.001						0.001					
Other	Comments		Greyish floating solids	Cloudy grey floating solids	Cloudy greyish floating solids	Cloudy grey floating solids	Clear floating solids	Clear, floating solids	Cloudy, greyish, floating solids	Cloudy, greyish, floating solids	Cloudy, greyish, floating solids	Cloudy greyish	Cloudy, greyish, floating solids	Cloudy, misty grey, floating solids
25	Conductivity at 25°C	mS/m	63.3	80.6	59.5	41	79.8	63.1	78.1	96.1	94.7	95.5	86.4	105
26	Copper - Dissolved	g/m³	0.0011						0.0016					
26	Dissolved Reactive Phosphorus	g/m³	0.036						0.04					
25	Faecal Coliforms	cfu/100ml	25	1	1	10	1	8	3	4	2	42	1	1
25	Iron - Dissolved	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03
26	Lead - Dissolved	g/m³	0.0005						0.0005					
25	Manganese - Dissolved	g/m³	0.0116	0.406	0.0032	0.0046	0.0024	0.0126	0.0064	0.602	0.002	0.0159	0.0242	0.187
26	Nickel - Dissolved	g/m³	0.0009						0.001					
26	Nitrate - Nitrogen	g/m³	2.51						2.4					
25	pH		6.4	6.5	6.4	6.4	6.4	6.5	6.7	6.7	6.8	6.4	6.3	6.4
Other	Water Level of Bore	Metres	4.6	4.8	4.6	4.2	4.6	4.3	4.5	4.6	4.7	4.6	4.4	4.6
Other	Weather - 24 hr		Some Rain	No Rain	No Rain	No Rain	No Rain	No Rain	Some Rain	No Rain	No Rain	Some Rain	No Rain	No Rain
26	Zinc - Dissolved	g/m³	0.003						0.002					

Condition	Description	Measure	22/06/2017	17/07/2017	18/08/2017	21/09/2017	18/10/2017	27/11/2017	21/12/2017	26/01/2018	27/02/2018	21/03/2018	17/04/2018	29/05/2018
26	Aluminium - Dissolved	g/m³	0.002						0.025					
25	Ammonia Nitrogen	g/m³	0.01	0.01	0.01	0.01	0.2	0.01	0.06	0.01	0.08	0.01	0.01	0.01
26	Arsenic - Dissolved	g/m³	0.001						0.001					
25	BOD5 - Total	g/m³	1	1	1	1	1	1	6	1	1	1	1	1
26	Boron - Dissolved	g/m³	0.21						0.25					
26	Cadmium - Dissolved	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	55	15	27	16	15	43	26	27	15	28	15	15
26	Chloride	g/m³	116						146					
26	Chromium - Dissolved	g/m³	0.001						0.001					
Other	Comments		Cloudy, floating solids	Clear, floating solids	Cloudy, brownish, floating solids	Light brown	Cloudy, misty grey, floating solids	Clear, floating solids	Brown and floating solids	Clear and floating solids	Cloudy	Cloudy	Clear	Clear
25	Conductivity at 25°C	mS/m	102	57.8	57	87	95.3	118	126	89.6	85.6	82.1	49.2	56.1
26	Copper - Dissolved	g/m³	0.0014						0.0031					
26	Dissolved Reactive Phosphorus	g/m³	0.041						0.043					
25	Faecal Coliforms	cfu/100ml	3	1	2	1	2	1	1	8	20	2	14	5
25	Iron - Dissolved	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.02	0.02	0.01	0.01	0.01
26	Lead - Dissolved	g/m³	0.0005						0.0005					
25	Manganese - Dissolved	g/m³	0.0134	0.0287	0.0136	0.001	0.662	0.0246	0.473	0.224	0.0337	0.0338	0.147	0.0179
26	Nickel - Dissolved	g/m³	0.0015						0.003					
26	Nitrate - Nitrogen	g/m³	0.88						0.22					
25	pH		6.5	6.5	6.6	6.7	6.6	6.5	6.4	6.6	6.7	6.5	6.5	6.5
Other	Water Level of Bore	Metres	4.8	4.4	4.5	4.6	4.8	4.9	4.8	4.8	4.6	4.9	4.7	4.5
Other	Weather - 24 hr				No Rain	Some Rain	No Rain	No Rain	No Rain	Some Rain	Some Rain	Some Rain	Some Rain	
26	Zinc - Dissolved	g/m³	0.002						0.006					

Condition	Description	Measure	29/06/2018	24/07/2018	28/08/2018	24/09/2018	30/10/2018	13/11/2018	13/12/2018	10/01/2019	25/02/2019	27/03/2019	23/04/2019	29/05/2019
26	Aluminium - Dissolved	g/m³	0.002						0.012					
25	Ammonia Nitrogen	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.01	0.42	0.01	0.13
26	Arsenic - Dissolved	g/m³	0.001						0.001					
25	BOD5 - Total	g/m³	1	1	6	6	1	6	1	1	1	1	1	1
26	Boron - Dissolved	g/m³	0.12						0.13					
26	Cadmium - Dissolved	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	15	15	15	21	15	15	28	26	15	34	15	15
26	Chloride	g/m³	96.5						73					
26	Chromium - Dissolved	g/m³	0.001						0.001					
Other	Comments			Clear	Brown, floating solids	Brown		Cloudy	Brownish		Clear			
25	Conductivity at 25°C	mS/m	64.4	69.3	54	61.8	52.4	51.5	74.4	98.1	19.6	43.5	33.6	66.3
26	Copper - Dissolved	g/m³	0.0005						0.0013					
26	Dissolved Reactive Phosphorus	g/m³	0.021						0.042					
25	Faecal Coliforms	cfu/100ml	1	1	7	45	80	14	33	1	21	2	90	26
25	Iron - Dissolved	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.04	0.02	0.01
26	Lead - Dissolved	g/m³	0.0005						0.0005					
25	Manganese - Dissolved	g/m³	0.0207	0.0019	0.0055	0.0014	0.002	0.0163	0.004	0.0086	0.0025	0.579	0.0012	0.0061
26	Nickel - Dissolved	g/m³	0.0008						0.0007					
26	Nitrate - Nitrogen	g/m³	1.92						2.24					
25	pH		6.7	6.5	6.7	6.6	6.6	6.6	6.5	6.6	6.8	6.7	6.7	7
Other	Water Level of Bore	Metres	4.8	4.7	4.8	4.8	4.1	4.5	4.4	4.7	3.5	4.1	3.8	4.2
Other	Weather - 24 hr		No Rain	Some Rain	Some Rain	No Rain	Some Rain	No Rain	No Rain	No Rain	Some Rain	Much Rain	Much Rain	No Rain
26	Zinc - Dissolved	g/m³	0.002						0.002					

Notes:
Values in red were reported below the detection limit.

SOUTHERN LANDFILL - BOREHOLE BH103B MONITORING RESULTS

Condition	Description	Measure	24/06/2016	13/07/2016	12/08/2016	20/09/2016	10/10/2016	22/11/2016	15/12/2016	11/01/2017	14/02/2017	29/03/2017	21/04/2017	17/05/2017
26	Aluminium - Dissolved	g/m³	0.002						0.008					
25	Ammonia Nitrogen	g/m³	2.92	3.32	2.39	2.24	2.84	0.05	2.5	3.41	2.58	2.33	1.89	2.49
26	Arsenic - Dissolved	g/m³	0.007						0.009					
25	BOD5 - Total	g/m³	1	11	2	4	6	1	7	3	8	4	1	6
26	Boron - Dissolved	g/m³	0.35						0.44					
26	Cadmium - Dissolved	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	21	56	37	34	36	46	57	25	38	36	52	39
26	Chloride	g/m³	142						168					
26	Chromium - Dissolved	g/m³	0.001						0.001					
Other	Comments		Clear floating solids	Clear floating solids	Clear floating solids	Clear floating solids	Clear floating solids	Clear, floating solids	Cloudy, greyish, floating solids	Clear, floating solids	Clear, floating solids	Cloudy greyish	Clear, floating solids	Clear, floating solids
25	Conductivity at 25°C	mS/m	165	170	169	153	175	29.9	174	176	173	167	165	170
26	Copper - Dissolved	g/m³	0.0005						0.0006					
26	Dissolved Reactive Phosphorus	g/m³	0.021						0.029					
25	Faecal Coliforms	cfu/100ml	1	1	1	2	1	1	3	12	3	44	1	1
25	Iron - Dissolved	g/m³	0.3	0.12	0.43	0.1	0.21	0.01	0.43	0.47	0.26	0.36	0.16	0.15
26	Lead - Dissolved	g/m³	0.0005						0.0006					
25	Manganese - Dissolved	g/m³	8.89	10.4	10.6	8.78	10.6	0.923	11.2	9.88	9.77	9.66	6.91	9.75
26	Nickel - Dissolved	g/m³	0.004						0.0029					
26	Nitrate - Nitrogen	g/m³	0.01						0.01					
25	pH		6.6	6.8	7	6.6	6.7	6.7	7	6.8	6.7	6.6	6.5	6.7
Other	Water Level of Bore	Metres	4.3	4.4	4.3	4	4.2	4	4.1	4.3	4.3	4.2	4.1	4.2
Other	Weather - 24 hr		Some Rain	No Rain	No Rain	No Rain	No Rain	No Rain	Some Rain	No Rain	No Rain	Some Rain	No Rain	No Rain
26	Zinc - Dissolved	g/m³	0.003						0.003					

Condition	Description	Measure	22/06/2017	17/07/2017	18/08/2017	21/09/2017	18/10/2017	27/11/2017	21/12/2017	26/01/2018	27/02/2018	21/03/2018	17/04/2018	29/05/2018
26	Aluminium - Dissolved	g/m³	0.002						0.012					
25	Ammonia Nitrogen	g/m³	2.26	2.39	2.66	2.82	2	2.91	2.83	0.18	0.05	0.08	1.97	1.97
26	Arsenic - Dissolved	g/m³	0.01						0.007					
25	BOD5 - Total	g/m³	2	5	3	9	11	14	5	1	1	1	2	8
26	Boron - Dissolved	g/m³	0.56						0.38					
26	Cadmium - Dissolved	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	76	27	45	43	32	56	50	107	15	54	26	22
26	Chloride	g/m³	168						181					
26	Chromium - Dissolved	g/m³	0.001						0.001					
Other	Comments		Clear, floating solids	Clear, mistry grey, floating solids	Clear, floating solids	Grey	Cloudy, misty grey, floating solids	Cloudy. Grey, floating solids	Clear/misty grey	Clear and floating solids	Cloudy	Cloudy	Greyish	Clear
25	Conductivity at 25°C	mS/m	171	147	158	175	119	173	174	51.6	106	48	121	130
26	Copper - Dissolved	g/m³	0.0005						0.0075					
26	Dissolved Reactive Phosphorus	g/m³	0.024						0.017					
25	Faecal Coliforms	cfu/100ml	1	1	1	1	15	1	1	130	4	17	26	2
25	Iron - Dissolved	g/m³	0.55	0.23	0.25	0.09	0.05	0.07	0.13	0.03	0.01	0.01	0.09	0.13
26	Lead - Dissolved	g/m³	0.0006						0.0005					
25	Manganese - Dissolved	g/m³	10.9	10.7	9.66	10.4	5.76	10.2	10.8	1.89	0.564	1.65	8	7.19
26	Nickel - Dissolved	g/m³	0.0048						0.0056					
26	Nitrate - Nitrogen	g/m³	0.02						0.24					
25	pH		6.6	6.6	6.7	6.8	6.7	6.6	6.6	6.7	6.7	6.5	6.6	6.7
Other	Water Level of Bore	Metres	4.3	4.1	4.1	4.2	4.7	4.8	5.2	4.9	4.8	4.8	4.7	5
Other	Weather - 24 hr				No Rain	Some Rain	No Rain	No Rain	No Rain	Some Rain	Some Rain	Some Rain	Some Rain	
26	Zinc - Dissolved	g/m³	0.005						0.03					

Condition	Description	Measure	29/06/2018	24/07/2018	28/08/2018	24/09/2018	30/10/2018	13/11/2018	13/12/2018	10/01/2019	25/02/2019	27/03/2019	23/04/2019	29/05/2019
26	Aluminium - Dissolved	g/m³	0.002						0.003					
25	Ammonia Nitrogen	g/m³	0.01	0.01	1.9	1.72	0.24	1.46	2.21	2.56	0.01	0.01	0.64	1.47
26	Arsenic - Dissolved	g/m³	0.001						0.002					
25	BOD5 - Total	g/m³	1	1	11	11	1	6	3	3	1	1	9	6
26	Boron - Dissolved	g/m³	0.17						0.36					
26	Cadmium - Dissolved	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	19	15	40	43	15	35	34	48	15	15	43	40
26	Chloride	g/m³	104						156					
26	Chromium - Dissolved	g/m³	0.001						0.001					
Other	Comments		Clear	Clear	Light brown, floating solids	Cloudy		Clear	Clear		Clear			
25	Conductivity at 25°C	mS/m	46.1	44.5	154	163	63.6	130	157	171	23.3	21.8	82.9	83.8
26	Copper - Dissolved	g/m³	0.0005						0.0015					
26	Dissolved Reactive Phosphorus	g/m³	0.023						0.025					
25	Faecal Coliforms	cfu/100ml	1	1	7	22	29	28	6	1	1	17	62	11
25	Iron - Dissolved	g/m³	0.01	0.01	0.02	0.02	0.01	0.01	0.02	0.04	0.01	0.01	0.01	0.02
26	Lead - Dissolved	g/m³	0.0005						0.0005					
25	Manganese - Dissolved	g/m³	0.38	0.0068	9.63	8.87	2.13	6.61	7.25	10.2	0.0158	0.0011	2.68	5.04
26	Nickel - Dissolved	g/m³	0.0019						0.0036					
26	Nitrate - Nitrogen	g/m³	1.01						0.18					
25	pH		7	6.8	6.6	6.6	6.6	6.6	6.6	6.7	6.7	6.6	6.8	6.6
Other	Water Level of Bore	Metres	4.7	4.5	4.8	4.8	4.5	4.7	4.5	4.7	4.2	4.1	4.1	4.2
Other	Weather - 24 hr		No Rain	Some Rain	Some Rain	No Rain	Some Rain	No Rain	No Rain	No Rain	Some Rain	Much Rain	Much Rain	No Rain
26	Zinc - Dissolved	g/m³	0.003						0.006					

Notes:
Values in red were reported below the detection limit.

SOUTHERN LANDFILL - BOREHOLE BH6 MONITORING RESULTS

Condition	Description	Measure	22/06/2016	13/07/2016	11/08/2016	15/09/2016	11/10/2016	21/11/2016	16/12/2016	11/01/2017	14/02/2017	29/03/2017	21/04/2017	16/05/2017
26	Aluminium - Dissolved	g/m³	0.029						0.089					
25	Ammonia Nitrogen	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		0.01
26	Arsenic - Dissolved	g/m³	0.001						0.001					
25	BOD5 - Total	g/m³	1	1	1	1	1	6	6	6	1	1		1
26	Boron - Dissolved	g/m³	0.04						0.04					
26	Cadmium - Dissolved	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	15	21	15	15	15	15	21	15	44	15		15
26	Chloride	g/m³	84.8						120					
26	Chromium - Dissolved	g/m³	0.001						0.001					
Other	Comments		Clear floating solids	Clear floating solids	Cloudy misty grey floating solids	Cloudy misty grey floating solids	Clear floating solids	Cloudy, greyish, floating solids	Cloudy, grey, floating solids	Cloudy, greyish, floating solids	Cloudy, greyish, floating solids	Cloudy, greyish	No sample obtained owing to debris	Cloudy, mistry grey, floating solids
25	Conductivity at 25°C	mS/m	40.9	46.2	38.7	39.2	49.1	59.3	59.3	44.2	43.3	51.6		58.1
26	Copper - Dissolved	g/m³	0.001						0.0008					
26	Dissolved Reactive Phosphorus	g/m³	0.012						0.022					
25	Faecal Coliforms	cfu/100ml	2	1	2	5	10	20	190	9	57	260		15
25	Iron - Dissolved	g/m³	0.03	0.04	0.06	0.02	0.01	0.03	0.08	0.01	0.02	0.01		0.01
26	Lead - Dissolved	g/m³	0.0005						0.0005					
25	Manganese - Dissolved	g/m³	0.117	0.0516	0.0322	0.0481	0.0283	0.0133	0.0168	0.0407	0.0886	0.0463		0.0353
26	Nickel - Dissolved	g/m³	0.0057						0.0015					
26	Nitrate - Nitrogen	g/m³	0.1						0.44					
25	pH		6.1	6.1	6.3	6.4	6.2	6.2	6.3	6.3	6.2	6.2		6.2
Other	Water Level of Bore	Metres	1.5	1.5	1.5	1.5	1	1.5	1.5	1.3	1.5	1.5		1
Other	Weather - 24 hr		Some Rain	No Rain	No Rain	No Rain	No Rain	No Rain	No Rain	No Rain	No Rain	Some Rain		No Rain
26	Zinc - Dissolved	g/m³	0.01						0.007					

Condition	Description	Measure	22/06/2017	17/07/2017	17/08/2017	21/09/2017	17/10/2017	27/11/2017	21/12/2017	26/01/2018	27/02/2018	21/03/2018	17/04/2018	29/05/2018
26	Aluminium - Dissolved	g/m³	0.009						0.039					
25	Ammonia Nitrogen	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
26	Arsenic - Dissolved	g/m³	0.001						0.001					
25	BOD5 - Total	g/m³	1	1	1	1	1	1	1	1	1	1	1	1
26	Boron - Dissolved	g/m³	0.05						0.04					
26	Cadmium - Dissolved	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	86	15	15	15	15	19	17	49	15	15	15	15
26	Chloride	g/m³	110						119					
26	Chromium - Dissolved	g/m³	0.001						0.001					
Other	Comments		Clear, floating solids, misty grey	Clear, misty grey, floating solids	Cloudy, misty grey, floating solids	Light brown	Clear, misty grey, floating solids	Clear, misty/grey, floating solids	Clear/misty grey	Clear and floating solids	Cloudy	Cloudy	Clear	Clear
25	Conductivity at 25°C	mS/m	58.2	57.8	58.1	58.6	59.6	54.4	55.6	29.3	37.7	46.6	57.3	56.2
26	Copper - Dissolved	g/m³	0.0005						0.0013					
26	Dissolved Reactive Phosphorus	g/m³	0.019						0.024					
25	Faecal Coliforms	cfu/100ml	15	3	3	4	1	4	2	110	2400	440	150	25
25	Iron - Dissolved	g/m³	0.01	0.01	0.01	0.01	0.04	0.01	0.04	0.07	0.03	0.04	0.01	0.01
26	Lead - Dissolved	g/m³	0.0005						0.0005					
25	Manganese - Dissolved	g/m³	0.0121	0.0067	0.014	0.0533	0.0273	0.0301	0.0313	0.0154	0.0081	0.0141	0.0464	0.0377
26	Nickel - Dissolved	g/m³	0.0039						0.004					
26	Nitrate - Nitrogen	g/m³	0.27						0.21					
25	pH		6.3	6.2	6.5	6.5	6.2	6.2	6	6.2	6.1	6.4	6.4	6.5
Other	Water Level of Bore	Metres	1.5	1	1	0.4	1	1.5	1.4	1.5	1.4	1.5	0.5	1
Other	Weather - 24 hr				Some Rain	Some Rain	No Rain	No Rain	No Rain	Some Rain	Some Rain	Some Rain	Some Rain	
26	Zinc - Dissolved	g/m³	0.011						0.015					

Condition	Description	Measure	29/06/2018	24/07/2018	28/08/2018	24/09/02018	30/10/2018	13/11/2018	13/12/2018	10/01/2019	25/02/2019	27/03/2019	23/04/2019	29/05/2019
26	Aluminium - Dissolved	g/m³	0.009											
25	Ammonia Nitrogen	g/m³	0.01	0.01	0.01	0.01								
26	Arsenic - Dissolved	g/m³	0.001											
25	BOD5 - Total	g/m³	1	1	1	1								
26	Boron - Dissolved	g/m³	0.03											
26	Cadmium - Dissolved	g/m³	0.0002											
Other	Chemical Oxygen Demand	g/m³	15	15	15	17								
26	Chloride	g/m³	101											
26	Chromium - Dissolved	g/m³	0.001											
Other	Comments		Clear	Clear	Light brown, floating solids	Clear	No sample collected - Bore covered by landslip, not accessible	No sample collected - Bore covered, not accessible	No sample collected - Bore covered, not accessible	No sample collected - Bore still covered by landslip, not accessible	No sample collected	No sample collected - Bore covered, not accessible	No sample collected	No sample collected - Bore covered, not accessible
25	Conductivity at 25°C	mS/m	55.2	56.4	57.7	57.3								
26	Copper - Dissolved	g/m³	0.0005											
26	Dissolved Reactive Phosphorus	g/m³	0.025											
25	Faecal Coliforms	cfu/100ml	2	1	1	1								
25	Iron - Dissolved	g/m³	0.01	0.01	0.01	0.01								
26	Lead - Dissolved	g/m³	0.0005											
25	Manganese - Dissolved	g/m³	0.0043	0.0092	0.0258	0.0278								
26	Nickel - Dissolved	g/m³	0.0019											
26	Nitrate - Nitrogen	g/m³	0.32											
25	pH		6.1	6.3	6.6	6.6								
Other	Water Level of Bore	Metres	1.3	1	2	0.7								
Other	Weather - 24 hr		No Rain	Some Rain	Some Rain	No Rain								
26	Zinc - Dissolved	g/m³	0.008											

Notes:
Values in red were reported below the detection limit.

SOUTHERN LANDFILL - UPSTREAM MONITORING OF CAREY'S STREAM

Condition	Description	Measure	22/06/2016	13/07/2016	11/08/2016	15/09/2016	10/10/2016	21/11/2016	16/12/2016	11/01/2017	14/02/2017	29/03/2017	21/04/2017	16/05/2017
26	Aluminium - Acid Soluble	g/m³	0.031						0.012					
25	Ammonia Nitrogen	g/m³	0.01	0.01	0.01	0.01		0.01	0.01	0.01	0.01	0.01	0.01	0.01
26	Arsenic - Acid Soluble	g/m³	0.001						0.001					
25	BOD5 - Total	g/m³	1	1	1	1		1	1	1	3	1	6	1
26	Boron - Acid Soluble	g/m³	0.03						0.03					
26	Cadmium - Acid Soluble	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	17	19	15	15		15	15	15	15	15	16	15
26	Chloride	g/m³	42.3						46.4					
26	Chromium - Acid Soluble	g/m³	0.001						0.001					
25	Conductivity at 25°C	mS/m	23.5	24.6	23.3	25.1		23.1	25.2	26.4	26.0	24.8	22.0	24.3
26	Copper - Acid Soluble	g/m³	0.0005						0.0005					
26	Dissolved Reactive Phosphorus	g/m³	0.006						0.012					
25	Faecal Coliforms	cfu/100ml	77	4	4	36		16	160	110	280	8	4	4
25	Iron - Acid Soluble	g/m³	1.65	0.01	0.01	0.01		0.01	0.01	0.02	0.02	0.01	0.01	0.01
26	Lead - Acid Soluble	g/m³	0.0005						0.0005					
25	Manganese - Acid Soluble	g/m³	0.0336	0.0007	0.0017	0.0016		0.0018	0.0012	0.0016	0.0102	0.0039	0.0013	0.0038
26	Nickel - Acid Soluble	g/m³	0.0005						0.0005					
26	Nitrate - Nitrogen	g/m³	0.31	0.29	0.32	0.14		0.48	0.4	0.36	0.32	0.28	0.37	0.45
25	pH		7.6	7.7	7.7	7.8		7.6	7.6	7.8	7.8	7.7	7.5	7.7
Other	Suspended Solids - Total	g/m³	6	6	6	9		6	6	5	5	6	6	6
26	Zinc - Acid Soluble	g/m³	0.008						0.002					

No sample obtained owing to H&S obstruction to sampling point

Condition	Description	Measure	22/06/2017	20/07/2017	18/08/2017	21/09/2017	17/10/2017	27/11/2017	21/12/2017	26/01/2018	27/02/2018	21/03/2018	17/04/2018	29/05/2018
26	Aluminium - Acid Soluble	g/m³	0.015						0.005					
25	Ammonia Nitrogen	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
26	Arsenic - Acid Soluble	g/m³	0.001						0.001					
25	BOD5 - Total	g/m³	1	1	1	1	1	1	1	1	1	1	1	1
26	Boron - Acid Soluble	g/m³	0.03						0.03					
26	Cadmium - Acid Soluble	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	15	59	15	15	15	15	15	15	15	15	15	15
26	Chloride	g/m³	43.3						47.4					
26	Chromium - Acid Soluble	g/m³	0.001						0.001					
25	Conductivity at 25°C	mS/m	23.8	22.1	21.5	23.5	23.9	26.3	26.5	27.5	22.1	24.7	22.2	22.3
26	Copper - Acid Soluble	g/m³	0.0005						0.0005					
26	Dissolved Reactive Phosphorus	g/m³	0.011						0.012					
25	Faecal Coliforms	cfu/100ml	8	4	12	32	58	150	12	84	96	77	20	28
25	Iron - Acid Soluble	g/m³	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.02
26	Lead - Acid Soluble	g/m³	0.0005						0.0005					
25	Manganese - Acid Soluble	g/m³	0.0027	0.0007	0.0052	0.0016	0.0006	0.0007	0.0005	0.0013	0.0023	0.0015	0.0068	0.0013
26	Nickel - Acid Soluble	g/m³	0.0005						0.0005					
26	Nitrate - Nitrogen	g/m³	0.46	0.48	0.51	0.46	0.38	0.36	0.35	0.39	0.26	0.31	0.25	0.31
25	pH		7.7	7.6	7.7	7.7	7.7	7.7	7.6	7.8	7.7	7.7	7.8	7.8
Other	Suspended Solids - Total	g/m³	5	5	6	6	6	6	6	7	6	6	6	6
26	Zinc - Acid Soluble	g/m³	0.002						0.002					

Condition	Description	Measure	29/06/2018	24/07/2018	28/08/2018	24/09/2018	30/10/2018	13/11/2018	13/12/2018	10/01/2019	25/02/2019	27/03/2019	23/04/2019	29/05/2019
26	Aluminium - Acid Soluble	g/m³	0.01						0.013					
25	Ammonia Nitrogen	g/m³	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
26	Arsenic - Acid Soluble	g/m³	0.001						0.001					
25	BOD5 - Total	g/m³	1	1	1	1	1	6	1	3	1	1	3	1
26	Boron - Acid Soluble	g/m³	0.03						0.03					
26	Cadmium - Acid Soluble	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	15	15	15	15	15	15	15	15	15	28	15	15
26	Chloride	g/m³	42.4						40.5					
26	Chromium - Acid Soluble	g/m³	0.001						0.001					
25	Conductivity at 25°C	mS/m	22.7	23.3	22.7	23.5	18.4	20.6	22.7	24.8	26.1	25.4	20.5	23.5
26	Copper - Acid Soluble	g/m³	0.0005						0.0005					
26	Dissolved Reactive Phosphorus	g/m³	0.013						0.01					
25	Faecal Coliforms	cfu/100ml	4	4	84	120	4	88	65	36	110	150	80	20
25	Iron - Acid Soluble	g/m³	0.01	0.01	0.01	0.01	0.05	0.01	0.02	0.02	0.01	0.02	0.03	0.01
26	Lead - Acid Soluble	g/m³	0.0005						0.0005					
25	Manganese - Acid Soluble	g/m³	0.0033	0.0086	0.0013	0.0006	0.0032	0.0008	0.0061	0.0053	0.0048	0.0034	0.0016	0.0024
26	Nickel - Acid Soluble	g/m³	0.0005						0.0005					
26	Nitrate - Nitrogen	g/m³	0.4	0.43	0.32	0.26	0.29	0.2	0.24	0.28	0.35	0.28	0.25	0.31
25	pH		7.6	7.7	7.7	7.8	7.7	7.3	7.8	7.8	7.7	7.8	7.9	7.8
Other	Suspended Solids - Total	g/m³	6	6	6	6	6	5	6	6	6	6	6	6
26	Zinc - Acid Soluble	g/m³	0.002						0.002					

Notes:
Values in red were reported below the detection limit.

SOUTHERN LANDFILL - DOWNSTREAM MONITORING OF CAREY'S STREAM

Condition	Description	Measure	22/06/2016	13/07/2016	11/08/2016	15/09/2016	10/10/2016	21/11/2016	15/12/2016	11/01/2017	14/02/2017	29/03/2017	21/04/2017	16/05/2017
26	Aluminium - Acid Soluble	g/m³	0.039						0.021					
25	Ammonia Nitrogen	g/m³	0.09	0.29	0.23	0.42	1.02	0.46	0.95	0.68	0.41	0.47	0.62	0.88
26	Arsenic - Acid Soluble	g/m³	0.001						0.002					
25	BOD5 - Total	g/m³	1	1	1	2	1	1	4	5	3	2	1	3
26	Boron - Acid Soluble	g/m³	0.04						0.06					
26	Cadmium - Acid Soluble	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	17	15	15	16	15	15	19	15	15	15	15	15
26	Chloride	g/m³	46.5						86.2					
26	Chromium - Acid Soluble	g/m³	0.001						0.001					
25	Conductivity at 25°C	mS/m	29.8	36	30	36.6	36	29.8	40.8	44.3	41.5	37.7	29.4	38.9
26	Copper - Acid Soluble	g/m³	0.0005						0.0005					
26	Dissolved Reactive Phosphorus	g/m³	0.01						0.014					
25	Faecal Coliforms	cfu/100ml	180	8	32	36	12	4	210	50	69	12	4	4
25	Iron - Acid Soluble	g/m³	0.14	0.04	0.04	0.04	0.04	0.06	0.17	0.16	0.09	0.06	0.05	0.08
26	Lead - Acid Soluble	g/m³	0.0005						0.0005					
25	Manganese - Acid Soluble	g/m³	0.204	0.27	0.199	0.249	0.336	0.24	0.607	0.636	0.342	0.232	0.223	0.505
26	Nickel - Acid Soluble	g/m³	0.0006						0.002					
26	Nitrate - Nitrogen	g/m³	0.73	1.07	0.64	0.91	0.38	0.56	0.86	1.66	1.2	1.01	0.44	0.9
25	pH		7.6	7.8	7.6	7.9	7.8	7.7	7.6	7.8	7.9	7.8	7.5	7.8
Other	Suspended Solids - Total	g/m³	6	5	6	6	6	6	5	5	5	6	6	6
26	Zinc - Acid Soluble	g/m³	0.002						0.002					

Condition	Description	Measure	22/06/2017	20/07/2017	17/08/2017	21/09/2017	17/10/2017	27/11/2017	21/12/2017	26/01/2018	27/02/2018	21/03/2018	17/04/2018	29/05/2018
26	Aluminium - Acid Soluble	g/m³	0.01						0.004					
25	Ammonia Nitrogen	g/m³	0.71	0.42	0.34	0.67	0.61	0.3	0.2	0.02	0.25	0.15	0.19	0.24
26	Arsenic - Acid Soluble	g/m³	0.001						0.001					
25	BOD5 - Total	g/m³	3	2	2	1	2	1	1	1	1	1	1	1
26	Boron - Acid Soluble	g/m³	0.05						0.04					
26	Cadmium - Acid Soluble	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	61	36	15	15	15	31	15	21	20	16	21	15
26	Chloride	g/m³	50.7						56.1					
26	Chromium - Acid Soluble	g/m³	0.001						0.001					
25	Conductivity at 25°C	mS/m	37.6	29.8	27.9	35.1	37.8	43.2	44.9	45	66.6	38.2	29.1	29.2
26	Copper - Acid Soluble	g/m³	0.0005						0.0005					
26	Dissolved Reactive Phosphorus	g/m³	0.012						0.013					
25	Faecal Coliforms	cfu/100ml	4	4	4	8	20	20	4	4	96	4	65	12
25	Iron - Acid Soluble	g/m³	0.07	0.06	0.41	0.07	0.05	0.1	0.07	0.07	0.2	0.03	0.04	0.06
26	Lead - Acid Soluble	g/m³	0.0005						0.0005					
25	Manganese - Acid Soluble	g/m³	0.505	0.233	0.259	0.41	0.345	0.337	0.294	0.211	0.453	0.208	0.169	0.193
26	Nickel - Acid Soluble	g/m³	0.0009						0.0007					
26	Nitrate - Nitrogen	g/m³	1.05	0.41	0.69	0.73	0.86	1.31	1.46	1.62	1.47	1.38	0.64	0.7
25	pH		7.7	7.6	7.7	7.9	7.7	7.9	7.8	8.1	7.6	7.8	7.8	7.5
Other	Suspended Solids - Total	g/m³	5	6	6	6	6	6	6	7	6	6	6	6
26	Zinc - Acid Soluble	g/m³	0.002						0.002					

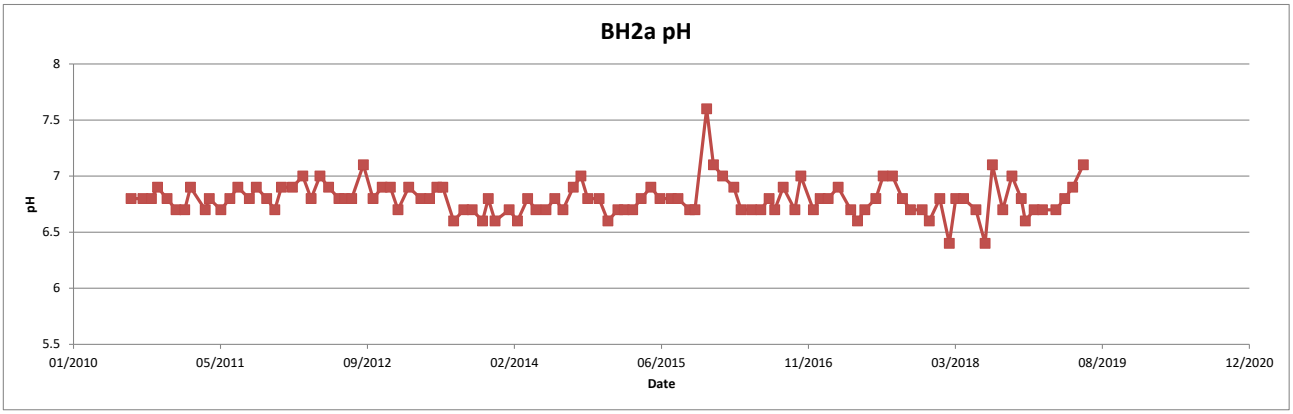
Condition	Description	Measure	29/06/2018	24/07/2018	28/08/2018	24/09/2018	30/10/2018	13/11/2018	13/12/2018	10/01/2019	25/02/2019	27/03/2019	23/04/2019	29/05/2019
26	Aluminium - Acid Soluble	g/m³	0.008						0.017					
25	Ammonia Nitrogen	g/m³	0.49	0.89	0.53	0.52	0.44	0.49	1.05	0.95	1.08	0.76	1	0.84
26	Arsenic - Acid Soluble	g/m³	0.001						0.002					
25	BOD5 - Total	g/m³	1	6	2	3	2	9	4	5	6	3	11	6
26	Boron - Acid Soluble	g/m³	0.01						0.38					
26	Cadmium - Acid Soluble	g/m³	0.0002						0.0002					
Other	Chemical Oxygen Demand	g/m³	15	33	15	19	15	15	19	28	15	55	42	15
26	Chloride	g/m³	45.3						61.2					
26	Chromium - Acid Soluble	g/m³	0.001						0.001					
25	Conductivity at 25°C	mS/m	30.5	79.5	33.1	35.5	38.8	62.7	76.1	74.4	72.4	74.0	37.4	68.2
26	Copper - Acid Soluble	g/m³	0.0005						0.0005					
26	Dissolved Reactive Phosphorus	g/m³	0.011						0.016					
25	Faecal Coliforms	cfu/100ml		2500	35	120	5900	8	4	4	270	230	10000	58
25	Iron - Acid Soluble	g/m³	0.04	0.35	0.05	0.05	0.52	0.26	0.39	0.59	0.43	0.8	2.03	0.36
26	Lead - Acid Soluble	g/m³	0.0005						0.0005					
25	Manganese - Acid Soluble	g/m³	0.213	0.961	0.3	0.319	0.215	0.694	1.02	1.11	1.05	1.05	0.453	0.835
26	Nickel - Acid Soluble	g/m³	0.0005						0.0005					
26	Nitrate - Nitrogen	g/m³	0.59	1.85	0.73	0.86	1.18	1.22	1.41	1.15	1.28	1.15	0.8	1.34
25	pH		7.6	7.9	7.7	7.6	7.7	7.5	7.6	8.0	7.5	8.0	7.5	7.8
Other	Suspended Solids - Total	g/m³	6	7	6	6	73	5	6	6	6	29	62	6
26	Zinc - Acid Soluble	g/m³	0.002						0.002					

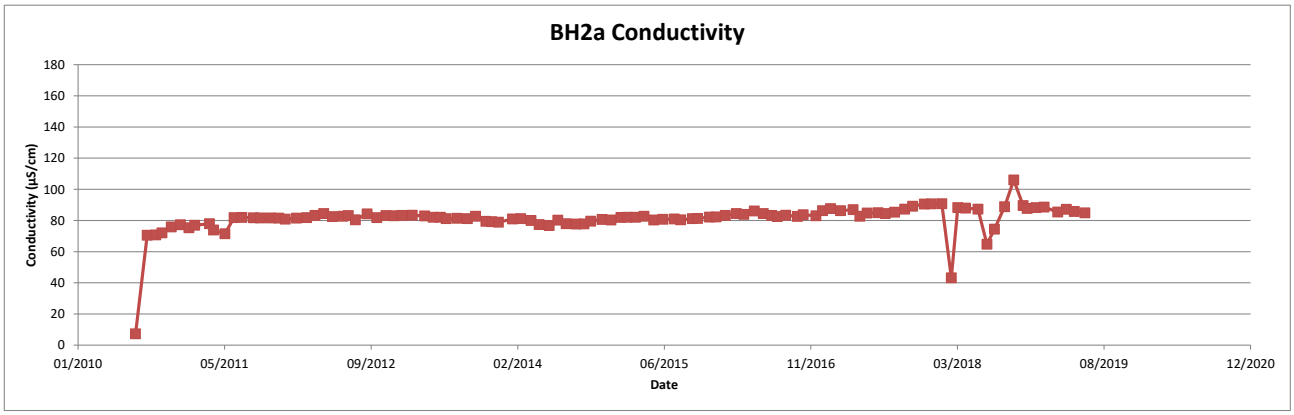
Notes:
Values in red were reported below the detection limit.

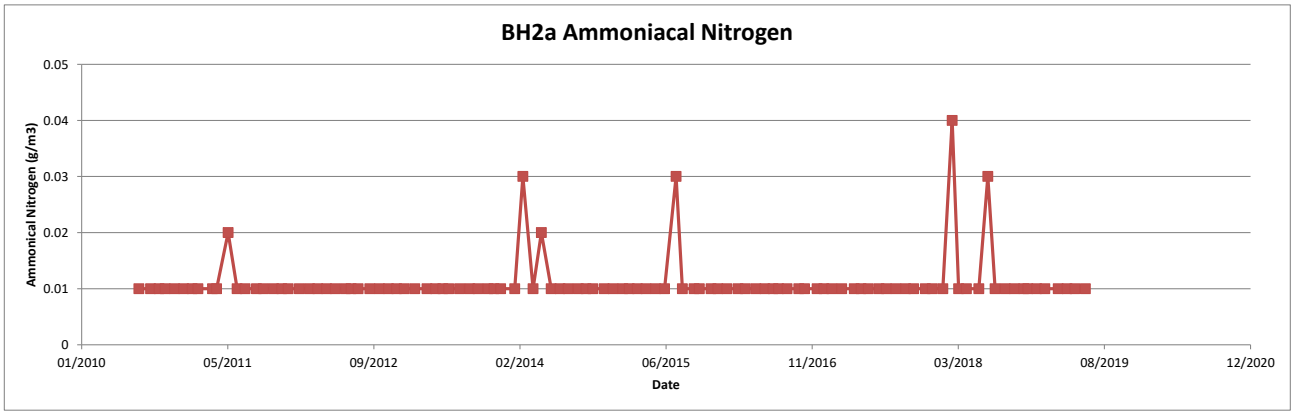
Appendix C

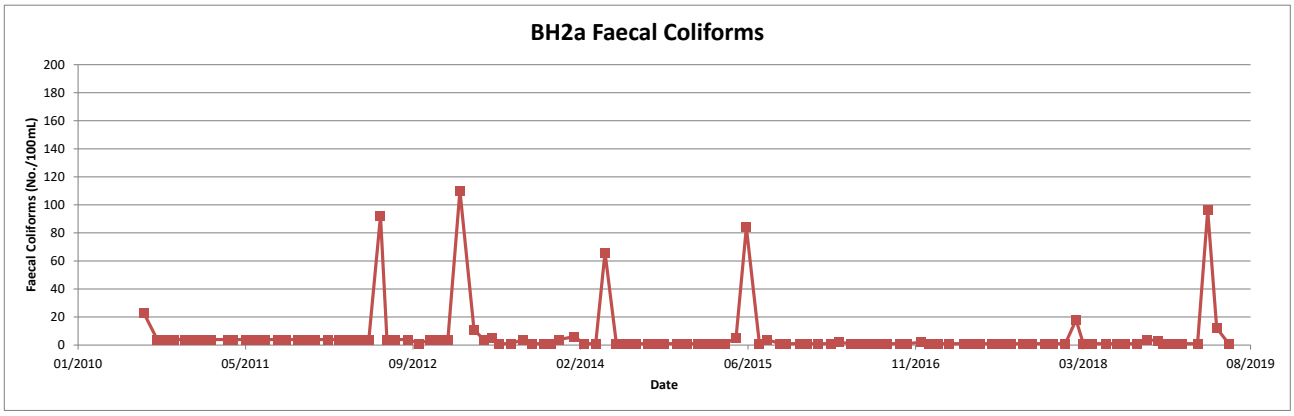
Time Series Graphs

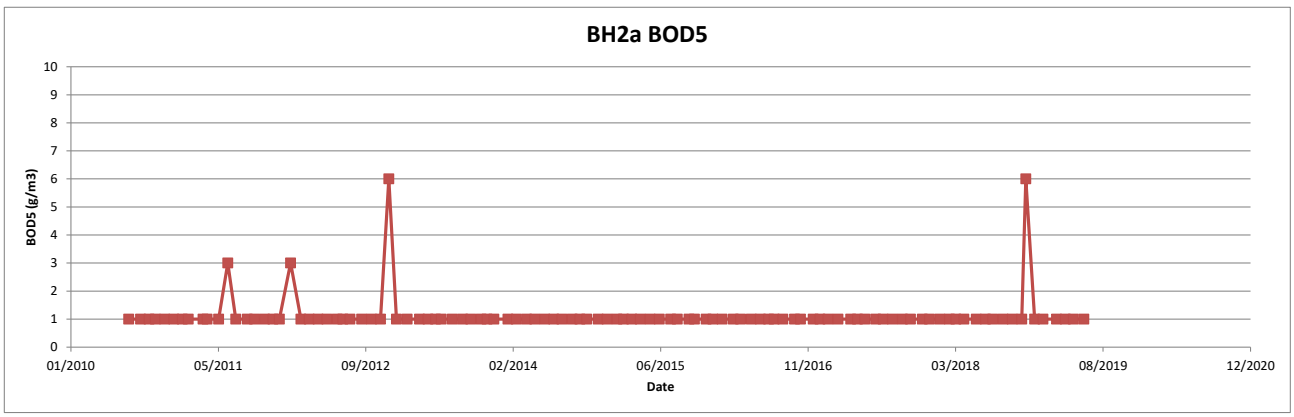
Appendix C Time Series Graphs

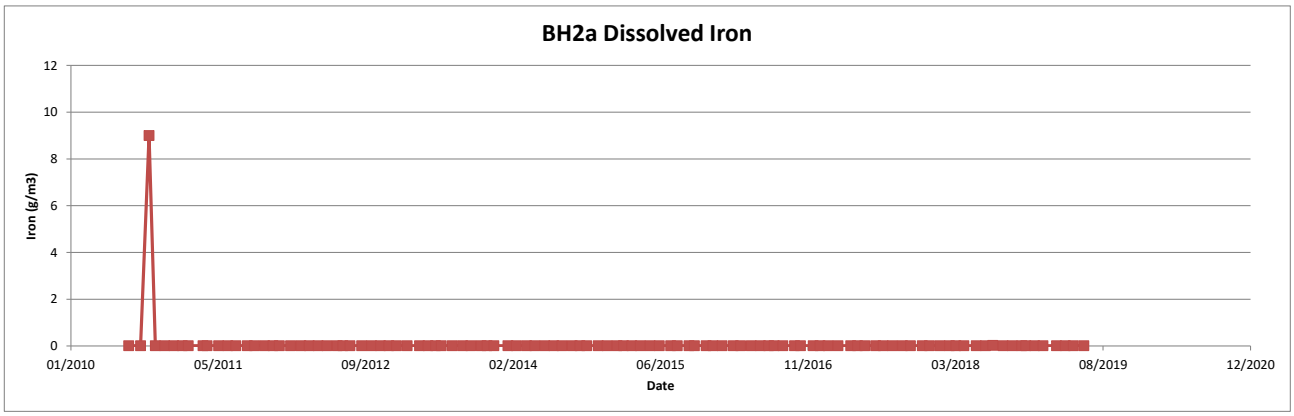

BH2a pH
pH
8
7.5
7
6.5
6
5.5
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

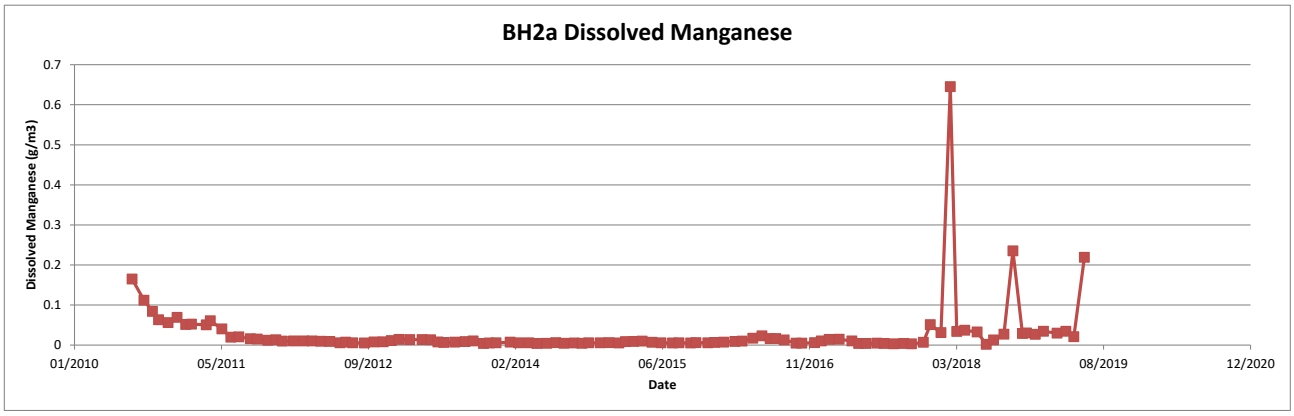

BH2a Conductivity
Conductivity (µS/cm)
180
160
140
120
100
80
60
40
20
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

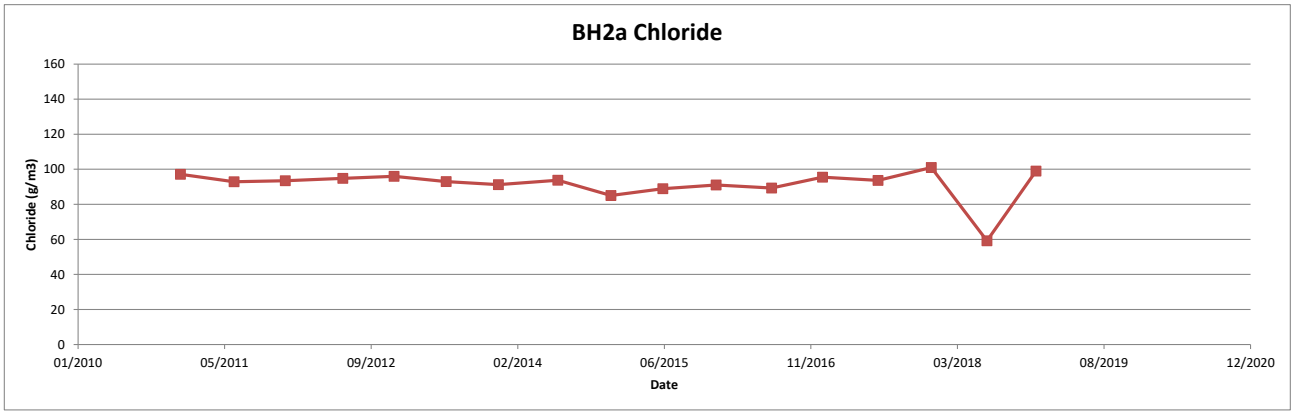

BH2a Ammoniacal Nitrogen
Ammonical Nitrogen (g/m3)
0.05
0.04
0.03
0.02
0.01
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

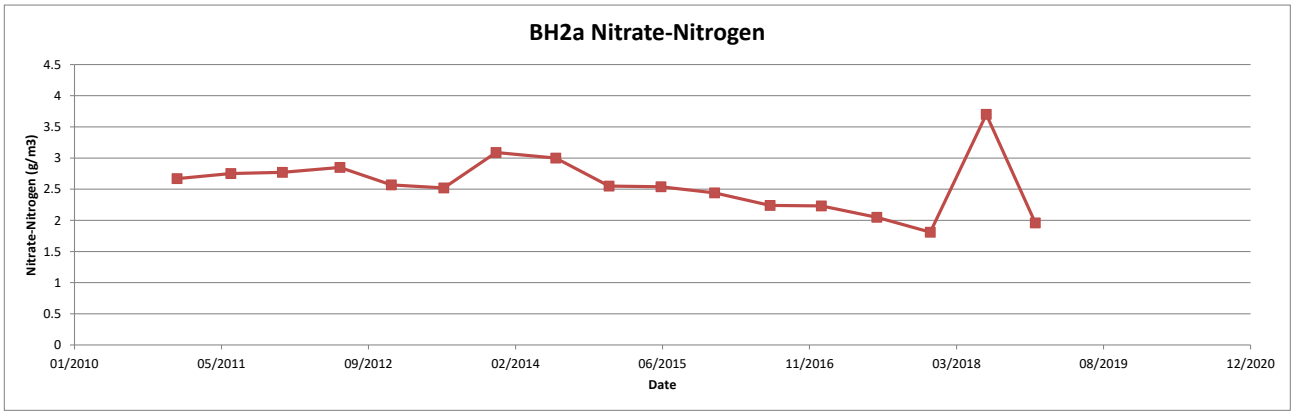

BH2a Faecal Coliforms
Faecal Coliforms (No./100mL)
200
180
160
140
120
100
80
60
40
20
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
Date

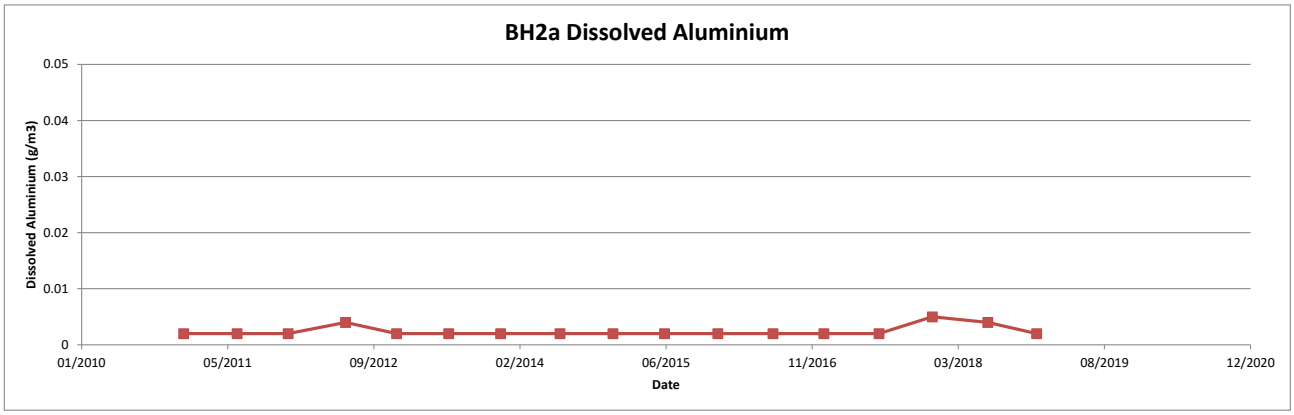

BH2a BOD5
BOD5 (g/m3)
10
9
8
7
6
5
4
3
2
1
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

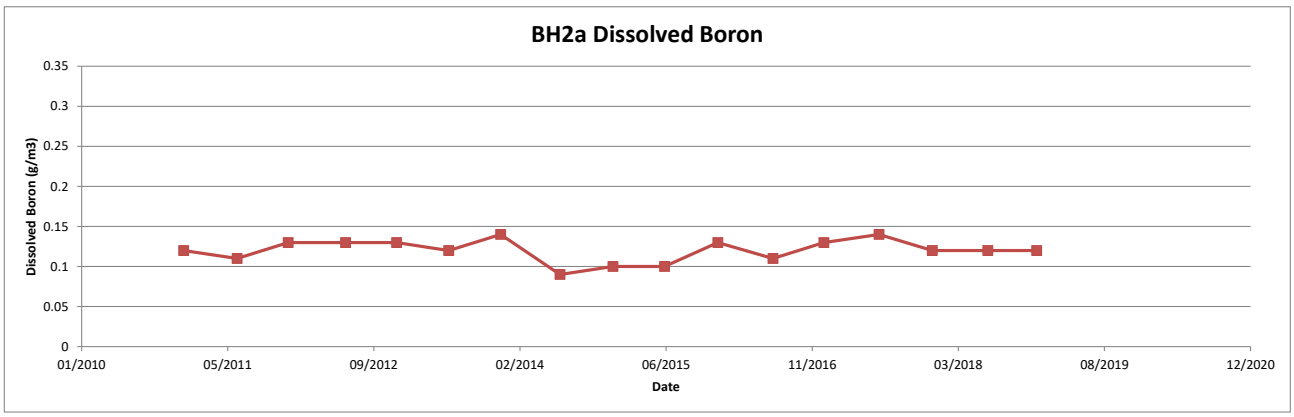

BH2a Dissolved Iron
Iron (g/m3)
12
10
8
6
4
2
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

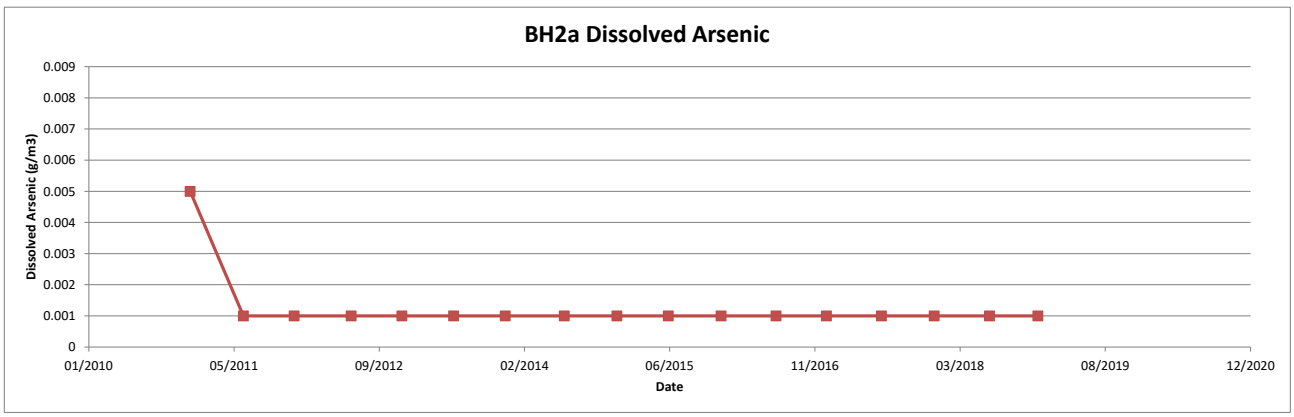

BH2a Dissolved Manganese
Dissolved Manganese (g/m3)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

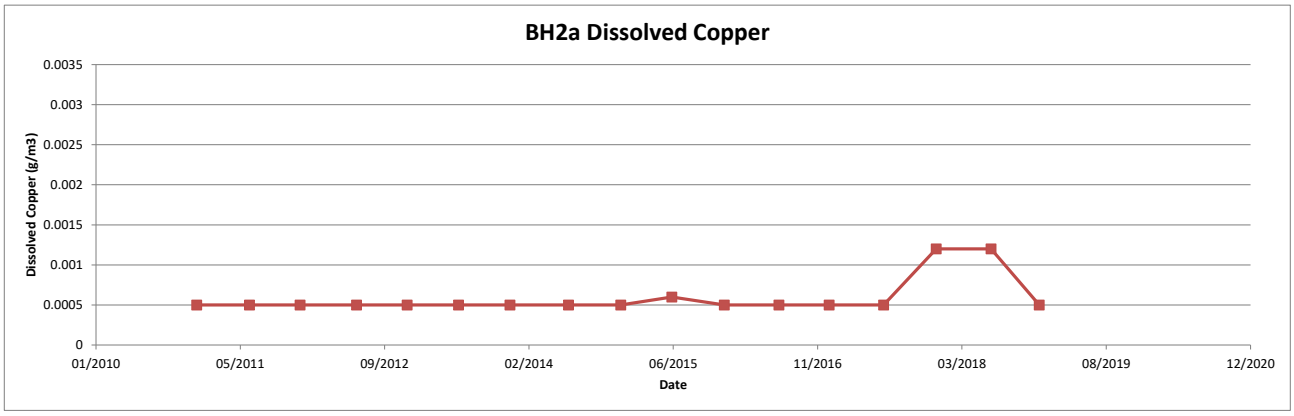

BH2a Chloride
Chloride (g/m3)
160
140
120
100
80
60
40
20
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

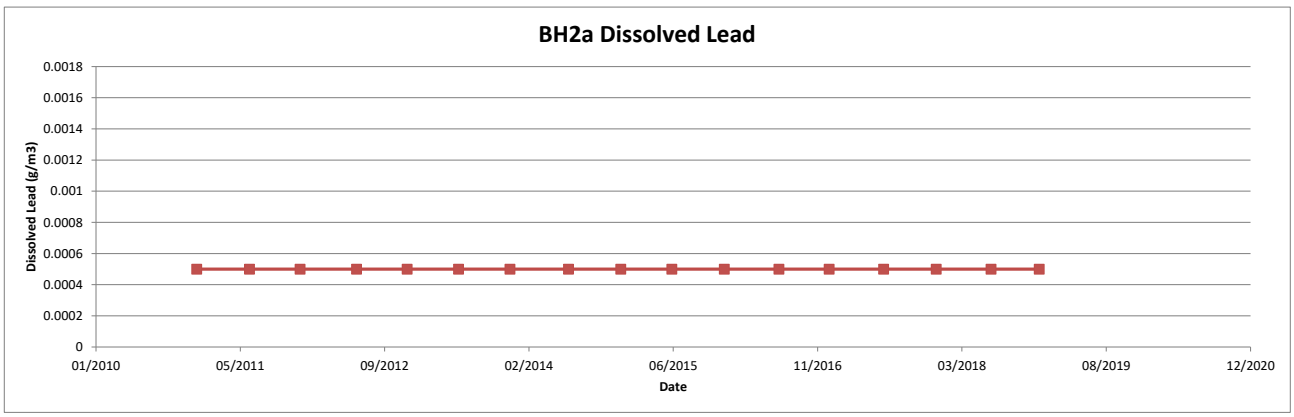

BH2a Nitrate-Nitrogen
Nitrate-Nitrogen (g/m3)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

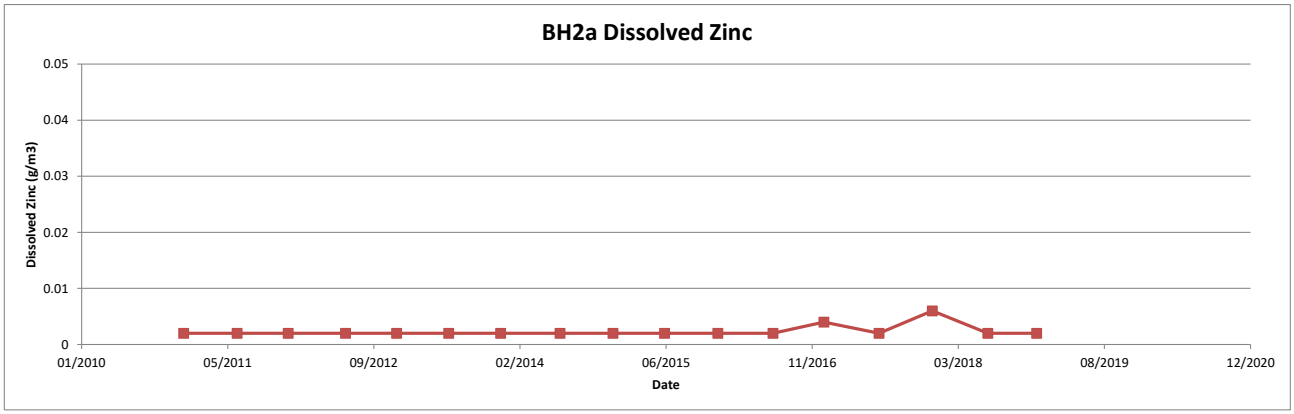

BH2a Dissolved Aluminium
Dissolved Aluminium (g/m3)
0.05
0.04
0.03
0.02
0.01
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

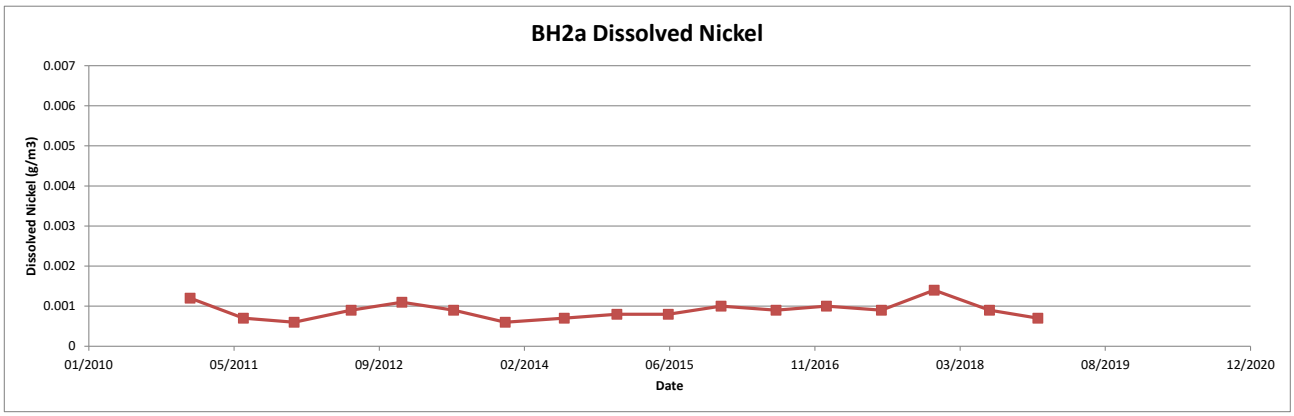

BH2a Dissolved Boron
Dissolved Boron (g/m3)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

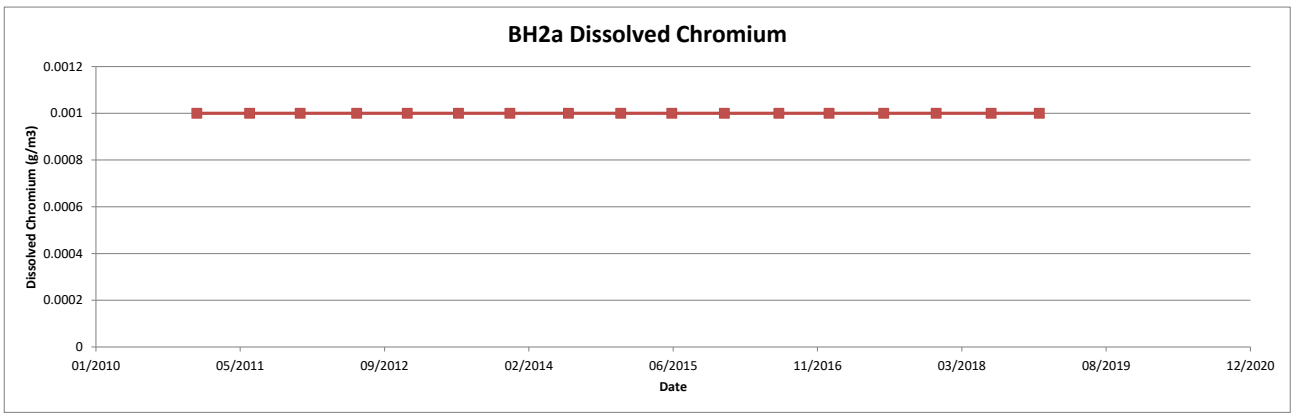

BH2a Dissolved Arsenic
Dissolved Arsenic (g/m3)
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

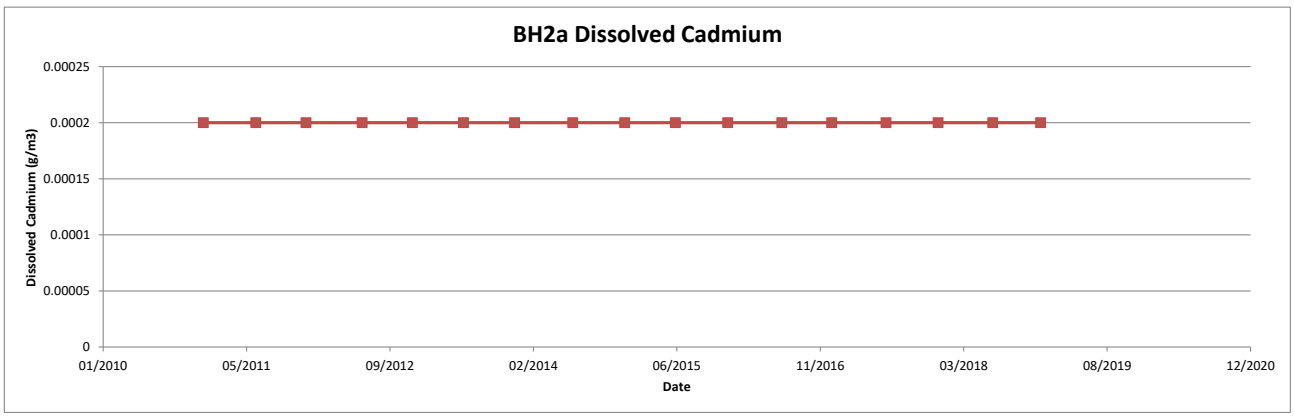

BH2a Dissolved Copper
Dissolved Copper (g/m3)
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

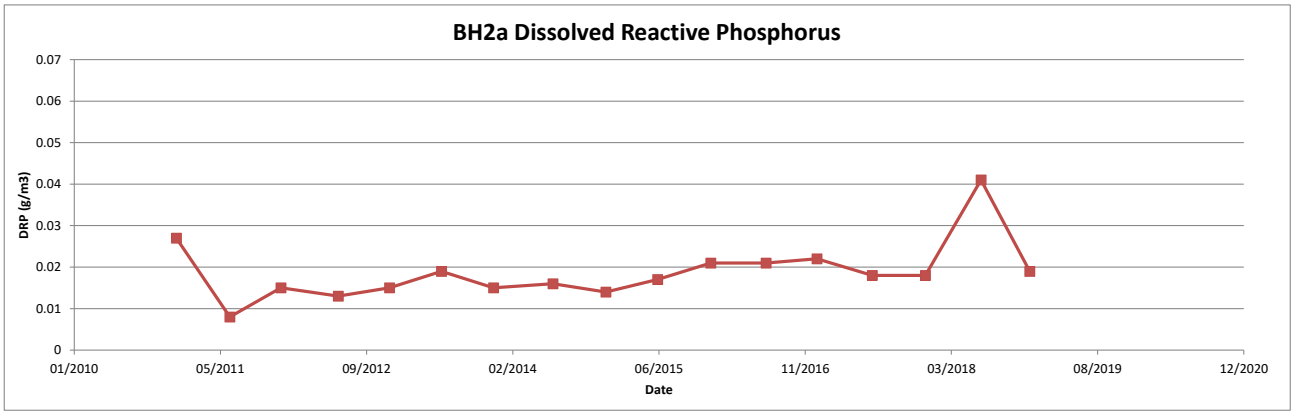

BH2a Dissolved Lead
Dissolved Lead (g/m3)
0.0018
0.0016
0.0014
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

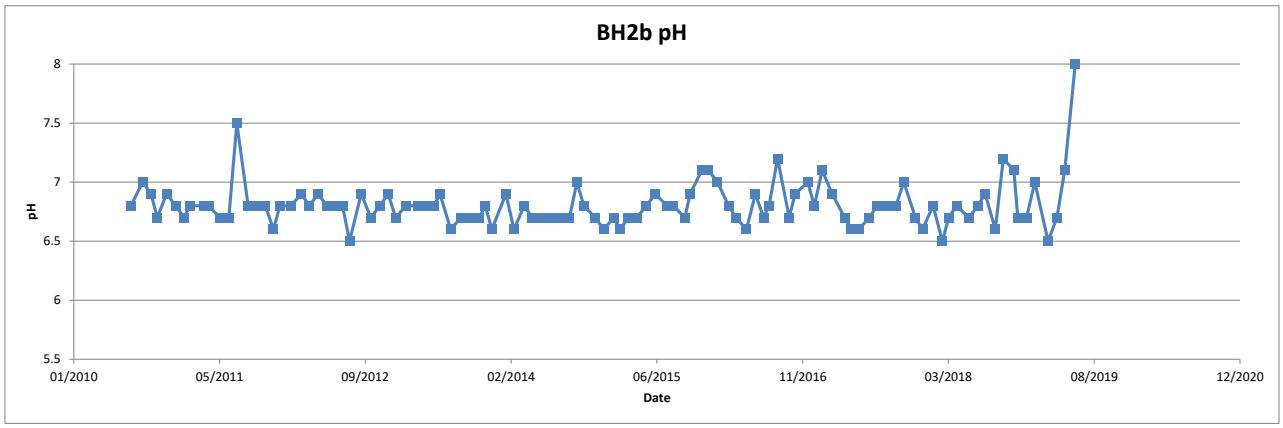

BH2a Dissolved Zinc
Dissolved Zinc (g/m3)
0.05
0.04
0.03
0.02
0.01
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

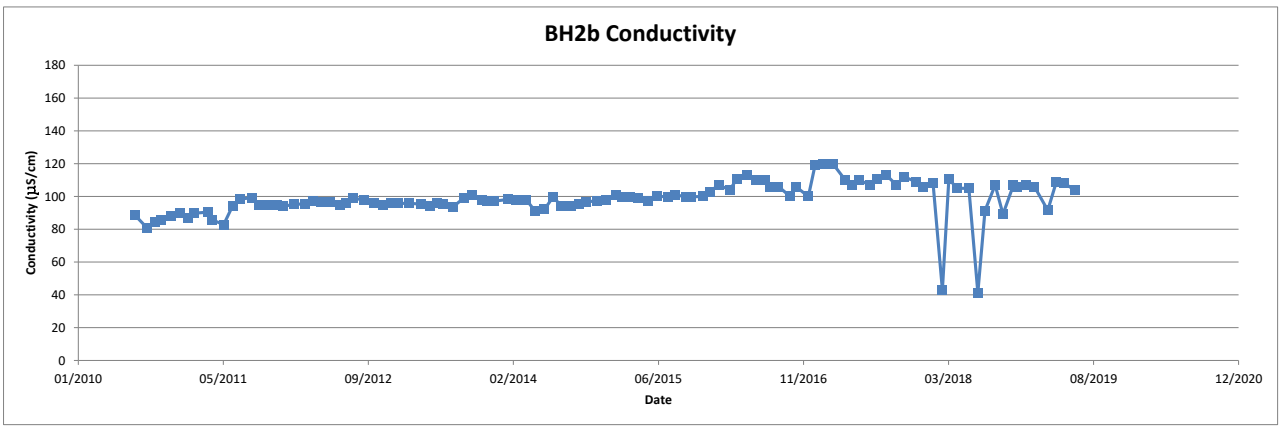

BH2a Dissolved Nickel
Dissolved Nickel (g/m3)
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

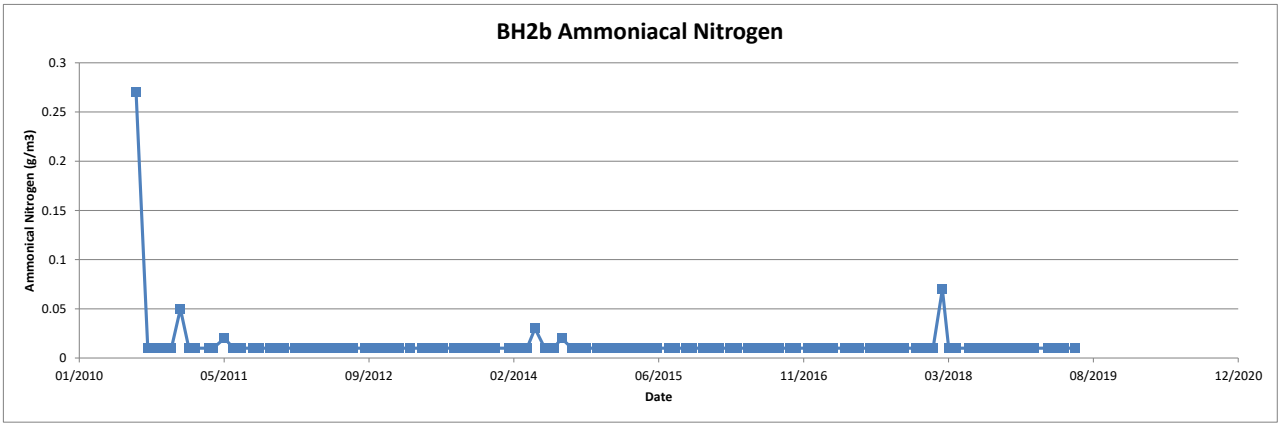

BH2a Dissolved Chromium
Dissolved Chromium (g/m3)
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

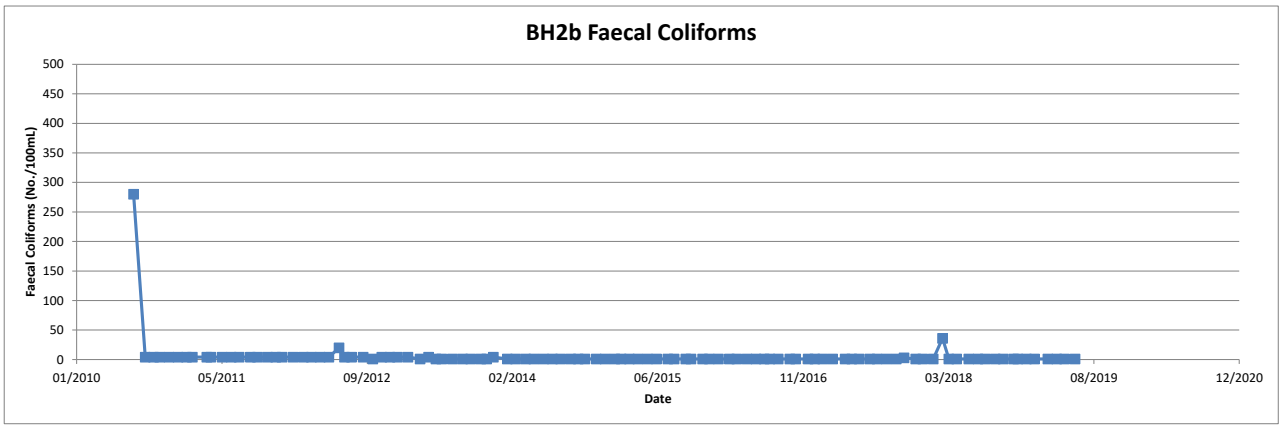

BH2a Dissolved Cadmium
Dissolved Cadmium (g/m3)
0.00025
0.0002
0.00015
0.0001
0.00005
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

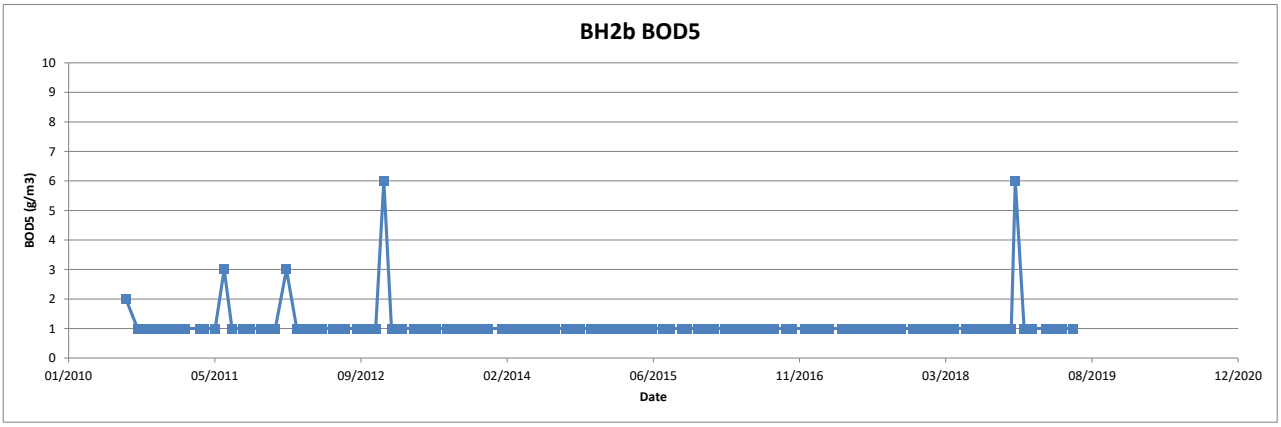

BH2a Dissolved Reactive Phosphorus
DRP (g/m3)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

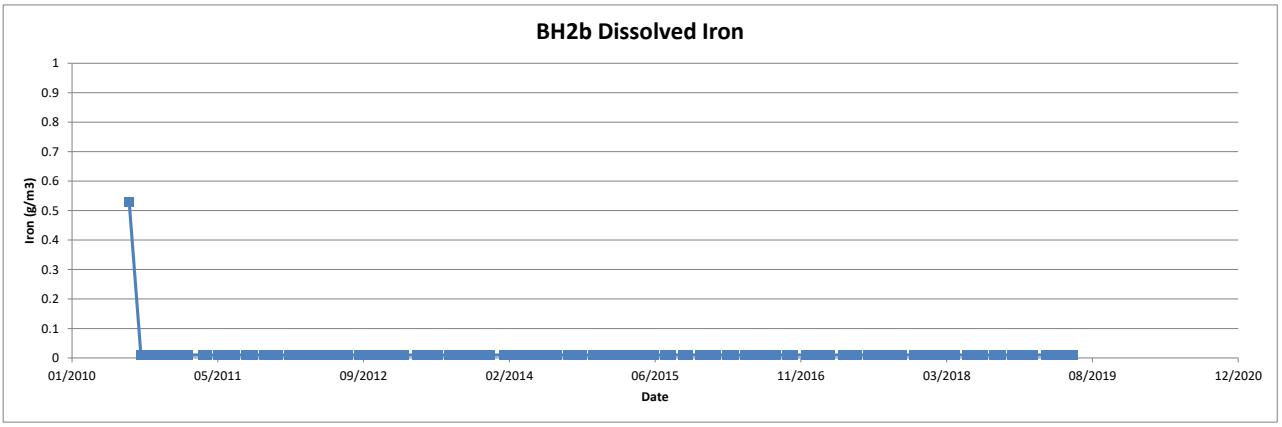

BH2b pH
pH
8
7.5
7
6.5
6
5.5
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

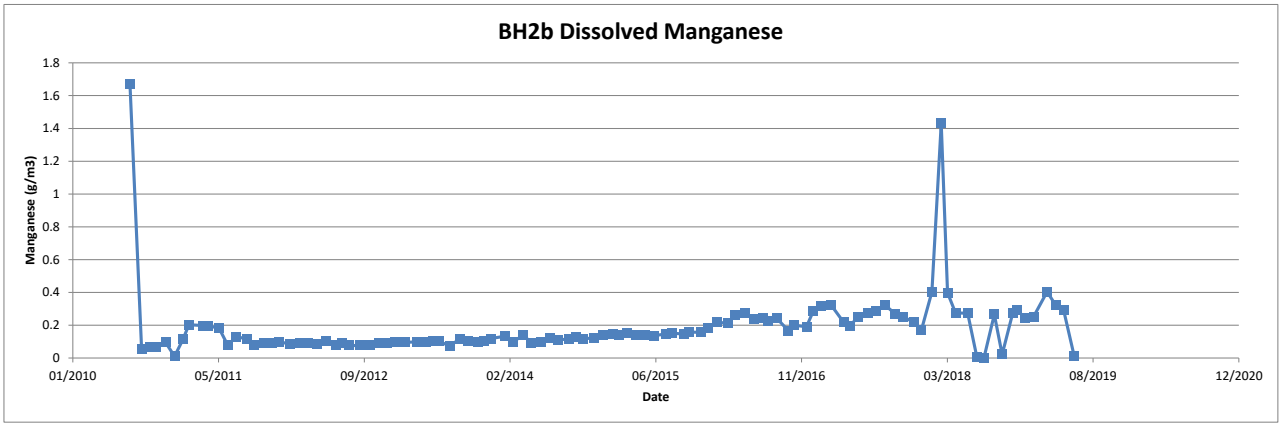

BH2b Conductivity
Conductivity (µS/cm)
180
160
140
120
100
80
60
40
20
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

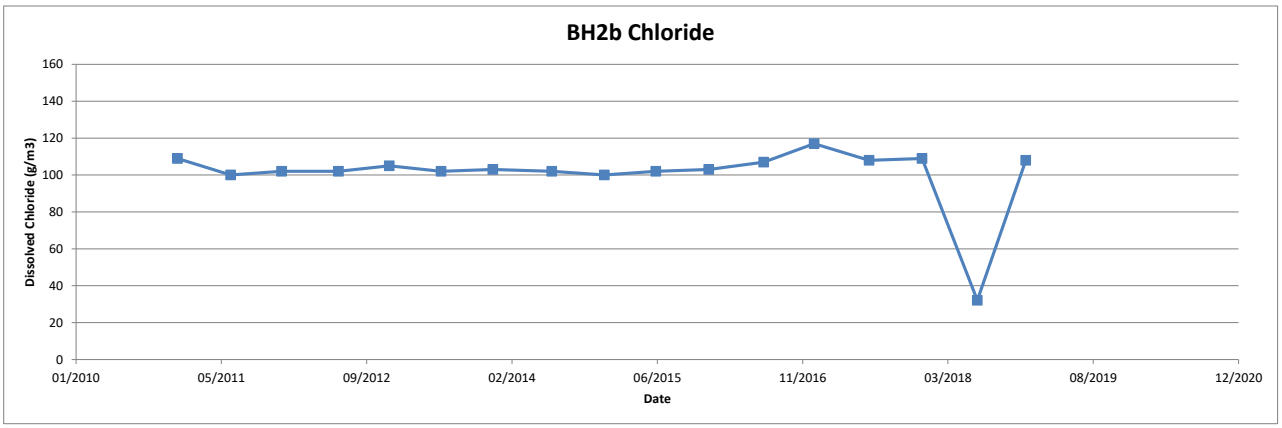

BH2b Ammoniacal Nitrogen
Ammonical Nitrogen (g/m3)
0.3
0.25
0.2
0.15
0.1
0.05
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

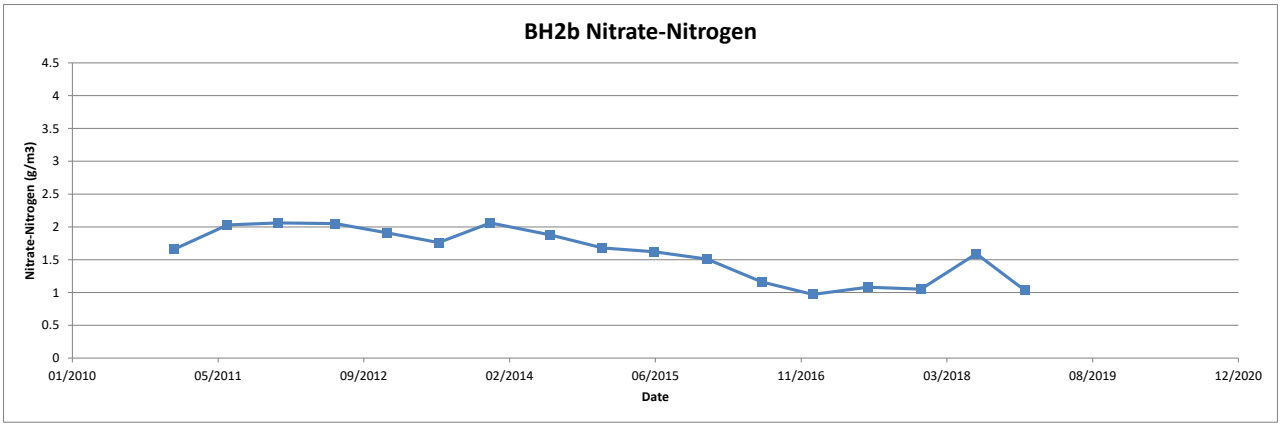

BH2b Faecal Coliforms
Faecal Coliforms (No./100mL)
500
450
400
350
300
250
200
150
100
50
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

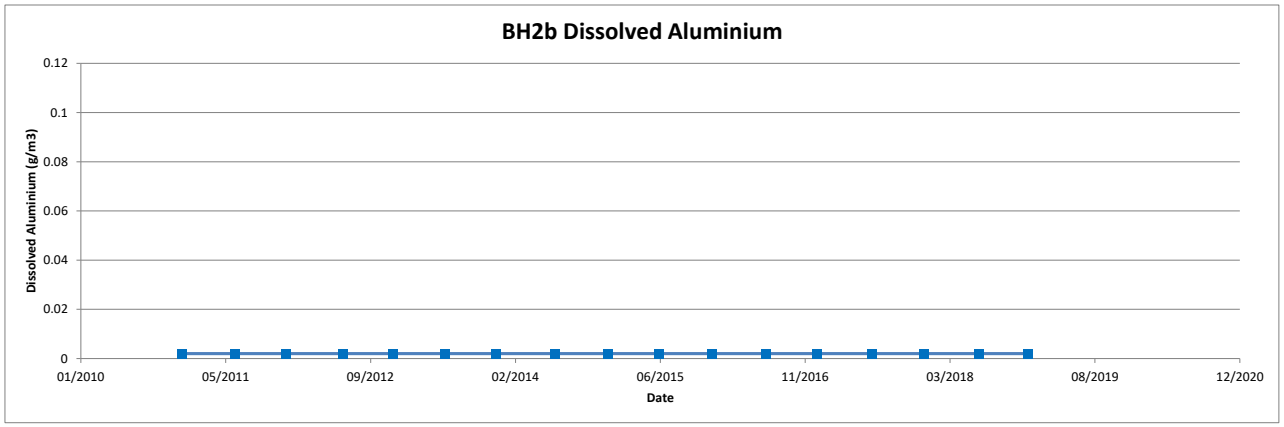

BH2b BOD5
BOD5 (g/m3)
10
9
8
7
6
5
4
3
2
1
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

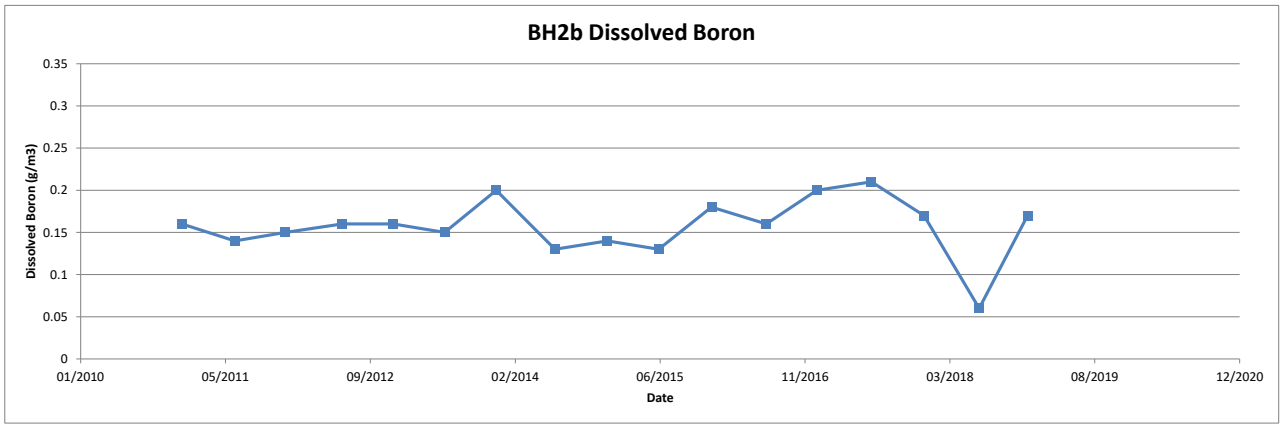

BH2b Dissolved Iron
Iron (g/m3)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

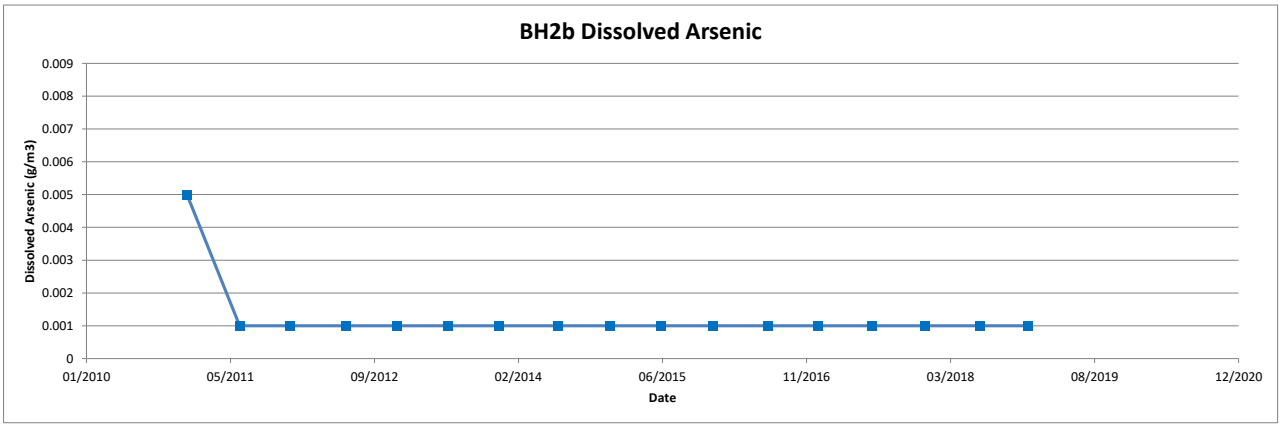

BH2b Dissolved Manganese
Manganese (g/m3)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

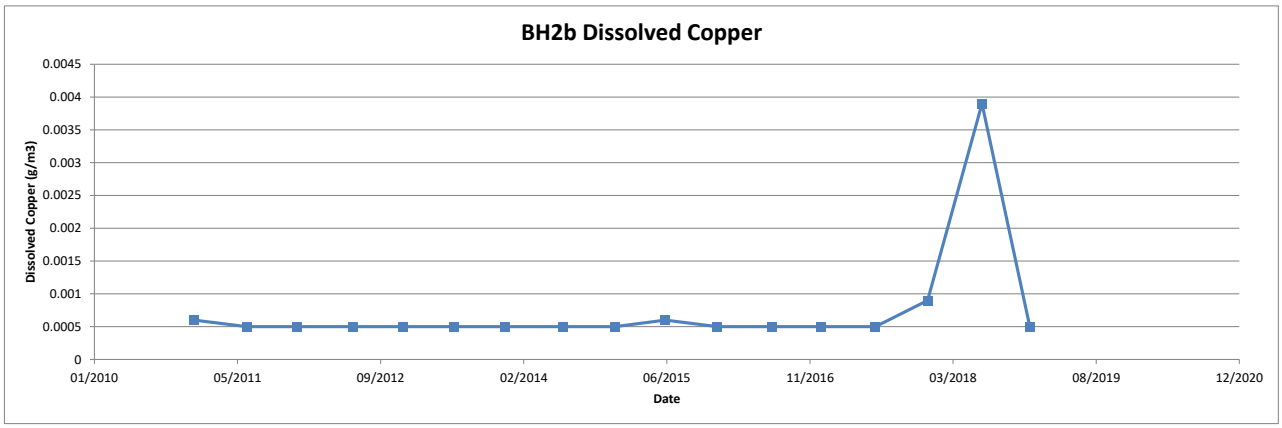

BH2b Chloride
Dissolved Chloride (g/m3)
160
140
120
100
80
60
40
20
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

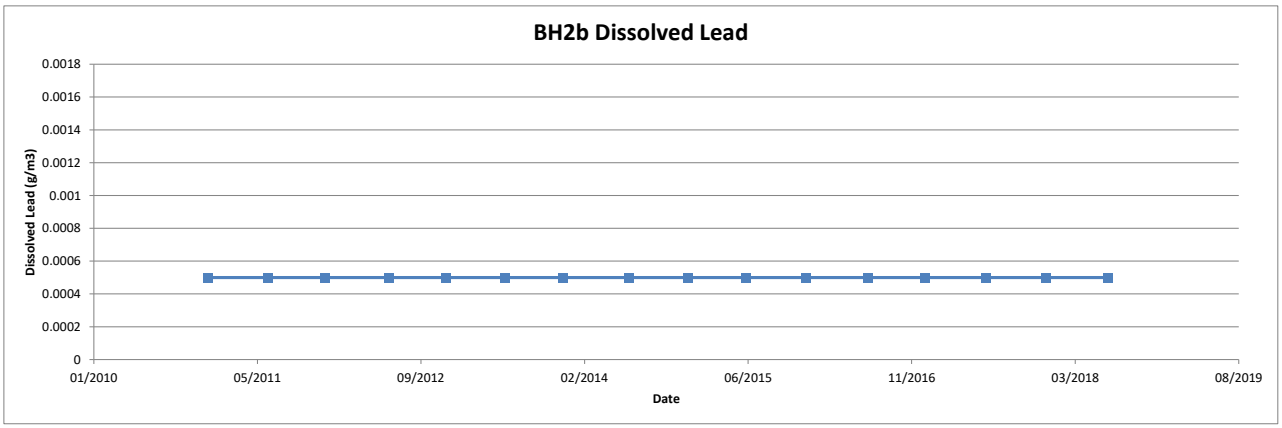

BH2b Nitrate-Nitrogen
Nitrate-Nitrogen (g/m3)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

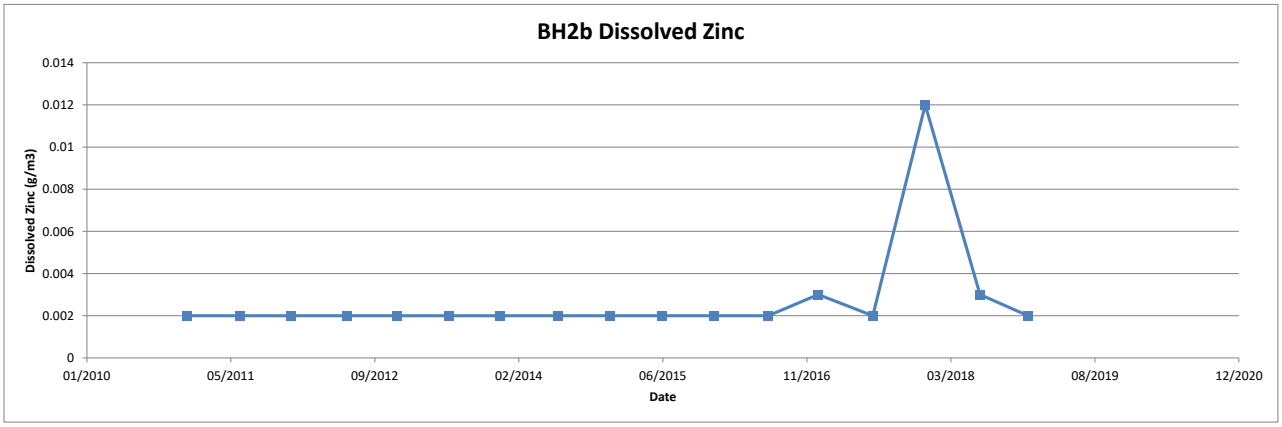

BH2b Dissolved Aluminium
Dissolved Aluminium (g/m3)
0.12
0.1
0.08
0.06
0.04
0.02
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

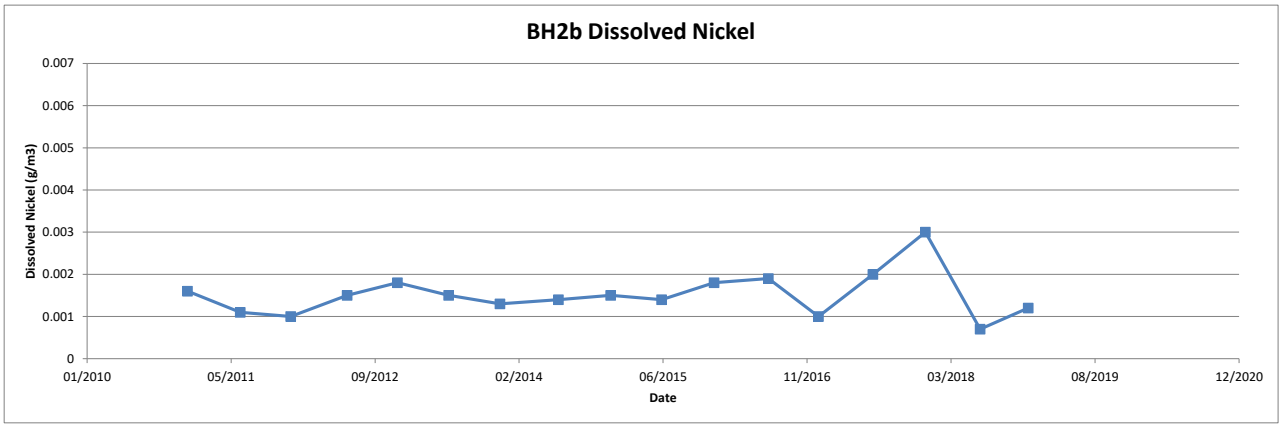

BH2b Dissolved Boron
Dissolved Boron (g/m3)
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

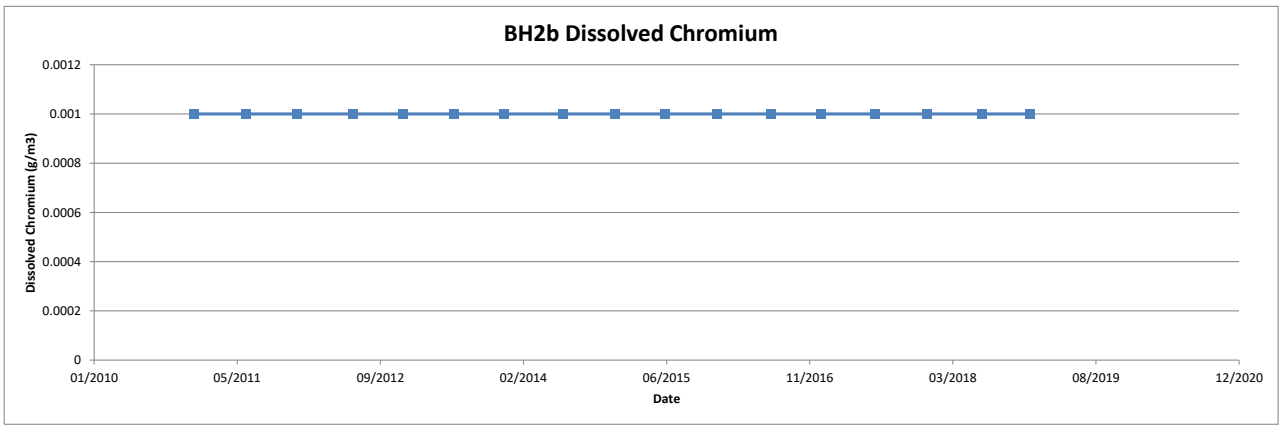

BH2b Dissolved Arsenic
Dissolved Arsenic (g/m3)
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

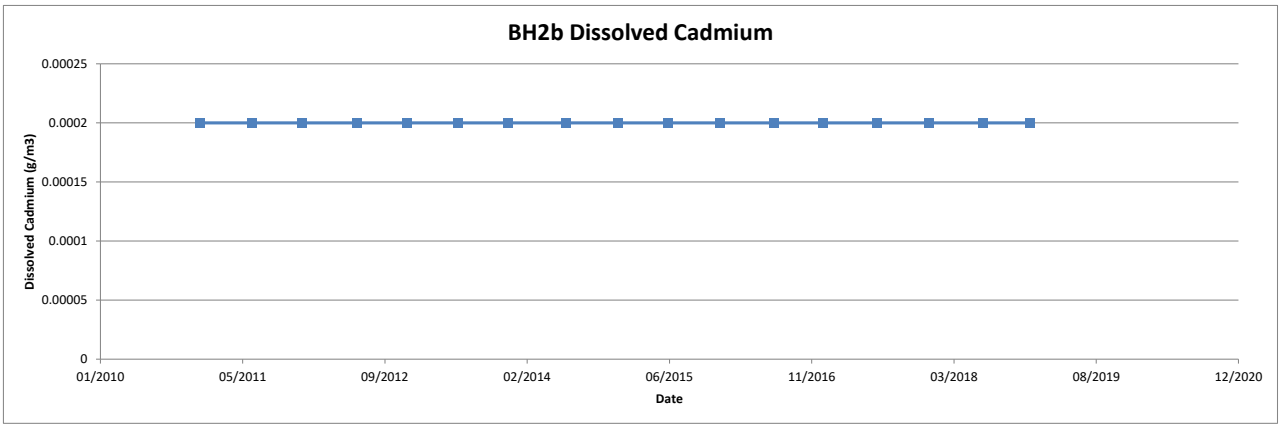

BH2b Dissolved Copper
Dissolved Copper (g/m3)
0.0045
0.004
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

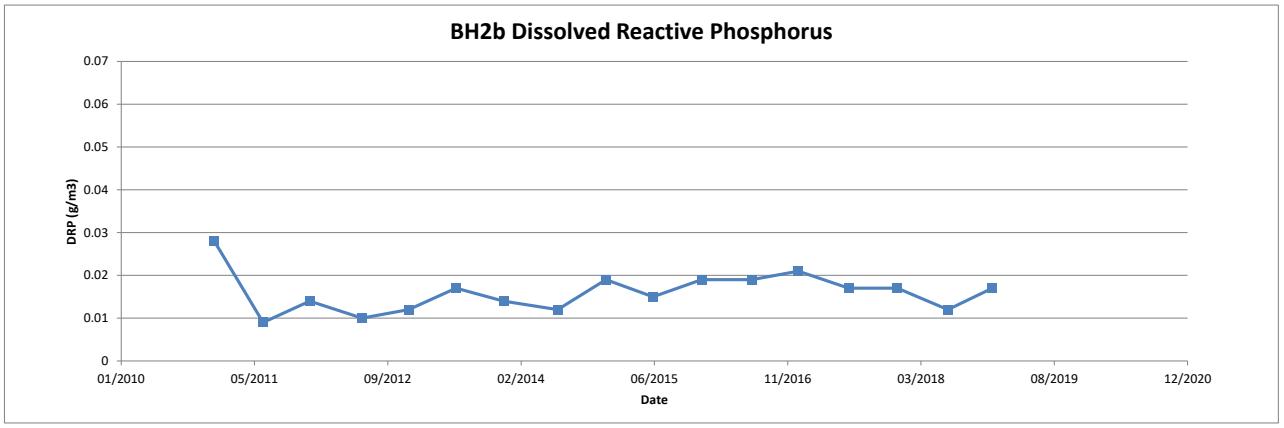

BH2b Dissolved Lead
Dissolved Lead (g/m3)
0.0018
0.0016
0.0014
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
Date

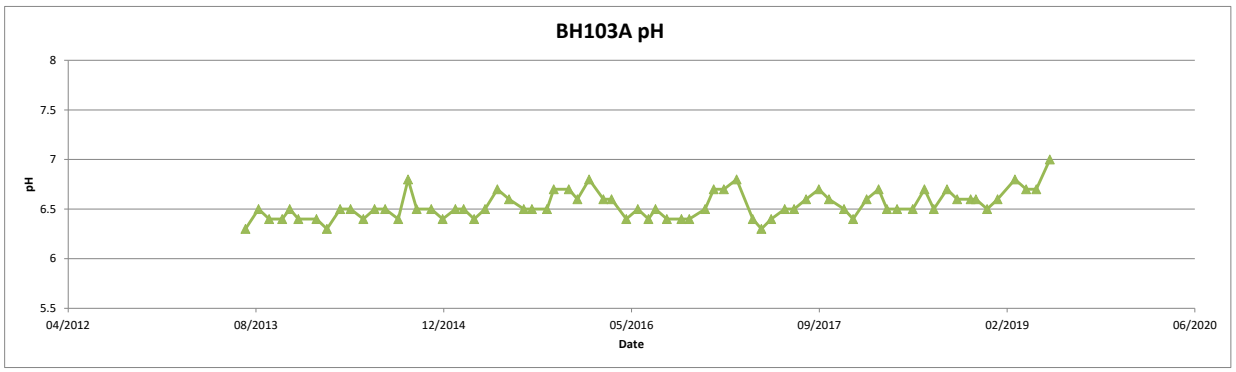

BH2b Dissolved Zinc
Dissolved Zinc (g/m3)
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

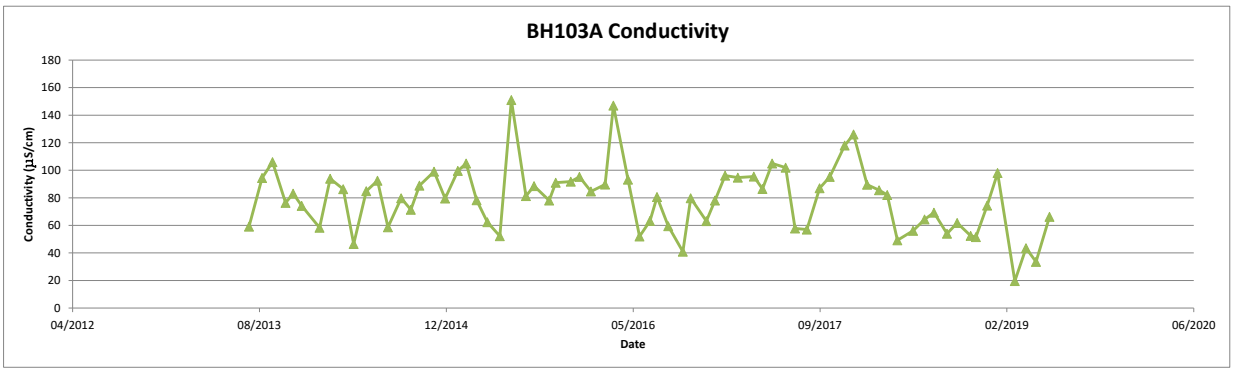

BH2b Dissolved Nickel
Dissolved Nickel (g/m3)
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

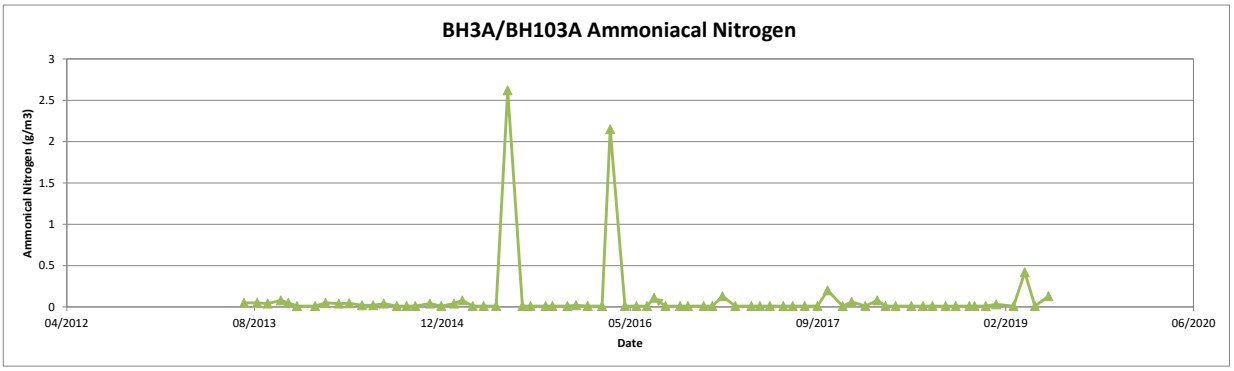

BH2b Dissolved Chromium
Dissolved Chromium (g/m3)
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

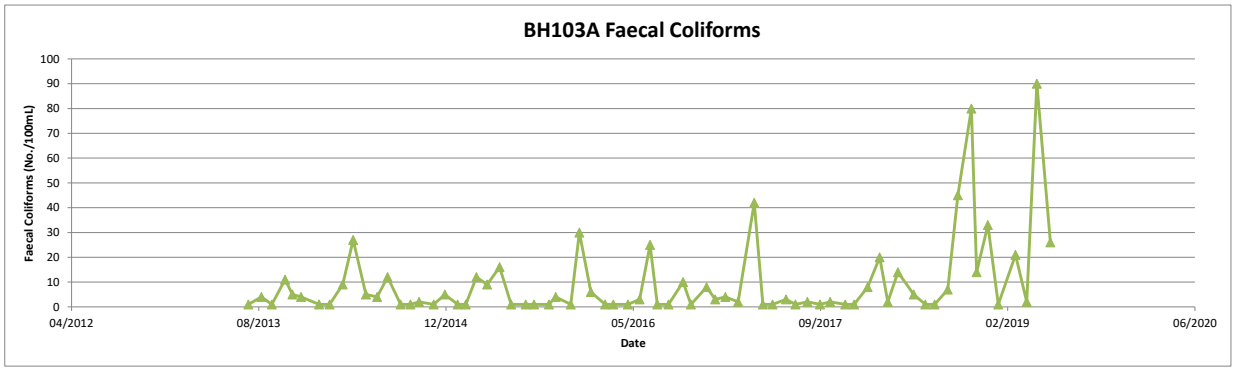

BH2b Dissolved Cadmium
Dissolved Cadmium (g/m3)
0.00025
0.0002
0.00015
0.0001
0.00005
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

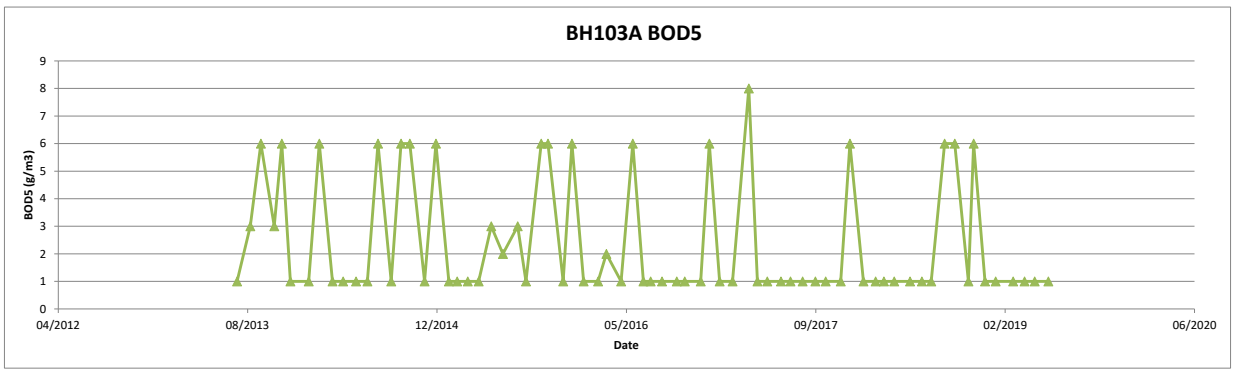

BH2b Dissolved Reactive Phosphorus
DRP (g/m3)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

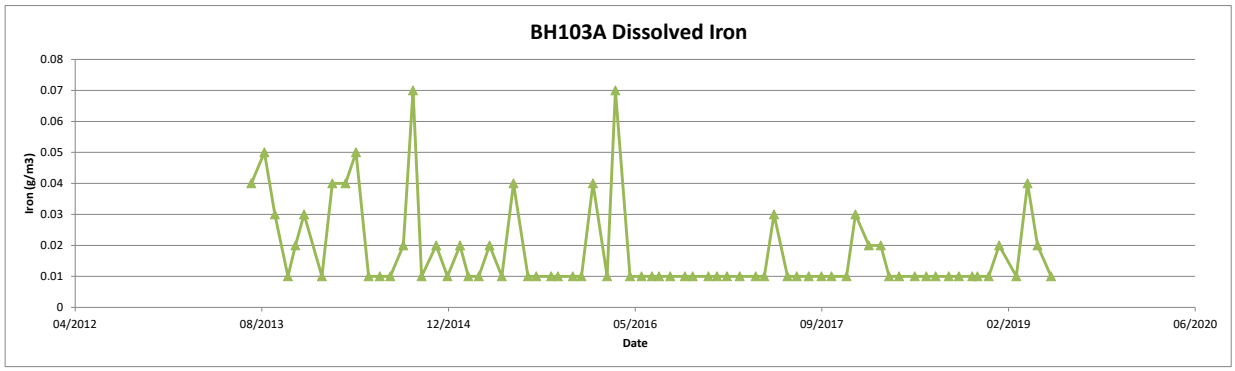

BH103A pH
pH
8
7.5
7
6.5
6
5.5
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
Date

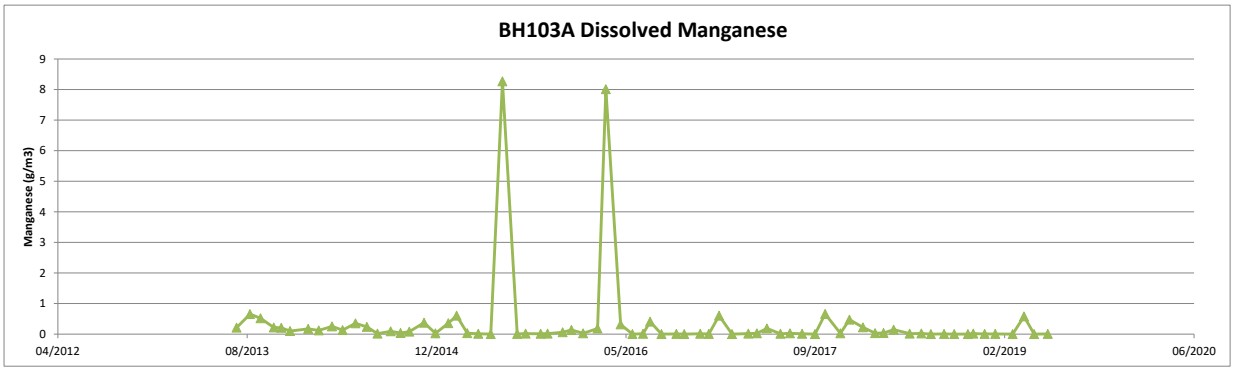

BH103A Conductivity
Conductivity (µS/cm)
180
160
140
120
100
80
60
40
20
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
Date

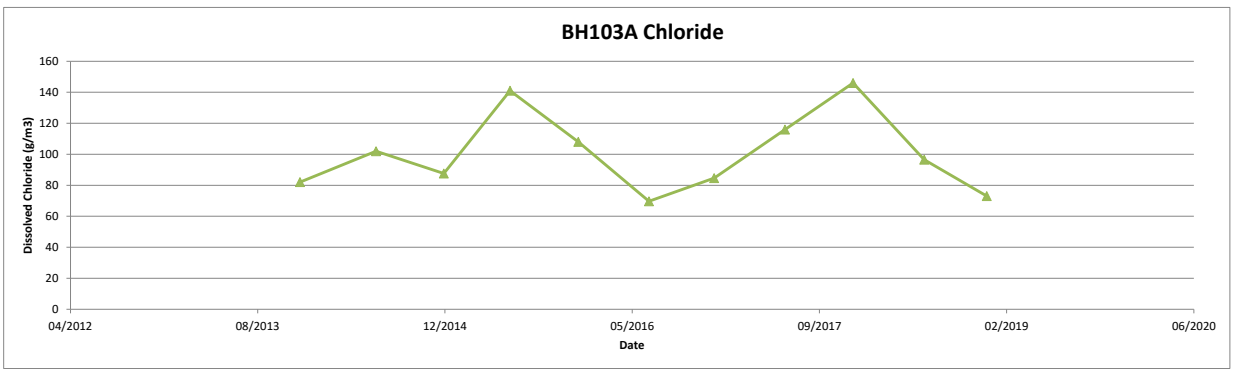

BH3A/BH103A Ammoniacal Nitrogen
Ammonical Nitrogen (g/m3)
3
2.5
2
1.5
1
0.5
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
Date

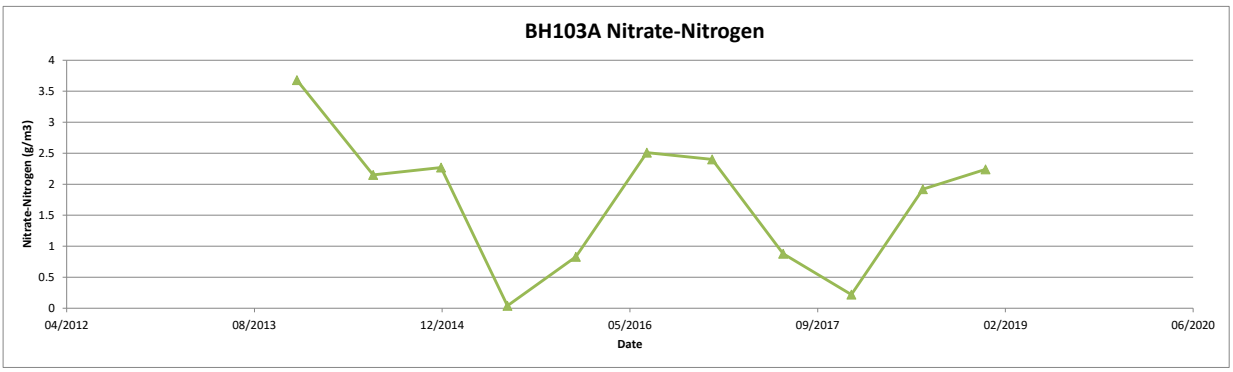

BH103A Faecal Coliforms
Faecal Coliforms (No./100mL)
100
90
80
70
60
50
40
30
20
10
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
Date

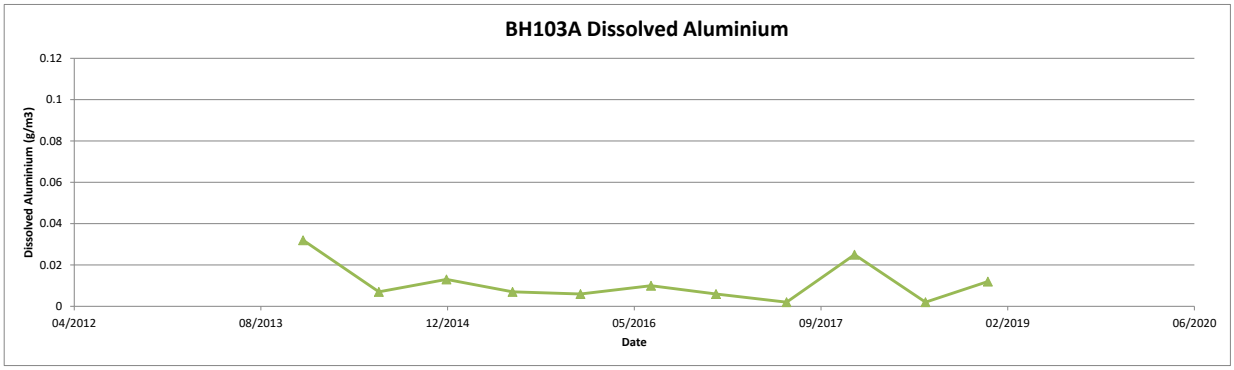

BH103A BOD5
BOD5 (g/m3)
9
8
7
6
5
4
3
2
1
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
Date

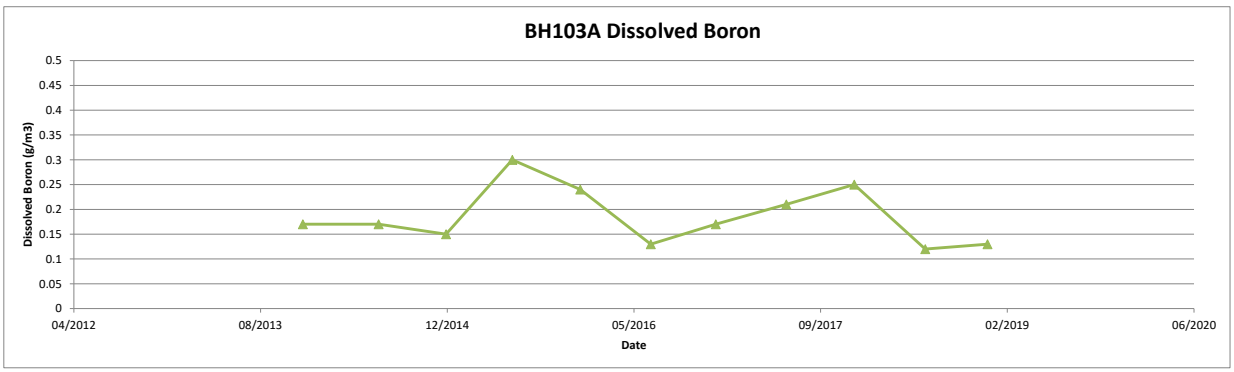

BH103A Dissolved Iron
Iron (g/m3)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
Date

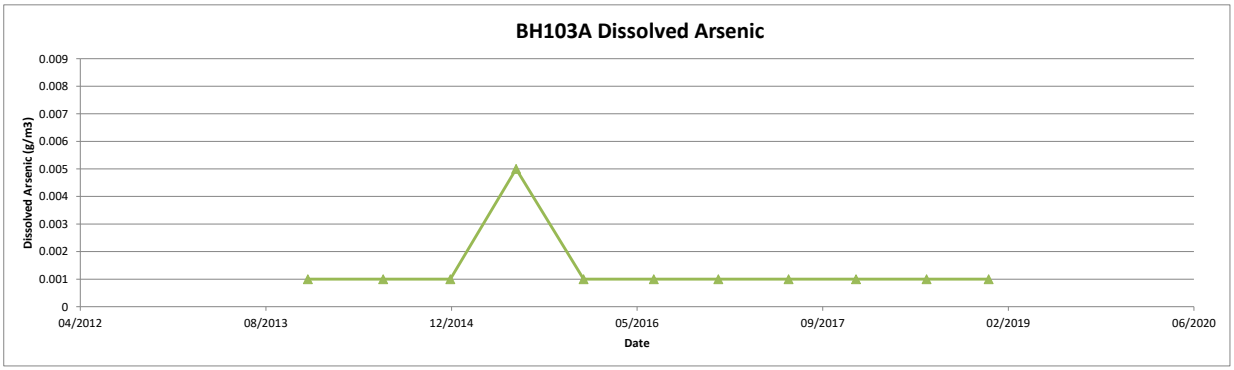

BH103A Dissolved Manganese
Manganese (g/m3)
9
8
7
6
5
4
3
2
1
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020

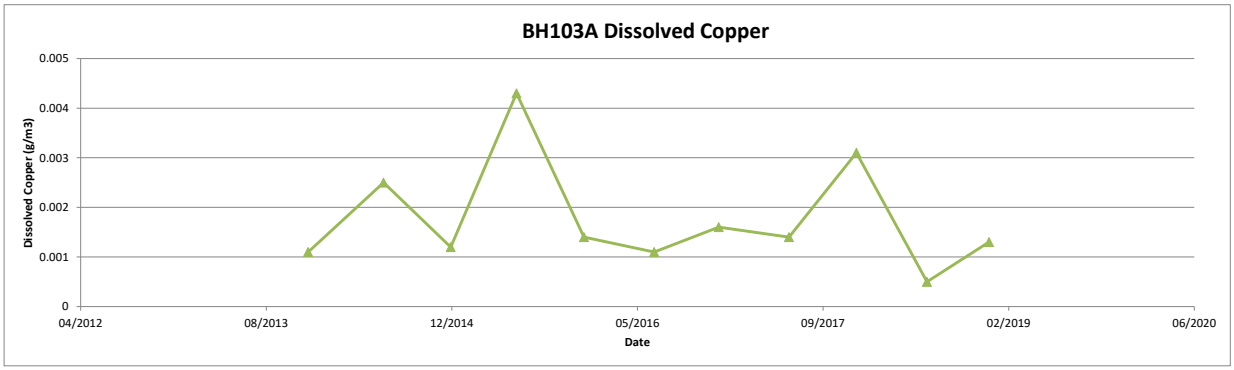

BH103A Chloride
Dissolved Chloride (g/m3)
160
140
120
100
80
60
40
20
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
Date

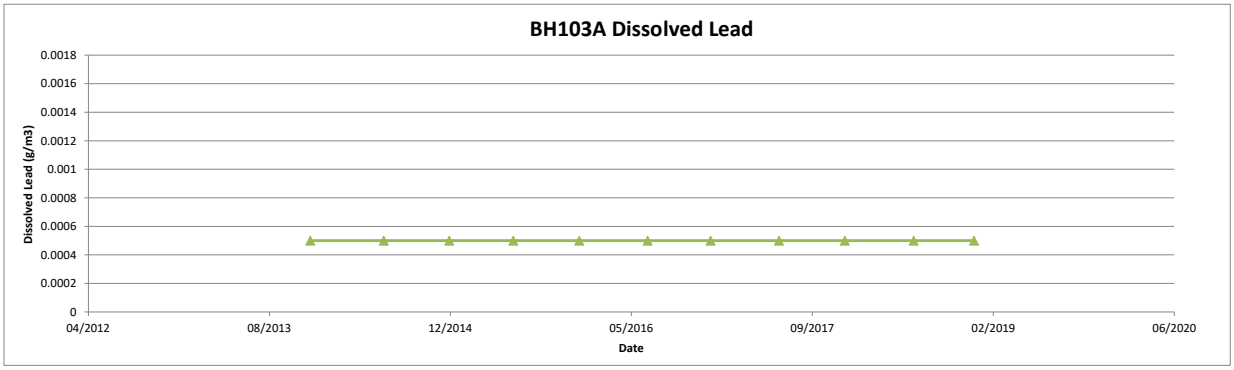

BH103A Nitrate-Nitrogen
Nitrate-Nitrogen (g/m3)
4
3.5
3
2.5
2
1.5
1
0.5
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
Date

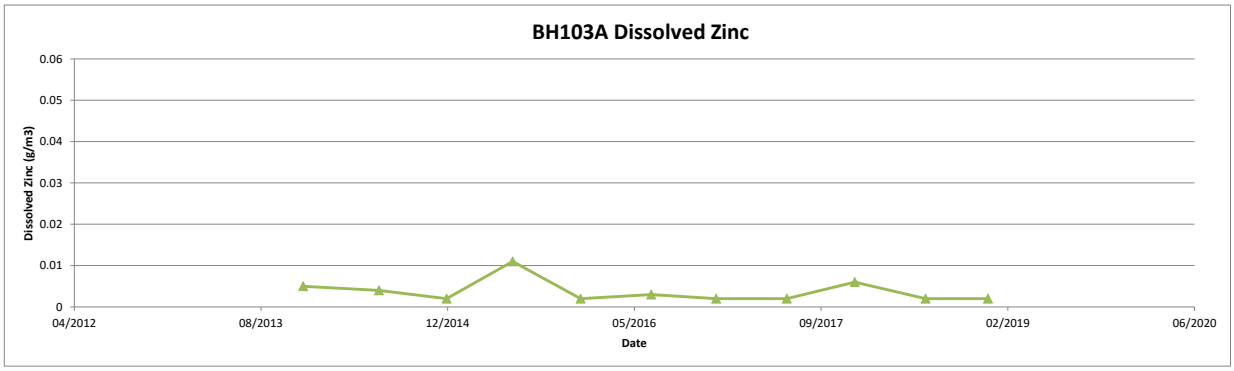

BH103A Dissolved Aluminium
Dissolved Aluminium (g/m3)
0.12
0.1
0.08
0.06
0.04
0.02
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
Date

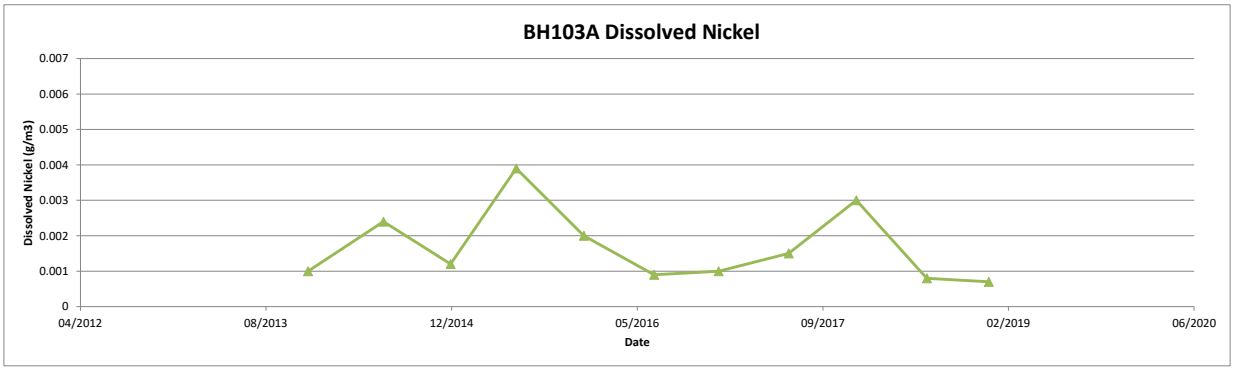

BH103A Dissolved Boron
Dissolved Boron (g/m3)
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
Date

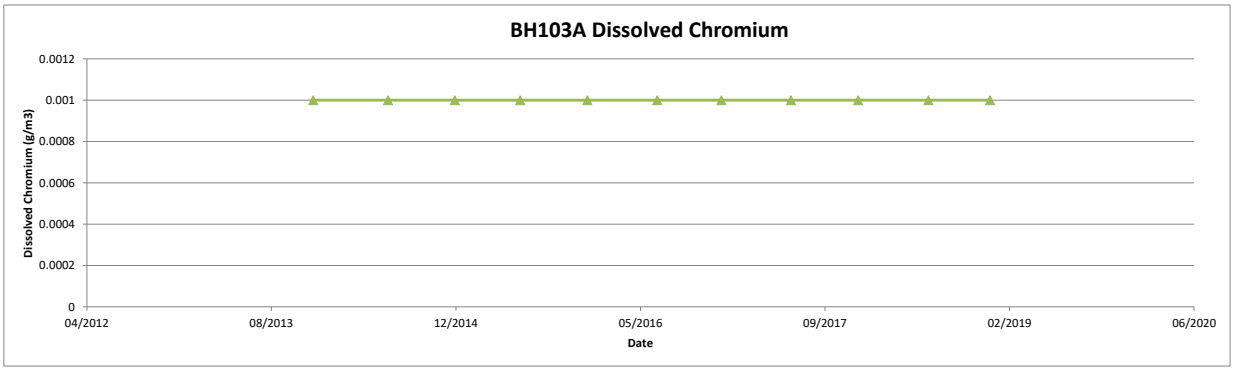

BH103A Dissolved Arsenic
Dissolved Arsenic (g/m3)
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
Date

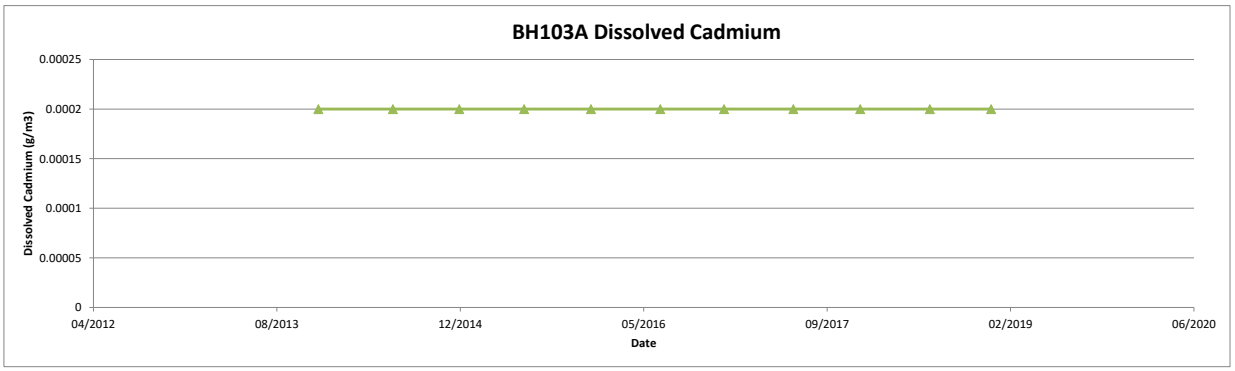

BH103A Dissolved Copper
Dissolved Copper (g/m3)
0.005
0.004
0.003
0.002
0.001
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
Date

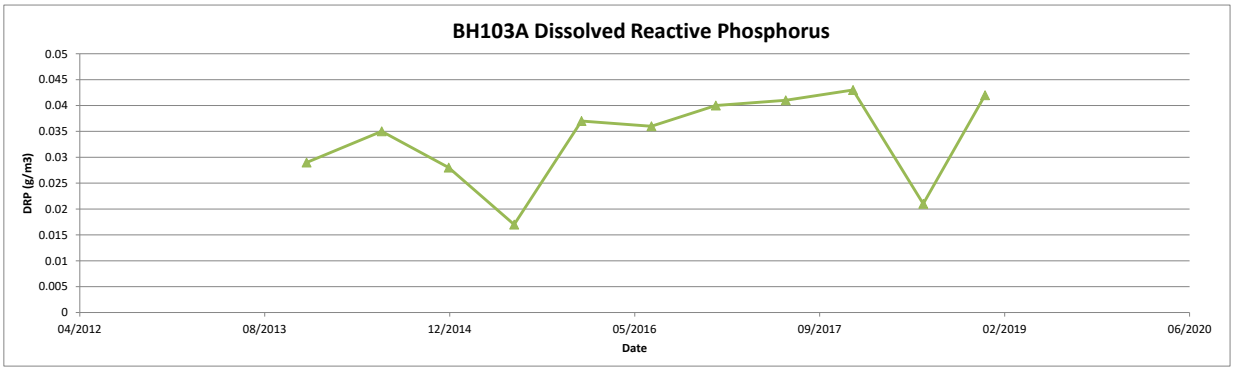

BH103A Dissolved Lead
Dissolved Lead (g/m3)
0.0018
0.0016
0.0014
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
Date

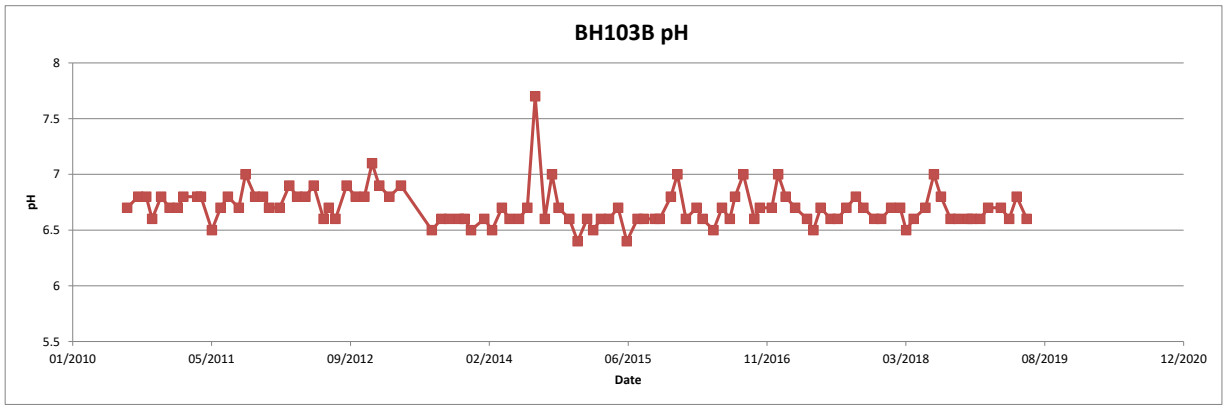

BH103A Dissolved Zinc
Dissolved Zinc (g/m3)
0.06
0.05
0.04
0.03
0.02
0.01
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
Date

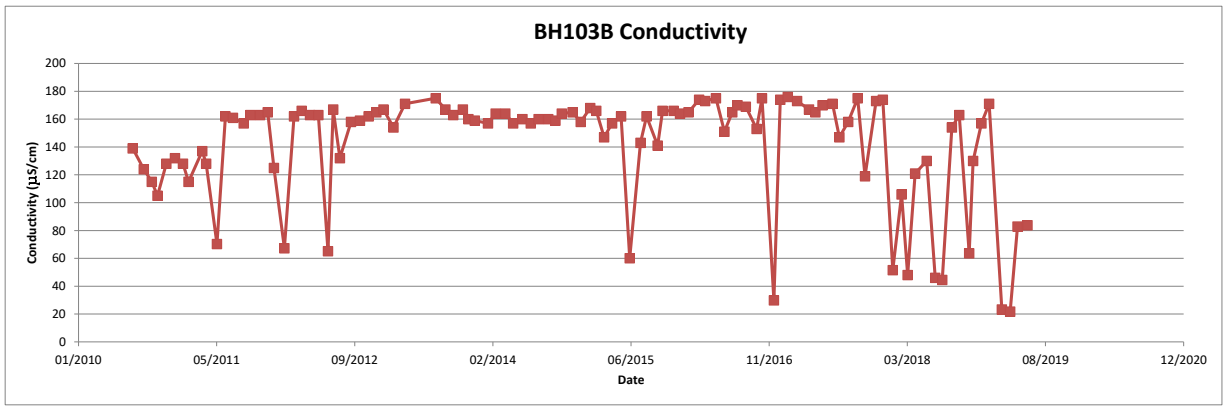

BH103A Dissolved Nickel
Dissolved Nickel (g/m3)
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
Date

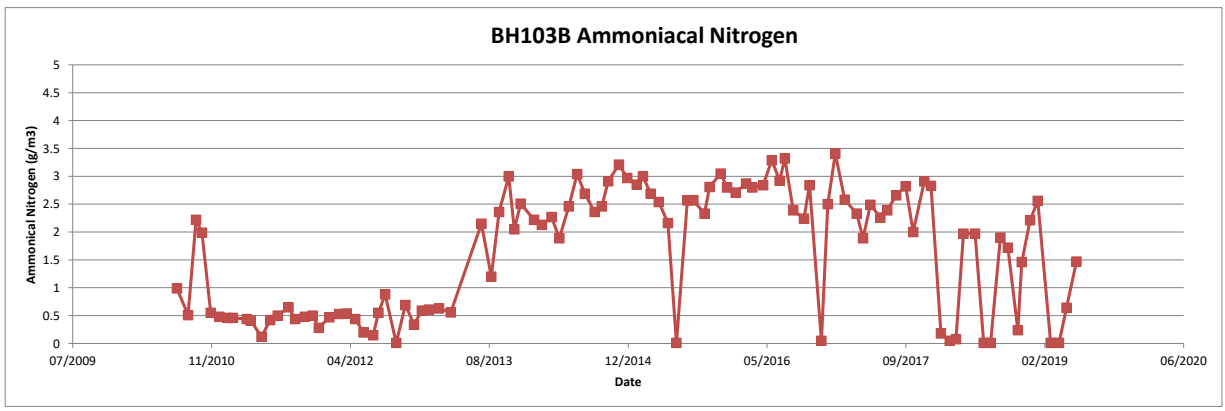

BH103A Dissolved Chromium
Dissolved Chromium (g/m3)
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
Date

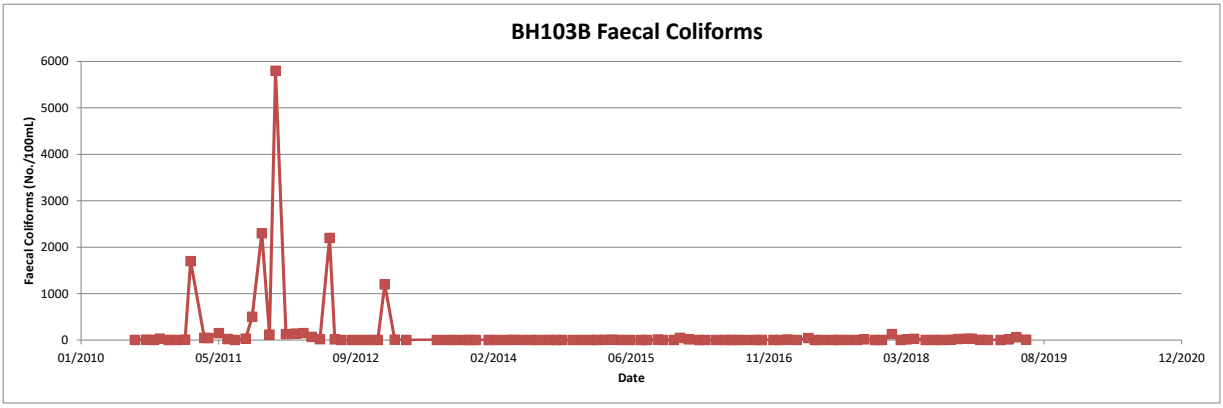

BH103A Dissolved Cadmium
Dissolved Cadmium (g/m3)
0.00025
0.0002
0.00015
0.0001
0.00005
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
Date

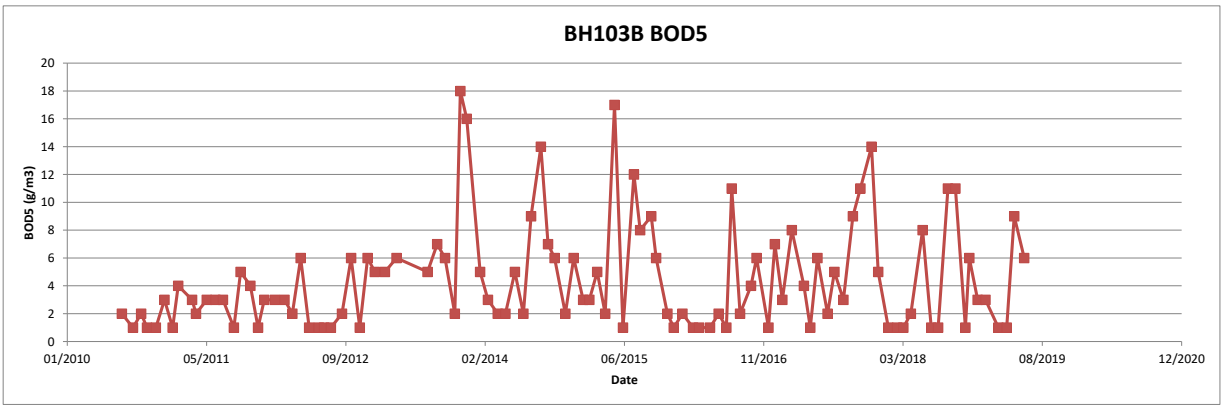

BH103A Dissolved Reactive Phosphorus
DRP (g/m3)
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
Date

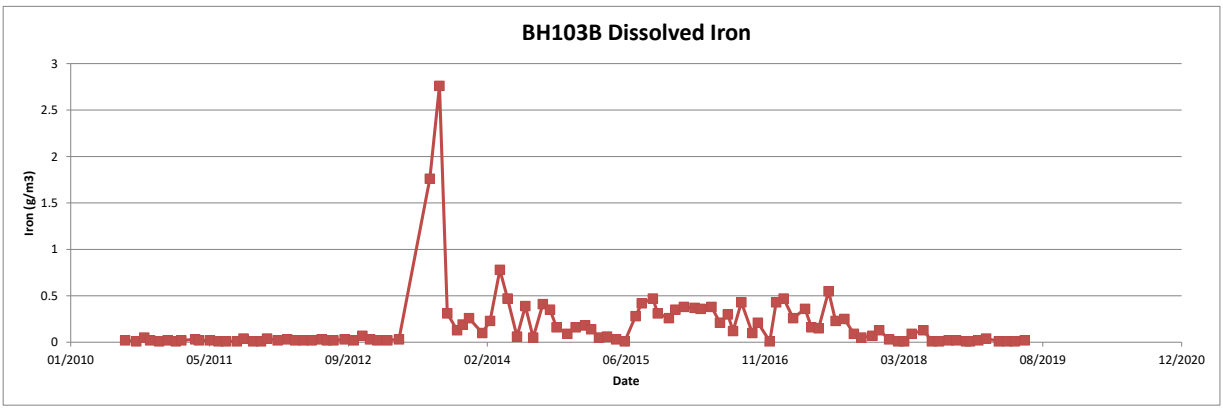

BH103B pH
pH
8
7.5
7
6.5
6
5.5
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

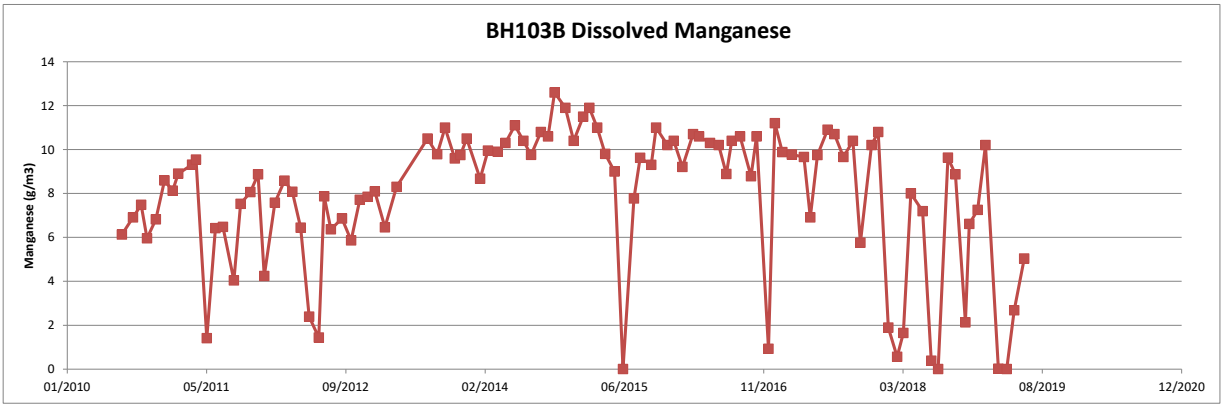

BH103B Conductivity
Conductivity (µS/cm)
200
180
160
140
120
100
80
60
40
20
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

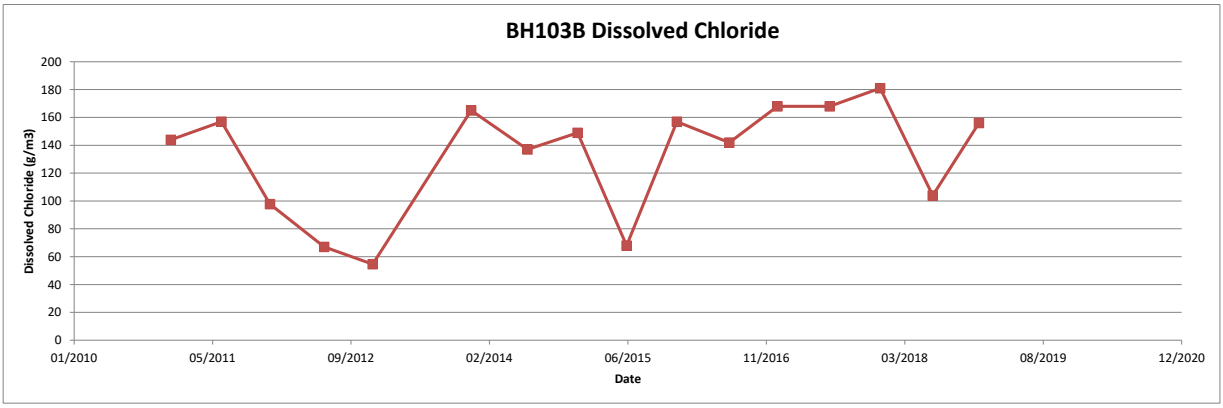

BH103B Ammoniacal Nitrogen
Ammonical Nitrogen (g/m3)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
07/2009
11/2010
04/2012
08/2013
12/2014
05/2016
09/2017
02/2019
06/2020
Date

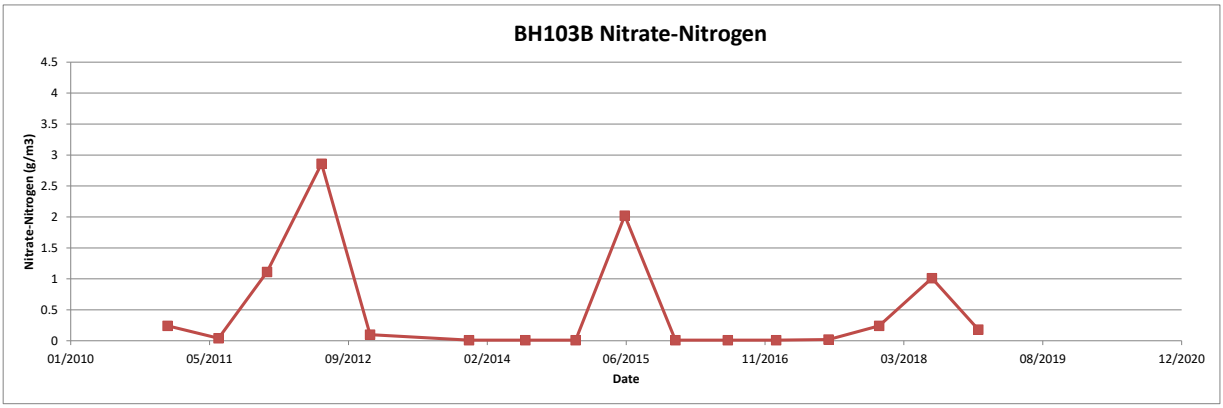

BH103B Faecal Coliforms
Faecal Coliforms (No./100mL)
6000
5000
4000
3000
2000
1000
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

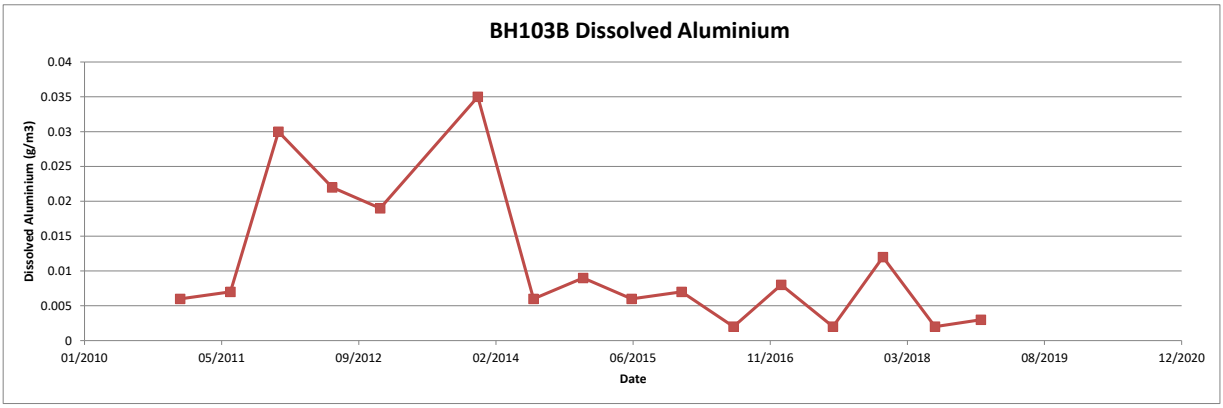

BH103B BOD5
BOD5 (g/m3)
20
18
16
14
12
10
8
6
4
2
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

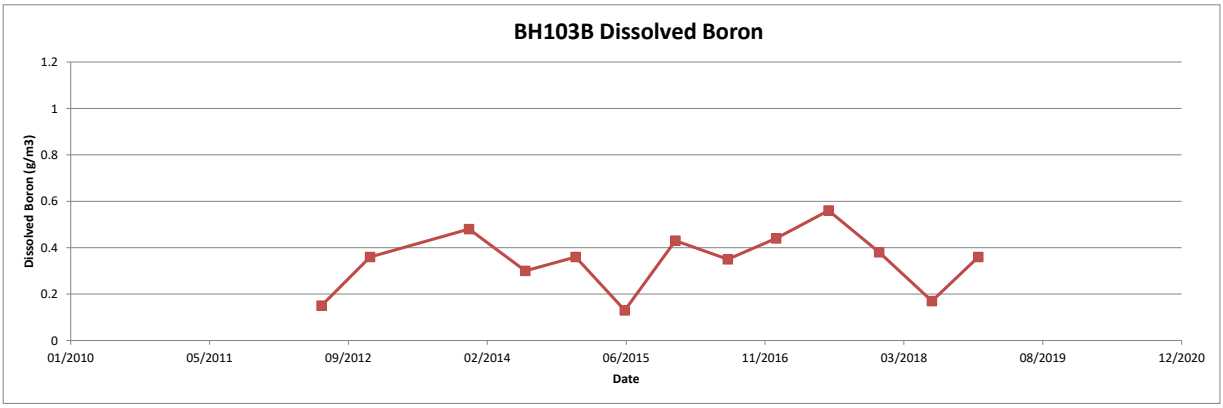

BH103B Dissolved Iron
Iron (g/m3)
3
2.5
2
1.5
1
0.5
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

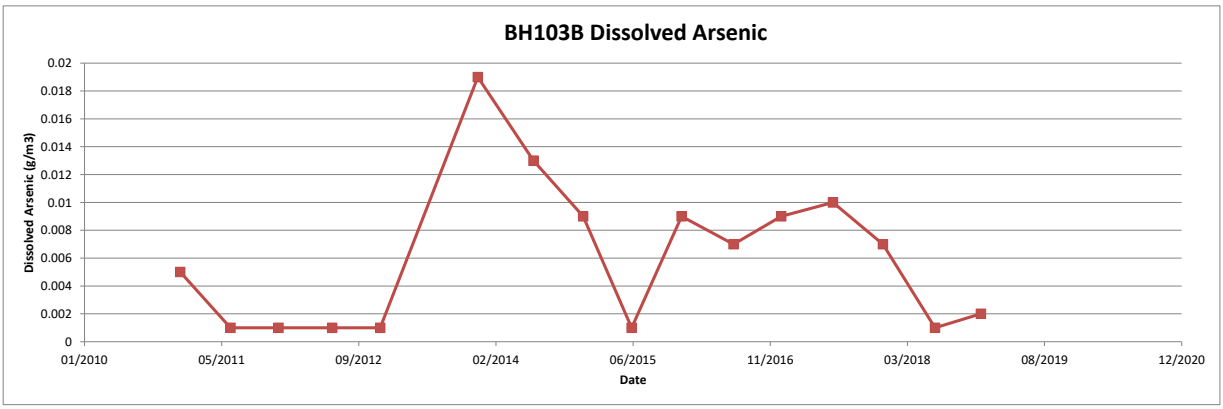

BH103B Dissolved Manganese
Manganese (g/m3)
0
2
4
6
8
10
12
14
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020

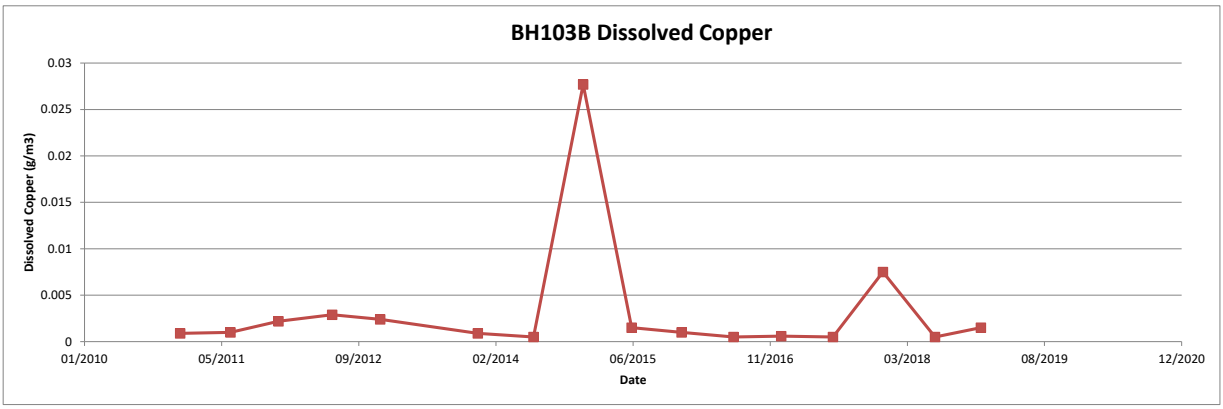

BH103B Dissolved Chloride
Dissolved Chloride (g/m3)
0
20
40
60
80
100
120
140
160
180
200
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

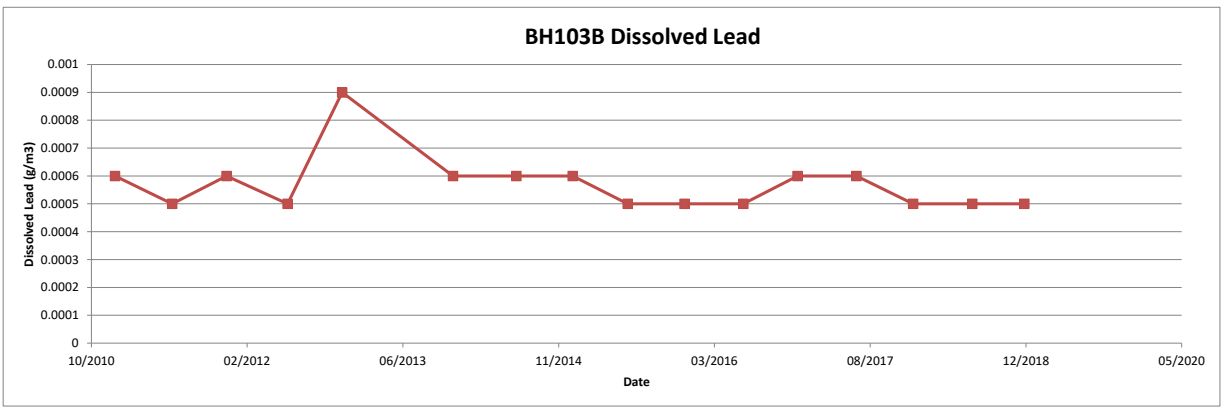

BH103B Nitrate-Nitrogen
Nitrate-Nitrogen (g/m3)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

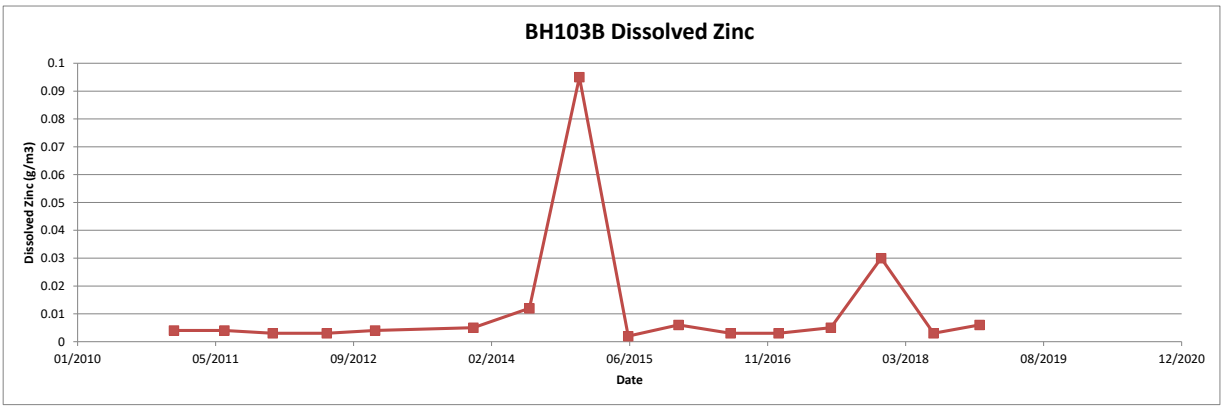

BH103B Dissolved Aluminium
Dissolved Aluminium (g/m3)
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

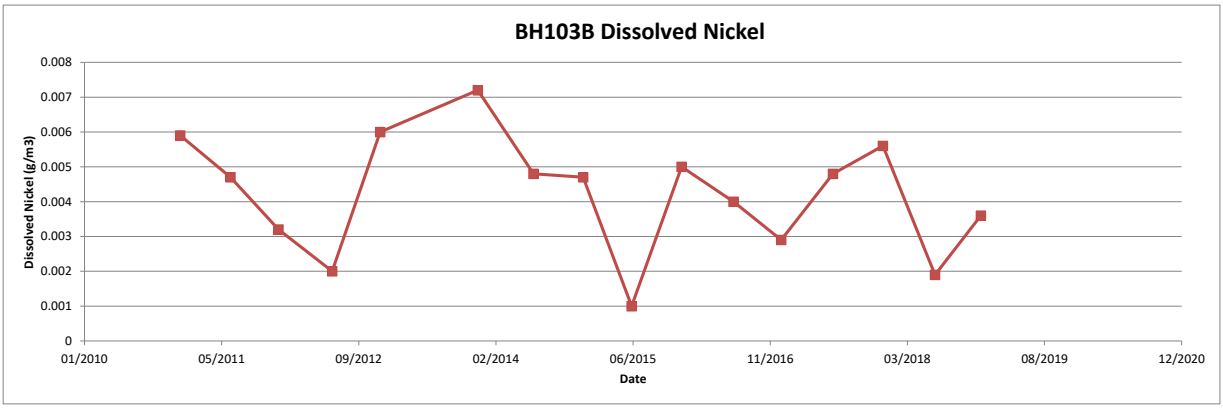

BH103B Dissolved Boron
Dissolved Boron (g/m3)
1.2
1
0.8
0.6
0.4
0.2
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

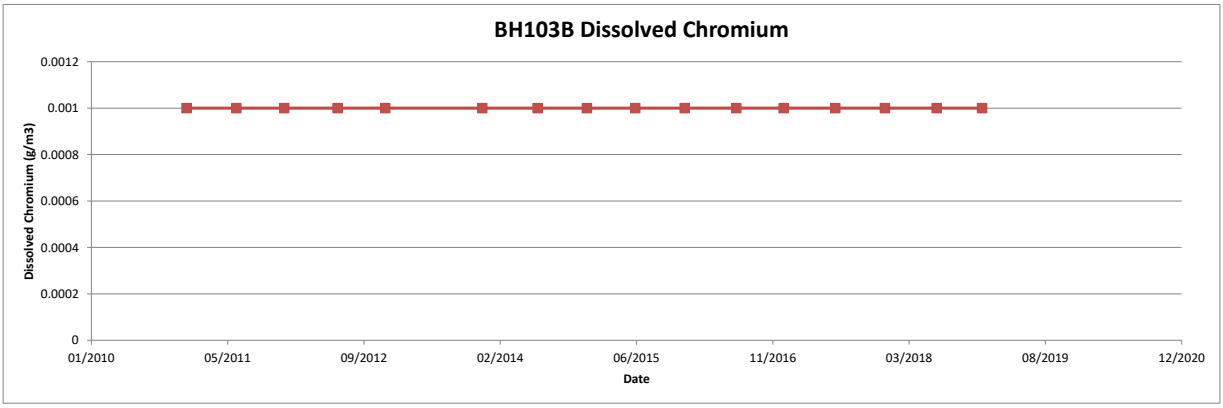

BH103B Dissolved Arsenic
Dissolved Arsenic (g/m3)
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

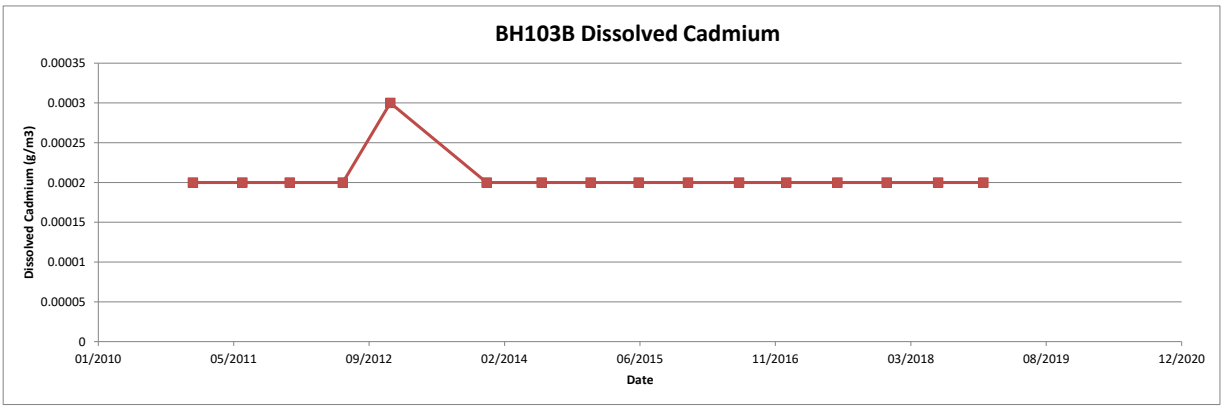

BH103B Dissolved Copper
Dissolved Copper (g/m3)
0.03
0.025
0.02
0.015
0.01
0.005
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

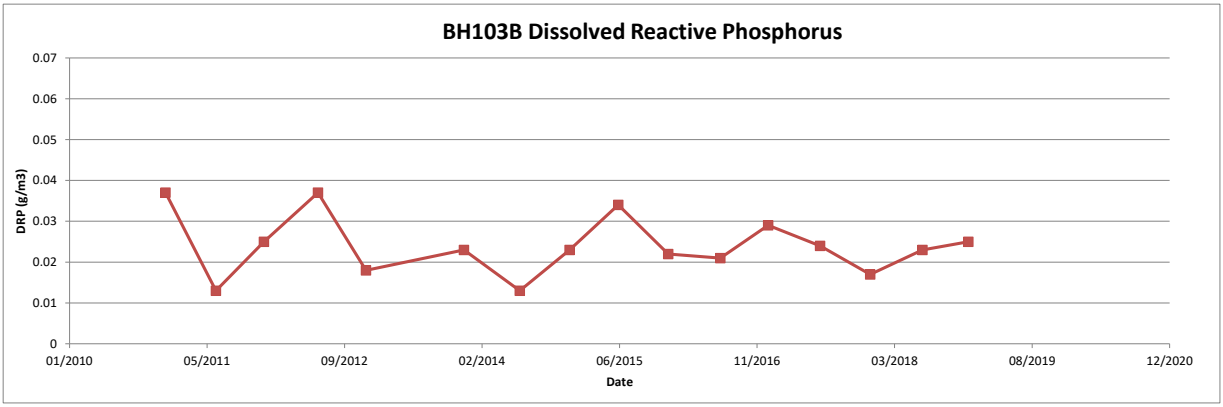

BH103B Dissolved Lead
Dissolved Lead (g/m3)
0.001
0.0009
0.0008
0.0007
0.0006
0.0005
0.0004
0.0003
0.0002
0.0001
0
10/2010
02/2012
06/2013
11/2014
03/2016
08/2017
12/2018
05/2020
Date

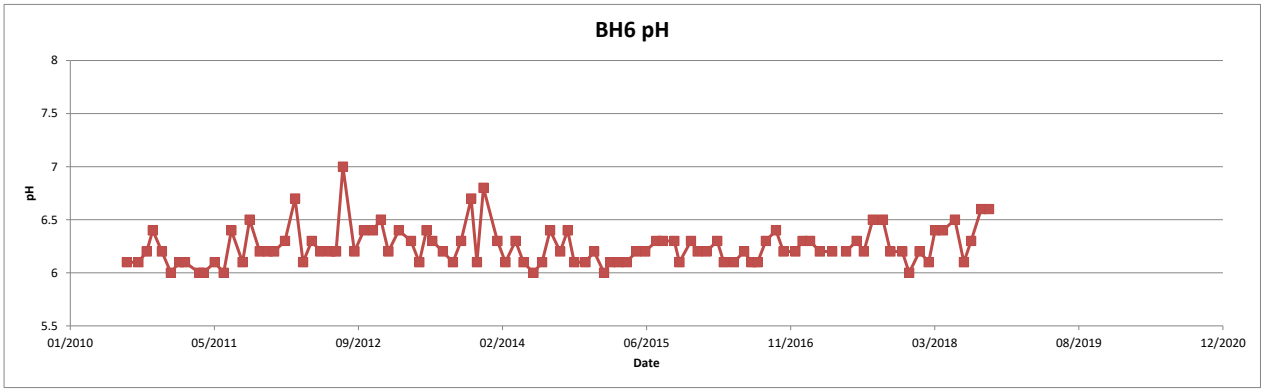

BH103B Dissolved Zinc
Dissolved Zinc (g/m3)
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

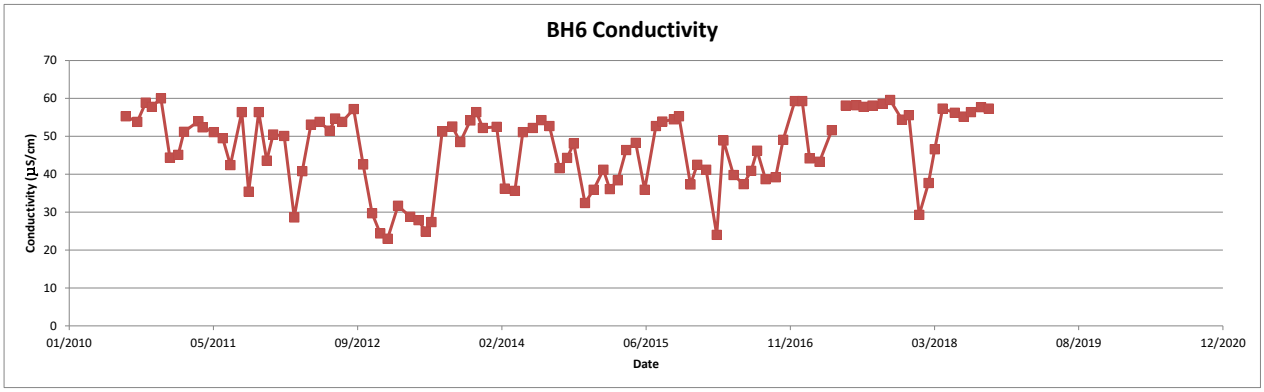

BH103B Dissolved Nickel
Dissolved Nickel (g/m3)
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

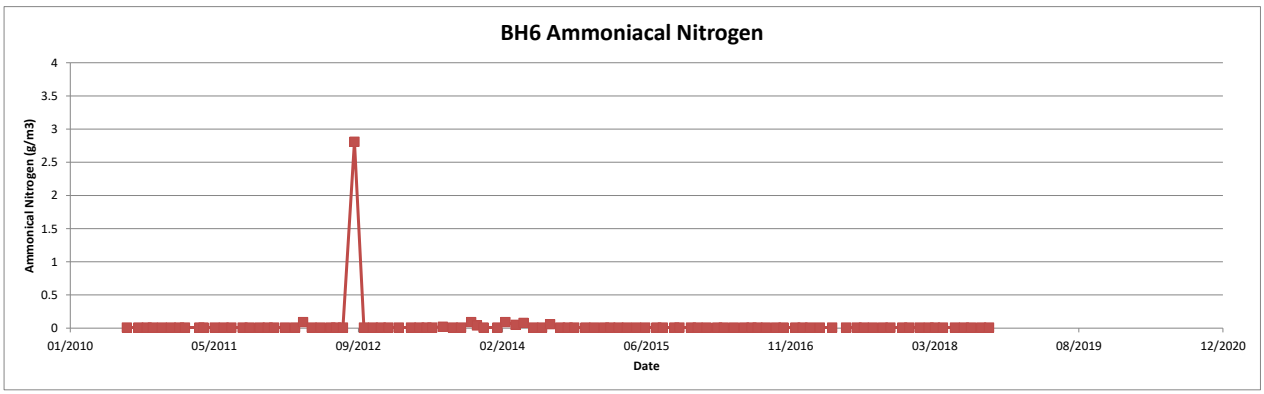

BH103B Dissolved Chromium
Dissolved Chromium (g/m3)
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

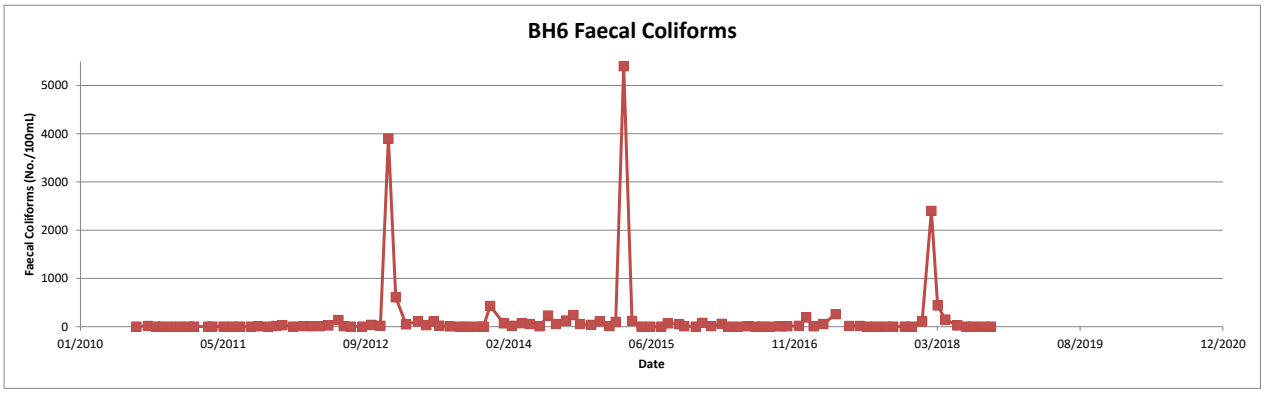

BH103B Dissolved Cadmium
Dissolved Cadmium (g/m3)
0.00035
0.0003
0.00025
0.0002
0.00015
0.0001
0.00005
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

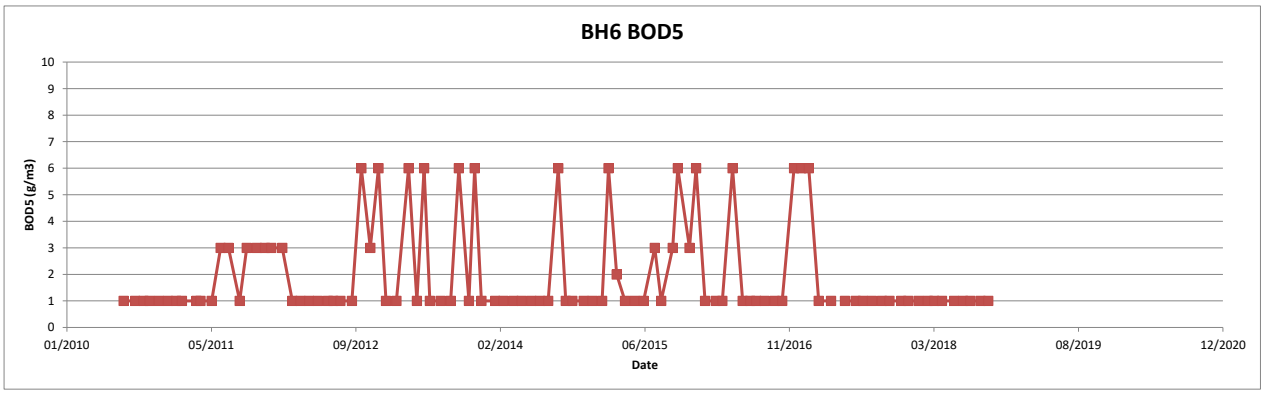

BH103B Dissolved Reactive Phosphorus
DRP (g/m3)
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

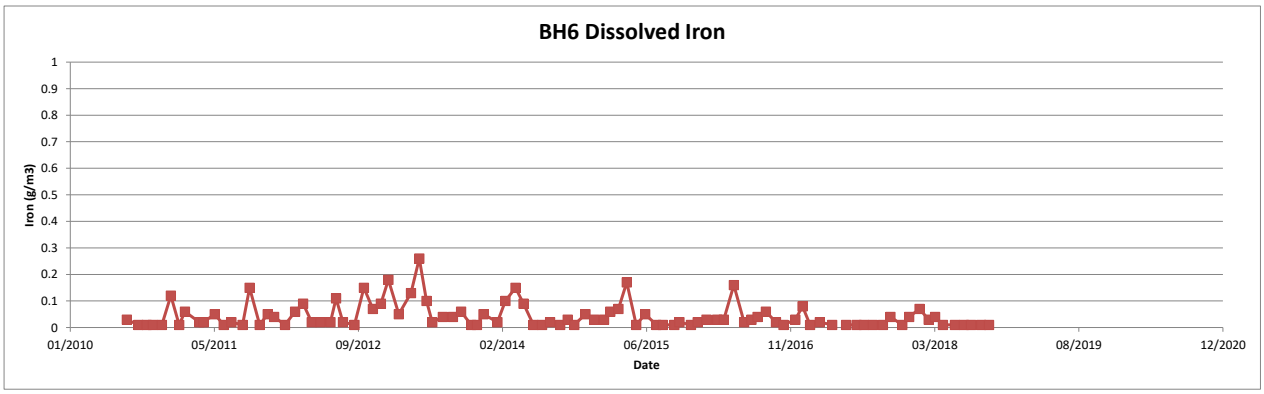

BH6 pH
pH
8
7.5
7
6.5
6
5.5
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

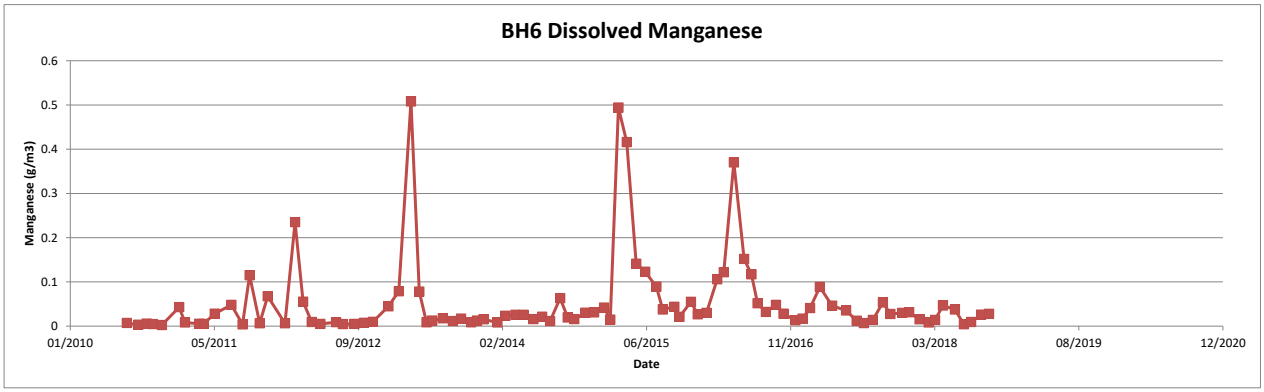

BH6 Conductivity
Conductivity (µS/cm)
70
60
50
40
30
20
10
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

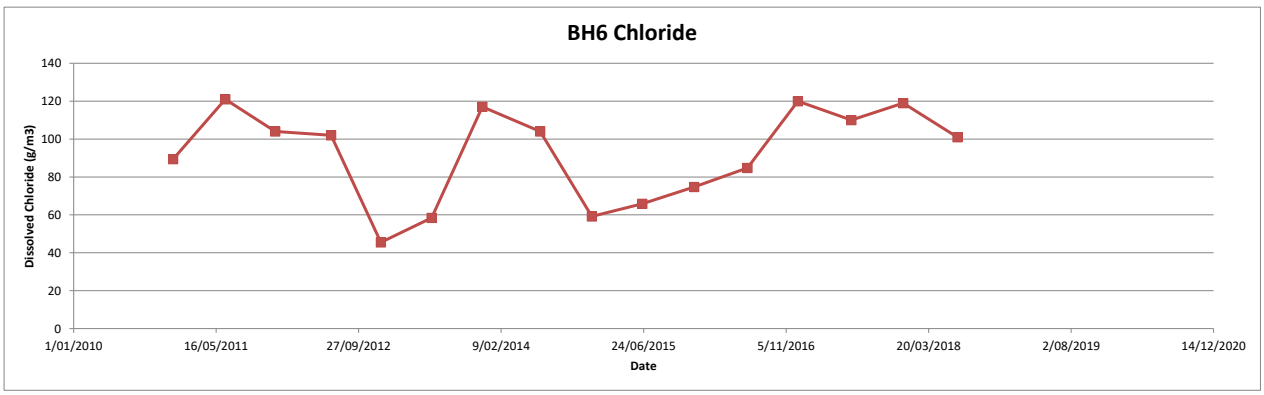

BH6 Ammoniacal Nitrogen
Ammonical Nitrogen (g/m3)
4
3.5
3
2.5
2
1.5
1
0.5
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

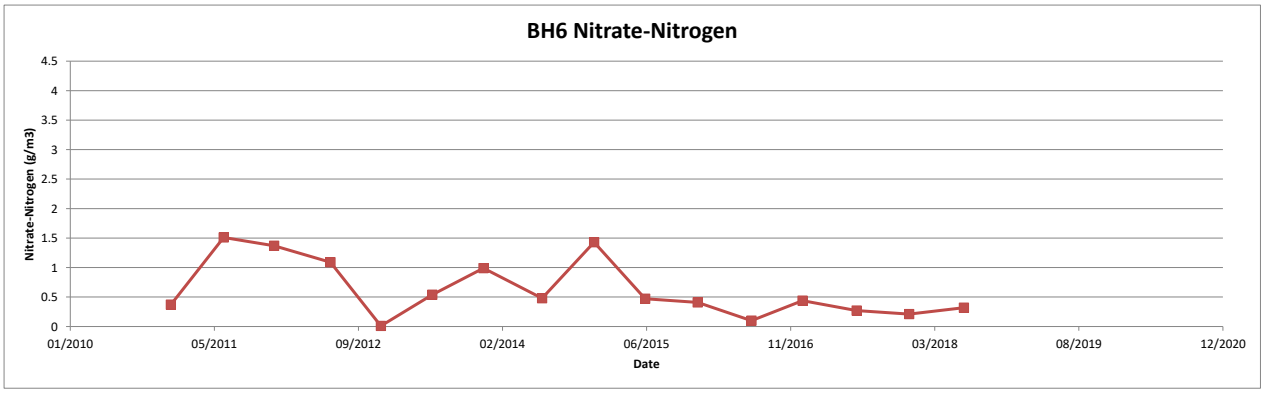

BH6 Faecal Coliforms
Faecal Coliforms (No./100mL)
5000
4000
3000
2000
1000
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

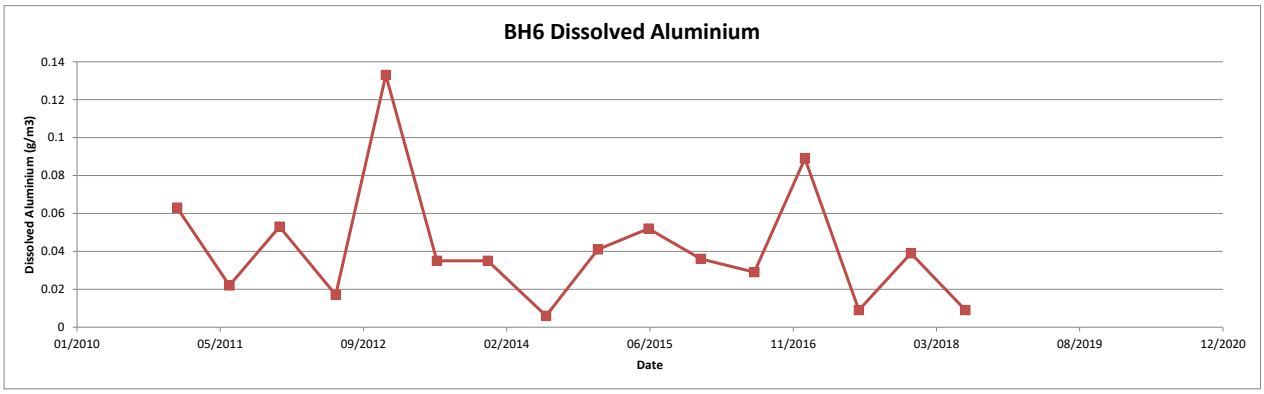

BH6 BOD5
BOD5 (g/m3)
10
9
8
7
6
5
4
3
2
1
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

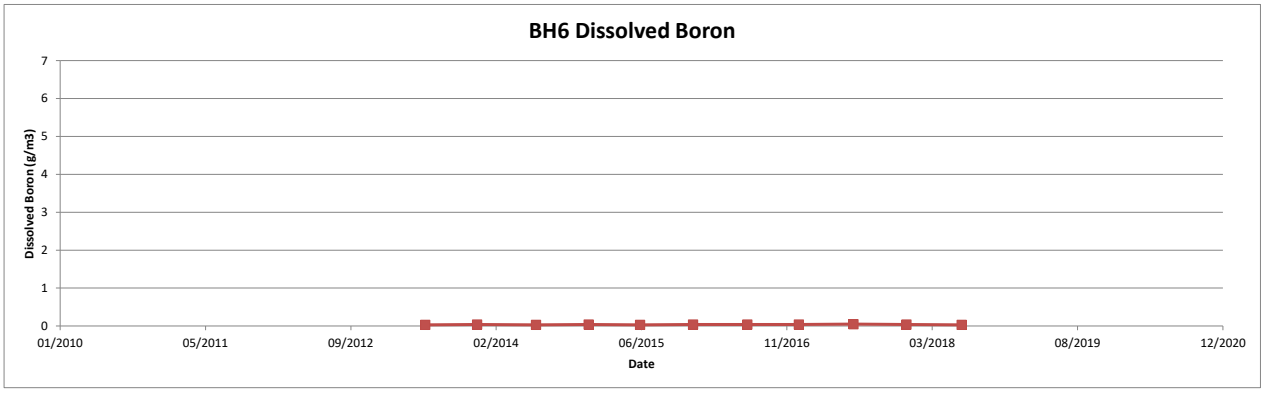

BH6 Dissolved Iron
Iron (g/m3)
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

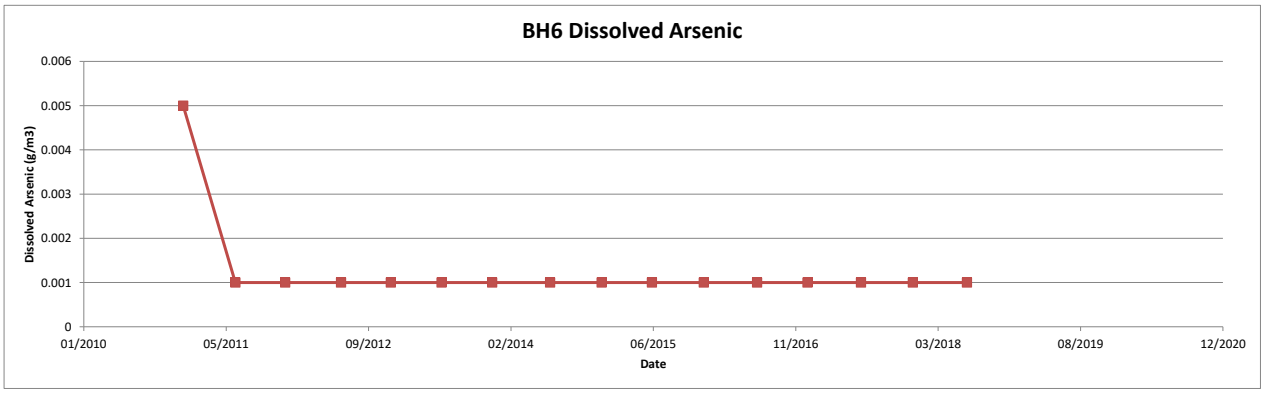

BH6 Dissolved Manganese
Manganese (g/m3)
0.6
0.5
0.4
0.3
0.2
0.1
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

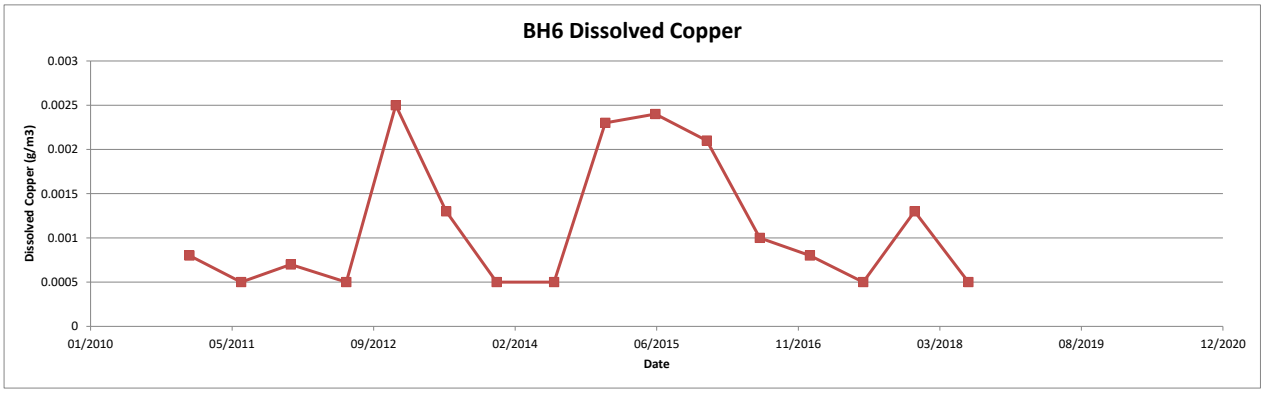

BH6 Chloride
Dissolved Chloride (g/m3)
140
120
100
80
60
40
20
0
1/01/2010
16/05/2011
27/09/2012
9/02/2014
24/06/2015
5/11/2016
20/03/2018
2/08/2019
14/12/2020
Date

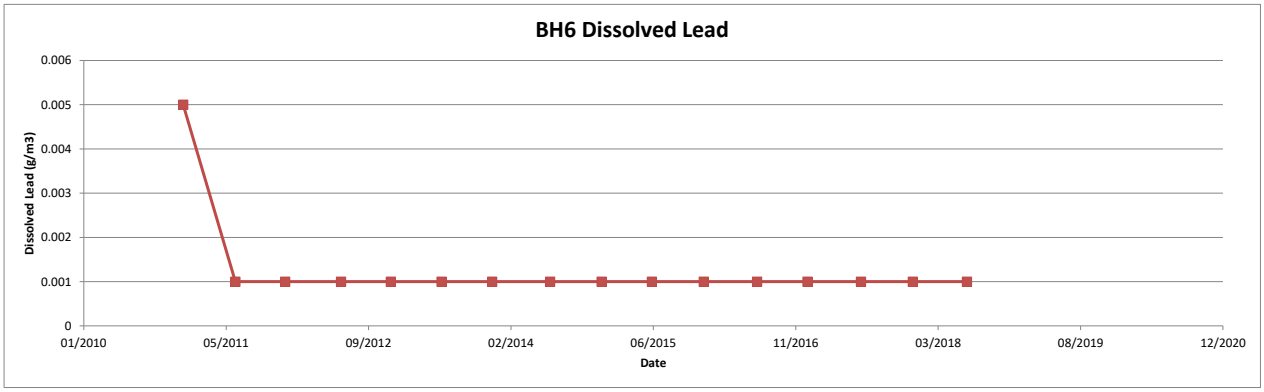

BH6 Nitrate-Nitrogen
Nitrate-Nitrogen (g/m3)
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

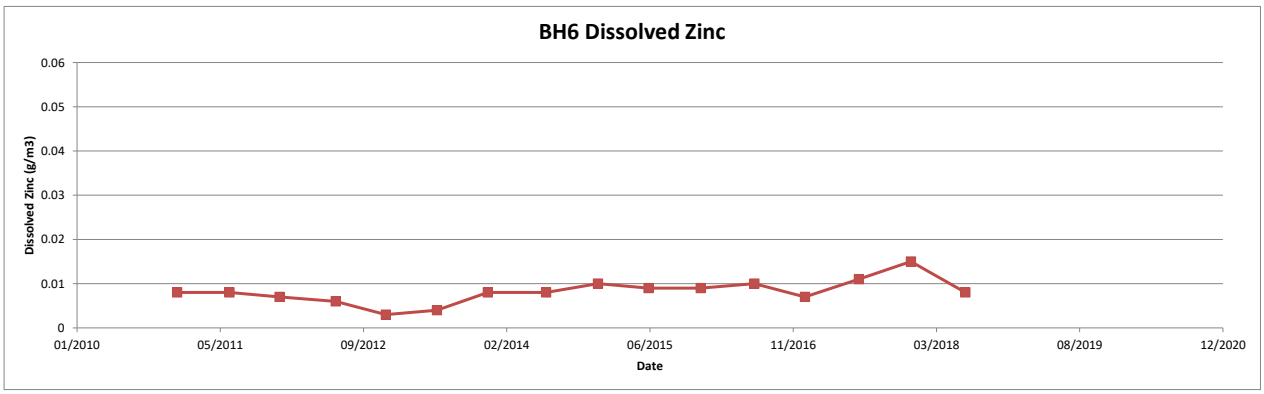

BH6 Dissolved Aluminium
Dissolved Aluminium (g/m3)
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

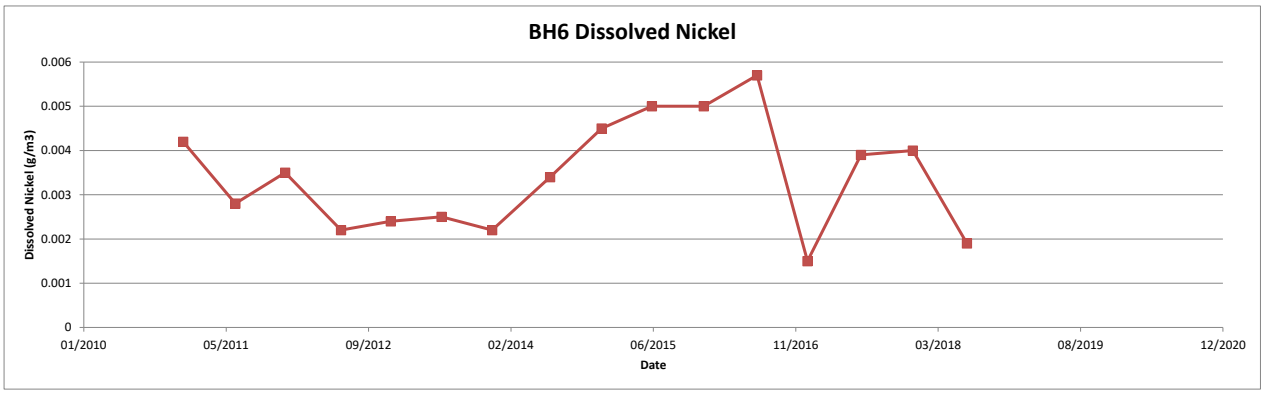

BH6 Dissolved Boron
Dissolved Boron (g/m3)
7
6
5
4
3
2
1
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

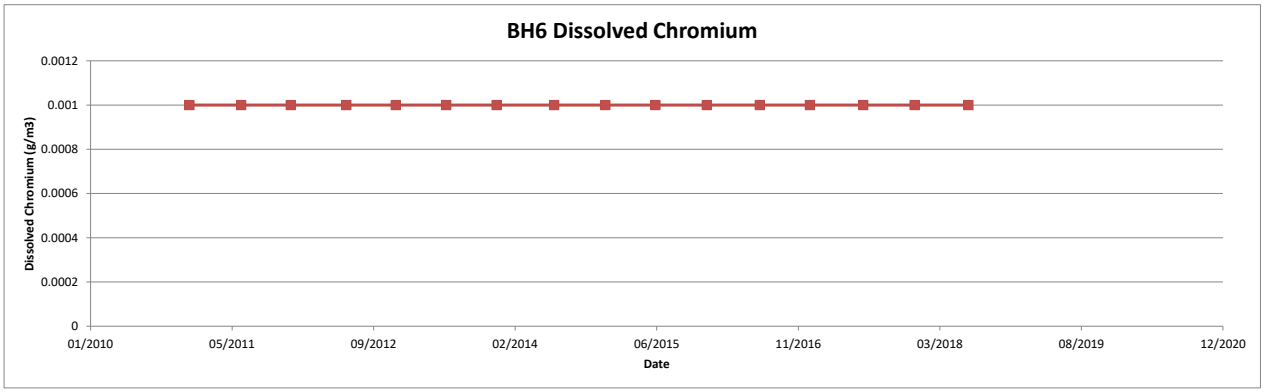

BH6 Dissolved Arsenic
Dissolved Arsenic (g/m3)
0.006
0.005
0.004
0.003
0.002
0.001
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

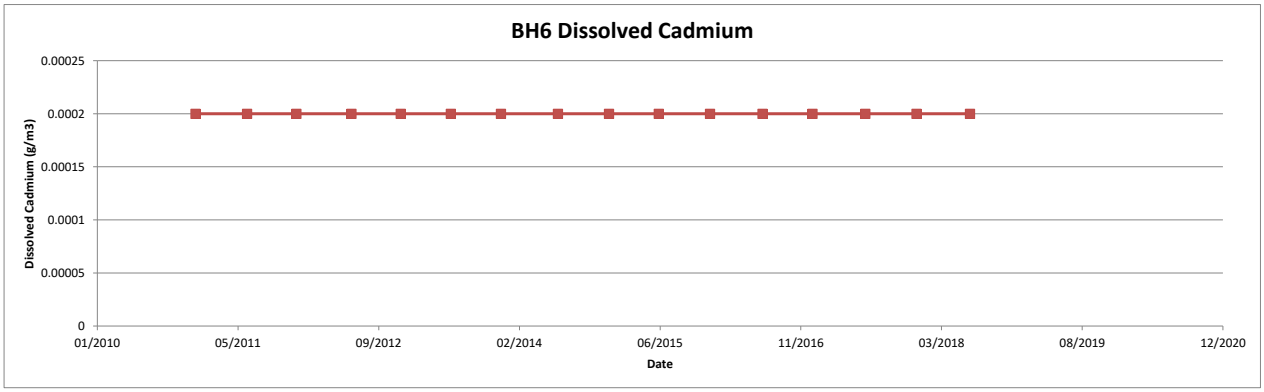

BH6 Dissolved Copper
Dissolved Copper (g/m3)
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

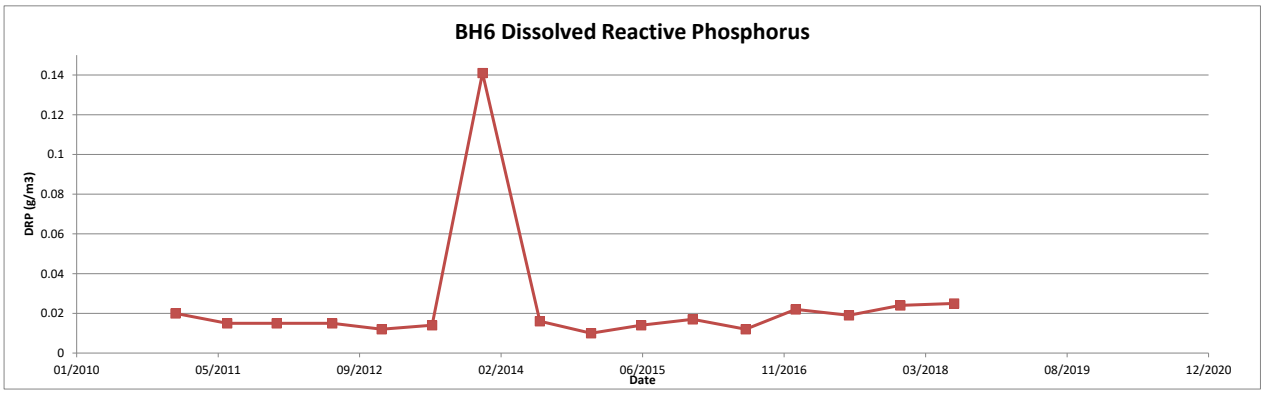

BH6 Dissolved Lead
Dissolved Lead (g/m3)
0.006
0.005
0.004
0.003
0.002
0.001
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

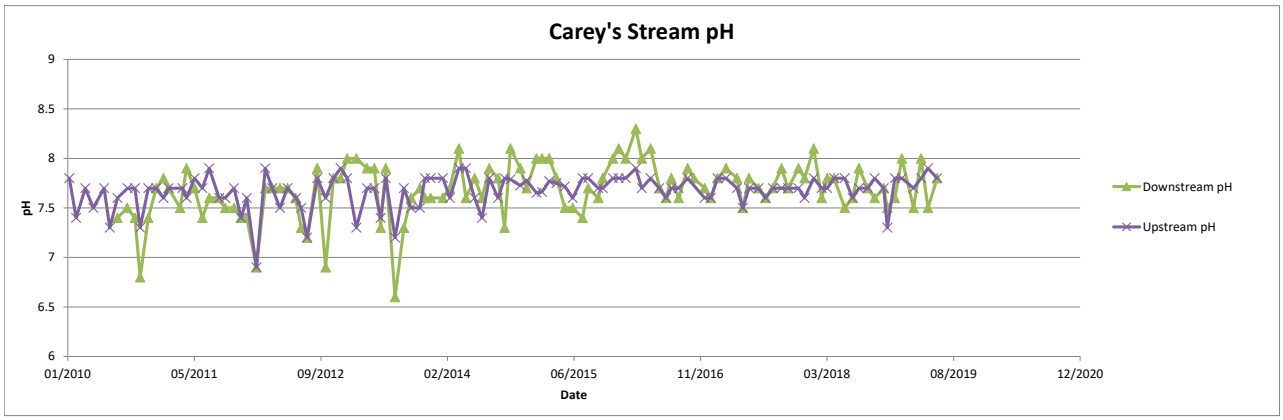

BH6 Dissolved Zinc
Dissolved Zinc (g/m3)
0.06
0.05
0.04
0.03
0.02
0.01
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

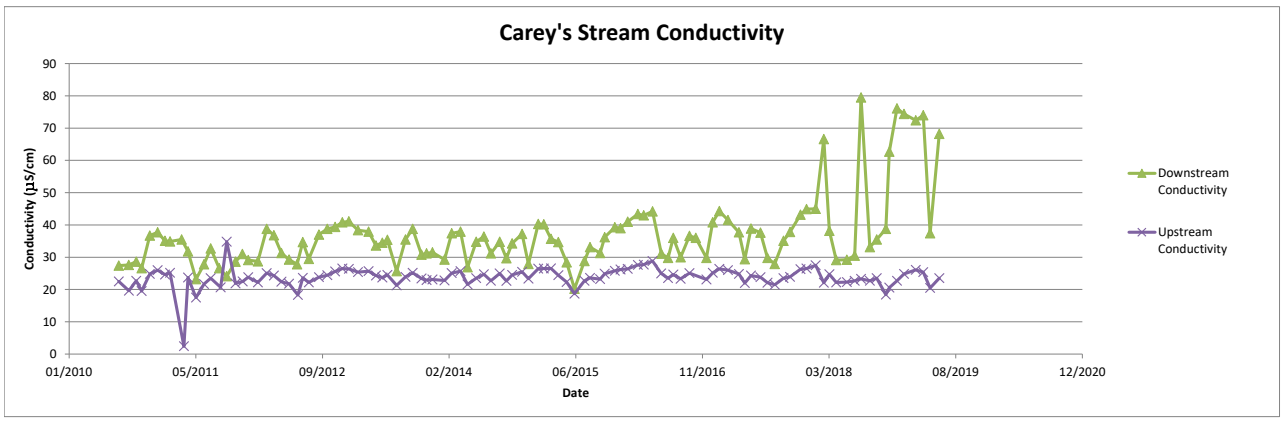

BH6 Dissolved Nickel
Dissolved Nickel (g/m3)
0.006
0.005
0.004
0.003
0.002
0.001
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

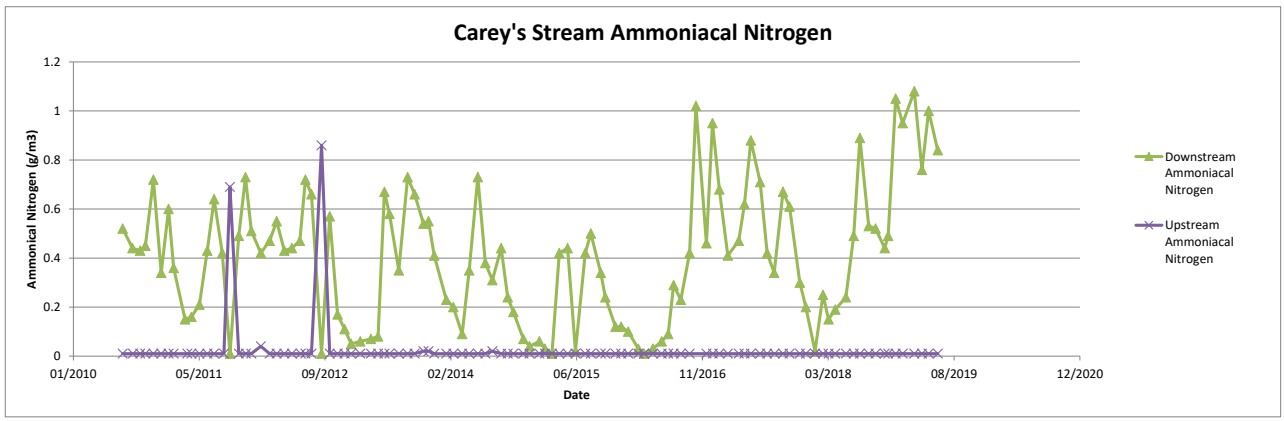

BH6 Dissolved Chromium
Dissolved Chromium (g/m3)
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

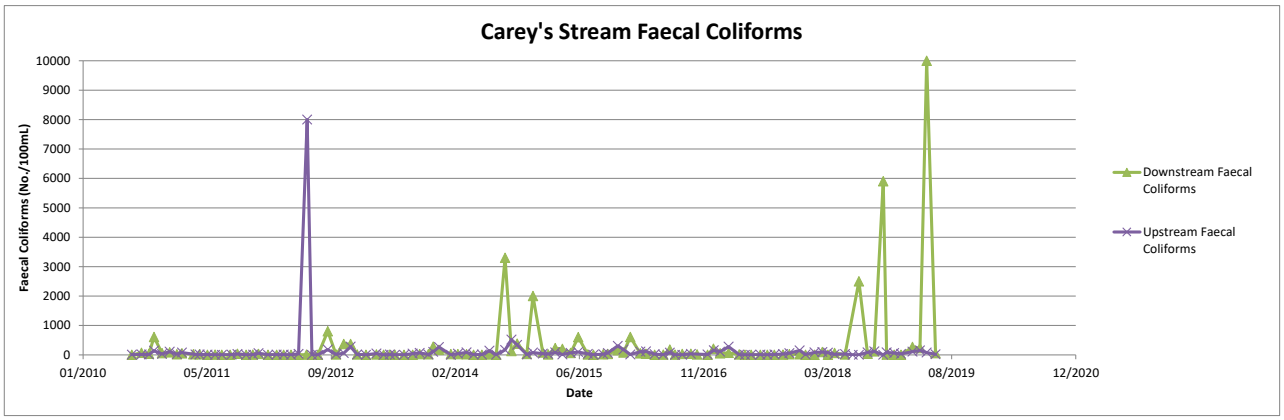

BH6 Dissolved Cadmium
Dissolved Cadmium (g/m3)
0.00025
0.0002
0.00015
0.0001
0.00005
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

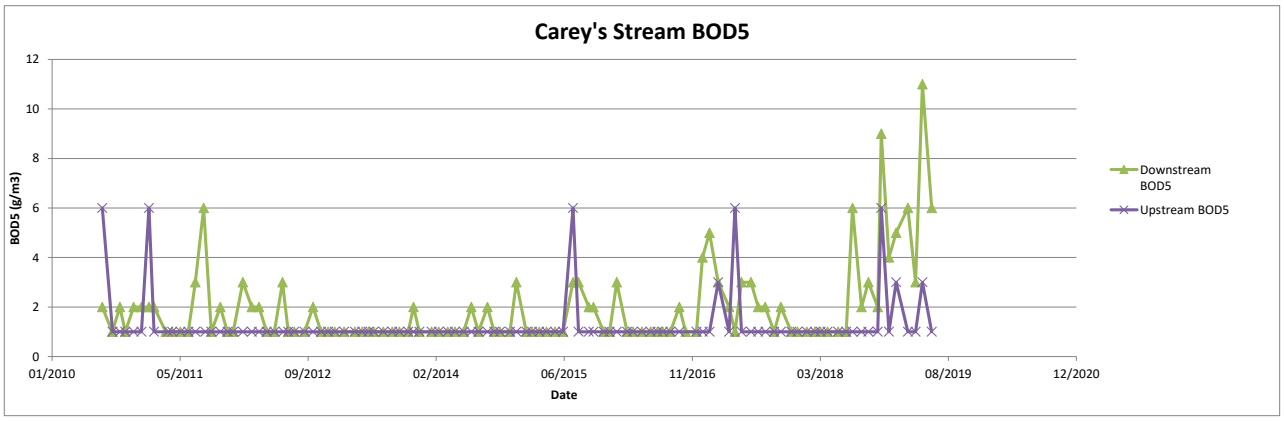

BH6 Dissolved Reactive Phosphorus
DRP (g/m3)
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date

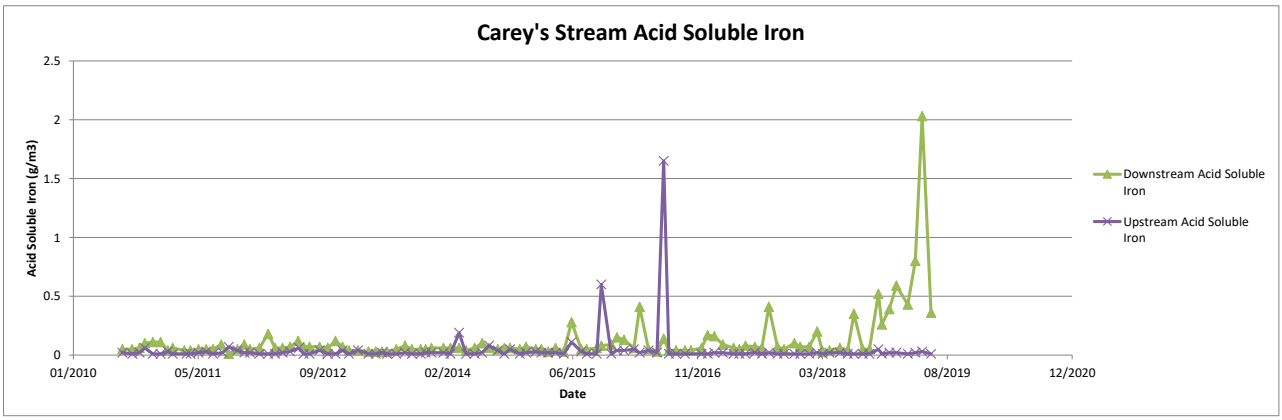

Carey's Stream pH
pH
9
8.5
8
7.5
7
6.5
6
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date
Downstream pH
Upstream pH

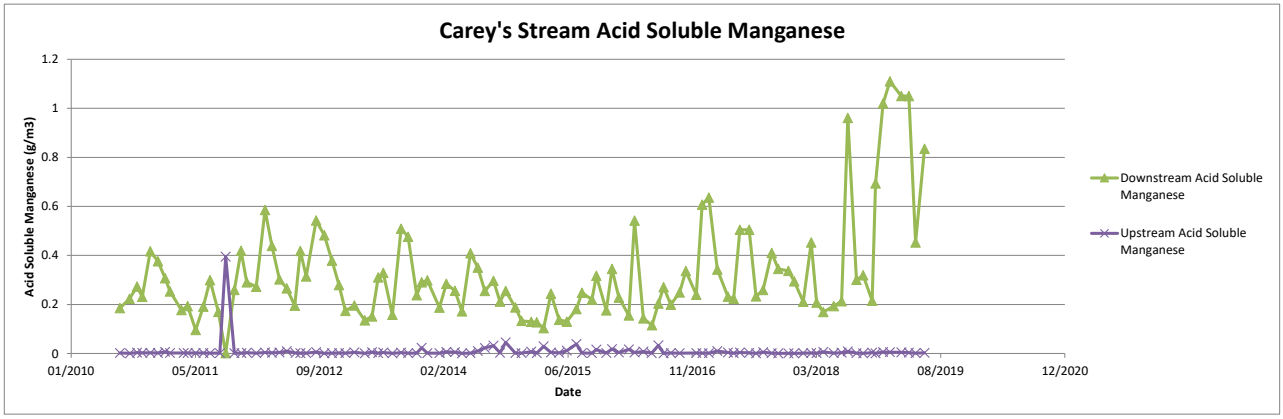

Carey's Stream Conductivity
Conductivity (µS/cm)
90
80
70
60
50
40
30
20
10
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date
Downstream Conductivity
Upstream Conductivity

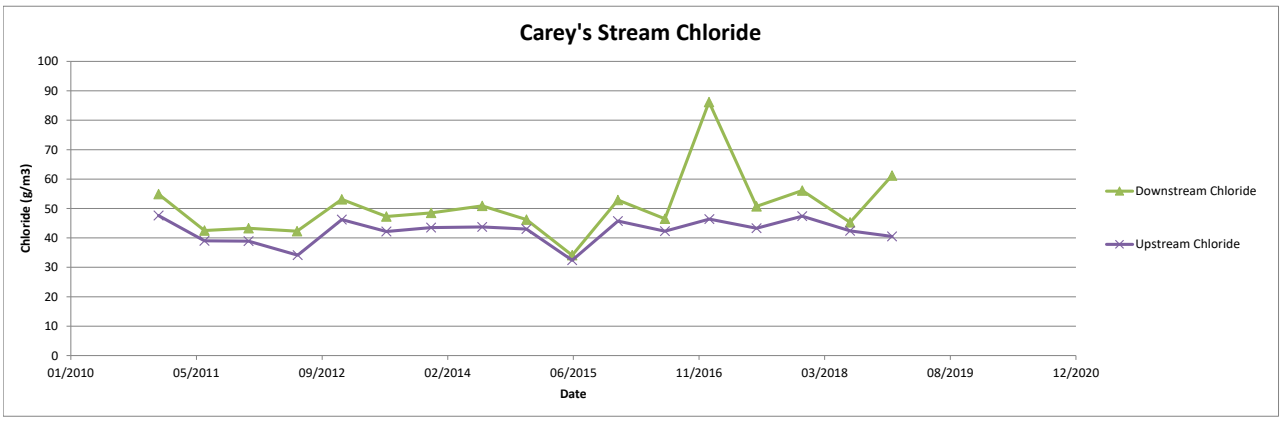

Carey's Stream Ammoniacal Nitrogen
Ammonical Nitrogen (g/m3)
1.2
1
0.8
0.6
0.4
0.2
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date
Downstream Ammoniacal Nitrogen
Upstream Ammoniacal Nitrogen

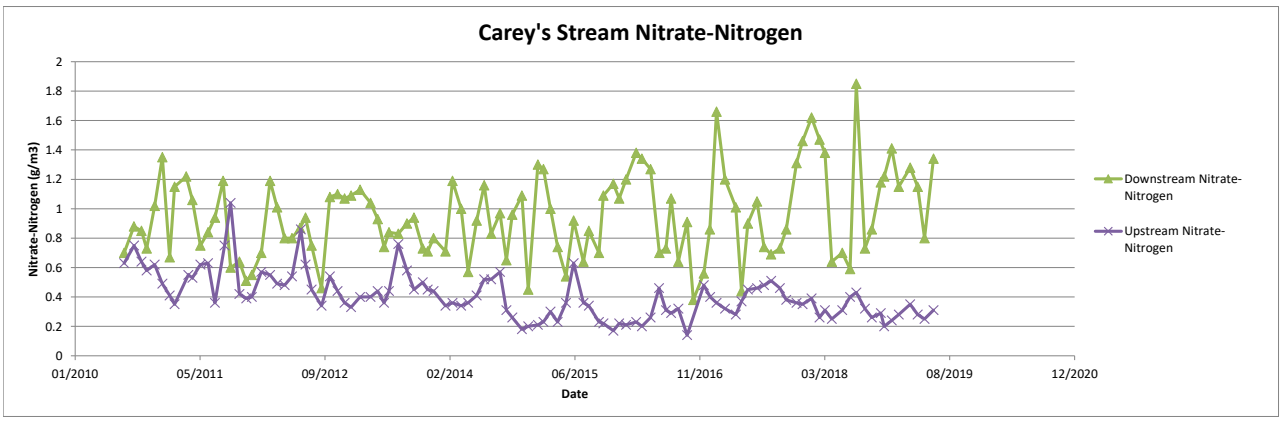

Carey's Stream Faecal Coliforms
Faecal Coliforms (No./100mL)
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date
Downstream Faecal Coliforms
Upstream Faecal Coliforms

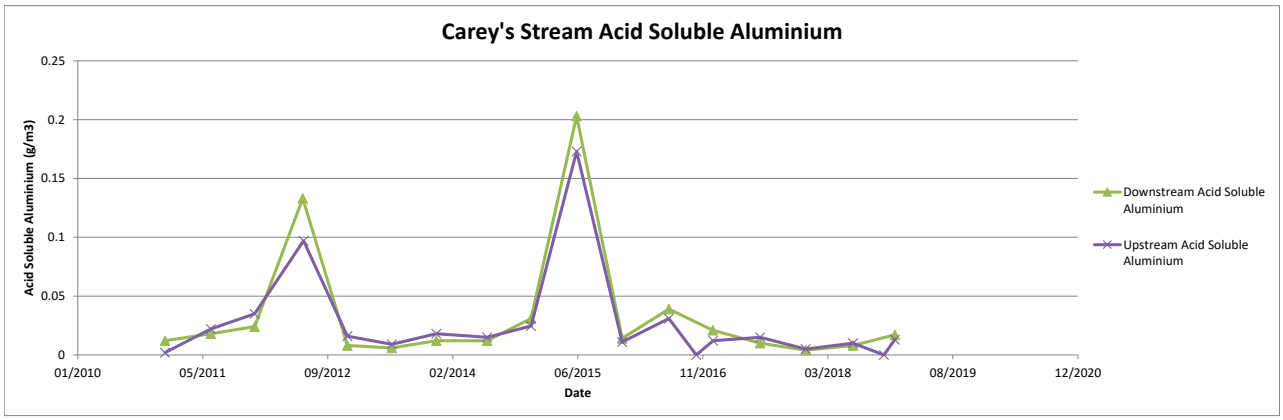

Carey's Stream BOD5
BOD5 (g/m3)
12
10
8
6
4
2
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date
Downstream BOD5
Upstream BOD5

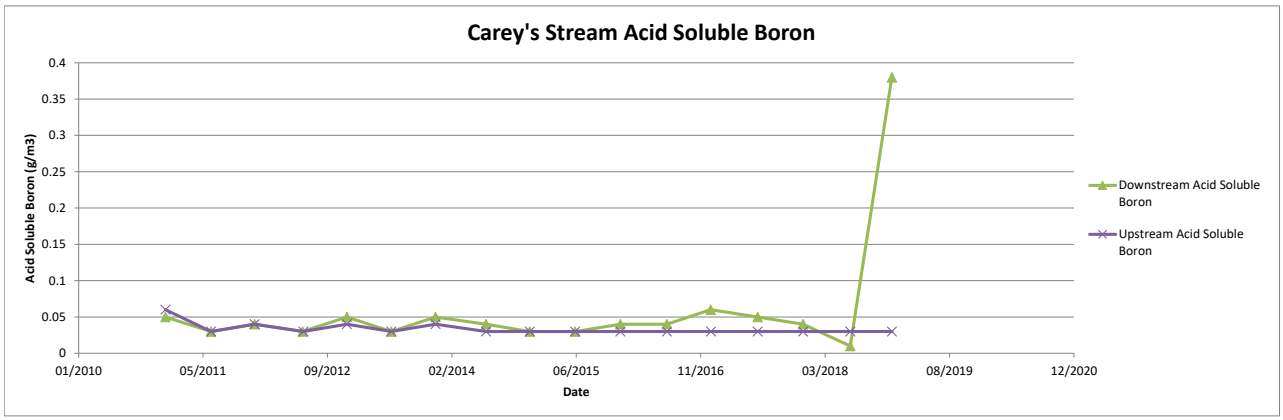

Carey's Stream Acid Soluble Iron
Acid Soluble Iron (g/m3)
2.5
2
1.5
1
0.5
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date
Downstream Acid Soluble Iron
Upstream Acid Soluble Iron

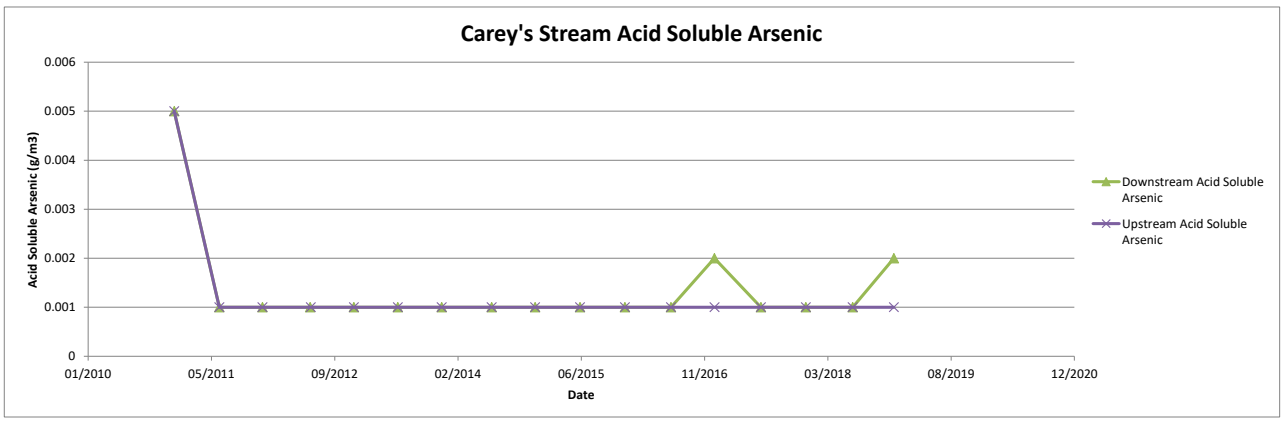

Carey's Stream Acid Soluble Manganese
Acid Soluble Manganese (g/m3)
1.2
1
0.8
0.6
0.4
0.2
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date
Downstream Acid Soluble Manganese
Upstream Acid Soluble Manganese

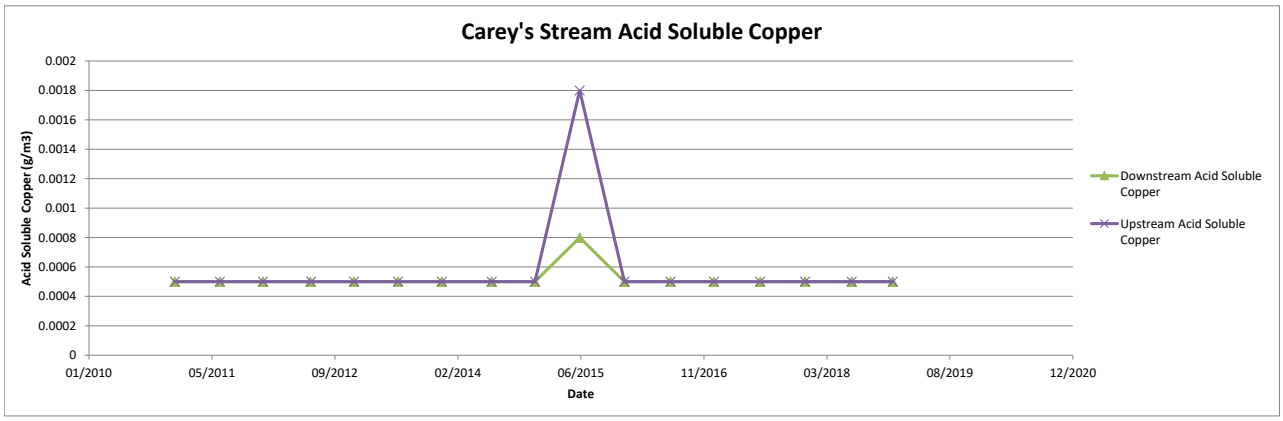

Carey's Stream Chloride
Chloride (g/m3)
100
90
80
70
60
50
40
30
20
10
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date
Downstream Chloride
Upstream Chloride

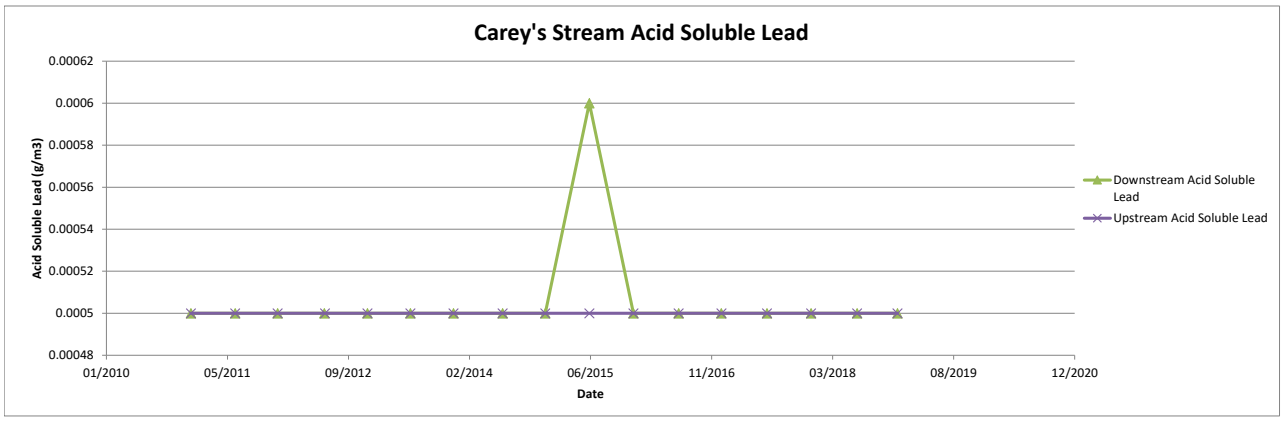

Carey's Stream Nitrate-Nitrogen
Nitrate-Nitrogen (g/m3)
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date
Downstream Nitrate-Nitrogen
Upstream Nitrate-Nitrogen

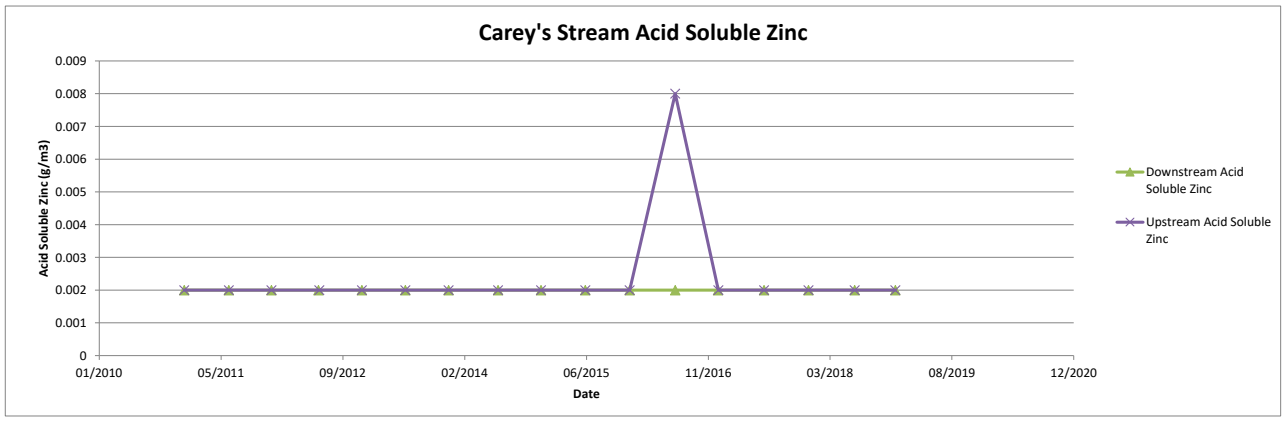

Carey's Stream Acid Soluble Aluminium
Acid Soluble Aluminium (g/m3)
0.25
0.2
0.15
0.1
0.05
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date
Downstream Acid Soluble Aluminium
Upstream Acid Soluble Aluminium

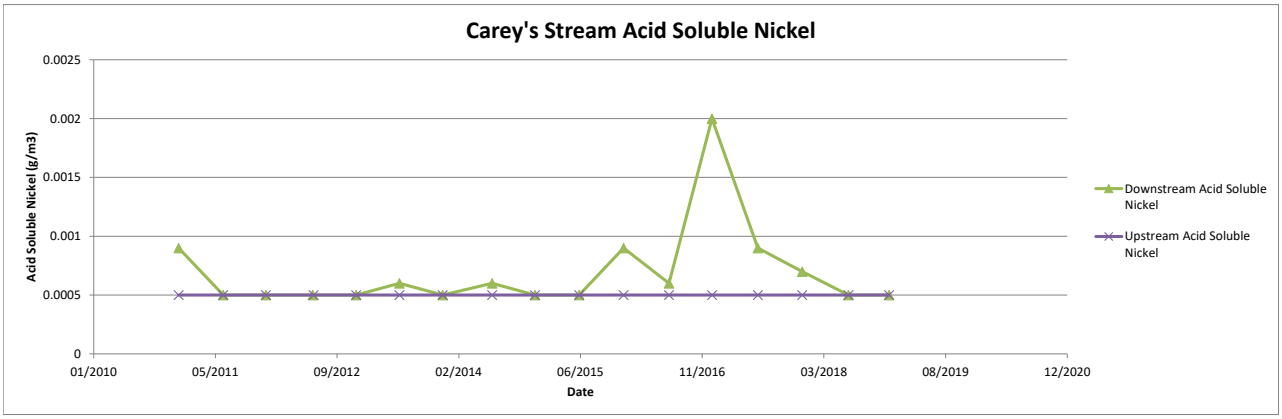

Carey's Stream Acid Soluble Boron
Acid Soluble Boron (g/m3)
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date
Downstream Acid Soluble Boron
Upstream Acid Soluble Boron

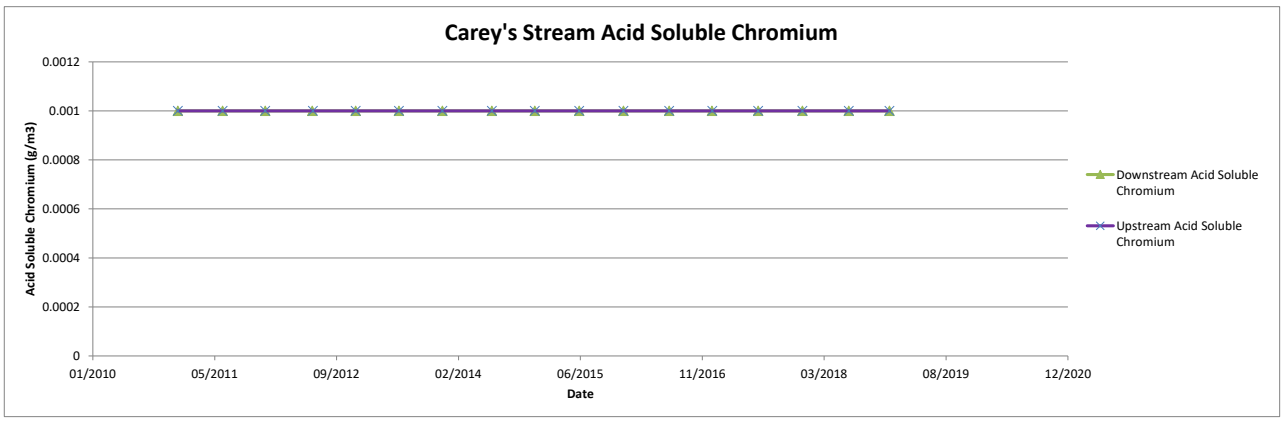

Carey's Stream Acid Soluble Arsenic
Acid Soluble Arsenic (g/m3)
0.006
0.005
0.004
0.003
0.002
0.001
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date
Downstream Acid Soluble Arsenic
Upstream Acid Soluble Arsenic

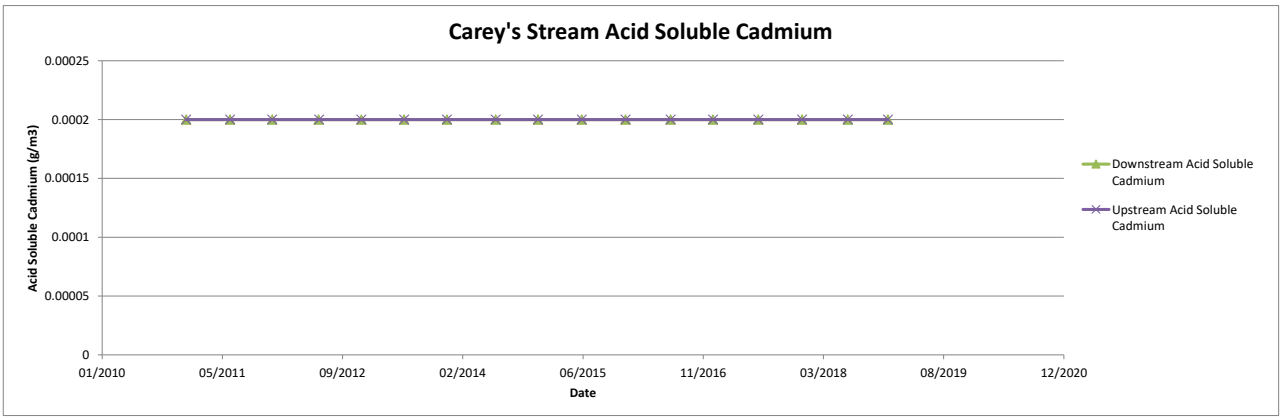

Carey's Stream Acid Soluble Copper
Acid Soluble Copper (g/m3)
0.002
0.0018
0.0016
0.0014
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date
Downstream Acid Soluble Copper
Upstream Acid Soluble Copper

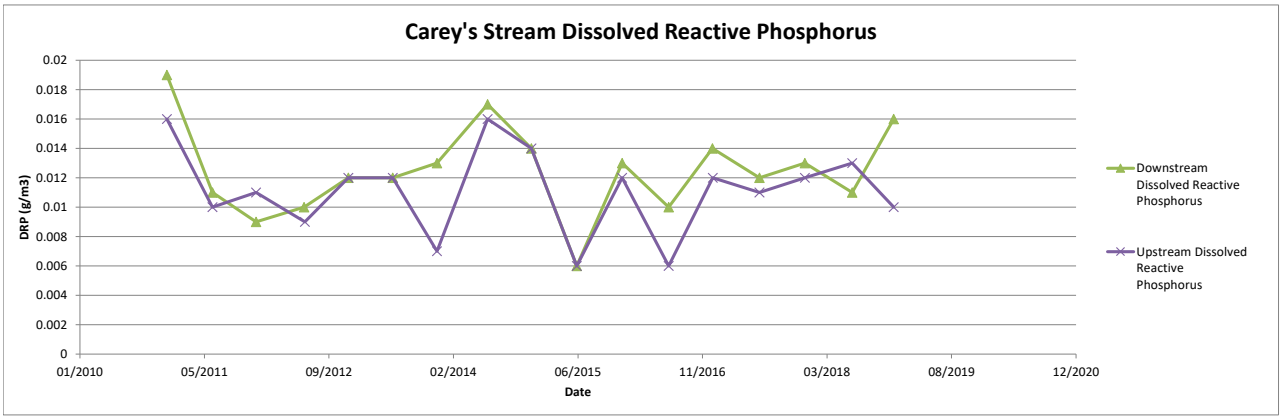

Carey's Stream Acid Soluble Lead
Acid Soluble Lead (g/m3)
0.00062
0.0006
0.00058
0.00056
0.00054
0.00052
0.0005
0.00048
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date
Downstream Acid Soluble Lead
Upstream Acid Soluble Lead

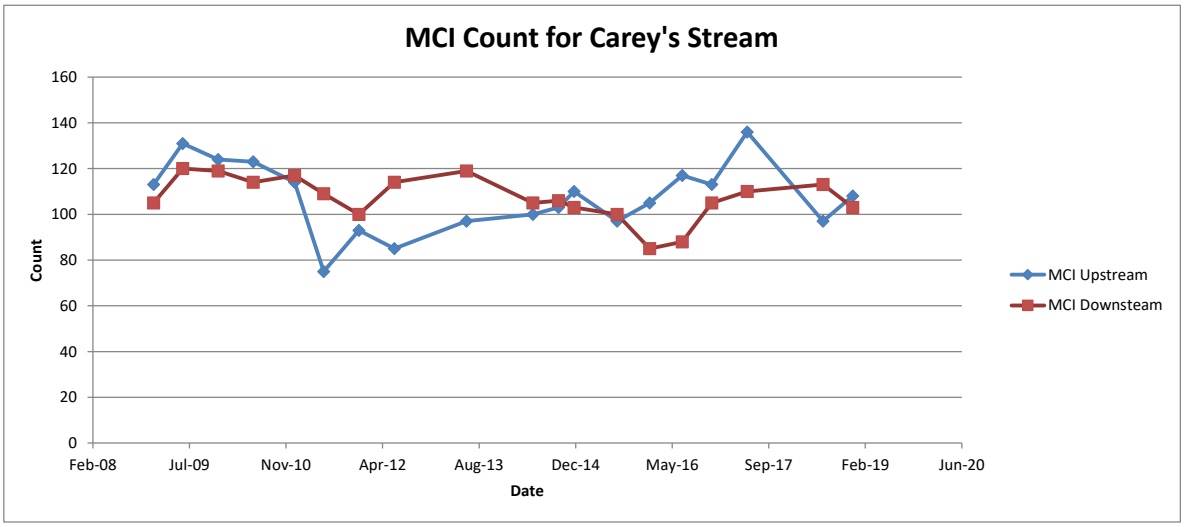

Carey's Stream Acid Soluble Zinc
Acid Soluble Zinc (g/m3)
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date
Downstream Acid Soluble Zinc
Upstream Acid Soluble Zinc

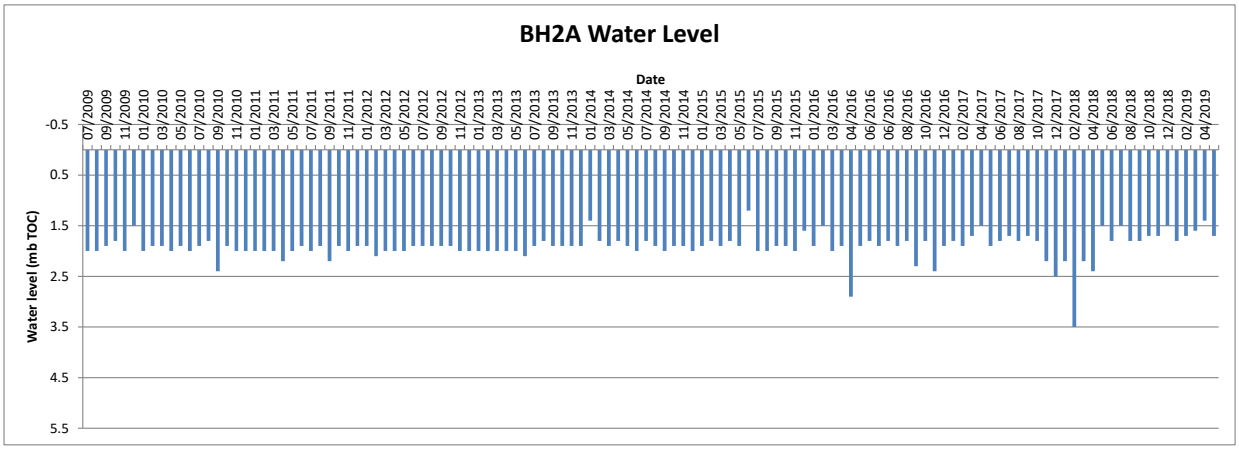

Carey's Stream Acid Soluble Nickel
Acid Soluble Nickel (g/m3)
0.0025
0.002
0.0015
0.001
0.0005
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date
Downstream Acid Soluble Nickel
Upstream Acid Soluble Nickel

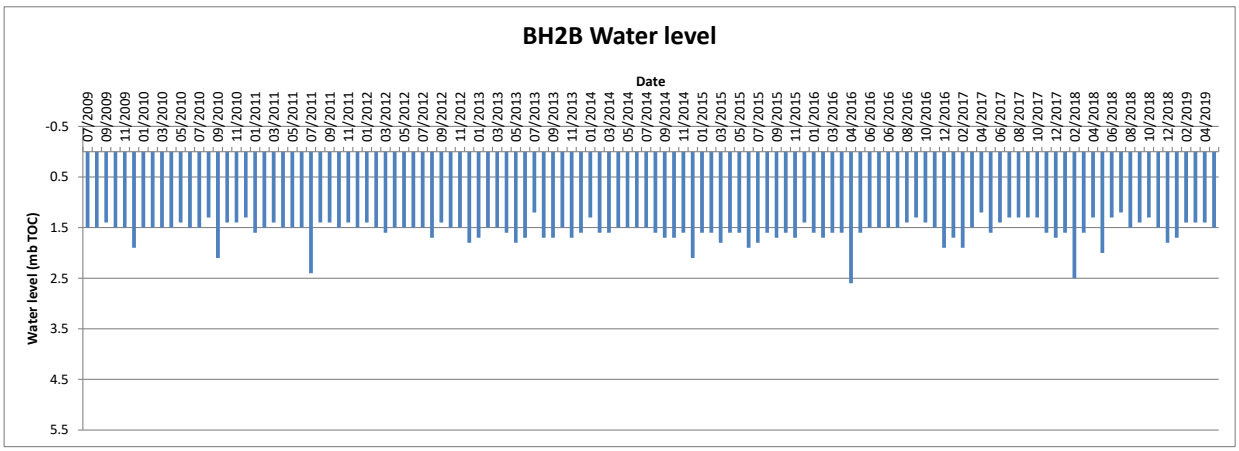

Carey's Stream Acid Soluble Chromium
Acid Soluble Chromium (g/m3)
0.0012
0.001
0.0008
0.0006
0.0004
0.0002
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date
Downstream Acid Soluble Chromium
Upstream Acid Soluble Chromium

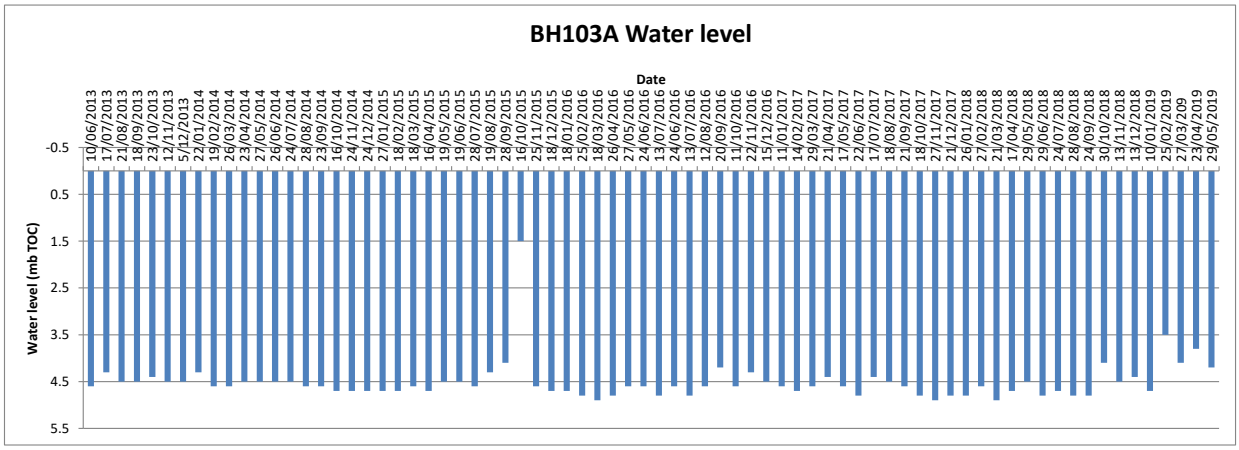

Carey's Stream Acid Soluble Cadmium
Acid Soluble Cadmium (g/m3)
0.00025
0.0002
0.00015
0.0001
0.00005
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date
Downstream Acid Soluble Cadmium
Upstream Acid Soluble Cadmium

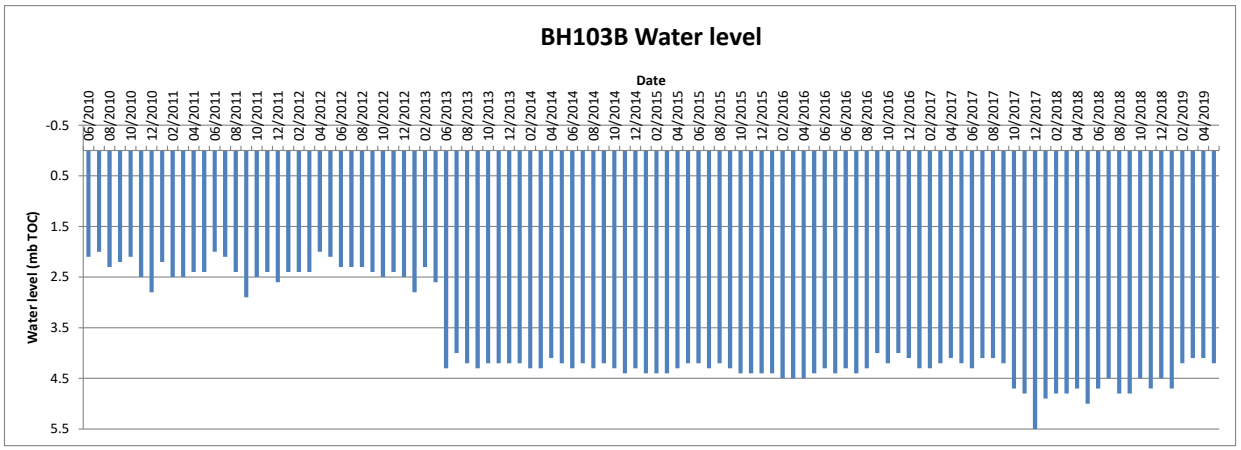

Carey's Stream Dissolved Reactive Phosphorus
DRP (g/m3)
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
01/2010
05/2011
09/2012
02/2014
06/2015
11/2016
03/2018
08/2019
12/2020
Date
Downstream Dissolved Reactive Phosphorus
Upstream Dissolved Reactive Phosphorus

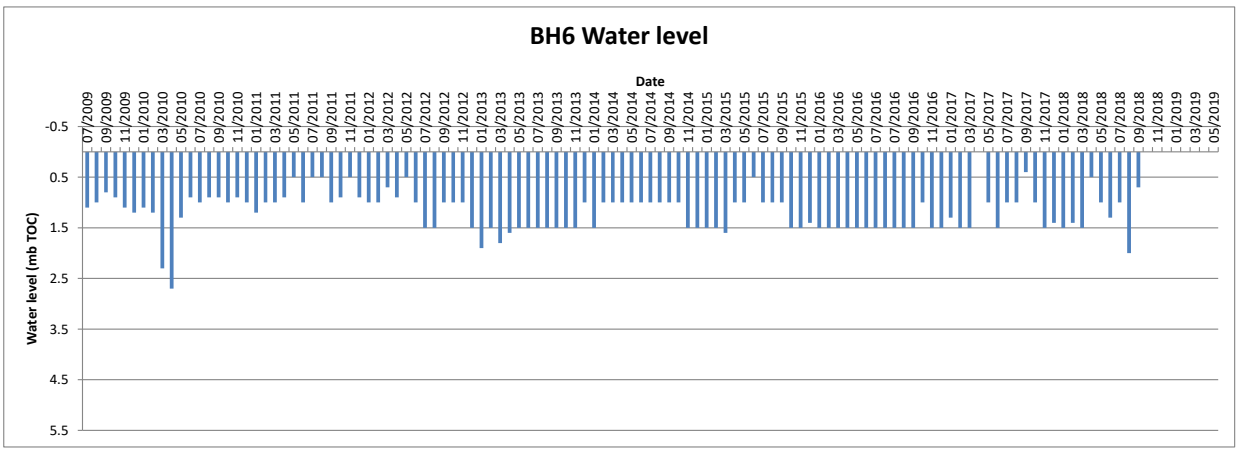

MCI Count for Carey's Stream
160
140
120
100
80
60
40
20
0
Count
Feb-08
Jul-09
Nov-10
Apr-12
Aug-13
Dec-14
May-16
Sep-17
Feb-19
Jun-20
Date
MCI Upstream
MCI Downsteam


BH2A Water Level
Date
Water level (mb TOC)
-0.5
0.5
1.5
2.5
3.5
4.5
5.5
07/2009
09/2009
11/2009
01/2010
03/2010
05/2010
07/2010
09/2010
11/2010
01/2011
03/2011
05/2011
07/2011
09/2011
11/2011
01/2012
03/2012
05/2012
07/2012
09/2012
11/2012
01/2013
03/2013
05/2013
07/2013
09/2013
11/2013
01/2014
03/2014
05/2014
07/2014
09/2014
11/2014
01/2015
03/2015
05/2015
07/2015
09/2015
11/2015
01/2016
03/2016
04/2016
06/2016
06/2016
08/2016
10/2016
12/2016
02/2017
04/2017
06/2017
08/2017
10/2017
12/2017
02/2018
04/2018
06/2018
08/2018
10/2018
12/2018
02/2019
04/2019


BH2B Water level
Date
Water level (mb TOC)
-0.5
0.5
1.5
2.5
3.5
4.5
5.5
07/2009
09/2009
11/2009
01/2010
03/2010
05/2010
07/2010
09/2010
11/2010
01/2011
03/2011
05/2011
07/2011
09/2011
11/2011
01/2012
03/2012
05/2012
07/2012
09/2012
11/2012
01/2013
03/2013
05/2013
07/2013
09/2013
11/2013
01/2014
03/2014
05/2014
07/2014
09/2014
11/2014
01/2015
03/2015
05/2015
07/2015
09/2015
11/2015
01/2016
03/2016
04/2016
06/2016
06/2016
08/2016
10/2016
12/2016
02/2017
04/2017
06/2017
08/2017
10/2017
12/2017
02/2018
04/2018
06/2018
08/2018
10/2018
12/2018
02/2019
04/2019


BH103A Water level
Date
Water level (mb TOC)
-0.5
0.5
1.5
2.5
3.5
4.5
5.5
10/06/2013
17/07/2013
21/08/2013
18/09/2013
23/10/2013
12/11/2013
5/12/2013
22/01/2014
19/02/2014
26/03/2014
23/04/2014
27/05/2014
26/06/2014
24/07/2014
28/08/2014
23/09/2014
16/10/2014
24/11/2014
24/12/2014
27/01/2015
18/02/2015
18/03/2015
16/04/2015
19/05/2015
19/06/2015
28/07/2015
19/08/2015
28/09/2015
16/10/2015
25/11/2015
18/12/2015
18/01/2016
25/02/2016
18/03/2016
26/04/2016
27/05/2016
24/06/2016
13/07/2016
24/06/2016
13/07/2016
12/08/2016
20/09/2016
11/10/2016
22/11/2016
15/12/2016
11/01/2017
14/02/2017
29/03/2017
21/04/2017
17/05/2017
22/06/2017
17/07/2017
18/08/2017
21/09/2017
18/10/2017
27/11/2017
21/12/2017
26/01/2018
27/02/2018
21/03/2018
17/04/2018
29/05/2018
29/06/2018
24/07/2018
28/08/2018
24/09/2018
30/10/2018
13/11/2018
13/12/2018
10/01/2019
25/02/2019
27/03/209
23/04/2019
29/05/2019


BH103B Water level
Date
06/2010
08/2010
10/2010
12/2010
02/2011
04/2011
06/2011
08/2011
10/2011
12/2011
02/2012
04/2012
06/2012
08/2012
10/2012
12/2012
02/2013
06/2013
08/2013
10/2013
12/2013
02/2014
04/2014
06/2014
08/2014
10/2014
12/2014
02/2015
04/2015
06/2015
08/2015
10/2015
12/2015
02/2016
04/2016
06/2016
08/2016
10/2016
12/2016
02/2017
04/2017
06/2017
08/2017
10/2017
12/2017
02/2018
04/2018
06/2018
08/2018
10/2018
12/2018
02/2019
04/2019
Water level (mb TOC)
-0.5
0.5
1.5
2.5
3.5
4.5
5.5


BH6 Water level
Date
07/2009
09/2009
11/2009
01/2010
03/2010
05/2010
07/2010
09/2010
11/2010
01/2011
03/2011
05/2011
07/2011
09/2011
11/2011
01/2012
03/2012
05/2012
07/2012
09/2012
11/2012
01/2013
03/2013
05/2013
07/2013
09/2013
11/2013
01/2014
03/2014
05/2014
07/2014
09/2014
11/2014
01/2015
03/2015
05/2015
07/2015
09/2015
11/2015
01/2016
03/2016
05/2016
07/2016
09/2016
11/2016
01/2017
03/2017
05/2017
07/2017
09/2017
11/2017
01/2018
03/2018
05/2018
07/2018
09/2018
11/2018
01/2019
03/2019
05/2019
Water level (mb TOC)
-0.5
0.5
1.5
2.5
3.5
4.5
5.5

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Wellington 6011
PO Box 27277
Wellington 6141
New Zealand
www.aecom.com

Memorandum

To	Wellington City Council Attn: Landfill Manager – Darren Hoskins	Page	1
CC			
Subject	Southern Landfill Groundwater and Surface Water Monitoring Data - June 2018		
From	Kate Shaskey		
File/Ref No.	Job Reference 60606010	Date	12-July-2019

Please find below a summary of groundwater and surface water monitoring data from the Southern Landfill for June 2018. This data includes a summary of the sampling round which occurred on **29 June 2018** and **30 June 2018**.

Groundwater Monitoring Bores – Summary of June 2018 Results		
Bore	**Date Sampled**	**Discussion of Results in Relation to Trigger Criteria***
2A	29 June 2018	**Chloride** was reported at a concentration (59.2 g/m^3) exceeding the PQL (0.2 g/m^3), but less than 10 times the data set median (932.5 g/m^3). Not considered significant. **Nitrate-N** was reported at a concentration (3.7 g/m^3) exceeding the PQL (0.1 g/m^3) but less than 10 times the data set median (25.6 g/m^3). Not considered significant.
2B	29 June 2018	**Chloride** was reported at a concentration (32.1 g/m^3) exceeding the PQL (0.2 g/m^3), but less than 10 times the data set median (1025 g/m^3). Not considered significant. **Copper** was reported at a concentration (0.0039 g/m^3) exceeding the ANZG 95% fresh water guidelines (0.0014 g/m^3) and as a third consecutive increase in concentration (0.0005 g/m^3, 0.0009 g/m^3, 0.0039 g/m^3), but less than 10 times the data set median (0.005 g/m^3). Not considered significant. **Manganese** was reported at a concentration (0.0059 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant. **Nitrate-N** was reported at a concentration (1.59 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (16.7 g/m^3). Not considered significant.
103A$^+$	29 June 2018	**Chloride** was reported at a concentration (96.5 g/m^3) exceeding the PQL (0.2 g/m^3), but less than 10 times the data set median (992.5g/m^3). Not considered significant. **Conductivity** was reported as a third consecutive increase in concentration (49.2 mS/m, 56.1 mS/m, 64.4 mS/m), but less than 10 times the data set median (852.5 mS/m). Not considered significant. **Manganese** was reported at a concentration (0.0207 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant. **Nitrate-N** was reported at a concentration (1.92 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (20.35 g/m^3). Not considered significant.
103B$^+$	29 June 2018	**Chloride** was reported at a concentration (104 g/m^3) exceeding the PQL (0.2 g/m^3), but less than 10 times the data set median (1,440 g/m^3). Not considered significant. **Manganese** was reported at a concentration (0.38 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant.

		Nitrate-N was reported at a concentration (1.01 g/m^3) exceeding the PQL (0.1 g/m^3), 10 times the data set median (0.4 g/m^3) and as a third consecutive increase in concentration (0.02 g/m^3, 0.24 g/m^3, 1.01 g/m^3). Considered significant. **pH** was reported as a third consecutive increase (6.6, 6.7,7.0). Not considered significant.
6	29 June 2019	**Chloride** was reported at a concentration (101 g/m^3) exceeding the PQL (0.2 g/m^3), but less than 10 times the data set median (1,015 g/m^3). Not considered significant. **Dissolved Reactive Phosphorus** was reported as a third consecutive increase in concentration (0.019 g/m^3, 0.024 g/m^3, 0.025 g/m^3), but less than 10 times the data set median (0.155 g/m^3) Not considered significant. **Nitrate-N** was reported at a concentration (0.32 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (4.55 g/m^3). Not considered significant.

Surface Water Sampling – Summary of June 2018 Results		
Location	**Date Sampled**	**Discussion of Results in Relation to Trigger Criteria***
Upstream	29 June 2018	**Chloride** was reported at a concentration (42.4 g/m^3) exceeding the PQL (0.2 g/m^3), but less than 10 times the data set median (430.5 g/m^3). Not considered significant. **Conductivity** was reported as a third consecutive increase in concentration (22.2 mS/m, 22.3 mS/m, 22.7 mS/m), but less than 10 times the data set median (243 mS/m). Not considered significant. **Nitrate-N** was reported at a concentration (0.4 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (4.4 g/m^3). Not considered significant. As these are upstream samples, the results are not considered to be associated with the landfill operations.
Downstream	29 June 2018	**Ammonia-N** was reported at a concentration (0.49 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (3.95 g/m^3). Not considered significant. **Chloride** was reported at a concentration (45.3 g/m^3) exceeding the PQL (0.2 g/m^3), but less than 10 times the data set median (471.5 g/m^3). Not considered significant. **Conductivity** was reported as a third consecutive increase in concentration (29.1 mS/m, 29.2 mS/m, 30.5 mS/m), but less than 10 times the data set median (343 mS/m). Not considered significant. **Manganese** was reported at a concentration (0.213 g/m^3) exceeding the PQL (0.005 g/m^3) and as a third consecutive increase in concentration (0.169 g/m^3, 0.193 g/m^3, 0.213 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant. **Nitrate-N** was reported at a concentration (0.59 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (9 g/m^3). Not considered significant.

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- Single values greater than 10 times the median (calculated from the entire data set beginning in July 2008).
- Single values above ANZG 95% fresh water guidelines.
- Three consecutive increasing measurements (at least one of which is greater than the median).

Values may be considered significant if they exceed one or more of the trigger criteria.

+ Decommissioned monitoring wells BH3A and BH3B have been superseded by monitoring wells BH103A and BH103B. These were installed in April 2013 and have been monitored since June 2013.

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Memorandum

To	Wellington City Council Attn: Landfill Manager – Darren Hoskins	Page	1
CC			
Subject	Southern Landfill Groundwater and Surface Water Monitoring Data - July 2018		
From	Kate Shaskey		
File/Ref No.	Job Reference 60606010	Date	15-July-2019

Please find below a summary of groundwater and surface water monitoring data from the Southern Landfill for July 2018. This data includes a summary of the sampling round which occurred on **24 July 2018**.

Groundwater Monitoring Bores – Summary of July 2018 Results		
Bore	**Date Sampled**	**Discussion of Results in Relation to Trigger Criteria***
2A	24 July 2018	**Manganese** was reported at a concentration (0.0128 g/m^3) exceeding the PQL(0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant.
2B	24 July 2018	No results exceeding the trigger criteria.
103A$^+$	24 July 2018	**Conductivity** was reported as a third consecutive increase (56.1 mS/m, 64.4 mS/m, 69.3 mS/m). Not considered significant.
103B$^+$	24 July 2018	**Manganese** was reported at a concentration (0.0068 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant.
6	24 July 2018	**Manganese** was reported at a concentration (0.0092 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant.

Surface Water Sampling – Summary of July 2018 Results		
Location	**Date Sampled**	**Discussion of Results in Relation to Trigger Criteria***
Upstream	24 July 2018	**Conductivity** was reported as a third consecutive increase (22.3 mS/m, 22.7 mS/m, 23.3 mS/m). Not considered significant. **Manganese** was reported at a concentration (0.0086 g/m^3) exceeding the PQL (0.005 g/m^3) and as a third consecutive increase in concentration (0.0013 g/m^3, 0.0033 g/m^3, 0.0086 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant. **Nitrate-N** was reported at a concentration (0.43 g/m^3) exceeding the PQL (0.1 g/m^3) and as a third consecutive increase in concentration (0.31 g/m^3, 0.40 g/m^3, 0.43 g/m^3), but less than 10 times the data set median (4.4 g/m^3). Not considered significant. As these are upstream samples, the results are not considered to be associated with the landfill operations.
Downstream	24 July 2018	**Ammonia-N** was reported at a concentration (0.89 g/m^3) exceeding the PQL (0.1 g/m^3) and as a third consecutive increase in concentration (0.24 g/m^3, 0.49 g/m^3, 0.89 g/m^3), but less than 10 times the data set median (4.1 g/m^3). Not considered significant.

		Conductivity was reported as a third consecutive increase (29.2 mS/m, 30.5 mS/m, 79.5 mS/m). Not considered significant. **Faecal Coliforms** were reported at a concentration (2,500 cfu/100ml) exceeding the PQL (10) and 10 times the data set median (165 cfu/100ml). Considered significant. **Iron** was reported at a concentration (0.35 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (0.6 g/m^3). Not considered significant. **Manganese** was reported at a concentration (0.961 g/m^3) exceeding the PQL (0.005 g/m^3) and as a third consecutive increase in concentration (0.193 g/m^3, 0.213 g/m^3, 0.961 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant. **Nitrate-N** was reported at a concentration (1.85 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (9 g/m^3). Not considered significant. **pH** was reported as a third consecutive increase (7.5, 7.6, 7.9). Not considered significant.

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- Single values greater than 10 times the median (calculated from the entire data set beginning in July 2008).
- Single values above ANZG 95% fresh water guidelines.
- Three consecutive increasing measurements (at least one of which is greater than the median).

Values may be considered significant if they exceed one or more of the trigger criteria.

+ Decommissioned monitoring wells BH3A and BH3B have been superseded by monitoring wells BH103A and BH103B. These were installed in April 2013 and have been monitored since June 2013.

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Memorandum

To	Wellington City Council Attn: Landfill Manager – Darren Hoskins	Page	1
CC			
Subject	Southern Landfill Groundwater and Surface Water Monitoring Data - August 2018		
From	Kate Shaskey		
File/Ref No.	Job Reference 60606010	Date	15-July-2019

Please find below a summary of groundwater and surface water monitoring data from the Southern Landfill for August 2018. This data includes a summary of the sampling round which occurred on **28 August 2019**.

Groundwater Monitoring Bores – Summary of August 2018 Results		
Bore	**Date Sampled**	**Discussion of Results in Relation to Trigger Criteria***
2A	28 August 2018	**Conductivity** was reported as a third consecutive increase in concentration (64.7 mS/m, 74.4 mS/m, 88.8 mS/m). Not considered significant. **Manganese** was reported was reported at a concentration (0.0271 g/m^3) exceeding the PQL (0.005 g/m^3) and as a third consecutive increase in concentration (0.0018 g/m^3, 0.0128 g/m^3, 0.0271 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant.
2B	28 August 2018	**Conductivity** was reported as a third consecutive increase in concentration (41.3 mS/m, 91.4 mS/m, 107 mS/m). Not considered significant. **Manganese** was reported at a concentration (0.266 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant.
103A$^+$	28 August 2018	**Manganese** was reported at a concentration (0.0055 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant.
103B$^+$	28 August 2018	**Ammonia-N** was reported at a concentration (1.9 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (21.3 g/m^3), Not considered significant. **BOD** was reported at a concentration (11 g/m^3) exceeding the PQL (10 g/m^3), but less than 10 times the data set median (30 g/m^3). Not considered significant. **Manganese** was reported at a concentration (9.63 g/m^3) exceeding the ANZG 95% fresh water guidelines (1.9 g/m^3) and the PQL (0.005 g/m^3), but less than 10 times the data set median (92.1 g/m^3). Not considered significant.
6	28 August 2018	**Conductivity** was reported as a third consecutive increase in concentration (55.2 mS/m, 56.4 mS/m, 57.7 mS/m). Not considered significant. **Manganese** was reported was reported at a concentration (0.0258 g/m^3) exceeding the PQL (0.005 g/m^3) and as a third consecutive increase in concentration (0.0043 g/m^3, 0.0092 g/m^3, 0.0258 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant. **pH** was reported as a third consecutive increase (6.1, 6.3, 6.6). Not considered significant.

Surface Water Sampling – Summary of August 2018 Results		
Location	**Date Sampled**	**Discussion of Results in Relation to Trigger Criteria***
Upstream	28 August 2018	**Faecal Coliforms** were reported at a concentration (84 cfu/100ml) exceeding the PQL (10 cfu/100ml), but less than 10 times the data set median (215 cfu/100ml). Not considered significant. **Nitrate-N** was reported at a concentration (0.32 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (4.35 g/m^3). Not considered significant. As these are upstream samples, the results are not considered to be associated with the landfill operations.
Downstream	28 August 2018	**Ammonia-N** was reported at a concentration (0.53 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (4.1 g/m^3). Not considered significant. **Faecal Coliforms** were reported at a concentration (35 cfu/100ml) exceeding the PQL (10 cfu/100ml), but less than 10 times the data set median (170 cfu/100ml). Not considered significant. **Manganese** was reported at a concentration (0.3 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant. **Nitrate-N** was reported at a concentration (0.73 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (9 g/m^3). Not considered significant.

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- Single values greater than 10 times the median (calculated from the entire data set beginning in July 2008).
- Single values above ANZG 95% fresh water guidelines.
- Three consecutive increasing measurements (at least one of which is greater than the median).

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Memorandum

To	Wellington City Council Attn: Landfill Manager – Darren Hoskins	Page	1
CC			
Subject	Southern Landfill Groundwater and Surface Water Monitoring Data - September 2018		
From	Kate Shaskey		
File/Ref No.	Job Reference 60606010	Date	15-July-2019

Please find below a summary of groundwater and surface water monitoring data from the Southern Landfill for September 2018. This data includes a summary of the sampling round which occurred on **24 and 28 September 2018**.

Groundwater Monitoring Bores – Summary of September 2018 Results		
Bore	**Date Sampled**	**Discussion of Results in Relation to Trigger Criteria***
2A	28 September 2018	**Conductivity** was reported as a third consecutive increase in concentration (74.4 mS/m, 88.8 mS/m, 106 mS/m). Not considered significant. **Manganese** was reported was reported at a concentration (0.235 g/m^3) exceeding the PQL (0.005 g/m^3), 10 times the data set median (0.089 g/m^3) and as a third consecutive increase in concentration (0.0128 g/m^3, 0.0271 g/m^3, 0.235 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant.
2B	24 September 2018	**Manganese** was reported at a concentration (0.0208 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant.
103A$^+$	24 September 2018	**Faecal Coliforms** were reported at a concentration (45 cfu/100ml) exceeding the PQL (10 cfu/100ml), 10 times the data set median (40 cfu/100ml) and as a third consecutive increase in concentration (1 cfu/100ml, 7 cfu/100ml, 45 cfu/100ml). Not considered significant.
103B$^+$	24 September 2018	**Ammonia-N** was reported at a concentration (1.72 g/m^3) exceeding the PQL (0.005 g/m^3), but less than 10 times the data set median (20.9 g/m^3). Not considered significant. **BOD** was reported at a concentration (11 g/m^3) exceeding the PQL (10 g/m^3), but less than 10 times the data set median (30 g/m^3). Not considered significant. **Chemical Oxygen Demand** was reported as a third consecutive increase in concentration (15 g/m^3, 40 g/m^3, 43 g/m^3), but less than 10 times the data set median (420 g/m^3). Not considered significant. **Conductivity** was reported as a third consecutive increase in concentration (44.5 mS/m, 154 mS/m, 163 mS/m). Not considered significant. **Faecal Coliforms** were reported at a concentration (22 cfu/100ml) exceeding the PQL (10 cfu/100ml) and as a third consecutive increase in concentration (1 cfu/100ml, 7 cfu/100ml, 22 cfu/100ml), but less than 10 times the data set median (40 cfu/100ml). Not considered significant. **Manganese** was reported at a concentration (8.87 g/m^3) exceeding the ANZG 95% fresh water guidelines (1.9 g/m^3) and the PQL (0.005 g/m^3), but less than 10 times the data set median (91.05 g/m^3). Not considered significant.
6	24 September 2018	**Manganese** was reported at a concentration (0.0278 g/m^3) exceeding the PQL (0.005 g/m^3) and as a third consecutive increase in concentration

		(0.0092 g/m^3, 0.0258 g/m^3, 0.0278 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant.

Surface Water Sampling – Summary of September 2018 Results		
Location	**Date Sampled**	**Discussion of Results in Relation to Trigger Criteria***
Upstream	24 September 2018	**Faecal Coliforms** were reported at a concentration (120 cfu/100ml) exceeding the PQL (10 cfu/100ml) and as a third consecutive increase in concentration (4 cfu/100ml, 84 cfu/100ml, 120 cfu/100ml), but less than 10 times the data set median (230 cfu/100ml). Not considered significant. **Nitrate-N** was reported at a concentration (0.26 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (4.3 g/m^3). Not considered significant. As these are upstream samples, the results are not considered to be associated with the landfill operations.
Downstream	24 September 2018	**Ammonia-N** was reported at a concentration (0.52 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (4.1 g/m^3). Not considered significant. **Conductivity** was reported as a third consecutive increase in concentration (33.1 mS/m, 35.5 mS/m, 38.8 mS/m). Not considered significant. **Faecal Coliforms** were reported at a concentration (120 cfu/100ml) exceeding the PQL (10 cfu/100ml), but less than 10 times the data set median (180 cfu/100ml). Not considered significant. **Manganese** was reported at a concentration (0.319 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant. **Nitrate-N** was reported at a concentration (0.86 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (9 g/m^3). Not considered significant.

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- Single values greater than 10 times the median (calculated from the entire data set beginning in July 2008).
- Single values above ANZG 95% fresh water guidelines.
- Three consecutive increasing measurements (at least one of which is greater than the median).

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Memorandum

To	Wellington City Council Attn: Landfill Manager – Darren Hoskins	Page	1
CC			
Subject	Southern Landfill Groundwater and Surface Water Monitoring Data - October 2018		
From	Kate Shaskey		
File/Ref No.	Job Reference 60606010	Date	16-July-2019

Please find below a summary of groundwater and surface water monitoring data from the Southern Landfill for October 2018. This data includes a summary of the sampling round which occurred on **30 October 2018**.

Groundwater Monitoring Bores – Summary of October 2018 Results		
Bore	**Date Sampled**	**Discussion of Results in Relation to Trigger Criteria***
2A	30 October 2018	**Manganese** was reported at a concentration (0.0287 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant.
2B	30 October 2018	**Manganese** was reported at a concentration (0.272 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant.
103A$^+$	30 October 2018	**Faecal Coliforms** were reported at a concentration (80 cfu/100ml) exceeding the PQL (10 cfu/100ml), 10 times the data set median (40 cfu/100ml) and as a third consecutive increase in concentration (7 cfu/100ml, 45 cfu/100ml, 80 cfu/100ml). Not considered significant.
103B$^+$	30 October 2018	**Ammonia-N** was reported at a concentration (0.24 g/m^3) exceeding the PQL (0.1 g/m^3) but less than 10 times the data median (20.5 g/m^3) and similar to recent previous data. Not considered significant. **Faecal Coliforms** were reported at a concentration (29 cfu/100ml) exceeding the PQL (10 cfu/100ml) and as a third consecutive increase in concentration (7 cfu/100ml, 22 cfu/100ml, 29 cfu/100ml), but less than 10 times the data set median (40 cfu/100ml). Not considered significant. **Manganese** was reported at a concentration (2.13 g/m^3) exceeding the ANZG 95% fresh water guidelines (1.9 g/m^3) and PQL (0.005 g/m^3), but less than 10 times the data set median (90 g/m^3) and similar to recent previous data. Not considered significant.
6	30 October 2018	No sample collected. Groundwater monitoring bore covered by landslip and not accessible.

Surface Water Sampling – Summary of October 2018 Results		
Location	**Date Sampled**	**Discussion of Results in Relation to Trigger Criteria***
Upstream	30 October 2018	**Nitrate-N** was reported at a concentration (0.29 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (4.25 g/m^3). Not considered significant. Results of upstream samples are not considered to be associated with the landfill operations.

Downstream	30 October 2018	**Ammonia-N** was reported at a concentration (0.44 g/m^3) exceeding the PQL (0.1 g/m^3) but less than 10 times the data set median (4.15 g/m^3). Not considered significant. **Conductivity** was reported as a third consecutive increase in concentration (33.1 mS/m, 35.5 mS/m, 38.8 mS/m). Not considered significant. **Faecal Coliforms** were reported at a concentration (5,900 cfu/100ml) exceeding the PQL (10 cfu/100ml), 10 times the data set median (190 cfu/100ml) and as a third consecutive increase in concentration (35 cfu/100ml, 120 cfu/100ml, 5,900 cfu/100ml). Considered significant. **Iron** was reported at a concentration (0.52 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (0.6 g/m^3). Not considered significant. **Manganese** was reported at a concentration (0.215 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant. **Nitrate-N** was reported at a concentration (1.18 g/m^3) exceeding the PQL (0.1 g/m^3) and as a third consecutive increase in concentration (0.73 g/m^3, 0.86 g/m^3, 1.18 g/m^3) but less than 10 times the data set median (9 g/m^3). Not considered significant. **Suspended solids** were reported at a concentration (73 g/m^3) exceeding the PQL (30 g/m^3) and 10 times the data set median (60 g/m^3). Not considered significant.

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  - Single values greater than 10 times the median (calculated from the entire data set beginning in July 2008).
  - Single values above ANZECC 95% fresh water guidelines.
  - Three consecutive increasing measurements (at least one of which is greater than the median).

Values may be considered significant if they exceed one or more of the trigger criteria.

+ Decommissioned monitoring wells BH3A and BH3B have been superseded by monitoring wells BH103A and BH103B. These were installed in April 2013 and have been monitored since June 2013.

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Memorandum

To	Wellington City Council Attn: Landfill Manager – Darren Hoskins	Page	1
CC			
Subject	Southern Landfill Groundwater and Surface Water Monitoring Data - November 2018		
From	Kate Shaskey		
File/Ref No.	Job Reference 60606010	Date	16-July-2019

Please find below a summary of groundwater and surface water monitoring data from the Southern Landfill for November 2018. This data includes a summary of the sampling round which occurred on **13 November 2018**.

Groundwater Monitoring Bores – Summary of November 2018 Results		
Bore	**Date Sampled**	**Discussion of Results in Relation to Trigger Criteria***
2A	13 November 2018	**Manganese** was reported at a concentration (0.03 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant.
2B	13 November 2018	**Manganese** was reported at a concentration (0.293 g/m^3) exceeding the PQL (0.005 g/m^3) and as a third consecutive increase in concentration (0.0208 g/m^3, 0.272 g/m^3, 0.293 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant.
103A$^+$	13 November 2018	**Manganese** was reported at a concentration (0.0163 g/m^3) exceeding the PQL (0.005 g/m^3) and as a third consecutive increase in concentration (0.0014 g/m^3, 0.002 g/m^3, 0.0163 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant. **Faecal Coliforms** were reported at a concentration (14 cfu/100ml) exceeding the PQL (10 cfu/100ml), but less than 10 times the data set median (40 cfu/100ml). Not considered significant.
103B$^+$	13 November 2018	**Ammonia-N** was reported at a concentration (1.46 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (20.25 g/m^3). Not considered significant. **Faecal Coliforms** were reported at a concentration (28 cfu/100ml) exceeding the PQL (10 cfu/100ml), but less than 10 times the data set median (40 cfu/100ml). Not considered significant. **Manganese** was reported at a concentration (6.61 g/m^3) exceeding the ANZG 95% fresh water guidelines (1.9 g/m^3) and PQL (0.005 g/m^3), but less than 10 times the data set median (89.5 g/m^3). Not considered significant.
6	13 November 2018	No sample collected. Groundwater monitoring bore covered by landslip and not accessible.

Surface Water Sampling – Summary of November 2018 Results		
Location	**Date Sampled**	**Discussion of Results in Relation to Trigger Criteria***
Upstream	13 November 2018	**Faecal Coliforms** were reported at a concentration (88 cfu/100ml) exceeding the PQL (10 cfu/100ml), but less than 10 times the data set median (230 cfu/100ml). Not considered significant.

		Nitrate-N was reported at a concentration (0.2 g/m^3) exceeding the PQL (0.1 g/m^3) but less than 10 times the data set median (4.2 g/m^3). Not considered significant. As these are upstream samples, the results are not considered to be associated with the landfill operations.
Downstream	13 November 2018	**Ammonia-N** was reported at a concentration (0.49 g/m^3) exceeding the PQL (0.005 g/m^3), but less than 10 times the data set median (4.2 g/m^3). Not considered significant. **Conductivity** was reported as a third consecutive increase in concentration (35.5 mS/m, 38.8 mS/m, 62.7 mS/m). Not considered significant. **Iron** was reported at a concentration (0.26 g/m^3) exceeding the PQL (0.005 g/m^3), but less than 10 times the data set median (0.6 g/m^3). Not considered significant. **Manganese** was reported at a concentration (0.694 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant. **Nitrate-N** was reported at a concentration (1.22 g/m^3) exceeding the PQL (0.1 g/m^3) and as a third consecutive increase in concentration (0.86 g/m^3, 1.18 g/m^3, 1.22 g/m^3), but less than 10 times the data set median (9 g/m^3). Not considered significant.

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- Single values above ANZG 95% fresh water guidelines.
- Three consecutive increasing measurements (at least one of which is greater than the median).

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Memorandum

To	Wellington City Council Attn: Landfill Manager – Darren Hoskins	Page	1
CC			
Subject	Southern Landfill Groundwater and Surface Water Monitoring Data - December 2018		
From	Kate Shaskey		
File/Ref No.	Job Reference 60606010	Date	16-June-2019

Please find below a summary of groundwater and surface water monitoring data from the Southern Landfill for December 2018. This data includes a summary of the sampling round which occurred on **13 December 2018**.

Groundwater Monitoring Bores – Summary of December 2018 Results		
Bore	**Date Sampled**	**Discussion of Results in Relation to Trigger Criteria***
2A	13 December 2018	**Chemical Oxygen Demand** was reported as third consecutive increase in concentration (15 g/m^3, 19 g/m^3, 29 g/m^3), but less than 10 times the data set median (150 g/m^3). Not considered significant. **Chloride** was reported at a concentration (99 g/m^3) exceeding the PQL (0.2 g/m^3), but less than 10 times the data set median (935 g/m^3). Not considered significant. **Manganese** was reported at a concentration (0.0267 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant. **Nitrate-N** was reported at a concentration (1.96 g/m^3) exceeding the PQL (0.1 g/m^3) but less than 10 times the data set median (25.5 g/m^3). Not considered significant.
2B	13 December 2018	**Chloride** was reported at a concentration (108 g/m^3) exceeding the PQL (0.2 g/m^3) but less than 10 times the data set median (1030 g/m^3). Not considered significant. **Manganese** was reported at a concentration (0.244 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant. **Nitrate-N** was reported at a concentration (1.03 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (16.6 g/m^3). Not considered significant.
103A$^+$	13 December 2018	**Chloride** was reported at a concentration (73 g/m^3) exceeding the PQL (0.2 g/m^3) but less than 10 times the data set median (965 g/m^3). Not considered significant. **Faecal Coliforms** were reported at a concentration (33 cfu/100ml) exceeding the PQL (10 cfu/100ml), but less than 10 times the data set median (40 cfu/100ml). Not considered significant. **Nitrate-N** was reported at a concentration (2.24 g/m^3) exceeding the PQL (0.1 g/m^3) and as a third consecutive increase in concentration (0.22 g/m^3, 1.92 g/m^3, 2.24 g/m^3), but less than 10 times the data set median (21.5 g/m^3). Not considered significant.
103B$^+$	13 December 2018	**Ammonia-N** was reported at a concentration (2.21 g/m^3) exceeding the PQL (0.1 g/m^3) and as a third consecutive increase in concentration (0.24 g/m^3, 1.46 g/m^3, 2.21 g/m^3), but less than 10 times the data set median (20.5 g/m^3). Not considered significant.

		Boron was reported at a concentration (0.36 g/m^3) exceeding the PQL (0.3 g/m^3), but less than ANZG 95% fresh water guidelines (0.37 g/m^3). Not considered significant. **Chloride** was reported at a concentration (156 g/m^3) exceeding the PQL (0.2 g/m^3) but less than 10 times the data set median (1465 g/m^3). Not considered significant. **Conductivity** was reported as a third consecutive increase in concentration (63.6 mS/m, 130 mS/m, 157 mS/m) but less than 10 times the data set median (1600 mS/m). Not considered significant. **Dissolved Reactive Phosphorus** was reported as a third consecutive increase in concentration (0.017 g/m^3, 0.023 g/m^3, 0.025 g/m^3), but less than 10 times the data set median (0.23 g/m^3). Not considered significant. **Manganese** was reported at a concentration (7.25 g/m^3) exceeding the PQL (0.005 g/m^3) and ANZG 95% freshwater guidelines (1.9 g/m^3), but less than 10 times the data set median (89 g/m^3). Not considered significant. **Nitrate-N** was reported at a concentration (0.18 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (0.7 g/m^3). Not considered significant.
6	13 December 2018	No sample collected. Groundwater monitoring bore covered by landslip and not accessible.

Surface Water Sampling – Summary of December 2018 Results		
Location	**Date Sampled**	**Discussion of Results in Relation to Trigger Criteria***
Upstream	13 December 2018	**Chloride** was reported at a concentration (40.5 g/m^3) exceeding the PQL (0.2 g/m^3) but less than 10 times the data set median (430 g/m^3). Not considered significant. **Conductivity** was reported as a third consecutive increase in concentration (18.4 mS/m, 20.6 mS/m, 22.7 mS/m). Not considered significant. **Faecal Coliforms** were reported at a concentration (65 cfu/100ml) exceeding the PQL (10 cfu/100ml) but less than 10 times the data set median (230 cfu/100ml). Not considered significant. **Nitrate-N** was reported at a concentration (0.24 g/m^3) exceeding the PQL (0.1 g/m^3) but less than 10 times the data set median (4.15 g/m^3). Not considered significant. As these are upstream samples, the results are not considered to be associated with the landfill operations.
Downstream	13 December 2018	**Aluminium** was reported as a third consecutive increase in concentration (0.004 g/m^3, 0.008 g/m^3, 0.017 g/m^3), but less than 10 times the data set median (0.15 g/m^3). Not considered significant. **Ammonia-N** was reported at a concentration (1.05 g/m^3) exceeding the PQL (0.1 g/m^3) and as a third consecutive increase in concentration (0.44 g/m^3, 0.49 g/m^3, 1.05 g/m^3), but less than 10 times the data set median (4.2 g/m^3). Not considered significant. **Boron** was reported at a concentration (0.38 g/m^3) exceeding the PQL (0.3 g/m^3) and ANZG 95% freshwater guidelines (0.37 g/m^3), but less than 10 times the data set median (0.4 g/m^3). Not considered significant. **Chloride** was reported at a concentration (61.2 g/m^3) exceeding the PQL (0.2 g/m^3) but less than 10 times the data set median (473 g/m^3). Not considered significant. **Conductivity** was reported as a third consecutive increase in concentration (38.8 mS/m, 62.7 mS/m, 76.1 mS/m). Not considered significant. **Iron** was reported at a concentration (0.39 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (0.6 g/m^3). Not considered significant. **Manganese** was reported at a concentration (1.02 g/m^3) exceeding the PQL (0.005 g/m^3) and as a third consecutive increase in concentration

		($0.215\ g/m^3$, $0.694\ g/m^3$, $1.02\ g/m^3$), but less than ANZG 95% freshwater guidelines ($1.9\ g/m^3$). Not considered significant. **Nitrate-N** was reported at a concentration ($1.41\ g/m^3$) exceeding the PQL ($0.1\ g/m^3$) and as a third consecutive increase in concentration ($1.18\ g/m^3$, $1.22\ g/m^3$, $1.41\ g/m^3$) but less than 10 times the data set median ($9.05\ g/m^3$). Not considered significant.

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Memorandum

To	Wellington City Council Attn: Landfill Manager – Darren Hoskins	Page	1
CC			
Subject	Southern Landfill Groundwater and Surface Water Monitoring Data - January 2019		
From	Kate Shaskey		
File/Ref No.	Job Reference 60606010	Date	17-July-2019

Please find below a summary of groundwater and surface water monitoring data from the Southern Landfill for January 2019. This data includes a summary of the sampling round which occurred on **10 January 2019**.

Groundwater Monitoring Bores – Summary of January 2019 Results		
Bore	**Date Sampled**	**Discussion of Results in Relation to Trigger Criteria***
2A	10 January 2019	**Conductivity** was reported as a third consecutive increase in concentration (87.7 mS/m, 88.3 mS/m, 88.6 mS/m). Not considered significant. **Manganese** was reported at a concentration (0.0342 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% freshwater guidelines (1.9 g/m^3). Not considered significant.
2B	10 January 2019	**Manganese** was reported at a concentration (0.253 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% freshwater guidelines (1.9 g/m^3). Not considered significant.
103A$^+$	10 January 2019	**Conductivity** was reported as a third consecutive increase in concentration (51.5 mS/m, 74.4 mS/m, 98.1 mS/m). Not considered significant
103B$^+$	10 January 2019	**Ammonia-N** was reported at a concentration (2.56 g/m^3) exceeding the PQL (0.1 g/m^3) and as a third consecutive increase in concentration (1.46 g/m^3, 2.21 g/m^3, 2.56 g/m^3), but less than 10 times the data set median (20.9 g/m^3). Not considered significant. **Conductivity** was reported as a third consecutive increase in concentration (130 mS/m, 157 mS/m, 171 mS/m). Not considered significant. **Iron** was reported as a third consecutive increase in concentration (0.01 g/m^3, 0.02 g/m^3, 0.04 g/m^3), but less than 10 times the data set median (0.6 g/m^3). Not considered significant. **Manganese** was reported at a concentration (10.2 g/m^3) exceeding the PQL (0.005 g/m^3), ANZG 95% freshwater guidelines (1.9 g/m^3) and as a third consecutive increase in concentration (6.61 g/m^3, 7.25 g/m^3, 10.2 g/m^3), but less than 10 times the data set median (89.5 g/m^3). Considered significant.
6	10 January 2019	No sample collected. Groundwater monitoring bore covered by landslip and not accessible.

Surface Water Sampling – Summary of January 2019 Results		
Location	**Date Sampled**	**Discussion of Results in Relation to Trigger Criteria***

Upstream	10 January 2019	**Conductivity** was reported as a third consecutive increase in concentration (20.6 mS/m, 22.7 mS/m, 24.8 mS/m). Not considered significant. **Faecal Coliforms** were reported at a concentration (36 cfu/100ml) exceeding the PQL (10 cfu/100ml) but less than 10 times the data set median (230 cfu/100ml). Not considered significant. **Manganese** was reported at a concentration (0.0053 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% freshwater guidelines (1.9 g/m^3). Not considered significant. **Nitrate-N** was reported at a concentration (0.28 g/m^3) exceeding the PQL (0.1 g/m^3) and as a third consecutive increase in concentration (0.2 g/m^3, 0.24 g/m^3, 0.28 g/m^3), but less than 10 times the data set median (4.1 g/m^3). Not considered significant. As these are upstream samples, the results are not considered to be associated with the landfill operations.
Downstream	10 January 2019	**Ammonia-N** was reported at a concentration (0.95 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (4.2 g/m^3). Not considered significant. **Chemical oxygen demand** was reported as a third consecutive increase in concentration (15 g/m^3, 19 g/m^3, 28 g/m^3), but less than 10 times the data set median (150 g/m^3). Not considered significant. **Iron** was reported at a concentration (0.59 g/m^3) exceeding the PQL (0.1 g/m^3) and as a third consecutive increase in concentration (0.26 g/m^3, 0.39 g/m^3, 0.59 g/m^3), but less than 10 times the data set median (0.6 g/m^3). Not considered significant. **Manganese** was reported at a concentration (1.11 g/m^3) exceeding the PQL (0.005 g/m^3) and as a third consecutive increase in concentration (0.694 g/m^3, 1.02 g/m^3, 1.11 g/m^3) but less than ANZG 95% freshwater guidelines (1.9 g/m^3). Not considered significant. **Nitrate-N** was reported at a concentration (1.15 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (9.1 g/m^3). Not considered significant. **pH** was reported as a third consecutive increase (7.5, 7.6, 8.0). Not considered significant.

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  - Three consecutive increasing measurements (at least one of which is greater than the median).

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Memorandum

To	Wellington City Council Attn: Landfill Manager – Darren Hoskins	Page	1
CC			
Subject	Southern Landfill Groundwater and Surface Water Monitoring Data - February 2019		
From	Kate Shaskey		
File/Ref No.	Job Reference 60606010	Date	18-July-2019

Please find below a summary of groundwater and surface water monitoring data from the Southern Landfill for February 2019. This data includes a summary of the sampling round which occurred on **25 February 2019**.

Groundwater Monitoring Bores – Summary of February 2019 Results		
Bore	**Date Sampled**	**Discussion of Results in Relation to Trigger Criteria***
2A	25 February 2019	**Manganese** was reported at a concentration (0.0299 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant.
2B	25 February 2019	**Manganese** was reported at a concentration (0.404 g/m^3) exceeding the PQL (0.005 g/m^3) and as a third consecutive increase in concentration (0.244 g/m^3, 0.253 g/m^3, 0.404 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant.
103A$^+$	25 February 2019	**Faecal Coliforms** were reported at a concentration (21 cfu/100ml) exceeding the PQL (10 cfu/100ml), but less than 10 times the data set median (40 cfu/100ml). Not considered significant. **pH** was reported as a third consecutive increase (6.5, 6.6, 6.8). Not considered significant.
103B$^+$	25 February 2019	**Manganese** was reported at a concentration (0.0158 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant.
6	25 February 2019	No sample collected. Groundwater monitoring bore covered by landslip and not accessible.

Surface Water Sampling – Summary of February 2019 Results		
Location	**Date Sampled**	**Discussion of Results in Relation to Trigger Criteria***
Upstream	25 February 2019	**Conductivity** was reported as a third consecutive increase in concentration (22.7 mS/m, 24.8 mS/m, 26.1 mS/m). Not considered significant. **Faecal Coliforms** were reported at a concentration (110 cfu/100ml) exceeding the PQL (10 cfu/100ml), but less than 10 times the data set median (230 cfu/100ml). Not considered significant. **Nitrate-N** was reported at a concentration (0.35 g/m^3) exceeding the PQL (0.1 g/m^3) and as a third consecutive increase in concentration (0.24 g/m^3, 0.28 g/m^3, 0.35 g/m^3), but less than 10 times the data set median (4.1 g/m^3). Not considered significant. As these are upstream samples, the results are not considered to be associated with the landfill operations.

Downstream	25 February 2019	**Ammonia-N** was reported at a concentration (1.08 g/m^3) exceeding the PQL (0.1 g/m^3) but less than 10 times the data set median (4.2 g/m^3). Not considered significant. **BOD** was reported as a third consecutive increase in concentration (4 g/m^3, 5 g/m^3, 6 g/m^3), but less than 10 times the data set median (10 g/m^3). Not considered significant. **Faecal Coliforms** were reported at a concentration (270 cfu/100ml) exceeding the PQL (10 cfu/100ml) and 10 times the data set median (170 cfu/100ml). Considered significant. **Iron** was reported at a concentration (0.43 g/m^3) exceeding the PQL (0.1 g/m^3), but less than ANZG 95% fresh water guidelines (0.6 g/m^3). Not considered significant. **Manganese** was reported at a concentration (1.05 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant. **Nitrate-N** was reported at a concentration (1.28 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (9.15 g/m^3). Not considered significant.

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- Single values above ANZG 95% fresh water guidelines.
- Three consecutive increasing measurements (at least one of which is greater than the median).

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Memorandum

To	Wellington City Council Attn: Landfill Manager – Darren Hoskins	Page	1
CC			
Subject	Southern Landfill Groundwater and Surface Water Monitoring Data - March 2019		
From	Kate Shaskey		
File/Ref No.	Job Reference 60606010	Date	18-July-2019

Please find below a summary of groundwater and surface water monitoring data from the Southern Landfill for March 2019. This data includes a summary of the sampling round which occurred on **27 March 2019**.

Groundwater Monitoring Bores – Summary of March 2019 Results		
Bore	**Date Sampled**	**Discussion of Results in Relation to Trigger Criteria***
2A	27 March 2019	**Faecal Coliforms** were reported at a concentration (96 cfu/100ml) exceeding the PQL (10 cfu/100ml) and 10 times the data set median (10 cfu/100ml). Considered significant. **Manganese** was reported at a concentration (0.0345 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant.
2B	27 March 2019	**Manganese** was reported at a concentration (0.322 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant.
103A$^+$	27 March 2019	**Ammonia-N** was reported at a concentration (0.42 g/m^3) exceeding the PQL (0.1 g/m^3) and 10 times the data set median (0.1 g/m^3). Considered significant. **Manganese** was reported at a concentration (0.579 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant.
103B$^+$	27 March 2019	**Faecal Coliforms** were reported at a concentration (17 cfu/100ml) exceeding the PQL (10 cfu/100ml) but less than 10 times the data set median (40 cfu/100ml). Not considered significant.
6	27 March 2019	No sample collected. Groundwater monitoring bore covered by landslip and not accessible.

Surface Water Sampling – Summary of March 2019 Results		
Location	**Date Sampled**	**Discussion of Results in Relation to Trigger Criteria***
Upstream	27 March 2019	**Faecal Coliforms** were reported at a concentration (150 cfu/100ml) exceeding the PQL (10 cfu/100ml) and as a third consecutive increase in concentration (36 cfu/100ml, 110 cfu/100ml, 150 cfu/100ml), but less than 10 times the data set median (230 cfu/100ml). Not considered significant. **Nitrate-N** was reported at a concentration (0.28 g/m^3) exceeding the PQL (0.1 g/m^3) but less than 10 times the data set median (4.1 g/m^3). Not considered significant. As these are upstream samples, the results are not considered to be associated with the landfill operations.

Downstream	27 March 2019	**Ammonia-N** was reported at a concentration (0.76 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (4.2 g/m^3). Not considered significant. **Faecal Coliforms** were reported at a concentration (230 cfu/100ml) exceeding the PQL (10 cfu/100ml) and 10 times the data set median (180 cfu/100ml). Considered significant. **Iron** was reported at a concentration (0.8 g/m^3) exceeding the PQL (0.1 g/m^3) and 10 times the data set median (0.6 g/m^3). Considered significant. **Manganese** was reported at a concentration (1.05 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant. **Nitrate-N** was reported at a concentration (1.15 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (9.2 g/m^3). Not considered significant.

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- Values greater than the Practical Quantification Limit (PQL calculated as 10 times the Method Detection Limit (MDL)).
- Single values greater than 10 times the median (calculated from the entire data set beginning in July 2008).
- Single values above ANZG 95% fresh water guidelines.
- Three consecutive increasing measurements (at least one of which is greater than the median).

Values may be considered significant if they exceed one or more of the trigger criteria.

+ Decommissioned monitoring wells BH3A and BH3B have been superseded by monitoring wells BH103A and BH103B. These were installed in April 2013 and have been monitored since June 2013.

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Memorandum

To	Wellington City Council Attn: Landfill Manager – Darren Hoskins	Page	1
CC			
Subject	Southern Landfill Groundwater and Surface Water Monitoring Data - April 2019		
From	Kate Shaskey		
File/Ref No.	Job Reference 60606010	Date	18-July-2019

Please find below a summary of groundwater and surface water monitoring data from the Southern Landfill for April 2019. This data includes a summary of the sampling round which occurred on **23 April 2019**.

Groundwater Monitoring Bores – Summary of April 2019 Results		
Bore	**Date Sampled**	**Discussion of Results in Relation to Trigger Criteria***
2A	23 April 2019	**Faecal Coliforms** were reported at a concentration (12 cfu/100ml) exceeding the PQL (10 cfu/100ml) and 10 times the data set median (10 cfu/100ml). Considered significant. **Manganese** was reported at a concentration (0.0207 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant. **pH** was reported as a third consecutive increase (6.7, 6.8, 6.9). Not considered significant.
2B	23 April 2019	**Manganese** was reported at a concentration (0.293 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant. **pH** was reported as a third consecutive increase (6.5, 6.7, 7.1). Not considered significant.
103A$^+$	23 April 2019	**Faecal Coliforms** were reported at a concentration (90 cfu/100ml) exceeding the PQL (10 cfu/100ml) and 10 times the data set median (40 cfu/10ml). Considered significant.
103B$^+$	23 April 2019	**Ammonia-N** was reported at a concentration (0.64 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (20 g/m^3). Not considered significant. **Faecal Coliforms** were reported at a concentration (62 cfu/100ml) exceeding the PQL (10 cfu/100ml), 10 times the data set median (40 cfu/100ml) and as a third consecutive increase in concentration (1 cfu/100ml, 17 cfu/100ml, 62 cfu/100ml). Considered significant. **Manganese** was reported at a concentration (2.68 g/m^3) exceeding the PQL (0.005 g/m^3) and ANZG 95% freshwater guidelines (1.9 g/m^3), but less than 10 times the data set median (88.9 g/m^3). Considered significant.
6	23 April 2019	No sample collected. Groundwater monitoring bore covered by landslip and not accessible.

Surface Water Sampling – Summary of April 2019 Results		
Location	**Date Sampled**	**Discussion of Results in Relation to Trigger Criteria***
Upstream	23 April 2019	**Faecal Coliforms** were reported at a concentration (80 cfu/100ml) exceeding the PQL (10 cfu/100ml), but less than 10 times the data set median (230 cfu/100ml). Not considered significant.

		Iron was reported as a third consecutive increase in concentration (0.01 g/m^3, 0.02 g/m^3, 0.03 g/m^3), but less than 10 times the data set median (0.2 g/m^3). Not considered significant. **Nitrate-N** was reported at a concentration (0.25 g/m^3) exceeding the PQL (0.1 g/m^3) but less than 10 times the data set median (4.05 g/m^3). Not considered significant. **pH** was reported as a third consecutive increase (7.7, 7.8, 7.9). Not considered significant. As these are upstream samples, the results are not considered to be associated with the landfill operations.
Downstream	23 April 2019	**Ammonia-N** was reported at a concentration (1 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (4.2 g/m^3). Not considered significant. **BOD** was reported at a concentration (11 g/m^3) exceeding the PQL (10 g/m^3) and10 times the data set median (10 g/m^3). Considered significant. **Faecal Coliforms** were reported at a concentration (10,000 cfu/100ml) exceeding the PQL (10 cfu/100ml) and 10 times the data set median (190 cfu/100ml). Considered significant. **Iron** was reported at a concentration (2.03 g/m^3) exceeding the PQL (0.1 g/m^3), 10 times the data set median (0.6 g/m^3) and as a third consecutive increase in concentration (0.43 g/m^3, 0.8 g/m^3, 2.03 g/m^3). Considered significant. **Manganese** was reported at a concentration (0.453 g/m^3) exceeding the PQL (0.005 g/m^3). but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant. **Nitrate-N** was reported at a concentration (0.8 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (9.15 g/m^3). Not considered significant. **Suspended Solids** were reported at a concentration exceeding the PQL (30 g/m^3), 10 times the data set median (60 g/m^3) and as a third consecutive increase in concentration (6 g/m^3, 29 g/m^3, 62 g/m^3). Considered significant.

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- Single values above ANZG 95% fresh water guidelines.
- Three consecutive increasing measurements (at least one of which is greater than the median).

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Memorandum

To	Wellington City Council Attn: Landfill Manager – Darren Hoskins	Page	1
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Subject	Southern Landfill Groundwater and Surface Water Monitoring Data - May 2019		
From	Kate Shaskey		
File/Ref No.	Job Reference 60606010	Date	18-July-2019

Please find below a summary of groundwater and surface water monitoring data from the Southern Landfill for May 2019. This data includes a summary of the sampling round which occurred on **29 May 2019**.

Groundwater Monitoring Bores – Summary of May 2019 Results		
Bore	**Date Sampled**	**Discussion of Results in Relation to Trigger Criteria***
2A	29 May 2019	**Chemical Oxygen Demand** was reported as a third consecutive increase in concentration (15 g/m^3, 18 g/m^3, 24 g/m^3), but less than 10 times the data set median (150 g/m^3). Not considered significant. **Manganese** was reported at a concentration (0.219 g/m^3) exceeding the PQL (0.005 g/m^3) and 10 times the data set median (0.098 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant. **pH** was reported as a third consecutive increase (6.8, 6.9, 7.1). Not considered significant.
2B	29 May 2019	**Manganese** was reported at a concentration (0.0129 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant. **pH** was reported as a third consecutive increase (6.7, 7.1, 8). Not considered significant.
103A$^+$	29 May 2019	**Ammonia-N** was reported at a concentration (0.13 g/m^3) exceeding the PQL (0.1 g/m^3) and 10 times the data set median (0.1 g/m^3). Considered significant. **Faecal Coliforms** were reported at a concentration (26 cfu/100ml) exceeding the PQL (10 cfu/100ml), but less than 10 times the data set median (40 cfu/100ml). Not considered significant. **Manganese** was reported at a concentration (0.0061 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant.
103B$^+$	29 May 2019	**Ammonia-N** was reported at a concentration (1.47 g/m^3) exceeding the PQL (0.1 g/m^3) and as a third consecutive increase in concentration (0.01 g/m^3, 0.64 g/m^3, 1.47 g/m^3), but less than 10 times the data set median (19.95 g/m^3). Not considered significant. **Conductivity** was reported as a third consecutive increase in concentration (21.8 mS/m, 82.9 mS/m, 83.8 mS/m). Not considered significant. **Faecal Coliforms** were reported at a concentration (11 cfu/100ml) exceeding the PQL (10 cfu/100ml), but less than 10 times the data set median (40 cfu/100ml). Not considered significant. **Manganese** was reported at a concentration (5.04 g/m^3) exceeding the PQL (0.005 g/m^3), and ANZG 95% fresh water guidelines (1.9 g/m^3) and as a third consecutive increase in concentration (0.0011 g/m^3, 2.68 g/m^3, 5.04

		g/m^3), but less than 10 times the data set median (88.8 g/m^3). Considered significant.
6	29 May 2019	No sample collected. Groundwater monitoring bore covered by landslip and not accessible.

Surface Water Sampling – Summary of May 2019 Results		
Location	**Date Sampled**	**Discussion of Results in Relation to Trigger Criteria***
Upstream	29 May 2019	**Faecal Coliforms** were reported at a concentration (20 cfu/100ml) exceeding the PQL (10 cfu/100ml), but less than 10 times the data set median (230 cfu/100ml). Not considered significant. **Nitrate-N** was reported at a concentration (0.31 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (4 g/m^3). Not considered significant. As these are upstream samples, the results are not considered to be associated with the landfill operations.
Downstream	29 May 2019	**Ammonia-N** was reported at a concentration (0.84 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (4.2 g/m^3). Not considered significant. **Faecal Coliforms** were reported at a concentration (58 cfu/100ml) exceeding the PQL (10 cfu/100ml), but less than 10 times the data set median (190 cfu/100ml). Not considered significant. **Iron** was reported at a concentration (0.36 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (0.6 g/m^3). Not considered significant. **Manganese** was reported at a concentration (0.835 g/m^3) exceeding the PQL (0.005 g/m^3), but less than ANZG 95% fresh water guidelines (1.9 g/m^3). Not considered significant. **Nitrate-N** was reported at a concentration (1.34 g/m^3) exceeding the PQL (0.1 g/m^3), but less than 10 times the data set median (9.2 g/m^3). Not considered significant.

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