REPORT

Tonkin+Taylor

For a comprehensive understanding of this report, please also refer to the relevant s92 responses

Auckland Regional Landfill

Water Quality Baseline Monitoring Report

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Waste Management NZ Ltd
Prepared by
Tonkin & Taylor Ltd
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1 Introduction

Tonkin & Taylor Ltd (T+T) has been engaged by Waste Management NZ Ltd to undertake a programme of baseline environment monitoring. This is to inform the Auckland Regional Landfill project, involving the development of a proposed landfill site in the Wayby Valley, approximately 10km North West of Warkworth.

1.1 Site description

The proposed landfill site is located in the Wayby Valley approximately 6 km southeast of Wellsford. The proposed landfill valley is northwest facing and currently vegetated with pine forest.

Access to the site is proposed off State Highway 1 just south of the Hōteo River Bridge, where a sealed road will be constructed up a neighbouring farm valley (Southern Valley). Existing access to the site is via Forestry Road off State Highway 1, which then turns into Wilson Rd.

1.2 Proposed development

The project comprises construction of a 25.8 Mm^3 landfill which is estimated to provide waste storage for the greater Auckland area for 25 years.

Key features of the proposed works include:

- Earthworks (cut and fill) to modify the existing valley landform to meet the required storage volume (air space)
- Construction of a clay and HDPE liner along the base of the landfill
- Construction of an access road from the existing State Highway 1 up the Southern Valley and into the proposed landfill, involving multiple cut slopes and earth fills along the alignment
- Construction of a bin exchange area, site office and staff car park on the eastern side of Waiteraire stream
- Construction of a weighbridge on the western side of Waiteraire stream
- Construction of a bridge over the Waiteraire stream

1.3 Site geology

Pakiri Formation sedimentary rocks of the Waitemata Group were the only geological unit observed at the site. Northland Allochthon has not been identified at the site but may be present on the lowland west of Valley one as shown in Figure 1-1 below. Tauranga Group alluvial sediments were encountered at the base of the road access valley, these materials will likely be encountered around low lying streams. Further details are provided in the Geotechnical Interpretive Report (Technical Report B, Volume 2).

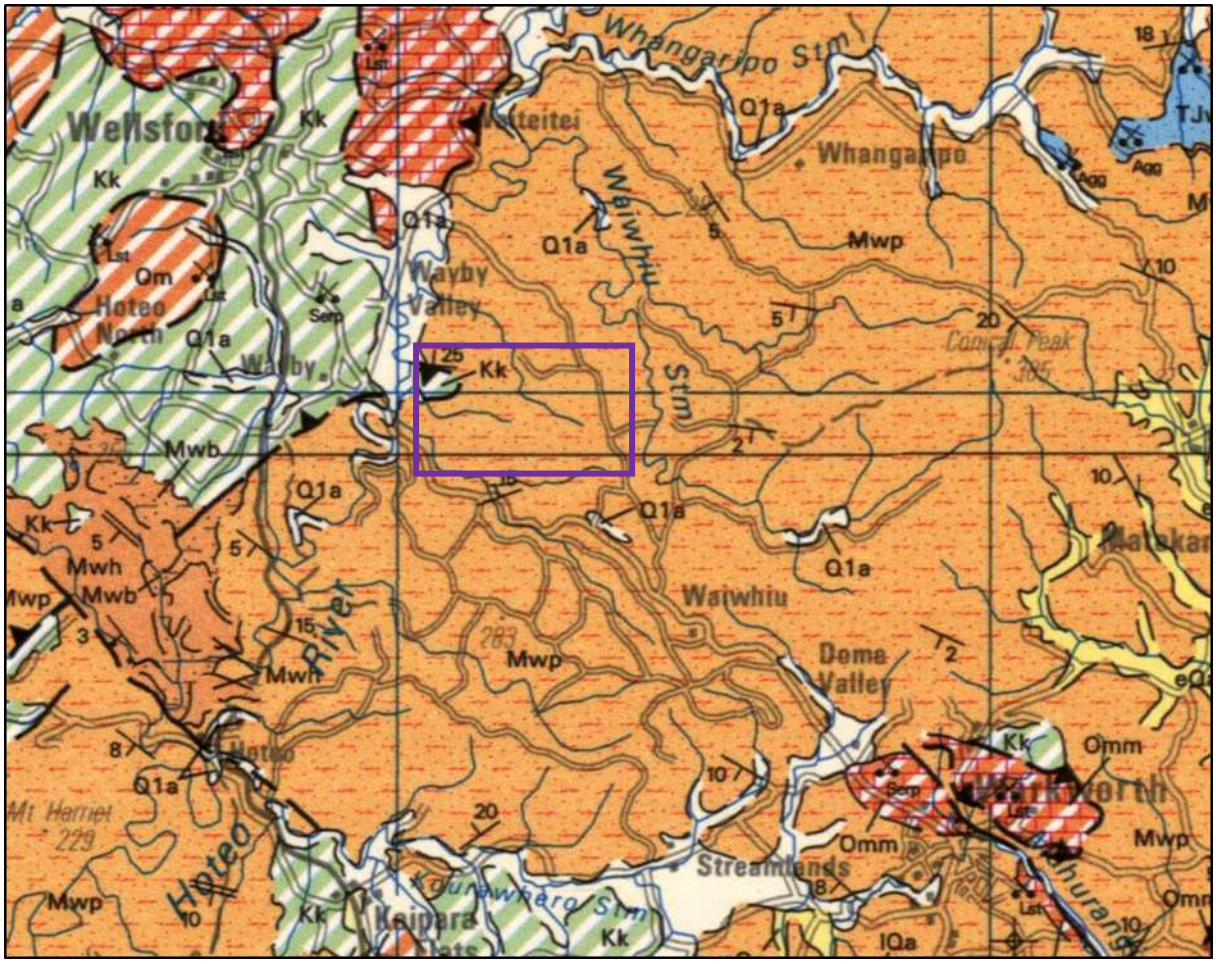

Figure 1-1: Geological setting (source: Edbrooke, 2001)

1.4 Scope of work

This report describes the monitoring programme which has been established and the preliminary results. The preliminary results will inform other technical studies for the Auckland Regional Landfill project.

The monitoring programme currently consists of sampling of the surface water, groundwater and Aquatic macroinvertebrates. The purpose of the monitoring programme, monitoring locations, and parameters for each aspect are outlined below.

1.5 Surface water monitoring

Surface water monitoring has been undertaken for the following purposes:

- To obtain existing water quality data to assist with the understanding of the current level of sediment and contaminant loads and the potential sensitivity to changes in contaminant loads;
- To provide a baseline against which changes in water quality, should they occur, can be assessed once the landfill is operating; and
- To inform the development of the landfill operation monitoring regime.

The monitoring sites have been selected on the following basis:

- A control site located within a similar size catchment with similar contributing catchment (e.g. plantation forestry) to the proposed landfill site, located upstream from the landfill discharge location (landfill control site);
- A site downstream of the landfill discharge point and the control site. This will enable comparison between the control site and the landfill discharge;
- A site upstream of the proposed access road (access road control site); and
- A site at the base of the access road to enable monitoring of the stream.

The four selected sites are shown on the attached plan **(Appendix A)**

The monitoring parameters for the surface water monitoring programme have been selected based on the following criteria:

- Parameters relevant to the initial construction phase and on-going earthworks;
- Parameters relevant to the Industrial and Trade Activities (ITA);
- Priority stormwater contaminants; and
- Indicators for leachate breakthrough or contamination.

1.5.1 Monitoring parameters

The following surface water monitoring parameters have been selected:

- Turbidity
- Total Suspended Solids
- Sample Temperature
- Nitrate-N
- Oil and Grease
- Chemical Oxygen Demand (COD)
- Total Phenols
- Volatile Organic Compounds Screening in Water by Headspace GC-MS
- pH
- Electrical Conductivity (EC)
- Total Alkalinity
- Heavy metals, totals, trace As, Cd, Cr, Cu, Ni, Pb, Zn
- Heavy metals, dissolved, trace As, Cd, Cr, Cu, Ni, Pb, Zn
- Carbonaceous Biochemical Oxygen Demand (cBOD5)
- Total Hardness
- Total Aluminium
- Total Calcium
- Total Iron
- Total Magnesium
- Total Manganese
- Total Potassium
- Total Sodium
- Chloride
- Total Ammoniacal-N

- Sulphate
- Total Phosphorus

1.6 Ground water

Groundwater monitoring has been undertaken for the following purposes:

- To obtain groundwater level readings;
- To obtain groundwater quality data to assist with the understanding of the current contaminant loads and the potential sensitivity to changes in contaminant loads;
- To provide a baseline against which changes in groundwater quality, should they occur, can be assessed once the landfill is operating; and
- To inform the development of the landfill operation monitoring regime.

1.6.1 Monitoring parameters

The following groundwater monitoring parameters have been selected:

- Heavy metals, dissolved trace As, Cd, Cr, Cu, Ni, Pb, and Zn.
- Polycyclic Aromatic Hydrocarbons (PAH)
- Total Petroleum Hydrocarbons (TPH)
- pH
- Total Alkalinity
- Carbonate/bicarbonate
- Total Hardness
- Electrical Conductivity
- Total boron
- Total calcium
- Hexavalent chromium
- Total magnesium
- Total potassium
- Total sodium
- Chloride
- Total ammoniacal-N
- Nitrate-N
- Nitrite-N
- Sulphate
- Chemical Oxygen Demand (COD)
- Biochemical Oxygen Demand (BOD)

1.7 Aquatic macroinvertebrate monitoring

Aquatic macroinvertebrate abundance and diversity are standard indicators of the health of streams. Different taxa have varying tolerance to pollutants and habitat conditions, so their presence or absence gives an indication of stream condition.

Macroinvertebrate data was collected on 26 and 30 July 2018 to inform baseline water quality and stream health across the project site. Three replicate samples were collected at six sites (Figure 1.2).

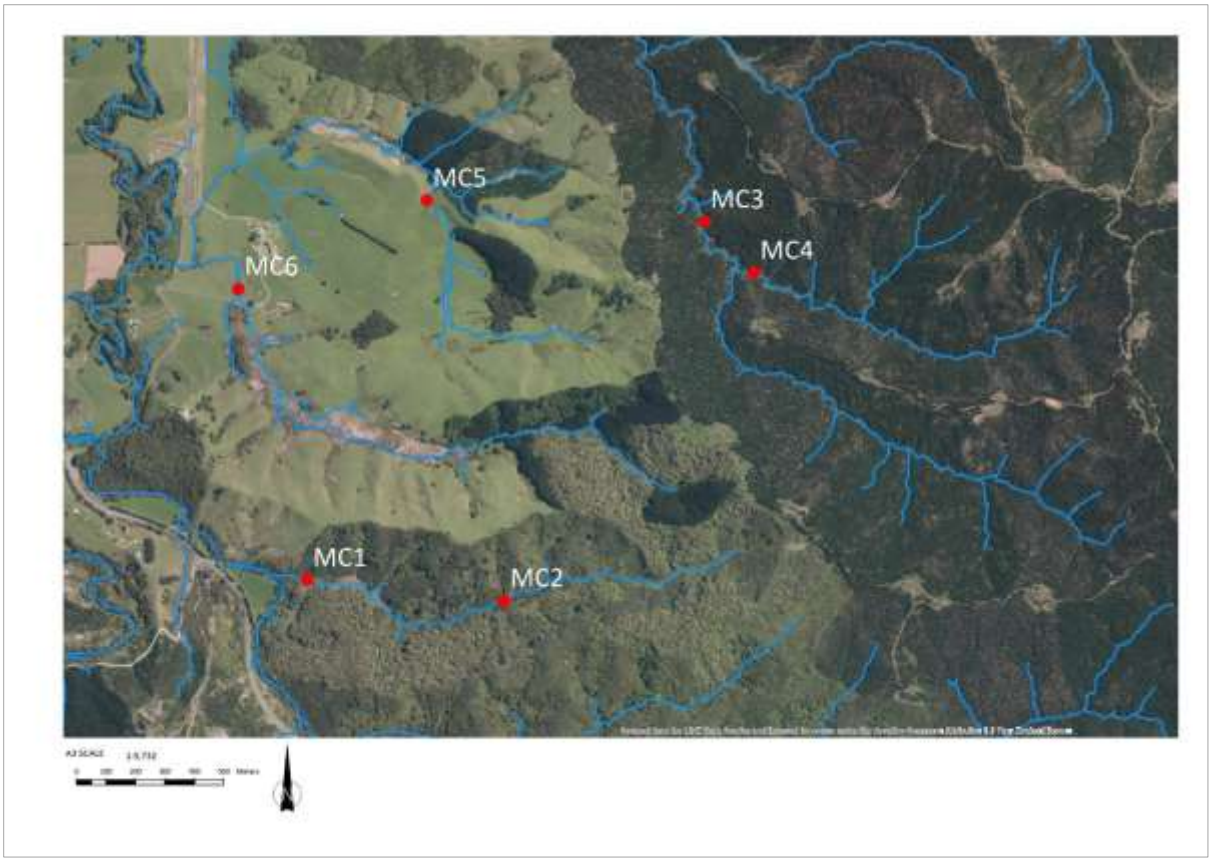

Figure 1.2: Location of six baseline macroinvertebrate monitoring sites across the project site. Blue lines show overland flow paths with a catchment size greater than 3 ha (source LINZ Data Service).

Sites MC1, MC3 and MC4 have been selected to complement baseline water quality monitoring sites (SW1, SW3 and SW4 respectively). Site MC4 has been chosen as a control site against which to compare long-term changes in aquatic macroinvertebrate communities at the MC3 site, which is located downstream of the proposed Eastern Block impact site.

Site MC2 has been selected as an additional site to monitor the effects of activities on the macroinvertebrate communities, in the Southern Block main stem which runs through a Natural Stream Management Area (NSMA).

Sites MC5 and MC6 have been selected to monitor the effects of the proposed activities on macroinvertebrate communities in the Western Block. Specifically, site MC5 has been selected to monitor effects on the main stream downstream of the proposed area for Stockpile 1, and site MC6 to monitor changes to the stream immediately downstream of the Western Block Significant Ecological Area (SEA) southern wetland.

Macroinvertebrate sampling has been undertaken following the methodologies outlined by Stark et al (2001[1]) for sampling macroinvertebrates in wade-able streams. Sampling has been undertaken at least 10 days after a rainfall event that elevated stream flow more than five times the preceding base flows. Stream flow data has been obtained from the Waiteitei River at Sandersons site, which is approximately 7 km from the site[2].

[1] Stark, J. D., Boothroyd, I. K. G., Harding, J. S., Maxted, J. R., & Scarsbrook, M. R. (2001). Protocols for sampling macroinvertebrates in wadeable streams (p. 57). Cawthron Institute.
[2] Flow data accessed from Auckland Council GeoMaps, https://geomapspublic.aucklandcouncil.govt.nz/viewer/index.html.

Three replicate samples were collected from each site to allow statistically significant differences in average macroinvertebrate index values to be detected when the difference is equal to or greater than 6.25 MCI units (Stark et al, 1998[3]). This allows statistically significant differences in MCI values between sites to be determined, as well as between sampling events at the same site.

Sites have been classified as hard-bottom or soft-bottom based on the predominant substrate type present in the sampling reach (Appendix D Table 1). For sites where both soft-bottom and hard-bottom substrates are present, the sampling protocol has been selected based on the habitat type most representative of the reach, as advised in Stark et al (2001[1]).

Basic water physicochemical measures have been recorded at each site at the time of macroinvertebrate sampling using calibrated handheld instruments (Appendix D Table 1).

Macroinvertebrate samples have been collected using a kick net (D-shape, 0.5 mm mesh size). Sampling followed the semi-quantitative method for hard-bottom and soft-bottom streams (protocols C1 and C2 respectively, of Stark et al, 2001[1]). Stable habitat features such as bank margins, woody debris and macrophyte have been sampled in soft-bottom streams according to their occurrence in the reach. Riffle habitat was sampled in all hard-bottom streams[4].

Macroinvertebrate samples have been preserved in ethanol prior to being sent to Stark Environmental Limited for taxonomic identification and processing. Samples were processed in accordance with Protocol P2 (200 fixed count and scan for rare taxa, in Stark et al, 2001[1]).

The results reported include:

- Taxonomic richness. This is a measure of the number of different types of macroinvertebrates present in each sample and is a reflection on the diversity of the sample;
- Ephemeroptera, Plecoptera and Trichoptera (EPT) richness. This index measures the number of pollution-sensitive macroinvertebrates (mayfly, stonefly and caddisfly (excluding *Oxyethira* and *Paroxyethira*) taxa) within a sample. Percent EPT richness represents the number of EPT taxa as a proportion of the total number of taxa within the sample;
- Macroinvertebrate Community Index (MCI). The MCI is an index for assessing the quality class of a stream using presence or absence of macroinvertebrates. MCI is used for hard bottom streams, while MCI-sb is for soft bottom streams; and
- Quantitative Macroinvertebrate Community Index (QMCI). QMCI is another index based tool, based on the relative abundance of taxa within a community, rather than just presence or absence. QMCI is used for hard bottom streams, while QMCI-sb is for soft bottom streams.

The MCI and QMCI reflect the sensitivity of the macroinvertebrate community to changes in water quality and habitat, where higher scores indicate better stream condition.

Macroinvertebrate index values can be translated to quality classes which describe the ecological health of the stream (Table 1.1).

[3] Stark J.D. (1998). SQMCI: a biotic index for freshwater macroinvertebrate coded abundance data. New Zealand Journal of Marine and Freshwater Research 32:55-66.

[4] The exception to this was baseline site MC3, which was characterised by bedrock cascades and deep run habitat, with minimal riffle or suitable soft-bottom habitat to allow three replicates to be taken for either protocol. Protocol C1 was therefore modified so that bedrock cascades covered with moss were sampled instead of riffle habitat (Appendix D Table 1).

Table 1.1: Interpretation of MCI-type biotic indices (Stark & Maxted, 2007b[5])

Stark & Maxted (2007b) quality class	MCI or MCI-sb	QMCI & QMCI-sb
Excellent	>119	> 5.99
Good	100 - 119	5.00 – 5.90
Fair	80 - 99	4.00 – 4.90
Poor	<80	< 4.00

[5] Stark J.D., Maxted J.R. (2007). A biotic index for New Zealand's soft-bottomed streams. New Zealand Journal of Marine and Freshwater Research 41(1)

2 Preliminary results

2.1 Surface water monitoring

Sampling has been undertaken on eleven occasions. The results of the analyses are provided in Appendix B. Laboratory transcripts and chain of custody documentation are provided in Appendix D.

The results for most parameters are as expected for the site in its current use (mixed use – forestry and sheep farming). The results from the monitoring rounds are comparable to those found at similar sites, as described further in Section 2.2.

More details regarding key parameters, including pH, total suspended solids, heavy metals, nitrogen, phosphorus and nitrate, are discussed below.

Figure 2.1 and 2.2 show that the pH levels and ammoniacal nitrogen levels across the site appear relatively stable over time, with some notable seasonal variations observed. Figure 2.3 shows that nitrate concentrations across the site have varied over time. When assessed against the National Policy Statement for Freshwater Management[6], the ammoniacal nitrogen and nitrate concentrations found across the site are below their respective annual medians of ≤0.03 g NH_4-N/m^3 and ≤1.0 g NO_3-N/m^3 for classification as an attribute state A. This indicates a high conservation value system.

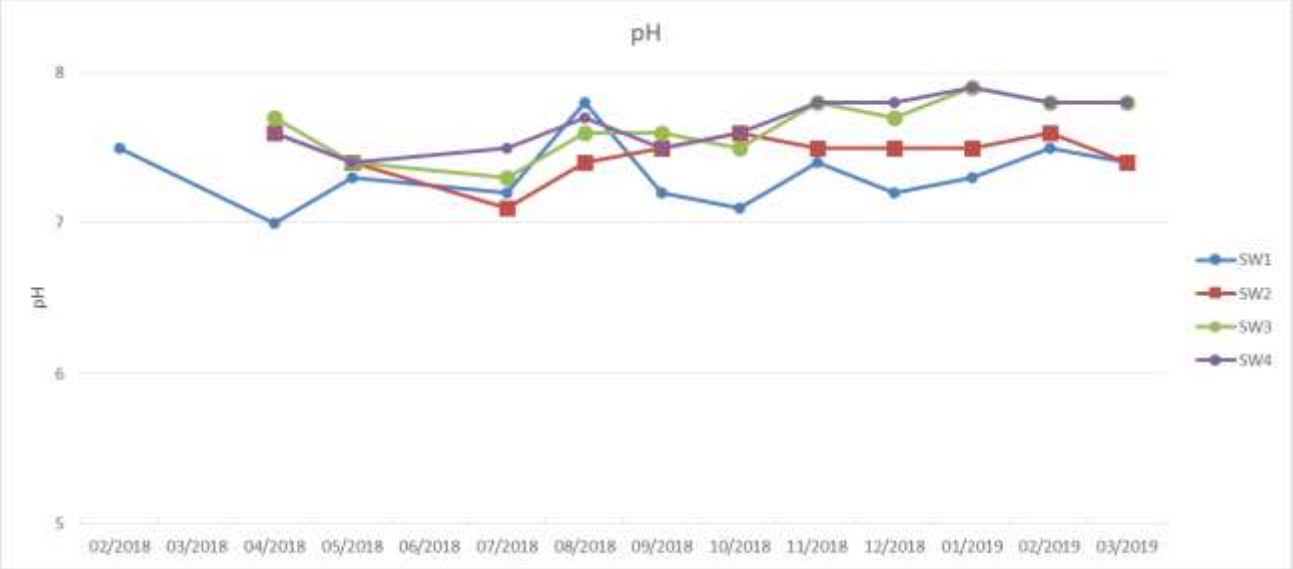

Figure 2.1: pH levels found in surface water across the site

[6] Ministry for the Environment, 2017. National Policy Statement for Freshwater Management

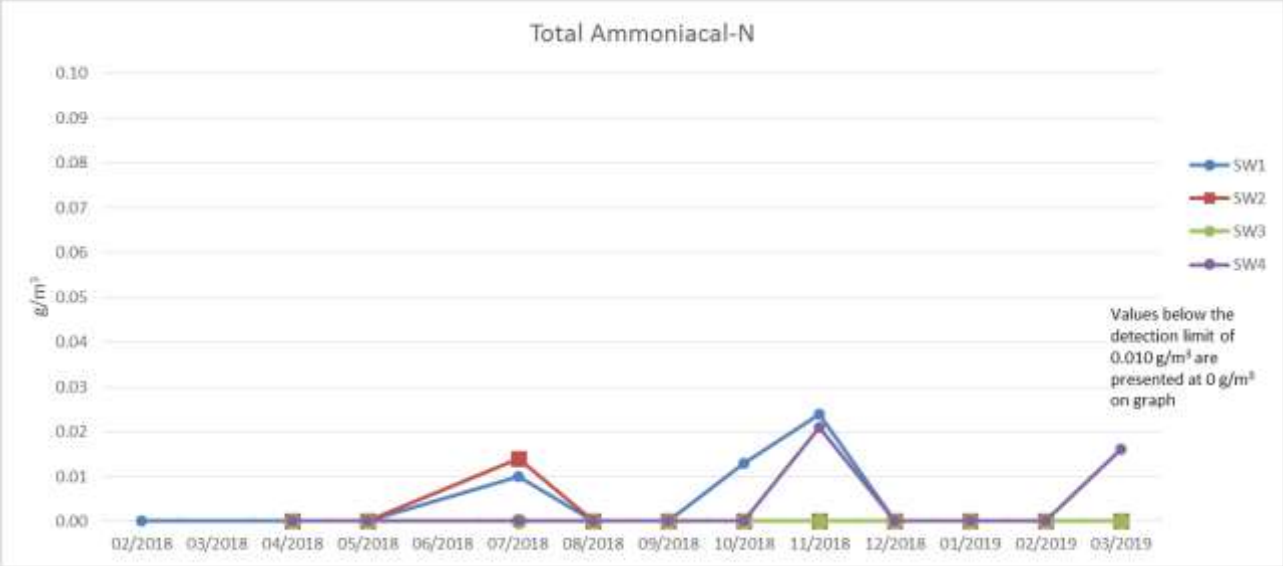

Figure 2.2: Ammoniacal nitrogen levels found in surface water across the site

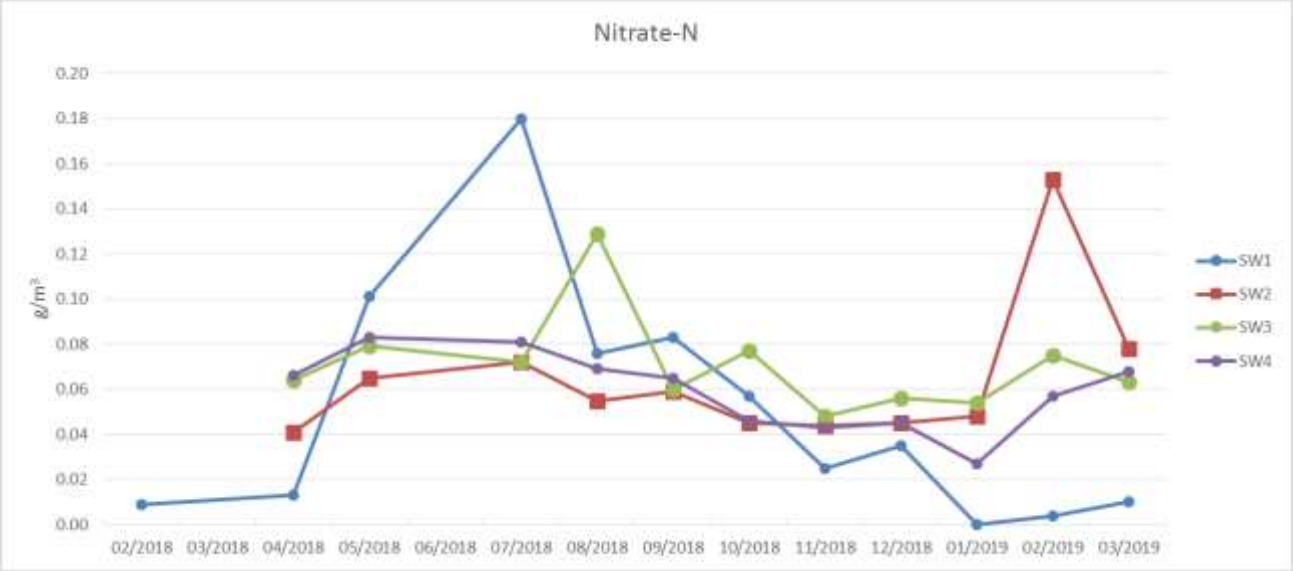

Figure 2.3: Nitrate-N concentrations found in surface water across the site

The level of suspended solids appears to have fluctuated over time with a range of <5 to 53 g/m^3 (Figure 2.3). The streams on this site are generally small and clear running, with silty beds, however with increased rainfall the suspended solids level can rise rapidly as a result of the silt being stirred up from the stream bed and being washed down from the edges of the streams. Increased suspended solids concentrations may also represent seasonal variation.

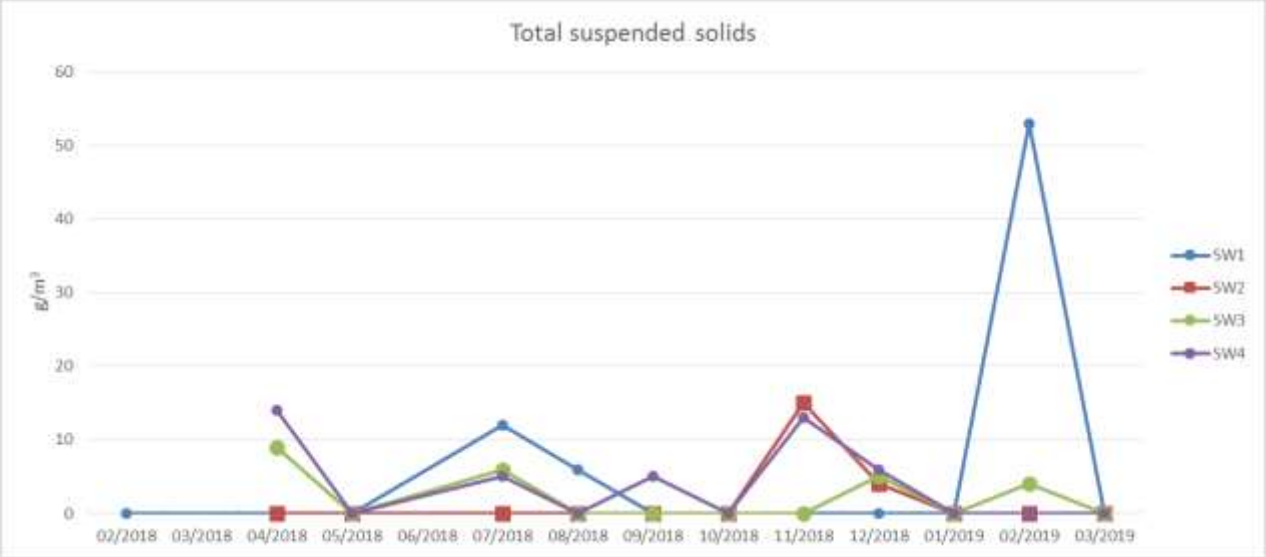

Figure 2.4: Total suspended solids levels found in surface water across the site

Total phosphorus concentrations across the site show signs of fluctuations over time and range from 0.007 to 0.032 g/m^3 (Figure 2.4).

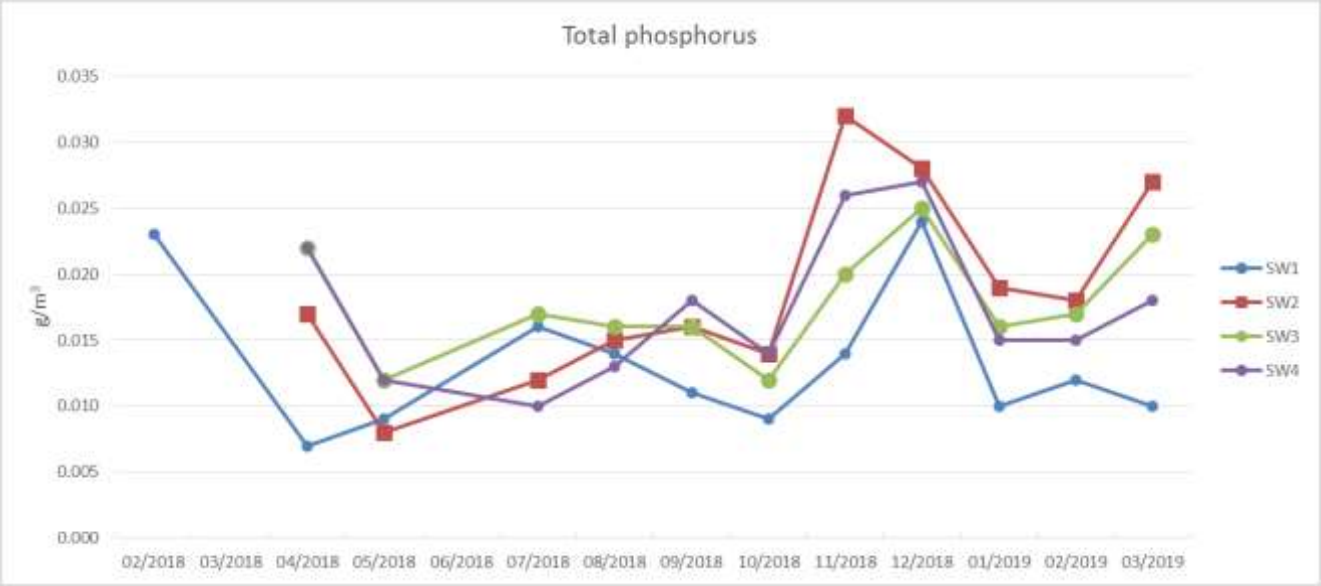

Figure 2.5: Total phosphorus concentrations found in surface water across the site

Figure 2.5 indicates that electrical conductivity levels across the site are very low and appear stable over time. The monitored streams on this site are all freshwater bodies with high quality environments which might help explain the low conductivity levels.

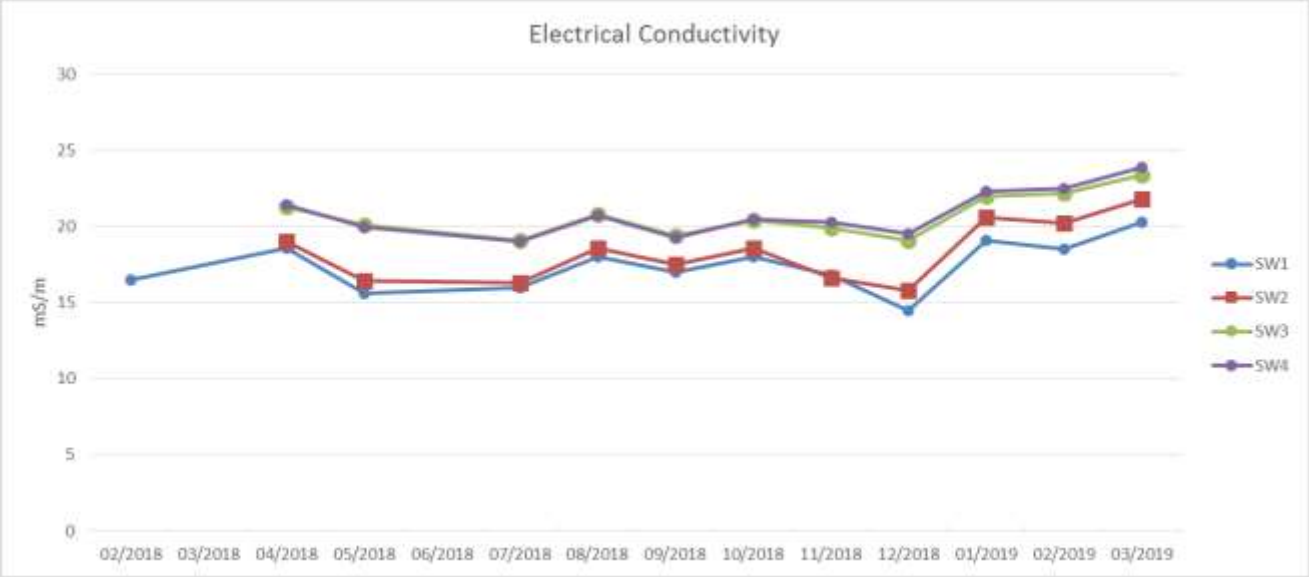

Figure 2.6: Electrical conductivity levels found in surface water across the site

Figures 2.6 and 2.7 show relatively low concentrations of total copper and total zinc found across the site, with some peaks which may be due to seasonal fluctuation and additionally affected by rainfall events, of which a major one occurred in June 2018.

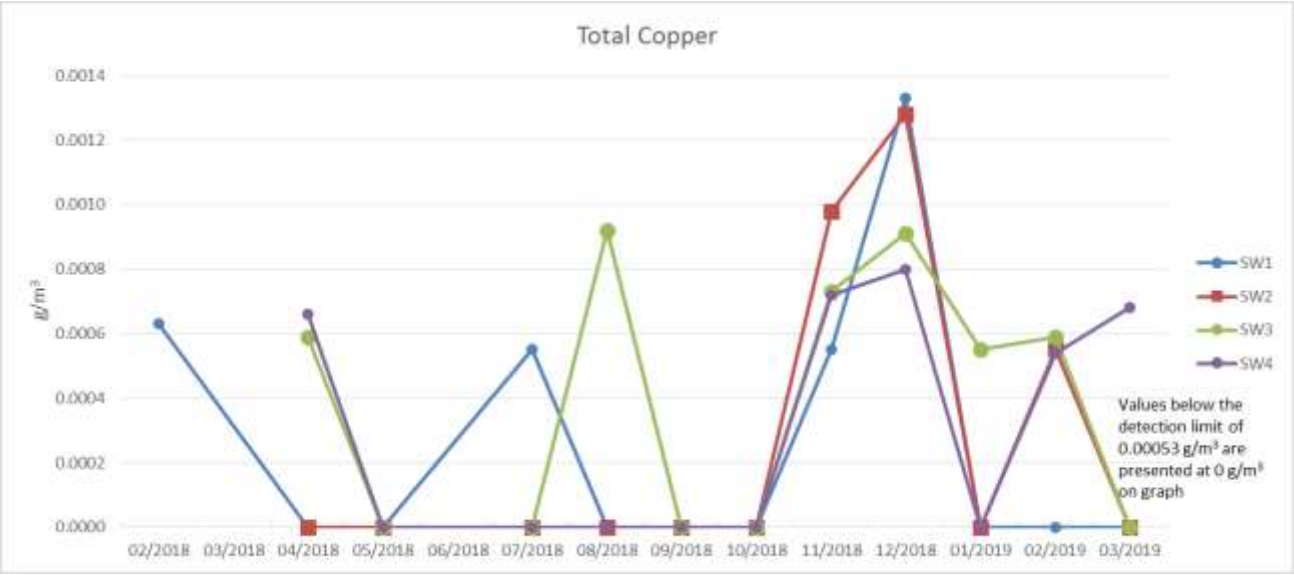

Figure 2.7: Total copper concentrations found in surface water across the site

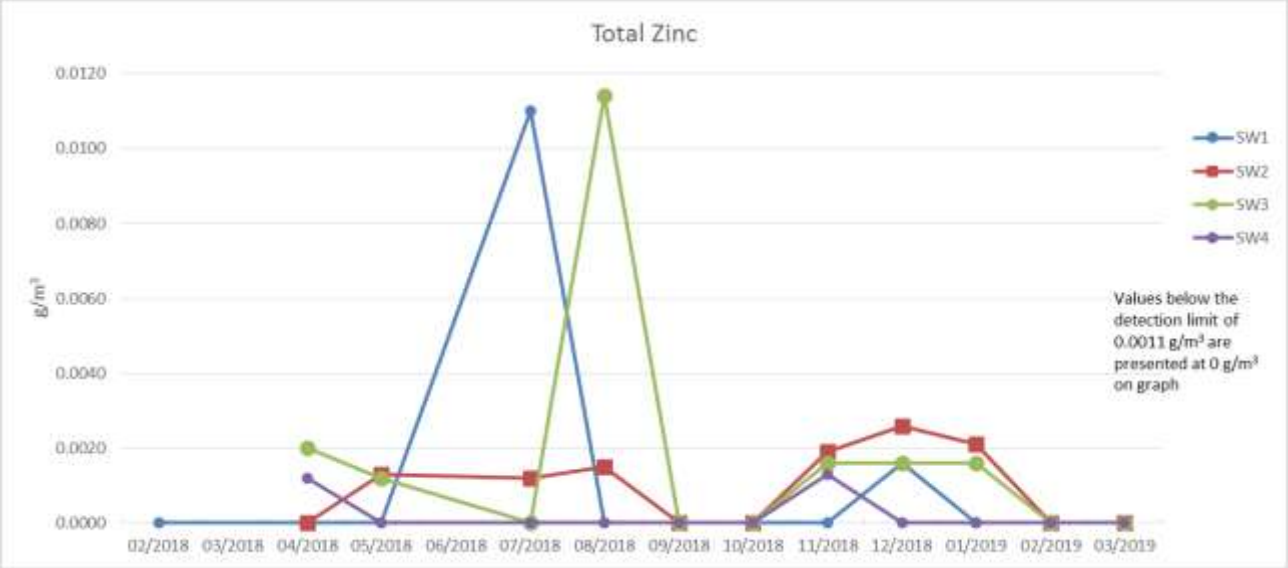

Figure 2.8: Total zinc concentrations found in surface water across the site

Overall water quality of the proposed landfill site is quite good and comparable to that expected in similar streams in the area (e.g. Mahurangi) as discussed in section 2.2.

2.2 Comparison to similar receiving environments

Due to the limited data at present, to understand the baseline monitoring results further, we have compared the results to a similar catchment in the surrounding area with a greater amount of surface water monitoring data. Auckland Council has undertaken monitoring at the Mahurangi Redwoods Catchment. The results of surface water sampling in the Mahurangi Catchment are contained in Appendix B. We have reviewed the catchment characteristics between the Dome Valley Catchment and the Mahurangi Catchments. The Redwoods Catchment is a plantation forest located approximately 15 kilometres to the south of the site.

The Redwoods Catchments is underlain with sandstone or coarse siltstones. The Redwood Catchment is comprised of steep sided valleys with mean annual rainfall above the region average. This can be compared to the Auckland Regional Landfill Catchment which is underlain by Pakiri Formation sediments which consists of alternating layers of sandstone and siltstone.

The Mahurangi River's environment and morphology resembles that of the streams at the Auckland Regional Landfill site. Key water quality parameters were compared to the Mahurangi river's historical data (from Auckland Council), as described below.

Figures 2.8, 2.9, 2.10, 2.11, 2.12 and 2.13 show that the overall water quality of the streams is similar to the Mahurangi catchment's water quality.

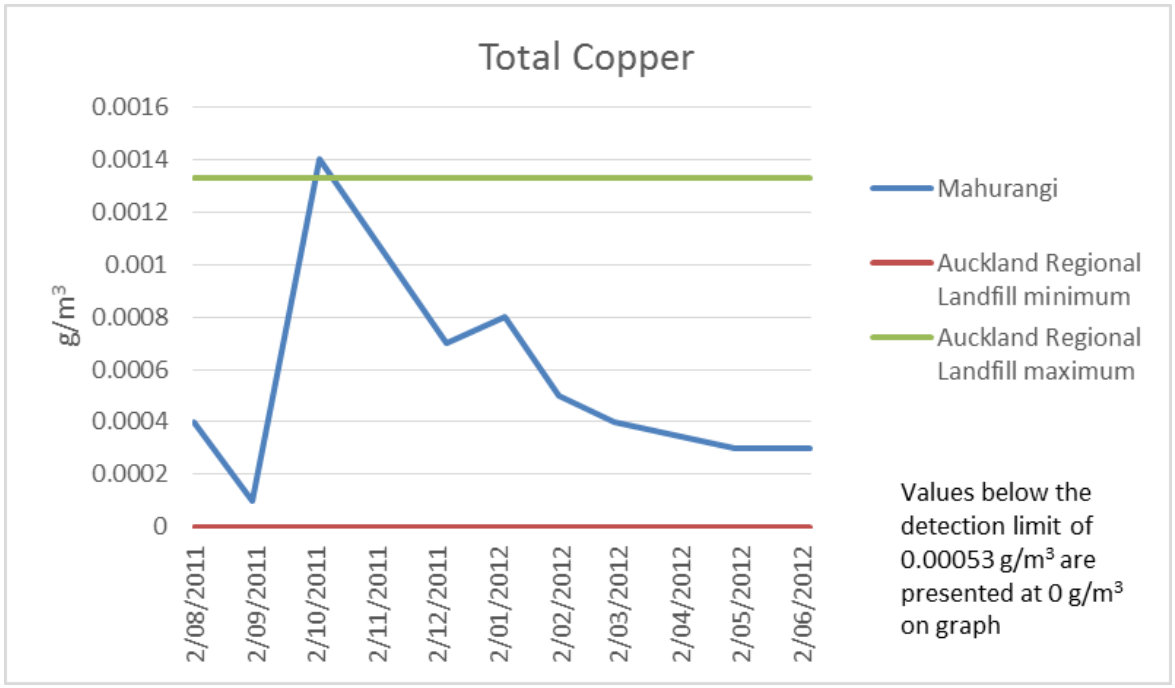

Figure 2.9: Total copper concentrations comparison: Mahurangi vs Auckland Regional Landfill minimum and maximum

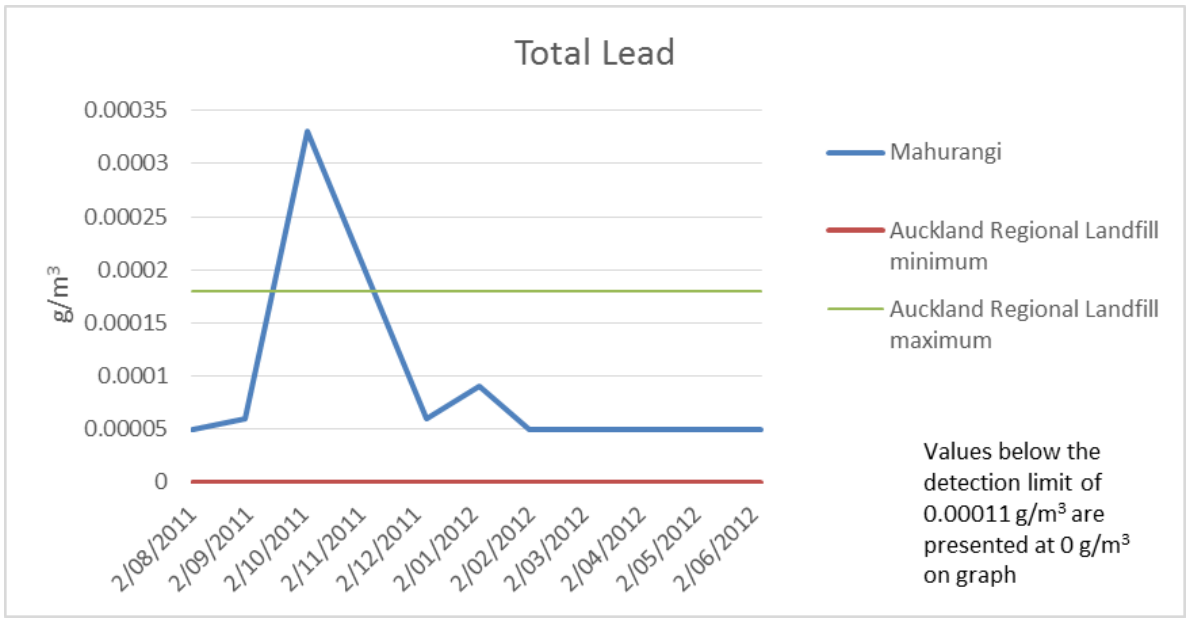

Figure 2.10: Total lead concentrations comparison: Mahurangi vs Auckland Regional Landfill minimum and maximum

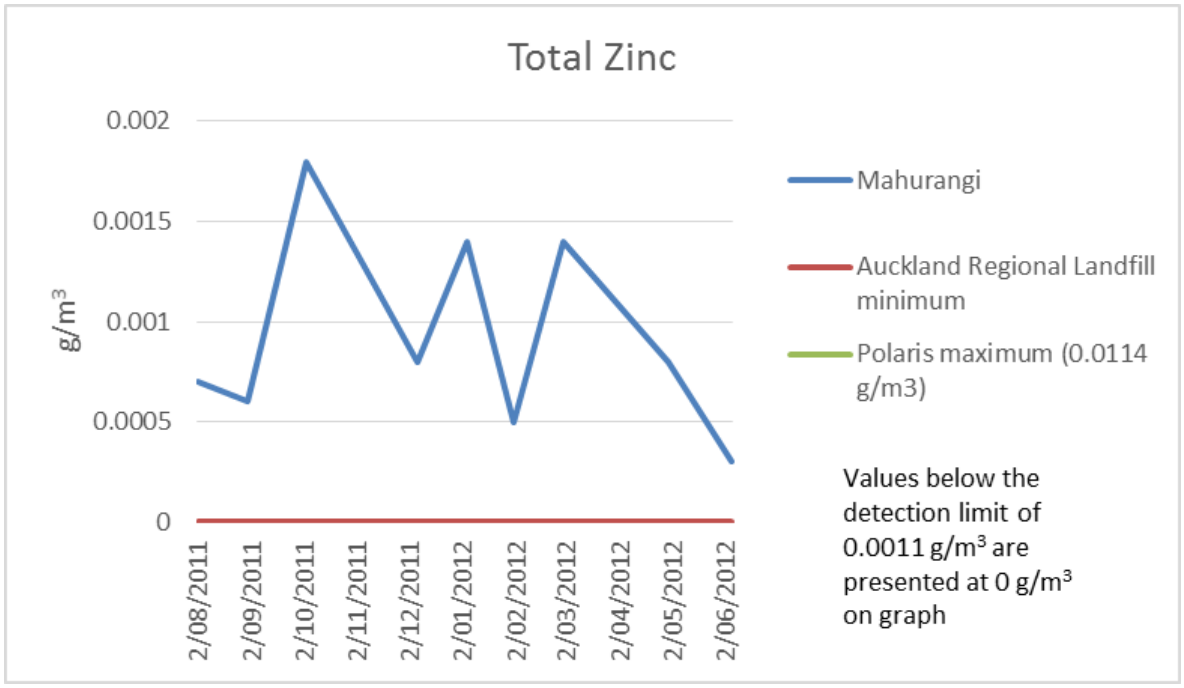

Figure 2.11: Total zinc concentrations comparison: Mahurangi vs Auckland Regional Landfill minimum and maximum

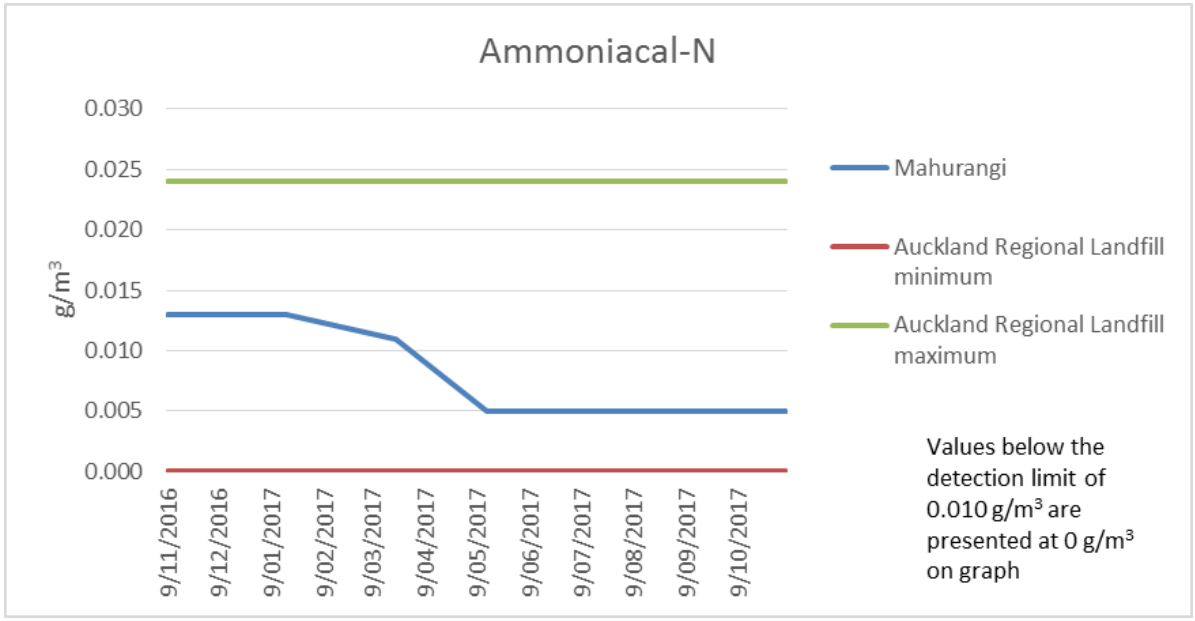

Figure 2.12: Total ammoniacal-Nitrogen concentrations comparison: Mahurangi vs Auckland Regional Landfill minimum and maximum

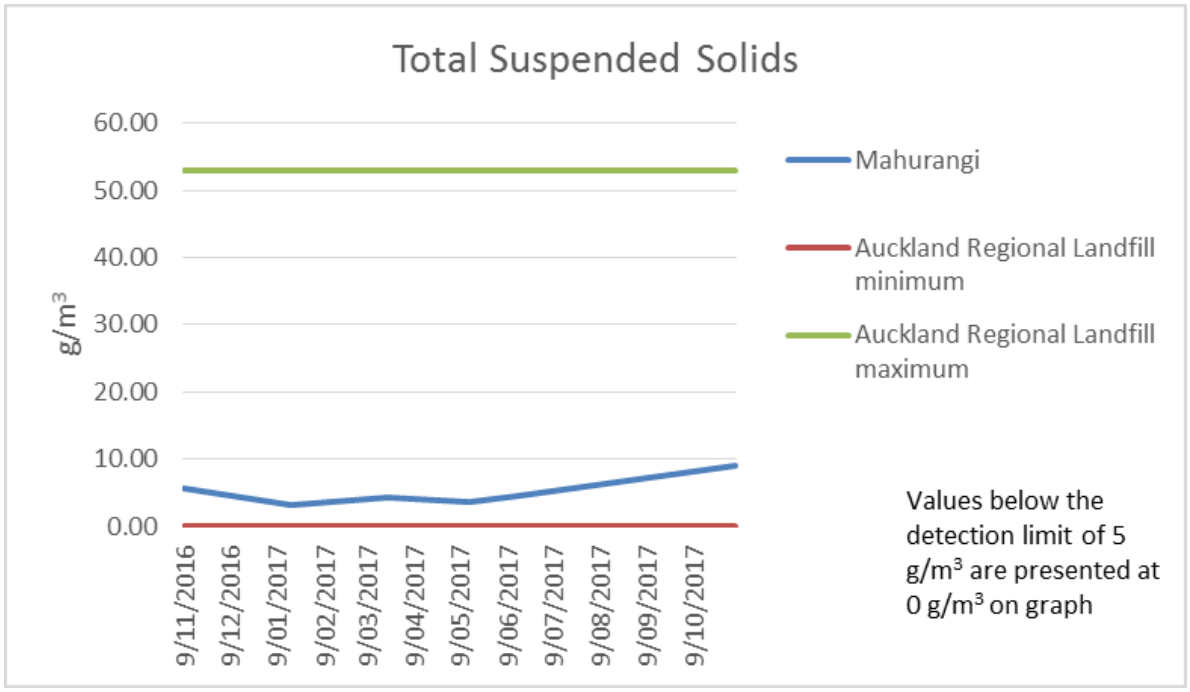

Figure 2.13: Total suspended solids levels comparison: Mahurangi vs Auckland Regional Landfill minimum and maximum

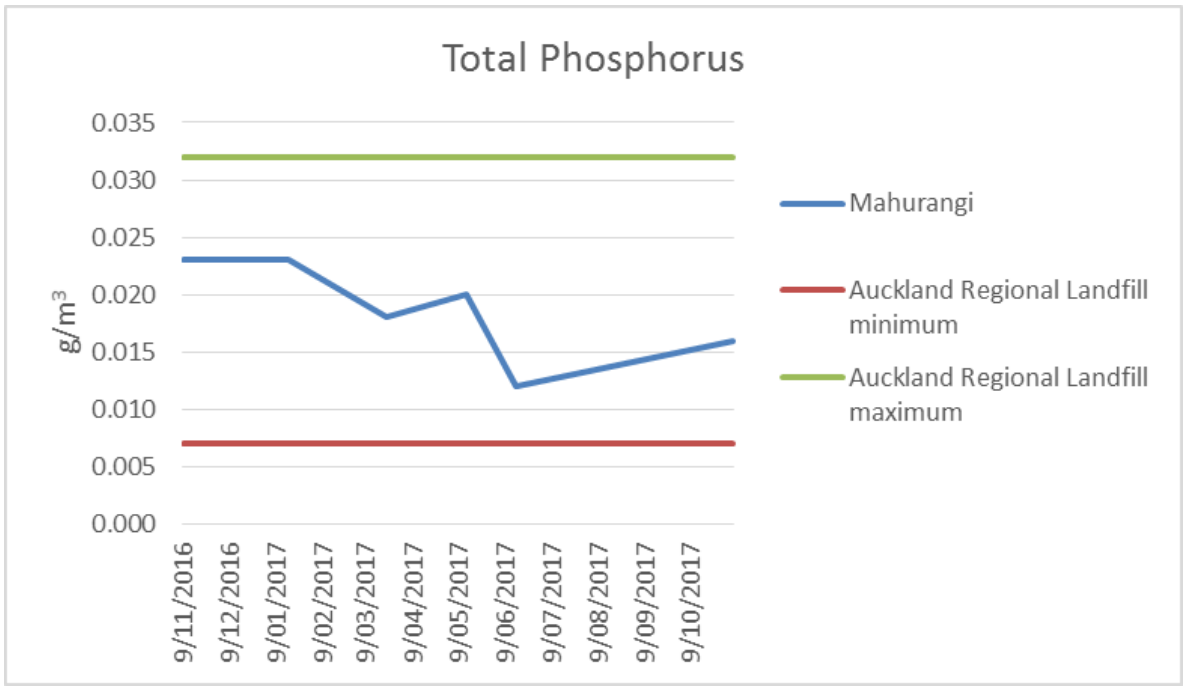

Figure 2.14: Total phosphorus concentrations comparison: Mahurangi vs Auckland Regional Landfill minimum and maximum

2.3 Groundwater monitoring

In general, the background water quality is free from contamination and is akin to naturally occurring conditions. However, copper and zinc appear to be naturally elevated above the ANZECC 2000 95% guidelines for freshwater, and iron and manganese were recorded above the NZ Drinking Water Standards guideline values (GV) and maximum acceptable value (MAV):

- Copper concentrations exceeded the 95% trigger value of 0.0014 g/m^3 at three locations, BH7 (0.0025 g/m^3), BH9 (0.0018 g/m^3) and BH10 (0.0015 g/m^3).
- Zinc concentrations exceeded the 95 % trigger value of 0.008 g/m^3 at three locations, BH1 (0.0144 g/m^3), BH5 (0.0085 g/m^3) and BH10 (0.0148 g/m^3 and 0.0152 g/ m^3).
- Total iron concentrations exceeded the GV at six locations (BH2, BH3, BH5, BH7, BH9 and BH10) with concentrations ranging from 1.32 g/m^3 to 5.8 g/m^3.
- Total manganese concentrations exceeded the GV at five locations (BH2, BH3, BH5, BH7 and BH10) with concentrations ranging from 0.046 g/m^3 to 0.165 g/m^3.

2.4 Aquatic macroinvertebrate monitoring

The average and standard error for MCI, QMCI and percent EPT richness at each site have been calculated across the three replicates (Table 2.1).

The highest average MCI and QMCI scores have been found at sites MC2, MC4 and MC3. With reference to the thresholds in Table 1.1, MC2 and MC4 index values correspond to "Excellent" quality classes for both MCI and QMCI, and at MC3 "Good" and "Excellent" quality classes for MCI and QMCI respectively. These three sites also have the highest percent EPT richness among the six baseline sites being no less than 50% at each site.

The lowest average macroinvertebrate index scores have been obtained at sites MC5 and MC6. The scores for the average MCI and QMCI at both sites correspond to "Poor" quality classes. The average percent EPT richness at these sites is also the lowest across the six baseline sites.

The average index values at site MC1 were indicative of "Fair" and "Poor" quality classes for MCI and QMCI, respectively. On average around one third of the total number of taxa at MC1 comprised of pollution-sensitive EPT taxa.

Table 2.1: Macroinvertebrate Indices across three replicates at each baseline monitoring site

		MC1	MC2	MC3	MC4	MC5	MC6
MCI*	Average	99	132	118	124	74	75
	Std. error	1.25	4.18	1.20	1.94	1.10	3.84
QMCI*	Average	3.91	8.03	6.27	6.96	3.07	2.75
	Std. error	0.62	0.06	0.11	0.28	0.19	0.12
EPT richness (%)	Average	32.49	52.38	61.62	57.01	12.22	13.89
	Std. error	4.10	3.26	2.53	0.80	0.58	3.17

*Grey shading indicates that soft-bottom indices (MCI-sb, QMCI-sb) were used, according to the substrate type and corresponding macroinvertebrate sampling methodology (Appendix D Table 1).

The difference between average MCI at sites MC3 and MC4 is 6 units, less than the threshold 6.25 units required for a statistically significant difference. This indicates there is no significant difference between average MCI values at these two sites and therefore confirms the suitability of site MC4 as a long-term control site for monitoring changes in macroinvertebrate communities at MC3.

Figure 2.15 shows the proportion of taxa within different taxonomic groups relative to the total number of taxa within all replicates at each site. For graphing purposes, eight dominant taxonomic groups have been displayed individually. All other remaining taxonomic groups are shown as "Other" taxa, including Platyhelminthes (flatworms) and *Microvelia* (water bugs). Appendix G contains a full list of taxa found in each sample.

Sites MC1, MC5 and MC6 contained a large proportion of pollution-tolerant taxa including Crustacea (such as copepods and ostracods), Diptera (true flies), and Mollusca (including snails) (Figure 2.15). In comparison, a high proportion of pollution-sensitive EPT taxa can be seen at sites MC2, MC3 and MC4 (Figure 2.15).

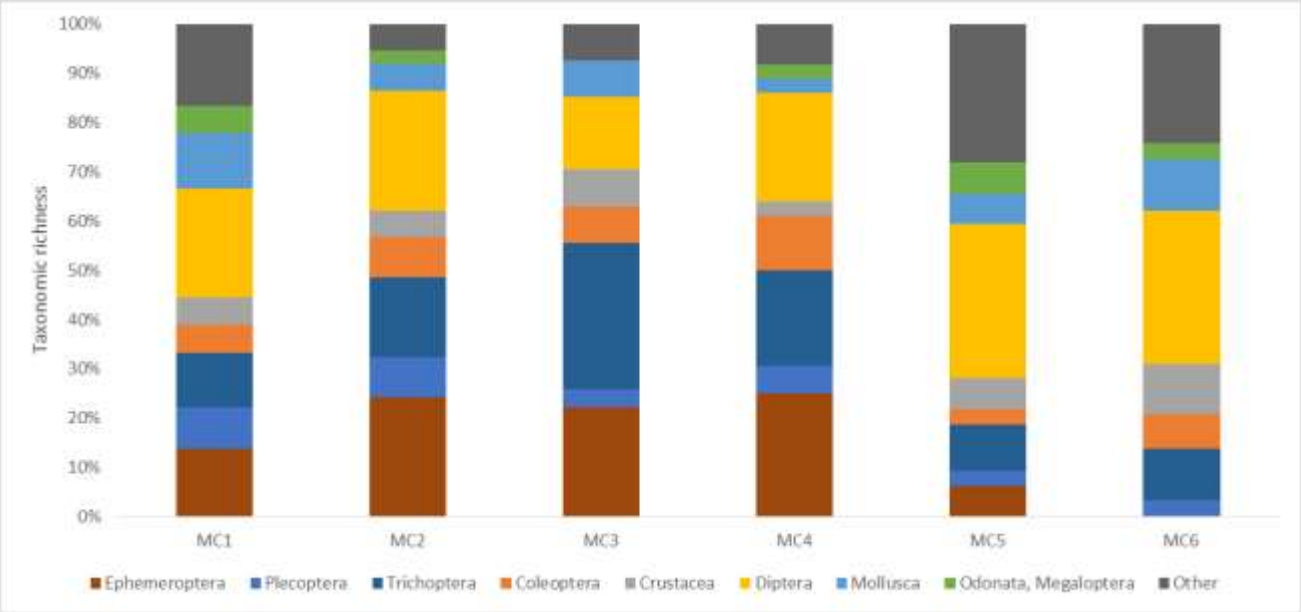

Figure 2.15: For each site, the proportion of taxa within each of eight common taxonomic groups, and all other taxa, are shown relative to the total number of taxonomic groups found in all replicates for that site. Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) are considered pollution-sensitive taxa.

2.5 Discussion on aquatic macroinvertebrate monitoring results

2.5.1 Macroinvertebrate quality classes

The average MCI, QMCI, associated quality classes, and percent EPT richness at each site are expected for the given type of land use at each site.

Site MC2's high average MCI and "Excellent" quality class was expected because of its location in regenerating forest with high shading and minimal disturbance in the catchment. The average MCI value at this site was higher than that of Auckland's State of the Environment (SOE) macroinvertebrate monitoring sites in native forest (124.9 MCI units, Neale et al, 2017[7]). MC2 percent EPT richness was also above the average for native forest SOE sites (48.2% EPT richness, Neale et al, 2017[7]).

The high MCI values and high proportion of pollution-sensitive EPT taxa recorded at Sites MC3 and MC4 was expected, given that these sites are located in exotic forestry and have experienced minimal catchment disturbance in recent years. The average MCI for sites MC3 and MC4 are comparable to Auckland SOE monitoring sites in exotic forestry catchments (average MCI 118.5, Neale et al, 2017[7]). EPT richness at MC3 and MC4 was close to the maximum EPT richness recorded among SOE forestry sites (61.8% EPT richness, Neale et al, 2017[7]).

[7] Neale, M.W., Moffett, E.R., Hancock, P., Phillips, N and Holland, K (2017). River ecology monitoring: state and trends 2003-2013. Auckland Council technical report, TR2017/011.

Sites MC5 and MC6 flow through pasture grazed by sheep. The "Poor" quality class and prevalence of pollution-tolerant taxa at these sites is expected given the characteristics of these sites, which include minimal shading, elevated deposits of fine sediments, and a dominance of one habitat type (macrophytes) (Appendix G). Average MCI values for these sites are below those recorded at Auckland's SOE macroinvertebrate sites in high intensity rural areas[8] (85.8 MCI units between 2011 and 2013), while EPT richness is above the average for SOE rural high intensity sites (22.9% EPT richness, Neale et al, 2017[7]).

Results from MC1 corresponded to "Fair" (MCI) and "Poor" (QMCI) quality classes. Although this site is located on the same reach as the high-scoring MC2 site, it flows through a raupo wetland with minimal shading along the true left bank of the stream. Dissolved oxygen at this site was comparable to readings at sites MC5 and MC6 (Appendix F). Elevated fine sediment loads and a lack of woody debris to provide stable habitat for macroinvertebrates were also noted at this site (Appendix F). These factors may explain the lower macroinvertebrate index values and corresponding quality classes at this site compared to the MC2 site upstream.

2.5.2 Control site selection

Site MC4 has been selected on the basis that it would serve as an appropriate control site for monitoring changes at site MC3, which is located downstream of the proposed Eastern Block impact site. The difference between average MCI values at sites MC3 and MC4 is statistically insignificant. This supports MC4 being a suitable control site for MC3.

2.5.3 Timing and frequency of sampling

Samples for the current report have been collected during winter months. Stark and Maxted (2007b[9]) advise that seasonal sampling and replication may be required for the first few years to establish a reference condition before for example, a discharge consent.

[8] Rural sites with less than 60% forest cover within the catchment.

[9] Stark JD, Maxted JR 2007. A user guide for the Macroinvertebrate Community Index. Prepared for the Ministry for the Environment. Cawthron Report No.1166. 58 p.

3 Applicability

This report has been prepared for the exclusive use of our client Waste Management NZ Ltd, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Tonkin & Taylor Ltd

Report prepared by:	Authorised for Tonkin & Taylor Ltd by:
	
.....	.....
Alexandre Safran	Simonne Eldridge
Environmental Scientist	Project Director

ALSA
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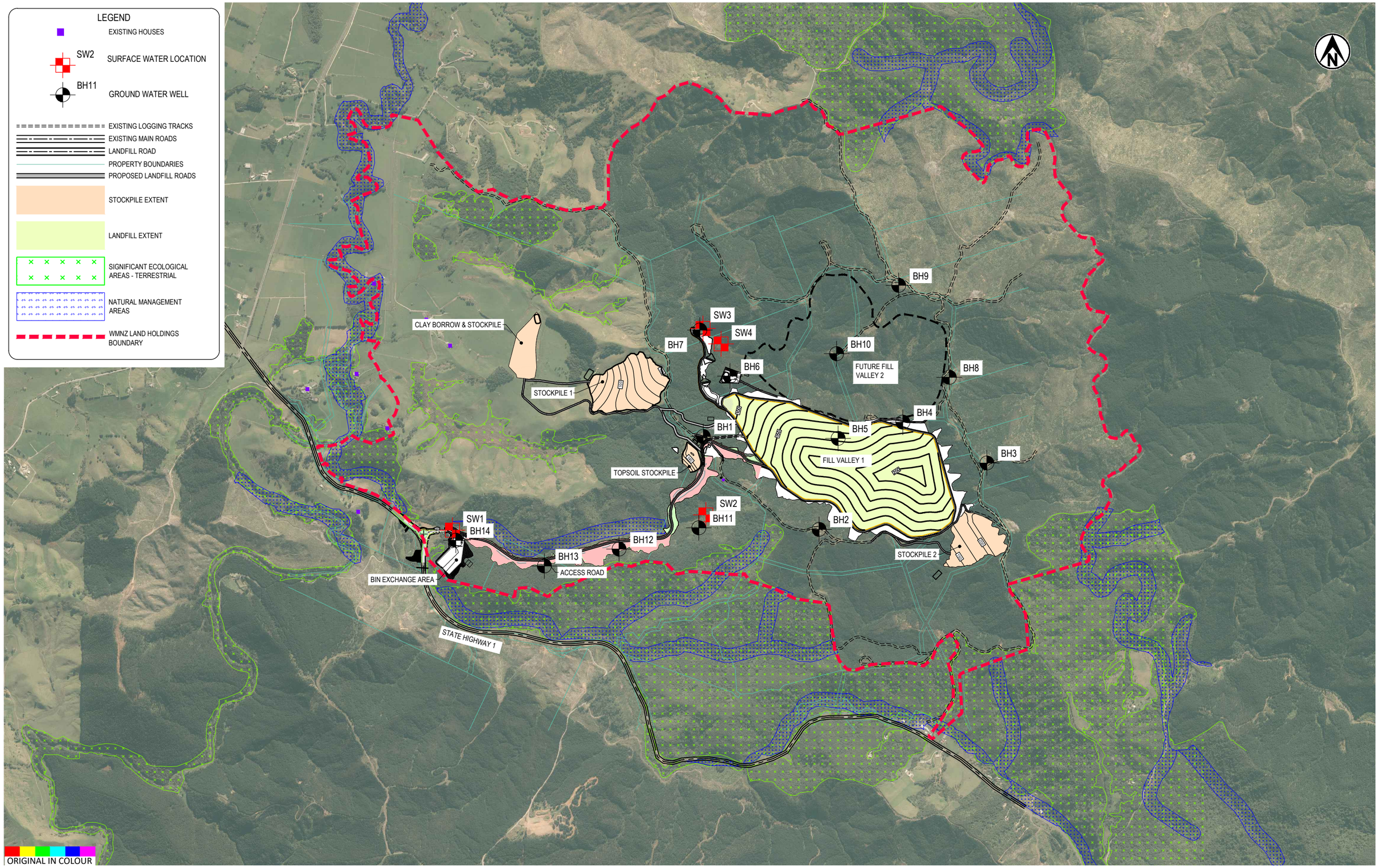
Appendix A: Figures

- **Figure 1. Site plan**

C:\12dSynergy\data\ALBTCAD\Polaris_WOL_Concept_55\CAD\FIG\Polaris-F1.dwg 2019-May-21 9:39:47 AM Plotted By: JUAN CARLOS ABREGO CASTILLO

LEGEND

- EXISTING HOUSES
- SW2 — SURFACE WATER LOCATION
- BH11 — GROUND WATER WELL
- EXISTING LOGGING TRACKS
- EXISTING MAIN ROADS
- LANDFILL ROAD
- PROPERTY BOUNDARIES
- PROPOSED LANDFILL ROADS
- STOCKPILE EXTENT
- LANDFILL EXTENT
- SIGNIFICANT ECOLOGICAL AREAS - TERRESTRIAL
- NATURAL MANAGEMENT AREAS
- WMNZ LAND HOLDINGS BOUNDARY



A3 SCALE 1:20000

0 200 400 600 800 1000

Aerial photo sourced from Auckland Council GIS Website.

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PROJECT No.	1005069.1200		
DESIGNED	RCR	Feb.19	
DRAWN	RBS	Feb.19	
CHECKED	SFE	May.19	
	Simonne F Eldridge	May.19	
	APPROVED	DATE	

CLIENT **WASTE MANAGEMENT NZ LTD**

PROJECT **AUCKLAND REGIONAL LANDFILL**

TITLE GROUNDWATER AND SURFACE WATER SAMPLING LOCATIONS

SCALE (A3) 1:20000 FIG No. Figure 1 REV 1

Appendix B: Surface water results tables

Auckland Regional Landfill:
Surface water monitoring results

Monitoring Location: **SW1**

Source: **Farmland downstream**

Parameter	Units	Mahurangi at FHQ[1]	21/02/2018	13/04/2018	31/05/2018	4/07/2018	8/08/2018	6/09/2018	3/10/2018	1/11/2018	5/12/2018	25/01/2019	26/02/2019	27/03/2019	
Lab number	-		1933157.1	1963226.1	1993680.1	2010662.1	2028667.1	2044476.1	2059471.1	2074603.1	2092542.1	2114827.1	2132426.1	2150351.1	
Sum of Anions	meq/L		1.49	1.75	1.44	1.44	1.63	1.54	1.61	1.50	1.26	1.76	1.67	1.79	
Sum of Cations	meq/L		1.54	1.72	1.48	1.49	1.63	1.54	1.67	1.47	1.45	1.71	1.77	1.94	
Turbidity	NTU	12.8	6.7	4.1	6.8	10.6	8.2	8	7	9	14.3	4.5	12.3	2.3	
pH	-	7.52	7.5	7.0	7.3	7.2	7.8	7	7	7	7.2	7.3	7.5	7.4	
Total Alkalinity	g/m^3 as $CaCO_3$		36	42	32	26	35	32	36	36	30	46	41	49	
Bicarbonate	g/m^3		44	51	39	32	42	39	44	43	36	56	50	59	
Total Hardness	g/m^3 as $CaCO_3$		37	41	36	32	39	35.0	40.0	36.0	32.0	42.0	43.0	50.0	
Electrical Conductivity	mS/m		16.5	18.6	15.6	16	18.0	17.0	18.0	16.8	14.5	19.1	18.5	20.3	
Total Suspended Solids	g/m^3	9.00	<5	<5	<7	12	6	< 8	< 3	< 5	< 5	< 8	53.0	< 6	
Dissolved Aluminium	g/m^3										0.39	0.044	0.049	0.021	
Total Aluminium	g/m^3		0.134	0.068	0.175	0.26	0.096	0.2	0.1	0.2	0.59	0.071	0.053	0.034	
Dissolved Calcium	g/m^3		7	7.8	6.1	5.8	7.2	6.5	7.5	7.0	6.1	8.2	8.0	9.3	
Total Calcium	g/m^3		6.9	7.8	6.3	6.0	6.9	6.6	7.4	6.9	6.4	8.7	8.3	9.0	
Dissolved Iron	g/m^3										0.75	0.46	0.30	0.25	
Total Iron	g/m^3		1.08	0.62	0.65	0.56	0.74	0.8	0.8	0.8	1.24	0.84	0.54	0.39	
Dissolved Magnesium	g/m^3		4.7	5.3	5	4.4	5.0	5	5	5	4.2	5.2	5.7	6.4	
Total Magnesium	g/m^3		4.9	5.3	4.8	4.2	4.6	5	5	5	4.3	5.4	6.0	5.8	
Dissolved Manganese	g/m^3										0.035	0.0123	0.006	0.0051	
Total Manganese	g/m^3		0.093	0.024	0.031	0.029	0.046	0.049	0.044	0.036	0.041	0.0194	0.0095	0.006	
Dissolved Potassium	g/m^3		1.73	1.38	1.37	1.45	1.39	1	1	1	1.26	1.09	1.20	1.12	
Total Potassium	g/m^3		1.72	1.35	1.35	1.46	1.40	1	1	1	1.24	1.11	1.22	1.07	
Dissolved Sodium	g/m^3		17.4	19.6	16.7	18.5	18.8	19	19	16	16.0	18.8	19.6	21.0	
Total Sodium	g/m^3		17.6	19.5	17.1	17.9	18.9	19.0	20.0	15.7	16.4	18.8	20.0	19.4	
Chloride	g/m^3		24	29	25	27	28	27.0	27.0	24.0	21.0	27.0	26	27	
Total Ammoniacal-N	g/m^3	0.005	<0.010	<0.010	<0.010	0.010	<0.010	< 0.010	0.013	0.024	< 0.010	< 0.010	< 0.010	< 0.010	
Nitrite-N	g/m^3		<0.002	<0.002	<0.002	<0.002	<0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	
Nitrate-N	g/m^3		0.009	0.013	0.101	0.180	0.076	0.1	0.1	0.025	0.035	< 0.002	0.004	0.010	
Nitrate-N + Nitrite-N	g/m^3	0.196	0.009	0.014	0.102	0.181	0.077	0.1	0.1	0.026	0.037	< 0.002	0.005	0.011	
Total Phosphorus	g/m^3	0.016	0.023	0.007	0.009	0.016	0.014	0.011	0.009	0.014	0.024	0.010	0.012	0.010	
Sulphate	g/m^3		3.5	4.4	4.7	6.4	6.1	5.7	6.2	4.8	3.8	3.8	5.0	3.2	
BOD	g O_2/m^3		<2	<2	<2	<2	<2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	
COD	g O_2/m^3		8	10	6	8	<6	< 6	< 6	8.0	10.0	< 6	< 6	8.0	
Oil and Grease	g/m^3		<8	<8	9	<8	<8	< 8	< 8	18.0	< 10	< 8	< 8	< 8	
Total Phenols	g/m^3		<0.02	<0.02	<0.02	<0.02	<0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	
Dissolved Arsenic	g/m^3										< 0.0010	< 0.0010	< 0.0010	< 0.0010	
Dissolved Cadmium	g/m^3										< 0.00005	< 0.00005	< 0.00005	< 0.00005	
Dissolved Chromium	g/m^3										0.001	< 0.0005	< 0.0005	< 0.0005	
Dissolved Copper	g/m^3										0.0009	< 0.0005	< 0.0005	< 0.0005	
Dissolved Lead	g/m^3										< 0.00010	< 0.00010	< 0.00010	< 0.00010	
Dissolved Nickel	g/m^3										0.0007	0.0	< 0.0005	< 0.0005	
Dissolved Zinc	g/m^3										< 0.0010	< 0.0010	< 0.0010	< 0.0010	
Total Arsenic	g/m^3		<0.0011	<0.0011	<0.0011	<0.0011	<0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011	
Total Cadmium	g/m^3		<0.000053	<0.000053	<0.000053	<0.000053	<0.000053	< 0.000053	< 0.000053	< 0.000053	< 0.000053	< 0.000053	< 0.000053	< 0.000053	
Total Chromium	g/m^3		0.00112	0.00075	0.00111	0.00141	0.00149	0.00113	0.00149	0.001	0.00168	0.001	0.00101	0.00080	
Total Copper	g/m^3	0.0003	0.00063	<0.00053	<0.00053	0.00055	<0.00053	< 0.00053	< 0.00053	0.00055	0.00133	< 0.00053	< 0.00053	< 0.00053	
Total Lead	g/m^3	0.00005	<0.00011	<0.00011	<0.00011	<0.00011	<0.00011	< 0.00011	< 0.00011	< 0.00011	0.00013	< 0.00011	< 0.00011	< 0.00011	
Total Nickel	g/m^3		0.00085	<0.00053	0.00063	0.00074	<0.00053	0.00071	< 0.00053	0.00058	0.00092	< 0.00053	< 0.00053	< 0.00053	
Total Zinc	g/m^3	0.0003	<0.0011	<0.0011	<0.0011	0.011	<0.0011	< 0.0011	< 0.0011	< 0.0011	0.0016	< 0.0011	< 0.0011	< 0.0011	
SVOCs	g/m^3		<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	
VOCs	g/m^3		<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	
Temp-field	°C		18.8	12.5	7.1	8.2	9.7	9.6	9.9	12.7	16.6	16.0	14.5	14.1	
DO-field	%		68.9	75.3	10.04	66.6	88.6	83.0	87.0	71.4	78.9	79.3	85.5	90.6	
Conductivity-field	ms/m		15.24	14.41	11.24	11.96	13.51	12.06	13.03	12.74	12.48	15.74	14.54	15.62	
pH-field	-		6.15	6.95	6.91	7.15	7.23	7.02	6.52	6.96	6.59	6.63	6.33	6.49	
ORP-field	mV		68.5	-120	177.3	122.9	140	135.2	177.4	80.4	121.1	294.5	173.8	166.8	

1. Latest values obtained from Auckland Council geomapper

Monitoring Location: SW2

Source: Farmland Upstream

Parameter	Units	Mahurangi at FHQ[1]	21/02/2018	13/04/2018	31/05/2018	4/07/2018	8/08/2018	6/09/2018	3/10/2018	31/10/2018	5/12/2018	25/01/2019	26/02/2019	27/03/2019	
Lab number	-		Not sampled	1963226.2	1993680.2	2010662.2	2028667.2	2044476.2	2059471.2	2074603.2	2092542.2	2114827.2	2132426.2	2150351.2	
Sum of Anions	meq/L			1.82	1.53	1.50	1.72	1.59	1.67	1.53	1.40	1.93	1.80	1.98	
Sum of Cations	meq/L			1.81	1.57	1.53	1.70	1.58	1.74	1.50	1.55	1.87	1.90	2.10	
Turbidity	NTU	**12.8**		6.4	6.4	6.9	6.3	7.2	6.3	21	17.3	6.3	7.3	9.1	
pH	-	**7.52**		7.6	7.4	7.1	7.4	7.5	7.6	7.5	7.5	7.5	7.6	7.4	
Total Alkalinity	g/m^3 as $CaCO_3$			46	37	34	42	38	42	39	34	53	48	55	
Bicarbonate	g/m^3			56	45	41	51	46	50	47	42	64	58	67	
Total Hardness	g/m^3 as $CaCO_3$			45	38	36	43	38.0	44.0	37.0	36.0	50.0	49.0	57.0	
Electrical Conductivity	mS/m			19	16.4	16.3	18.6	17.5	18.6	16.6	15.8	20.6	20.2	21.8	
Total Suspended Solids	g/m^3	**9.00**		<5	<5	<5	<5	< 5	< 4	15.0	4.0	< 6	< 3	< 8	
Dissolved Aluminum	g/m^3										0.54	0.055	0.096	0.073	
Total Aluminium	g/m^3			0.149	0.25	0.30	0.120	0.3	0.2	0.5	0.66	0.128	0.198	0.176	
Dissolved Calcium	g/m^3			8.8	6.9	6.6	8.3	7.6	8.7	7.4	7.0	10.0	9.4	11.1	
Total Calcium	g/m^3			9	7	6.8	8.0	7.5	8.7	7.7	7.1	10.4	9.7	10.6	
Dissolved Iron	g/m^3										0.73	0.26	0.29	0.36	
Total Iron	g/m^3			0.5	0.47	0.38	0.34	0.4	0.4	0.9	0.95	0.58	0.71	0.82	
Dissolved Magnesium	g/m^3			5.5	5.1	4.7	5.3	5	6	5	4.4	6	6.2	7.0	
Total Magnesium	g/m^3			5.5	5	4.4	5.0	5	6	5	4.3	6	6.0	6.1	
Dissolved Manganese	g/m^3										0.018	0.021	0.0132	0.0220	
Total Manganese	g/m^3			0.022	0.024	0.0188	0.022	0	0	0	0.024	0.031	0.027	0.032	
Dissolved Potassium	g/m^3			1.38	1.25	1.38	1.27	1	1	1	1.52	1.31	1.46	1.44	
Total Potassium	g/m^3			1.4	1.31	1.37	1.31	1	1	1	1.39	1.39	1.55	1.42	
Dissolved Sodium	g/m^3			20	17.9	17.9	18.8	18	19	17	16.4	19	19.8	20.0	
Total Sodium	g/m^3			20	17.6	17.5	18.7	18.2	19.1	18.5	17.3	19.0	20.0	19.6	
Chloride	g/m^3			27	25	26	27	26.0	26.0	23.0	22.0	27.0	26.0	27.0	
Total Ammoniacal-N	g/m^3	**0.005**		<0.010	<0.010	0.014	<0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
Nitrite-N	g/m^3			<0.002	<0.002	<0.002	<0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	
Nitrate-N	g/m^3			0.041	0.065	0.072	0.055	0.1	0.045	0.044	0.045	0.048	0.153	0.078	
Nitrate-N + Nitrite-N	g/m^3	**0.196**		0.041	0.066	0.074	0.055	0.1	0.046	0.045	0.047	0.049	0.155	0.079	
Total Phosphorus	g/m^3	**0.016**		0.017	0.008	0.012	0.015	0.016	0.014	0.032	0.028	0.019	0.018	0.027	
Sulphate	g/m^3			5.9	4.6	5.0	5.6	4.9	5.4	4.8	4.7	5.0	5.2	5.2	
BOD	$g\ O_2/m^3$			<3	<2	<2	<2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	
COD	$g\ O_2/m^3$			<6	<6	<6	<6	< 6	< 6	8.0	12.0	< 6	< 6	6.0	
Oil and Grease	g/m^3			<8	<8	<8	<8	17.0	< 7	< 10	< 10	< 8	< 8	< 8	
Total Phenols	g/m^3			<0.02	<0.02	<0.02	<0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	
Dissolved Arsenic	g/m^3										< 0.0010	< 0.0010	< 0.0010	< 0.0010	
Dissolved Cadmium	g/m^3										< 0.00005	< 0.00005	< 0.00005	< 0.00005	
Dissolved Chromium	g/m^3										0.0013	0.0006	0.0008	0.0008	
Dissolved Copper	g/m^3										0.0008	0.0	< 0.0005	< 0.0005	
Dissolved Lead	g/m^3										< 0.00010	< 0.00010	< 0.00010	< 0.00010	
Dissolved Nickel	g/m^3										0.0010	< 0.0005	0.0007	0.0006	
Dissolved Zinc	g/m^3										0.0012	< 0.0010	< 0.0010	0.0015	
Total Arsenic	g/m^3			<0.0011	<0.0011	<0.0011	<0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011	
Total Cadmium	g/m^3			<0.000053	<0.000053	<0.000053	<0.000053	< 0.000053	< 0.000053	< 0.000053	< 0.000053	< 0.000053	< 0.000053	< 0.000053	
Total Chromium	g/m^3			0.00129	0.00162	0.00185	0.00157	0.00183	0.0015	0.0021	0.002	0.00197	0.00186	0.00098	
Total Copper	g/m^3	**0.0003**		<0.00053	<0.00053	<0.00053	<0.00053	< 0.00053	< 0.00053	0.00098	0.00128	< 0.00053	0.00055	< 0.00053	
Total Lead	g/m^3	**0.00005**		<0.00011	<0.00011	<0.00011	<0.00011	< 0.00011	< 0.00011	0.00015	0.00018	< 0.00011	< 0.00011	< 0.00011	
Total Nickel	g/m^3			0.00078	0.00101	0.00054	0.00060	0.0008	0.00093	0.00101	0.00094	0.00078	0.00089	0.00067	
Total Zinc	g/m^3	**0.0003**		<0.0011	0.0013	0.0012	0.0015	< 0.0011	< 0.0011	0.0019	0.0026	0.0021	< 0.0011	< 0.0011	
SVOCs	g/m^3			<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	
VOCs	g/m^3			<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	
Temp-field	°C			12.6	9	9.7	11.5	10.8	10.8	13.2	14.8	15.8	13.9	15.1	
DO-field	%			85.8	93.7	76.11	93.6	87.1	87.5	86.8	83.4	83.3	87.9	109.5	
Conductivity-field	ms/m			15.19	12.14	12.68	14.56	12.75	13.67	128.80	12.77	17.04	15.43	17.56	
pH-field	-			7.26	7.28	7.32	7.5	6.97	7.06	7.19	6.63	7.42	6.72	6.79	
ORP-field	mV			-71.6	152.6	124.9	216.0	220.1	223.2	117.2	121.4	207.4	175.5	169.4	

1. Latest values obtained from Auckland Council geomapper

Monitoring Location: SW3

Source: Forestry downstream

Parameter	Units	Mahurangi at FHQ[1]	21/02/2018	13/04/2018	31/05/2018	4/07/2018	8/08/2018	6/09/2018	3/10/2018	1/11/2018	5/12/2018	25/01/2019	26/02/2019	27/03/2019	
Lab number	-		Not sampled	1963226.3	1993680.3	2010662.3	2028667.3	2044476.3	2059471.3	2074603.3	2092542.3	2114827.3	2132426.3	2150351.3	
Sum of Anions	meq/L			2.0	1.8	1.74	1.88	1.75	1.82	1.83	1.67	1.90	1.99	2.10	
Sum of Cations	meq/L			1.96	1.86	1.78	1.89	1.73	1.88	1.76	1.83	1.94	2.10	2.20	
Turbidity	NTU	**12.8**		9.5	7	8.6	7.3	8.6	7.6	12.2	15.6	7.0	7.4	7.1	
pH	-	**7.52**		7.7	7.4	7.3	7.6	7.6	7.5	7.8	7.7	7.9	7.8	7.8	
Total Alkalinity	g/m^3 as $CaCO_3$			46	39	34	39	36	39	43	37	48	48	53	
Bicarbonate	g/m^3			56	48	41	47	44	48	52	45	58	58	64	
Total Hardness	g/m^3 as $CaCO_3$			52	49	43	48	43.0	47.0	47.0	46.0	52.0	54.0	62.0	
Electrical Conductivity	mS/m			21.3	20.1	19.1	20.8	19.4	20.4	19.9	19.1	22.0	22.2	23.4	
Total Suspended Solids	g/m^3	**9.00**		9	<4	6	<5	< 5	< 4	< 5	5.0	< 6	4.0	< 6	
Dissolved Aluminium	g/m^3										0.26	0.063	0.10	0.06	
Total Aluminium	g/m^3			0.23	0.21	0.25	0.115	0.2	0.1	0.3	0.54	0.137	0.20	0.12	
Dissolved Calcium	g/m^3			10	9.1	8.2	9.6	8.5	9.5	9.5	9.2	10.6	10.5	12.2	
Total Calcium	g/m^3			10.4	9.3	8.4	9.3	8.5	9.6	9.7	9.4	11.4	10.9	12.2	
Dissolved Iron											0.50	0.31	0.42	0.42	
Total Iron	g/m^3			0.9	0.61	0.48	0.50	0.6	0.5	0.8	1.13	0.7	0.88	0.85	
Dissolved Magnesium	g/m^3			6	6.3	5.4	5.9	5	6	6	5.5	6.1	6.7	7.7	
Total Magnesium	g/m^3			6.2	6.3	5.2	5.4	5	6	6	5.5	6.3	6.8	6.8	
Dissolved Manganese	g/m^3										0.020	0.0058	0.008	0.008	
Total Manganese	g/m^3			0.044	0.038	0.040	0.033	0	0	0	0.032	0.02	0.022	0.024	
Dissolved Potassium	g/m^3			1.44	1.25	1.320	1.31	1	1	1	1.45	1.41	1.55	1.52	
Total Potassium	g/m^3			1.45	1.29	1.29	1.39	1	1	1	1.36	1.5	1.57	1.45	
Dissolved Sodium	g/m^3			21	19.5	20	20	20	21	18	19.1	19.6	21.0	21.0	
Total Sodium	g/m^3			21	19.8	19.8	19.8	20.0	21.0	18.0	19.9	20.0	22.0	21.0	
Chloride	g/m^3			35	32	34	34	33.0	33.0	31.0	29.0	31.0	33.0	34.0	
Total Ammoniacal-N	g/m^3	**0.005**		<0.010	<0.010	<0.010	<0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	
Nitrite-N	g/m^3			<0.002	<0.002	<0.002	<0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	
Nitrate-N	g/m^3			0.064	0.079	0.072	0.129	0.1	0.1	0.048	0.056	0.054	0.075	0.063	
Nitrate-N + Nitrite-N	g/m^3	**0.196**		0.064	0.08	0.072	0.13	0.1	0.1	0.049	0.057	0.055	0.076	0.064	
Total Phosphorus	g/m^3	**0.016**		0.022	0.012	0.017	0.016	0.016	0.012	0.020	0.025	0.016	0.017	0.023	
Sulphate	g/m^3			4.9	5.1	5.2	6	5.1	5.4	4.6	4.5	4.1	4.7	4.2	
BOD	$g\ O_2/m^3$			<2	<2	<2	<2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	
COD	$g\ O_2/m^3$			<6	<6	<6	<6	< 6	< 6	< 6	< 6	< 6	< 6	8.0	
Oil and Grease	g/m^3			<8	<8	<8	<8	< 8	8.0	< 10 #1	< 10	< 8	< 8	< 8	
Total Phenols	g/m^3			<0.02	<0.02	<0.02	<0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	
Dissolved Arsenic	g/m^3										< 0.0010	< 0.0010	< 0.0010	< 0.0010	
Dissolved Cadmium	g/m^3										< 0.00005	< 0.00005	< 0.00005	< 0.00005	
Dissolved Chromium	g/m^3										0.0007	0.0005	0.0005	< 0.0005	
Dissolved Copper	g/m^3										0.0005	< 0.0005	< 0.0005	< 0.0005	
Dissolved Lead	g/m^3										< 0.00010	< 0.00010	< 0.00010	< 0.00010	
Dissolved Nickel	g/m^3										0.0006	< 0.0005	< 0.0005	< 0.0005	
Dissolved Zinc	g/m^3										< 0.0010	< 0.0010	< 0.0010	< 0.0010	
Total Arsenic	g/m^3			<0.0011	<0.0011	<0.0011	<0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011	
Total Cadmium	g/m^3			<0.000053	<0.000053	<0.000053	<0.000053	< 0.000053	< 0.000053	< 0.000053	< 0.000053	< 0.000053	< 0.000053	< 0.000053	
Total Chromium	g/m^3			0.00155	0.0014	0.0021	0.00171	0.00179	0.00183	0.0014	0.002	0.00143	0.002	0.001	
Total Copper	g/m^3	**0.0003**		0.00059	<0.00053	<0.00053	0.00092	< 0.00053	< 0.00053	0.00073	0.00091	0.00055	0.00059	< 0.00053	
Total Lead	g/m^3	**0.00005**		<0.00011	<0.00011	<0.00011	0.00015	< 0.00011	< 0.00011	< 0.00011	0.00014	< 0.00011	< 0.00011	< 0.00011	
Total Nickel	g/m^3			0.00061	0.00073	0.00072	0.00065	0.00055	0.00059	0.0007	0.00091	0.00056	< 0.00053	< 0.00053	
Total Zinc	g/m^3	**0.0003**		0.002	0.0012	<0.0011	0.0114	< 0.0011	< 0.0011	0.0016	0.0016	0.0016	< 0.0011	< 0.0011	
SVOCs	g/m^3			<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	
VOCs	g/m^3			<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	
Temp-field	°C			13.5	8.9	9.2	12.3	11.3	11.3	13.3	16.5	19.2	14.8	16.3	
DO-field	%			94	95	9.63	102.1	98.1	97.5	91.5	92.9	92.1	89.4	106.4	
Conductivity-field	ms/m			17.04	14.75	14.5	16.49	14.25	15.35	15.56	16.35	19.52	17.42	19.11	
pH-field	-			7.83	7.92	7.14	7.89	7.41	7.7	7.54	7.32	7.92	7.24	7.61	
ORP-field	mV			-134.7	108	121	196.2	228.6	206.4	82.0	77.7	214.5	165.3	180.6	

1. Latest values obtained from Auckland Council geomapper

Monitoring Location: SW4

Source: Control

Parameter	Units	Mahurangi at FHQ[1]	21/02/2018	13/04/2018	31/05/2018	4/07/2018	8/08/2018	6/09/2018	3/10/2018	1/11/2018	5/12/2018	25/01/2019	26/02/2019	27/03/2019	
Lab number	-		Not sampled	1963226.4	1993680.4	2010662.4	2028667.4	2044476.4	2059471.4	2074603.4	2092542.4	2114827.4	2132426.4	2150351.4	
Sum of Anions	meq/L			2.0	1.83	1.71	1.88	1.72	1.78	1.83	1.76	2.00	2.00	2.10	
Sum of Cations	meq/L			2.0	1.86	1.74	1.86	1.71	1.89	1.79	1.82	1.99	2.10	2.30	
Turbidity	NTU	12.8		10.4	7	7.9	8	9.4	7.6	17.8	15.1	6.8	7.5	7.0	
pH	-	7.52		7.6	7.4	7.5	7.7	7.5	7.6	7.8	7.8	7.9	7.8	7.8	
Total Alkalinity	g/m^3 as $CaCO_3$			47	41	34	40	36	40	43	42	50	49	55	
Bicarbonate	g/m^3			57	50	41	49	44	48	52	51	60	60	66	
Total Hardness	g/m^3 as $CaCO_3$			52	48	42	46	41.0	47.0	46.0	45.0	52.0	56.0	63.0	
Electrical Conductivity	mS/m			21.4	20	19	20.7	19.3	20.5	20.3	19.5	22.3	22.5	23.9	
Total Suspended Solids	g/m^3	9.00		14	<5	5	<5	5.0	< 4	13.0	6.0	< 6	< 5	< 9	
Dissolved Aluminium	g/m^3										0.23	0.076	0.11	0.06	
Total Aluminium	g/m^3			0.36	0.21	0.23	0.123	0.3	0.3	0.5	0.53	0.083	0.26	0.19	
Dissolved Calcium	g/m^3			10.3	9.1	7.9	9.4	8.3	9.6	9.5	9.1	10.6	10.9	12.6	
Total Calcium	g/m^3			10.7	9.2	8.0	9.3	8.4	9.5	9.7	9.6	11.1	11.1	11.9	
Dissolved Iron	g/m^3										0.41	0.26	0.33	0.30	
Total Iron	g/m^3			0.94	0.57	0.39	0.41	0.5	0.4	1.0	0.98	0.53	0.79	0.71	
Dissolved Magnesium	g/m^3			6.1	6.2	5.4	5.6	5	6	6	5.5	6.2	6.9	7.6	
Total Magnesium	g/m^3			6.2	6	5.1	5.4	5	6	6	5.7	6.2	7.1	6.4	
Dissolved manganese	g/m^3										0.012	0.0023	0.005	0.006	
Total Manganese	g/m^3			0.039	0.022	0.025	0.022	0	0	0	0.023	0.0118	0.016	0.016	
Dissolved Potassium	g/m^3			1.42	1.24	1.20	1.19	1	1	1	1.37	1.31	1.45	1.40	
Total Potassium	g/m^3			1.38	1.26	1.21	1.21	1	1	1	1.32	1.38	1.51	1.36	
Dissolved Sodium	g/m^3			23	20	20	21	20	21	19	19.4	21	22.0	22.0	
Total Sodium	g/m^3			22	19.8	20	21	21.0	22.0	18.6	21.0	21.0	23.0	21.0	
Chloride	g/m^3			35	32	33	34	32.0	31.0	31.0	30.0	34.0	33.0	34.0	
Total Ammoniacal-N	g/m^3	0.005		<0.010	<0.010	<0.010	<0.010	< 0.010	< 0.010	0.02100	< 0.010	< 0.010	< 0.010	0.016	
Nitrite-N	g/m^3			<0.002	<0.002	<0.002	<0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	
Nitrate-N	g/m^3			0.066	0.083	0.081	0.069	0.1	0.046	0.043	0.045	0.027	0.057	0.068	
Nitrate-N + Nitrite-N	g/m^3	0.196		0.067	0.083	0.082	0.069	0.1	0.046	0.043	0.046	0.027	0.058	0.069	
Total Phosphorus	g/m^3	0.016		0.022	0.012	0.01	0.013	0.018	0.014	0.026	0.027	0.015	0.015	0.018	
Sulphate	g/m^3			5.1	5.1	5.2	5.4	4.8	5.0	4.5	4.4	4.4	4.7	4.2	
BOD	$g\ O_2/m^3$			<2	<2	<2	<2	< 2	< 2	< 2	< 2	< 2	< 2	< 2	
COD	$g\ O_2/m^3$			8	<6	<6	<6	< 6	< 6	< 6	< 6	< 6	< 6	6.0	
Oil and Grease	g/m^3			<8	<8	25	<8	< 7	8.0	< 10	< 10	< 8	< 7	< 8	
Total Phenols	g/m^3			<0.02	<0.02	<0.02	<0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	
Dissolved Arsenic	g/m^3										< 0.0010	< 0.0010	< 0.0010	< 0.0010	
Dissolved Cadmium	g/m^3										< 0.00005	< 0.00005	< 0.00005	< 0.00005	
Dissolved Chromium	g/m^3										0.0008	< 0.0005	0.0006	0.0005	
Dissolved Copper	g/m^3										0.0005	< 0.0005	< 0.0005	< 0.0005	
Dissolved Lead	g/m^3										< 0.00010	< 0.00010	< 0.00010	< 0.00010	
Dissolved Nickel	g/m^3										< 0.0005	< 0.0005	< 0.0005	< 0.0005	
Dissolved Zinc	g/m^3										< 0.0010	< 0.0010	< 0.0010	< 0.0010	
Total Arsenic	g/m^3			<0.0011	<0.0011	<0.0011	<0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011	
Total Cadmium	g/m^3			<0.000053	<0.000053	<0.000053	<0.000053	< 0.000053	< 0.000053	< 0.000053	< 0.000053	< 0.000053	< 0.000053	< 0.000053	
Total Chromium	g/m^3			0.0022	0.00182	0.0023	0.00179	0.0023	0.00154	0.0022	0.00210	0.00129	0.00171	0.00113	
Total Copper	g/m^3	0.0003		0.00066	<0.00053	<0.00053	<0.00053	< 0.00053	< 0.00053	0.00072	0.00080	< 0.00053	0.00054	0.00068	
Total Lead	g/m^3	0.00005		<0.00011	<0.00011	<0.00011	<0.00011	< 0.00011	< 0.00011	0.00016	< 0.00011	< 0.00011	< 0.00011	< 0.00011	
Total Nickel	g/m^3			0.00062	0.00054	0.00055	<0.00053	0.00079	0.00054	0.00072	0.00062	< 0.00053	0.00057	< 0.00053	
Total Zinc	g/m^3	0.0003		0.0012	<0.0011	<0.0011	<0.0011	< 0.0011	< 0.0011	0.0013	< 0.0011	< 0.0011	< 0.0011	< 0.0011	
SVOCs	g/m^3			<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	
VOCs	g/m^3			<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	
Temp-field	°C			13.3	8.9	9.2	12.4	11.3	11.3	13.1	16.1	17.9	14.7	16.0	
DO-field	%			95.3	10.91	9.35	98.3	98.9	97.0	92.6	98.2	94.8	95.5	119.0	
Conductivity-field	ms/m			17.24	13.52	14.54	16.56	14.12	15.27	15.45	16.27	19.20	17.51	19.39	
pH-field	-			7.75	7.67	7.48	7.74	7.41	7.41	7.55	7.34	8.09	7.37	7.54	
ORP-field	mV			-117.9	137.6	121.6	223.3	228.2	232.2	104.2	100.9	205.3	155.3	191.0	

1. Latest values obtained from Auckland Council geomapper

Monitoring Location: SW5

Source: Farmland downstream by bridge (only used as a test location)

Parameter	Units	Mahurangi at FHQ[1]	21/02/2018	13/04/2018	31/05/2018	4/07/2018	8/08/2018								
Lab number	-		1933157.2	Not sampled	Not sampled	Not sampled	Not sampled								
Sum of Anions	meq/L		1.68												
Sum of Cations	meq/L		1.72												
Turbidity	NTU	12.8	7.7												
pH	-	7.52	7.6												
Total Alkalinity	g/m^3 as $CaCO_3$		42												
Bicarbonate	g/m^3		51												
Total Hardness	g/m^3 as $CaCO_3$		46												
Electrical Conductivity	mS/m		18.2												
Total Suspended Solids	g/m^3	9.00	9												
Total Aluminium	g/m^3		0.122												
Dissolved Calcium	g/m^3		10.3												
Total Calcium	g/m^3		10.3												
Total Iron	g/m^3		0.92												
Dissolved Magnesium	g/m^3		4.9												
Total Magnesium	g/m^3		4.9												
Total Manganese	g/m^3		0.032												
Dissolved Potassium	g/m^3		1.43												
Total Potassium	g/m^3		1.45												
Dissolved Sodium	g/m^3		17.6												
Total Sodium	g/m^3		18.6												
Chloride	g/m^3		25												
Total Ammoniacal-N	g/m^3	0.005	<0.010												
Nitrite-N	g/m^3		<0.002												
Nitrate-N	g/m^3		0.052												
Nitrate-N + Nitrite-N	g/m^3	0.196	0.053												
Total Phosphorus	g/m^3	0.016	0.022												
Sulphate	g/m^3		6												
BOD	$g\ O_2/m^3$		<2												
COD	$g\ O_2/m^3$		6												
Oil and Grease	g/m^3		<8												
Total Phenols	g/m^3		<0.02												
Total Arsenic	g/m^3		<0.0011												
Total Cadmium	g/m^3		<0.000053												
Total Chromium	g/m^3		0.00163												
Total Copper	g/m^3	0.0003	0.00089												
Total Lead	g/m^3	0.00005	<0.00011												
Total Nickel	g/m^3		0.00084												
Total Zinc	g/m^3	0.0003	0.0015												
SVOCs	g/m^3		<DL												
VOCs	g/m^3		<DL												
Temp-field	°C		19												
DO-field	%		81.1												
Conductivity-field	ms/m		17.05												
pH-field	-		6.74												
ORP-field	mV		80.2												

1. Latest values obtained from Auckland Council geomapper

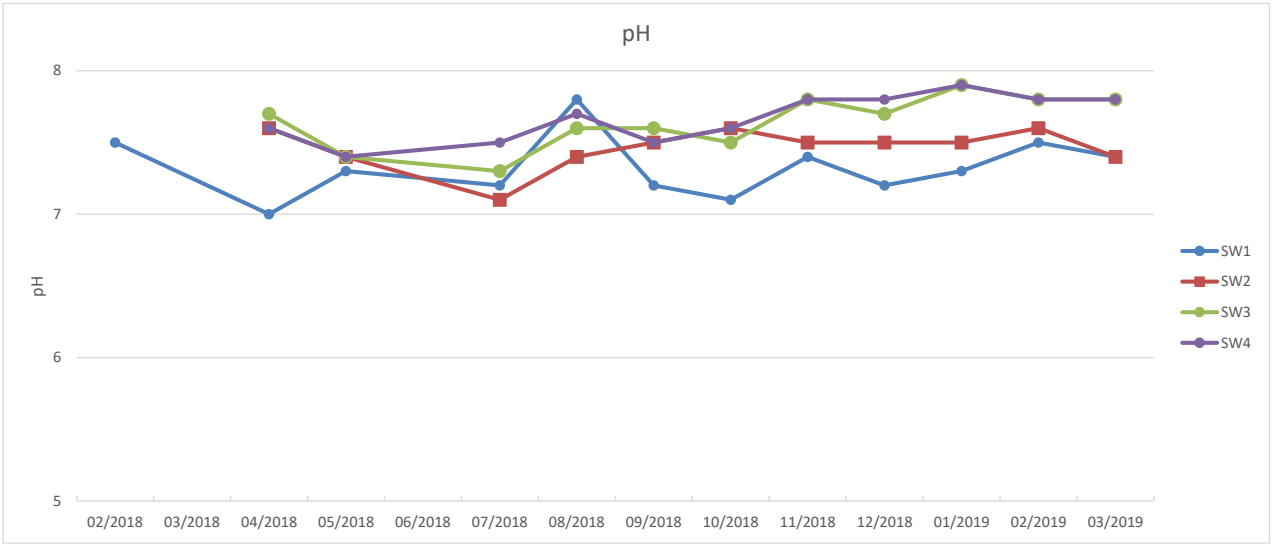
Appendix B Table 2: Results of surface water analysis at Mahurangi catchment

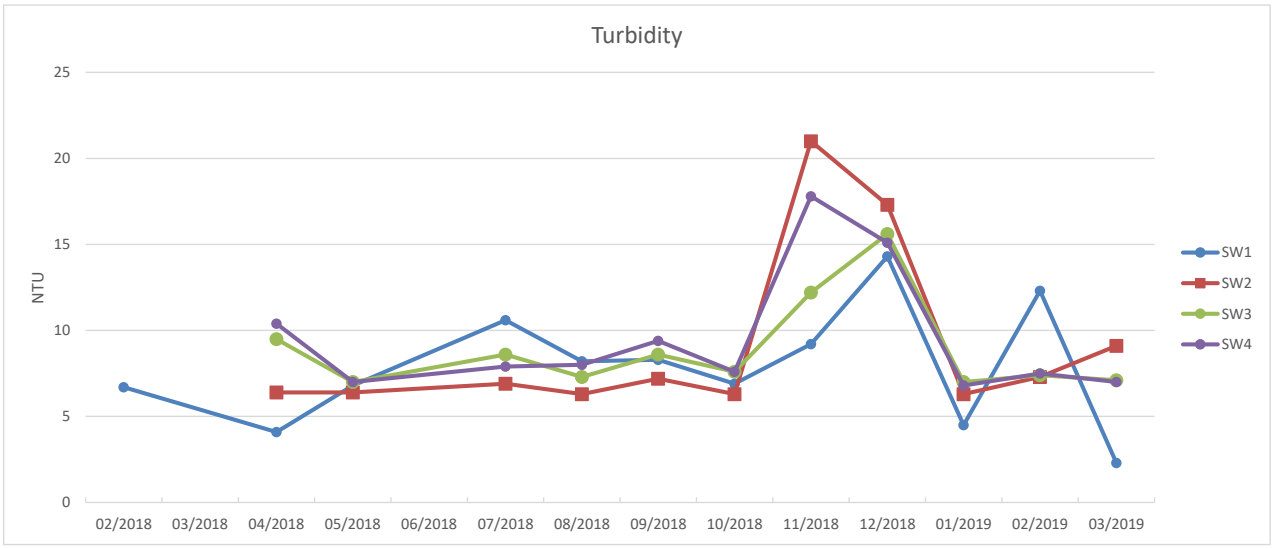
Parameter	Units	Maximum	6/11/17	16/06/17	15/05/17	23/03/17	18/01/17	9/11/16	6/06/12	30/04/12	29/02/12	1/02/12	5/01/12	7/12/11	4/10/11	31/08/11	2/08/11
Dissolved Copper	g/m^3	0.0005	-	-	-	-	-	-	0.0002	0.0002	0.0003	0.0002	0.0005	0.0005	0.0005	0.0003	0.0001
Total Copper	g/m^3	0.0014	-	-	-	-	-	-	0.0003	0.0003	0.0004	0.0005	0.0008	0.0007	0.0014	0.0001	0.0004
Dissolved Lead	g/m^3	0.00005	-	-	-	-	-	-	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Total Lead	g/m^3	0.0003	-	-	-	-	-	-	0.00005	0.00005	0.00005	0.00005	0.00009	0.00006	0.00033	0.00006	0.00005
Dissolved Zinc	g/m^3	0.0005	-	-	-	-	-	-	0.0003	0.0003	0.0005	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
Total Zinc	g/m^3	0.0018	-	-	-	-	-	-	0.0003	0.0008	0.0014	0.0005	0.0014	0.0008	0.0018	0.0006	0.0007
Ammoniacal-N	g/m^3	0.013	0.005	0.005	0.005	0.011	0.013	0.013	-	-	-	-	-	-	-	-	-
Dissolved Phosphorus	g/m^3	0.015	0.003	0.012	0.012	0.015	0.013	0.009	-	-	-	-	-	-	-	-	-
Total Suspended Solids	g/m^3	9.00	9.00	4.40	3.50	4.20	3.20	5.60	-	-	-	-	-	-	-	-	-
Total Kjedhal Nitrogen	g/m^3	0.180	0.140	0.054	0.120	0.087	0.160	0.180	-	-	-	-	-	-	-	-	-
Total Oxidised Inorganic Nitrogen	g/m^3	0.220	0.196	0.220	0.210	0.160	0.140	0.120	-	-	-	-	-	-	-	-	-
Total Phosphorus	g/m^3	0.023	0.016	0.012	0.020	0.018	0.023	0.023	-	-	-	-	-	-	-	-	-

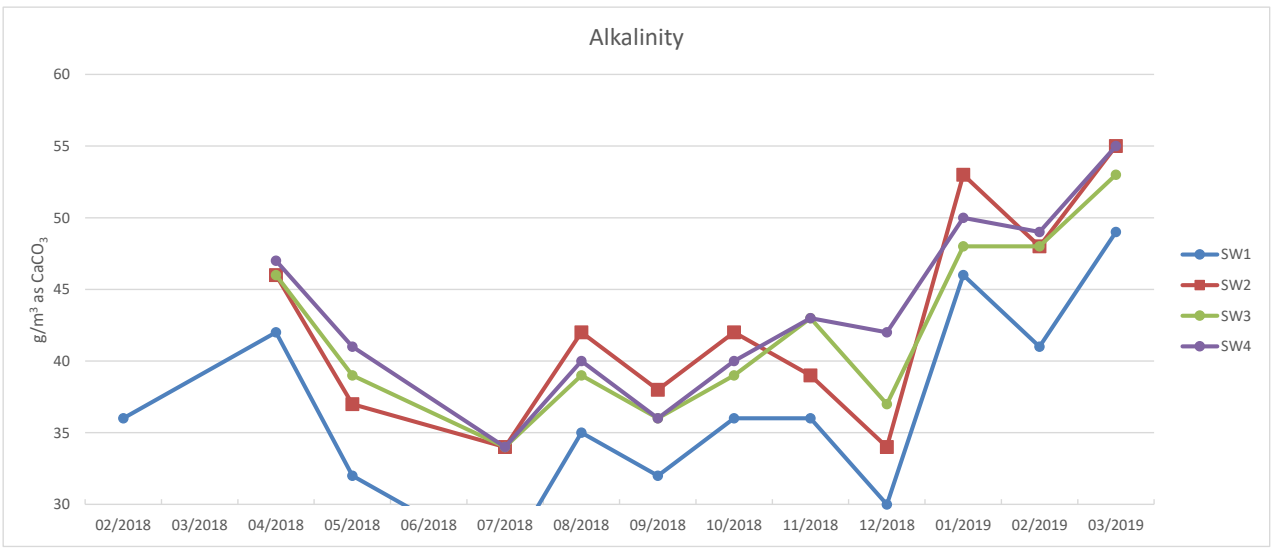
Source: Land Air Water Aotearoa, water quality for Mahurangi River at Forestry Headquarters (FHQ).

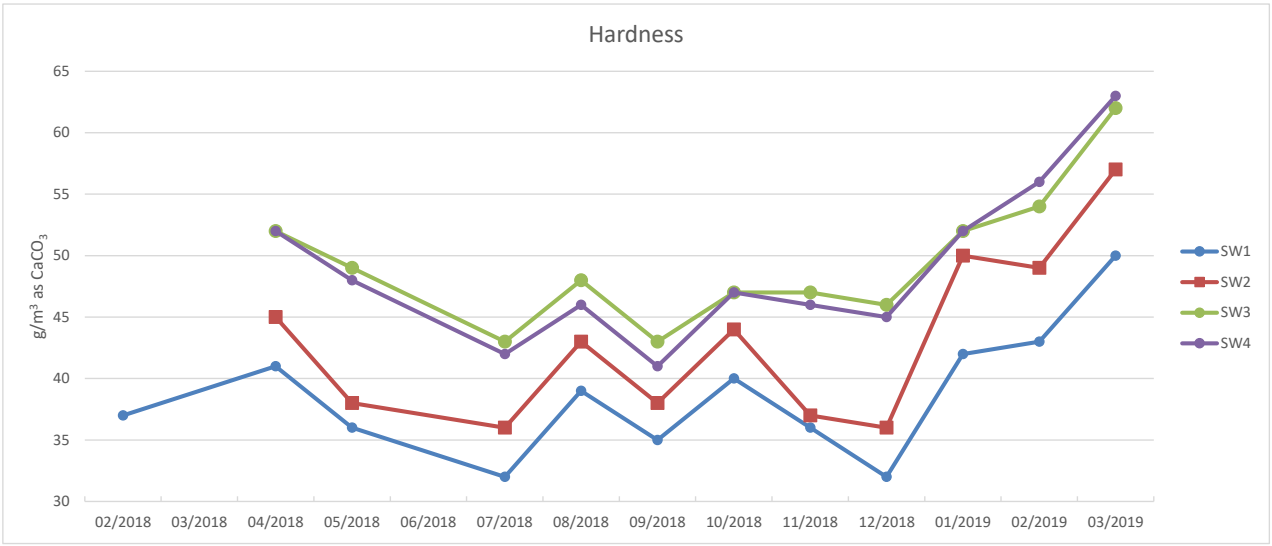
Appendix C: Surface water graphs

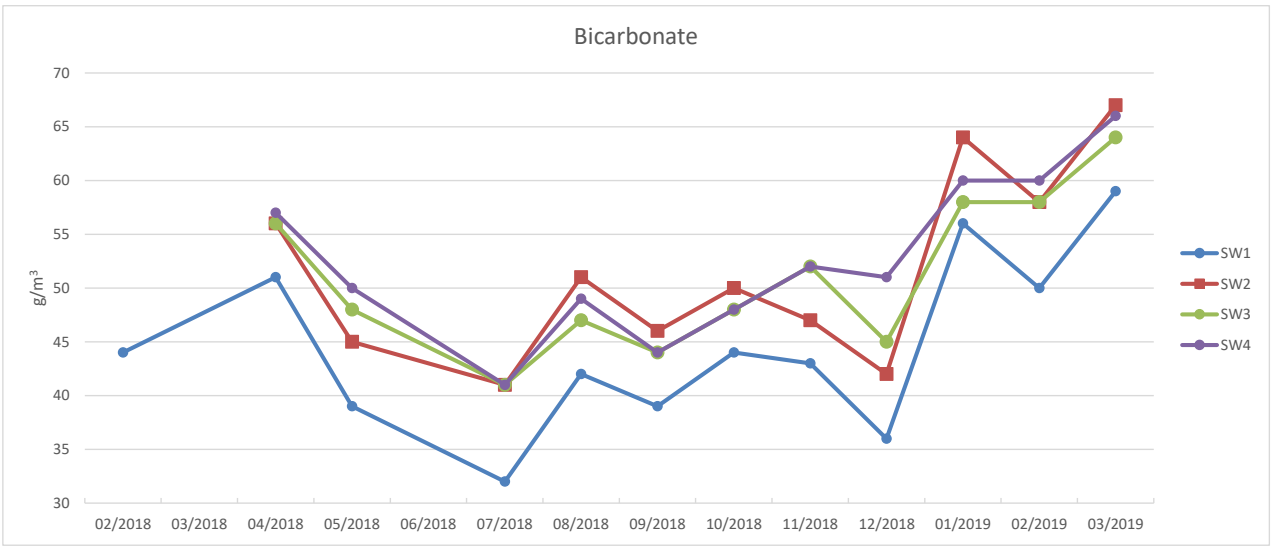
Auckland Regional Landfill:
Surface water monitoring results

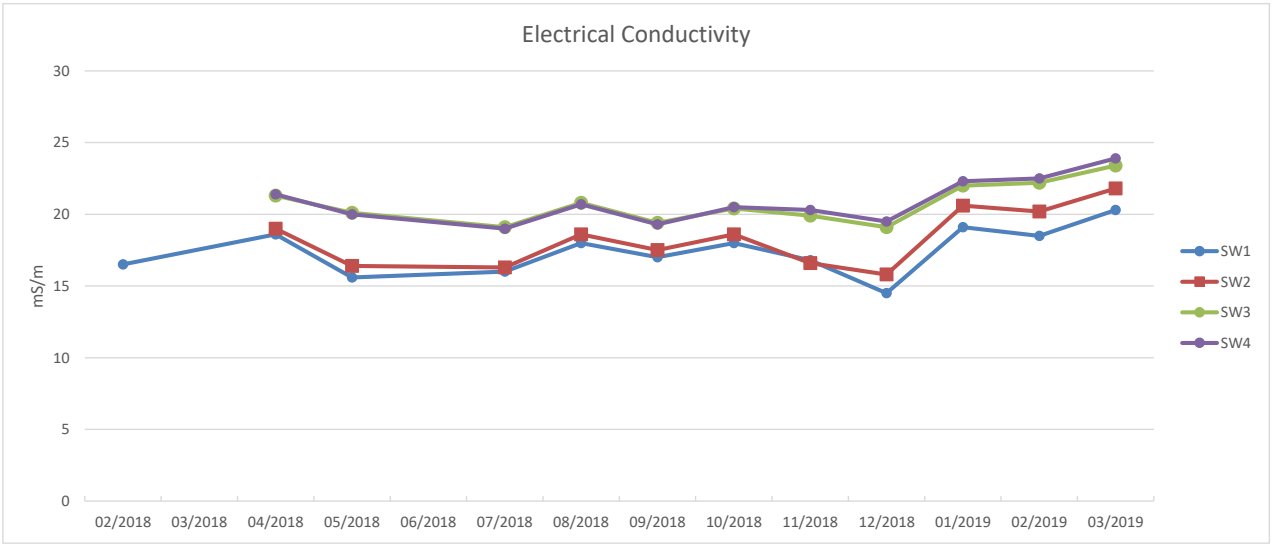


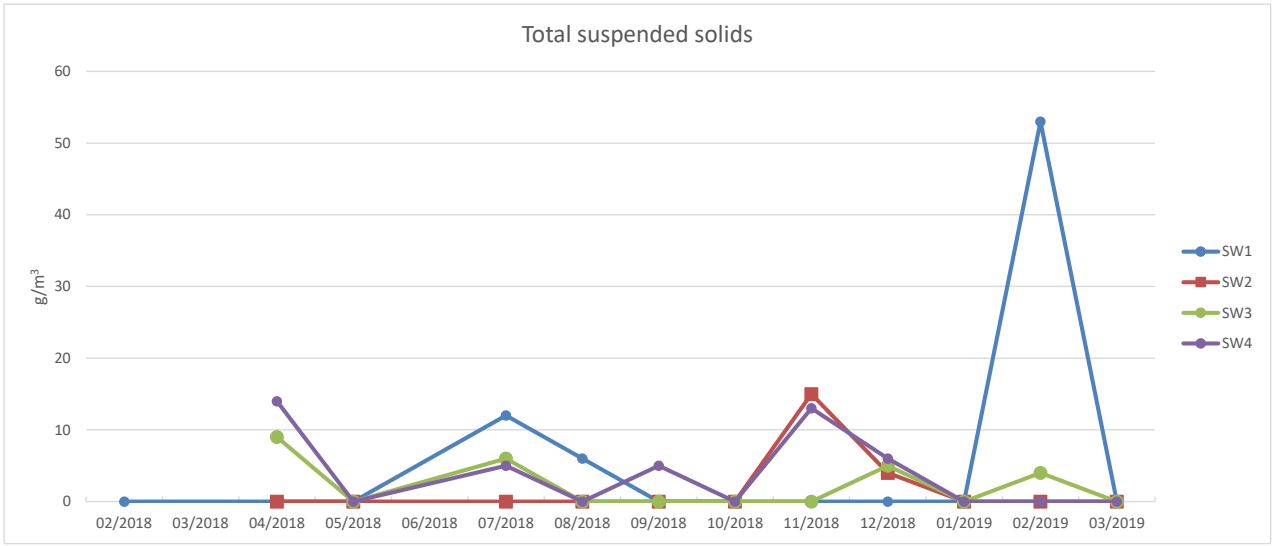


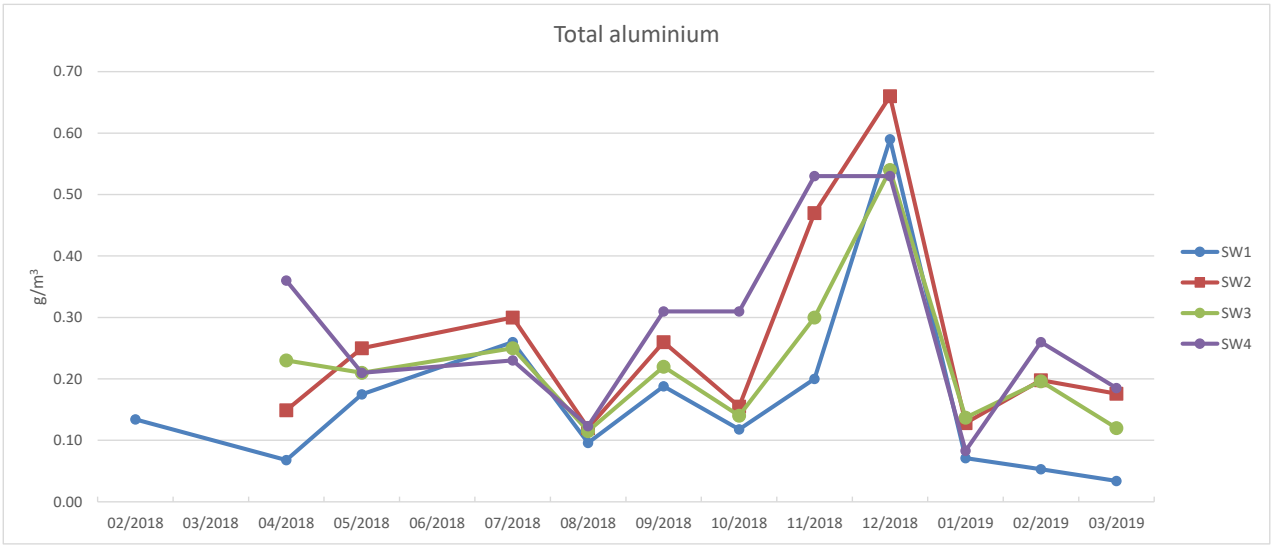


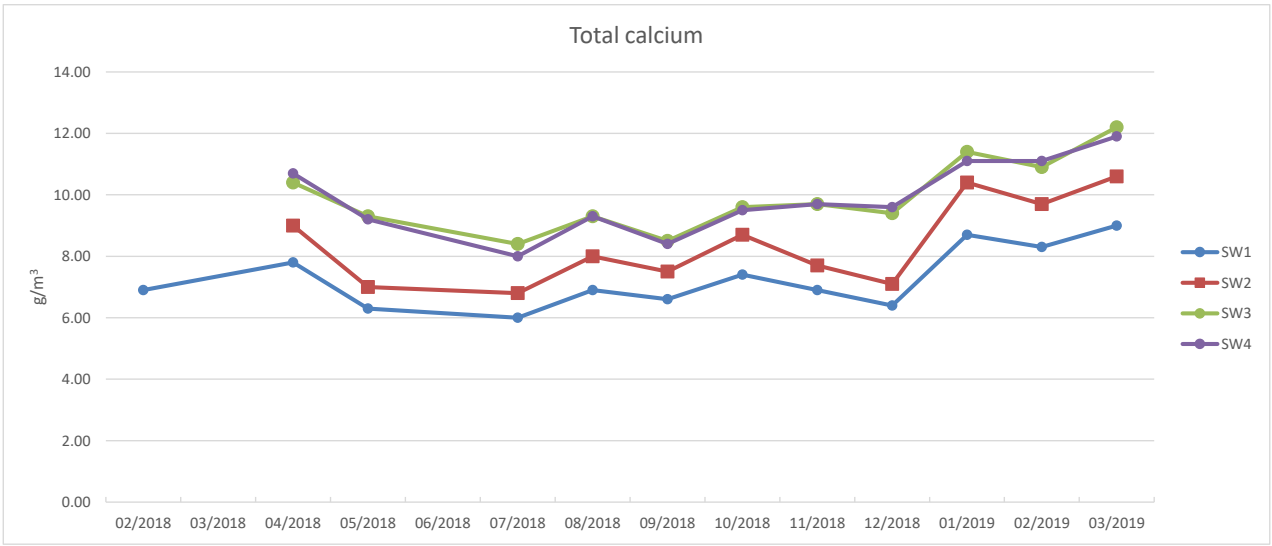

Hardness
65
60
55
50
45
40
35
30
g/m³ as CaCO3
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4

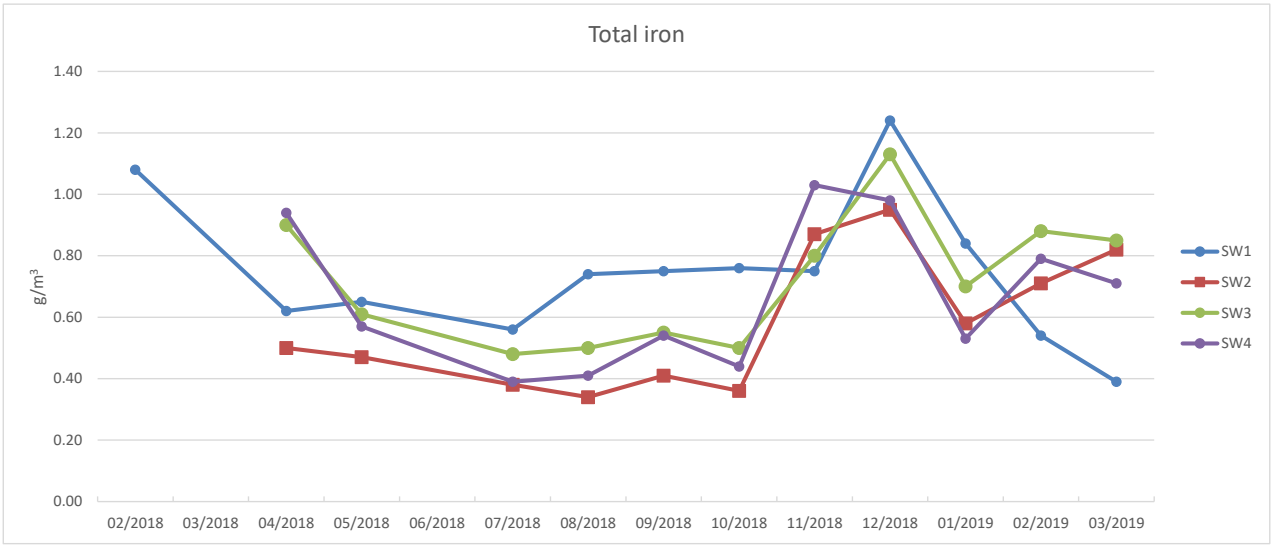

Bicarbonate
70
65
60
55
50
45
40
35
30
g/m³
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4

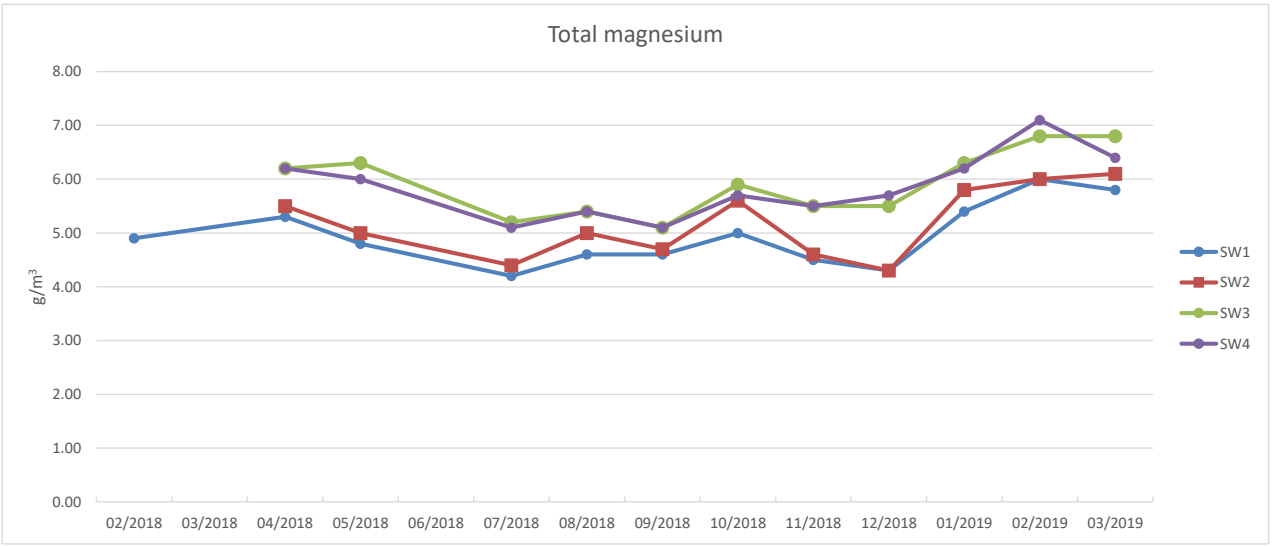

Electrical Conductivity
30
25
20
15
10
5
0
mS/m
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4

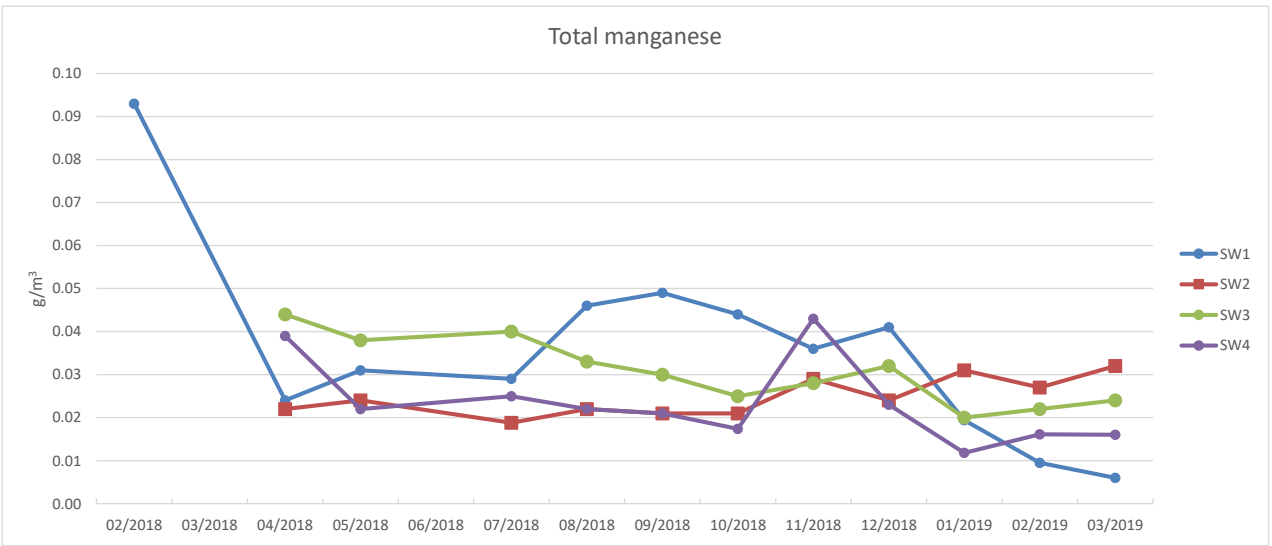

Total suspended solids
60
50
40
30
20
10
0
g/m³
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4

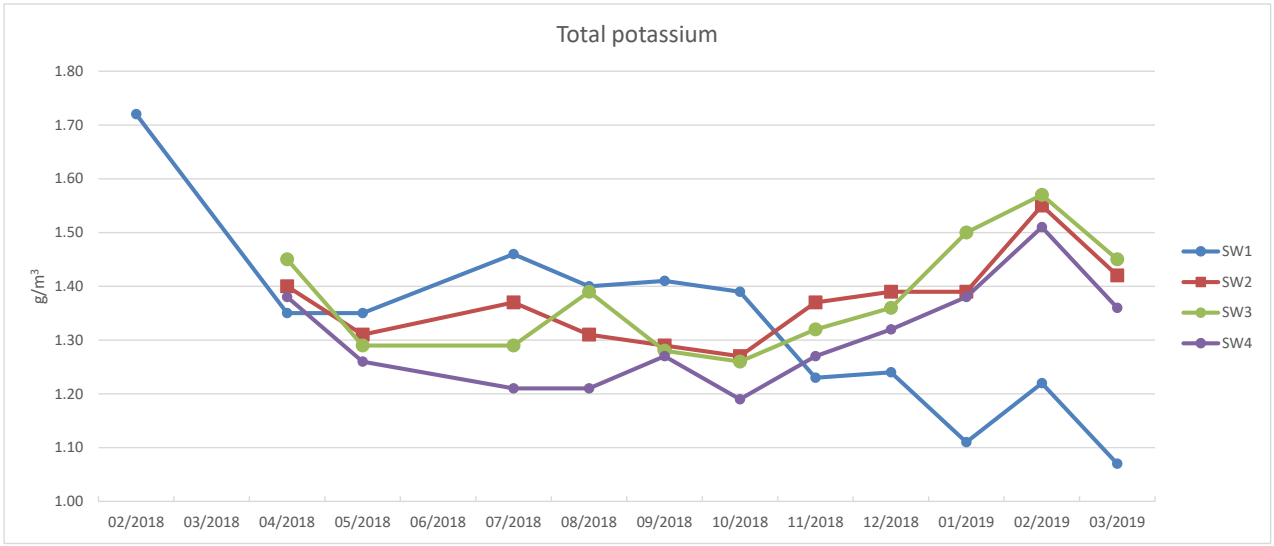

Total aluminium
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
g/m³
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4

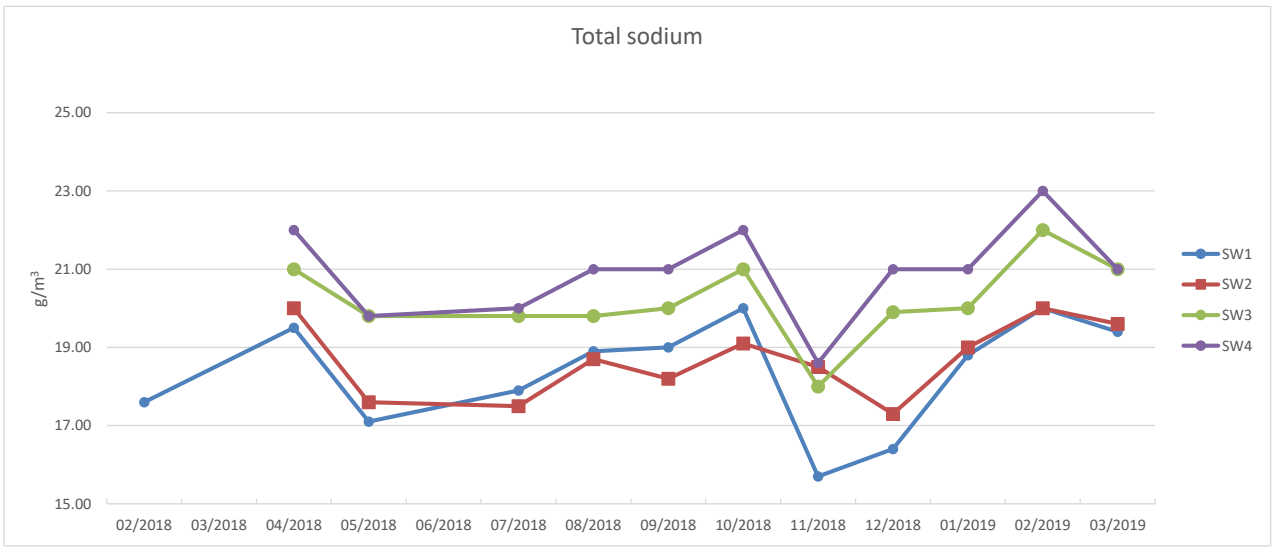

Total calcium
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
g/m³
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4

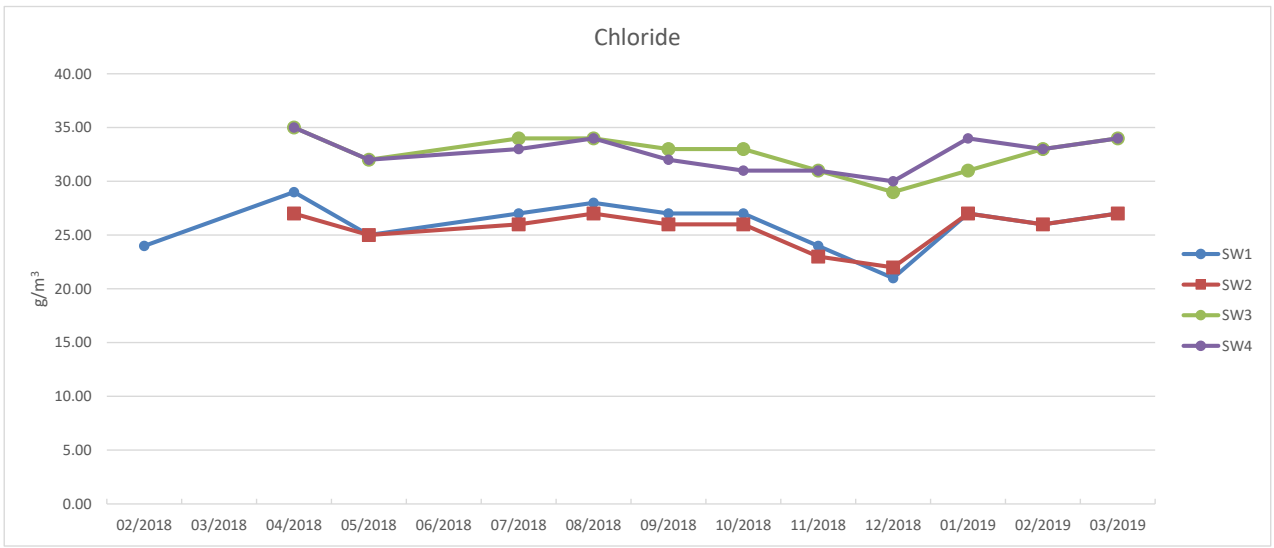

Total iron
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
g/m3
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4

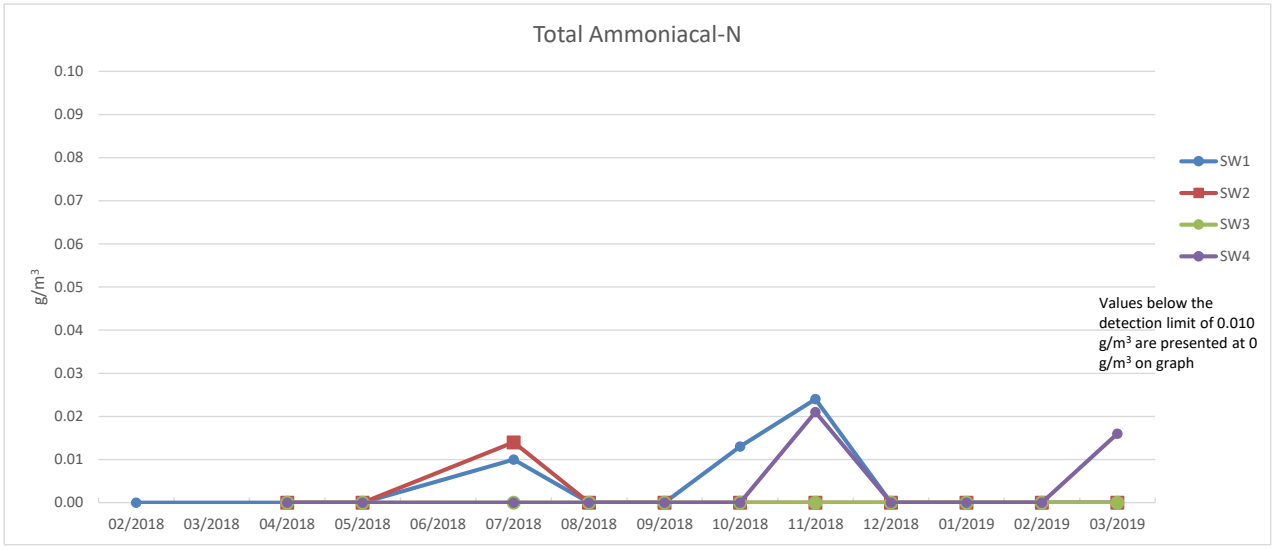

Total magnesium
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
g/m3
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4

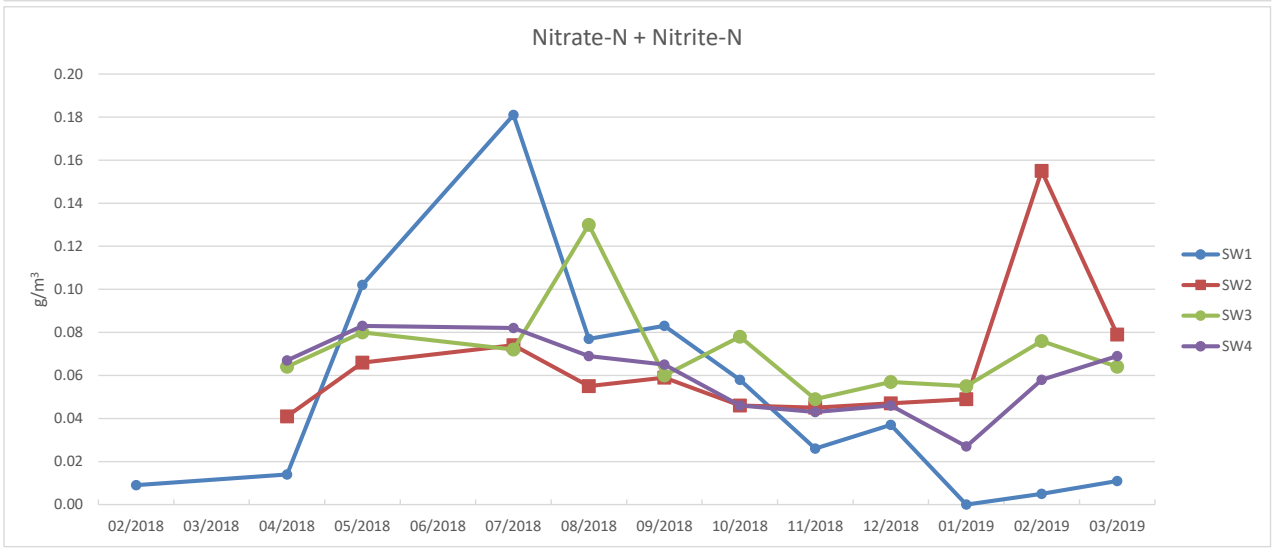

Total manganese
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
g/m3
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4

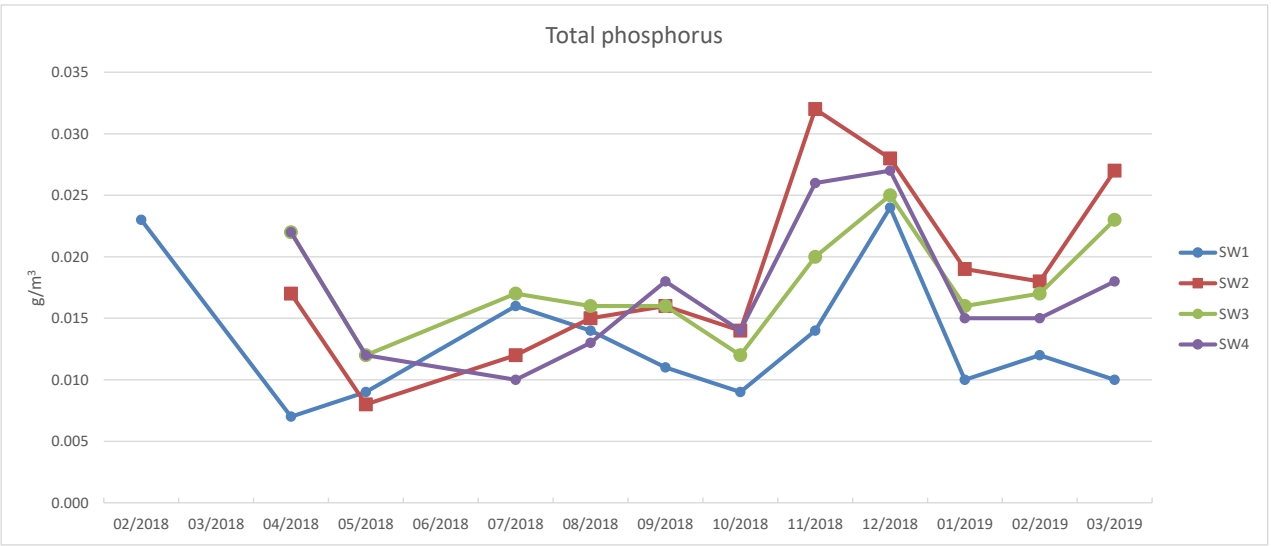

Total potassium
1.80
1.70
1.60
1.50
1.40
1.30
1.20
1.10
1.00
g/m³
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4

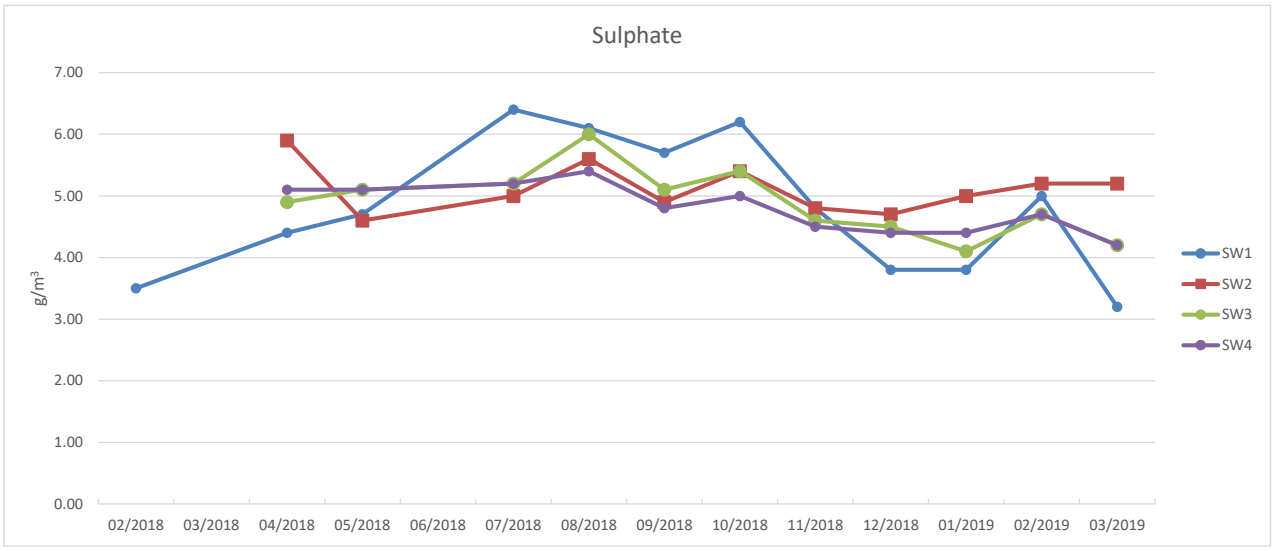

Total sodium
25.00
23.00
21.00
19.00
17.00
15.00
g/m³
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4

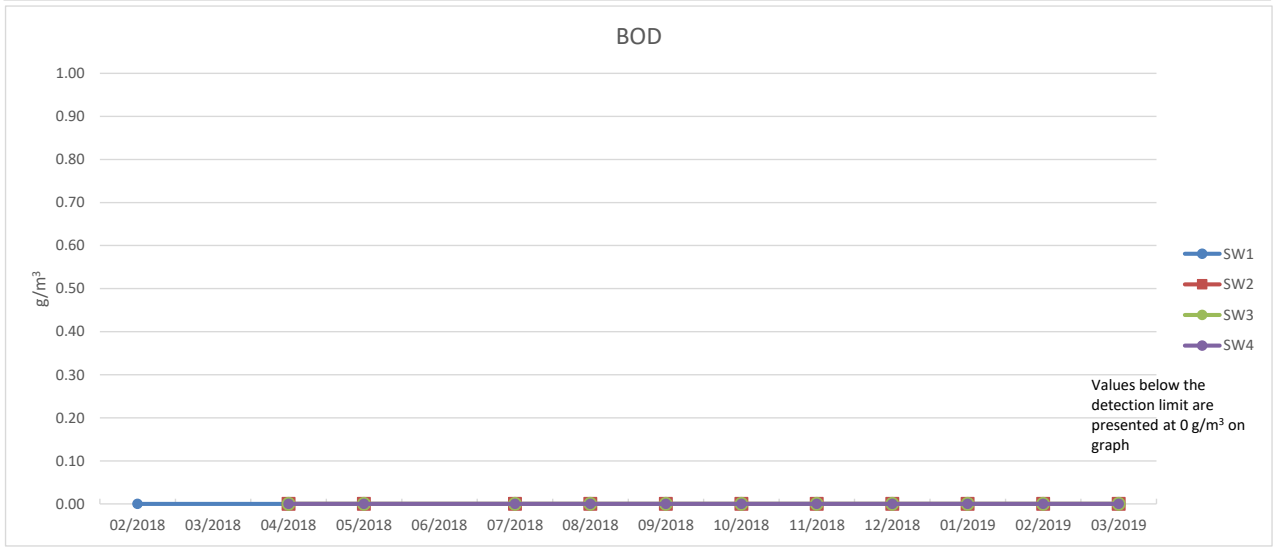

Chloride
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
g/m³
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4

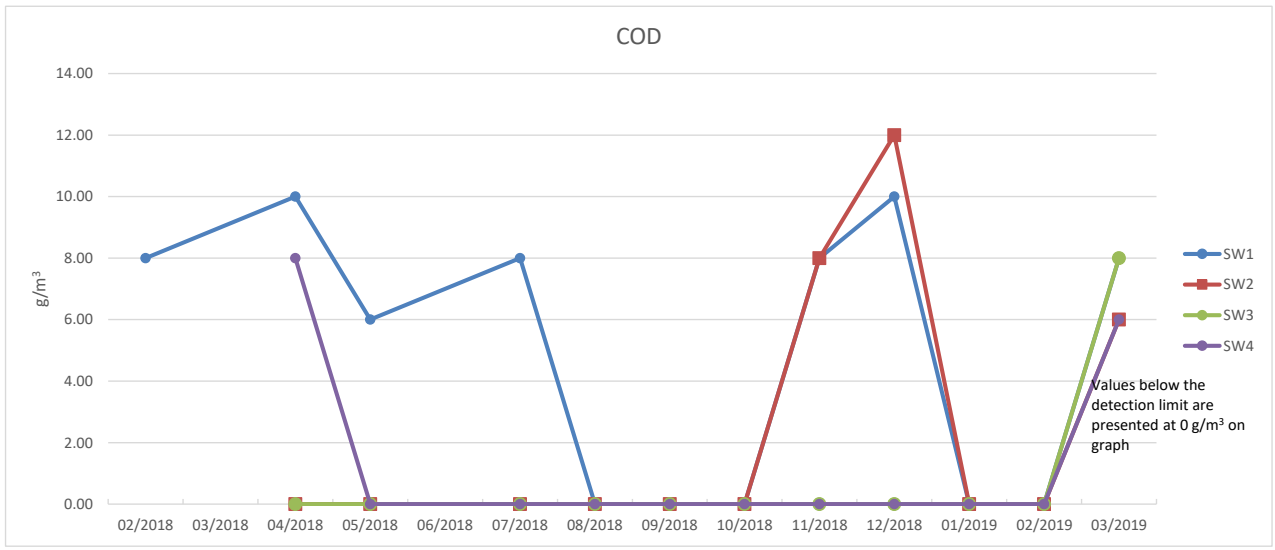

Total Ammoniacal-N
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
g/m³
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4
Values below the detection limit of 0.010 g/m³ are presented at 0 g/m³ on graph

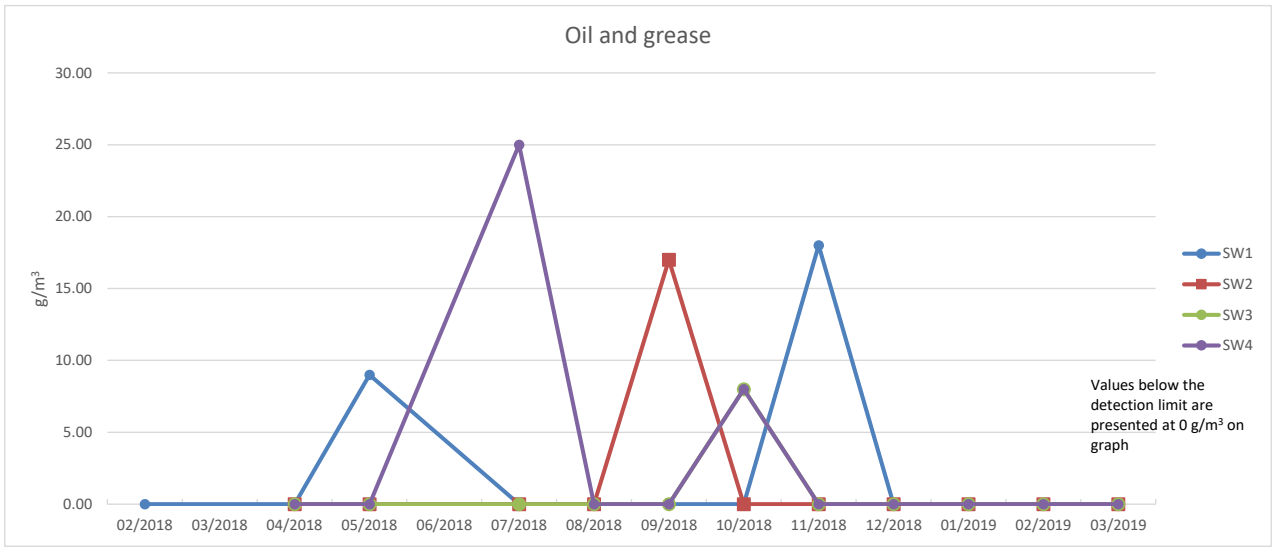

Nitrate-N + Nitrite-N
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
g/m³
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4

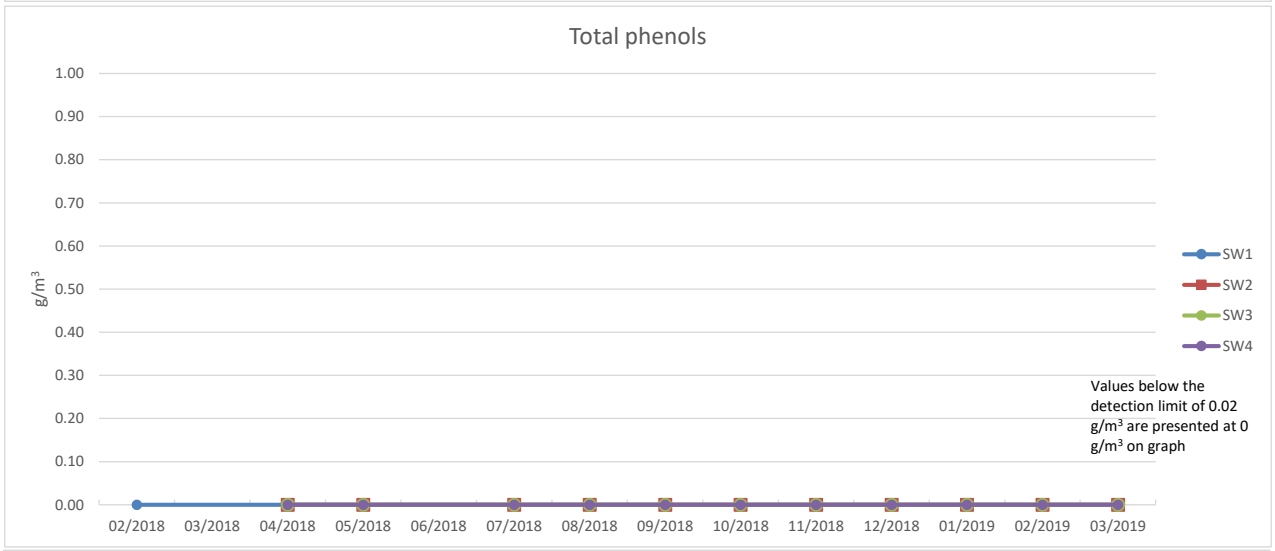

Total phosphorus
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
g/m³
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4

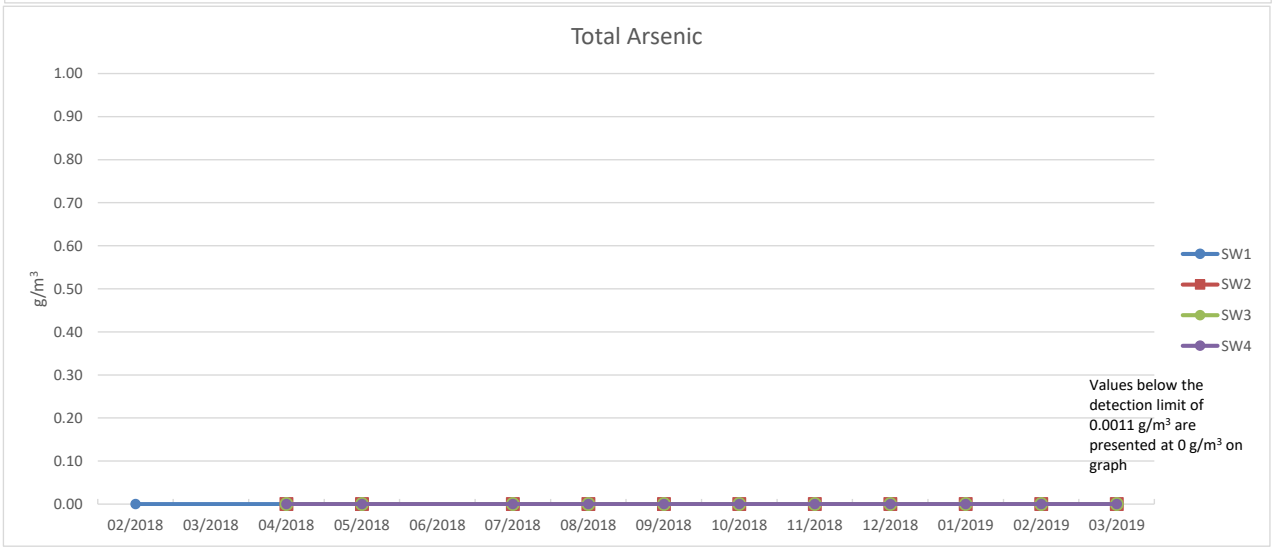

Sulphate
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
g/m³
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4

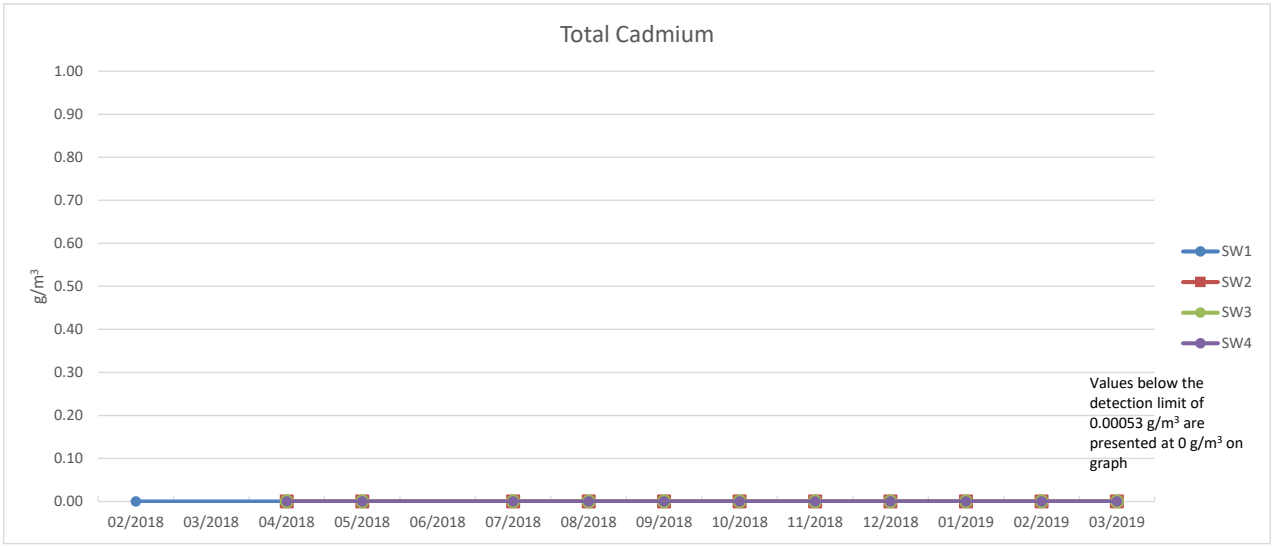

BOD
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
g/m³
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4
Values below the detection limit are presented at 0 g/m³ on graph

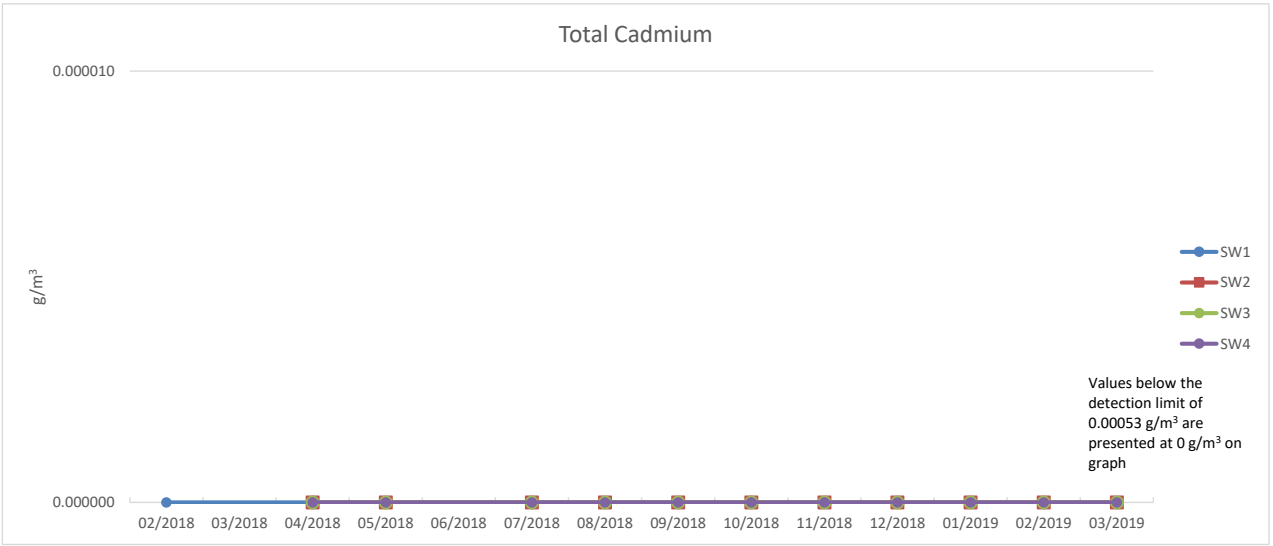

COD
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
g/m³
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4
Values below the detection limit are presented at 0 g/m³ on graph

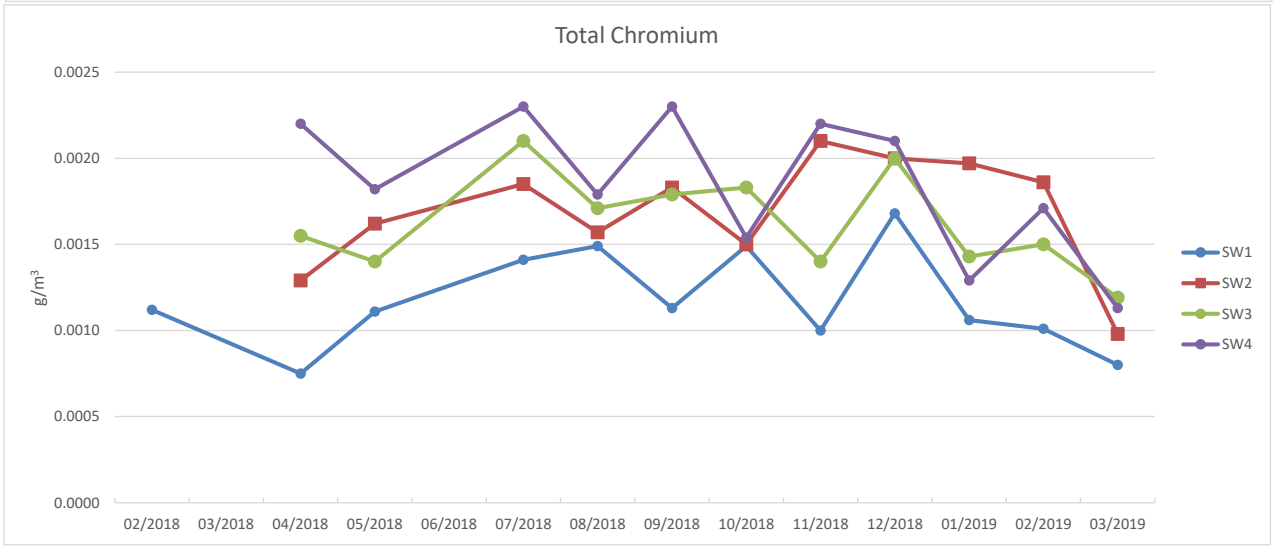

Oil and grease
30.00
25.00
20.00
15.00
10.00
5.00
0.00
g/m3
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4
Values below the detection limit are presented at 0 g/m3 on graph

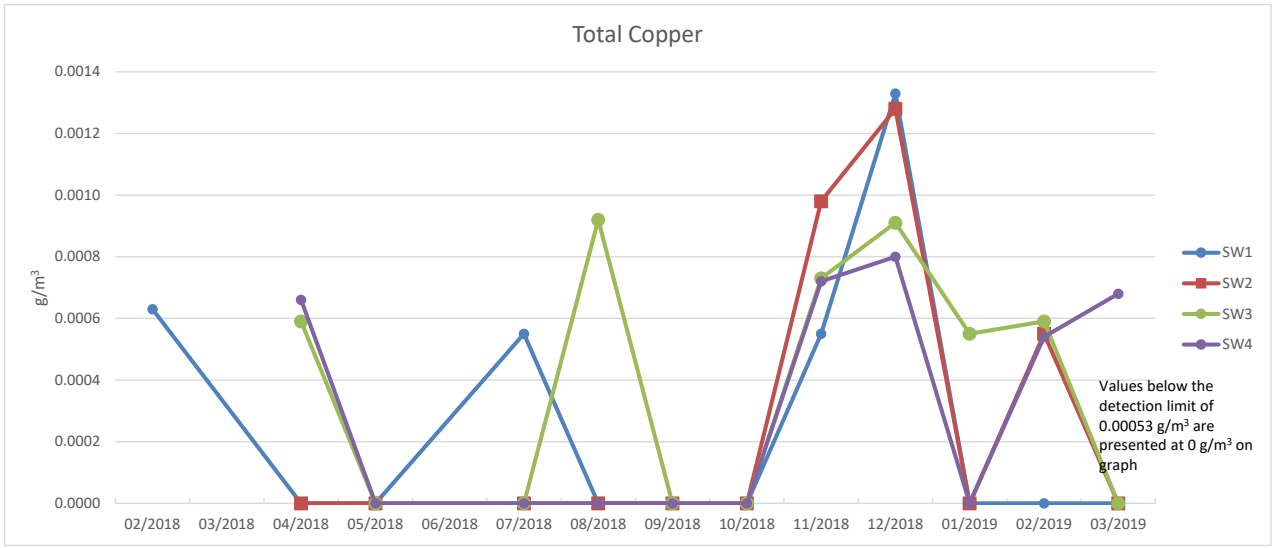

Total phenols
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
g/m3
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4
Values below the detection limit of 0.02 g/m3 are presented at 0 g/m3 on graph

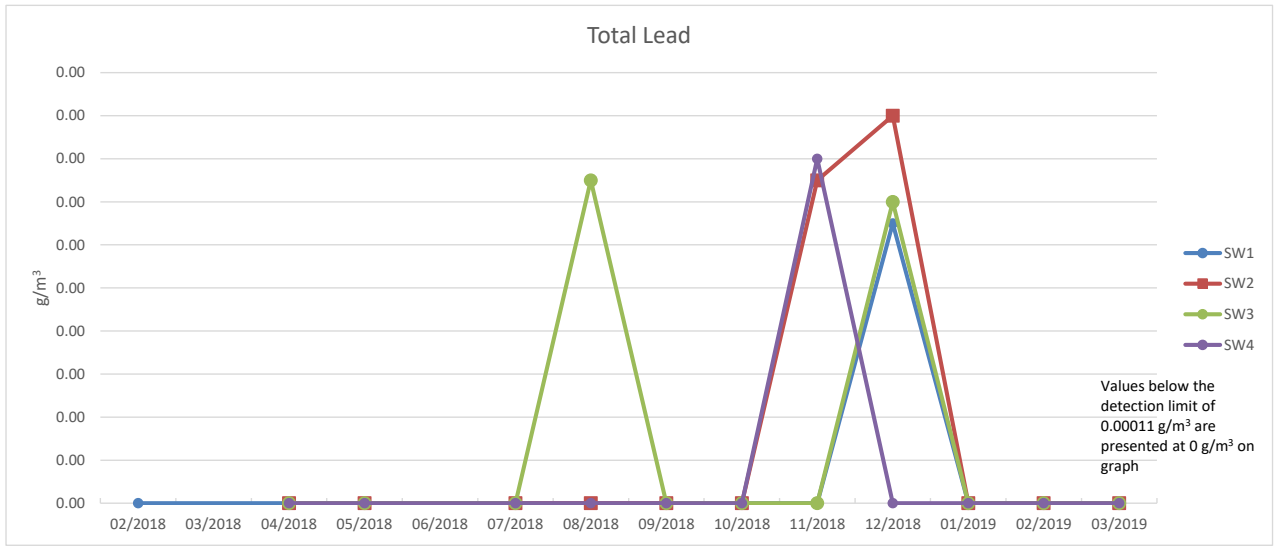

Total Arsenic
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
g/m3
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4
Values below the detection limit of 0.0011 g/m3 are presented at 0 g/m3 on graph

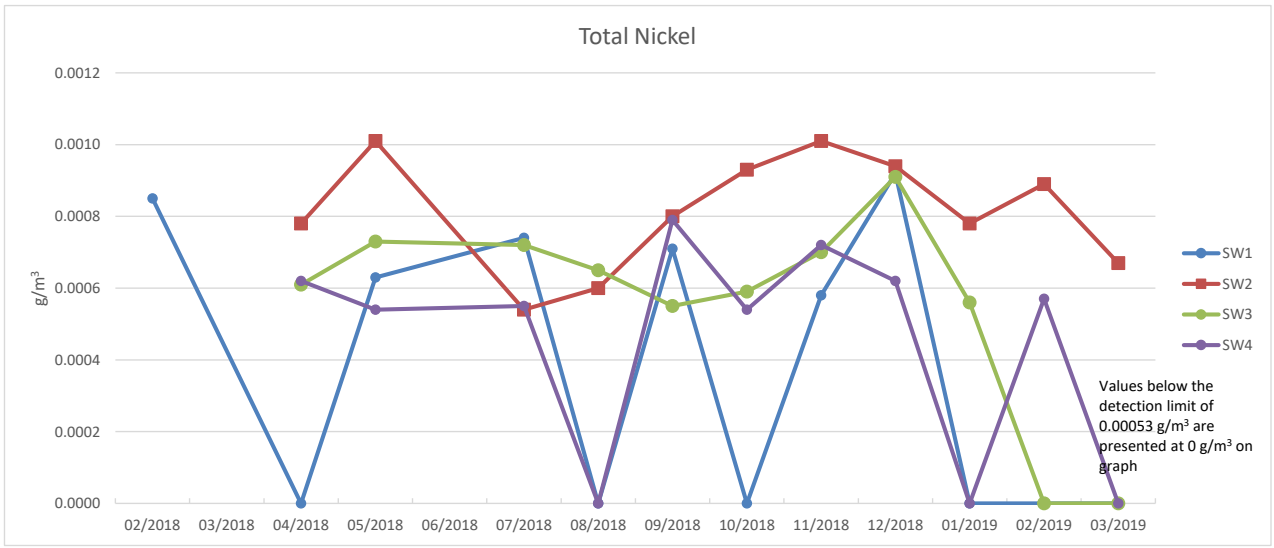

Total Cadmium
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
g/m³
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4
Values below the detection limit of 0.00053 g/m³ are presented at 0 g/m³ on graph

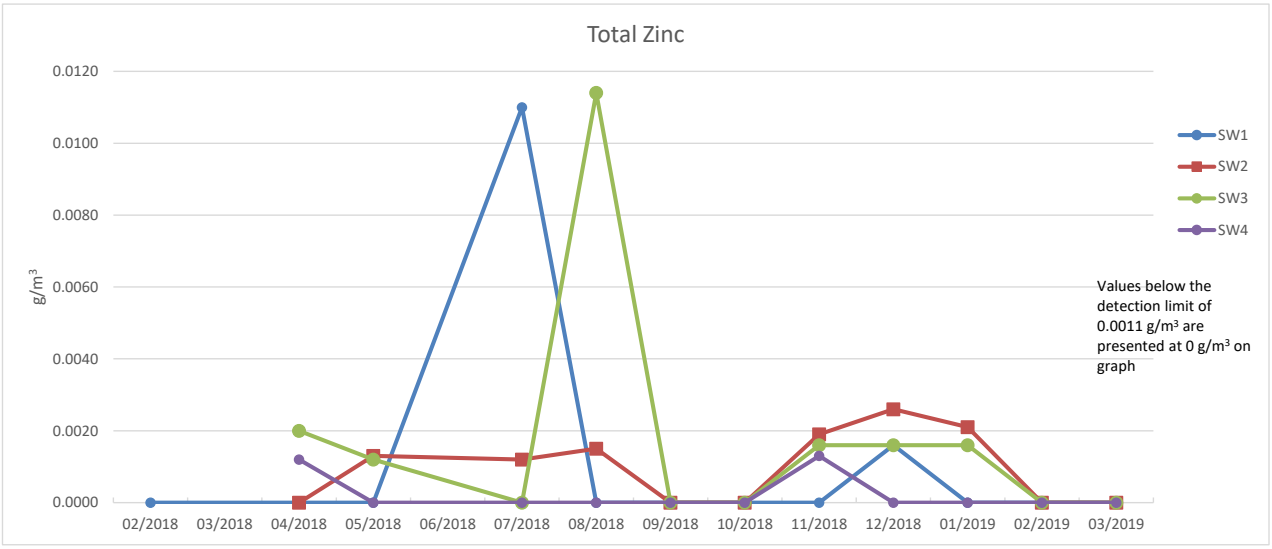

Total Cadmium
0.000010
0.000000
g/m³
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4
Values below the detection limit of 0.00053 g/m³ are presented at 0 g/m³ on graph

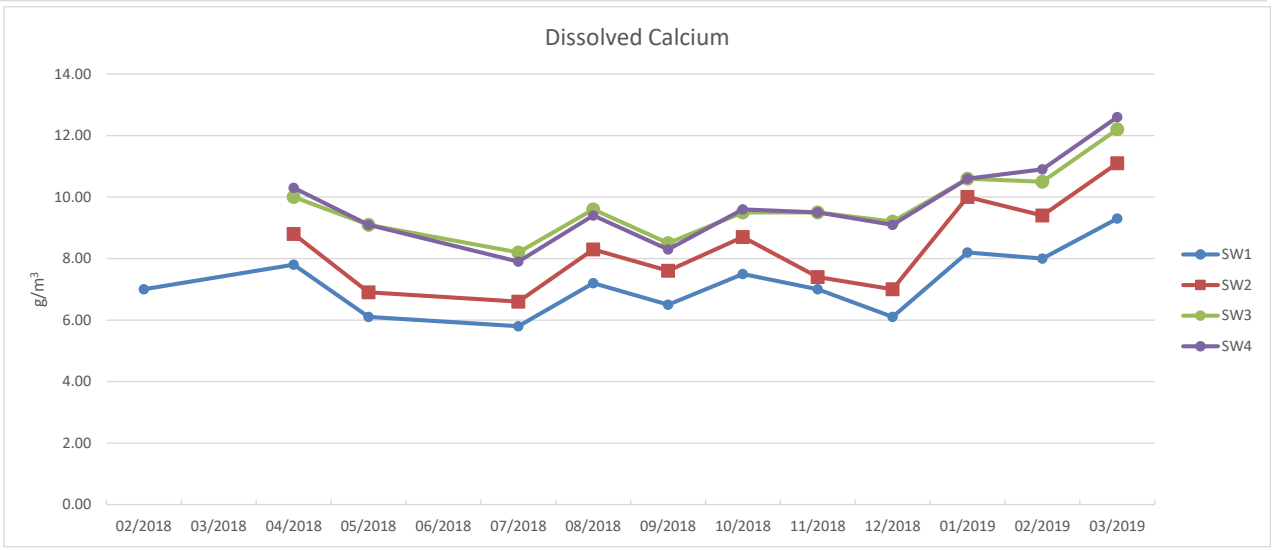

Total Chromium
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
g/m³
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4

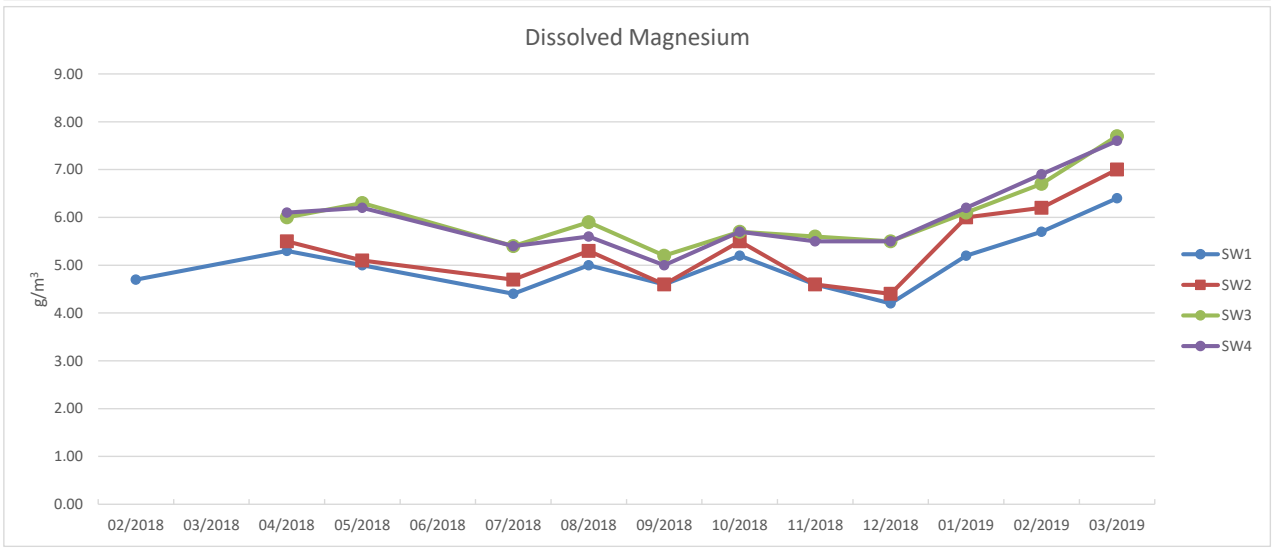

Total Copper
0.0014
0.0012
0.0010
0.0008
0.0006
0.0004
0.0002
0.0000
g/m³
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4
Values below the detection limit of 0.00053 g/m³ are presented at 0 g/m³ on graph

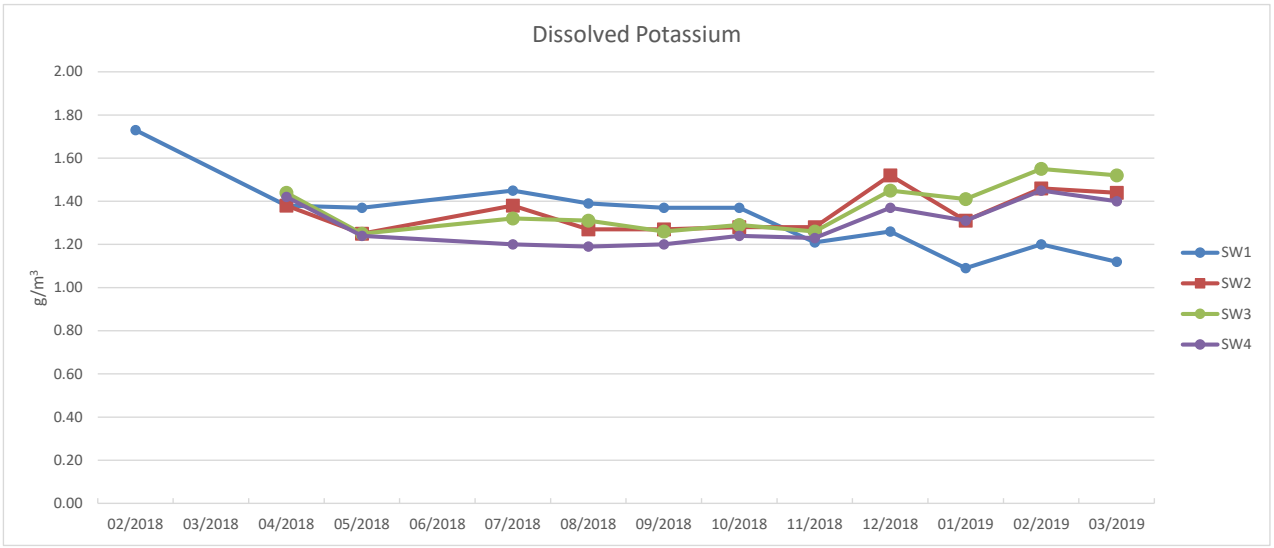

Total Lead
0.00
0.00
0.00
0.00
0.00
0.00
0.00
0.00
0.00
0.00
g/m³
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4
Values below the detection limit of 0.00011 g/m³ are presented at 0 g/m³ on graph

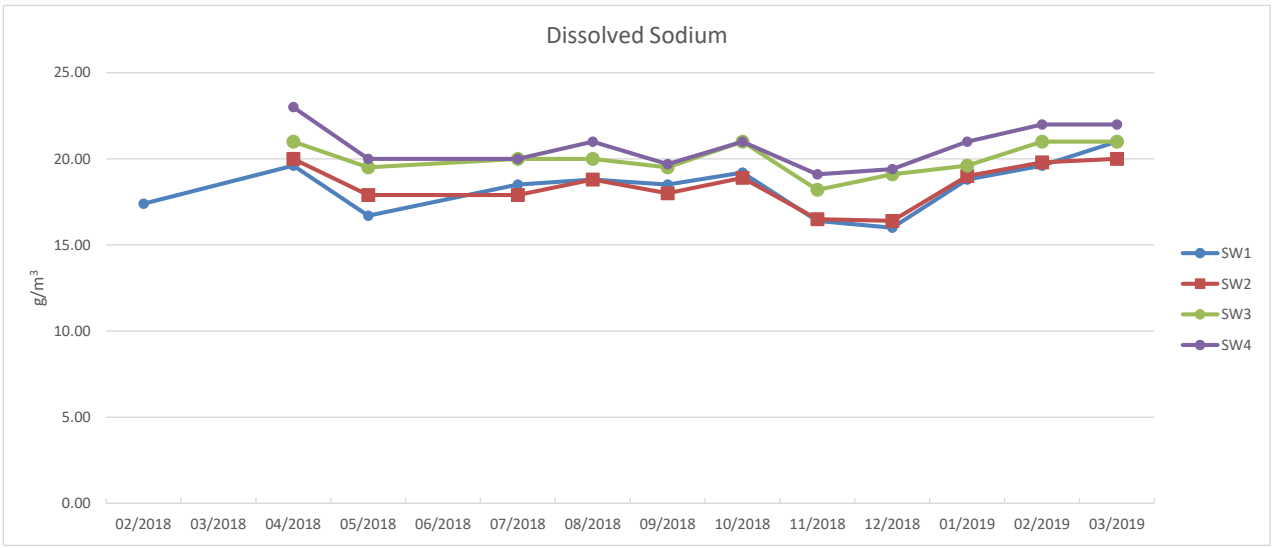

Total Nickel
0.0012
0.0010
0.0008
0.0006
0.0004
0.0002
0.0000
g/m³
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4
Values below the detection limit of 0.00053 g/m³ are presented at 0 g/m³ on graph

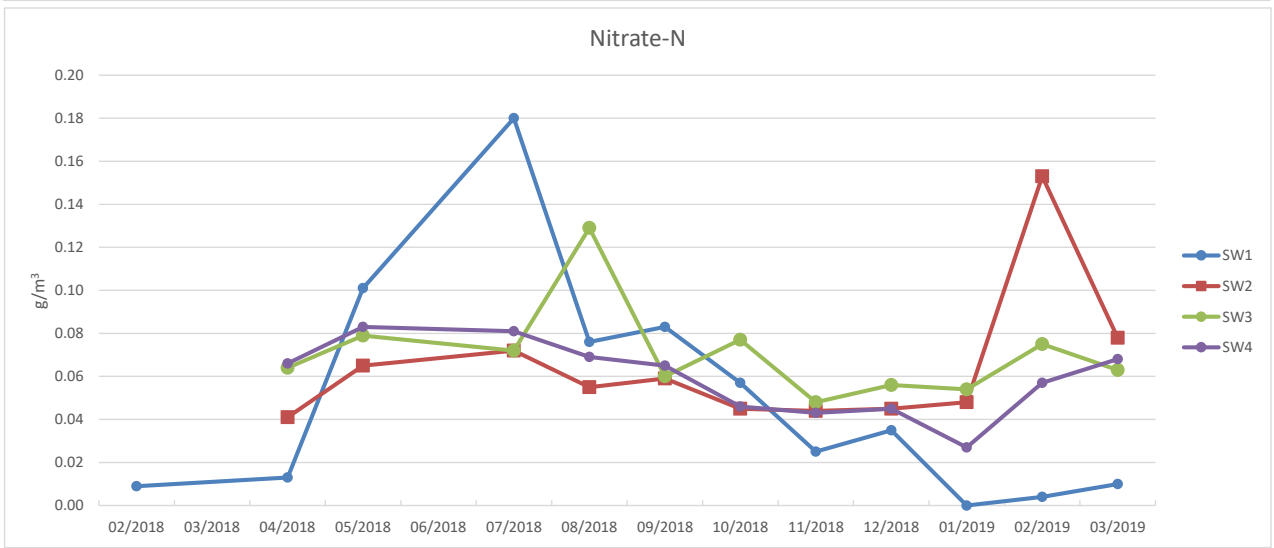

Total Zinc
0.0120
0.0100
0.0080
0.0060
0.0040
0.0020
0.0000
g/m³
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4
Values below the detection limit of 0.0011 g/m³ are presented at 0 g/m³ on graph


Dissolved Calcium
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
g/m³
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4


Dissolved Magnesium
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
g/m³
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4


Dissolved Potassium
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
g/m³
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4


Dissolved Sodium
25.00
20.00
15.00
10.00
5.00
0.00
g/m³
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4


Nitrate-N
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
g/m³
02/2018
03/2018
04/2018
05/2018
06/2018
07/2018
08/2018
09/2018
10/2018
11/2018
12/2018
01/2019
02/2019
03/2019
SW1
SW2
SW3
SW4

Appendix D: Groundwater results table

Appendix D Table 1: Summary groundwater quality laboratory analysis

Chemical	Unit	Result range		ANZECC 2000 95% trigger values for freshwater	Drinking water standards	
		Minimum	Maximum		Maximum acceptable values (MAV)	Guideline values for aesthetics (GV)
pH	pH Units	7	11.3	-	-	7.0-8.5
Total Alkalinity	g/m3 as CaCO3	67	240	-	-	-
Carbonate	g/m3 at 25°C	<1.0	50	-	-	-
Bicarbonate	g/m3 at 25°C	1.9	290	-	-	-
Total Hardness	g/m3 as CaCO3	40	175	-	-	200
Electrical Conductivity (EC)	mS/m	22.3	58.4	-	-	-
Total Dissolved Solids (TDS)[1]	g/m3	143	374	-	-	1000
Total Boron	g/m3	0.024	0.3	0.37	1.4	-
Total Calcium	g/m3	11.1	53	-	-	-
Hexavalent Chromium	g/m3	<0.001	0.0024	0.001	-	-
Dissolved Iron	g/m3	0.03	0.36	-	-	-
Total Iron	g/m3	0.184	5.8	-	-	0.2
Total Magnesium	g/m3	1.64	14.7	-	-	-
Dissolved Manganese	g/m3	<0.0005	0.154	1.9	-	-
Total Manganese	g/m3	0.021	0.165	-	0.4	0.04 (staining) 0.1 (taste)
Total Potassium	g/m3	0.49	2.9	-	-	-
Total Sodium	g/m3	20	115	-	-	200
Chloride	g/m3	21	41	-	-	250
Total Ammoniacal-N	g/m3	<0.01	0.101	-	-	1.5
Nitrite-N	g/m3	<0.002	0.053	-	0.2	-
Nitrate-N	g/m3	0.003	0.42	0.7	50	-
Nitrate-N + Nitrite-N	g/m3	<0.002	0.42	-	-	-
Sulphate	g/m3	6.1	19	-	-	250

Chemical	Unit	Result range		ANZECC 2000 95% trigger values for freshwater	Drinking water standards	
		Minimum	Maximum		Maximum acceptable values (MAV)	Guideline values for aesthetics (GV)
Carbonaceous Biochemical Oxygen Demand (cBOD5)	g O2/m3	<2	6	-	-	-
Chemical Oxygen Demand (COD)	g O2/m3	<6	19	-	-	-
Dissolved heavy metals						
Dissolved Arsenic	g/m3	<0.001	0.0027	0.024	0.01	-
Dissolved Cadmium	g/m3	<0.00005	0.0001	0.0002	0.004	-
Dissolved Chromium	g/m3	<0.0005	0.0051	-	0.05	-
Dissolved Copper	g/m3	<0.0005	0.0025	0.0014	2	1
Dissolved Lead	g/m3	<0.0001	0.00076	0.0034	0.01	-
Dissolved Nickel	g/m3	<0.0005	0.0016	0.011	0.08	
Dissolved Zinc	g/m3	<0.001	0.0152	0.008	-	1.5
Polycyclic aromatic hydrocarbons (PAH)						
Acenaphthene	g/m3	<0.0001	0.00077	-	-	-
Anthracene	g/m3	<0.0001	0.00017	-	-	-
Fluoranthene	g/m3	<0.0001	0.00016	-	-	-
Fluorene	g/m3	<0.0002	0.0006	-	-	-
Phenanthrene	g/m3	<0.0004	0.0007	-		-
Total petroleum hydrocarbons (TPH)						
Total petroleum hydrocarbons (TPH)	g/m3	<0.06	<0.7	[2]	[2]	[2]

Notes:

[1] TDS determined using the electrical conductivity values.

[2] Drinking water standards are provided individually for TPH compounds. These compounds were all recorded below the laboratory limit of detection and have not been included in the table. Only PAH compounds with detectable concentrations are provided in the results summary.

Shading indicates guideline exceedances.

Appendix E: Laboratory transcripts and Chain of Custody documentation

Hill Laboratories
TRIED, TESTED AND TRUSTED

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Private Bag 3205
Hamilton 3240 New Zealand

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E mail@hill-labs.co.nz
W www.hill-laboratories.com

Certificate of Analysis

Client:	Tonkin & Taylor	**Lab No:**	1933157	SPv1
Contact:	Alexandre Safran	**Date Received:**	28-Feb-2018	
	C/- Tonkin & Taylor	**Date Reported:**	09-Mar-2018	
	PO Box 5271	**Quote No:**	90609	
	Auckland 1141	**Order No:**	1005069.0000	
		Client Reference:	1005069.0000	
		Submitted By:	Alexandre Safran	

Sample Type: Aqueous

Sample Name:		Dome SW1 21-Feb-2018	Dome SW5 21-Feb-2018			
Lab Number:		1933157.1	1933157.2			
Individual Tests						
Sum of Anions	meq/L	1.49	1.68	-	-	-
Sum of Cations	meq/L	1.54	1.72	-	-	-
Turbidity	NTU	6.7	7.7	-	-	-
pH	pH Units	7.5	7.6	-	-	-
Total Alkalinity	g/m³ as $CaCO_3$	36	42	-	-	-
Bicarbonate	g/m³ at 25°C	44	51	-	-	-
Total Hardness	g/m³ as $CaCO_3$	37	46	-	-	-
Electrical Conductivity (EC)	mS/m	16.5	18.2	-	-	-
Total Suspended Solids	g/m³	< 5 #1	9	-	-	-
Sample Temperature*	°C	20.0	20.0	-	-	-
Total Aluminium	g/m³	0.134	0.122	-	-	-
Dissolved Calcium	g/m³	7.0	10.3	-	-	-
Total Calcium	g/m³	6.9	10.3	-	-	-
Total Iron	g/m³	1.08	0.92	-	-	-
Dissolved Magnesium	g/m³	4.7	4.9	-	-	-
Total Magnesium	g/m³	4.9	4.9	-	-	-
Total Manganese	g/m³	0.093	0.032	-	-	-
Dissolved Potassium	g/m³	1.73	1.43	-	-	-
Total Potassium	g/m³	1.72	1.45	-	-	-
Dissolved Sodium	g/m³	17.4	17.6	-	-	-
Total Sodium	g/m³	17.6	18.6	-	-	-
Chloride	g/m³	24	25	-	-	-
Total Ammoniacal-N	g/m³	< 0.010	< 0.010	-	-	-
Nitrite-N	g/m³	< 0.002	< 0.002	-	-	-
Nitrate-N	g/m³	0.009	0.052	-	-	-
Nitrate-N + Nitrite-N	g/m³	0.009	0.053	-	-	-
Total Phosphorus	g/m³	0.023	0.022	-	-	-
Sulphate	g/m³	3.5	6.0	-	-	-
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	g O_2/m³	< 2	< 2	-	-	-
Chemical Oxygen Demand (COD)	g O_2/m³	8	6	-	-	-
Oil and Grease	g/m³	< 8 #2	< 8 #2	-	-	-
Total Phenols	g/m³	< 0.02	< 0.02	-	-	-
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Arsenic	g/m³	< 0.0011	< 0.0011	-	-	-
Total Cadmium	g/m³	< 0.000053	< 0.000053	-	-	-
Total Chromium	g/m³	0.00112	0.00163	-	-	-
Total Copper	g/m³	0.00063	0.00089	-	-	-

ilac-MRA IANZ ACCREDITED LABORATORY

This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised.
The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked *, which are not accredited.

Sample Type: Aqueous						
Sample Name:		Dome SW1 21-Feb-2018	Dome SW5 21-Feb-2018			
Lab Number:		1933157.1	1933157.2			
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Lead	g/m³	< 0.00011	< 0.00011	-	-	-
Total Nickel	g/m³	0.00085	0.00084	-	-	-
Total Zinc	g/m³	< 0.0011	0.0015	-	-	-
Haloethers in SVOC Water Samples by GC-MS						
Bis(2-chloroethoxy) methane	g/m³	< 0.005	< 0.005	-	-	-
Bis(2-chloroethyl)ether	g/m³	< 0.005	< 0.005	-	-	-
Bis(2-chloroisopropyl)ether	g/m³	< 0.005	< 0.005	-	-	-
4-Bromophenyl phenyl ether	g/m³	< 0.005	< 0.005	-	-	-
4-Chlorophenyl phenyl ether	g/m³	< 0.005	< 0.005	-	-	-
Nitrogen containing compounds in SVOC Water Samples by GC-MS						
2,4-Dinitrotoluene	g/m³	< 0.010	< 0.010	-	-	-
2,6-Dinitrotoluene	g/m³	< 0.010	< 0.010	-	-	-
Nitrobenzene	g/m³	< 0.005	< 0.005	-	-	-
N-Nitrosodi-n-propylamine	g/m³	< 0.010	< 0.010	-	-	-
N-Nitrosodiphenylamine + Diphenylamine*	g/m3	< 0.010	< 0.010	-	-	-
Organochlorine Pesticides in SVOC Water Samples by GC-MS						
Aldrin	g/m³	< 0.005	< 0.005	-	-	-
alpha-BHC	g/m³	< 0.005	< 0.005	-	-	-
beta-BHC	g/m³	< 0.005	< 0.005	-	-	-
delta-BHC	g/m³	< 0.005	< 0.005	-	-	-
gamma-BHC (Lindane)	g/m³	< 0.005	< 0.005	-	-	-
4,4'-DDD	g/m³	< 0.005	< 0.005	-	-	-
4,4'-DDE	g/m³	< 0.005	< 0.005	-	-	-
4,4'-DDT	g/m³	< 0.010	< 0.010	-	-	-
Dieldrin	g/m³	< 0.005	< 0.005	-	-	-
Endosulfan I	g/m³	< 0.010	< 0.010	-	-	-
Endosulfan II	g/m³	< 0.010	< 0.010	-	-	-
Endosulfan sulfate	g/m³	< 0.010	< 0.010	-	-	-
Endrin	g/m³	< 0.010	< 0.010	-	-	-
Endrin ketone	g/m³	< 0.010	< 0.010	-	-	-
Heptachlor	g/m³	< 0.005	< 0.005	-	-	-
Heptachlor epoxide	g/m³	< 0.005	< 0.005	-	-	-
Hexachlorobenzene	g/m³	< 0.005	< 0.005	-	-	-
Polycyclic Aromatic Hydrocarbons in SVOC Water Samples by GC-MS						
Acenaphthene	g/m³	< 0.003	< 0.003	-	-	-
Acenaphthylene	g/m³	< 0.003	< 0.003	-	-	-
Anthracene	g/m³	< 0.003	< 0.003	-	-	-
Benzo[a]anthracene	g/m³	< 0.003	< 0.003	-	-	-
Benzo[a]pyrene (BAP)	g/m³	< 0.003	< 0.003	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m³	< 0.003	< 0.003	-	-	-
Benzo[g,h,i]perylene	g/m³	< 0.003	< 0.003	-	-	-
Benzo[k]fluoranthene	g/m³	< 0.003	< 0.003	-	-	-
1&2-Chloronaphthalene	g/m³	< 0.003	< 0.003	-	-	-
Chrysene	g/m³	< 0.003	< 0.003	-	-	-
Dibenzo[a,h]anthracene	g/m³	< 0.003	< 0.003	-	-	-
Fluoranthene	g/m³	< 0.003	< 0.003	-	-	-
Fluorene	g/m³	< 0.003	< 0.003	-	-	-
Indeno(1,2,3-c,d)pyrene	g/m³	< 0.003	< 0.003	-	-	-
2-Methylnaphthalene	g/m³	< 0.003	< 0.003	-	-	-
Naphthalene	g/m³	< 0.003	< 0.003	-	-	-
Phenanthrene	g/m³	< 0.003	< 0.003	-	-	-
Pyrene	g/m³	< 0.003	< 0.003	-	-	-

Sample Type: Aqueous						
Sample Name:		Dome SW1 21-Feb-2018	Dome SW5 21-Feb-2018			
Lab Number:		1933157.1	1933157.2			
Phenols in SVOC Water Samples by GC-MS						
4-Chloro-3-methylphenol	g/m³	< 0.010	< 0.010	-	-	-
2-Chlorophenol	g/m³	< 0.005	< 0.005	-	-	-
2,4-Dichlorophenol	g/m³	< 0.005	< 0.005	-	-	-
2,4-Dimethylphenol	g/m³	< 0.005	< 0.005	-	-	-
3 & 4-Methylphenol (m- + p-cresol)	g/m³	< 0.010	< 0.010	-	-	-
2-Methylphenol (o-Cresol)	g/m³	< 0.005	< 0.005	-	-	-
2-Nitrophenol	g/m³	< 0.010	< 0.010	-	-	-
Pentachlorophenol (PCP)	g/m³	< 0.10	< 0.10	-	-	-
Phenol	g/m³	< 0.010	< 0.010	-	-	-
2,4,5-Trichlorophenol	g/m³	< 0.010	< 0.010	-	-	-
2,4,6-Trichlorophenol	g/m³	< 0.010	< 0.010	-	-	-
Plasticisers in SVOC Water Samples by GC-MS						
Bis(2-ethylhexyl)phthalate	g/m³	< 0.03	< 0.03	-	-	-
Butylbenzylphthalate	g/m³	< 0.010	< 0.010	-	-	-
Di(2-ethylhexyl)adipate	g/m³	< 0.005	< 0.005	-	-	-
Diethylphthalate	g/m³	< 0.010	< 0.010	-	-	-
Dimethylphthalate	g/m³	< 0.010	< 0.010	-	-	-
Di-n-butylphthalate	g/m³	< 0.010	< 0.010	-	-	-
Di-n-octylphthalate	g/m³	< 0.010	< 0.010	-	-	-
Other Halogenated compounds in SVOC Water Samples by GC-MS						
1,2-Dichlorobenzene	g/m³	< 0.010	< 0.010	-	-	-
1,3-Dichlorobenzene	g/m³	< 0.010	< 0.010	-	-	-
1,4-Dichlorobenzene	g/m³	< 0.010	< 0.010	-	-	-
Hexachlorobutadiene	g/m³	< 0.010	< 0.010	-	-	-
Hexachloroethane	g/m³	< 0.010	< 0.010	-	-	-
1,2,4-Trichlorobenzene	g/m³	< 0.005	< 0.005	-	-	-
Other compounds in SVOC Water Samples by GC-MS						
Benzyl alcohol	g/m³	< 0.05	< 0.05	-	-	-
Carbazole	g/m³	< 0.005	< 0.005	-	-	-
Dibenzofuran	g/m³	< 0.005	< 0.005	-	-	-
Isophorone	g/m³	< 0.005	< 0.005	-	-	-
BTEX in VOC Water by Headspace GC-MS						
Benzene	g/m³	< 0.003	< 0.003	-	-	-
Ethylbenzene	g/m³	< 0.005	< 0.005	-	-	-
Toluene	g/m³	< 0.003	< 0.003	-	-	-
m&p-Xylene	g/m³	< 0.005	< 0.005	-	-	-
o-Xylene	g/m³	< 0.003	< 0.003	-	-	-
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
Bromomethane (Methyl Bromide)	g/m³	< 0.003	< 0.003	-	-	-
Carbon tetrachloride	g/m³	< 0.003	< 0.003	-	-	-
Chloroethane	g/m³	< 0.003	< 0.003	-	-	-
Chloromethane	g/m³	< 0.003	< 0.003	-	-	-
1,2-Dibromo-3-chloropropane	g/m³	< 0.003	< 0.003	-	-	-
1,2-Dibromoethane (ethylene dibromide, EDB)	g/m³	< 0.003	< 0.003	-	-	-
Dibromomethane	g/m³	< 0.003	< 0.003	-	-	-
Dichlorodifluoromethane	g/m³	< 0.003	< 0.003	-	-	-
1,1-Dichloroethane	g/m³	< 0.003	< 0.003	-	-	-
1,2-Dichloroethane	g/m³	< 0.003	< 0.003	-	-	-
1,1-Dichloroethene	g/m³	< 0.003	< 0.003	-	-	-
cis-1,2-Dichloroethene	g/m³	< 0.003	< 0.003	-	-	-
trans-1,2-Dichloroethene	g/m³	< 0.003	< 0.003	-	-	-
Dichloromethane (methylene chloride)	g/m³	< 0.10	< 0.10	-	-	-
1,2-Dichloropropane	g/m³	< 0.003	< 0.003	-	-	-
1,3-Dichloropropane	g/m³	< 0.003	< 0.003	-	-	-

Sample Type: Aqueous						
Sample Name:		Dome SW1 21-Feb-2018	Dome SW5 21-Feb-2018			
Lab Number:		1933157.1	1933157.2			
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
1,1-Dichloropropene	g/m³	< 0.003	< 0.003	-	-	-
cis-1,3-Dichloropropene	g/m³	< 0.005	< 0.005	-	-	-
trans-1,3-Dichloropropene	g/m³	< 0.005	< 0.005	-	-	-
Hexachlorobutadiene	g/m³	< 0.003	< 0.003	-	-	-
1,1,1,2-Tetrachloroethane	g/m³	< 0.003	< 0.003	-	-	-
1,1,2,2-Tetrachloroethane	g/m³	< 0.003	< 0.003	-	-	-
Tetrachloroethene (tetrachloroethylene)	g/m³	< 0.003	< 0.003	-	-	-
1,1,1-Trichloroethane	g/m³	< 0.003	< 0.003	-	-	-
1,1,2-Trichloroethane	g/m³	< 0.003	< 0.003	-	-	-
Trichloroethene (trichloroethylene)	g/m³	< 0.003	< 0.003	-	-	-
Trichlorofluoromethane	g/m³	< 0.003	< 0.003	-	-	-
1,2,3-Trichloropropane	g/m³	< 0.003	< 0.003	-	-	-
1,1,2-Trichlorotrifluoroethane (Freon 113)	g/m³	< 0.003	< 0.003	-	-	-
Vinyl chloride	g/m³	< 0.003	< 0.003	-	-	-
Haloaromatics in VOC Water by Headspace GC-MS						
Bromobenzene	g/m³	< 0.003	< 0.003	-	-	-
Chlorobenzene (monochlorobenzene)	g/m³	< 0.003	< 0.003	-	-	-
2-Chlorotoluene	g/m³	< 0.003	< 0.003	-	-	-
1,2-Dichlorobenzene	g/m³	< 0.003	< 0.003	-	-	-
1,3-Dichlorobenzene	g/m³	< 0.003	< 0.003	-	-	-
1,4-Dichlorobenzene	g/m³	< 0.003	< 0.003	-	-	-
4-Chlorotoluene	g/m³	< 0.003	< 0.003	-	-	-
1,2,3-Trichlorobenzene	g/m³	< 0.003	< 0.003	-	-	-
1,2,4-Trichlorobenzene	g/m³	< 0.003	< 0.003	-	-	-
1,3,5-Trichlorobenzene	g/m³	< 0.003	< 0.003	-	-	-
Monoaromatic Hydrocarbons in VOC Water by Headspace GC-MS						
n-Butylbenzene	g/m³	< 0.005	< 0.005	-	-	-
tert-Butylbenzene	g/m³	< 0.003	< 0.003	-	-	-
4-Isopropyltoluene (p-Cymene)	g/m³	< 0.005	< 0.005	-	-	-
Isopropylbenzene (Cumene)	g/m³	< 0.003	< 0.003	-	-	-
n-Propylbenzene	g/m³	< 0.005	< 0.005	-	-	-
sec-Butylbenzene	g/m³	< 0.003	< 0.003	-	-	-
Styrene	g/m³	< 0.005	< 0.005	-	-	-
1,2,4-Trimethylbenzene	g/m³	< 0.003	< 0.003	-	-	-
1,3,5-Trimethylbenzene	g/m³	< 0.003	< 0.003	-	-	-
Ketones in VOC Water by Headspace GC-MS						
Acetone	g/m³	< 0.5	< 0.5	-	-	-
2-Butanone (MEK)	g/m³	< 0.5	< 0.5	-	-	-
Methyl tert-butylether (MTBE)	g/m³	< 0.003	< 0.003	-	-	-
4-Methylpentan-2-one (MIBK)	g/m³	< 0.10	< 0.10	-	-	-
Trihalomethanes in VOC Water by Headspace GC-MS						
Bromodichloromethane	g/m³	< 0.003	< 0.003	-	-	-
Bromoform (tribromomethane)	g/m³	< 0.003	< 0.003	-	-	-
Chloroform (Trichloromethane)	g/m³	< 0.003	< 0.003	-	-	-
Dibromochloromethane	g/m³	< 0.003	< 0.003	-	-	-
Other VOC in Water by Headspace GC-MS						
Carbon disulphide	g/m³	< 0.0010	< 0.0010	-	-	-
Naphthalene	g/m³	< 0.005	< 0.005	-	-	-

Analyst's Comments

#1 There was insufficient sample left to filter the usual amount for the Total Suspended Solids test on sample 1933157/1 so the detection limit is higher than normal.

#2 There was insufficient sample to perform the oil and grease analysis on sample 1933157/1&2. Therefore a smaller aliquot was taken prior to analysis, resulting in a detection limit higher than that normally achieved.

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8	0.000053 - 0.0011 g/m^3	1-2
Semivolatile Organic Compounds Screening in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	-	1-2
Volatile Organic Compounds Screening in Water by Headspace GC-MS	Headspace, GC-MS SIM analysis [KBIs:37857,37921]	0.0010 - 0.5 g/m^3	1-2
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-2
Total Digestion	Nitric acid digestion. APHA 3030 E 22nd ed. 2012 (modified).	-	1-2
Total Phosphorus Digestion	Acid persulphate digestion.	-	1-2
Total anions for anion/cation balance check	Calculation: sum of anions as mEquiv/L calculated from Alkalinity (bicarbonate), Chloride and Sulphate. Nitrate-N, Nitrite-N. Fluoride, Dissolved Reactive Phosphorus and Cyanide also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.07 meq/L	1-2
Total cations for anion/cation balance check	Sum of cations as mEquiv/L calculated from Sodium, Potassium, Calcium and Magnesium. Iron, Manganese, Aluminium, Zinc, Copper, Lithium, Total Ammoniacal-N and pH (H^+) also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.05 meq/L	1-2
Turbidity	Analysis using a Hach 2100N, Turbidity meter. APHA 2130 B 22nd ed. 2012.	0.05 NTU	1-2
pH	pH meter. APHA 4500-H^+ B 22nd ed. 2012. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-2
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (Modified for alk <20) 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-2
Bicarbonate	Calculation: from alkalinity and pH, valid where TDS is not >500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO_2 D 22nd ed. 2012.	1.0 g/m^3 at 25°C	1-2
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-2
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1-2
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D 22nd ed. 2012.	3 g/m^3	1-2
Sample Temperature*	Supplied by customer, otherwise 20°C.	0.1 °C	1-2
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 22nd ed. 2012.	-	1-2
Total Aluminium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.0032 g/m^3	1-2
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3	1-2
Total Calcium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m^3	1-2
Total Iron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m^3	1-2
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m^3	1-2
Total Magnesium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m^3	1-2
Total Manganese	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00053 g/m^3	1-2
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3	1-2
Total Potassium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m^3	1-2
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m^3	1-2
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m^3	1-2

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-2
Total Ammoniacal-N	Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) 22nd ed. 2012.	0.010 g/m³	1-2
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-2
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m³	1-2
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-2
Total Phosphorus	Total phosphorus digestion, ascorbic acid colorimetry. Discrete Analyser. APHA 4500-P B & E (modified from manual analysis) 22nd ed. 2012. Also modified to include the use of a reductant to eliminate interference from arsenic present in the sample. NAWASCO, Water & soil Miscellaneous Publication No. 38, 1982.	0.004 g/m³	1-2
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-2
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	Incubation 5 days, DO meter, nitrification inhibitor added, dilutions, seeded. APHA 5210 B (modified) 22nd ed. 2012.	2 g O_2/m³	1-2
Chemical Oxygen Demand (COD), trace level	Dichromate/sulphuric acid digestion in Hach tubes, colorimetry. Trace Level method. APHA 5220 D 22nd ed. 2012.	6 g O_2/m³	1-2
Oil and Grease	Sample filtration through filter aid, Soxhlet extraction, gravimetric determination of extracted Oil & Grease. APHA 5520 D (modified) 22nd ed. 2012.	4 g/m³	1-2
Total Phenols	In-line distillation, segmented flow colorimetry. NB: Does not detect 4-methylphenol. Skalar Method I497-001 (modified). APHA 5530 B & D (modified) 22nd ed. 2012.	0.02 g/m³	1-2

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

Job No: Date Recv: 28-Feb-18 06:49

ANALYSIS 193 3157

Received by: Kayley Steel

3119331579

Hill Laboratories
BETTER TESTING BETTER RESULTS

R J Hill Laboratories Limited
1 Clyde Street
Private Bag 3205
Hamilton 3240, New Zealand

Client

Name: Tonkin & Taylor
Address: 105 Carlton Gore Rd, Newmarket, Auckland
Phone: Fax:
Client Reference: 1005069.0000
Quote No: 90609 Order Number:

Primary Contact Alex Safran
Submitted By Alex Safran
Charge To Tonkin & Taylor 512

Results To ☑ Mail Client ☐ Mail Submitter
☐ Fax Results
☑ Email Results asafran@tonkintaylor.co.nz

Office use only Job No:

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 27/02/2018
Name: Alex Safran
☐ Please tick if you require COC to be faxed back
Signature:

Received at Hill Laboratories
Date & Time:
Name:
Signature:

Condition ☐ Room Temp ☑ Chilled ☐ Frozen Temp: 3.9
☐ Sample Analysis details checked
Signature:

ADDITIONAL INFORMATION

Priority
☐ Low ☐ Normal ☑ High
☐ Urgent (ASAP, extra charge applies, please contact the lab first)

Requested Reporting Date:

Sample Types

Waters	E	Effluent	G	Geothermal	Pot1	Potable Water (LAS/EU)	Pot2	Potable Water (NZDWS)
	GW	Ground Water	L	Leachate	☐	Audit Monitoring	Pot3	Potable Water (other)
	SW	Surface Water	S	Saline	☐	Check Monitoring	Pool	Swimming/Spa Pool
	TW	Trade Waste						
Solids	ES	Soil	SE	Sediment	SL	Sludge	PL	Plant
Other	O	O Oil	M	Miscellaneous	FS	FS Fish/shellfish/biota	BM	BM Biological Material

No.	Sample Name	Sample Date & Time	Sample Type	Tests Required
1	Dome SW1	21/02/2018	SW	Turb, SS, Temp, ANCATL, NO3N, CBOD5, OAG, CODTt, Phenols, VOCHSsc, pH, EC, Alk, AlTt, CaTt, FeTt, MgTt, MnTt, K_Tt, NaTt, MWHMtt, HardT, Cl, NH4N, SO4, TP, SVOCsc
2	Dome SW5	21/02/2018	SW	
3				
4				
5				
6				
7				
8				
9				
10				

Continued on next page

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Job Information Summary

Client:	Tonkin & Taylor	**Lab No:**	1933157
Contact:	Alexandre Safran	**Date Registered:**	01-Mar-2018 2:12 pm
	C/- Tonkin & Taylor	**Priority:**	High
	PO Box 5271	**Quote No:**	90609
	Auckland 1141	**Order No:**	1005069.0000
		Client Reference:	1005069.0000
		Add. Client Ref:	
		Submitted By:	Alexandre Safran
		Charge To:	Tonkin & Taylor
		Target Date:	09-Mar-2018 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	Dome SW1 21-Feb-2018	Surface Water	UP1L, Org500, TPH250, S100, N100, VOC40, VOC40	Anion / Cation profile, dissolved metals trace level; Turbidity; Total Suspended Solids; Sample Temperature; Nitrate-N; Oil and Grease; Chemical Oxygen Demand (COD), trace level; Total Phenols; Volatile Organic Compounds Screening in Water by Headspace GC-MS; pH; Electrical Conductivity (EC); Total Alkalinity; Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn; Total Hardness; Total Aluminium; Total Calcium; Total Iron; Total Magnesium; Total Manganese; Total Potassium; Total Sodium; Chloride; Total Ammoniacal-N; Sulphate; Total Phosphorus; Carbonaceous Biochemical Oxygen Demand ($cBOD_5$); Semivolatile Organic Compounds Screening in Water by GC-MS
2	Dome SW5 21-Feb-2018	Surface Water	UP1L, Org500, TPH250, S100, N100, VOC40, VOC40	Anion / Cation profile, dissolved metals trace level; Turbidity; Total Suspended Solids; Sample Temperature; Nitrate-N; Oil and Grease; Chemical Oxygen Demand (COD), trace level; Total Phenols; Volatile Organic Compounds Screening in Water by Headspace GC-MS; pH; Electrical Conductivity (EC); Total Alkalinity; Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn; Total Hardness; Total Aluminium; Total Calcium; Total Iron; Total Magnesium; Total Manganese; Total Potassium; Total Sodium; Chloride; Total Ammoniacal-N; Sulphate; Total Phosphorus; Carbonaceous Biochemical Oxygen Demand ($cBOD_5$); Semivolatile Organic Compounds Screening in Water by GC-MS

SUMMARY OF METHODS

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8	0.000053 - 0.0011 g/m^3	1-2
Semivolatile Organic Compounds Screening in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	-	1-2
Volatile Organic Compounds Screening in Water by Headspace GC-MS	Headspace, GC-MS SIM analysis [KBIs:37857,37921]	0.0010 - 0.5 g/m^3	1-2
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-2
Total Digestion	Nitric acid digestion. APHA 3030 E 22nd ed. 2012 (modified).	-	1-2
Total Phosphorus Digestion	Acid persulphate digestion.	-	1-2
Total anions for anion/cation balance check	Calculation: sum of anions as mEquiv/L calculated from Alkalinity (bicarbonate), Chloride and Sulphate. Nitrate-N, Nitrite-N. Fluoride, Dissolved Reactive Phosphorus and Cyanide also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.07 meq/L	1-2

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total cations for anion/cation balance check	Sum of cations as mEquiv/L calculated from Sodium, Potassium, Calcium and Magnesium. Iron, Manganese, Aluminium, Zinc, Copper, Lithium, Total Ammoniacal-N and pH (H^+) also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.05 meq/L	1-2
Turbidity	Analysis using a Hach 2100N, Turbidity meter. APHA 2130 B 22nd ed. 2012.	0.05 NTU	1-2
pH	pH meter. APHA 4500-H^+ B 22nd ed. 2012. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-2
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (Modified for alk <20) 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-2
Bicarbonate	Calculation: from alkalinity and pH, valid where TDS is not > 500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO_2 D 22nd ed. 2012.	1.0 g/m^3 at 25°C	1-2
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-2
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1-2
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D 22nd ed. 2012.	3 g/m^3	1-2
Sample Temperature	Supplied by customer, otherwise 20°C.	0.1 °C	1-2
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 22nd ed. 2012.	-	1-2
Total Aluminium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.0032 g/m^3	1-2
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3	1-2
Total Calcium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m^3	1-2
Total Iron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m^3	1-2
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m^3	1-2
Total Magnesium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m^3	1-2
Total Manganese	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00053 g/m^3	1-2
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3	1-2
Total Potassium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m^3	1-2
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m^3	1-2
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m^3	1-2
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m^3	1-2
Total Ammoniacal-N	Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) 22nd ed. 2012.	0.010 g/m^3	1-2
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m^3	1-2
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m^3	1-2
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m^3	1-2
Total Phosphorus	Total phosphorus digestion, ascorbic acid colorimetry. Discrete Analyser. APHA 4500-P B & E (modified from manual analysis) 22nd ed. 2012. Also modified to include the use of a reductant to eliminate interference from arsenic present in the sample. NAWASCO, Water & soil Miscellaneous Publication No. 38, 1982.	0.004 g/m^3	1-2
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m^3	1-2

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	Incubation 5 days, DO meter, nitrification inhibitor added, dilutions, seeded. APHA 5210 B (modified) 22nd ed. 2012.	2 g O_2/m^3	1-2
Chemical Oxygen Demand (COD), trace level	Dichromate/sulphuric acid digestion in Hach tubes, colorimetry. Trace Level method. APHA 5220 D 22nd ed. 2012.	6 g O_2/m^3	1-2
Oil and Grease	Sample filtration through filter aid, Soxhlet extraction, gravimetric determination of extracted Oil & Grease. APHA 5520 D (modified) 22nd ed. 2012.	4 g/m^3	1-2
Total Phenols	In-line distillation, segmented flow colorimetry. NB: Does not detect 4-methylphenol. Skalar Method I497-001 (modified). APHA 5530 B & D (modified) 22nd ed. 2012.	0.02 g/m^3	1-2

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Certificate of Analysis

Client:	Tonkin & Taylor	**Lab No:**	1963226	SPv1
Contact:	Alexandre Safran	**Date Received:**	14-Apr-2018	
	C/- Tonkin & Taylor	**Date Reported:**	02-May-2018	
	PO Box 5271	**Quote No:**	90609	
	Auckland 1141	**Order No:**	1005069.0000	
		Client Reference:	1005069.0000	
		Submitted By:	Alexandre Safran	

Sample Type: Aqueous

Sample Name:		Dome SW1 13-Apr-2018	Dome SW2 13-Apr-2018	Dome SW3 13-Apr-2018	Dome SW4 13-Apr-2018	
Lab Number:		1963226.1	1963226.2	1963226.3	1963226.4	
Individual Tests						
Sum of Anions	meq/L	1.75	1.82	2.0	2.0	-
Sum of Cations	meq/L	1.72	1.81	1.96	2.0	-
Turbidity	NTU	4.1	6.4	9.5	10.4	-
pH	pH Units	7.0	7.6	7.7	7.6	-
Total Alkalinity	g/m³ as $CaCO_3$	42	46	46	47	-
Bicarbonate	g/m³ at 25°C	51	56	56	57	-
Total Hardness	g/m³ as $CaCO_3$	41	45	52	52	-
Electrical Conductivity (EC)	mS/m	18.6	19.0	21.3	21.4	-
Total Suspended Solids	g/m³	< 5 #2	< 5 #2	9	14	-
Sample Temperature*	°C	20.0	20.0	20.0	20.0	-
Total Aluminium	g/m³	0.068	0.149	0.23	0.36	-
Dissolved Calcium	g/m³	7.8	8.8	10.0	10.3	-
Total Calcium	g/m³	7.8	9.0	10.4	10.7	-
Total Iron	g/m³	0.62	0.50	0.90	0.94	-
Dissolved Magnesium	g/m³	5.3	5.5	6.0	6.1	-
Total Magnesium	g/m³	5.3	5.5	6.2	6.2	-
Total Manganese	g/m³	0.024	0.022	0.044	0.039	-
Dissolved Potassium	g/m³	1.38	1.38	1.44	1.42	-
Total Potassium	g/m³	1.35	1.40	1.45	1.38	-
Dissolved Sodium	g/m³	19.6	20	21	23	-
Total Sodium	g/m³	19.5	20	21	22	-
Chloride	g/m³	29	27	35	35	-
Total Ammoniacal-N	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Nitrite-N	g/m³	< 0.002	< 0.002	< 0.002	< 0.002	-
Nitrate-N	g/m³	0.013	0.041	0.064	0.066	-
Nitrate-N + Nitrite-N	g/m³	0.014	0.041	0.064	0.067	-
Total Phosphorus	g/m³	0.007	0.017	0.022	0.022	-
Sulphate	g/m³	4.4	5.9	4.9	5.1	-
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	g O_2/m³	< 2 #3	< 3 #4	< 2 #3	< 2 #3	-
Chemical Oxygen Demand (COD)	g O_2/m³	10	< 6	< 6	8	-
Oil and Grease	g/m³	< 8 #1	< 8 #1	< 8 #1	< 8 #1	-
Total Phenols	g/m³	< 0.02	< 0.02	< 0.02	< 0.02	-
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Arsenic	g/m³	< 0.0011	< 0.0011	< 0.0011	< 0.0011	-
Total Cadmium	g/m³	< 0.000053	< 0.000053	< 0.000053	< 0.000053	-
Total Chromium	g/m³	0.00075	0.00129	0.00155	0.0022	-
Total Copper	g/m³	< 0.00053	< 0.00053	0.00059	0.00066	-

Sample Type: Aqueous						
Sample Name:		Dome SW1 13-Apr-2018	Dome SW2 13-Apr-2018	Dome SW3 13-Apr-2018	Dome SW4 13-Apr-2018	
Lab Number:		1963226.1	1963226.2	1963226.3	1963226.4	
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Lead	g/m³	< 0.00011	< 0.00011	< 0.00011	< 0.00011	-
Total Nickel	g/m³	< 0.00053	0.00078	0.00061	0.00062	-
Total Zinc	g/m³	< 0.0011	< 0.0011	0.0020	0.0012	-
Haloethers in SVOC Water Samples by GC-MS						
Bis(2-chloroethoxy) methane	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Bis(2-chloroethyl)ether	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Bis(2-chloroisopropyl)ether	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4-Bromophenyl phenyl ether	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4-Chlorophenyl phenyl ether	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Nitrogen containing compounds in SVOC Water Samples by GC-MS						
2,4-Dinitrotoluene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2,6-Dinitrotoluene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Nitrobenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
N-Nitrosodi-n-propylamine	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
N-Nitrosodiphenylamine + Diphenylamine*	g/m3	< 0.010	< 0.010	< 0.010	< 0.010	-
Organochlorine Pesticides in SVOC Water Samples by GC-MS						
Aldrin	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
alpha-BHC	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
beta-BHC	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
delta-BHC	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
gamma-BHC (Lindane)	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4,4'-DDD	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4,4'-DDE	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4,4'-DDT	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Dieldrin	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Endosulfan I	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Endosulfan II	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Endosulfan sulfate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Endrin	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Endrin ketone	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Heptachlor	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Heptachlor epoxide	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Hexachlorobenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Polycyclic Aromatic Hydrocarbons in SVOC Water Samples by GC-MS						
Acenaphthene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Acenaphthylene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Anthracene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Benzo[a]anthracene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Benzo[a]pyrene (BAP)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Benzo[g,h,i]perylene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Benzo[k]fluoranthene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1&2-Chloronaphthalene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Chrysene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dibenzo[a,h]anthracene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Fluoranthene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Fluorene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Indeno(1,2,3-c,d)pyrene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
2-Methylnaphthalene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Naphthalene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Phenanthrene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Pyrene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-

Sample Type: Aqueous						
Sample Name:		Dome SW1 13-Apr-2018	Dome SW2 13-Apr-2018	Dome SW3 13-Apr-2018	Dome SW4 13-Apr-2018	
Lab Number:		1963226.1	1963226.2	1963226.3	1963226.4	
Phenols in SVOC Water Samples by GC-MS						
4-Chloro-3-methylphenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2-Chlorophenol	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
2,4-Dichlorophenol	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
2,4-Dimethylphenol	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
3 & 4-Methylphenol (m- + p-cresol)	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2-Methylphenol (o-Cresol)	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
2-Nitrophenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Pentachlorophenol (PCP)	g/m³	< 0.10	< 0.10	< 0.10	< 0.10	-
Phenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2,4,5-Trichlorophenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2,4,6-Trichlorophenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Plasticisers in SVOC Water Samples by GC-MS						
Bis(2-ethylhexyl)phthalate	g/m³	< 0.03	< 0.03	< 0.03	< 0.03	-
Butylbenzylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Di(2-ethylhexyl)adipate	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Diethylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Dimethylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Di-n-butylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Di-n-octylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Other Halogenated compounds in SVOC Water Samples by GC-MS						
1,2-Dichlorobenzene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
1,3-Dichlorobenzene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
1,4-Dichlorobenzene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Hexachlorobutadiene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Hexachloroethane	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
1,2,4-Trichlorobenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Other compounds in SVOC Water Samples by GC-MS						
Benzyl alcohol	g/m³	< 0.05	< 0.05	< 0.05	< 0.05	-
Carbazole	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Dibenzofuran	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Isophorone	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
BTEX in VOC Water by Headspace GC-MS						
Benzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Ethylbenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Toluene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
m&p-Xylene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
o-Xylene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
Bromomethane (Methyl Bromide)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Carbon tetrachloride	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Chloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Chloromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2-Dibromo-3-chloropropane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2-Dibromoethane (ethylene dibromide, EDB)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dibromomethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dichlorodifluoromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1-Dichloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2-Dichloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1-Dichloroethene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
cis-1,2-Dichloroethene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
trans-1,2-Dichloroethene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dichloromethane (methylene chloride)	g/m³	< 0.10	< 0.10	< 0.10	< 0.10	-
1,2-Dichloropropane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,3-Dichloropropane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-

Sample Type: Aqueous						
Sample Name:		Dome SW1 13-Apr-2018	Dome SW2 13-Apr-2018	Dome SW3 13-Apr-2018	Dome SW4 13-Apr-2018	
Lab Number:		1963226.1	1963226.2	1963226.3	1963226.4	
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
1,1-Dichloropropene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
cis-1,3-Dichloropropene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
trans-1,3-Dichloropropene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Hexachlorobutadiene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,1,2-Tetrachloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,2,2-Tetrachloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Tetrachloroethene (tetrachloroethylene)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,1-Trichloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,2-Trichloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Trichloroethene (trichloroethylene)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Trichlorofluoromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2,3-Trichloropropane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,2-Trichlorotrifluoroethane (Freon 113)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Vinyl chloride	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Haloaromatics in VOC Water by Headspace GC-MS						
Bromobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Chlorobenzene (monochlorobenzene)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
2-Chlorotoluene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2-Dichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,3-Dichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,4-Dichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
4-Chlorotoluene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2,3-Trichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2,4-Trichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,3,5-Trichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Monoaromatic Hydrocarbons in VOC Water by Headspace GC-MS						
n-Butylbenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
tert-Butylbenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
4-Isopropyltoluene (p-Cymene)	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Isopropylbenzene (Cumene)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
n-Propylbenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
sec-Butylbenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Styrene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
1,2,4-Trimethylbenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,3,5-Trimethylbenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Ketones in VOC Water by Headspace GC-MS						
Acetone	g/m³	< 0.5	< 0.5	< 0.5	< 0.5	-
2-Butanone (MEK)	g/m³	< 0.5	< 0.5	< 0.5	< 0.5	-
Methyl tert-butylether (MTBE)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
4-Methylpentan-2-one (MIBK)	g/m³	< 0.10	< 0.10	< 0.10	< 0.10	-
Trihalomethanes in VOC Water by Headspace GC-MS						
Bromodichloromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Bromoform (tribromomethane)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Chloroform (Trichloromethane)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dibromochloromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Other VOC in Water by Headspace GC-MS						
Carbon disulphide	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	-
Naphthalene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-

Analyst's Comments

#1 There was insufficient sample to perform the Oil and Grease analysis on samples 1963226/1-4. Therefore a smaller aliquot was taken prior to analysis, resulting in a detection limit higher than that normally achieved.

#2 There was insufficient sample left to filter the usual amount for the Total Suspended Solids test on samples 1963226/1&2 so the detection limit is higher than normal.

#3 During the original analysis of carbonaceous Biochemical Oxygen Demand (cBOD5) the results obtained for the Quality Control standards were outside our acceptance limits and so the analysis of cBOD5 was repeated from the frozen sample.

#4 During the original analysis of carbonaceous Biochemical Oxygen Demand (cBOD5) the result obtained for the Quality Control standards were outside our acceptance limits and so the analysis of cBOD5 was repeated from the frozen sample. There was insufficient sample left for the repeat cBOD5 analysis on this sample so the detection limit is higher than normal.

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8	0.000053 - 0.0011 g/m^3	1-4
Semivolatile Organic Compounds Screening in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	-	1-4
Volatile Organic Compounds Screening in Water by Headspace GC-MS	Headspace, GC-MS SIM analysis [KBIs:37857,37921]	0.0010 - 0.5 g/m^3	1-4
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-4
Total Digestion	Nitric acid digestion. APHA 3030 E 22nd ed. 2012 (modified).	-	1-4
Total Phosphorus Digestion	Acid persulphate digestion.	-	1-4
Total anions for anion/cation balance check	Calculation: sum of anions as mEquiv/L calculated from Alkalinity (bicarbonate), Chloride and Sulphate. Nitrate-N, Nitrite-N. Fluoride, Dissolved Reactive Phosphorus and Cyanide also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.07 meq/L	1-4
Total cations for anion/cation balance check	Sum of cations as mEquiv/L calculated from Sodium, Potassium, Calcium and Magnesium. Iron, Manganese, Aluminium, Zinc, Copper, Lithium, Total Ammoniacal-N and pH (H^+) also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.05 meq/L	1-4
Turbidity	Analysis using a Hach 2100N, Turbidity meter. APHA 2130 B 22nd ed. 2012.	0.05 NTU	1-4
pH	pH meter. APHA 4500-H^+ B 22nd ed. 2012. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-4
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (Modified for alk <20) 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-4
Bicarbonate	Calculation: from alkalinity and pH, valid where TDS is not >500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO_2 D 22nd ed. 2012.	1.0 g/m^3 at 25°C	1-4
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-4
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1-4
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D (modified) 22nd ed. 2012.	3 g/m^3	1-4
Sample Temperature*	Supplied by customer, otherwise 20°C.	0.1 °C	1-4
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 22nd ed. 2012.	-	1-4
Total Aluminium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.0032 g/m^3	1-4
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3	1-4
Total Calcium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m^3	1-4
Total Iron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m^3	1-4

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-4
Total Magnesium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m³	1-4
Total Manganese	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00053 g/m³	1-4
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1-4
Total Potassium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m³	1-4
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-4
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m³	1-4
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-4
Total Ammoniacal-N	Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) 22nd ed. 2012.	0.010 g/m³	1-4
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-4
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m³	1-4
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-4
Total Phosphorus	Total phosphorus digestion, ascorbic acid colorimetry. Discrete Analyser. APHA 4500-P B & E (modified from manual analysis) 22nd ed. 2012. Also modified to include the use of a reductant to eliminate interference from arsenic present in the sample. NAWASCO, Water & soil Miscellaneous Publication No. 38, 1982.	0.004 g/m³	1-4
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-4
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	Incubation 5 days, DO meter, nitrification inhibitor added, dilutions, seeded. APHA 5210 B (modified) 22nd ed. 2012.	2 g O_2/m³	1-4
Chemical Oxygen Demand (COD), trace level	Dichromate/sulphuric acid digestion in Hach tubes, colorimetry. Trace Level method. APHA 5220 D 22nd ed. 2012.	6 g O_2/m³	1-4
Oil and Grease	Sample filtration through filter aid, Soxhlet extraction, gravimetric determination of extracted Oil & Grease. APHA 5520 D (modified) 22nd ed. 2012.	4 g/m³	1-4
Total Phenols	In-line distillation, segmented flow colorimetry. NB: Does not detect 4-methylphenol. Skalar Method I497-001 (modified). APHA 5530 B & D (modified) 22nd ed. 2012.	0.02 g/m³	1-4

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

Hill Laboratories
BETTER TESTING **BETTER RESULTS**

ANALYSIS

Job No: **196 3226**

Date Recv: **14-Apr-18 08:59**

R J Hill Laboratories Limited
1 Clyde Street
Private Bag 3205
Hamilton 3240, New Zealand

Received by: Maysell Downey

3119632263

Client

Name Tonkin & Taylor

Address 105 Carlton Gore Rd, Newmarket, Auckland

Phone *Fax*

Client Reference 1005069.0000

Quote No 90609 *Order Number*

Primary Contact Alex Safran

Submitted By Alex Safran

Charge To Tonkin & Taylor 512

Results To ☑ Mail Client ☐ Mail Submitter

☐ Fax Results

☑ Email Results asafran@tonkintaylor.co.nz

Office use only Job No:

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories

Date & Time: 13/04/2018

Name: Alex Safran

☐ *Please tick if you require COC to be faxed back*

Signature:

Received at Hill Laboratories

Date & Time:

Name:

Signature:

Condition ☐ *Room Temp* ☑ *Chilled* ☐ *Frozen* *Temp:* 9.1

☐ Sample Analysis details checked

Signature:

ADDITIONAL INFORMATION

Priority

☐ **Low** ☐ **Normal** ☑ **High**

☐ **Urgent** (ASAP, extra charge applies, please contact the lab first)

Requested Reporting Date:

Sample Types

Waters	**E**	Effluent	**G**	Geothermal	**Pot1**	Potable Water (LAS/EU)	**Pot2**	Potable Water (NZDWS)
	GW	Ground Water	**L**	Leachate	☐	Audit Monitoring	**Pot3**	Potable Water (other)
	SW	Surface Water	**S**	Saline	☐	Check Monitoring	**Pool**	Swimming/Spa Pool
	TW	Trade Waste						
Solids	**ES**	Soil	**SE**	Sediment	**SL**	Sludge	**PL**	Plant
Other	**O**	O Oil	**M**	Miscellaneous	**FS**	FS Fish/shellfish/biota	**BM**	BM Biological Material

No.	*Sample Name*	*Sample Date & Time*	*Sample Type*	*Tests Required*
1	Dome SW1	13/04/2018	SW	Turb, SS, Temp, ANCATL, NO3N, CBOD5, OAG, CODTt, Phenols, VOCHSsc, pH, EC, Alk, AlTt, CaTt, FeTt, MgTt, MnTt, K_Tt, NaTt, MWHMtt, HardT, Cl, NH4N, SO4, TP, SVOCsc
2	Dome SW2	13/04/2018	SW	
3	Dome SW3	13/04/2018	SW	
4	Dome SW4	13/04/2018	SW	
5				
6				
7				
8				
9				
10				

Continued on next page

Hill Laboratories
TRIED, TESTED AND TRUSTED

R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

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E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job Information Summary

Client:	Tonkin & Taylor	**Lab No:**	1963226
Contact:	Alexandre Safran	**Date Registered:**	14-Apr-2018 1:49 pm
	C/- Tonkin & Taylor	**Priority:**	High
	PO Box 5271	**Quote No:**	90609
	Auckland 1141	**Order No:**	1005069.0000
		Client Reference:	1005069.0000
		Add. Client Ref:	
		Submitted By:	Alexandre Safran
		Charge To:	Tonkin & Taylor
		Target Date:	26-Apr-2018 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	Dome SW1 13-Apr-2018	Ground Water	S100, N100, VOC40, VOC40, TPH250, Org500, UP1L	Chemical Oxygen Demand (COD), trace level; Total Phenols; Volatile Organic Compounds Screening in Water by Headspace GC-MS; Oil and Grease; Anion / Cation profile, dissolved metals trace level; Turbidity; Total Suspended Solids; Sample Temperature; Nitrate-N; pH; Electrical Conductivity (EC); Total Alkalinity; Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn; Total Hardness; Total Aluminium; Total Calcium; Total Iron; Total Magnesium; Total Manganese; Total Potassium; Total Sodium; Chloride; Total Ammoniacal-N; Sulphate; Total Phosphorus; Carbonaceous Biochemical Oxygen Demand ($cBOD_5$); Semivolatile Organic Compounds Screening in Water by GC-MS
2	Dome SW2 13-Apr-2018	Ground Water	S100, N100, VOC40, VOC40, TPH250, Org500, UP1L	Chemical Oxygen Demand (COD), trace level; Total Phenols; Volatile Organic Compounds Screening in Water by Headspace GC-MS; Oil and Grease; Anion / Cation profile, dissolved metals trace level; Turbidity; Total Suspended Solids; Sample Temperature; Nitrate-N; pH; Electrical Conductivity (EC); Total Alkalinity; Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn; Total Hardness; Total Aluminium; Total Calcium; Total Iron; Total Magnesium; Total Manganese; Total Potassium; Total Sodium; Chloride; Total Ammoniacal-N; Sulphate; Total Phosphorus; Carbonaceous Biochemical Oxygen Demand ($cBOD_5$); Semivolatile Organic Compounds Screening in Water by GC-MS
3	Dome SW3 13-Apr-2018	Ground Water	S100, N100, VOC40, VOC40, TPH250, Org500, UP1L	Chemical Oxygen Demand (COD), trace level; Total Phenols; Volatile Organic Compounds Screening in Water by Headspace GC-MS; Oil and Grease; Anion / Cation profile, dissolved metals trace level; Turbidity; Total Suspended Solids; Sample Temperature; Nitrate-N; pH; Electrical Conductivity (EC); Total Alkalinity; Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn; Total Hardness; Total Aluminium; Total Calcium; Total Iron; Total Magnesium; Total Manganese; Total Potassium; Total Sodium; Chloride; Total Ammoniacal-N; Sulphate; Total Phosphorus; Carbonaceous Biochemical Oxygen Demand ($cBOD_5$); Semivolatile Organic Compounds Screening in Water by GC-MS

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
4	Dome SW4 13-Apr-2018	Ground Water	S100, N100, VOC40, VOC40, TPH250, Org500, UP1L	Chemical Oxygen Demand (COD), trace level; Total Phenols; Volatile Organic Compounds Screening in Water by Headspace GC-MS; Oil and Grease; Anion / Cation profile, dissolved metals trace level; Turbidity; Total Suspended Solids; Sample Temperature; Nitrate-N; pH; Electrical Conductivity (EC); Total Alkalinity; Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn; Total Hardness; Total Aluminium; Total Calcium; Total Iron; Total Magnesium; Total Manganese; Total Potassium; Total Sodium; Chloride; Total Ammoniacal-N; Sulphate; Total Phosphorus; Carbonaceous Biochemical Oxygen Demand ($cBOD_5$); Semivolatile Organic Compounds Screening in Water by GC-MS

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8	0.000053 - 0.0011 g/m³	1-4
Semivolatile Organic Compounds Screening in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	-	1-4
Volatile Organic Compounds Screening in Water by Headspace GC-MS	Headspace, GC-MS SIM analysis [KBIs:37857,37921]	0.0010 - 0.5 g/m³	1-4
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-4
Total Digestion	Nitric acid digestion. APHA 3030 E 22nd ed. 2012 (modified).	-	1-4
Total Phosphorus Digestion	Acid persulphate digestion.	-	1-4
Total anions for anion/cation balance check	Calculation: sum of anions as mEquiv/L calculated from Alkalinity (bicarbonate), Chloride and Sulphate. Nitrate-N, Nitrite-N. Fluoride, Dissolved Reactive Phosphorus and Cyanide also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.07 meq/L	1-4
Total cations for anion/cation balance check	Sum of cations as mEquiv/L calculated from Sodium, Potassium, Calcium and Magnesium. Iron, Manganese, Aluminium, Zinc, Copper, Lithium, Total Ammoniacal-N and pH (H^+) also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.05 meq/L	1-4
Turbidity	Analysis using a Hach 2100N, Turbidity meter. APHA 2130 B 22nd ed. 2012.	0.05 NTU	1-4
pH	pH meter. APHA 4500-H^+ B 22nd ed. 2012. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-4
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (Modified for alk <20) 22nd ed. 2012.	1.0 g/m³ as $CaCO_3$	1-4
Bicarbonate	Calculation: from alkalinity and pH, valid where TDS is not > 500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO_2 D 22nd ed. 2012.	1.0 g/m³ at 25°C	1-4
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m³ as $CaCO_3$	1-4
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1-4
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D (modified) 22nd ed. 2012.	3 g/m³	1-4
Sample Temperature	Supplied by customer, otherwise 20°C.	0.1 °C	1-4
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 22nd ed. 2012.	-	1-4
Total Aluminium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.0032 g/m³	1-4

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1-4
Total Calcium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m³	1-4
Total Iron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m³	1-4
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-4
Total Magnesium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m³	1-4
Total Manganese	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00053 g/m³	1-4
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1-4
Total Potassium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m³	1-4
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-4
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m³	1-4
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-4
Total Ammoniacal-N	Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) 22nd ed. 2012.	0.010 g/m³	1-4
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-4
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m³	1-4
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-4
Total Phosphorus	Total phosphorus digestion, ascorbic acid colorimetry. Discrete Analyser. APHA 4500-P B & E (modified from manual analysis) 22nd ed. 2012. Also modified to include the use of a reductant to eliminate interference from arsenic present in the sample. NAWASCO, Water & soil Miscellaneous Publication No. 38, 1982.	0.004 g/m³	1-4
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-4
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	Incubation 5 days, DO meter, nitrification inhibitor added, dilutions, seeded. APHA 5210 B (modified) 22nd ed. 2012.	2 g O_2/m³	1-4
Chemical Oxygen Demand (COD), trace level	Dichromate/sulphuric acid digestion in Hach tubes, colorimetry. Trace Level method. APHA 5220 D 22nd ed. 2012.	6 g O_2/m³	1-4
Oil and Grease	Sample filtration through filter aid, Soxhlet extraction, gravimetric determination of extracted Oil & Grease. APHA 5520 D (modified) 22nd ed. 2012.	4 g/m³	1-4
Total Phenols	In-line distillation, segmented flow colorimetry. NB: Does not detect 4-methylphenol. Skalar Method I497-001 (modified). APHA 5530 B & D (modified) 22nd ed. 2012.	0.02 g/m³	1-4

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Certificate of Analysis

Client:	Tonkin & Taylor	**Lab No:**	1993680	SPv1
Contact:	Alexandre Safran	**Date Received:**	01-Jun-2018	
	C/- Tonkin & Taylor	**Date Reported:**	13-Jun-2018	
	PO Box 5271	**Quote No:**	90609	
	Auckland 1141	**Order No:**	1005069.0000	
		Client Reference:	1005069.0000	
		Submitted By:	Alexandre Safran	

Sample Type: Aqueous

Sample Name:		Dome SW1 31-May-2018	Dome SW2 31-May-2018	Dome SW3 31-May-2018	Dome SW4 31-May-2018	
Lab Number:		1993680.1	1993680.2	1993680.3	1993680.4	
Individual Tests						
Sum of Anions	meq/L	1.44	1.53	1.80	1.83	-
Sum of Cations	meq/L	1.48	1.57	1.86	1.86	-
Turbidity	NTU	6.8	6.4	7.0	7.0	-
pH	pH Units	7.3	7.4	7.4	7.4	-
Total Alkalinity	g/m³ as $CaCO_3$	32	37	39	41	-
Bicarbonate	g/m³ at 25°C	39	45	48	50	-
Total Hardness	g/m³ as $CaCO_3$	36	38	49	48	-
Electrical Conductivity (EC)	mS/m	15.6	16.4	20.1	20.0	-
Total Suspended Solids	g/m³	< 7 #1	< 5 #1	< 4 #1	< 5 #1	-
Sample Temperature*	°C	20.0	20.0	20.0	20.0	-
Total Aluminium	g/m³	0.175	0.25	0.21	0.21	-
Dissolved Calcium	g/m³	6.1	6.9	9.1	9.1	-
Total Calcium	g/m³	6.3	7.0	9.3	9.2	-
Total Iron	g/m³	0.65	0.47	0.61	0.57	-
Dissolved Magnesium	g/m³	5.0	5.1	6.3	6.2	-
Total Magnesium	g/m³	4.8	5.0	6.3	6.0	-
Total Manganese	g/m³	0.031	0.024	0.038	0.022	-
Dissolved Potassium	g/m³	1.37	1.25	1.25	1.24	-
Total Potassium	g/m³	1.35	1.31	1.29	1.26	-
Dissolved Sodium	g/m³	16.7	17.9	19.5	20	-
Total Sodium	g/m³	17.1	17.6	19.8	19.8	-
Chloride	g/m³	25	25	32	32	-
Total Ammoniacal-N	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Nitrite-N	g/m³	< 0.002	< 0.002	< 0.002	< 0.002	-
Nitrate-N	g/m³	0.101	0.065	0.079	0.083	-
Nitrate-N + Nitrite-N	g/m³	0.102	0.066	0.080	0.083	-
Total Phosphorus	g/m³	0.009	0.008	0.012	0.012	-
Sulphate	g/m³	4.7	4.6	5.1	5.1	-
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	g O_2/m³	< 2	< 2	< 2	< 2	-
Chemical Oxygen Demand (COD)	g O_2/m³	6	< 6	< 6	< 6	-
Oil and Grease	g/m³	9	< 8 #2	< 8 #2	< 8 #2	-
Total Phenols	g/m³	< 0.02	< 0.02	< 0.02	< 0.02	-
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Arsenic	g/m³	< 0.0011	< 0.0011	< 0.0011	< 0.0011	-
Total Cadmium	g/m³	< 0.000053	< 0.000053	< 0.000053	< 0.000053	-
Total Chromium	g/m³	0.00111	0.00162	0.00140	0.00182	-
Total Copper	g/m³	< 0.00053	< 0.00053	< 0.00053	< 0.00053	-

Sample Type: Aqueous						
Sample Name:		Dome SW1 31-May-2018	Dome SW2 31-May-2018	Dome SW3 31-May-2018	Dome SW4 31-May-2018	
Lab Number:		1993680.1	1993680.2	1993680.3	1993680.4	
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Lead	g/m³	< 0.00011	< 0.00011	< 0.00011	< 0.00011	-
Total Nickel	g/m³	0.00063	0.00101	0.00073	0.00054	-
Total Zinc	g/m³	< 0.0011	0.0013	0.0012	< 0.0011	-
Haloethers in SVOC Water Samples by GC-MS						
Bis(2-chloroethoxy) methane	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Bis(2-chloroethyl)ether	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Bis(2-chloroisopropyl)ether	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4-Bromophenyl phenyl ether	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4-Chlorophenyl phenyl ether	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Nitrogen containing compounds in SVOC Water Samples by GC-MS						
2,4-Dinitrotoluene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2,6-Dinitrotoluene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Nitrobenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
N-Nitrosodi-n-propylamine	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
N-Nitrosodiphenylamine + Diphenylamine*	g/m3	< 0.010	< 0.010	< 0.010	< 0.010	-
Organochlorine Pesticides in SVOC Water Samples by GC-MS						
Aldrin	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
alpha-BHC	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
beta-BHC	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
delta-BHC	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
gamma-BHC (Lindane)	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4,4'-DDD	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4,4'-DDE	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4,4'-DDT	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Dieldrin	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Endosulfan I	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Endosulfan II	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Endosulfan sulfate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Endrin	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Endrin ketone	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Heptachlor	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Heptachlor epoxide	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Hexachlorobenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Polycyclic Aromatic Hydrocarbons in SVOC Water Samples by GC-MS						
Acenaphthene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Acenaphthylene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Anthracene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Benzo[a]anthracene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Benzo[a]pyrene (BAP)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Benzo[g,h,i]perylene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Benzo[k]fluoranthene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1&2-Chloronaphthalene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Chrysene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dibenzo[a,h]anthracene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Fluoranthene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Fluorene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Indeno(1,2,3-c,d)pyrene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
2-Methylnaphthalene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Naphthalene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Phenanthrene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Pyrene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-

Sample Type: Aqueous						
Sample Name:		Dome SW1 31-May-2018	Dome SW2 31-May-2018	Dome SW3 31-May-2018	Dome SW4 31-May-2018	
Lab Number:		1993680.1	1993680.2	1993680.3	1993680.4	
Phenols in SVOC Water Samples by GC-MS						
4-Chloro-3-methylphenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2-Chlorophenol	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
2,4-Dichlorophenol	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
2,4-Dimethylphenol	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
3 & 4-Methylphenol (m- + p-cresol)	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2-Methylphenol (o-Cresol)	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
2-Nitrophenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Pentachlorophenol (PCP)	g/m³	< 0.10	< 0.10	< 0.10	< 0.10	-
Phenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2,4,5-Trichlorophenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2,4,6-Trichlorophenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Plasticisers in SVOC Water Samples by GC-MS						
Bis(2-ethylhexyl)phthalate	g/m³	< 0.03	< 0.03	< 0.03	< 0.03	-
Butylbenzylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Di(2-ethylhexyl)adipate	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Diethylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Dimethylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Di-n-butylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Di-n-octylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Other Halogenated compounds in SVOC Water Samples by GC-MS						
1,2-Dichlorobenzene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
1,3-Dichlorobenzene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
1,4-Dichlorobenzene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Hexachlorobutadiene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Hexachloroethane	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
1,2,4-Trichlorobenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Other compounds in SVOC Water Samples by GC-MS						
Benzyl alcohol	g/m³	< 0.05	< 0.05	< 0.05	< 0.05	-
Carbazole	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Dibenzofuran	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Isophorone	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
BTEX in VOC Water by Headspace GC-MS						
Benzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Ethylbenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Toluene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
m&p-Xylene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
o-Xylene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
Bromomethane (Methyl Bromide)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Carbon tetrachloride	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Chloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Chloromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2-Dibromo-3-chloropropane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2-Dibromoethane (ethylene dibromide, EDB)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dibromomethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dichlorodifluoromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1-Dichloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2-Dichloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1-Dichloroethene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
cis-1,2-Dichloroethene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
trans-1,2-Dichloroethene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dichloromethane (methylene chloride)	g/m³	< 0.10	< 0.10	< 0.10	< 0.10	-
1,2-Dichloropropane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,3-Dichloropropane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-

Sample Type: Aqueous						
Sample Name:		Dome SW1 31-May-2018	Dome SW2 31-May-2018	Dome SW3 31-May-2018	Dome SW4 31-May-2018	
Lab Number:		1993680.1	1993680.2	1993680.3	1993680.4	
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
1,1-Dichloropropene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
cis-1,3-Dichloropropene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
trans-1,3-Dichloropropene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Hexachlorobutadiene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,1,2-Tetrachloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,2,2-Tetrachloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Tetrachloroethene (tetrachloroethylene)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,1-Trichloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,2-Trichloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Trichloroethene (trichloroethylene)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Trichlorofluoromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2,3-Trichloropropane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,2-Trichlorotrifluoroethane (Freon 113)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Vinyl chloride	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Haloaromatics in VOC Water by Headspace GC-MS						
Bromobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Chlorobenzene (monochlorobenzene)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
2-Chlorotoluene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2-Dichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,3-Dichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,4-Dichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
4-Chlorotoluene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2,3-Trichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2,4-Trichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,3,5-Trichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Monoaromatic Hydrocarbons in VOC Water by Headspace GC-MS						
n-Butylbenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
tert-Butylbenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
4-Isopropyltoluene (p-Cymene)	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Isopropylbenzene (Cumene)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
n-Propylbenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
sec-Butylbenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Styrene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
1,2,4-Trimethylbenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,3,5-Trimethylbenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Ketones in VOC Water by Headspace GC-MS						
Acetone	g/m³	< 0.5	< 0.5	< 0.5	< 0.5	-
2-Butanone (MEK)	g/m³	< 0.5	< 0.5	< 0.5	< 0.5	-
Methyl tert-butylether (MTBE)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
4-Methylpentan-2-one (MIBK)	g/m³	< 0.10	< 0.10	< 0.10	< 0.10	-
Trihalomethanes in VOC Water by Headspace GC-MS						
Bromodichloromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Bromoform (tribromomethane)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Chloroform (Trichloromethane)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dibromochloromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Other VOC in Water by Headspace GC-MS						
Carbon disulphide	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	-
Naphthalene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-

Analyst's Comments

#1 There was insufficient sample left to filter the usual amount for the Total Suspended Solids test on samples 1993680/1-4 so the detection limit is higher than normal.

#2 There was insufficient sample to perform the oil and grease analysis on samples 1993680/2-4. Therefore a smaller aliquot was taken prior to analysis, resulting in a detection limit higher than that normally achieved.

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8	0.000053 - 0.0011 g/m^3	1-4
Semivolatile Organic Compounds Screening in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	-	1-4
Volatile Organic Compounds Screening in Water by Headspace GC-MS	Headspace, GC-MS SIM analysis [KBIs:37857,37921]	0.0010 - 0.5 g/m^3	1-4
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-4
Total Digestion	Nitric acid digestion. APHA 3030 E 22nd ed. 2012 (modified).	-	1-4
Total anions for anion/cation balance check	Calculation: sum of anions as mEquiv/L calculated from Alkalinity (bicarbonate), Chloride and Sulphate. Nitrate-N, Nitrite-N. Fluoride, Dissolved Reactive Phosphorus and Cyanide also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.07 meq/L	1-4
Total cations for anion/cation balance check	Sum of cations as mEquiv/L calculated from Sodium, Potassium, Calcium and Magnesium. Iron, Manganese, Aluminium, Zinc, Copper, Lithium, Total Ammoniacal-N and pH (H^+) also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.05 meq/L	1-4
Turbidity	Analysis using a Hach 2100N, Turbidity meter. APHA 2130 B 22nd ed. 2012.	0.05 NTU	1-4
pH	pH meter. APHA 4500-H^+ B 22nd ed. 2012. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-4
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (Modified for alk <20) 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-4
Bicarbonate	Calculation: from alkalinity and pH, valid where TDS is not >500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO_2 D 22nd ed. 2012.	1.0 g/m^3 at 25°C	1-4
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-4
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1-4
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D (modified) 22nd ed. 2012.	3 g/m^3	1-4
Sample Temperature*	Supplied by customer, otherwise 20°C.	0.1 °C	1-4
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 22nd ed. 2012.	-	1-4
Total Aluminium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.0032 g/m^3	1-4
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3	1-4
Total Calcium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m^3	1-4
Total Iron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m^3	1-4
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m^3	1-4
Total Magnesium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m^3	1-4
Total Manganese	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00053 g/m^3	1-4
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3	1-4

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total Potassium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m³	1-4
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-4
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m³	1-4
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-4
Total Ammoniacal-N	Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) 22nd ed. 2012.	0.010 g/m³	1-4
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-4
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m³	1-4
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-4
Total Phosphorus	Total phosphorus digestion, ascorbic acid colorimetry. Discrete Analyser. APHA 4500-P B & E (modified from manual analysis) 22nd ed. 2012. Also modified to include the use of a reductant to eliminate interference from arsenic present in the sample. NAWASCO, Water & soil Miscellaneous Publication No. 38, 1982.	0.004 g/m³	1-4
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-4
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	Incubation 5 days, DO meter, nitrification inhibitor added, dilutions, seeded. APHA 5210 B (modified) 22nd ed. 2012.	2 g O_2/m³	1-4
Chemical Oxygen Demand (COD), trace level	Dichromate/sulphuric acid digestion in Hach tubes, colorimetry. Trace Level method. APHA 5220 D 22nd ed. 2012.	6 g O_2/m³	1-4
Oil and Grease	Sample filtration through filter aid, Soxhlet extraction, gravimetric determination of extracted Oil & Grease. APHA 5520 D (modified) 22nd ed. 2012.	4 g/m³	1-4
Total Phenols	In-line distillation, segmented flow colorimetry. NB: Does not detect 4-methylphenol. Skalar Method I497-001 (modified). APHA 5530 B & D (modified) 22nd ed. 2012.	0.02 g/m³	1-4

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

Hill Laboratories
BETTER TESTING BETTER RESULTS

Job No: 199 3680
Date Recv: 01-Jun-18 12:42
Received by: Zandra Edwards

ANALYSIS

R J Hill Laboratories Limited
1 Clyde Street
Private Bag 3205
Hamilton 3240, New Zealand

Client

Name Tonkin & Taylor

Address 105 Carlton Gore Rd, Newmarket, Auckland

Phone *Fax*

Client Reference 1005069.0000

Quote No 90609 *Order Number*

Primary Contact Alex Safran

Submitted By Alex Safran

Charge To Tonkin & Taylor 512

Results To ☑ Mail Client ☐ Mail Submitter

☐ Fax Results

☑ Email Results asafran@tonkintaylor.co.nz

Office use only Job No:

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories
Date & Time: 31/05/2018
Name: Alex Safran
☐ *Please tick if you require COC to be faxed back*
Signature:

Received at Hill Laboratories
Date & Time:
Name:
Signature:

Condition ☐ *Room Temp* ☑ *Chilled* ☐ *Frozen* *Temp:* 5 8

☐ Sample Analysis details checked
Signature:

ADDITIONAL INFORMATION

Priority

☐ **Low** ☐ **Normal** ☑ **High**

☐ **Urgent** (ASAP, extra charge applies, please contact the lab first)

Requested Reporting Date:

Sample Types

Waters	**E** Effluent	**G** Geothermal	**Pot1** Potable Water (LAS/EU)	**Pot2** Potable Water (NZDWS)
	GW Ground Water	**L** Leachate	☐ Audit Monitoring	**Pot3** Potable Water (other)
	SW Surface Water	**S** Saline	☐ Check Monitoring	**Pool** Swimming/Spa Pool
	TW Trade Waste			
Solids	**ES** Soil	**SE** Sediment	**SL** Sludge	**PL** Plant
Other	**O** O Oil	**M** Miscellaneous	**FS** FS Fish/shellfish/biota	**BM** BM Biological Material

No.	*Sample Name*	*Sample Date & Time*	*Sample Type*	*Tests Required*
1	Dome SW1	31/05/2018	SW	Turb, SS, Temp, ANCATL, NO3N, CBOD5, OAG, CODTt, Phenols, VOCHSsc, pH, EC, Alk, AlTt, CaTt, FeTt, MgTt, MnTt, K_Tt, NaTt, MWHMtt, HardT, Cl, NH4N, SO4, TP, SVOCsc
2	Dome SW2	31/05/2018	SW	
3	Dome SW3	31/05/2018	SW	
4	Dome SW4	31/05/2018	SW	
5				
6				
7				
8				
9				
10				

Continued on next page

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TRIED, TESTED AND TRUSTED

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Certificate of Analysis

Client:	Tonkin & Taylor	**Lab No:**	2010662	SPv1
Contact:	Alexandre Safran	**Date Received:**	05-Jul-2018	
	C/- Tonkin & Taylor	**Date Reported:**	17-Jul-2018	
	PO Box 5271	**Quote No:**	90609	
	Auckland 1141	**Order No:**	1005069.0000	
		Client Reference:	1005069.0000	
		Submitted By:	Alexandre Safran	

Sample Type: Aqueous

Sample Name:		Dome SW1 04-Jul-2018	Dome SW2 04-Jul-2018	Dome SW3 04-Jul-2018	Dome SW4 04-Jul-2018	
Lab Number:		2010662.1	2010662.2	2010662.3	2010662.4	
Individual Tests						
Sum of Anions	meq/L	1.44	1.50	1.74	1.71	-
Sum of Cations	meq/L	1.49	1.53	1.78	1.74	-
Turbidity	NTU	10.6	6.9	8.6	7.9	-
pH	pH Units	7.2	7.1	7.3	7.5	-
Total Alkalinity	g/m³ as $CaCO_3$	26	34	34	34	-
Bicarbonate	g/m³ at 25°C	32	41	41	41	-
Total Hardness	g/m³ as $CaCO_3$	32	36	43	42	-
Electrical Conductivity (EC)	mS/m	16.0	16.3	19.1	19.0	-
Total Suspended Solids	g/m³	12	< 5 #3	6	5	-
Sample Temperature*	°C	20.0	20.0	20.0	20.0	-
Total Aluminium	g/m³	0.26	0.30	0.25	0.23	-
Dissolved Calcium	g/m³	5.8	6.6	8.2	7.9	-
Total Calcium	g/m³	6.0	6.8	8.4	8.0	-
Total Iron	g/m³	0.56	0.38	0.48	0.39	-
Dissolved Magnesium	g/m³	4.4	4.7	5.4	5.4	-
Total Magnesium	g/m³	4.2	4.4	5.2	5.1	-
Total Manganese	g/m³	0.029	0.0188	0.040	0.025	-
Dissolved Potassium	g/m³	1.45	1.38	1.32	1.20	-
Total Potassium	g/m³	1.46	1.37	1.29	1.21	-
Dissolved Sodium	g/m³	18.5	17.9	20	20	-
Total Sodium	g/m³	17.9	17.5	19.8	20	-
Chloride	g/m³	27	26	34	33	-
Total Ammoniacal-N	g/m³	0.010	0.014	< 0.010	< 0.010	-
Nitrite-N	g/m³	< 0.002	< 0.002	< 0.002	< 0.002	-
Nitrate-N	g/m³	0.180	0.072	0.072	0.081	-
Nitrate-N + Nitrite-N	g/m³	0.181	0.074	0.072	0.082	-
Total Phosphorus	g/m³	0.016	0.012	0.017	0.010	-
Sulphate	g/m³	6.4	5.0	5.2	5.2	-
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	g O_2/m³	< 2 #2	< 2 #2	< 2 #2	< 2 #2	-
Chemical Oxygen Demand (COD)	g O_2/m³	8	< 6	< 6	< 6	-
Oil and Grease	g/m³	< 8 #1	< 8 #1	< 8 #1	25	-
Total Phenols	g/m³	< 0.02	< 0.02	< 0.02	< 0.02	-
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Arsenic	g/m³	< 0.0011	< 0.0011	< 0.0011	< 0.0011	-
Total Cadmium	g/m³	< 0.000053	< 0.000053	< 0.000053	< 0.000053	-
Total Chromium	g/m³	0.00141	0.00185	0.0021	0.0023	-
Total Copper	g/m³	0.00055	< 0.00053	< 0.00053	< 0.00053	-

Sample Type: Aqueous						
Sample Name:		Dome SW1 04-Jul-2018	Dome SW2 04-Jul-2018	Dome SW3 04-Jul-2018	Dome SW4 04-Jul-2018	
Lab Number:		2010662.1	2010662.2	2010662.3	2010662.4	
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Lead	g/m³	< 0.00011	< 0.00011	< 0.00011	< 0.00011	-
Total Nickel	g/m³	0.00074	0.00054	0.00072	0.00055	-
Total Zinc	g/m³	0.0011	0.0012	< 0.0011	< 0.0011	-
Haloethers in SVOC Water Samples by GC-MS						
Bis(2-chloroethoxy) methane	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Bis(2-chloroethyl)ether	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Bis(2-chloroisopropyl)ether	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4-Bromophenyl phenyl ether	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4-Chlorophenyl phenyl ether	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Nitrogen containing compounds in SVOC Water Samples by GC-MS						
2,4-Dinitrotoluene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2,6-Dinitrotoluene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Nitrobenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
N-Nitrosodi-n-propylamine	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
N-Nitrosodiphenylamine + Diphenylamine*	g/m3	< 0.010	< 0.010	< 0.010	< 0.010	-
Organochlorine Pesticides in SVOC Water Samples by GC-MS						
Aldrin	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
alpha-BHC	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
beta-BHC	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
delta-BHC	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
gamma-BHC (Lindane)	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4,4'-DDD	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4,4'-DDE	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4,4'-DDT	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Dieldrin	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Endosulfan I	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Endosulfan II	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Endosulfan sulfate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Endrin	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Endrin ketone	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Heptachlor	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Heptachlor epoxide	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Hexachlorobenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Polycyclic Aromatic Hydrocarbons in SVOC Water Samples by GC-MS						
Acenaphthene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Acenaphthylene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Anthracene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Benzo[a]anthracene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Benzo[a]pyrene (BAP)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Benzo[g,h,i]perylene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Benzo[k]fluoranthene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1&2-Chloronaphthalene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Chrysene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dibenzo[a,h]anthracene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Fluoranthene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Fluorene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Indeno(1,2,3-c,d)pyrene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
2-Methylnaphthalene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Naphthalene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Phenanthrene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Pyrene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-

Sample Type: Aqueous						
Sample Name:		Dome SW1 04-Jul-2018	Dome SW2 04-Jul-2018	Dome SW3 04-Jul-2018	Dome SW4 04-Jul-2018	
Lab Number:		2010662.1	2010662.2	2010662.3	2010662.4	
Phenols in SVOC Water Samples by GC-MS						
4-Chloro-3-methylphenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2-Chlorophenol	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
2,4-Dichlorophenol	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
2,4-Dimethylphenol	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
3 & 4-Methylphenol (m- + p-cresol)	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2-Methylphenol (o-Cresol)	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
2-Nitrophenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Pentachlorophenol (PCP)	g/m³	< 0.10	< 0.10	< 0.10	< 0.10	-
Phenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2,4,5-Trichlorophenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2,4,6-Trichlorophenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Plasticisers in SVOC Water Samples by GC-MS						
Bis(2-ethylhexyl)phthalate	g/m³	< 0.03	< 0.03	< 0.03	< 0.03	-
Butylbenzylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Di(2-ethylhexyl)adipate	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Diethylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Dimethylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Di-n-butylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Di-n-octylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Other Halogenated compounds in SVOC Water Samples by GC-MS						
1,2-Dichlorobenzene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
1,3-Dichlorobenzene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
1,4-Dichlorobenzene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Hexachlorobutadiene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Hexachloroethane	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
1,2,4-Trichlorobenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Other compounds in SVOC Water Samples by GC-MS						
Benzyl alcohol	g/m³	< 0.05	< 0.05	< 0.05	< 0.05	-
Carbazole	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Dibenzofuran	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Isophorone	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
BTEX in VOC Water by Headspace GC-MS						
Benzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Ethylbenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Toluene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
m&p-Xylene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
o-Xylene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
Bromomethane (Methyl Bromide)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Carbon tetrachloride	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Chloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Chloromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2-Dibromo-3-chloropropane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2-Dibromoethane (ethylene dibromide, EDB)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dibromomethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dichlorodifluoromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1-Dichloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2-Dichloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1-Dichloroethene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
cis-1,2-Dichloroethene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
trans-1,2-Dichloroethene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dichloromethane (methylene chloride)	g/m³	< 0.10	< 0.10	< 0.10	< 0.10	-
1,2-Dichloropropane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,3-Dichloropropane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-

Sample Type: Aqueous						
Sample Name:		Dome SW1 04-Jul-2018	Dome SW2 04-Jul-2018	Dome SW3 04-Jul-2018	Dome SW4 04-Jul-2018	
Lab Number:		2010662.1	2010662.2	2010662.3	2010662.4	
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
1,1-Dichloropropene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
cis-1,3-Dichloropropene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
trans-1,3-Dichloropropene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Hexachlorobutadiene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,1,2-Tetrachloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,2,2-Tetrachloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Tetrachloroethene (tetrachloroethylene)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,1-Trichloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,2-Trichloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Trichloroethene (trichloroethylene)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Trichlorofluoromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2,3-Trichloropropane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,2-Trichlorotrifluoroethane (Freon 113)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Vinyl chloride	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Haloaromatics in VOC Water by Headspace GC-MS						
Bromobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Chlorobenzene (monochlorobenzene)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
2-Chlorotoluene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2-Dichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,3-Dichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,4-Dichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
4-Chlorotoluene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2,3-Trichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2,4-Trichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,3,5-Trichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Monoaromatic Hydrocarbons in VOC Water by Headspace GC-MS						
n-Butylbenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
tert-Butylbenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
4-Isopropyltoluene (p-Cymene)	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Isopropylbenzene (Cumene)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
n-Propylbenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
sec-Butylbenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Styrene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
1,2,4-Trimethylbenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,3,5-Trimethylbenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Ketones in VOC Water by Headspace GC-MS						
Acetone	g/m³	< 0.5	< 0.5	< 0.5	< 0.5	-
2-Butanone (MEK)	g/m³	< 0.5	< 0.5	< 0.5	< 0.5	-
Methyl tert-butylether (MTBE)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
4-Methylpentan-2-one (MIBK)	g/m³	< 0.10	< 0.10	< 0.10	< 0.10	-
Trihalomethanes in VOC Water by Headspace GC-MS						
Bromodichloromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Bromoform (tribromomethane)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Chloroform (Trichloromethane)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dibromochloromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Other VOC in Water by Headspace GC-MS						
Carbon disulphide	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	-
Naphthalene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-

Analyst's Comments

#1 There was insufficient sample to perform the oil and grease analysis on samples 2010662/1,2&3. Therefore a smaller aliquot was taken prior to analysis, resulting in a detection limit higher than that normally achieved.

#2 The carbonaceous Biochemical Oxygen Demand (cBOD5) result for this sample may be biased slightly low as evidenced by quality control samples analysed with these samples. We are currently investigating the possible cause of the low bias.

#3 There was insufficient sample left to filter the usual amount for the Total Suspended Solids test on sample 2010662/2, so the detection limit is higher than normal.

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8	0.000053 - 0.0011 g/m^3	1-4
Semivolatile Organic Compounds Screening in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	-	1-4
Volatile Organic Compounds Screening in Water by Headspace GC-MS	Headspace, GC-MS SIM analysis [KBIs:37857,37921]	0.0010 - 0.5 g/m^3	1-4
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-4
Total Digestion	Nitric acid digestion. APHA 3030 E 22nd ed. 2012 (modified).	-	1-4
Total anions for anion/cation balance check	Calculation: sum of anions as mEquiv/L calculated from Alkalinity (bicarbonate), Chloride and Sulphate. Nitrate-N, Nitrite-N. Fluoride, Dissolved Reactive Phosphorus and Cyanide also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.07 meq/L	1-4
Total cations for anion/cation balance check	Sum of cations as mEquiv/L calculated from Sodium, Potassium, Calcium and Magnesium. Iron, Manganese, Aluminium, Zinc, Copper, Lithium, Total Ammoniacal-N and pH (H^+) also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.05 meq/L	1-4
Turbidity	Analysis using a Hach 2100N, Turbidity meter. APHA 2130 B 22nd ed. 2012.	0.05 NTU	1-4
pH	pH meter. APHA 4500-H^+ B 22nd ed. 2012. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-4
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (Modified for alk <20) 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-4
Bicarbonate	Calculation: from alkalinity and pH, valid where TDS is not >500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO_2 D 22nd ed. 2012.	1.0 g/m^3 at 25°C	1-4
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-4
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1-4
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D (modified) 22nd ed. 2012.	3 g/m^3	1-4
Sample Temperature*	Supplied by customer, otherwise 20°C.	0.1 °C	1-4
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 22nd ed. 2012.	-	1-4
Total Aluminium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.0032 g/m^3	1-4
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3	1-4
Total Calcium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m^3	1-4
Total Iron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m^3	1-4
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m^3	1-4
Total Magnesium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m^3	1-4

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total Manganese	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00053 g/m³	1-4
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1-4
Total Potassium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m³	1-4
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-4
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m³	1-4
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-4
Total Ammoniacal-N	Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) 22nd ed. 2012.	0.010 g/m³	1-4
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-4
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m³	1-4
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-4
Total Phosphorus	Total phosphorus digestion, ascorbic acid colorimetry. Discrete Analyser. APHA 4500-P B & E (modified from manual analysis) 22nd ed. 2012. Also modified to include the use of a reductant to eliminate interference from arsenic present in the sample. NAWASCO, Water & soil Miscellaneous Publication No. 38, 1982.	0.004 g/m³	1-4
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-4
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	Incubation 5 days, DO meter, nitrification inhibitor added, dilutions, seeded. APHA 5210 B (modified) 22nd ed. 2012.	2 g O_2/m³	1-4
Chemical Oxygen Demand (COD), trace level	Dichromate/sulphuric acid digestion in Hach tubes, colorimetry. Trace Level method. APHA 5220 D 22nd ed. 2012.	6 g O_2/m³	1-4
Oil and Grease	Sample filtration through filter aid, Soxhlet extraction, gravimetric determination of extracted Oil & Grease. APHA 5520 D (modified) 22nd ed. 2012.	4 g/m³	1-4
Total Phenols	In-line distillation, segmented flow colorimetry. NB: Does not detect 4-methylphenol. Skalar Method I497-001 (modified). APHA 5530 B & D (modified) 22nd ed. 2012.	0.02 g/m³	1-4

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

Hill Laboratories
BETTER TESTING BETTER RESULTS

R J Hill Laboratories Limited
1 Clyde Street
Private Bag 3205
Hamilton 3240, New Zealand

ANALYSIS

Job No: 201 0662
Date Recv: 05-Jul-18 05:37
Received by: Emily Corfield
3120106626

Client

Name Tonkin & Taylor

Address 105 Carlton Gore Rd, Newmarket, Auckland

Phone *Fax*

Client Reference 1005069.0000

Quote No 90609 *Order Number*

Primary Contact Alex Safran

Submitted By Alex Safran

Charge To Tonkin & Taylor 512

Results To ☑ Mail Client ☐ Mail Submitter

☐ Fax Results

☑ Email Results asafran@tonkintaylor.co.nz

Office use only Job No

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories *Date & Time:* 4/07/2018

Name: Alex Safran

☐ *Please tick if you require COC to be faxed back* *Signature:*

Received at Hill Laboratories *Date & Time:*

Name:

Signature:

Condition ☐ *Room Temp* ☑ *Chilled* ☐ *Frozen* *Temp:* 8.7

☐ Sample Analysis details checked

Signature:

ADDITIONAL INFORMATION

Priority

☐ **Low** ☐ **Normal** ☑ **High**

☐ **Urgent** (ASAP, extra charge applies, please contact the lab first)

Requested Reporting Date:

Sample Types

Waters	**E** Effluent	**G** Geothermal	**Pot1** Potable Water (LAS/EU)	**Pot2** Potable Water (NZDWS)
	GW Ground Water	**L** Leachate	☐ Audit Monitoring	**Pot3** Potable Water (other)
	SW Surface Water	**S** Saline	☐ Check Monitoring	**Pool** Swimming/Spa Pool
	TW Trade Waste			
Solids	**ES** Soil	**SE** Sediment	**SL** Sludge	**PL** Plant
Other	**O** O Oil	**M** Miscellaneous	**FS** FS Fish/shellfish/biota	**BM** BM Biological Material

No.	*Sample Name*	*Sample Date & Time*	*Sample Type*	*Tests Required*
1	Dome SW1	4/07/2018	SW	Turb, SS, Temp, ANCATL, NO3N, CBOD5, OAG, CODTt, Phenols, VOCHSsc, pH, EC, Alk, AlTt, CaTt, FeTt, MgTt, MnTt, K_Tt, NaTt, MWHMtt, HardT, Cl, NH4N, SO4, TP, SVOCsc
2	Dome SW2	4/07/2018	SW	
3	Dome SW3	4/07/2018	SW	
4	Dome SW4	4/07/2018	SW	
5				
6				
7				
8				
9				
10				

Continued on next page

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W www.hill-laboratories.com

Job Information Summary

Client:	Tonkin & Taylor	**Lab No:**	2010662
Contact:	Alexandre Safran	**Date Registered:**	05-Jul-2018 12:35 pm
	C/- Tonkin & Taylor	**Priority:**	High
	PO Box 5271	**Quote No:**	90609
	Auckland 1141	**Order No:**	1005069.0000
		Client Reference:	1005069.0000
		Add. Client Ref:	
		Submitted By:	Alexandre Safran
		Charge To:	Tonkin & Taylor
		Target Date:	16-Jul-2018 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	Dome SW1 04-Jul-2018	Surface Water	UP1L, Org500, TPH250, VOC40, VOC40, S100, N100	Anion / Cation profile, dissolved metals trace level; Turbidity; Total Hardness; Total Suspended Solids; Sample Temperature; Nitrate-N; Oil and Grease; Volatile Organic Compounds Screening in Water by Headspace GC-MS; Chemical Oxygen Demand (COD), trace level; Total Phenols; pH; Electrical Conductivity (EC); Total Alkalinity; Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn; Total Aluminium; Total Calcium; Total Iron; Total Magnesium; Total Manganese; Total Potassium; Total Sodium; Chloride; Total Ammoniacal-N; Sulphate; Total Phosphorus; Carbonaceous Biochemical Oxygen Demand ($cBOD_5$); Semivolatile Organic Compounds Screening in Water by GC-MS
2	Dome SW2 04-Jul-2018	Surface Water	UP1L, Org500, TPH250, VOC40, S100, N100, VOC40	Anion / Cation profile, dissolved metals trace level; Turbidity; Total Hardness; Total Suspended Solids; Sample Temperature; Nitrate-N; Oil and Grease; Volatile Organic Compounds Screening in Water by Headspace GC-MS; Chemical Oxygen Demand (COD), trace level; Total Phenols; pH; Electrical Conductivity (EC); Total Alkalinity; Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn; Total Aluminium; Total Calcium; Total Iron; Total Magnesium; Total Manganese; Total Potassium; Total Sodium; Chloride; Total Ammoniacal-N; Sulphate; Total Phosphorus; Carbonaceous Biochemical Oxygen Demand ($cBOD_5$); Semivolatile Organic Compounds Screening in Water by GC-MS
3	Dome SW3 04-Jul-2018	Surface Water	UP1L, Org500, TPH250, VOC40, VOC40, S100, N100	Anion / Cation profile, dissolved metals trace level; Turbidity; Total Hardness; Total Suspended Solids; Sample Temperature; Nitrate-N; Oil and Grease; Volatile Organic Compounds Screening in Water by Headspace GC-MS; Chemical Oxygen Demand (COD), trace level; Total Phenols; pH; Electrical Conductivity (EC); Total Alkalinity; Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn; Total Aluminium; Total Calcium; Total Iron; Total Magnesium; Total Manganese; Total Potassium; Total Sodium; Chloride; Total Ammoniacal-N; Sulphate; Total Phosphorus; Carbonaceous Biochemical Oxygen Demand ($cBOD_5$); Semivolatile Organic Compounds Screening in Water by GC-MS

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
4	Dome SW4 04-Jul-2018	Surface Water	UP1L, Org500, TPH250, VOC40, VOC40, S100, N100	Anion / Cation profile, dissolved metals trace level; Turbidity; Total Hardness; Total Suspended Solids; Sample Temperature; Nitrate-N; Oil and Grease; Volatile Organic Compounds Screening in Water by Headspace GC-MS; Chemical Oxygen Demand (COD), trace level; Total Phenols; pH; Electrical Conductivity (EC); Total Alkalinity; Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn; Total Aluminium; Total Calcium; Total Iron; Total Magnesium; Total Manganese; Total Potassium; Total Sodium; Chloride; Total Ammoniacal-N; Sulphate; Total Phosphorus; Carbonaceous Biochemical Oxygen Demand ($cBOD_5$); Semivolatile Organic Compounds Screening in Water by GC-MS

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8	0.000053 - 0.0011 g/m³	1-4
Semivolatile Organic Compounds Screening in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	-	1-4
Volatile Organic Compounds Screening in Water by Headspace GC-MS	Headspace, GC-MS SIM analysis [KBIs:37857,37921]	0.0010 - 0.5 g/m³	1-4
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-4
Total Digestion	Nitric acid digestion. APHA 3030 E 22nd ed. 2012 (modified).	-	1-4
Total anions for anion/cation balance check	Calculation: sum of anions as mEquiv/L calculated from Alkalinity (bicarbonate), Chloride and Sulphate. Nitrate-N, Nitrite-N. Fluoride, Dissolved Reactive Phosphorus and Cyanide also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.07 meq/L	1-4
Total cations for anion/cation balance check	Sum of cations as mEquiv/L calculated from Sodium, Potassium, Calcium and Magnesium. Iron, Manganese, Aluminium, Zinc, Copper, Lithium, Total Ammoniacal-N and pH (H^+) also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.05 meq/L	1-4
Turbidity	Analysis using a Hach 2100N, Turbidity meter. APHA 2130 B 22nd ed. 2012.	0.05 NTU	1-4
pH	pH meter. APHA 4500-H^+ B 22nd ed. 2012. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-4
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (Modified for alk <20) 22nd ed. 2012.	1.0 g/m³ as $CaCO_3$	1-4
Bicarbonate	Calculation: from alkalinity and pH, valid where TDS is not > 500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO_2 D 22nd ed. 2012.	1.0 g/m³ at 25°C	1-4
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m³ as $CaCO_3$	1-4
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1-4
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D (modified) 22nd ed. 2012.	3 g/m³	1-4
Sample Temperature	Supplied by customer, otherwise 20°C.	0.1 °C	1-4
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 22nd ed. 2012.	-	1-4
Total Aluminium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.0032 g/m³	1-4
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1-4

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total Calcium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m³	1-4
Total Iron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m³	1-4
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-4
Total Magnesium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m³	1-4
Total Manganese	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00053 g/m³	1-4
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1-4
Total Potassium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m³	1-4
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-4
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m³	1-4
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-4
Total Ammoniacal-N	Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) 22nd ed. 2012.	0.010 g/m³	1-4
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-4
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m³	1-4
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-4
Total Phosphorus	Total phosphorus digestion, ascorbic acid colorimetry. Discrete Analyser. APHA 4500-P B & E (modified from manual analysis) 22nd ed. 2012. Also modified to include the use of a reductant to eliminate interference from arsenic present in the sample. NAWASCO, Water & soil Miscellaneous Publication No. 38, 1982.	0.004 g/m³	1-4
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-4
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	Incubation 5 days, DO meter, nitrification inhibitor added, dilutions, seeded. APHA 5210 B (modified) 22nd ed. 2012.	2 g O_2/m³	1-4
Chemical Oxygen Demand (COD), trace level	Dichromate/sulphuric acid digestion in Hach tubes, colorimetry. Trace Level method. APHA 5220 D 22nd ed. 2012.	6 g O_2/m³	1-4
Oil and Grease	Sample filtration through filter aid, Soxhlet extraction, gravimetric determination of extracted Oil & Grease. APHA 5520 D (modified) 22nd ed. 2012.	4 g/m³	1-4
Total Phenols	In-line distillation, segmented flow colorimetry. NB: Does not detect 4-methylphenol. Skalar Method I497-001 (modified). APHA 5530 B & D (modified) 22nd ed. 2012.	0.02 g/m³	1-4

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Certificate of Analysis

Client:	Tonkin & Taylor	**Lab No:**	2028667	SPv1
Contact:	Alexandre Safran	**Date Received:**	09-Aug-2018	
	C/- Tonkin & Taylor	**Date Reported:**	20-Aug-2018	
	PO Box 5271	**Quote No:**	90609	
	Auckland 1141	**Order No:**	1005069.0000	
		Client Reference:	1005069.0000	
		Submitted By:	Alexandre Safran	

Sample Type: Aqueous

Sample Name:		Dome SW1 08-Aug-2018	Dome SW2 08-Aug-2018	Dome SW3 08-Aug-2018	Dome SW4 08-Aug-2018	
Lab Number:		2028667.1	2028667.2	2028667.3	2028667.4	
Individual Tests						
Sum of Anions	meq/L	1.63	1.72	1.88	1.88	-
Sum of Cations	meq/L	1.63	1.70	1.89	1.86	-
Turbidity	NTU	8.2	6.3	7.3	8.0	-
pH	pH Units	7.8	7.4	7.6	7.7	-
Total Alkalinity	g/m³ as $CaCO_3$	35	42	39	40	-
Bicarbonate	g/m³ at 25°C	42	51	47	49	-
Total Hardness	g/m³ as $CaCO_3$	39	43	48	46	-
Electrical Conductivity (EC)	mS/m	18.0	18.6	20.8	20.7	-
Total Suspended Solids	g/m³	6	< 5 #3	< 5 #3	< 5 #3	-
Sample Temperature*	°C	20.0	20.0	20.0	20.0	-
Total Aluminium	g/m³	0.096	0.120	0.115	0.123	-
Dissolved Calcium	g/m³	7.2 #2	8.3 #2	9.6 #2	9.4 #2	-
Total Calcium	g/m³	6.9 #2	8.0 #2	9.3 #2	9.3 #2	-
Total Iron	g/m³	0.74	0.34	0.50	0.41	-
Dissolved Magnesium	g/m³	5.0 #2	5.3 #2	5.9 #2	5.6 #2	-
Total Magnesium	g/m³	4.6 #2	5.0 #2	5.4 #2	5.4 #2	-
Total Manganese	g/m³	0.046	0.022	0.033	0.022	-
Dissolved Potassium	g/m³	1.39	1.27	1.31	1.19	-
Total Potassium	g/m³	1.40	1.31	1.39	1.21	-
Dissolved Sodium	g/m³	18.8	18.8 #2	20 #2	21	-
Total Sodium	g/m³	18.9	18.7 #2	19.8 #2	21	-
Chloride	g/m³	28	27	34	34	-
Total Ammoniacal-N	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Nitrite-N	g/m³	< 0.002	< 0.002	< 0.002	< 0.002	-
Nitrate-N	g/m³	0.076	0.055	0.129	0.069	-
Nitrate-N + Nitrite-N	g/m³	0.077	0.055	0.130	0.069	-
Total Phosphorus	g/m³	0.014	0.015	0.016	0.013	-
Sulphate	g/m³	6.1	5.6	6.0	5.4	-
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	g O_2/m³	< 2	< 2	< 2	< 2	-
Chemical Oxygen Demand (COD)	g O_2/m³	< 6	< 6	< 6	< 6	-
Oil and Grease	g/m³	< 8 #1	< 8 #1	< 8 #1	< 8 #1	-
Total Phenols	g/m³	< 0.02	< 0.02	< 0.02	< 0.02	-
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Arsenic	g/m³	< 0.0011	< 0.0011	< 0.0011	< 0.0011	-
Total Cadmium	g/m³	< 0.000053	< 0.000053	< 0.000053	< 0.000053	-
Total Chromium	g/m³	0.00149	0.00157	0.00171	0.00179	-
Total Copper	g/m³	< 0.00053	< 0.00053	0.00092	< 0.00053	-

Sample Type: Aqueous						
Sample Name:		Dome SW1 08-Aug-2018	Dome SW2 08-Aug-2018	Dome SW3 08-Aug-2018	Dome SW4 08-Aug-2018	
Lab Number:		2028667.1	2028667.2	2028667.3	2028667.4	
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Lead	g/m³	< 0.00011	< 0.00011	0.00015	< 0.00011	-
Total Nickel	g/m³	< 0.00053	0.00060	0.00065	< 0.00053	-
Total Zinc	g/m³	< 0.0011	0.0015	0.0114	< 0.0011	-
Haloethers in SVOC Water Samples by GC-MS						
Bis(2-chloroethoxy) methane	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Bis(2-chloroethyl)ether	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Bis(2-chloroisopropyl)ether	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4-Bromophenyl phenyl ether	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4-Chlorophenyl phenyl ether	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Nitrogen containing compounds in SVOC Water Samples by GC-MS						
2,4-Dinitrotoluene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2,6-Dinitrotoluene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Nitrobenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
N-Nitrosodi-n-propylamine	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
N-Nitrosodiphenylamine + Diphenylamine*	g/m3	< 0.010	< 0.010	< 0.010	< 0.010	-
Organochlorine Pesticides in SVOC Water Samples by GC-MS						
Aldrin	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
alpha-BHC	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
beta-BHC	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
delta-BHC	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
gamma-BHC (Lindane)	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4,4'-DDD	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4,4'-DDE	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4,4'-DDT	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Dieldrin	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Endosulfan I	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Endosulfan II	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Endosulfan sulfate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Endrin	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Endrin ketone	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Heptachlor	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Heptachlor epoxide	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Hexachlorobenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Polycyclic Aromatic Hydrocarbons in SVOC Water Samples by GC-MS						
Acenaphthene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Acenaphthylene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Anthracene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Benzo[a]anthracene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Benzo[a]pyrene (BAP)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Benzo[g,h,i]perylene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Benzo[k]fluoranthene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1&2-Chloronaphthalene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Chrysene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dibenzo[a,h]anthracene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Fluoranthene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Fluorene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Indeno(1,2,3-c,d)pyrene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
2-Methylnaphthalene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Naphthalene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Phenanthrene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Pyrene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-

Sample Type: Aqueous						
Sample Name:		Dome SW1 08-Aug-2018	Dome SW2 08-Aug-2018	Dome SW3 08-Aug-2018	Dome SW4 08-Aug-2018	
Lab Number:		2028667.1	2028667.2	2028667.3	2028667.4	
Phenols in SVOC Water Samples by GC-MS						
4-Chloro-3-methylphenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2-Chlorophenol	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
2,4-Dichlorophenol	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
2,4-Dimethylphenol	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
3 & 4-Methylphenol (m- + p-cresol)	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2-Methylphenol (o-Cresol)	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
2-Nitrophenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Pentachlorophenol (PCP)	g/m³	< 0.10	< 0.10	< 0.10	< 0.10	-
Phenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2,4,5-Trichlorophenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2,4,6-Trichlorophenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Plasticisers in SVOC Water Samples by GC-MS						
Bis(2-ethylhexyl)phthalate	g/m³	< 0.03	< 0.03	< 0.03	< 0.03	-
Butylbenzylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Di(2-ethylhexyl)adipate	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Diethylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Dimethylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Di-n-butylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Di-n-octylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Other Halogenated compounds in SVOC Water Samples by GC-MS						
1,2-Dichlorobenzene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
1,3-Dichlorobenzene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
1,4-Dichlorobenzene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Hexachlorobutadiene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Hexachloroethane	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
1,2,4-Trichlorobenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Other compounds in SVOC Water Samples by GC-MS						
Benzyl alcohol	g/m³	< 0.05	< 0.05	< 0.05	< 0.05	-
Carbazole	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Dibenzofuran	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Isophorone	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
BTEX in VOC Water by Headspace GC-MS						
Benzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Ethylbenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Toluene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
m&p-Xylene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
o-Xylene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
Bromomethane (Methyl Bromide)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Carbon tetrachloride	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Chloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Chloromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2-Dibromo-3-chloropropane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2-Dibromoethane (ethylene dibromide, EDB)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dibromomethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dichlorodifluoromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1-Dichloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2-Dichloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1-Dichloroethene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
cis-1,2-Dichloroethene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
trans-1,2-Dichloroethene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dichloromethane (methylene chloride)	g/m³	< 0.10	< 0.10	< 0.10	< 0.10	-
1,2-Dichloropropane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,3-Dichloropropane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-

Sample Type: Aqueous						
Sample Name:		Dome SW1 08-Aug-2018	Dome SW2 08-Aug-2018	Dome SW3 08-Aug-2018	Dome SW4 08-Aug-2018	
Lab Number:		2028667.1	2028667.2	2028667.3	2028667.4	
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
1,1-Dichloropropene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
cis-1,3-Dichloropropene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
trans-1,3-Dichloropropene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Hexachlorobutadiene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,1,2-Tetrachloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,2,2-Tetrachloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Tetrachloroethene (tetrachloroethylene)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,1-Trichloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,2-Trichloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Trichloroethene (trichloroethylene)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Trichlorofluoromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2,3-Trichloropropane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,2-Trichlorotrifluoroethane (Freon 113)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Vinyl chloride	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Haloaromatics in VOC Water by Headspace GC-MS						
Bromobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Chlorobenzene (monochlorobenzene)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
2-Chlorotoluene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2-Dichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,3-Dichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,4-Dichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
4-Chlorotoluene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2,3-Trichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2,4-Trichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,3,5-Trichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Monoaromatic Hydrocarbons in VOC Water by Headspace GC-MS						
n-Butylbenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
tert-Butylbenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
4-Isopropyltoluene (p-Cymene)	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Isopropylbenzene (Cumene)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
n-Propylbenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
sec-Butylbenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Styrene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
1,2,4-Trimethylbenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,3,5-Trimethylbenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Ketones in VOC Water by Headspace GC-MS						
Acetone	g/m³	< 0.5	< 0.5	< 0.5	< 0.5	-
2-Butanone (MEK)	g/m³	< 0.5	< 0.5	< 0.5	< 0.5	-
Methyl tert-butylether (MTBE)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
4-Methylpentan-2-one (MIBK)	g/m³	< 0.10	< 0.10	< 0.10	< 0.10	-
Trihalomethanes in VOC Water by Headspace GC-MS						
Bromodichloromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Bromoform (tribromomethane)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Chloroform (Trichloromethane)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dibromochloromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Other VOC in Water by Headspace GC-MS						
Carbon disulphide	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Naphthalene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-

Analyst's Comments

#1 There was insufficient sample to perform the Oil and Grease analysis on samples 2028667/1-4. Therefore a smaller aliquot was taken prior to analysis, resulting in a detection limit higher than that normally achieved.

#2 It has been noted that the result for the dissolved fraction was greater than that for the total fraction, but within analytical variation of the methods.

#3 There was insufficient sample left to filter the usual amount for the Total Suspended Solids test on samples 2028667/2-4 so the detection limit is higher than normal.

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8	0.000053 - 0.0011 g/m^3	1-4
Semivolatile Organic Compounds Screening in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	-	1-4
Volatile Organic Compounds Screening in Water by Headspace GC-MS	Headspace, GC-MS SIM analysis [KBIs:37857,37921]	0.003 - 0.5 g/m^3	1-4
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-4
Total Digestion	Nitric acid digestion. APHA 3030 E 22nd ed. 2012 (modified).	-	1-4
Total anions for anion/cation balance check	Calculation: sum of anions as mEquiv/L calculated from Alkalinity (bicarbonate), Chloride and Sulphate. Nitrate-N, Nitrite-N. Fluoride, Dissolved Reactive Phosphorus and Cyanide also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.07 meq/L	1-4
Total cations for anion/cation balance check	Sum of cations as mEquiv/L calculated from Sodium, Potassium, Calcium and Magnesium. Iron, Manganese, Aluminium, Zinc, Copper, Lithium, Total Ammoniacal-N and pH (H^+) also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.05 meq/L	1-4
Turbidity	Analysis using a Hach 2100N, Turbidity meter. APHA 2130 B 22nd ed. 2012.	0.05 NTU	1-4
pH	pH meter. APHA 4500-H^+ B 22nd ed. 2012. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-4
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (Modified for alk <20) 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-4
Bicarbonate	Calculation: from alkalinity and pH, valid where TDS is not >500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO_2 D 22nd ed. 2012.	1.0 g/m^3 at 25°C	1-4
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-4
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1-4
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D (modified) 22nd ed. 2012.	3 g/m^3	1-4
Sample Temperature*	Supplied by customer, otherwise 20°C.	0.1 °C	1-4
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 22nd ed. 2012.	-	1-4
Total Aluminium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.0032 g/m^3	1-4
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3	1-4
Total Calcium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m^3	1-4
Total Iron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m^3	1-4
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m^3	1-4
Total Magnesium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m^3	1-4

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total Manganese	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00053 g/m³	1-4
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1-4
Total Potassium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m³	1-4
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-4
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m³	1-4
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-4
Total Ammoniacal-N	Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) 22nd ed. 2012.	0.010 g/m³	1-4
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-4
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m³	1-4
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-4
Total Phosphorus	Total phosphorus digestion, ascorbic acid colorimetry. Discrete Analyser. APHA 4500-P B & E (modified from manual analysis) 22nd ed. 2012. Also modified to include the use of a reductant to eliminate interference from arsenic present in the sample. NAWASCO, Water & soil Miscellaneous Publication No. 38, 1982.	0.004 g/m³	1-4
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-4
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	Incubation 5 days, DO meter, nitrification inhibitor added, dilutions, seeded. APHA 5210 B (modified) 22nd ed. 2012.	2 g O_2/m³	1-4
Chemical Oxygen Demand (COD), trace level	Dichromate/sulphuric acid digestion in Hach tubes, colorimetry. Trace Level method. APHA 5220 D 22nd ed. 2012.	6 g O_2/m³	1-4
Oil and Grease	Sample filtration through filter aid, Soxhlet extraction, gravimetric determination of extracted Oil & Grease. APHA 5520 D (modified) 22nd ed. 2012.	4 g/m³	1-4
Total Phenols	In-line distillation, segmented flow colorimetry. NB: Does not detect 4-methylphenol. Skalar Method I497-001 (modified). APHA 5530 B & D (modified) 22nd ed. 2012.	0.02 g/m³	1-4

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Graham Corban MSc Tech (Hons)
Client Services Manager - Environmental

Hill Laboratories
BETTER TESTING **BETTER RESULTS**

Job No: Date Recv: 09-Aug-18 06:25

ANALYS 202 8667

R J Hill Laboratories Limited
1 Clyde Street
Private Bag 3205
Hamilton 3240, New Zealand

Received by: Sarah Collier

3120286677

Client

Name Tonkin & Taylor

Address 105 Carlton Gore Rd, Newmarket, Auckland

Phone *Fax*

Client Reference 1005069.0000

Quote No 90609 *Order Number*

Primary Contact Alex Safran

Submitted By Alex Safran

Charge To Tonkin & Taylor 512

Results To ☑ Mail Client ☐ Mail Submitter

☐ Fax Results

☑ Email Results asafran@tonkintaylor.co.nz

ADDITIONAL INFORMATION

Office use only Job No:

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories *Date & Time:* 8/08/2018

Name: Alex Safran

☐ *Please tick if you require COC to be faxed back*

Signature:

Received at Hill Laboratories *Date & Time:*

Name:

Signature:

Condition ☐ *Room Temp* ☑ *Chilled* ☐ *Frozen* *Temp:* 10.9

☐ Sample Analysis details checked

Signature:

Priority

☐ **Low** ☐ **Normal** ☑ **High**

☐ **Urgent** (ASAP, extra charge applies, please contact the lab first)

Requested Reporting Date:

Sample Types

Waters	**E**	Effluent	**G**	Geothermal	**Pot1**	Potable Water (LAS/EU)	**Pot2**	Potable Water (NZDWS)
	GW	Ground Water	**L**	Leachate	☐	Audit Monitoring	**Pot3**	Potable Water (other)
	SW	Surface Water	**S**	Saline	☐	Check Monitoring	**Pool**	Swimming/Spa Pool
	TW	Trade Waste						
Solids	**ES**	Soil	**SE**	Sediment	**SL**	Sludge	**PL**	Plant
Other	**O**	O Oil	**M**	Miscellaneous	**FS**	FS Fish/shellfish/biota	**BM**	BM Biological Material

No.	*Sample Name*	*Sample Date & Time*	*Sample Type*	*Tests Required*
1	Dome SW1	8/08/2018	SW	Turb, SS, Temp, ANCATL, NO3N, CBOD5, OAG, CODTt, Phenols, VOCHSsc, pH, EC, Alk, AlTt, CaTt, FeTt, MgTt, MnTt, K_Tt, NaTt, MWHMtt, HardT, Cl, NH4N, SO4, TP, SVOCsc
2	Dome SW2	8/08/2018	SW	
3	Dome SW3	8/08/2018	SW	
4	Dome SW4	8/08/2018	SW	
5				
6				
7				
8				
9				
10				

Continued on next page

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TRIED, TESTED AND TRUSTED

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Private Bag 3205
Hamilton 3240 New Zealand

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E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job Information Summary

Client:	Tonkin & Taylor	**Lab No:**	2028667
Contact:	Alexandre Safran	**Date Registered:**	09-Aug-2018 3:00 pm
	C/- Tonkin & Taylor	**Priority:**	High
	PO Box 5271	**Quote No:**	90609
	Auckland 1141	**Order No:**	1005069.0000
		Client Reference:	1005069.0000
		Add. Client Ref:	
		Submitted By:	Alexandre Safran
		Charge To:	Tonkin & Taylor
		Target Date:	20-Aug-2018 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	Dome SW1 08-Aug-2018	Surface Water	UP1L, Org500, TPH250, S100, N100, VOC40, VOC40	Anion / Cation profile, dissolved metals trace level; Turbidity; Total Suspended Solids; Sample Temperature; Nitrate-N; Oil and Grease; Chemical Oxygen Demand (COD), trace level; Total Phenols; Volatile Organic Compounds Screening in Water by Headspace GC-MS; pH; Electrical Conductivity (EC); Total Alkalinity; Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn; Total Aluminium; Total Calcium; Total Iron; Total Magnesium; Total Manganese; Total Potassium; Total Sodium; Chloride; Total Ammoniacal-N; Sulphate; Total Phosphorus; Carbonaceous Biochemical Oxygen Demand ($cBOD_5$); Semivolatile Organic Compounds Screening in Water by GC-MS
2	Dome SW2 08-Aug-2018	Surface Water	UP1L, Org500, TPH250, S100, N100, VOC40, VOC40	Anion / Cation profile, dissolved metals trace level; Turbidity; Total Suspended Solids; Sample Temperature; Nitrate-N; Oil and Grease; Chemical Oxygen Demand (COD), trace level; Total Phenols; Volatile Organic Compounds Screening in Water by Headspace GC-MS; pH; Electrical Conductivity (EC); Total Alkalinity; Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn; Total Aluminium; Total Calcium; Total Iron; Total Magnesium; Total Manganese; Total Potassium; Total Sodium; Chloride; Total Ammoniacal-N; Sulphate; Total Phosphorus; Carbonaceous Biochemical Oxygen Demand ($cBOD_5$); Semivolatile Organic Compounds Screening in Water by GC-MS
3	Dome SW3 08-Aug-2018	Surface Water	UP1L, Org500, TPH250, S100, N100, VOC40, VOC40	Anion / Cation profile, dissolved metals trace level; Turbidity; Total Suspended Solids; Sample Temperature; Nitrate-N; Oil and Grease; Chemical Oxygen Demand (COD), trace level; Total Phenols; Volatile Organic Compounds Screening in Water by Headspace GC-MS; pH; Electrical Conductivity (EC); Total Alkalinity; Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn; Total Aluminium; Total Calcium; Total Iron; Total Magnesium; Total Manganese; Total Potassium; Total Sodium; Chloride; Total Ammoniacal-N; Sulphate; Total Phosphorus; Carbonaceous Biochemical Oxygen Demand ($cBOD_5$); Semivolatile Organic Compounds Screening in Water by GC-MS

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
4	Dome SW4 08-Aug-2018	Surface Water	UP1L, Org500, TPH250, S100, N100, VOC40, VOC40	Anion / Cation profile, dissolved metals trace level; Turbidity; Total Suspended Solids; Sample Temperature; Nitrate-N; Oil and Grease; Chemical Oxygen Demand (COD), trace level; Total Phenols; Volatile Organic Compounds Screening in Water by Headspace GC-MS; pH; Electrical Conductivity (EC); Total Alkalinity; Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn; Total Aluminium; Total Calcium; Total Iron; Total Magnesium; Total Manganese; Total Potassium; Total Sodium; Chloride; Total Ammoniacal-N; Sulphate; Total Phosphorus; Carbonaceous Biochemical Oxygen Demand ($cBOD_5$); Semivolatile Organic Compounds Screening in Water by GC-MS

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8	0.000053 - 0.0011 g/m^3	1-4
Semivolatile Organic Compounds Screening in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	-	1-4
Volatile Organic Compounds Screening in Water by Headspace GC-MS	Headspace, GC-MS SIM analysis [KBIs:37857,37921]	0.003 - 0.5 g/m^3	1-4
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-4
Total Digestion	Nitric acid digestion. APHA 3030 E 22nd ed. 2012 (modified).	-	1-4
Total anions for anion/cation balance check	Calculation: sum of anions as mEquiv/L calculated from Alkalinity (bicarbonate), Chloride and Sulphate. Nitrate-N, Nitrite-N. Fluoride, Dissolved Reactive Phosphorus and Cyanide also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.07 meq/L	1-4
Total cations for anion/cation balance check	Sum of cations as mEquiv/L calculated from Sodium, Potassium, Calcium and Magnesium. Iron, Manganese, Aluminium, Zinc, Copper, Lithium, Total Ammoniacal-N and pH (H^+) also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.05 meq/L	1-4
Turbidity	Analysis using a Hach 2100N, Turbidity meter. APHA 2130 B 22nd ed. 2012.	0.05 NTU	1-4
pH	pH meter. APHA 4500-H^+ B 22nd ed. 2012. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-4
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (Modified for alk <20) 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-4
Bicarbonate	Calculation: from alkalinity and pH, valid where TDS is not > 500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO_2 D 22nd ed. 2012.	1.0 g/m^3 at 25°C	1-4
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-4
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1-4
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D (modified) 22nd ed. 2012.	3 g/m^3	1-4
Sample Temperature	Supplied by customer, otherwise 20°C.	0.1 °C	1-4
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 22nd ed. 2012.	-	1-4
Total Aluminium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.0032 g/m^3	1-4
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3	1-4
Total Calcium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m^3	1-4

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total Iron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m^3	1-4
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m^3	1-4
Total Magnesium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m^3	1-4
Total Manganese	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00053 g/m^3	1-4
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3	1-4
Total Potassium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m^3	1-4
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m^3	1-4
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m^3	1-4
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m^3	1-4
Total Ammoniacal-N	Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) 22nd ed. 2012.	0.010 g/m^3	1-4
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m^3	1-4
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m^3	1-4
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m^3	1-4
Total Phosphorus	Total phosphorus digestion, ascorbic acid colorimetry. Discrete Analyser. APHA 4500-P B & E (modified from manual analysis) 22nd ed. 2012. Also modified to include the use of a reductant to eliminate interference from arsenic present in the sample. NAWASCO, Water & soil Miscellaneous Publication No. 38, 1982.	0.004 g/m^3	1-4
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m^3	1-4
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	Incubation 5 days, DO meter, nitrification inhibitor added, dilutions, seeded. APHA 5210 B (modified) 22nd ed. 2012.	2 g O_2/m^3	1-4
Chemical Oxygen Demand (COD), trace level	Dichromate/sulphuric acid digestion in Hach tubes, colorimetry. Trace Level method. APHA 5220 D 22nd ed. 2012.	6 g O_2/m^3	1-4
Oil and Grease	Sample filtration through filter aid, Soxhlet extraction, gravimetric determination of extracted Oil & Grease. APHA 5520 D (modified) 22nd ed. 2012.	4 g/m^3	1-4
Total Phenols	In-line distillation, segmented flow colorimetry. NB: Does not detect 4-methylphenol. Skalar Method I497-001 (modified). APHA 5530 B & D (modified) 22nd ed. 2012.	0.02 g/m^3	1-4

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Certificate of Analysis

Client:	Tonkin & Taylor	**Lab No:**	2044476	SPv1
Contact:	Alexandre Safran C/- Tonkin & Taylor PO Box 5271 Auckland 1141	**Date Received:** **Date Reported:** **Quote No:** **Order No:** **Client Reference:** **Submitted By:**	07-Sep-2018 19-Sep-2018 90609 1005069.0000 1005069.0000 Alexandre Safran	

Sample Type: Aqueous

Sample Name:		Dome SW1 06-Sep-2018	Dome SW2 06-Sep-2018	Dome SW3 06-Sep-2018	Dome SW4 06-Sep-2018	
Lab Number:		2044476.1	2044476.2	2044476.3	2044476.4	
Individual Tests						
Sum of Anions	meq/L	1.54	1.59	1.75	1.72	-
Sum of Cations	meq/L	1.54	1.58	1.73	1.71	-
Turbidity	NTU	8.3	7.2	8.6	9.4	-
pH	pH Units	7.2	7.5	7.6	7.5	-
Total Alkalinity	g/m³ as $CaCO_3$	32	38	36	36	-
Bicarbonate	g/m³ at 25°C	39	46	44	44	-
Total Hardness	g/m³ as $CaCO_3$	35	38	43	41	-
Electrical Conductivity (EC)	mS/m	17.0	17.5	19.4	19.3	-
Total Suspended Solids	g/m³	< 8	< 5	< 5	5	-
Sample Temperature*	°C	20.0	20.0	20.0	20.0	-
Total Aluminium	g/m³	0.188	0.26	0.22	0.31	-
Dissolved Calcium	g/m³	6.5	7.6 #2	8.5	8.3	-
Total Calcium	g/m³	6.6	7.5 #2	8.5	8.4	-
Total Iron	g/m³	0.75	0.41	0.55	0.54	-
Dissolved Magnesium	g/m³	4.6	4.6	5.2 #2	5.0	-
Total Magnesium	g/m³	4.6	4.7	5.1 #2	5.1	-
Total Manganese	g/m³	0.049	0.021	0.030	0.021	-
Dissolved Potassium	g/m³	1.37	1.27	1.26	1.20	-
Total Potassium	g/m³	1.41	1.29	1.28	1.27	-
Dissolved Sodium	g/m³	18.5	18.0	19.5	19.7	-
Total Sodium	g/m³	19.0	18.2	20	21	-
Chloride	g/m³	27	26	33	32	-
Total Ammoniacal-N	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Nitrite-N	g/m³	< 0.002	< 0.002	< 0.002	< 0.002	-
Nitrate-N	g/m³	0.083	0.059	0.060	0.065	-
Nitrate-N + Nitrite-N	g/m³	0.083	0.059	0.060	0.065	-
Total Phosphorus	g/m³	0.011	0.016	0.016	0.018	-
Sulphate	g/m³	5.7	4.9	5.1	4.8	-
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	g O_2/m³	< 2	< 2	< 2	< 2	-
Chemical Oxygen Demand (COD)	g O_2/m³	< 6	< 6	< 6	< 6	-
Oil and Grease	g/m³	< 8 #1	17	< 8 #1	< 7 #1	-
Total Phenols	g/m³	< 0.02	< 0.02	< 0.02	< 0.02	-
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Arsenic	g/m³	< 0.0011	< 0.0011	< 0.0011	< 0.0011	-
Total Cadmium	g/m³	< 0.000053	< 0.000053	< 0.000053	< 0.000053	-
Total Chromium	g/m³	0.00113	0.00183	0.00179	0.0023	-
Total Copper	g/m³	< 0.00053	< 0.00053	< 0.00053	< 0.00053	-

Sample Type: Aqueous						
Sample Name:		Dome SW1 06-Sep-2018	Dome SW2 06-Sep-2018	Dome SW3 06-Sep-2018	Dome SW4 06-Sep-2018	
Lab Number:		2044476.1	2044476.2	2044476.3	2044476.4	
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Lead	g/m³	< 0.00011	< 0.00011	< 0.00011	< 0.00011	-
Total Nickel	g/m³	0.00071	0.00080	0.00055	0.00079	-
Total Zinc	g/m³	< 0.0011	< 0.0011	< 0.0011	< 0.0011	-
Haloethers in SVOC Water Samples by GC-MS						
Bis(2-chloroethoxy) methane	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Bis(2-chloroethyl)ether	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Bis(2-chloroisopropyl)ether	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4-Bromophenyl phenyl ether	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4-Chlorophenyl phenyl ether	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Nitrogen containing compounds in SVOC Water Samples by GC-MS						
2,4-Dinitrotoluene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2,6-Dinitrotoluene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Nitrobenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
N-Nitrosodi-n-propylamine	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
N-Nitrosodiphenylamine + Diphenylamine*	g/m3	< 0.010	< 0.010	< 0.010	< 0.010	-
Organochlorine Pesticides in SVOC Water Samples by GC-MS						
Aldrin	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
alpha-BHC	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
beta-BHC	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
delta-BHC	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
gamma-BHC (Lindane)	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4,4'-DDD	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4,4'-DDE	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4,4'-DDT	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Dieldrin	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Endosulfan I	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Endosulfan II	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Endosulfan sulfate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Endrin	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Endrin ketone	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Heptachlor	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Heptachlor epoxide	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Hexachlorobenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Polycyclic Aromatic Hydrocarbons in SVOC Water Samples by GC-MS						
Acenaphthene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Acenaphthylene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Anthracene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Benzo[a]anthracene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Benzo[a]pyrene (BAP)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Benzo[g,h,i]perylene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Benzo[k]fluoranthene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1&2-Chloronaphthalene	g/m³	< 0.006	< 0.006	< 0.006	< 0.006	-
Chrysene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dibenzo[a,h]anthracene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Fluoranthene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Fluorene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Indeno(1,2,3-c,d)pyrene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
2-Methylnaphthalene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Naphthalene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Phenanthrene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Pyrene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-

Sample Type: Aqueous						
Sample Name:		Dome SW1 06-Sep-2018	Dome SW2 06-Sep-2018	Dome SW3 06-Sep-2018	Dome SW4 06-Sep-2018	
Lab Number:		2044476.1	2044476.2	2044476.3	2044476.4	
Phenols in SVOC Water Samples by GC-MS						
4-Chloro-3-methylphenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2-Chlorophenol	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
2,4-Dichlorophenol	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
2,4-Dimethylphenol	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
3 & 4-Methylphenol (m- + p-cresol)	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2-Methylphenol (o-Cresol)	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
2-Nitrophenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Pentachlorophenol (PCP)	g/m³	< 0.10	< 0.10	< 0.10	< 0.10	-
Phenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2,4,5-Trichlorophenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2,4,6-Trichlorophenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Plasticisers in SVOC Water Samples by GC-MS						
Bis(2-ethylhexyl)phthalate	g/m³	< 0.03	< 0.03	< 0.03	< 0.03	-
Butylbenzylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Di(2-ethylhexyl)adipate	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Diethylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Dimethylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Di-n-butylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Di-n-octylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Other Halogenated compounds in SVOC Water Samples by GC-MS						
1,2-Dichlorobenzene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
1,3-Dichlorobenzene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
1,4-Dichlorobenzene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Hexachlorobutadiene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Hexachloroethane	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
1,2,4-Trichlorobenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Other compounds in SVOC Water Samples by GC-MS						
Benzyl alcohol	g/m³	< 0.05	< 0.05	< 0.05	< 0.05	-
Carbazole	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Dibenzofuran	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Isophorone	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
BTEX in VOC Water by Headspace GC-MS						
Benzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Ethylbenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Toluene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
m&p-Xylene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
o-Xylene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
Bromomethane (Methyl Bromide)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Carbon tetrachloride	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Chloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Chloromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2-Dibromo-3-chloropropane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2-Dibromoethane (ethylene dibromide, EDB)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dibromomethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dichlorodifluoromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1-Dichloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2-Dichloroethane	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
1,1-Dichloroethene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
cis-1,2-Dichloroethene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
trans-1,2-Dichloroethene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dichloromethane (methylene chloride)	g/m³	< 0.10	< 0.10	< 0.10	< 0.10	-
1,2-Dichloropropane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,3-Dichloropropane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-

Sample Type: Aqueous						
Sample Name:		Dome SW1 06-Sep-2018	Dome SW2 06-Sep-2018	Dome SW3 06-Sep-2018	Dome SW4 06-Sep-2018	
Lab Number:		2044476.1	2044476.2	2044476.3	2044476.4	
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
1,1-Dichloropropene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
cis-1,3-Dichloropropene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
trans-1,3-Dichloropropene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Hexachlorobutadiene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,1,2-Tetrachloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,2,2-Tetrachloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Tetrachloroethene (tetrachloroethylene)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,1-Trichloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,2-Trichloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Trichloroethene (trichloroethylene)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Trichlorofluoromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2,3-Trichloropropane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,2-Trichlorotrifluoroethane (Freon 113)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Vinyl chloride	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Haloaromatics in VOC Water by Headspace GC-MS						
Bromobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Chlorobenzene (monochlorobenzene)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
2-Chlorotoluene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2-Dichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,3-Dichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,4-Dichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
4-Chlorotoluene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2,3-Trichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2,4-Trichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,3,5-Trichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Monoaromatic Hydrocarbons in VOC Water by Headspace GC-MS						
n-Butylbenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
tert-Butylbenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
4-Isopropyltoluene (p-Cymene)	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Isopropylbenzene (Cumene)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
n-Propylbenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
sec-Butylbenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Styrene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
1,2,4-Trimethylbenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,3,5-Trimethylbenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Ketones in VOC Water by Headspace GC-MS						
Acetone	g/m³	< 0.5	< 0.5	< 0.5	< 0.5	-
2-Butanone (MEK)	g/m³	< 0.5	< 0.5	< 0.5	< 0.5	-
Methyl tert-butylether (MTBE)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
4-Methylpentan-2-one (MIBK)	g/m³	< 0.10	< 0.10	< 0.10	< 0.10	-
Trihalomethanes in VOC Water by Headspace GC-MS						
Bromodichloromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Bromoform (tribromomethane)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Chloroform (Trichloromethane)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dibromochloromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Other VOC in Water by Headspace GC-MS						
Carbon disulphide	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Naphthalene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-

Analyst's Comments

#1 There was insufficient sample to perform the Oil and Grease analysis on samples 2044476/1,3&4. Therefore a smaller aliquot was taken prior to analysis, resulting in a detection limit higher than that normally achieved.

#2 It has been noted that the result for the dissolved fraction was greater than that for the total fraction, but within analytical variation of the methods.

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.
Unless otherwise indicated, analyses were performed at Hill Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8	0.000053 - 0.0011 g/m^3	1-4
Semivolatile Organic Compounds Screening in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	-	1-4
Volatile Organic Compounds Screening in Water by Headspace GC-MS	Headspace, GC-MS SIM analysis [KBIs:37857,37921]	0.003 - 0.5 g/m^3	1-4
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-4
Total Digestion	Nitric acid digestion. APHA 3030 E 22nd ed. 2012 (modified).	-	1-4
Total anions for anion/cation balance check	Calculation: sum of anions as mEquiv/L calculated from Alkalinity (bicarbonate), Chloride and Sulphate. Nitrate-N, Nitrite-N. Fluoride, Dissolved Reactive Phosphorus and Cyanide also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.07 meq/L	1-4
Total cations for anion/cation balance check	Sum of cations as mEquiv/L calculated from Sodium, Potassium, Calcium and Magnesium. Iron, Manganese, Aluminium, Zinc, Copper, Lithium, Total Ammoniacal-N and pH (H^+) also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.05 meq/L	1-4
Turbidity	Analysis using a Hach 2100N, Turbidity meter. APHA 2130 B 22nd ed. 2012.	0.05 NTU	1-4
pH	pH meter. APHA 4500-H^+ B 22nd ed. 2012. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-4
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (Modified for alk <20) 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-4
Bicarbonate	Calculation: from alkalinity and pH, valid where TDS is not >500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO_2 D 22nd ed. 2012.	1.0 g/m^3 at 25°C	1-4
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-4
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1-4
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D (modified) 22nd ed. 2012.	3 g/m^3	1-4
Sample Temperature*	Supplied by customer, otherwise 20°C.	0.1 °C	1-4
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 22nd ed. 2012.	-	1-4
Total Aluminium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.0032 g/m^3	1-4
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3	1-4
Total Calcium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m^3	1-4
Total Iron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m^3	1-4
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m^3	1-4
Total Magnesium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m^3	1-4
Total Manganese	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00053 g/m^3	1-4

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1-4
Total Potassium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m³	1-4
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-4
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m³	1-4
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-4
Total Ammoniacal-N	Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) 22nd ed. 2012.	0.010 g/m³	1-4
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-4
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m³	1-4
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-4
Total Phosphorus	Total phosphorus digestion, ascorbic acid colorimetry. Discrete Analyser. APHA 4500-P B & E (modified from manual analysis) 22nd ed. 2012. Also modified to include the use of a reductant to eliminate interference from arsenic present in the sample. NAWASCO, Water & soil Miscellaneous Publication No. 38, 1982.	0.004 g/m³	1-4
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-4
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	Incubation 5 days, DO meter, nitrification inhibitor added, dilutions, seeded. APHA 5210 B (modified) 22nd ed. 2012.	2 g O_2/m³	1-4
Chemical Oxygen Demand (COD), trace level	Dichromate/sulphuric acid digestion in Hach tubes, colorimetry. Trace Level method. APHA 5220 D 22nd ed. 2012.	6 g O_2/m³	1-4
Oil and Grease	Sample filtration through filter aid, Soxhlet extraction, gravimetric determination of extracted Oil & Grease. APHA 5520 D (modified) 22nd ed. 2012.	4 g/m³	1-4
Total Phenols	In-line distillation, segmented flow colorimetry. NB: Does not detect 4-methylphenol. Skalar Method I497-001 (modified). APHA 5530 B & D (modified) 22nd ed. 2012.	0.02 g/m³	1-4

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Helena Bertram BSc
Client Services Manager - Environmental

Hill Laboratories
BETTER TESTING **BETTER RESULTS**

ANALYSIS

Job No: **204 4476**

Date Recv: 07-Sep-18 05:57

R J Hill Laboratories Limited
1 Clyde Street
Private Bag 3205
Hamilton 3240, New Zealand

Received by: Nathaniel Sue

3120444761

Client

Name Tonkin & Taylor

Address 105 Carlton Gore Rd, Newmarket, Auckland

Phone *Fax*

Client Reference 1005069.0000

Quote No 90609 *Order Number*

Primary Contact Alex Safran

Submitted By Alex Safran

Charge To Tonkin & Taylor 512

Results To ☑ Mail Client ☐ Mail Submitter

☐ Fax Results

☑ Email Results asafran@tonkintaylor.co.nz

Office use only Job No:

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories

Date & Time: 6/09/2018

Name: Alex Safran

☐ *Please tick if you require COC to be faxed back*

Signature:

Received at Hill Laboratories

Date & Time:

Name:

Signature:

Condition ☐ *Room Temp* ☑ *Chilled* ☐ *Frozen* *Temp:* 10.5

☐ Sample Analysis details checked

Signature:

ADDITIONAL INFORMATION

Priority

☐ **Low** ☐ **Normal** ☑ **High**

☐ **Urgent** (ASAP, extra charge applies, please contact the lab first)

Requested Reporting Date:

Sample Types

Waters	**E**	Effluent	**G**	Geothermal	**Pot1**	Potable Water (LAS/EU)	**Pot2**	Potable Water (NZDWS)
	GW	Ground Water	**L**	Leachate	☐	Audit Monitoring	**Pot3**	Potable Water (other)
	SW	Surface Water	**S**	Saline	☐	Check Monitoring	**Pool**	Swimming/Spa Pool
	TW	Trade Waste						
Solids	**ES**	Soil	**SE**	Sediment	**SL**	Sludge	**PL**	Plant
Other	**O**	O Oil	**M**	Miscellaneous	**FS**	FS Fish/shellfish/biota	**BM**	BM Biological Material

No.	*Sample Name*	*Sample Date & Time*	*Sample Type*	*Tests Required*
1	Dome SW1	6/09/2018	SW	Turb, SS, Temp, ANCATL, NO3N, CBOD5, OAG, CODTt, Phenols, VOCHSsc, pH, EC, Alk, AlTt, CaTt, FeTt, MgTt, MnTt, K_Tt, NaTt, MWHMtt, HardT, Cl, NH4N, SO4, TP, SVOCsc
2	Dome SW2	6/09/2018	SW	
3	Dome SW3	6/09/2018	SW	
4	Dome SW4	6/09/2018	SW	
5				
6				
7				
8				
9				
10				

Continued on next page

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Hamilton 3240 New Zealand

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E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job Information Summary

Client:	Tonkin & Taylor	**Lab No:**	2044476
Contact:	Alexandre Safran	**Date Registered:**	07-Sep-2018 10:53 am
	C/- Tonkin & Taylor	**Priority:**	High
	PO Box 5271	**Quote No:**	90609
	Auckland 1141	**Order No:**	1005069.0000
		Client Reference:	1005069.0000
		Add. Client Ref:	
		Submitted By:	Alexandre Safran
		Charge To:	Tonkin & Taylor
		Target Date:	18-Sep-2018 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	Dome SW1 06-Sep-2018	Surface Water	UP1L, Org500, TPH250, N100, S100, VOC40, VOC40	Anion / Cation profile, dissolved metals trace level; Turbidity; Total Suspended Solids; Sample Temperature; Nitrate-N; Oil and Grease; Chemical Oxygen Demand (COD), trace level; Total Phenols; Volatile Organic Compounds Screening in Water by Headspace GC-MS; pH; Electrical Conductivity (EC); Total Alkalinity; Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn; Total Aluminium; Total Calcium; Total Iron; Total Magnesium; Total Manganese; Total Potassium; Total Sodium; Chloride; Total Ammoniacal-N; Sulphate; Total Phosphorus; Carbonaceous Biochemical Oxygen Demand ($cBOD_5$); Semivolatile Organic Compounds Screening in Water by GC-MS
2	Dome SW2 06-Sep-2018	Surface Water	UP1L, Org500, TPH250, N100, S100, VOC40, VOC40	Anion / Cation profile, dissolved metals trace level; Turbidity; Total Suspended Solids; Sample Temperature; Nitrate-N; Oil and Grease; Chemical Oxygen Demand (COD), trace level; Total Phenols; Volatile Organic Compounds Screening in Water by Headspace GC-MS; pH; Electrical Conductivity (EC); Total Alkalinity; Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn; Total Aluminium; Total Calcium; Total Iron; Total Magnesium; Total Manganese; Total Potassium; Total Sodium; Chloride; Total Ammoniacal-N; Sulphate; Total Phosphorus; Carbonaceous Biochemical Oxygen Demand ($cBOD_5$); Semivolatile Organic Compounds Screening in Water by GC-MS
3	Dome SW3 06-Sep-2018	Surface Water	UP1L, cTPH250, N100, S100, VOC40, VOC40, cOrg500	Anion / Cation profile, dissolved metals trace level; Turbidity; Total Suspended Solids; Sample Temperature; Nitrate-N; Oil and Grease; Chemical Oxygen Demand (COD), trace level; Total Phenols; Volatile Organic Compounds Screening in Water by Headspace GC-MS; pH; Electrical Conductivity (EC); Total Alkalinity; Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn; Total Aluminium; Total Calcium; Total Iron; Total Magnesium; Total Manganese; Total Potassium; Total Sodium; Chloride; Total Ammoniacal-N; Sulphate; Total Phosphorus; Carbonaceous Biochemical Oxygen Demand ($cBOD_5$); Semivolatile Organic Compounds Screening in Water by GC-MS

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
4	Dome SW4 06-Sep-2018	Surface Water	UP1L, Org500, TPH250, N100, S100, VOC40, VOC40	Anion / Cation profile, dissolved metals trace level; Turbidity; Total Suspended Solids; Sample Temperature; Nitrate-N; Oil and Grease; Chemical Oxygen Demand (COD), trace level; Total Phenols; Volatile Organic Compounds Screening in Water by Headspace GC-MS; pH; Electrical Conductivity (EC); Total Alkalinity; Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn; Total Aluminium; Total Calcium; Total Iron; Total Magnesium; Total Manganese; Total Potassium; Total Sodium; Chloride; Total Ammoniacal-N; Sulphate; Total Phosphorus; Carbonaceous Biochemical Oxygen Demand ($cBOD_5$); Semivolatile Organic Compounds Screening in Water by GC-MS

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8	0.000053 - 0.0011 g/m³	1-4
Semivolatile Organic Compounds Screening in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	-	1-4
Volatile Organic Compounds Screening in Water by Headspace GC-MS	Headspace, GC-MS SIM analysis [KBIs:37857,37921]	0.003 - 0.5 g/m³	1-4
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-4
Total Digestion	Nitric acid digestion. APHA 3030 E 22nd ed. 2012 (modified).	-	1-4
Total anions for anion/cation balance check	Calculation: sum of anions as mEquiv/L calculated from Alkalinity (bicarbonate), Chloride and Sulphate. Nitrate-N, Nitrite-N. Fluoride, Dissolved Reactive Phosphorus and Cyanide also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.07 meq/L	1-4
Total cations for anion/cation balance check	Sum of cations as mEquiv/L calculated from Sodium, Potassium, Calcium and Magnesium. Iron, Manganese, Aluminium, Zinc, Copper, Lithium, Total Ammoniacal-N and pH (H^+) also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.05 meq/L	1-4
Turbidity	Analysis using a Hach 2100N, Turbidity meter. APHA 2130 B 22nd ed. 2012.	0.05 NTU	1-4
pH	pH meter. APHA 4500-H^+ B 22nd ed. 2012. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-4
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (Modified for alk <20) 22nd ed. 2012.	1.0 g/m³ as $CaCO_3$	1-4
Bicarbonate	Calculation: from alkalinity and pH, valid where TDS is not > 500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO_2 D 22nd ed. 2012.	1.0 g/m³ at 25°C	1-4
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m³ as $CaCO_3$	1-4
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1-4
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D (modified) 22nd ed. 2012.	3 g/m³	1-4
Sample Temperature	Supplied by customer, otherwise 20°C.	0.1 °C	1-4
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 22nd ed. 2012.	-	1-4
Total Aluminium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.0032 g/m³	1-4
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1-4

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total Calcium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m³	1-4
Total Iron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m³	1-4
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-4
Total Magnesium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m³	1-4
Total Manganese	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00053 g/m³	1-4
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1-4
Total Potassium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m³	1-4
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-4
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m³	1-4
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-4
Total Ammoniacal-N	Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) 22nd ed. 2012.	0.010 g/m³	1-4
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-4
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m³	1-4
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-4
Total Phosphorus	Total phosphorus digestion, ascorbic acid colorimetry. Discrete Analyser. APHA 4500-P B & E (modified from manual analysis) 22nd ed. 2012. Also modified to include the use of a reductant to eliminate interference from arsenic present in the sample. NAWASCO, Water & soil Miscellaneous Publication No. 38, 1982.	0.004 g/m³	1-4
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-4
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	Incubation 5 days, DO meter, nitrification inhibitor added, dilutions, seeded. APHA 5210 B (modified) 22nd ed. 2012.	2 g O_2/m³	1-4
Chemical Oxygen Demand (COD), trace level	Dichromate/sulphuric acid digestion in Hach tubes, colorimetry. Trace Level method. APHA 5220 D 22nd ed. 2012.	6 g O_2/m³	1-4
Oil and Grease	Sample filtration through filter aid, Soxhlet extraction, gravimetric determination of extracted Oil & Grease. APHA 5520 D (modified) 22nd ed. 2012.	4 g/m³	1-4
Total Phenols	In-line distillation, segmented flow colorimetry. NB: Does not detect 4-methylphenol. Skalar Method I497-001 (modified). APHA 5530 B & D (modified) 22nd ed. 2012.	0.02 g/m³	1-4

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Hamilton 3240 New Zealand

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Certificate of Analysis

Client:	Tonkin & Taylor	**Lab No:**	2059471	SPv1
Contact:	Alexandre Safran	**Date Received:**	04-Oct-2018	
	C/- Tonkin & Taylor	**Date Reported:**	18-Oct-2018	
	PO Box 5271	**Quote No:**	90609	
	Auckland 1141	**Order No:**	1005069.0000	
		Client Reference:	1005069.0000	
		Submitted By:	Alexandre Safran	

Sample Type: Aqueous

Sample Name:		Dome SW1 03-Oct-2018	Dome SW2 03-Oct-2018	Dome SW3 03-Oct-2018	Dome SW4 03-Oct-2018	
Lab Number:		2059471.1	2059471.2	2059471.3	2059471.4	
Individual Tests						
Sum of Anions	meq/L	1.61	1.67	1.82	1.78	-
Sum of Cations	meq/L	1.67	1.74	1.88	1.89	-
Turbidity	NTU	6.9	6.3	7.6	7.6	-
pH	pH Units	7.1	7.6	7.5	7.6	-
Total Alkalinity	g/m³ as $CaCO_3$	36	42	39	40	-
Bicarbonate	g/m³ at 25°C	44	50	48	48	-
Total Hardness	g/m³ as $CaCO_3$	40	44	47	47	-
Electrical Conductivity (EC)	mS/m	18.0	18.6	20.4	20.5	-
Total Suspended Solids	g/m³	< 3	< 4 #2	< 4 #2	< 4 #2	-
Sample Temperature*	°C	20.0	20.0	20.0	20.0	-
Total Aluminium	g/m³	0.118	0.155	0.140	0.31	-
Dissolved Calcium	g/m³	7.5	8.7	9.5	9.6	-
Total Calcium	g/m³	7.4	8.7	9.6	9.5	-
Total Iron	g/m³	0.76	0.36	0.50	0.44	-
Dissolved Magnesium	g/m³	5.2	5.5	5.7	5.7	-
Total Magnesium	g/m³	5.0	5.6	5.9	5.7	-
Total Manganese	g/m³	0.044	0.021	0.025	0.0174	-
Dissolved Potassium	g/m³	1.37	1.28	1.29	1.24	-
Total Potassium	g/m³	1.39	1.27	1.26	1.19	-
Dissolved Sodium	g/m³	19.2	18.9	21	21	-
Total Sodium	g/m³	20	19.1	21	22	-
Chloride	g/m³	27	26	33	31	-
Total Ammoniacal-N	g/m³	0.013	< 0.010	< 0.010	< 0.010	-
Nitrite-N	g/m³	< 0.002	< 0.002	< 0.002	< 0.002	-
Nitrate-N	g/m³	0.057	0.045	0.077	0.046	-
Nitrate-N + Nitrite-N	g/m³	0.058	0.046	0.078	0.046	-
Total Phosphorus	g/m³	0.009	0.014	0.012	0.014	-
Sulphate	g/m³	6.2	5.4	5.4	5.0	-
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	g O_2/m³	< 2	< 2	< 2	< 2	-
Chemical Oxygen Demand (COD)	g O_2/m³	< 6	< 6	< 6	< 6	-
Oil and Grease	g/m³	< 8 #1	< 7 #1	8	8	-
Total Phenols	g/m³	< 0.02	< 0.02	< 0.02	< 0.02	-
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Arsenic	g/m³	< 0.0011	< 0.0011	< 0.0011	< 0.0011	-
Total Cadmium	g/m³	< 0.000053	< 0.000053	< 0.000053	< 0.000053	-
Total Chromium	g/m³	0.00149	0.00150	0.00183	0.00154	-
Total Copper	g/m³	< 0.00053	< 0.00053	< 0.00053	< 0.00053	-

Sample Type: Aqueous						
Sample Name:		Dome SW1 03-Oct-2018	Dome SW2 03-Oct-2018	Dome SW3 03-Oct-2018	Dome SW4 03-Oct-2018	
Lab Number:		2059471.1	2059471.2	2059471.3	2059471.4	
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Lead	g/m³	< 0.00011	< 0.00011	< 0.00011	< 0.00011	-
Total Nickel	g/m³	< 0.00053	0.00093	0.00059	0.00054	-
Total Zinc	g/m³	< 0.0011	< 0.0011	< 0.0011	< 0.0011	-
Haloethers in SVOC Water Samples by GC-MS						
Bis(2-chloroethoxy) methane	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Bis(2-chloroethyl)ether	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Bis(2-chloroisopropyl)ether	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4-Bromophenyl phenyl ether	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4-Chlorophenyl phenyl ether	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Nitrogen containing compounds in SVOC Water Samples by GC-MS						
2,4-Dinitrotoluene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2,6-Dinitrotoluene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Nitrobenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
N-Nitrosodi-n-propylamine	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
N-Nitrosodiphenylamine + Diphenylamine*	g/m3	< 0.010	< 0.010	< 0.010	< 0.010	-
Organochlorine Pesticides in SVOC Water Samples by GC-MS						
Aldrin	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
alpha-BHC	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
beta-BHC	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
delta-BHC	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
gamma-BHC (Lindane)	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4,4'-DDD	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4,4'-DDE	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
4,4'-DDT	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Dieldrin	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Endosulfan I	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Endosulfan II	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Endosulfan sulfate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Endrin	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Endrin ketone	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Heptachlor	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Heptachlor epoxide	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Hexachlorobenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Polycyclic Aromatic Hydrocarbons in SVOC Water Samples by GC-MS						
Acenaphthene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Acenaphthylene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Anthracene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Benzo[a]anthracene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Benzo[a]pyrene (BAP)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Benzo[g,h,i]perylene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Benzo[k]fluoranthene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1&2-Chloronaphthalene	g/m³	< 0.006	< 0.006	< 0.006	< 0.006	-
Chrysene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dibenzo[a,h]anthracene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Fluoranthene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Fluorene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Indeno(1,2,3-c,d)pyrene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
2-Methylnaphthalene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Naphthalene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Phenanthrene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Pyrene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-

Sample Type: Aqueous						
Sample Name:		Dome SW1 03-Oct-2018	Dome SW2 03-Oct-2018	Dome SW3 03-Oct-2018	Dome SW4 03-Oct-2018	
Lab Number:		2059471.1	2059471.2	2059471.3	2059471.4	
Phenols in SVOC Water Samples by GC-MS						
4-Chloro-3-methylphenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2-Chlorophenol	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
2,4-Dichlorophenol	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
2,4-Dimethylphenol	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
3 & 4-Methylphenol (m- + p-cresol)	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2-Methylphenol (o-Cresol)	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
2-Nitrophenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Pentachlorophenol (PCP)	g/m³	< 0.10	< 0.10	< 0.10	< 0.10	-
Phenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2,4,5-Trichlorophenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
2,4,6-Trichlorophenol	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Plasticisers in SVOC Water Samples by GC-MS						
Bis(2-ethylhexyl)phthalate	g/m³	< 0.03	< 0.03	< 0.03	< 0.03	-
Butylbenzylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Di(2-ethylhexyl)adipate	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Diethylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Dimethylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Di-n-butylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Di-n-octylphthalate	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Other Halogenated compounds in SVOC Water Samples by GC-MS						
1,2-Dichlorobenzene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
1,3-Dichlorobenzene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
1,4-Dichlorobenzene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Hexachlorobutadiene	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Hexachloroethane	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
1,2,4-Trichlorobenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Other compounds in SVOC Water Samples by GC-MS						
Benzyl alcohol	g/m³	< 0.05	< 0.05	< 0.05	< 0.05	-
Carbazole	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Dibenzofuran	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Isophorone	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
BTEX in VOC Water by Headspace GC-MS						
Benzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Ethylbenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Toluene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
m&p-Xylene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
o-Xylene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
Bromomethane (Methyl Bromide)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Carbon tetrachloride	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Chloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Chloromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2-Dibromo-3-chloropropane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2-Dibromoethane (ethylene dibromide, EDB)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dibromomethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dichlorodifluoromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1-Dichloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2-Dichloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1-Dichloroethene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
cis-1,2-Dichloroethene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
trans-1,2-Dichloroethene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dichloromethane (methylene chloride)	g/m³	< 0.10	< 0.10	< 0.10	< 0.10	-
1,2-Dichloropropane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,3-Dichloropropane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-

Sample Type: Aqueous						
Sample Name:		Dome SW1 03-Oct-2018	Dome SW2 03-Oct-2018	Dome SW3 03-Oct-2018	Dome SW4 03-Oct-2018	
Lab Number:		2059471.1	2059471.2	2059471.3	2059471.4	
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
1,1-Dichloropropene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
cis-1,3-Dichloropropene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
trans-1,3-Dichloropropene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Hexachlorobutadiene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,1,2-Tetrachloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,2,2-Tetrachloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Tetrachloroethene (tetrachloroethylene)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,1-Trichloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,2-Trichloroethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Trichloroethene (trichloroethylene)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Trichlorofluoromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2,3-Trichloropropane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,1,2-Trichlorotrifluoroethane (Freon 113)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Vinyl chloride	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Haloaromatics in VOC Water by Headspace GC-MS						
Bromobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Chlorobenzene (monochlorobenzene)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
2-Chlorotoluene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2-Dichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,3-Dichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,4-Dichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
4-Chlorotoluene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2,3-Trichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,2,4-Trichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,3,5-Trichlorobenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Monoaromatic Hydrocarbons in VOC Water by Headspace GC-MS						
n-Butylbenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
tert-Butylbenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
4-Isopropyltoluene (p-Cymene)	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Isopropylbenzene (Cumene)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
n-Propylbenzene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
sec-Butylbenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Styrene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
1,2,4-Trimethylbenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
1,3,5-Trimethylbenzene	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Ketones in VOC Water by Headspace GC-MS						
Acetone	g/m³	< 0.5	< 0.5	< 0.5	< 0.5	-
2-Butanone (MEK)	g/m³	< 0.5	< 0.5	< 0.5	< 0.5	-
Methyl tert-butylether (MTBE)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
4-Methylpentan-2-one (MIBK)	g/m³	< 0.10	< 0.10	< 0.10	< 0.10	-
Trihalomethanes in VOC Water by Headspace GC-MS						
Bromodichloromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Bromoform (tribromomethane)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Chloroform (Trichloromethane)	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Dibromochloromethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Other VOC in Water by Headspace GC-MS						
Carbon disulphide	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Naphthalene	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-

Analyst's Comments

#1 There was insufficient sample to perform the Oil and Grease analysis on samples 2059471/1&2. Therefore a smaller aliquot was taken prior to analysis, resulting in a detection limit higher than that normally achieved.

#2 There was insufficient sample left to filter the usual amount for the Total Suspended Solids test on samples 2059471/2,3& 4, so the detection limit is higher than normal.

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.
Unless otherwise indicated, analyses were performed at Hill Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8	0.000053 - 0.0011 g/m^3	1-4
Semivolatile Organic Compounds Screening in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	-	1-4
Volatile Organic Compounds Screening in Water by Headspace GC-MS	Headspace, GC-MS SIM analysis [KBIs:37857,37921]	0.003 - 0.5 g/m^3	1-4
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-4
Total Digestion	Nitric acid digestion. APHA 3030 E 22nd ed. 2012 (modified).	-	1-4
Total anions for anion/cation balance check	Calculation: sum of anions as mEquiv/L calculated from Alkalinity (bicarbonate), Chloride and Sulphate. Nitrate-N, Nitrite-N. Fluoride, Dissolved Reactive Phosphorus and Cyanide also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.07 meq/L	1-4
Total cations for anion/cation balance check	Sum of cations as mEquiv/L calculated from Sodium, Potassium, Calcium and Magnesium. Iron, Manganese, Aluminium, Zinc, Copper, Lithium, Total Ammoniacal-N and pH (H^+) also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.05 meq/L	1-4
Turbidity	Analysis using a Hach 2100N, Turbidity meter. APHA 2130 B 22nd ed. 2012.	0.05 NTU	1-4
pH	pH meter. APHA 4500-H^+ B 22nd ed. 2012. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-4
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (Modified for alk <20) 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-4
Bicarbonate	Calculation: from alkalinity and pH, valid where TDS is not >500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO_2 D 22nd ed. 2012.	1.0 g/m^3 at 25°C	1-4
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-4
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1-4
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D (modified) 22nd ed. 2012.	3 g/m^3	1-4
Sample Temperature*	Supplied by customer, otherwise 20°C.	0.1 °C	1-4
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 22nd ed. 2012.	-	1-4
Total Aluminium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.0032 g/m^3	1-4
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3	1-4
Total Calcium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m^3	1-4
Total Iron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m^3	1-4
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m^3	1-4
Total Magnesium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m^3	1-4
Total Manganese	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00053 g/m^3	1-4

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1-4
Total Potassium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m³	1-4
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-4
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m³	1-4
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-4
Total Ammoniacal-N	Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) 22nd ed. 2012.	0.010 g/m³	1-4
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-4
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m³	1-4
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-4
Total Phosphorus	Total phosphorus digestion, ascorbic acid colorimetry. Discrete Analyser. APHA 4500-P B & E (modified from manual analysis) 22nd ed. 2012. Also modified to include the use of a reductant to eliminate interference from arsenic present in the sample. NAWASCO, Water & soil Miscellaneous Publication No. 38, 1982.	0.004 g/m³	1-4
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-4
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	Incubation 5 days, DO meter, nitrification inhibitor added, dilutions, seeded. APHA 5210 B (modified) 22nd ed. 2012.	2 g O_2/m³	1-4
Chemical Oxygen Demand (COD), trace level	Dichromate/sulphuric acid digestion in Hach tubes, colorimetry. Trace Level method. APHA 5220 D 22nd ed. 2012.	6 g O_2/m³	1-4
Oil and Grease	Sample filtration through filter aid, Soxhlet extraction, gravimetric determination of extracted Oil & Grease. APHA 5520 D (modified) 22nd ed. 2012.	4 g/m³	1-4
Total Phenols	In-line distillation, segmented flow colorimetry. NB: Does not detect 4-methylphenol. Skalar Method I497-001 (modified). APHA 5530 B & D (modified) 22nd ed. 2012.	0.02 g/m³	1-4

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

Hill Laboratories
BETTER TESTING BETTER RESULTS

ANALYSIS

Job No: 205 9471

Date Recv: 04-Oct-18 05:52

R J Hill Laboratories Limited
1 Clyde Street
Private Bag 3205
Hamilton 3240, New Zealand

Received by: Nathaniel Sue

3120594718

Client

Name Tonkin & Taylor

Address 105 Carlton Gore Rd, Newmarket, Auckland

Phone *Fax*

Client Reference 1005069.0000

Quote No 90609 *Order Number*

Primary Contact Alex Safran

Submitted By Alex Safran

Charge To Tonkin & Taylor 512

Results To ☑ Mail Client ☐ Mail Submitter

☐ Fax Results

☑ Email Results asafran@tonkintaylor.co.nz

Office use only Job No:

CHAIN OF CUSTODY RECORD

Sent to Hill Laboratories

Date & Time: 3/10/2018

Name: Alex Safran

☐ *Please tick if you require COC to be faxed back*

Signature:

Received at Hill Laboratories

Date & Time:

Name:

Signature:

Condition ☐ *Room Temp* ☑ *Chilled* ☐ *Frozen* *Temp:* 13.0

☐ Sample Analysis details checked

Signature:

ADDITIONAL INFORMATION

Priority

☐ **Low** ☐ **Normal** ☑ **High**

☐ **Urgent** (ASAP, extra charge applies, please contact the lab first)

Requested Reporting Date:

Sample Types

Waters	**E**	Effluent	**G**	Geothermal	**Pot1**	Potable Water (LAS/EU)	**Pot2**	Potable Water (NZDWS)
	GW	Ground Water	**L**	Leachate	☐	Audit Monitoring	**Pot3**	Potable Water (other)
	SW	Surface Water	**S**	Saline	☐	Check Monitoring	**Pool**	Swimming/Spa Pool
	TW	Trade Waste						
Solids	**ES**	Soil	**SE**	Sediment	**SL**	Sludge	**PL**	Plant
Other	**O**	O Oil	**M**	Miscellaneous	**FS**	FS Fish/shellfish/biota	**BM**	BM Biological Material

No.	*Sample Name*	*Sample Date & Time*	*Sample Type*	*Tests Required*
1	Dome SW1	3/10/2018	SW	Turb, SS, Temp, ANCATL, NO3N, CBOD5, OAG, CODTt, Phenols, VOCHSsc, pH, EC, Alk, AlTt, CaTt, FeTt, MgTt, MnTt, K_Tt, NaTt, MWHMtt, HardT, Cl, NH4N, SO4, TP, SVOCsc
2	Dome SW2	3/10/2018	SW	
3	Dome SW3	3/10/2018	SW	
4	Dome SW4	3/10/2018	SW	
5				
6				
7				
8				
9				
10				

Continued on next page

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R J Hill Laboratories Limited
28 Duke Street Frankton 3204
Private Bag 3205
Hamilton 3240 New Zealand

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T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Job Information Summary

Client:	Tonkin & Taylor	**Lab No:**	2059471
Contact:	Alexandre Safran	**Date Registered:**	04-Oct-2018 11:12 am
	C/- Tonkin & Taylor	**Priority:**	High
	PO Box 5271	**Quote No:**	90609
	Auckland 1141	**Order No:**	1005069.0000
		Client Reference:	1005069.0000
		Add. Client Ref:	
		Submitted By:	Alexandre Safran
		Charge To:	Tonkin & Taylor
		Target Date:	15-Oct-2018 4:30 pm

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
1	Dome SW1 03-Oct-2018	Surface Water	UP1L, Org500, TPH250, VOC40, VOC40, S100, N100	Anion / Cation profile, dissolved metals trace level; Turbidity; Total Suspended Solids; Sample Temperature; Nitrate-N; Oil and Grease; Volatile Organic Compounds Screening in Water by Headspace GC-MS; Chemical Oxygen Demand (COD), trace level; Total Phenols; pH; Electrical Conductivity (EC); Total Alkalinity; Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn; Total Aluminium; Total Calcium; Total Iron; Total Magnesium; Total Manganese; Total Potassium; Total Sodium; Chloride; Total Ammoniacal-N; Sulphate; Total Phosphorus; Carbonaceous Biochemical Oxygen Demand ($cBOD_5$); Semivolatile Organic Compounds Screening in Water by GC-MS
2	Dome SW2 03-Oct-2018	Surface Water	UP1L, Org500, TPH250, VOC40, VOC40, S100, N100	Anion / Cation profile, dissolved metals trace level; Turbidity; Total Suspended Solids; Sample Temperature; Nitrate-N; Oil and Grease; Volatile Organic Compounds Screening in Water by Headspace GC-MS; Chemical Oxygen Demand (COD), trace level; Total Phenols; pH; Electrical Conductivity (EC); Total Alkalinity; Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn; Total Aluminium; Total Calcium; Total Iron; Total Magnesium; Total Manganese; Total Potassium; Total Sodium; Chloride; Total Ammoniacal-N; Sulphate; Total Phosphorus; Carbonaceous Biochemical Oxygen Demand ($cBOD_5$); Semivolatile Organic Compounds Screening in Water by GC-MS
3	Dome SW3 03-Oct-2018	Surface Water	UP1L, Org500, TPH250, VOC40, VOC40, S100, N100	Anion / Cation profile, dissolved metals trace level; Turbidity; Total Suspended Solids; Sample Temperature; Nitrate-N; Oil and Grease; Volatile Organic Compounds Screening in Water by Headspace GC-MS; Chemical Oxygen Demand (COD), trace level; Total Phenols; pH; Electrical Conductivity (EC); Total Alkalinity; Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn; Total Aluminium; Total Calcium; Total Iron; Total Magnesium; Total Manganese; Total Potassium; Total Sodium; Chloride; Total Ammoniacal-N; Sulphate; Total Phosphorus; Carbonaceous Biochemical Oxygen Demand ($cBOD_5$); Semivolatile Organic Compounds Screening in Water by GC-MS

Samples

No	Sample Name	Sample Type	Containers	Tests Requested
4	Dome SW4 03-Oct-2018	Surface Water	UP1L, Org500, TPH250, VOC40, VOC40, S100, N100	Anion / Cation profile, dissolved metals trace level; Turbidity; Total Suspended Solids; Sample Temperature; Nitrate-N; Oil and Grease; Volatile Organic Compounds Screening in Water by Headspace GC-MS; Chemical Oxygen Demand (COD), trace level; Total Phenols; pH; Electrical Conductivity (EC); Total Alkalinity; Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn; Total Aluminium; Total Calcium; Total Iron; Total Magnesium; Total Manganese; Total Potassium; Total Sodium; Chloride; Total Ammoniacal-N; Sulphate; Total Phosphorus; Carbonaceous Biochemical Oxygen Demand ($cBOD_5$); Semivolatile Organic Compounds Screening in Water by GC-MS

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. Unless otherwise indicated, analyses were performed at Hill Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous

Test	Method Description	Default Detection Limit	Sample No
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8	0.000053 - 0.0011 g/m^3	1-4
Semivolatile Organic Compounds Screening in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	-	1-4
Volatile Organic Compounds Screening in Water by Headspace GC-MS	Headspace, GC-MS SIM analysis [KBIs:37857,37921]	0.003 - 0.5 g/m^3	1-4
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-4
Total Digestion	Nitric acid digestion. APHA 3030 E 22nd ed. 2012 (modified).	-	1-4
Total anions for anion/cation balance check	Calculation: sum of anions as mEquiv/L calculated from Alkalinity (bicarbonate), Chloride and Sulphate. Nitrate-N, Nitrite-N. Fluoride, Dissolved Reactive Phosphorus and Cyanide also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.07 meq/L	1-4
Total cations for anion/cation balance check	Sum of cations as mEquiv/L calculated from Sodium, Potassium, Calcium and Magnesium. Iron, Manganese, Aluminium, Zinc, Copper, Lithium, Total Ammoniacal-N and pH (H^+) also included in calculation if available. APHA 1030 E 22nd ed. 2012.	0.05 meq/L	1-4
Turbidity	Analysis using a Hach 2100N, Turbidity meter. APHA 2130 B 22nd ed. 2012.	0.05 NTU	1-4
pH	pH meter. APHA 4500-H^+ B 22nd ed. 2012. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-4
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (Modified for alk <20) 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-4
Bicarbonate	Calculation: from alkalinity and pH, valid where TDS is not > 500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO_2 D 22nd ed. 2012.	1.0 g/m^3 at 25°C	1-4
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-4
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1-4
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D (modified) 22nd ed. 2012.	3 g/m^3	1-4
Sample Temperature	Supplied by customer, otherwise 20°C.	0.1 °C	1-4
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 22nd ed. 2012.	-	1-4
Total Aluminium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.0032 g/m^3	1-4
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3	1-4

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total Calcium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m^3	1-4
Total Iron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m^3	1-4
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m^3	1-4
Total Magnesium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m^3	1-4
Total Manganese	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00053 g/m^3	1-4
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3	1-4
Total Potassium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m^3	1-4
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m^3	1-4
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m^3	1-4
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m^3	1-4
Total Ammoniacal-N	Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) 22nd ed. 2012.	0.010 g/m^3	1-4
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m^3	1-4
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m^3	1-4
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m^3	1-4
Total Phosphorus	Total phosphorus digestion, ascorbic acid colorimetry. Discrete Analyser. APHA 4500-P B & E (modified from manual analysis) 22nd ed. 2012. Also modified to include the use of a reductant to eliminate interference from arsenic present in the sample. NAWASCO, Water & soil Miscellaneous Publication No. 38, 1982.	0.004 g/m^3	1-4
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m^3	1-4
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	Incubation 5 days, DO meter, nitrification inhibitor added, dilutions, seeded. APHA 5210 B (modified) 22nd ed. 2012.	2 g O_2/m^3	1-4
Chemical Oxygen Demand (COD), trace level	Dichromate/sulphuric acid digestion in Hach tubes, colorimetry. Trace Level method. APHA 5220 D 22nd ed. 2012.	6 g O_2/m^3	1-4
Oil and Grease	Sample filtration through filter aid, Soxhlet extraction, gravimetric determination of extracted Oil & Grease. APHA 5520 D (modified) 22nd ed. 2012.	4 g/m^3	1-4
Total Phenols	In-line distillation, segmented flow colorimetry. NB: Does not detect 4-methylphenol. Skalar Method I497-001 (modified). APHA 5530 B & D (modified) 22nd ed. 2012.	0.02 g/m^3	1-4

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Certificate of Analysis

Client:	Tonkin & Taylor	**Lab No:**	2028672	SPv1
Contact:	Leon Pemberton	**Date Received:**	09-Aug-2018	
	C/- Tonkin & Taylor	**Date Reported:**	16-Aug-2018	
	PO Box 5271	**Quote No:**	90687	
	Auckland 1141	**Order No:**	1005069	
		Client Reference:	1005069	
		Submitted By:	Leon Pemberton	

Sample Type: Aqueous

Sample Name:		BH1 08-Aug-2018	BH2 08-Aug-2018	BH3 08-Aug-2018	BH5 08-Aug-2018	BH7 08-Aug-2018
Lab Number:		2028672.1	2028672.2	2028672.3	2028672.4	2028672.5
Individual Tests						
pH	pH Units	7.0	8.6	9.9	7.7	8.1
Total Alkalinity	g/m³ as $CaCO_3$	67	200	167	198	100
Carbonate	g/m³ at 25°C	< 1.0	3.9	41	< 1.0	< 1.0
Bicarbonate	g/m³ at 25°C	82	240	115	240	121
Total Hardness	g/m³ as $CaCO_3$	60	42	44	170	66
Electrical Conductivity (EC)	mS/m	22.3	48.3	45.1	44.2	33.0
Total Boron	g/m³	0.024	0.126	0.30	0.030	0.048
Total Calcium	g/m³	12.1	11.5	14.2	53	19.4
Hexavalent Chromium	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Dissolved Iron	g/m³	< 0.02	0.06	0.28	0.03	0.36
Total Iron	g/m³	0.184	1.46	3.6	1.90	1.32
Total Magnesium	g/m³	7.2	3.2	2.0	9.0	4.2
Dissolved Manganese	g/m³	0.0197	0.021	0.0045	0.154	0.148
Total Manganese	g/m³	0.021	0.046	0.061	0.165	0.148
Total Potassium	g/m³	1.28	1.22	1.08	1.51	0.61
Total Sodium	g/m³	20	97	92	32	42
Chloride	g/m³	22	31	37	21	34
Total Ammoniacal-N	g/m³	< 0.010	< 0.010	0.101	0.027	< 0.010
Nitrite-N	g/m³	< 0.002	< 0.002	0.008	< 0.002	< 0.002
Nitrate-N	g/m³	0.42	< 0.002	0.006	0.004	< 0.002
Nitrate-N + Nitrite-N	g/m³	0.42	< 0.002	0.014	0.004	< 0.002
Sulphate	g/m³	7.0	7.4	12.4	6.1	12.4
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	g O_2/m³	< 2	3	< 2	< 2	4
Chemical Oxygen Demand (COD)	g O_2/m³	< 6	< 6	< 6	< 6	13
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m³	< 0.0010	< 0.0010	0.0018	< 0.0010	< 0.0010
Dissolved Cadmium	g/m³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Chromium	g/m³	0.0008	< 0.0005	0.0008	< 0.0005	< 0.0005
Dissolved Copper	g/m³	< 0.0005	< 0.0005	0.0010	< 0.0005	< 0.0005
Dissolved Lead	g/m³	< 0.00010	< 0.00010	0.00025	< 0.00010	< 0.00010
Dissolved Nickel	g/m³	0.0011	< 0.0005	0.0005	0.0006	< 0.0005
Dissolved Zinc	g/m³	0.0025	0.0018	0.0026	0.0035	0.0023
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq						
Acenaphthene	g/m³	< 0.00010	< 0.00010	< 0.00010	0.00077	0.00019
Acenaphthylene	g/m³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Anthracene	g/m³	< 0.00010	< 0.00010	< 0.00010	0.00017	< 0.00010
Benzo[a]anthracene	g/m³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010

Sample Type: Aqueous						
Sample Name:		BH1 08-Aug-2018	BH2 08-Aug-2018	BH3 08-Aug-2018	BH5 08-Aug-2018	BH7 08-Aug-2018
Lab Number:		2028672.1	2028672.2	2028672.3	2028672.4	2028672.5
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq						
Benzo[a]pyrene (BAP)	g/m³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Benzo[g,h,i]perylene	g/m³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Benzo[k]fluoranthene	g/m³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Chrysene	g/m³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dibenzo[a,h]anthracene	g/m³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Fluoranthene	g/m³	< 0.00010	< 0.00010	< 0.00010	0.00016	< 0.00010
Fluorene	g/m³	< 0.0002	< 0.0002	< 0.0002	0.0006	< 0.0002
Indeno(1,2,3-c,d)pyrene	g/m³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Naphthalene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Phenanthrene	g/m³	< 0.0004	< 0.0004	< 0.0004	0.0007	< 0.0004
Pyrene	g/m³	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Total Petroleum Hydrocarbons in Water						
C7 - C9	g/m³	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
C10 - C14	g/m³	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
C15 - C36	g/m³	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Total hydrocarbons (C7 - C36)	g/m³	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7

Sample Name:		BH9 08-Aug-2018	BH10 08-Aug-2018			
Lab Number:		2028672.6	2028672.7			
Individual Tests						
pH	pH Units	11.3	8.3	-	-	-
Total Alkalinity	g/m³ as $CaCO_3$	136	188	-	-	-
Carbonate	g/m³ at 25°C	17.9	2.0	-	-	-
Bicarbonate	g/m³ at 25°C	1.9	220	-	-	-
Total Hardness	g/m³ as $CaCO_3$	49	40	-	-	-
Electrical Conductivity (EC)	mS/m	58.4	50.0	-	-	-
Total Boron	g/m³	0.075	0.22	-	-	-
Total Calcium	g/m³	16.9	11.1	-	-	-
Hexavalent Chromium	g/m³	0.0024	< 0.0010	-	-	-
Dissolved Iron	g/m³	< 0.02	0.34	-	-	-
Total Iron	g/m³	2.0	5.8	-	-	-
Total Magnesium	g/m³	1.64	3.1	-	-	-
Dissolved Manganese	g/m³	< 0.0005	0.0056	-	-	-
Total Manganese	g/m³	0.031	0.081	-	-	-
Total Potassium	g/m³	1.91	0.49	-	-	-
Total Sodium	g/m³	65	101	-	-	-
Chloride	g/m³	27	38	-	-	-
Total Ammoniacal-N	g/m³	< 0.010	< 0.010	-	-	-
Nitrite-N	g/m³	< 0.002	< 0.002	-	-	-
Nitrate-N	g/m³	0.003	< 0.002	-	-	-
Nitrate-N + Nitrite-N	g/m³	0.004	< 0.002	-	-	-
Sulphate	g/m³	12.2	10.9	-	-	-
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	g O_2/m³	3	< 2	-	-	-
Chemical Oxygen Demand (COD)	g O_2/m³	9	< 6	-	-	-
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m³	< 0.0010	0.0027	-	-	-
Dissolved Cadmium	g/m³	< 0.00005	< 0.00005	-	-	-
Dissolved Chromium	g/m³	0.0051	< 0.0005	-	-	-
Dissolved Copper	g/m³	0.0009	0.0015	-	-	-
Dissolved Lead	g/m³	< 0.00010	0.00024	-	-	-
Dissolved Nickel	g/m³	< 0.0005	0.0007	-	-	-
Dissolved Zinc	g/m³	0.0015	0.0152	-	-	-

Sample Type: Aqueous						
Sample Name:		BH9 08-Aug-2018	BH10 08-Aug-2018			
Lab Number:		2028672.6	2028672.7			
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq						
Acenaphthene	g/m³	< 0.00010	< 0.00010	-	-	-
Acenaphthylene	g/m³	< 0.00010	< 0.00010	-	-	-
Anthracene	g/m³	< 0.00010	< 0.00010	-	-	-
Benzo[a]anthracene	g/m³	< 0.00010	< 0.00010	-	-	-
Benzo[a]pyrene (BAP)	g/m³	< 0.00010	< 0.00010	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m³	< 0.00010	< 0.00010	-	-	-
Benzo[g,h,i]perylene	g/m³	< 0.00010	< 0.00010	-	-	-
Benzo[k]fluoranthene	g/m³	< 0.00010	< 0.00010	-	-	-
Chrysene	g/m³	< 0.00010	< 0.00010	-	-	-
Dibenzo[a,h]anthracene	g/m³	< 0.00010	< 0.00010	-	-	-
Fluoranthene	g/m³	< 0.00010	< 0.00010	-	-	-
Fluorene	g/m³	< 0.0002	< 0.0002	-	-	-
Indeno(1,2,3-c,d)pyrene	g/m³	< 0.00010	< 0.00010	-	-	-
Naphthalene	g/m³	< 0.0005	< 0.0005	-	-	-
Phenanthrene	g/m³	< 0.0004	< 0.0004	-	-	-
Pyrene	g/m³	< 0.0002	< 0.0002	-	-	-
Total Petroleum Hydrocarbons in Water						
C7 - C9	g/m³	< 0.06	< 0.06	-	-	-
C10 - C14	g/m³	< 0.2	< 0.2	-	-	-
C15 - C36	g/m³	< 0.4	< 0.4	-	-	-
Total hydrocarbons (C7 - C36)	g/m³	< 0.7	< 0.7	-	-	-

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn	0.45µm filtration, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.00005 - 0.0010 g/m³	1-7
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq	Liquid / liquid extraction, SPE (if required), GC-MS SIM analysis [KBIs:4736,2695]	0.00010 - 0.0005 g/m³	1-7
Total Petroleum Hydrocarbons in Water	Solvent Hexane extraction, GC-FID analysis, Headspace GC-MS FS analysis US EPA 8015B/MfE Petroleum Industry Guidelines [KBIs:2803,10734;26687,3629]	0.06 - 0.7 g/m³	1-7
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-7
Total Digestion	Nitric acid digestion. APHA 3030 E 22nd ed. 2012 (modified).	-	1-7
pH	pH meter. APHA 4500-H^+ B 22nd ed. 2012. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-7
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (Modified for alk <20) 22nd ed. 2012.	1.0 g/m³ as $CaCO_3$	1-7
Carbonate	Calculation: from alkalinity and pH, valid where TDS is not >500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO_2 D 22nd ed. 2012.	1.0 g/m³ at 25°C	1-7
Bicarbonate	Calculation: from alkalinity and pH, valid where TDS is not >500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO_2 D 22nd ed. 2012.	1.0 g/m³ at 25°C	1-7
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m³ as $CaCO_3$	1-7
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1-7
Total Boron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0053 g/m³	1-7
Total Calcium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m³	1-7

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Hexavalent Chromium	Diphenylcarbazide colorimetry. Discrete Analyser. APHA 3500 Cr B (modified from manual analysis) 22nd ed. 2012.	0.0010 g/m³	1-7
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-7
Total Iron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m³	1-7
Total Magnesium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m³	1-7
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0005 g/m³	1-7
Total Manganese	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00053 g/m³	1-7
Total Potassium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m³	1-7
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m³	1-7
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-7
Total Ammoniacal-N	Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) 22nd ed. 2012.	0.010 g/m³	1-7
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-7
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m³	1-7
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-7
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-7
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	Incubation 5 days, DO meter, nitrification inhibitor added, dilutions, seeded. APHA 5210 B (modified) 22nd ed. 2012.	2 g O_2/m³	1-7
Chemical Oxygen Demand (COD), trace level	Dichromate/sulphuric acid digestion in Hach tubes, colorimetry. Trace Level method. APHA 5220 D 22nd ed. 2012.	6 g O_2/m³	1-7
C7 - C9	Head Space, GCMS analysis.	0.06 g/m³	1-7

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

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Certificate of Analysis

Client:	Tonkin & Taylor	**Lab No:**	1993002	SPv1
Contact:	Leon Pemberton	**Date Received:**	01-Jun-2018	
	C/- Tonkin & Taylor	**Date Reported:**	18-Jun-2018	
	PO Box 5271	**Quote No:**	90687	
	Auckland 1141	**Order No:**	Leon Pemberton	
		Client Reference:		
		Submitted By:	Leon Pemberton	

Sample Type: Aqueous

Sample Name:		BH1 31-May-2018	BH2 31-May-2018	BH3 30-May-2018	BH7 31-May-2018	BH9 30-May-2018
Lab Number:		1993002.1	1993002.2	1993002.3	1993002.4	1993002.5
Individual Tests						
pH	pH Units	7.0	8.5	8.9	8.7	10.2
Total Alkalinity	g/m³ as $CaCO_3$	72	210	210	95	146
Carbonate	g/m³ at 25°C	< 1.0	3.4	9.7	2.3	50
Bicarbonate	g/m³ at 25°C	88	240	240	111	68
Total Hardness	g/m³ as $CaCO_3$	65	53	95	57	83
Electrical Conductivity (EC)	mS/m	22.3	46.7	46.6	31.7	33.2
Total Boron	g/m³	0.029	0.115	0.26	0.116	0.078
Total Calcium	g/m³	12.8	14.9	24	14.8	25
Hexavalent Chromium	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	0.0020
Total Magnesium	g/m³	8.1	3.9	8.4	4.9	4.9
Total Potassium	g/m³	1.39	1.17	2.8	1.47	2.1
Total Sodium	g/m³	23	107	114	68	64
Chloride	g/m³	23	32	40	35	29
Total Ammoniacal-N	g/m³	< 0.010	< 0.010	0.055	0.032	< 0.010
Nitrite-N	g/m³	0.053	< 0.002	0.011	< 0.002	< 0.002
Nitrate-N	g/m³	0.26	< 0.002	0.025	0.008	< 0.002
Nitrate-N + Nitrite-N	g/m³	0.31	< 0.002	0.036	0.008	< 0.002
Sulphate	g/m³	6.7	7.5	12.6	19.0	10.2
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	g O_2/m³	< 2	4	< 2	3	6
Chemical Oxygen Demand (COD)	g O_2/m³	< 6	16	10	19	14
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m³	< 0.0010	0.0012	0.0022	0.0024	< 0.0010
Dissolved Cadmium	g/m³	< 0.00005	0.00010	< 0.00005	< 0.00005	< 0.00005
Dissolved Chromium	g/m³	< 0.0005	< 0.0005	< 0.0005	0.0012	0.0030
Dissolved Copper	g/m³	< 0.0005	< 0.0005	0.0006	0.0025	0.0018
Dissolved Lead	g/m³	< 0.00010	< 0.00010	< 0.00010	0.00053	0.00012
Dissolved Nickel	g/m³	0.0015	0.0009	< 0.0005	0.0016	< 0.0005
Dissolved Zinc	g/m³	0.0144	0.0019	< 0.0010	0.0067	0.0038
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq						
Acenaphthene	g/m³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Acenaphthylene	g/m³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Anthracene	g/m³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Benzo[a]anthracene	g/m³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Benzo[a]pyrene (BAP)	g/m³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Benzo[b]fluoranthene + Benzo[j]fluoranthene	g/m³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Benzo[g,h,i]perylene	g/m³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010

Sample Type: Aqueous						
Sample Name:		BH1 31-May-2018	BH2 31-May-2018	BH3 30-May-2018	BH7 31-May-2018	BH9 30-May-2018
Lab Number:		1993002.1	1993002.2	1993002.3	1993002.4	1993002.5
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq						
Benzo[k]fluoranthene	g/m³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Chrysene	g/m³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dibenzo[a,h]anthracene	g/m³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Fluoranthene	g/m³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Fluorene	g/m³	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Indeno(1,2,3-c,d)pyrene	g/m³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Naphthalene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Phenanthrene	g/m³	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Pyrene	g/m³	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Total Petroleum Hydrocarbons in Water						
C7 - C9	g/m³	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
C10 - C14	g/m³	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
C15 - C36	g/m³	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Total hydrocarbons (C7 - C36)	g/m³	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7

Sample Name:		BH10 31-May-2018	BH5 31-May-2018			
Lab Number:		1993002.6	1993002.7			
Individual Tests						
pH	pH Units	8.5	7.6	-	-	-
Total Alkalinity	g/m³ as $CaCO_3$	200	240	-	-	-
Carbonate	g/m³ at 25°C	3.7	< 1.0	-	-	-
Bicarbonate	g/m³ at 25°C	240	290	-	-	-
Total Hardness	g/m³ as $CaCO_3$	115	175	-	-	-
Electrical Conductivity (EC)	mS/m	46.9	44.5	-	-	-
Total Boron	g/m³	0.22	0.036	-	-	-
Total Calcium	g/m³	22	53	-	-	-
Hexavalent Chromium	g/m³	< 0.0010	< 0.0010	-	-	-
Total Magnesium	g/m³	14.7	10.7	-	-	-
Total Potassium	g/m³	2.1	2.9	-	-	-
Total Sodium	g/m³	115	51	-	-	-
Chloride	g/m³	41	22	-	-	-
Total Ammoniacal-N	g/m³	< 0.010	< 0.010	-	-	-
Nitrite-N	g/m³	0.002	< 0.002	-	-	-
Nitrate-N	g/m³	0.049	< 0.002	-	-	-
Nitrate-N + Nitrite-N	g/m³	0.052	< 0.002	-	-	-
Sulphate	g/m³	7.3	8.3	-	-	-
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	g O_2/m³	< 2 #2	6	-	-	-
Chemical Oxygen Demand (COD)	g O_2/m³	< 12 #1	< 12 #1	-	-	-
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m³	0.0014	< 0.0010	-	-	-
Dissolved Cadmium	g/m³	< 0.00005	< 0.00005	-	-	-
Dissolved Chromium	g/m³	0.0006	< 0.0005	-	-	-
Dissolved Copper	g/m³	0.0008	< 0.0005	-	-	-
Dissolved Lead	g/m³	0.00076	< 0.00010	-	-	-
Dissolved Nickel	g/m³	< 0.0005	0.0012	-	-	-
Dissolved Zinc	g/m³	0.0148	0.0085	-	-	-
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq						
Acenaphthene	g/m³	< 0.00010	< 0.00010	-	-	-
Acenaphthylene	g/m³	< 0.00010	< 0.00010	-	-	-
Anthracene	g/m³	< 0.00010	< 0.00010	-	-	-
Benzo[a]anthracene	g/m³	< 0.00010	< 0.00010	-	-	-
Benzo[a]pyrene (BAP)	g/m³	< 0.00010	< 0.00010	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m³	< 0.00010	< 0.00010	-	-	-
Benzo[g,h,i]perylene	g/m³	< 0.00010	< 0.00010	-	-	-

Sample Type: Aqueous						
Sample Name:		BH10 31-May-2018	BH5 31-May-2018			
Lab Number:		1993002.6	1993002.7			
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq						
Benzo[k]fluoranthene	g/m³	< 0.00010	< 0.00010	-	-	-
Chrysene	g/m³	< 0.00010	< 0.00010	-	-	-
Dibenzo[a,h]anthracene	g/m³	< 0.00010	< 0.00010	-	-	-
Fluoranthene	g/m³	< 0.00010	< 0.00010	-	-	-
Fluorene	g/m³	< 0.0002	< 0.0002	-	-	-
Indeno(1,2,3-c,d)pyrene	g/m³	< 0.00010	< 0.00010	-	-	-
Naphthalene	g/m³	< 0.0005	< 0.0005	-	-	-
Phenanthrene	g/m³	< 0.0004	< 0.0004	-	-	-
Pyrene	g/m³	< 0.0002	< 0.0002	-	-	-
Total Petroleum Hydrocarbons in Water						
C7 - C9	g/m³	< 0.06	< 0.06	-	-	-
C10 - C14	g/m³	< 0.2	< 0.2	-	-	-
C15 - C36	g/m³	< 0.4	< 0.4	-	-	-
Total hydrocarbons (C7 - C36)	g/m³	< 0.7	< 0.7	-	-	-

Analyst's Comments

#1 Severe matrix interferences required that a dilution be performed prior to analysis of samples 1993002/6&7, resulting in a detection limit higher than that normally achieved for the Total COD analysis.

#2 Due to workload pressure, we were unable to commence the carbonaceous Biochemical Oxygen Demand (cBOD5) analyses on the day that they arrived at the laboratory. The analyses were performed, as soon as possible, on the frozen samples.

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively clean matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis.

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn	0.45µm filtration, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.00005 - 0.0010 g/m³	1-7
Polycyclic Aromatic Hydrocarbons Screening in Water, By Liq/Liq	Liquid / liquid extraction, SPE (if required), GC-MS SIM analysis [KBIs:4736,2695]	0.00010 - 0.0005 g/m³	1-7
Total Petroleum Hydrocarbons in Water	Solvent Hexane extraction, GC-FID analysis, Headspace GC-MS FS analysis US EPA 8015B/MfE Petroleum Industry Guidelines [KBIs:2803,10734;26687,3629]	0.06 - 0.7 g/m³	1-7
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-7
Total Digestion	Nitric acid digestion. APHA 3030 E 22nd ed. 2012 (modified).	-	1-7
pH	pH meter. APHA 4500-H^+ B 22nd ed. 2012. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-7
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (Modified for alk <20) 22nd ed. 2012.	1.0 g/m³ as $CaCO_3$	1-7
Carbonate	Calculation: from alkalinity and pH, valid where TDS is not >500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO_2 D 22nd ed. 2012.	1.0 g/m³ at 25°C	1-7
Bicarbonate	Calculation: from alkalinity and pH, valid where TDS is not >500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO_2 D 22nd ed. 2012.	1.0 g/m³ at 25°C	1-7
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m³ as $CaCO_3$	1-7
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1-7
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 22nd ed. 2012.	-	3, 5
Total Boron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0053 g/m³	1-7
Total Calcium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m³	1-7

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Hexavalent Chromium	Diphenylcarbazide colorimetry. Discrete Analyser. APHA 3500 Cr B (modified from manual analysis) 22nd ed. 2012.	0.0010 g/m³	1-7
Total Magnesium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m³	1-7
Total Potassium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.053 g/m³	1-7
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m³	1-7
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-7
Total Ammoniacal-N	Phenol/hypochlorite colourimetry. Flow injection analyser. (NH_4-N = NH_4^+-N + NH_3-N). APHA 4500-NH_3 H (modified) 22nd ed. 2012.	0.010 g/m³	1-7
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-7
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m³	1-7
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-7
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-7
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	Incubation 5 days, DO meter, nitrification inhibitor added, dilutions, seeded. APHA 5210 B (modified) 22nd ed. 2012.	2 g O_2/m³	1-7
Chemical Oxygen Demand (COD), trace level	Dichromate/sulphuric acid digestion in Hach tubes, colorimetry. Trace Level method. APHA 5220 D 22nd ed. 2012.	6 g O_2/m³	1-7
C7 - C9	Head Space, GCMS analysis.	0.06 g/m³	1-7

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Samples are held at the laboratory after reporting for a length of time depending on the preservation used and the stability of the analytes being tested. Once the storage period is completed the samples are discarded unless otherwise advised by the client.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

Appendix F: Macroinvertebrate field data and sampling notes

Appendix F Table 1: Aquatic macroinvertebrate baseline site field observations, in-situ physicochemical readings, and sampling protocols used

Site	Date	Time	Weather	Dissolved Oxygen (% saturation)	Dissolved Oxygen (mg/L)	Temperature (°C)	pH	Electrical Conductivity (uS)	Protocol used
MC1	30/07/2018	10:00	Sunny	87.5	9.77	10.5	7.3	192	C2 (SB)
MC2	30/07/2018	12:00	Sunny	103.9	11.29	11.4	7.46	193	C1 (HB)
MC3	26/07/2018	14:00	Sunny	104.6	11.2	12.3	7.56	218	C1 (HB)*
MC4	26/07/2018	15:30	Sunny	103.8	11.06	12.5	7.45	215	C1 (HB)
MC5	26/07/2018	10:00	Sunny	87.8	9.74	10.8	7.48	125	C2 (SB)
MC6	26/07/2018	12:00	Sunny	84.4	9.55	10	7.11	145	C2 (SB)

Physicochemical readings were measured using calibrated YSI (dissolved oxygen and temperature), Eutech pH30 (pH) and Eutech pH 35 (electrical conductivity) meters.
**Riffle habitat usually sampled for the C1 protocol was unavailable at the MC3 site. Instead, bedrock cascades were sampled as these were representative habitat for this reach. An area of bedrock cascade approximately 0.4 x 0.4 m was 'rubbed' for 10 seconds to dislodge macroinvertebrates into a D-net placed immediately downstream of the sampling area. This was repeated four more times, so that five subsamples were collected for each replicate.*

Appendix F Table 2: Indicative proportion of habitat type sampled for each replicate macroinvertebrate sample.

Site	Replicate	Wood (1 subsample = 1.0m length)	Macrophyte (bankside or emergent)	Bank (root mat, undercut banks etc.)	No. HB kick-samples	Overall gravel: cobble ratio (approx.)	Sampling notes
MC1	1	2	5	3	-	-	
MC1	2	1	7	2	-	-	
MC1	3	2	7	1	-	-	
MC2	1	-	-	-	5	10:1	
MC2	2	-	-	-	5	10:1	
MC2	3	-	-	-	5	10:1	
MC3	1	-	-	-	-	-	5 bedrock subsamples. See Appendix F Table 1: note.
MC3	2	-	-	-	-	-	5 bedrock subsamples. See Appendix F Table 1: note.
MC3	3	-	-	-	-	-	5 bedrock subsamples. See Appendix F Table 1: note.
MC4	1	-	-	-	5	4:1	
MC4	2	-	-	-	5	4:1	
MC4	3	-	-	-	5	5:1	Last kick sample mostly gravel (few cobbles).
MC5	1	1	9	0	-	-	
MC5	2	1	9	0	-	-	
MC5	3	1	9	0	-	-	
MC6	1	0	10	0	-	-	Gambusia abundant. Minimal wood habitat.
MC6	2	0	10	0	-	-	Gambusia abundant. Minimal wood habitat.
MC6	3	0	10	0	-	-	Gambusia abundant. Minimal wood habitat.

Appendix G: Macroinvertebrate results tables

Table 3.3: Results of macroinvertebrate sample processing using Protocol P2 (200 individual fixed count with scan for rare taxa, in Stark et al, 2001[1])

			MC1	MC1	MC1	MC2	MC2	MC2	MC3	MC3	MC3	MC4	MC4	MC4	MC5	MC5	MC5	MC6	MC6	MC6
	MCI	MCI-sb	30-Jul-18	30-Jul-18	30-Jul-18	30-Jul-18	30-Jul-18	30-Jul-18	26-Jul-18	26-Jul-18	26-Jul-18	26-Jul-18	26-Jul-18	26-Jul-18	26-Jul-18	26-Jul-18	26-Jul-18	26-Jul-18	26-Jul-18	26-Jul-18
	score	score	rep1	rep2	rep3	rep1	rep2	rep3	rep1	rep2	rep3	rep1	rep2	rep3	rep1	rep2	rep3	rep 1	rep 2	rep 3
Ephemeroptera (mayflies			SB	SB	SB	HB	HB	HB	HB	HB	HB	HB	HB	HB	SB	SB	SB	SB	SB	SB
Acanthophlebia	7	9.6	-	-	-	-	1	1	-	-	-	-	1	1	-	-	-	-	-	-
Ameletopsis	10	10.0	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arachnocolus	8	8.1	1	6	4	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Austroclima	9	6.5	1	-	1	14	16	15	54	40	35	6	3	63	-	-	-	-	-	-
Coloburiscus	9	8.1	-	-	-	83	111	102	-	1	1	56	54	8	-	-	-	-	-	-
Deleatidium	8	5.6	-	-	1	9	24	17	11	9	22	7	19	53	-	-	1	-	-	-
Ichthybotus	8	9.2	-	-	-	1	-	2	-	-	-	1	1	4	-	-	-	-	-	-
Neozephlebia	7	7.6	4	2	3	8	24	22	-	2	-	2	1	3	-	-	-	-	-	-
Nesameletus	9	8.6	-	-	-	-	-	1	2	2	1	3	1	3	-	-	-	-	-	-
Zephlebia	7	8.8	12	50	29	35	34	25	1	1	1	14	13	11	-	-	1	-	-	-
Plecoptera (stoneflies)																				
Acroperla	5	5.1	5	4	9	1	1	-	27	51	54	9	4	11	-	1	-	1	1	-
Austroperla	9	8.4	-	1	-	4	1	2	-	-	-	-	-	-	-	-	-	-	-	-
Zelandobius	5	7.4	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Zelandoperla	10	8.9	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Dobsonflies																				
Archichauliodes	7	7.3	-	-	-	9	7	3	-	-	-	18	9	10	-	-	-	-	-	-
Coleoptera (Beetles)																				
Elmidae	6	7.2	-	-	-	1	-	-	48	47	43	12	5	7	-	-	-	-	-	-
Enochrus	5	2.6	1	1	-	-	-	-	-	-	-	-	-	1	-	1	1	-	-	1
Hydraenidae	8	6.7	1	-	-	10	6	13	1	1	-	2	-	-	-	-	-	-	-	1
Ptilodactylidae	8	7.1	-	-	-	2	1	1	-	-	-	1	1	1	-	-	-	-	-	-
Staphylinidae	5	6.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Water Bugs																				
Microvelia	5	4.6	1	-	1	-	1	1	-	-	-	1	-	-	-	-	-	-	-	-
Damselflies & Dragonflies																				
Aeshna	5	1.4	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hemicordulia	5	0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Xanthocnemis	5	1.2	2	12	7	-	-	-	-	-	-	-	-	-	12	4	5	1	-	1

			MC1	MC1	MC1	MC2	MC2	MC2	MC3	MC3	MC3	MC4	MC4	MC4	MC5	MC5	MC5	MC6	MC6	MC6
Diptera (True Flies)																				
Aphrophila	5	5.6	-	-	-	-	-	-	1	1	2	1	1	-	-	-	-	-	-	-
Austrosimulium	3	3.9	2	22	23	1	1	3	2	1	8	-	2	1	45	102	71	3	26	21
Ceratopogonidae	3	6.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Corynoneura	2	1.7	-	-	-	-	-	-	-	-	-	-	-	-	2	4	2	-	3	2
Empididae	3	5.4	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ephydridae	4	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Eriopterini	9	7.5	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-
Harrisius	6	4.7	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexatomini	5	6.7	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Limonia	6	6.3	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mischoderus	4	5.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molophilus	5	6.3	-	-	1	1	-	1	-	-	-	-	-	-	-	-	-	-	-	1
Orthocladiinae	2	3.2	1	4	2	1	-	-	1	5	3	1	1	-	69	70	41	20	9	11
Paradixa	4	8.5	-	1	2	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-
Paralimnophila	*6*	7.4	-	-	-	-	-	-	-	-	-	-	1	-	-	1	1	-	-	-
Paucispinigera	*6*	7.7	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polypedilum	*3*	8.0	-	-	-	-	-	1	-	-	-	-	1	1	-	1	-	1	1	2
Psychodidae	1	6.1	1	1	1	-	-	-	-	-	-	1	1	1	-	2	3	-	-	-
Tabanidae	3	6.8	-	-	-	-	-	-	-	1	-	1	-	1	-	-	-	-	-	-
Tanypodinae	5	6.5	3	1	1	-	-	-	-	-	-	-	-	-	1	1	4	10	6	17
Tanytarsus	3	4.5	-	-	-	1	2	1	-	-	-	-	-	-	1	-	-	-	-	1
Zelandotipula	6	3.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Trichoptera (caddiflies)																				
Alloecentrella	9		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Beraeoptera	8	7.0	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Confluens	5	7.2	-	-	-	-	-	-	1	1	1	-	-	-	-	-	-	-	1	-
Costachorema	7	7.2	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Helicopsyche	10	8.6	-	-	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Hudsonema	6	6.5	-	-	-	-	-	-	6	-	1	-	-	-	-	-	-	-	-	-
Hydrobiosis	5	6.7	1	-	-	5	2	2	1	2	1	2	1	1	-	-	-	-	-	-
Hydropsyche - Aoteapsyche	4	6.0	-	-	-	-	-	-	7	17	16	6	1	-	-	-	-	-	-	-
Hydropsyche - Orthopsyche	9	7.5	-	-	-	7	12	10	8	10	9	10	6	5	-	-	-	-	-	-
Olinga	9	7.9	-	-	-	-	-	-	3	1	1	2	1	2	-	-	-	-	-	-
Oxyethira	2	1.2	-	1	-	-	-	-	1	1	1	-	1	-	44	18	24	18	15	18
Polyplectropus	8	8.1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	1	1
Psilochorema	8	7.8	1	1	-	-	-	1	-	-	-	1	2	-	2	3	2	3	2	4
Pycnocentria	7	6.8	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Pycnocentrodes	5	3.8	-	-	-	-	-	-	40	17	22	30	44	17	-	-	-	-	-	-
Triplectides	5	5.7	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

			MC1	MC1	MC1	MC2	MC2	MC2	MC3	MC3	MC3	MC4	MC4	MC4	MC5	MC5	MC5	MC6	MC6	MC6
Zelolessica	10	6.5	-	-	-	-	-	-	1	-	2	-	1	-	-	-	-	-	-	-
Crustacea																				
Copepoda	5	2.4	-	-	-	-	-	-	-	-	-	-	-	-	2	1	7	5	14	23
Paracalliope	5	5.5	6	41	23	-	-	-	1	-	-	-	1	1	-	-	-	-	-	-
Paraleptamphopus	5	5.5	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	4	9
Ostracoda	3	1.9	-	-	-	-	-	-	-	-	-	-	-	-	4	2	1	21	26	43
Paranephrops	5	8.4	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Talitridae	5	5.5	-	1	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mites	5	5.2	4	1	1	2	1	1	-	-	-	1	-	-	-	5	1	-	5	6
Worms	1	3.8	-	2	1	-	-	-	-	-	-	-	-	-	8	5	9	1	2	10
Flatworms	3	0.9	1	1	1	-	-	-	-	1	-	-	-	-	5	4	18	1	2	6
Springtails	6	5.3	-	-	-	-	-	-	-	-	-	-	-	-	1	5	1	-	3	4
Leeches																				
Alboglossiphonia	3	1.2	-	-	-	-	-	-	-	-	-	-	-	-	3	3	-	1	1	1
Placobdelloides	3	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-
Mollusca (Snails)																				
Ferrissia	3	2.4	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Gyraulus	3	1.7	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lymnaeidae	3	1.2	-	-	-	-	-	1	-	-	-	-	-	-	7	6	10	12	15	14
Physa	3	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	9	5
Potamopyrgus	4	2.1	192	48	148	5	8	1	10	1	6	27	35	7	-	-	1	35	61	29
Sphaeriidae	3	2.9	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Proboscis worms	3	1.8	1	-	1	-	-	-	-	-	-	-	-	-	-	1	1	1	-	1
Round worms	3	3.1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Percentage Counted			12.5	22.5	20.0	30.0	10.0	20.0	15.0	20.0	20.0	40.0	30.0	25.0	30.0	20.0	30.0	100.0	50.0	50.0
Number of taxa			23	24	24	26	21	26	22	22	21	27	28	24	18	23	24	19	22	26
Number of rare taxa			4	6	6	5	6	9	5	3	5	4	10	4	1	5	7	0	2	1
Number of individuals			244	206	264	209	257	230	228	213	231	217	212	214	209	242	208	138	208	233
MCI			105	95	93	128	140	127	119	115	119	128	122	123	77	78	82	78	80	84
MCI-sb			102	98	98	131	134	130	116	115	115	131	129	133	73	76	74	69	83	74
QMCI			4.35	5.03	4.49	7.90	8.07	8.11	6.48	6.21	6.12	6.79	6.58	7.51	2.61	2.83	2.87	3.37	3.56	3.60
QMCI-sb			2.95	5.07	3.71	7.52	7.46	7.56	5.77	5.97	5.70	6.25	5.73	6.21	2.76	3.40	3.05	2.62	2.64	2.99
%EPT richness (excl. Hydroptilidae)			39.13	33.33	25.00	46.15	57.14	53.85	59.09	59.09	66.67	55.56	57.14	58.33	11.11	13.04	12.50	15.79	18.18	7.69
%EPT abundance (excl. Hydroptilidae)			11.07	32.52	17.80	81.34	89.11	87.83	71.05	72.30	72.29	69.12	72.17	85.51	1.44	2.07	1.92	3.62	2.40	2.15

Yelllow shading indicates rare taxa. Blue shading indicates which index should be referred to, depending on the dominant substrate type (hard-bottom or soft-bottom) in the sample re

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