South Taranaki District Council
Eltham Central Landfill
Baseline Monitoring Programme
Annual Report
2017-2018

Technical Report 2018-91

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Executive summary

In 1996 the South Taranaki District Council (STDC) instigated plans to establish a large landfill in the Eltham area. The (proposed) Eltham Central landfill site is situated in the Waingongoro catchment on Rotokare Road approximately two kilometres south of Eltham. The purpose of this site was originally to accept waste from the South Taranaki and Stratford Districts. The plan was changed to allow for a regionalised approach to waste disposal and the site is now currently a proposed option as the replacement regional landfill once the facility at Colson Road, New Plymouth has reached capacity. As it is now expected that the Colson Road landfill will be closing at the end of June 2019, detailed planning has started for the facility. This report for the period July 2017 to June 2018 describes the baseline monitoring programme implemented by the Taranaki Regional Council (the Council).

STDC holds a total of five consents which contain a total of 77 special conditions. These consents cover all aspects of the construction and operation of the landfill. At present none of the consents held by STDC in relation to landfill construction and operation have been exercised. The consents have extended lapse periods to allow for an interim period prior to exercise.

Consent conditions specify that baseline monitoring of the ground and surface receiving waters are to be undertaken to obtain data for comparison to that gathered from compliance monitoring surveys when the landfill has commenced operations. To date the baseline monitoring has included some biological (macroinvertebrate) investigations, determination of a range of indicator physicochemical parameters in the groundwater and surface waters, and gathering some groundwater level data.

During the monitoring period the environmental performance of STDC at the Eltham Central landfill was not assessed as the consents are yet to be exercised.

Consent conditions specify that baseline monitoring of the ground and surface receiving waters is to be undertaken to obtain data for comparison to that gathered from compliance monitoring surveys when the landfill has commenced operations. In the 2016-2017 year the Council was informed that site establishment was commencing. This report outlines the progress made towards site establishment, the consents held by STDC for this site, reports on the baseline monitoring activities carried out in the 2017-2018 period, and discusses these results along with the previously obtained groundwater monitoring results.

As some baseline monitoring had been undertaken for a number of years, and there had been uncertainty around if and when the consents might be exercised, monitoring had been scaled back to consist of only the collection and analysis of six surface water samples per year between the 2014-2015 and 2017-2018 years.

During the year under review, the baseline monitoring was increased significantly with the expectation that the site would become operational late in the 2018-2019 year.

The monitoring has shown that surface water quality is generally comparable to that found during previous monitoring periods and was indicative of good water quality when compared to that expected in similar streams in the area. The only exception to this is the occasional high faecal coliform count. During the year under review, a high faecal coliform result was recorded in March 2018. At the time of sampling it was noted that a temporary electric fence bounding the tributary had been taken down by livestock. No incidents were recorded by the Council in regards to the consents included in this programme during the period under review.

During the monitoring year the Council liaised closely with STDC around the detailed requirements of the consent, changes to best practice guidelines and health and safety requirements since the consents were granted and how these requirements can be accommodated through the landfill design. This work is predominantly considered to be outside the scope of the baseline monitoring programme, however where

this related directly to relevant consent conditions and/or there are resultant changes to the baseline monitoring programme, they have been included in this report.

STDC demonstrated a high level of administrative compliance with its resource consents. No rating is given for environmental effects as none of the consents included in this programme have been exercised.

For reference, in the 2017-2018 year, consent holders were found to achieve a high level of environmental performance and compliance for 76% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 20% of the consents, a good level of environmental performance and compliance was achieved.

This report includes recommendations for the 2018-2019 year, including a recommendation relating to an optional review of consents 5347-1, 5348-1, 5349-1, 5350-1, and 5351-1. At the time of writing this report the Council was advised that the design work had been put on hold, due to an agreement between the three district councils to dispose of their waste outside of the region. The Council is yet to be advised of the plans for the Eltham Central landfill site.

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1 Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report is for the period July 2017 to June 2018 by the Taranaki Regional Council (the Council) on the monitoring programme associated with resource consents held by South Taranaki District Council (STDC) for a proposed regional landfill. STDC has consents to establish and operate a landfill situated on Rotokare Road, two kilometres south of Eltham in the Waingongoro catchment.

The report includes the results and findings of the baseline monitoring programme implemented by the Council in respect of the consents held by STDC that relate to damming, diverting and installing structures in tributaries of the Waingongoro Stream, discharges to water, air and land associated with the establishment and operation of a proposed regional landfill in the Waingongoro catchment. It is noted that this report is for baseline environmental monitoring of the existing environment at the site as none of the consents associated with the landfill have been exercised. The report does however provide a brief summary of the progress that was made towards preparing the site for the landfill establishment during the year under review.

One of the intents of the *Resource Management Act 1991* (RMA) is that environmental management should be integrated across all media, so that a consent holder's use of water, air, and land should be considered from a single comprehensive environmental perspective. Accordingly, the Council generally implements integrated environmental monitoring programmes and reports the results of the programmes jointly. This report discusses the environmental effects from the Eltham Central landfill's use of water, land and air, and is the ninth combined annual report by the Council for the STDC.

1.1.2 Structure of this report

Section 1 of this report is a background section. It sets out general information about:

- consent compliance monitoring under the RMA and the Council's obligations;
- the Council's approach to monitoring sites though annual programmes;
- the resource consents held by STDC for the Eltham Central landfill;
- the nature of the monitoring programme in place for the period under review; and
- a description of the activities and operations conducted in the Waingongoro catchment.

Section 2 presents the results of monitoring during the period under review, including scientific and technical data.

Section 3 discusses the results, their interpretations, and their significance for the environment.

Section 4 presents recommendations to be implemented in the 2018-2019 monitoring year.

A glossary of common abbreviations and scientific terms, and a bibliography, are presented at the end of the report.

1.1.3 The Resource Management Act 1991 and monitoring

The RMA primarily addresses environmental 'effects' which are defined as positive or adverse, temporary or permanent, past, present or future, or cumulative. Effects may arise in relation to:

a. the neighbourhood or the wider community around an activity, and may include cultural and social-economic effects;
b. physical effects on the locality, including landscape, amenity and visual effects;
c. ecosystems, including effects on plants, animals, or habitats, whether aquatic or terrestrial;
d. natural and physical resources having special significance (for example recreational, cultural, or aesthetic); and
e. risks to the neighbourhood or environment.

In drafting and reviewing conditions on discharge permits, and in implementing monitoring programmes, the Council is recognising the comprehensive meaning of 'effects' inasmuch as is appropriate for each activity. Monitoring programmes are not only based on existing permit conditions, but also on the obligations of the RMA to assess the effects of the exercise of consents. In accordance with Section 35 of the RMA, the Council undertakes compliance monitoring for consents and rules in regional plans, and maintains an overview of the performance of resource users and consent holders. Compliance monitoring, including both activity and impact monitoring, enables the Council to continually re-evaluate its approach and that of consent holders to resource management and, ultimately, through the refinement of methods and considered responsible resource utilisation, to move closer to achieving sustainable development of the region's resources.

1.1.4 Evaluation of environmental and administrative performance

Besides discussing the various details of the performance and extent of compliance by STDC, this report also assigns them a rating for their environmental and administrative performance during the period under review.

Environmental performance is concerned with actual or likely effects on the receiving environment from the activities during the monitoring year. Administrative performance is concerned with STDC's approach to demonstrating consent compliance in site operations and management including the timely provision of information to Council (such as contingency plans and water take data) in accordance with consent conditions.

Events that were beyond the control of the consent holder and unforeseeable (that is a defence under the provisions of the RMA can be established) may be excluded with regard to the performance rating applied. For example loss of data due to a flood destroying deployed field equipment.

The categories used by the Council for this monitoring period, and their interpretation, are as follows:

Environmental Performance

High: No or inconsequential (short-term duration, less than minor in severity) breaches of consent or regional plan parameters resulting from the activity; no adverse effects of significance noted or likely in the receiving environment. The Council did not record any verified unauthorised incidents involving significant environmental impacts and was not obliged to issue any abatement notices or infringement notices in relation to such impacts.

Good: Likely or actual adverse effects of activities on the receiving environment were negligible or minor at most. There were some such issues noted during monitoring, from self reports, or in response to unauthorised incident reports, but these items were not critical, and follow-up inspections showed they have been dealt with. These minor issues were resolved positively, co-operatively, and quickly. The Council was not obliged to issue any abatement notices or infringement notices in relation to the minor non-compliant effects; however abatement notices may have been issued to mitigate an identified potential for an environmental effect to occur.

For example:

- High suspended solid values recorded in discharge samples, however the discharge was to land or to receiving waters that were in high flow at the time;
- Strong odour beyond boundary but no residential properties or other recipient nearby.

Improvement required: Likely or actual adverse effects of activities on the receiving environment were more than minor, but not substantial. There were some issues noted during monitoring, from self reports, or in response to unauthorised incident reports. Cumulative adverse effects of a persistent minor non-compliant activity could elevate a minor issue to this level. Abatement notices and infringement notices may have been issued in respect of effects.

Poor: Likely or actual adverse effects of activities on the receiving environment were significant. There were some items noted during monitoring, from self reports, or in response to unauthorised incident reports. Cumulative adverse effects of a persistent moderate non-compliant activity could elevate an 'improvement required' issue to this level. Typically there were grounds for either a prosecution or an infringement notice in respect of effects.

Administrative performance

High: The administrative requirements of the resource consents were met, or any failure to do this had trivial consequences and were addressed promptly and co-operatively.

Good: Perhaps some administrative requirements of the resource consents were not met at a particular time, however this was addressed without repeated interventions from the Council staff. Alternatively adequate reason was provided for matters such as the no or late provision of information, interpretation of 'best practical option' for avoiding potential effects, etc.

Improvement required: Repeated interventions to meet the administrative requirements of the resource consents were made by Council staff. These matters took some time to resolve, or remained unresolved at the end of the period under review. The Council may have issued an abatement notice to attain compliance.

Poor: Material failings to meet the administrative requirements of the resource consents. Significant intervention by the Council was required. Typically there were grounds for an infringement notice.

For reference, in the 2017-2018 year, consent holders were found to achieve a high level of environmental performance and compliance for 76% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 20% of the consents, a good level of environmental performance and compliance was achieved.

1.2 Process description

STDC has identified a proposed landfill site in Eltham at Rotokare Road, on the east side of State Highway 3, approximately two kilometres south of the Eltham Township. The site of the proposed landfill is a 92 ha farm that is owned by STDC and will continue to be farmed until construction of the landfill commences. The original concept was that the landfilling operation would utilise approximately 5 ha of the site at any one time and the site was estimated to have a capacity of 2,200,000 m^3. Access to the site is proposed to be from Rotokare Road. The concept was that the proposed landfill would be a fully engineered facility with a 1.5 mm high density poly ethylene (HDPE) liner laid over a 600 mm layer of compacted clay. Leachate will be collected by leachate lines and transferred to the sewer pipeline that runs between the Eltham oxidation ponds and the Hawera waste water treatment plant (WWTP).

Consents 5347, 5348, 5349, 5350, and 5351 were granted on 15 March 2000 with the expectation that, within three years, landfill space available to STDC at other landfill sites in the district would be full and that

the Eltham site would commence operation (exercise of consent) within the five year lapse period set in the consents for the site.

However, during the intervening period, a plan was developed and agreed on by the three district councils in the region that saw a regionalised approach to waste management being implemented by the district councils. Part of this plan was to route all municipal waste in the region to Colson Road landfill in New Plymouth, with the eventual closure of all other municipal landfills in the region. When the Colson Road landfill approaches its projected capacity the plan calls for Eltham Central landfill to be commissioned to take over as the regional landfill for Taranaki.

In July 2005 the STDC was granted changes to consent conditions to increase the consent lapse periods from 5 years to 20 years. These changes allowed for the extended timeframes resulting from the change of designation from proposed district to proposed regional landfill.

During 2016-2017, the Council was advised that planning for the establishment of the new landfill was commencing and work on the road re-alignment in the vicinity of the SH3 and Rotokere Road junction began.

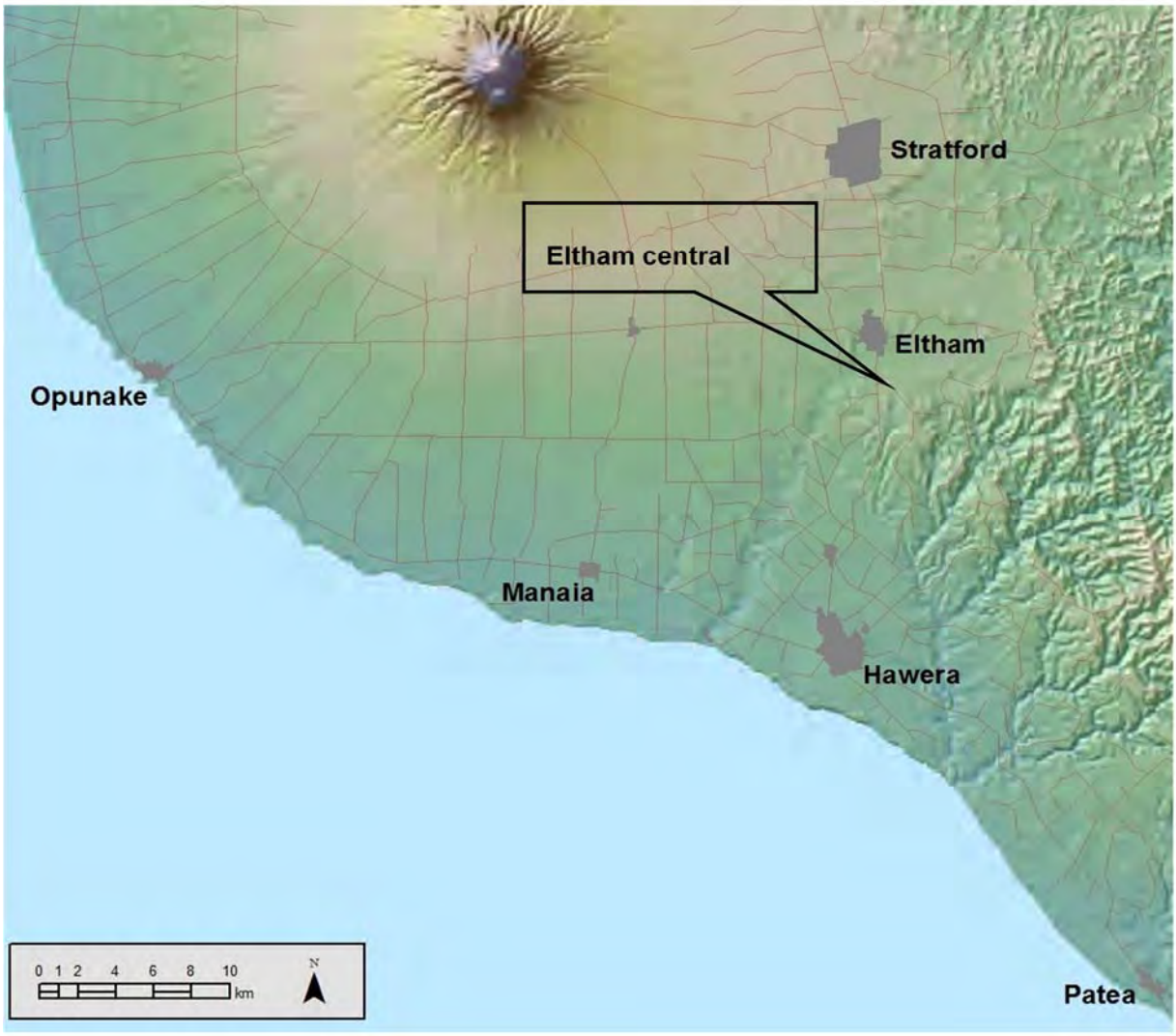

Figure 1 Regional map of Taranaki showing the location of the Eltham Central landfill site

Photo 1 Eltham Central landfill site (north westerly view from the east side of the site)

Photo 2 Eltham Central landfill site (westerly view from the east side of the site)

Photo 3 Eltham Central landfill site (south westerly view from the east side of the site)

As can been seen by the photos, the site itself consists of a large bowl shaped valley, which makes it well suited to use as a landfill site. The proposed landfill foot print also in the shape of a horseshoe and contains the headwaters of two unnamed tributaries that eventually feed into the Waingongoro River, approximately two kilometres northwest of the site. The northern landfill tributary is permanently flowing and has some established riparian planting. The southern tributary is currently ephemeral and the sediment ponds serving the stage one and two areas will be at the headwaters of this landfill tributary. Several groundwater bores and freshwater sampling sites have been established for the purposes of baseline monitoring.

1.2.1 Site development preparations

During the year under review, a number of matters were progressed relating to the site establishment. These included:

- Continuation of the Neighbourhood Liaison Group meetings;
- Additional technical investigations at the site to inform the design;
- Consultation on changes to the draft design and detailed design;
- Consultation on the draft Operation and Management Plan;
- The granting of addition consents to allow the Stage 1 enabling works to commence;
- Commencement of the Stage 1 enabling works; and
- More intensive baseline monitoring.

Photo 4 Stage 1 earthworks and southern stormwater pond, April 2018

Photo 5 Central stormwater pond (headwaters above WGG000647), April 2018

Photo 6 Southern access track, culvert and silt controls, April 2018

Photo 7 Access track and silt controls, April 2018

1.3 Resource consents

STDC holds a total of five consents relating to a regional landfill that will be developed at the corner of Rotokare Road and State Highway 3, just south of Eltham. The consents, originally granted on 15 March 2000, provided for a landfill catering to the South Taranaki and Stratford Districts, but were changed in July 2005 to allow for the landfill to become a regional facility also taking wastes from the New Plymouth District. The resource consents are summarised in Table 1.

Table 1 Summary of resource consents held by the STDC for the Eltham Central landfill

Consent	Purpose	Review	Expiry
5347-1.2	To discharge contaminants onto and into land	June 2019 June 2023 June 2029 Within 18 months of the exercise of the consent	June 2034
5348-1.3	To discharge emissions into the air		
5349-1.2	To discharge stormwater		
5350-1.2	To dam and divert water		
5351-1.2	To erect, place and maintain structures in the beds of the unnamed tributaries		

In the 2015-2016 annual report, the recommendation in relation to the June 2017 review opportunity was that no review was required as the consents were yet to be exercised. However, during the 2016-2017 year the Council was informed that the landfill would be established in time to take over from Colson Road when it was due to close in June 2019, with preparations beginning in the 2016-2017 year. A re-evaluation of the suitability of the current conditions on the consent was therefore undertaken prior to June 2017. It was recognised that:

- Conditions 27, 19, 19, 10, and 12 of the respective consents provided for the Council to review consent conditions for the purpose of assessing the effectiveness of conditions in avoiding, remedying or mitigating adverse effects on the environment from the discharges of contaminants permitted by these consents.
- The original consents were issued based on an Assessment of Environmental Effects and draft Management Plan compiled in May 1998. Although the most recent versions of the consents were granted in July 2005, only the potential effects of the variation sought at this time (expanding the area from which the refuse would originate from) were able to be considered.
- Council was aware that there were likely to be a number of changes to the design, construction and operation of the landfill that had not yet been finalised.
- There have been new National Environmental Standards[1] and disposal to land guidelines[2] released since the consent conditions were drafted.
- There is no General Condition (d) on any of the consents so references to it are not needed.

The Council therefore determined that the current conditions on the consents may not be adequate to deal with potential adverse effects on the environment. Also that they may not be aligned with current best practice and expected levels of environmental performance. The consent conditions provided for a notice of review to be served during June 2017 but all the information required to undertake the review was not yet available. STDC was therefore advised that the Council would be reviewing the consents to provide additional review opportunities, allowing for reviews to be undertaken in an appropriate and timely manner

[1] Resource Management (National Environmental Standards for Air Quality) Regulations 2004)

[2] Waste Management Institute of New Zealand (April 2016): Technical Guidelines for Disposal to Land

as the landfill design progresses. The additional review opportunities included in all the consents were December 2017, June 2018 and June 2019. The reviewed consents were granted on 23 August 2017.

The permits are discussed further in sections 1.3.1 to 1.3.5 below, with the discussion including a summary of the conditions on each of the consents. The summary may not reflect the full requirements of each consent condition, but these can be found in full in the resource consents, which are appended to this report (Appendix I).

Two additional permits were issued to STDC in May 2017, one to allow for the extension of a culvert in the tributary of the Waingongoro Stream tributary (**10428-1**), and one to allow for the discharge of stormwater from the earthworks (**10418-1**). These consents both relate to the road widening and re-alignment required by the New Zealand Transport Agency to provide safe access to Rotokere Road, rather than to the development of the landfill site itself. Two consents were also granted on 23 November 2017, one to discharge stormwater and sediment arising from earthworks onto land (**10501-1**), and one to install a culvert in an unnamed tributary of the Waingongoro River, including the associated disturbance of the stream bed (**10502-1**). These consents relate to the first stage of enabling works on the landfill site, including construction of the access road into the property and the replacement of an existing culvert under the proposed access road. The consents themselves are not covered in this annual report, as they are monitored under the short term culvert/earthworks monitoring rounds, rather than being included in this compliance monitoring programme. However, any issues occurring that may have had the potential to affect the baseline conditions in the receiving waters will be discussed in this report.

1.3.1 Water permit

Section 14 of the RMA stipulates that no person may take, use, dam or divert any water, unless the activity is expressly allowed for by a resource consent or a rule in a regional plan, or it falls within some particular categories set out in Section 14.

Maintaining sufficient volumes of water within streams and rivers to protect aquatic habitat is a primary concern of the Council with respect to water permits.

STDC holds consent **5350-1** to dam and divert water around the Central landfill and into the headwaters of the Waingongoro River. This permit was issued by the Council on 15 March 2000 under Section 87(d) of the RMA. It is due to expire on 1 June 2034. The consent was reviewed on 24 August 2017, with additional review dates included in condition 10.

Condition 1 requires the submission of a Landfill Management Plan three months prior to the exercise of the consent and states that this plan must be adhered to at all times.

Conditions 2 and 3 relate to stormwater control and diversion to prevent or minimise erosion and land instability.

Condition 4 requires the rehabilitation of land destabilised or eroded by earthworks and construction.

Condition 5 requires an Annual Monitoring Plan to be provided by the consent holder, with the initial plan to be provided to the Council at least six months prior to any dam construction.

Condition 6 stipulates that all structures and earthworks are to be certified by a registered engineer, with a copy of the certificates provided to the Council.

Condition 7 sets out the requirements for a Neighbourhood Liaison Committee.

Condition 8 specifies that the consent will lapse after a 20 year period if the consent is not exercised.

Condition 9 restricts the matters for which variations to the consent may be sought.

Condition 10 contains review provisions.

This summary of consent conditions may not reflect the full requirements of each condition. The consent conditions in full can be found in the resource consent which is appended to this report (Appendix I).

1.3.2 Water discharge permit

Section 15(1)(a) of the RMA stipulates that no person may discharge any contaminant into water, unless the activity is expressly allowed for by a resource consent or a rule in a regional plan, or by national regulations.

STDC holds consent **5349-1** to discharge up to 15,000 m^3/day of uncontaminated stormwater and 4,000 m^3/day of treated stormwater onto and into land and into an unnamed tributary of the Waingongoro River. This permit was issued by the Council on 15 March 2000 under Section 87(e) of the RMA. It is due to expire on 1 June 2034.

The consent was reviewed on 24 August 2017, with additional review dates included in condition 19. It was also varied in December 2017 at STDC's request, with the timeframe for the provision of the Landfill Management Plan changed. The change made was from it being required three months to prior to exercise of the consent, to simply being required prior to the exercise of the consent. As this consent would be exercised prior to the placement of any waste, and the Council was provided with an opportunity to review and request changes to the plan as it was being drafted, the timeframe requirement was no longer considered necessary.

Condition 1 requires the submission of a Landfill Management Plan prior to the exercise of the consent and states that this plan must be adhered to at all times.

Condition 2 prohibits the discharge of any leachate.

Conditions 3, 5, 6 and 15 deal with the management and certification of the onsite stormwater systems and prohibit the direct discharge of contaminated stormwater.

Condition 4 requires the adoption of the best practicable option to prevent or minimise effects.

Conditions 7 and 8 specify the mixing zone, prohibit specific effects and give parameter limits for certain components in the receiving waters.

Conditions 9, 10 and 11 relate to the minimisation of disturbance of vegetation, and erosion and destabilising of land, due to construction and stormwater runoff. These conditions also require remediation if necessary.

Conditions 13 and 14 relate to site monitoring. These conditions require that an Annual Monitoring Plan be provided by the consent holder, with the initial plan to be provided to the Council at least six months prior to exercise of the consent. The results must also be provided to the Council by 31 August each year.

Condition 16 sets out the requirements for a Neighbourhood Liaison Committee.

Condition 17 specifies that the consent will lapse after a 20 year period if the consent is not exercised.

Condition 18 restricts the matters for which variations to the consent may be sought.

Condition 19 contains review provisions.

This summary of consent conditions may not reflect the full requirements of each condition. The consent conditions in full can be found in the resource consent which is appended to this report (Appendix I).

1.3.3 Air discharge permit

Section 15(1)(c) of the RMA stipulates that no person may discharge any contaminant from any industrial or trade premises into air, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations.

STDC holds consent **5348-1** to discharge emissions into the air from landfilling activities. This permit was issued by the Council on 15 March 2000 under Section 87(e) of the RMA. It is due to expire on 1 June 2034. The consent was reviewed on 24 August 2017, with additional review dates included in condition 19.

Condition 1 requires the submission of a Landfill Management Plan three months prior to the exercise of the consent and states that this plan must be adhered to at all times.

Condition 2 requires the adoption of the best practicable option to prevent or minimise effects.

Conditions 3, 4 and 5 specify the nature of prohibited discharges to air and require that dust is controlled.

Conditions 6 and 7 prohibit burning and composting on the site.

Condition 8 relates to gas venting and extraction, prohibiting this to occur within 200 m of the site boundary.

Condition 9 requires all practicable steps be taken to minimise the discharge of contaminants from the site, and includes specific requirements in relation to the method of disposal, compaction and daily cover.

Conditions 10, 11, 12, 14 and 15 relate to monitoring and record keeping. Amongst other things, these conditions:

- require that an Annual Monitoring Plan be provided by the consent holder, with the initial plan to be provided to the Council at least six months prior to exercise of the consent,
- specify the minimum monitoring required,
- require the installation of meteorological station be installed along with specifying the timing of the installation and parameters to be recorded, and
- specify the records that are to be kept, their availability and the reporting of them to the Council.

Conditions 13 and 16 relate to the handling of complaints and the formation of a Neighbourhood Liaison Committee.

Condition 17 specifies a lapse period of 20 years if the consent is not exercised.

Condition 18 restricts the matters for which variations to the consent maybe sought.

Condition 19 is a review condition.

The permit is attached to this report in Appendix I.

This summary of consent conditions may not reflect the full requirements of each condition. The consent conditions in full can be found in the resource consent which is appended to this report.

1.3.4 Discharges of wastes to land

Sections 15(1)(b) and (d) of the RMA stipulate that no person may discharge any contaminant onto land if it may then enter water, or from any industrial or trade premises onto land under any circumstances, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations.

STDC holds consent **5347-1** to discharge contaminants onto and into land. This permit was issued by the Council on 20 July 2000 under Section 87(e) of the RMA. It is due to expire on 1 June 2034. The consent was reviewed on 24 August 2017, with additional review dates included in condition 27.

Conditions 1 and 2 require the submission of a Landfill Management Plan three months prior to the exercise of the consent and state that this plan must be adhered to at all times.

Condition 3 requires that the consent holder meets the costs of the Council retaining a Technical Advisor, and outlines the work that the Advisor may be contracted to undertake on the Council's behalf.

Conditions 4 and 5 relate to landfill construction.

Conditions 7, 8, 9, 10, 11, 12 and 13 specify the types of waste that may and may not be accepted, and the way in which certain waste materials must be managed.

Conditions 14, 15 and 16 relate, in general terms, to the manner in which the wastes are to be discharged and managed.

Conditions 17 and 18 specify monitoring requirements. The consent holder is required to submit an Annual Monitoring Plan to the Council at least six months prior to exercise of the consent. These conditions specify the minimum level of monitoring that must be undertaken and stipulate who the results must be reported and/or made available to. Amongst other things, the Annual Monitoring Plan must include:

- any further baseline monitoring required prior to commencement of filling, and
- guidelines for determining whether or not contamination is occurring, including "alert" and "response" levels for individual contaminants

Conditions 19, 20, and 21 control the areas from which stormwater may be discharged, leachate containment and require on site monitoring.

Conditions 22 and 23 relate to record keeping and notification.

Condition 24 sets out the requirements for the set up of a Neighbourhood Liaison Committee.

Condition 25 specifies that the consent will lapse after a 20 year period if the consent is not exercised.

Condition 26 restricts the matters for which variations to the consent may be sought.

Condition 27 contains review provisions.

This summary of consent conditions may not reflect the full requirements of each condition. The consent conditions in full can be found in the resource consent which is appended to this report (Appendix I).

1.3.5 Land use permit

Section 13(1)(a) of the RMA stipulates that no person may in relation to the bed of any lake or river use, erect, reconstruct, place, alter, extend, remove, or demolish any structure or part of any structure in, on, under, or over the bed, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations.

STDC holds consent **5351-1** to erect, place and maintain structures in the beds of unnamed tributaries of the Waingongoro River for construction and maintenance. This permit was issued by the Council on 20 July 2005 under Section 87(e) of the RMA. It is due to expire on 1 June 2034. The consent was reviewed on 24 August 2017, with additional review dates included in condition 12.

Condition 1 requires the submission of a Landfill Management Plan three months prior to the exercise of the consent and states that this plan must be adhered to at all times.

Conditions 2 sets outs the environmental effects that the exercise of this consent shall not give rise to.

Conditions 3, 4 and 5 deal with the minimisation of erosion, land instability and require rehabilitation at the site if necessary.

Condition 6 requires an Annual Monitoring Plan to be provided by the consent holder, with the initial plan to be provided to the Council at least six months prior to the exercise of the consent.

Condition 7 specifies that the works be certified by a registered engineer and that copies of the certification documents are to be provided to the Council.

Condition 8 requires removal and reinstatement when structures are no longer required.

Condition 9 sets out the requirements for the set up of a Neighbourhood Liaison Committee.

Condition 10 specifies a lapse period of 20 years if the consent is not exercised.

Condition 11 restricts the matters for which variations to the consent may be sought.

Condition 12 contains review provisions.

This summary of consent conditions may not reflect the full requirements of each condition. The consent conditions in full can be found in the resource consent which is appended to this report (Appendix I).

1.4 Monitoring programme

1.4.1 Introduction

Section 35 of the RMA sets obligations upon the Council to gather information, monitor and conduct research on the exercise of resource consents within the Taranaki region. The Council is also required to assess the effects arising from the exercising of these consents and report upon them.

The Council may therefore make and record measurements of physical and chemical parameters, take samples for analysis, carry out surveys and inspections, conduct investigations and seek information from consent holders.

The monitoring programme for the proposed Eltham landfill site consisted of four primary components, having been expanded significantly from the previous year following the notification that the landfill was proceeding and would need to be operational by approximately April 2019. The changes were in line with the recommendations in the 2016-2017 Annual Report and the monitoring is outlined below. The historical monitoring sites are shown in Figure 2, with the monitoring sites used in the 2017-2018 year shown in (Figure 3). Where necessary, further detail on the development of the various aspects of the monitoring programme is contained within the relevant results subsection.

1.4.2 Programme liaison and management

There is generally a significant investment of time and resources by the Council in:

- ongoing liaison with resource consent holders over consent conditions and their interpretation and application;
- in discussion over monitoring requirements;
- preparation for any consent reviews, renewals or new consent applications;
- advice on the Council's environmental management strategies and content of regional plans; and
- consultation on associated matters.

1.4.3 Site inspections

Initially when this programme was set up, site inspections were only scheduled to be carried out to monitor landfill construction and operation. As construction was significantly delayed, routine compliance monitoring inspections were put in abeyance until preparations for construction begin.

During the year under review there was an inspection scheduled to confirm that the weather station complied with the requirements of the consent. In addition to this there was one site visit undertaken to observe and confirm appropriate methodology for the compaction testing of the in-situ soils.

1.4.4 Chemical sampling

The Council undertook baseline monitoring of groundwater in the vicinity of the site and the receiving waters below the proposed landfill site.

The programme included the sampling of 19 groundwater sites and six surface water sites on two occasions. The samples were analysed for a wide variety of components to assess the baseline concentrations of the analytes that the consents would require to be monitored once they are exercised and those recommended by New Zealand and international best practice guidelines.

Three of the surface water sites were those that have been monitored for a small range of basic parameters for 14 years (Figure 2). An additional three sites (Figure 3) were added to the programme during the year under review, due to the planned construction of Stage 1, in the headwaters of the 'southern ephemeral' tributary.

Seven of the groundwater monitoring bores were those that had been monitored for a small range of basic parameters for up to 14 years, during the period August 2005 to June 2014 (Figure 2). However, during this time period, some of the bores fell into disrepair so do not have a full data set. The 12 bores added to the programme were drilled during the year under review to meet the requirement of consent 5347. The bores monitored during the year under review to meet the requirements of this consent are shown in Figure 3.

At the request of STDC, the programme also included baseline monitoring of the neighbours' water supplies that would require testing after the consents are exercised. This was agreed during the consent application consultation process and documented in the consent conditions. The consent provides for this work to be undertaken by STDC, however, the Council was requested to undertake this work on their behalf.

1.4.5 Biomonitoring surveys

Biological surveys were performed on two occasions in an unnamed tributary of the Waingongoro River. Three of the sites were established sites, used on 11 occasions previously to gather baseline data prior to the establishment of the proposed Eltham Central landfill. An additional two sites were added during the period under review, due to the planned construction of Stage 1, in the headwaters of the 'southern ephemeral' tributary.

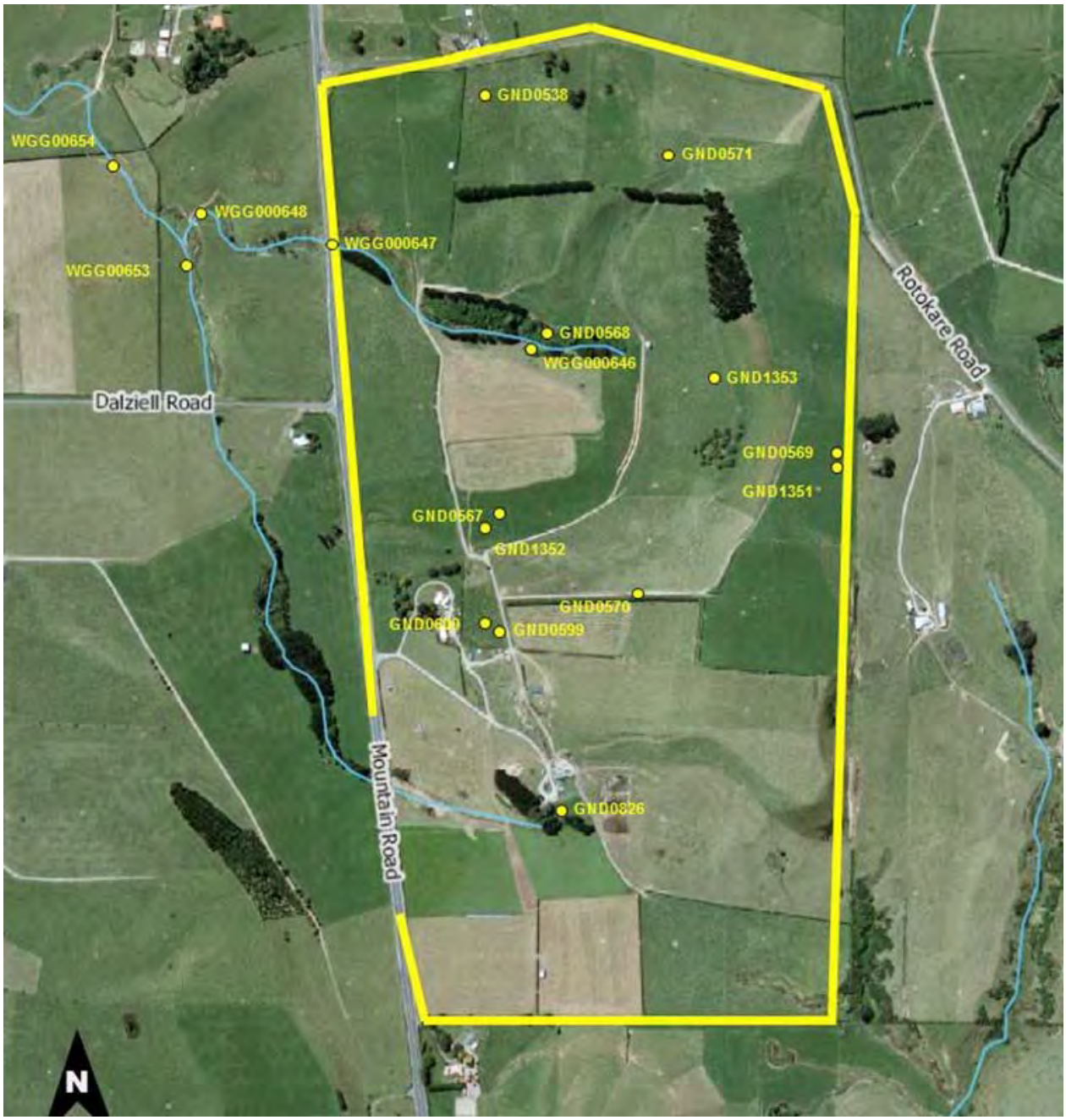

Figure 2 Aerial view of the Eltham Central landfill site and sampling points, up to June 2017

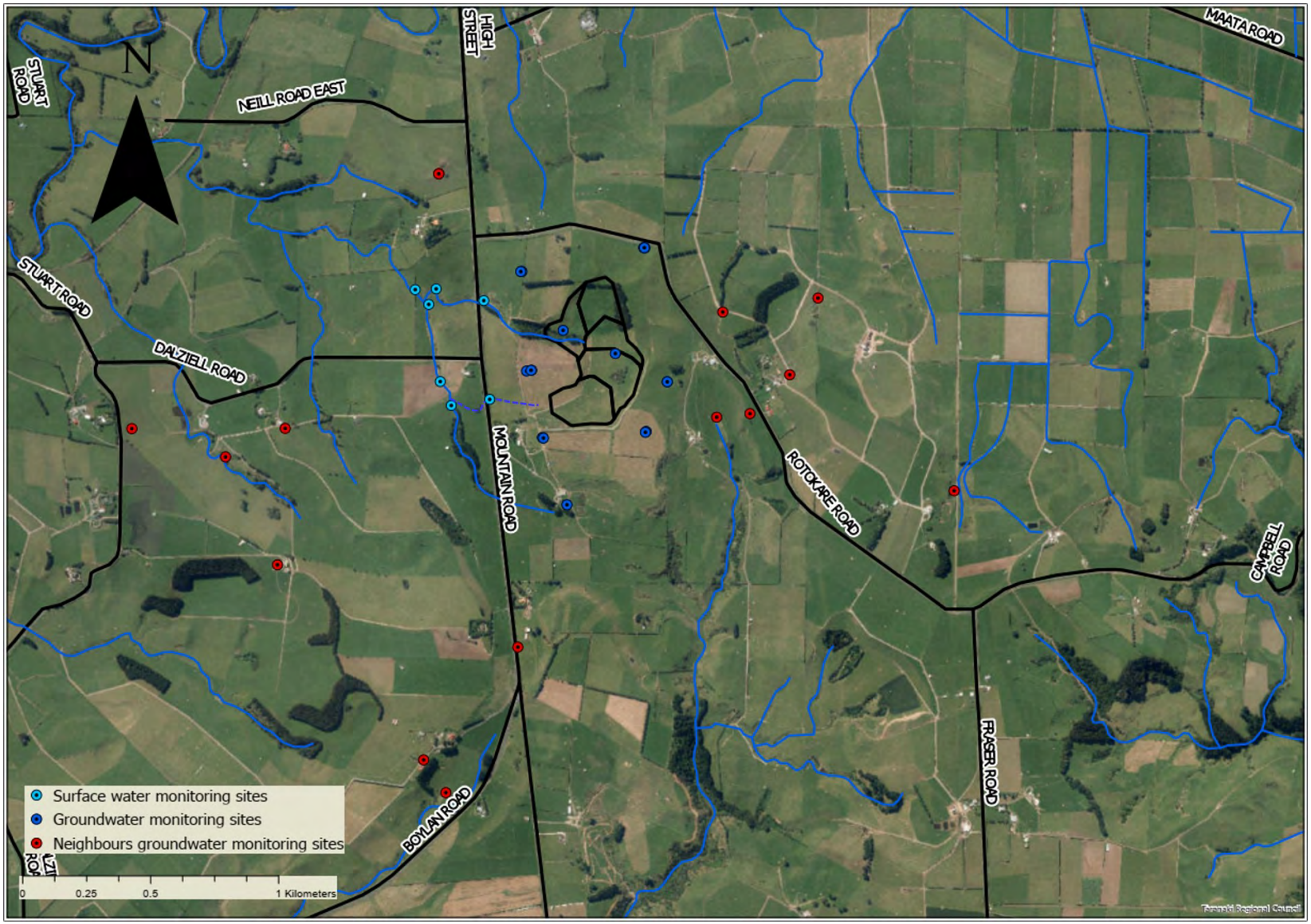

Figure 3 Increased Eltham Central landfill monitoring network, July 2017 onward

2 Results

2.1 Programme management and liaison

There were a series of meetings held with the STDC design team and their consultants, along with the technical expert supporting the Council as required by the consents (for example condition 3 of consent 5347).

The meetings and associated liaison occurred on a regular basis from July 2017 to May 2018. During this period the initial draft design, additional testing (e.g. compaction and infiltration rate), the final design and operation and management plans were developed, and the Stage 1 enabling works commenced. The initial draft design showed that the slopes proposed for the sides of the landfill, the cap contour and liner details provided in the concept plans provided with the initial applications, presented health and safety implications and/or did not meet current best practice. The STDC design team kept the Council fully informed of the changes that would have to be made to the build design and sought confirmation that these would be acceptable with respect to a variation and/or review of the conditions of the consent and environmental performance. The neighbourhood liaison meetings also commenced with the neighbours kept abreast of changes to the design and the proposed stage preparation ground work schedule. Their comments were sought prior to moving to the next stage of the design work. Areas of particular relevance to the neighbours were discussed and these included the road re-alignment feedback, the changed contour of the cap, and the screen planting.

Council was advised on 24 May 2018 that the decision had been made to stop the enabling works in order to undertake stabilisation works for the winter. The site was to be monitored by the contractors during the winter and work was expected to recommence in October 2018.

2.2 Water

2.2.1 Inspections

Although there were no inspections scheduled in this baseline monitoring programme, there was one site visit undertaken during the development of the detailed design, and the site was visited on multiple occasions in association with the new culvert and earthworks consents for the Stage 1 enabling works.

27 March 2018

The site was visited along with the STDC design team and the Technical Expert supporting the Council. The purpose of the visit was to get an appreciation for the work that had happened on site to date, and to observe the compaction testing that was taking place.

As mentioned above, monitoring of the enabling works was carried out. As this was under consents 10501 (discharge of sediment) and 10502 (culvert install), it does not form part of this baseline monitoring programme. However, it is noted that the site was found to be compliant with consent conditions and the sediment controls that were put in place were of a high standard and were well maintained.

Photo 8 Silt controls below the stockpile area in the north west corner of the site, March 2018

Photo 9 Silt controls above southern ephemeral tributary, May 2018

Photo 10 Sediment control pond approximately 100 m above WGG000647, June 2018

Photo 11 Central stormwater pond (headwaters above WGG000647), June 2018

2.2.2 Results of surface water monitoring

Sampling of six sites was undertaken on two occasions (6 March and 14 June 2018). The sampling sites are shown in Figure 5 and the results for selected parameters are presented in Table 2 and Table 3. The full results are attached in Appendix II.

A baseline characterisation of the water type present at each of the sampling sites at the time of the surveys is given in the following Piper diagram. This may be a useful comparator in relation to looking for potential connection to the groundwater aquifers monitored (that is identifying possible contaminant transmission routes), seasonal variations and changes that may occur to groundwater recharge in the area, as the landfill basin becomes disconnected from any direct rainfall recharge.

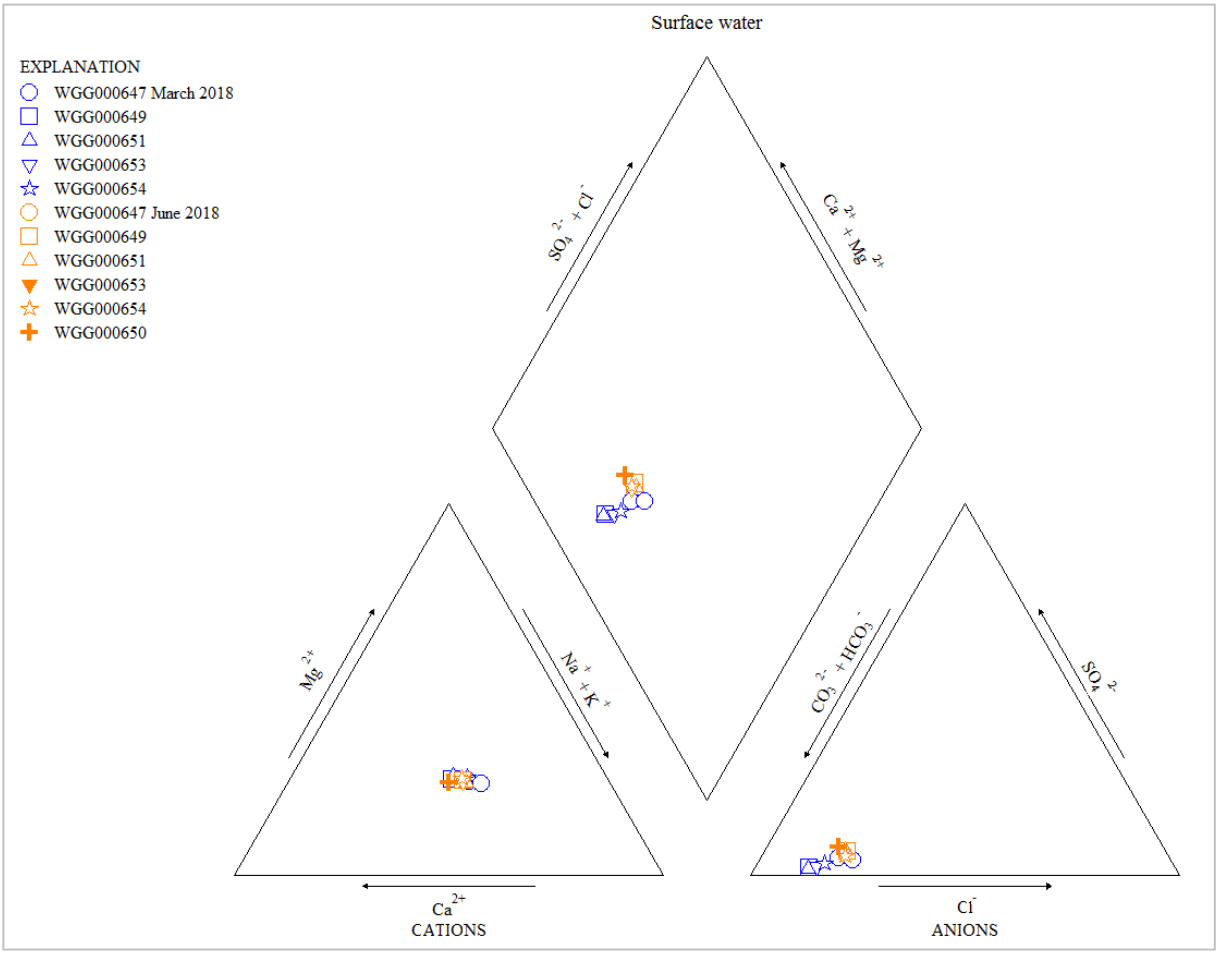

Figure 4 Piper diagram for the surface water monitoring during the year under review

In terms of water type, the piper diagram shows that the water collected from all six surface water sampling sites are chemically similar, with slight seasonal changes in some parameters.

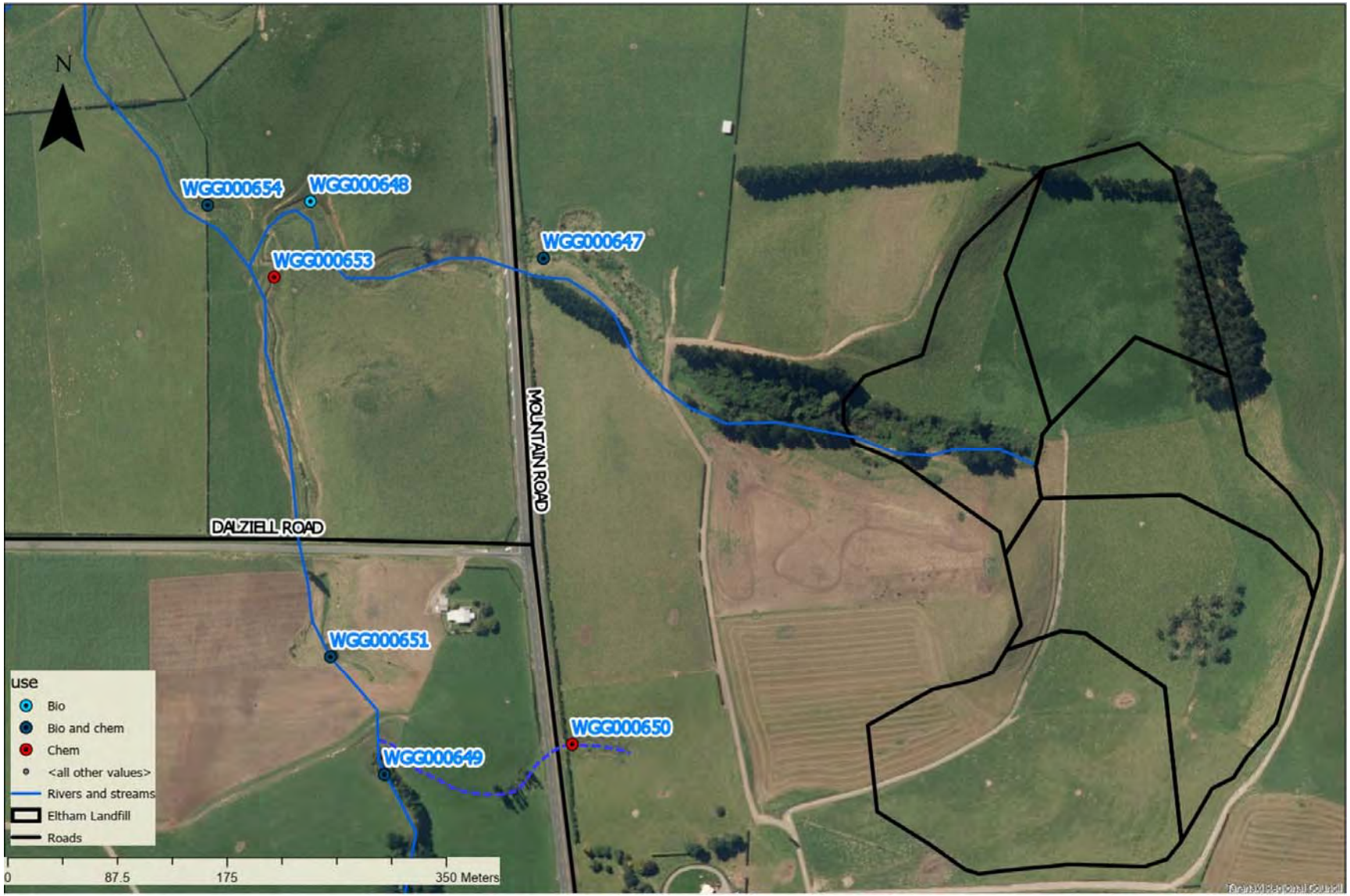

Figure 5 Eltham Central landfill surface water monitoring sites

The results for most of the surface water are as expected for the site in its current use, and the downstream land use (dairy farming).

From a baseline monitoring perspective, it is noted that there are occasional high faecal coliform results found in the main tributary that are above the levels permitted by the landfill consent (1,000 cfu/100 ml). There were elevated results found during the 2015-2016 and 2016-2017 years. In the 2016-2017 year, the level of faecal coliforms found in the main tributary on 28 February 2017 was 3,700 cfu/100 ml. This result was logged as an unauthorised incident. The investigation did not identify the source of this particular discharge however, some recommendations were made to neighbouring farms to minimise the effects of the agricultural land use.

During the year under review, a result of 5,400 cfu/100 ml was returned for the sample collected at the same location (WGG000653) on 6 March 2018. The count obtained for the new site (WGG000651) upstream of Dalziell Road and downstream of the southern ephemeral tributary was 1,600 cfu/100 ml. It was noted at the time of sampling that the sample collection point for WGG000649 was moved upstream slightly as the electric fence erected to exclude livestock from the tributary had been taken down by the livestock. Although there were no livestock present at the time of sampling, there was extensive pugging and noticeable cow excrement present in the low lying swampy area around the sampling site.

The levels of zinc, copper, and dissolved reactive phosphorus are low and stable, as are the levels for alkalinity, conductivity and filtered carbonaceous biochemical oxygen demand (BODCF). The results from this monitoring period are, for the most part, comparable to those found over previous monitoring periods and generally indicate typical water quality for this type of waterbody.

In addition to the previously monitored biological and physicochemical parameters and organic and non organic indicator chemicals, the samples collected during the year under review were also tested for volatile and semi-volatile organic compounds (VOC's and SVOC's), organo-nitrogen and phosphorus pesticides and a range of total and dissolved metals. There were no VOC's, SVOC's and organo-nitrogen and phosphorus pesticides detected at any of the sites at the time of the two sampling surveys. The full results are attached in Appendix II

Table 2 Results of surface water sampling at the Eltham Central landfill, 6 March 2018

Parameter	Unit	6 March 2018					
		WGG000649 250m u/s Dalziell road	WGG000650* Ephemeral trib below	WGG000651 75m u/s Dalziell road	WGG000653 u/s landfill trib	WGG000647 landfill trib d/s of site	WGG000654 200m d/s S.H.3
Alkalinity	g/m^3	99	-	104	74	58	63
BODCF	g/m^3	<2	-	<2	<2	<2	<2
Conductivity	mS/m @25°C	32.0	-	32.7	27.5	26.2	25.9
Dissolved copper	g/m^3	<0.0005	-	0.0006	0.0005	0.0008	0.001
Total copper	g/m^3	0.00076	-	0.00097	0.00065	0.0026	0.00093
Dissolved oxygen	g/m^3	6.88	-	6.58	4.98	4.52	7.03
Dissolved reactive phosphorus	g/m^3	0.042	-	0.020	0.010	0.019	0.010
Faecal coliforms	per/100ml	350	-	1,600	5,400	1,110	700

Parameter	Unit	6 March 2018					
		WGG000649 250m u/s Dalziell road	WGG000650* Ephemeral trib below	WGG000651 75m u/s Dalziell road	WGG000653 u/s landfill trib	WGG000647 landfill trib d/s of site	WGG000654 200m d/s S.H.3
Dissolved iron	g/m^3	0.08	-	0.17	0.07	0.06	0.04
Total iron	g/m^3	0.47	-	0.52	0.172	1.3	0.127
Hardness	g/m^3 $CaCO_3$	97	-	101	79	71	71
Unionised ammonia	g/m^3-N	0.0006	-	0.0012	0.0004	0.0003	<0.0004
Ammoniacal nitrogen	g/m^3-N	0.013	-	0.038	0.017	0.010	<0.010
Nitrate/nitrite nitrogen	g/m^3-N	0.51	-	0.33	2.7	3.1	2.7
Nitrite nitrogen	g/m^3-N	<0.002	-	0.007	0.009	0.011	0.007
pH	pH	8.0	-	7.8	7.7	7.7	7.8
Suspended solids	g/m^3	14	-	3	<3	4	<3
Temperature	Deg °C	17.0	-	18.0	16.4	15.7	16.1
Dissolved zinc	g/m^3	0.0018	-	0.0015	<0.0010	0.0013	0.0015
Total zinc	g/m^3	0.0067	-	0.0046	0.0019	0.0061	<0.0011
SVOC's	g/m^3	ND	-	ND	ND	ND	ND
VOC	g/m^3	ND	-	ND	ND	ND	ND
Pesticides	g/m^3	ND	-	ND	ND	ND	ND

* Not flowing at the time of sampling

ND Not detected

Table 3 Results of surface water sampling at the Eltham Central landfill, 14 June 2018

Parameter	Unit	14 June 2018					
		WGG000649 250m u/s Dalziell road	WGG000650 Ephemeral trib below	WGG000651 75m u/s Dalziell road	WGG000653 u/s landfill trib	WGG000647 landfill trib d/s of site	WGG000654 200m d/s S.H.3
Alkalinity	g/m^3	68	69	68	63	51	57
BODCF	g/m^3	<2	<2	<2	<2	<2	<2
Conductivity	mS/m @25°C	33.5	31.0	32.6	30.1	26.4	27.6
Dissolved copper	g/m^3	0.0005	0.0027	0.0007	0.0007	0.0007	0.0010
Total copper	g/m^3	0.00118	0.0169	0.00136	0.00179	0.0052	0.0032

Parameter	Unit	14 June 2018					
		WGG000649 250m u/s Dalziell road	WGG000650 Ephemeral trib below	WGG000651 75m u/s Dalziell road	WGG000653 u/s landfill trib	WGG000647 landfill trib d/s of site	WGG000654 200m d/s S.H.3
Dissolved oxygen	g/m^3	8.52	7.26	8.39	9.19	8.95	9.31
Dissolved reactive phosphorus	g/m^3	0.017	0.007	0.010	0.018	0.016	0.014
Faecal coliforms	per/100ml	700	49	350	540	540	540
Dissolved iron	g/m^3	0.05	0.04	0.08	0.07	0.06	0.07
Total iron	g/m^3	0.80	7.0	0.82	0.91	1.61	1.36
Hardness	g/m^3-$CaCO_3$	92	91	93	83	68	76
Unionised ammonia	g/m^3-N	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Ammoniacal nitrogen	g/m^3-N	<0.010	0.012	0.012	0.025	0.015	0.016
Nitrate/nitrite nitrogen	g/m^3-N	4.3	1.69	4.2	4.3	4.4	4.2
Nitrite nitrogen	g/m^3-N	0.005	0.004	0.007	0.008	0.007	0.008
pH	pH	7.6	7.4	7.5	7.5	7.4	7.4
Suspended solids	g/m^3	17	54	17	24	38	24
Temperature	Deg °C	12.7	11.7	12.8	13.6	12.1	13.7
Dissolved zinc	g/m^3	0.0017	<0.0010	0.0024	0.0017	<0.0010	<0.0010
Total zinc	g/m^3	0.0088	0.0131	0.0076	0.0061	0.0041	0.0057
SVOC's	g/m^3	ND	ND	ND	ND	ND	ND
VOC	g/m^3	ND	ND	ND	ND	ND	ND
Pesticides	g/m^3	ND	ND	ND	ND	ND	ND

ND Not detected

Historical surface water data for the proposed landfill site for selected parameters is shown in Figure 6 to Figure 9.

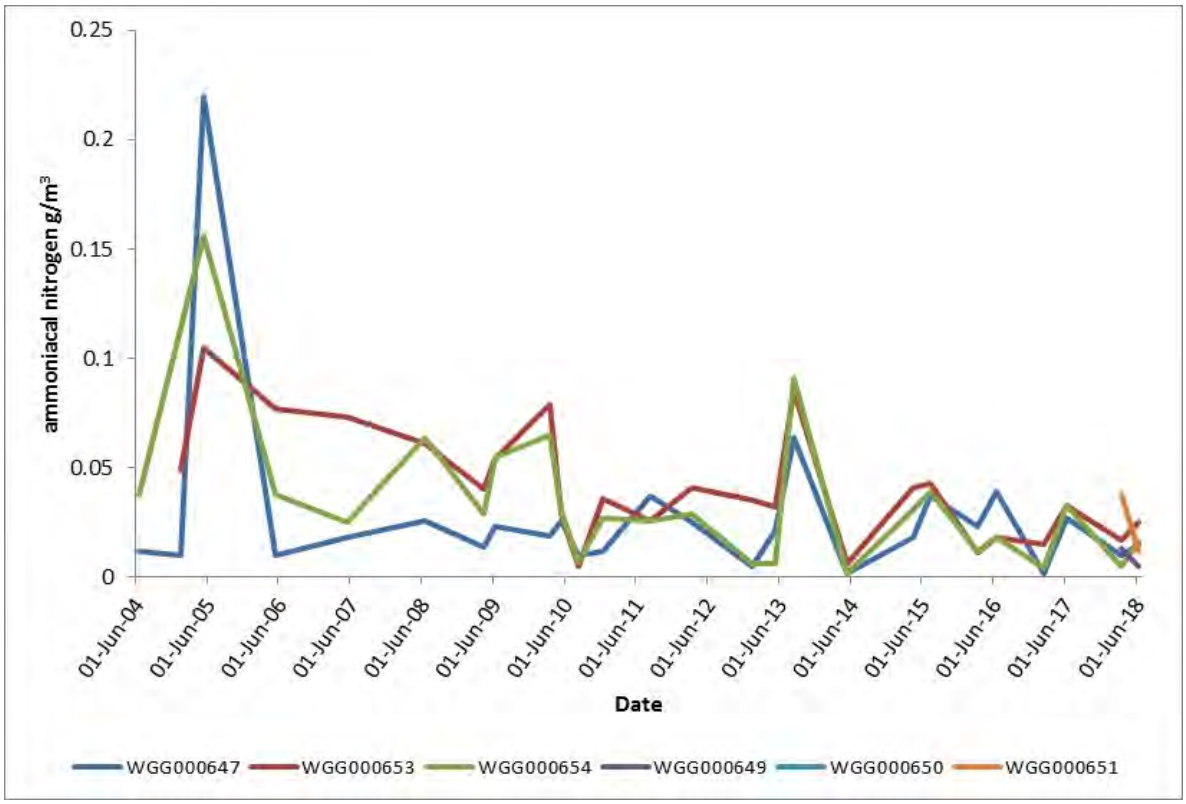

Figure 6 Ammoniacal nitrogen levels found in surface water at the Central landfill site, 2004-2018

Figure 6 illustrates comparative fluctuations in the levels of ammoniacal nitrogen at all sites. All the results are for surface water sites in pastoral areas, and when taken in conjunction with pH and temperature measurements, the highest level of free ammonia found to date at any of the sites is 0.0012 g/m^3 (WGG000653, January 2013 and WGG000651, 6 March 2018) . This is well within the 0.025 g/m^3 guideline for aquatic ecosystem protection.

The level of suspended solids also fluctuate over time with a range of <2 to 250 g/m^3 recorded over all the sites. The unnamed tributaries on this site are generally small, clear running, low energy brooks with silty beds. Some of the monitoring sites are very slow flowing under low flow conditions and can become covered in duck weed at some sites. With increased rainfall the suspended solids level in these tributaries can rise quite quickly as silt is stirred up from the beds and edges of the streams, entraining it in the flow. There were some elevated suspended solids found in previous monitoring periods, one across all sites related to a fresh, and the other at site WGG000654 taken during the road re-alignment works in June 2017. Barring these exceptions, the overall the level of suspended solids indicates good water quality in the stream system.

Apart from a slight comparative spike in conductivity levels in the results for June 2008 in the downstream sites, the overall levels had appeared to be quite stable. All but two results were in the 18-27 mS/m range, indicating only moderate to low levels of dissolved metals in this stream system. During the year under review, seven of the 11 results were greater than 27.0 mS/m, two of which were samples collected from the sites that have been monitored since 2004.

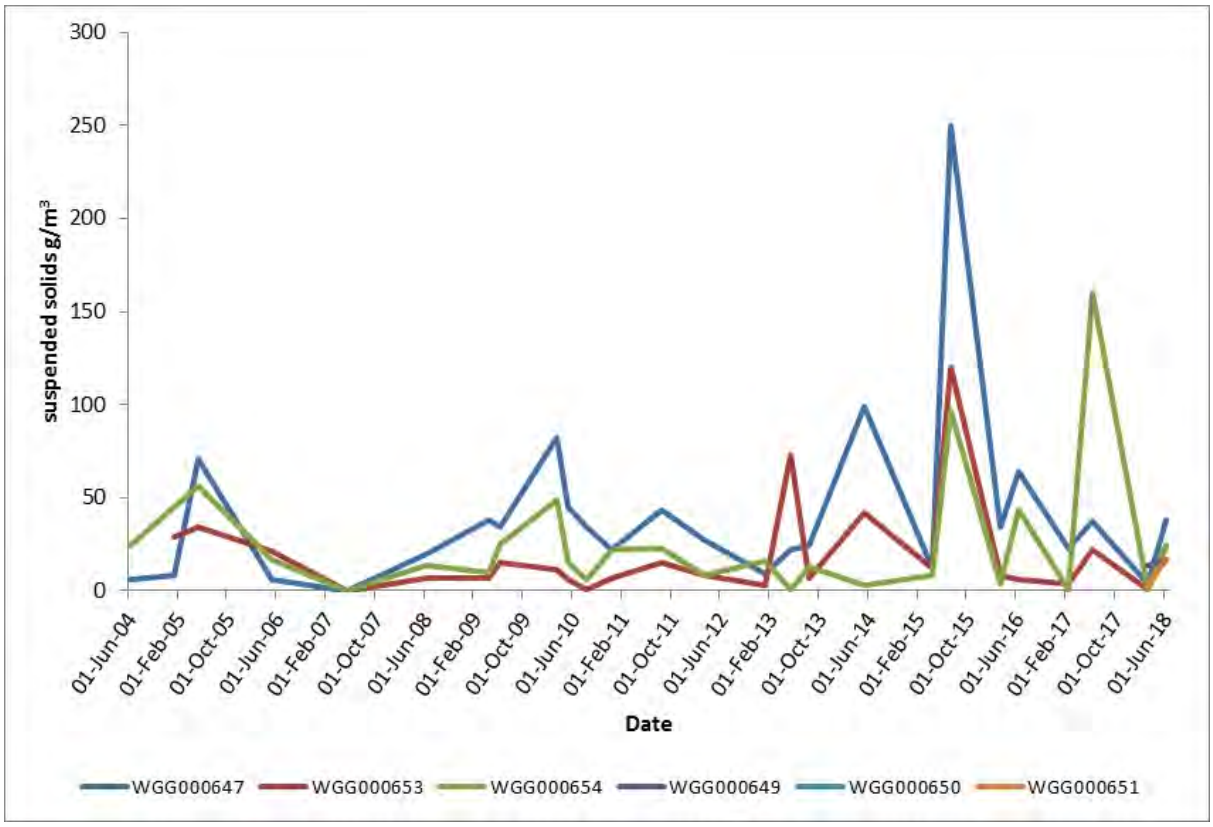

Figure 7 Suspended solids levels found in surface water at the Central landfill site, 2004-2018

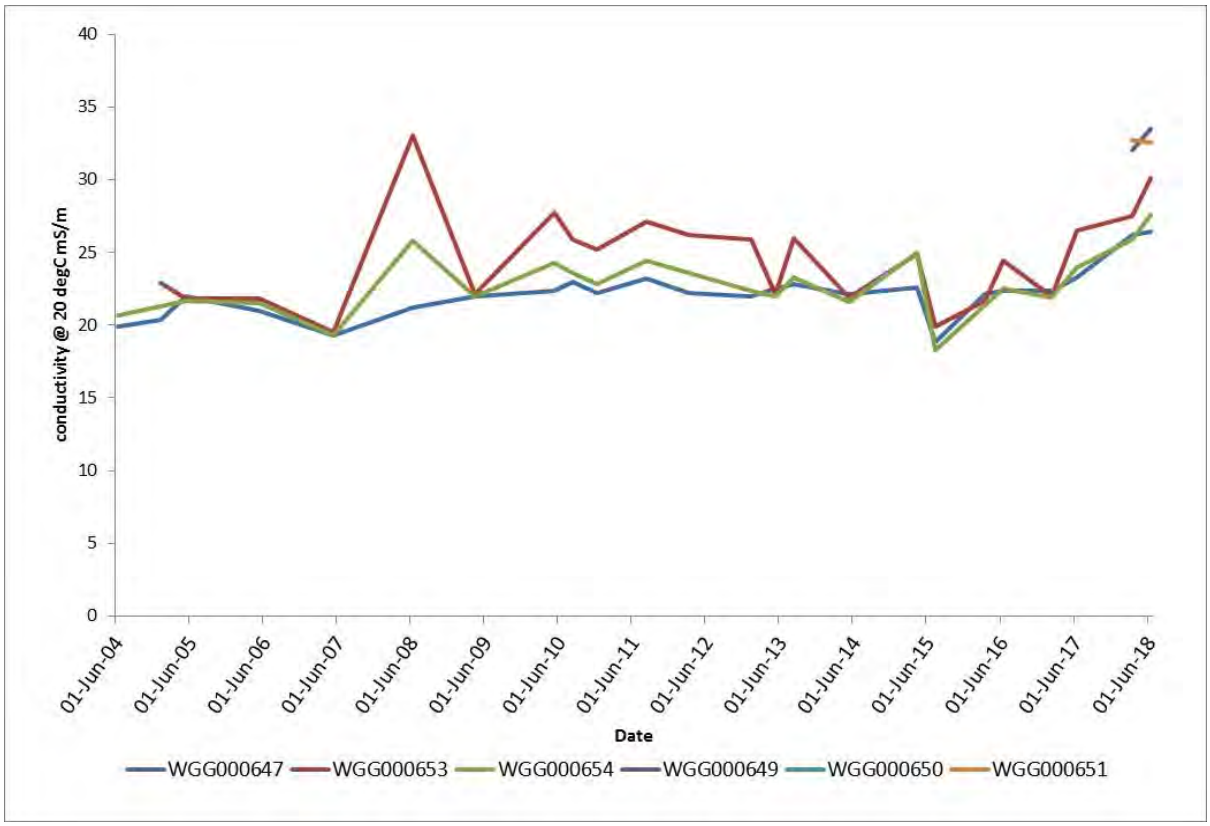

Figure 8 Conductivity levels found in surface water at the Central landfill site, 2004-2018

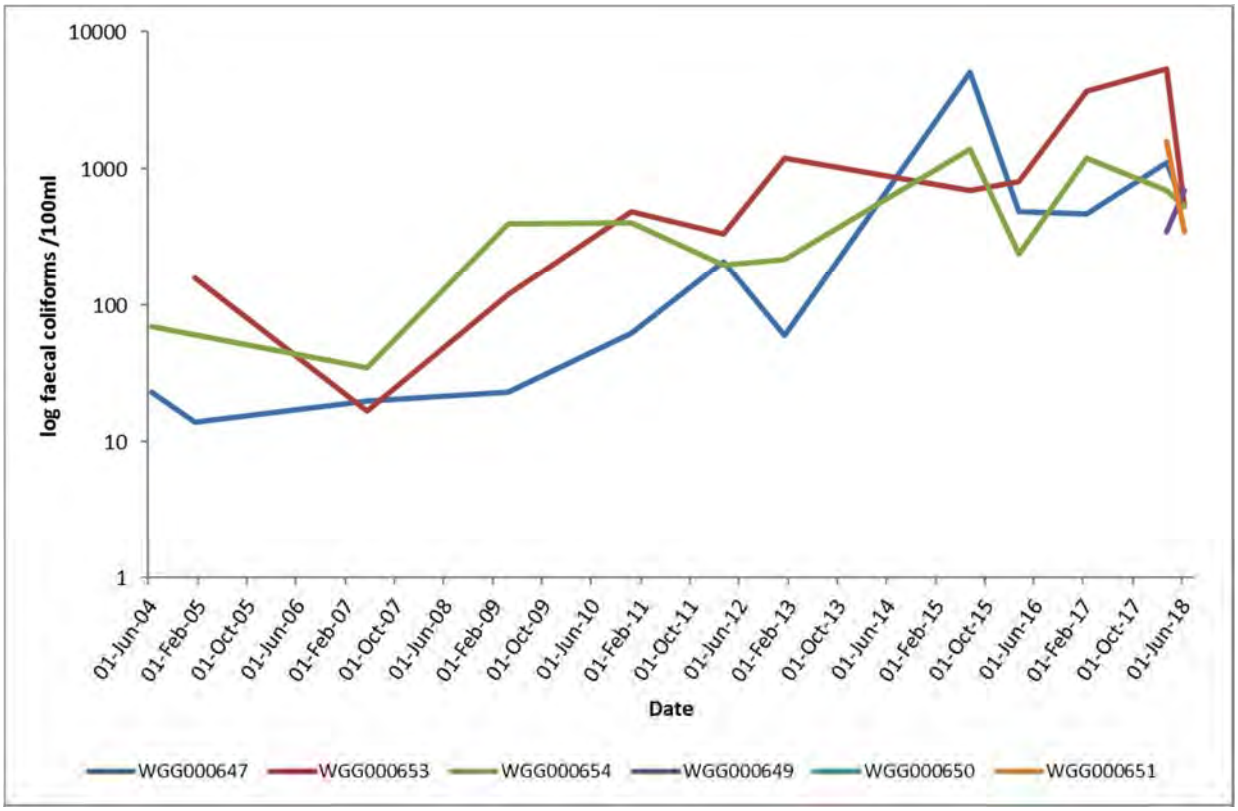

Figure 9 Faecal coliform counts found in surface water at the Central landfill site (log scale), 2004-2018

Overall water quality downstream of the proposed landfill site is quite good and is comparable to that expected in similar streams in the area. The concentrations of ammoniacal nitrogen, conductivity and faecal coliforms are generally found to be higher at site WGG000653, upstream of the northern landfill tributary (with the exception of the faecal coliforms in the northern landfill tributary in July 2015). The same can be said of the newly introduced sampling sites aimed to isolate potential effects from the southern ephemeral tributary that is downstream of Stage 1 of the landfill. It is noted that there appears to be an emerging trend of increasing conductivity and faecal coliforms in the pre landfilling condition of the tributaries.

2.2.3 Groundwater monitoring

This monitoring was put in abeyance until the two years prior to construction activities commencing at the site. As it was anticipated that the landfill would be accepting waste some time just prior to June 2019, the baseline groundwater monitoring was increased significantly during the year under review. This was carried out based on the recommendations of the 2016-2017 year, which is summarised below.

The nature of the baseline monitoring that needed to be undertaken to add to the baseline data already collected was assessed as follows:

- Parameters for baseline monitoring needed to include those listed in the consent for on-going monitoring, those deemed necessary for groundwater characterisation, and those identified as possible landfill contaminants. Baseline monitoring should be carried out as early as feasible and be carried out during summer and winter to capture any seasonal differences.
- All bores needed to be surveyed to provide accurate ground reduced levels (GRL) and casing heights to allow for ongoing groundwater flow monitoring in the target aquifers.
- Water level monitoring needed to be undertaken at least quarterly in the majority of bores to monitor seasonal effects and at 15 minute intervals, using downhole loggers, in at least three (shallow, moderate, deep) bores to provide a more comprehensive dataset.

Consent 5347 requires quarterly monitoring of the bores shown in the application documentation, with an additional bore to be installed down gradient of the leachate pond. The application documentation was reviewed and it was identified that this amounted to a minimum of 15 bores. The consent is also specific about the parameters that need to be monitored on a quarterly and/or annual basis. Work was undertaken during the 2016-2017 year in an attempt to locate all of the bores specified in the application and assess their condition. The activities and revisions to the baseline monitoring programme with respect to the groundwater monitoring locations is discussed further in section 2.2.3.1, with the results of the baseline groundwater monitoring undertaken to date discussed in the following sections.

Once consent 5347 is exercised the monitoring of groundwater will need to be undertaken on a quarterly basis as per good practice guidelines and condition 17 of consent 5347.

2.2.3.1 Groundwater monitoring bores

The original groundwater monitoring bores were installed for geotechnical and engineering purposes such as groundwater level and flow direction determination, and it was previously considered that there may have been be sufficient water level data collected already to serve this purpose. For a number of years, it was considered that the existing bores could, in the short term, remain in their current state and be dealt with once it was confirmed that the site would be developed for landfilling.

In previous annual reports it was noted that, prior to the exercise of the consents, many of the bores required maintenance and in some cases may need relining or re-drilling. It was noted that many of the bores are likely to be sitting within the proposed landfill footprint and would have to be retired appropriately to prevent them becoming a potential conduit for contaminants to enter groundwater.

Condition 17 of consent 5347 requires that all 14 bores identified in the application information (Appendix IV), and at least one additional bore down gradient of the leachate storage pond, are monitored. During the 2016-2017 year, the site was visited to reassess the condition of the bores and to attempt to locate all 14 bores. The consent requirements and recommendations contained in previous annual reports were also evaluated. Only seven of the original bores were located that were, or could easily be made, fit for the purpose of monitoring groundwater levels and quality, with some of the bores requiring maintenance to make them useable. New monitoring bores were drilled and old bores reconditioned as required. Bore GND0567, which was required for monitoring under the air discharge consent rather than for groundwater quality purposes, was decommissioned to allow for the installation of a sediment detention pond.

In August and September 2017, STDC installed 12 new groundwater monitoring wells and renovated six old wells at the proposed landfill site. Bores GND0568, GND0569, GND0599, GND0600, GND1351 and GND1353 were renovated. This involved gently developing each well with compressed air, repairing/replacing the steel upstand and pouring a cement pad around the wellhead. The bore details are given in Table 4 and their locations are shown in Figure 11.

Table 4 Groundwater monitoring bore locations required by consent 5347

Bore Name	STDC Name	Coordinates (NZTM) (Taradise)		Ground reduced level masl	Depth	Screened/slotted interval	Depth Range
		Eastings	Northings		mbgl	mblg	
GND0568	BH2	1712127	5631551	206.76	10.1	4.2-10.1	Shallow
GND0569	BH1	1712534	5631349	228.55	35.6	27.5-35.0	Shallow
GND0600	BH7a	1712046	5631130	217.77	20.1	16.3-19.3	Shallow
GND0826	-	1712142	5630866	-	24.2*	-	Shallow
GND1351	BH1a	1712534	5631349	228.48	12	3.0 - 12.0	Shallow

Bore Name	STDC Name	Coordinates (NZTM) (Taradise)		Ground reduced level masl	Depth	Screened/slotted interval	Depth Range
		Eastings	Northings		mbgl	mblg	
GND1353	BH6	1712331	5631460	209.53	13	9.2 - 12.2	Shallow
GND2693	new	1712448	56311501	250.34	10	5.5 – 8	Shallow
GND2696	new	1711961	5631781	215.00	10	5.5 – 7.5	Shallow
GND2699	new	1712441	5631875	218.10	11	4.8 - 10	Shallow
GND2702	new	1711984	5631391	217.87	18	6.5 – 18	Shallow
GND2692	new	1712449	5631152	250.34	40	36 – 38	Intermediate
GND2695	new	1711963	5631782	215.05	41	22.9 – 38.8	Intermediate
GND2698	new	1712444	5631875	218.14	49	37 – 48	Intermediate
GND2701	new	1712001	5631394	218.01	49	40.5 – 47.5	Intermediate
GND0599	BH7	1712050	5631128	250.33	83	78.5 - 81.5	Deep
GND2691	new	1712451	5631153	215.07	83	74 - 80	Deep
GND2694	new	1711965	5631782	218.12	75	68.5 – 72.5	Deep
GND2697	new	1712446	5631875	217.95	79	71 – 74	Deep
GND2700	new	1712004	5631394	206.76	75	65 – 72.5	Deep

Key: * - to be confirmed

Figure 10 Eltham Central landfill groundwater monitoring bore locations, 2017-2018 onwards

The 2016-2017 Annual Report listed the bores that would need to be appropriately abandoned as the project progressed. These are given in Table 5, with the bores to be monitored, to be abandoned and those Council attempted to locate at the site visit are also depicted in Figure 11. The monitoring sites within the landfill footprint are to be decommissioned only when that stage needs to be developed for accepting waste.

During the site enabling works carried out during the year under review some of these bores were appropriately abandoned. Three holes have been decommissioned to date. The decommissioning involved digging a 0.5 m deep square hole around each well head, removing the PVC liner, cutting the steel casing off below ground level, then filling each well and its surrounding hole with cement slurry.

Table 5 Groundwater bores to be appropriately retired and their status

Bore Name	STDC Name	Estimated Coordinates (NZTM)		Shown in consent application documentation (appendix 10 Figure 4 of AEE)	Depth Range (m)	Comments
		Eastings	Northings			
GND0570	BH4	1712142	5630866	Yes	20.3	Bore couldn't be found as it is located in a very overgrown area. Headworks may have been destroyed
-	-	Refer to Appendix IV		Yes	Unknown	Couldn't find a bore in this location. Figure 4 shows the bore about 40 m to west of BH4
-	-	1712396	5630956	Yes	Unknown	Couldn't find a bore in this location
-	-	1712299	5631174	Yes	Unknown	Couldn't find a bore in this location. Figure 4 shows located in stage 3, south of borrow area
GND1352	BH3a	1712093	5631275	Yes	Deep	Decommissioned Oct 2017
Unknown	-	Inside landfill footprint		No	Unknown	Tidy, closed and capped bore not on map or recorded in TRC database. Will require abandonment
GND0538	-	1712043	5631837	No	37.3 m	In a turnip field, determined it would probably have been destroyed during ploughing, or may be incorrect coordinates on GIS
GND0571	BH5	1711888	5631716	Yes	28.0 m	Damaged. Not useable
-	-	Refer to Appendix IV		Yes	Unknown	On figure 4 –stage 5/6 border towards the south west of stage 5, in the borrow area. A pipe/hose was found going into the ground, but no sign of the bore

Bore Name	STDC Name	Estimated Coordinates (NZTM)		Shown in consent application documentation (appendix 10 Figure 4 of AEE)	Depth Range (m)	Comments
		Eastings	Northings			
-	-	1712298	5631522	No	Unknown	RL 209.30 m
-	-	1712325	5631460	No	Unknown	RL 210.30 m
-	-	1712293	5631311	No	Unknown	RL 217.62 m
-	-	1712333	5631350	No	Unknown	RL 215.55 m
-	-	1712228	5631283	No	Unknown	RL 213.75 m

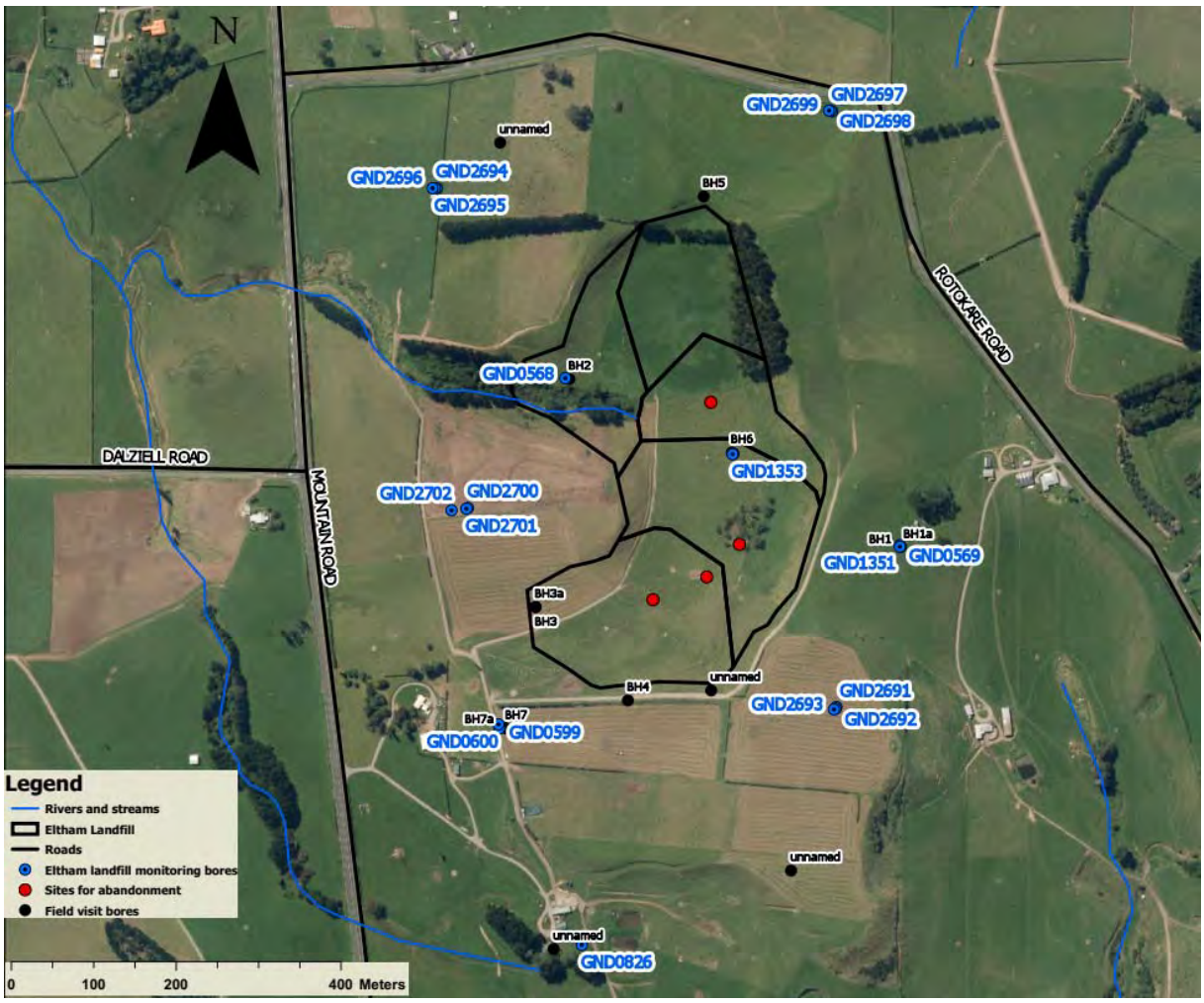

Figure 11 The location of the bores to be monitored and abandoned, and those investigated during the site visit

The bores referred to in the air discharge consent 5348 are given in Table 6. The consent requires annual sampling of the headspace gas in these water monitoring bores, and of the leachate pumping chamber, to be undertaken for the first five years and at five yearly intervals thereafter. The Stage 1 enabling works required BH3 to be abandoned and therefore the appropriate bores for this monitoring, to satisfy the intent of the consent conditions, will be determined when the consents are reviewed/varied prior to waste disposal taking place.

Table 6 Bores for monitoring required by consent 5348-1

Bore Name	STDC Name	Coordinates (NZTM)		Status	Depth	Screened/slotted interval	Depth Range
		Eastings	Northings		m	m	
GND0569	BH1	1712534	5631349		35.6	27.5-35.0	Shallow
GND0567	BH3	1712087	5631271	Decommissioned	-	-	24.0

2.2.3.2 Baseline groundwater monitoring programme

A comprehensive monitoring programme was designed to provide an indication of baseline groundwater flow and quality in the vicinity of the proposed landfill footprint, with the chemical parameters monitored and the reasons for their inclusion outlined in section 1.4.4.

The selected groundwater monitoring sites have been separated into shallow, intermediate and deep, depending on the actual drilled depth of each bore, with additional bores installed during 2017, designed to fill any gaps in monitoring depth (Table 4) and provide good spatial coverage of the area surrounding the proposed landfill (Figure 10). The monitoring sites should provide for reasonable and practicable coverage of the shallow, intermediate and deeper aquifers in the vicinity of the footprint and enable any future assessment of change in flow or quality to be robust.

2.2.3.3 Baseline groundwater elevations

The baseline groundwater elevations for shallow, intermediate and deep bores for November 2017 and July 2018 are shown graphically in Figure 12 to Figure 14. The elevations are expected to be fairly indicative of spring (November 2017) and winter (July 2018) groundwater conditions.

All three intervals show increased groundwater elevations during winter indicating a seasonal response in all intervals. The increase in groundwater elevation between November 2017 and April 2018 differs greatly between bores with the smallest change of 4 cm evident in the shallow bore GND0568 (Figure 12) and the greatest 13.6 m in the deep bore GND2697 (Figure 14). Groundwater elevations in all bores indicate that the predominant groundwater flow direction follows topography, with all intervals showing higher groundwater elevations in the low lying areas located in the base of the topographic depression.

Groundwater level loggers have also now been installed (as of 18 July 2018) into GND2691, GND2692, and GND2693 up gradient of the landfill footprint and GND2700, GND2701 and GND2702 down gradient of the landfill footprint. The data collected will enable a more comprehensive assessment to be made in relation to the connectivity between intervals and the degree each interval responds to rainfall and seasonal change.

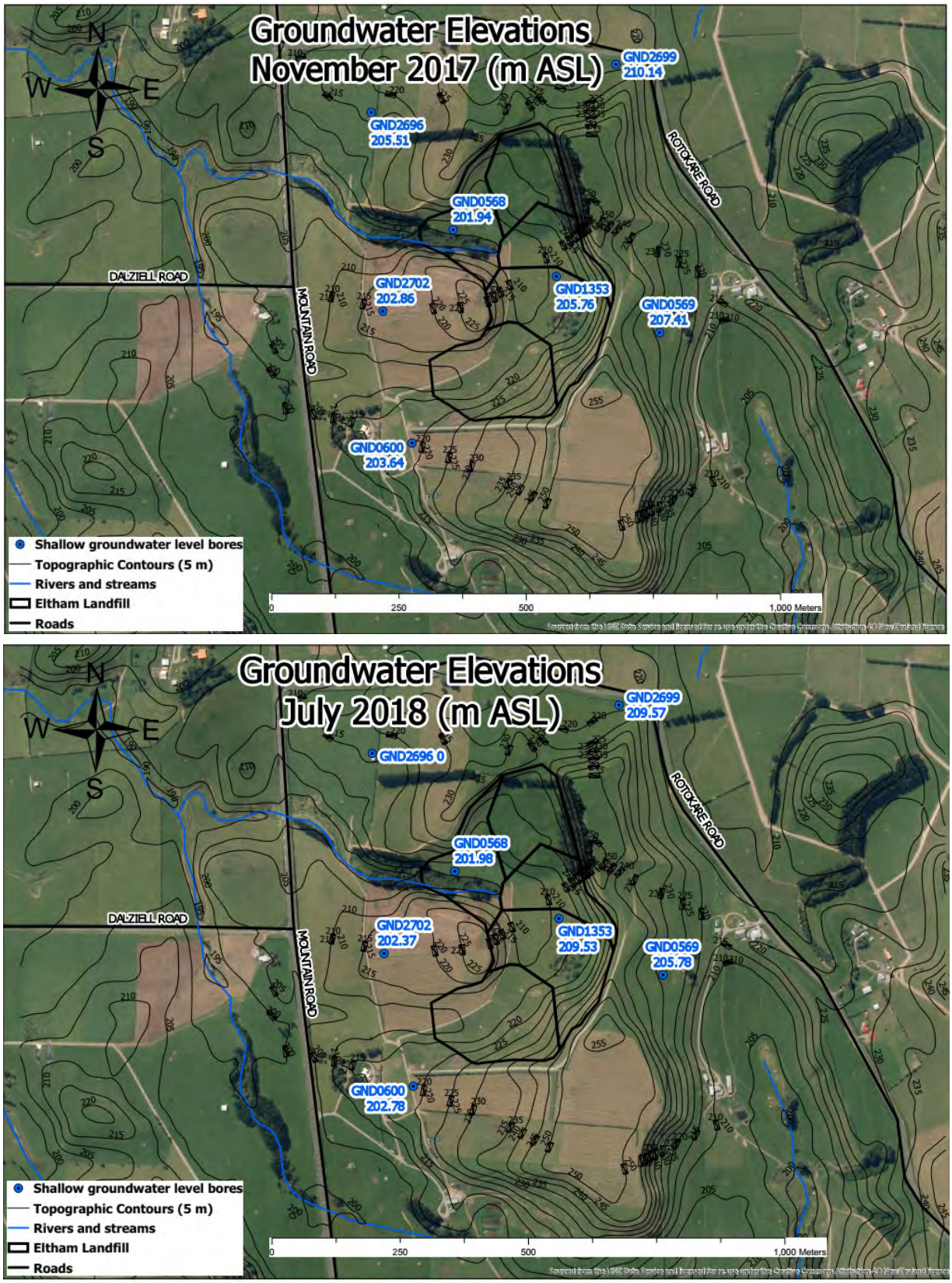

Figure 12 Groundwater elevations in shallow monitoring bores

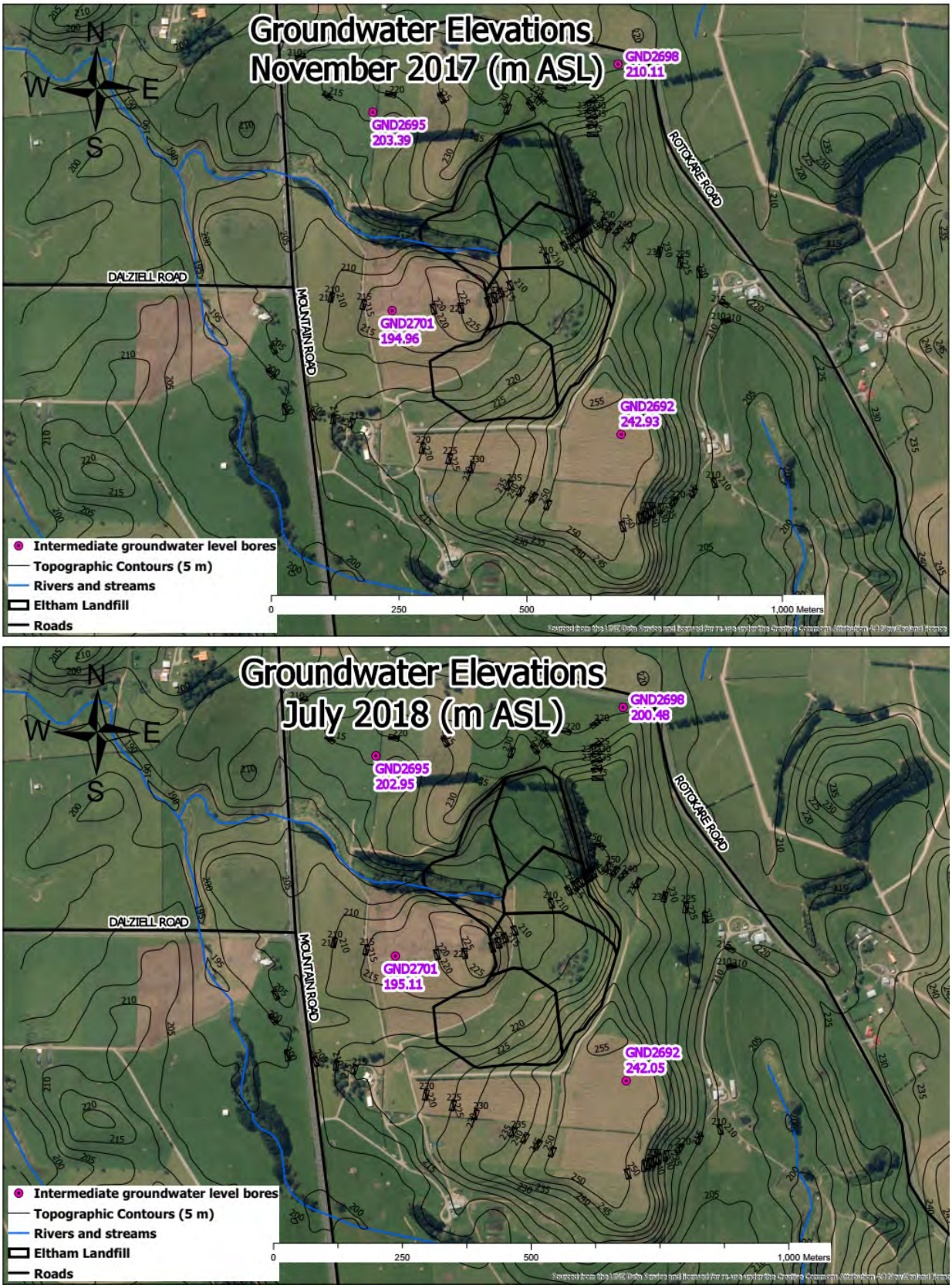

Figure 13 Groundwater elevations in intermediate monitoring bores

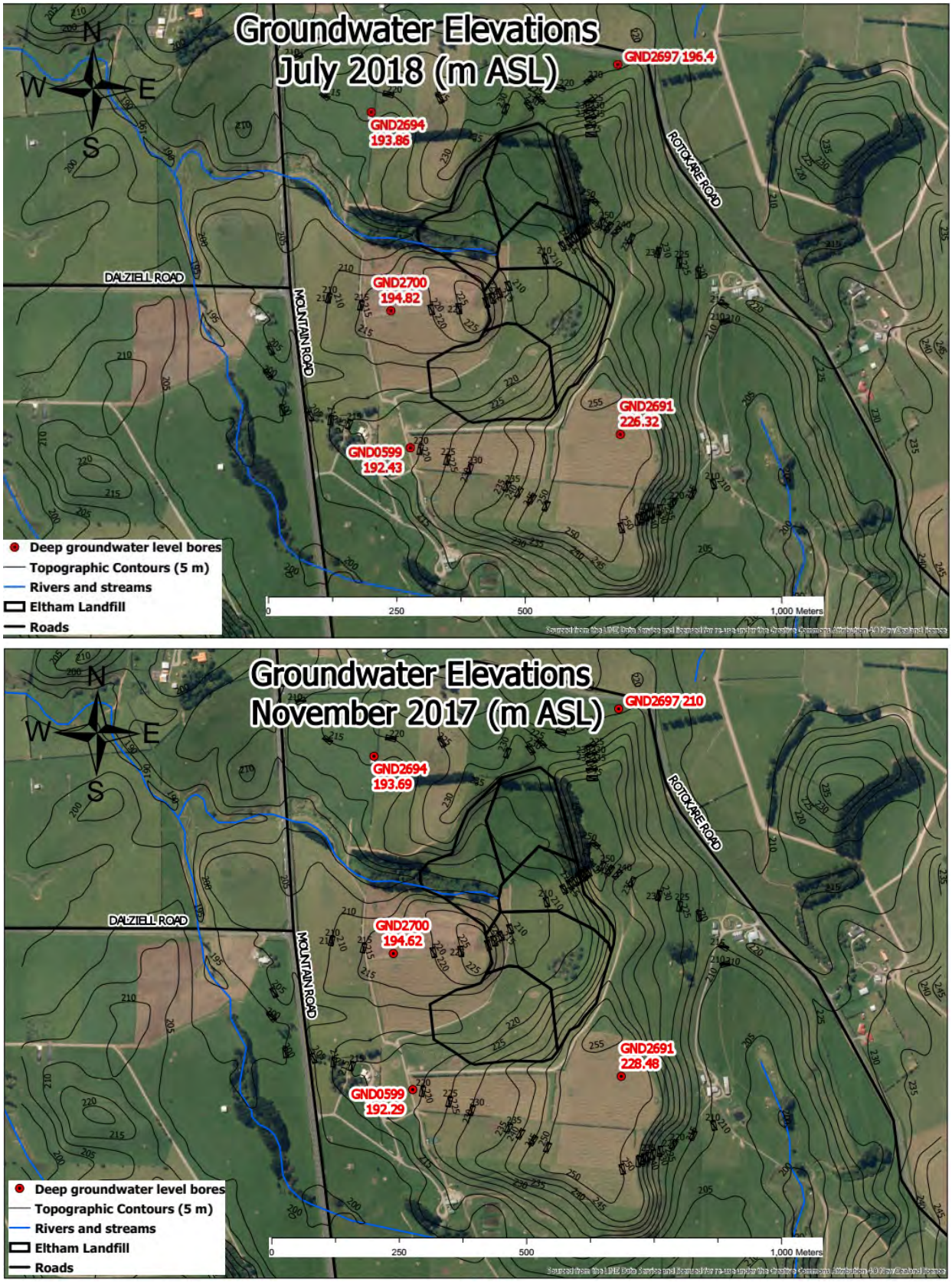

Figure 14 Groundwater elevations in deep monitoring bores

2.2.3.4 Baseline groundwater quality

Shallow, intermediate and deep groundwater monitoring bores were sampled in November and December 2017 and April 2018 and analysed for a comprehensive suite of baseline parameters. The full groundwater quality results are appended to this report (Appendix V). Selected parameters are presented the piper plots below (Figure 15.

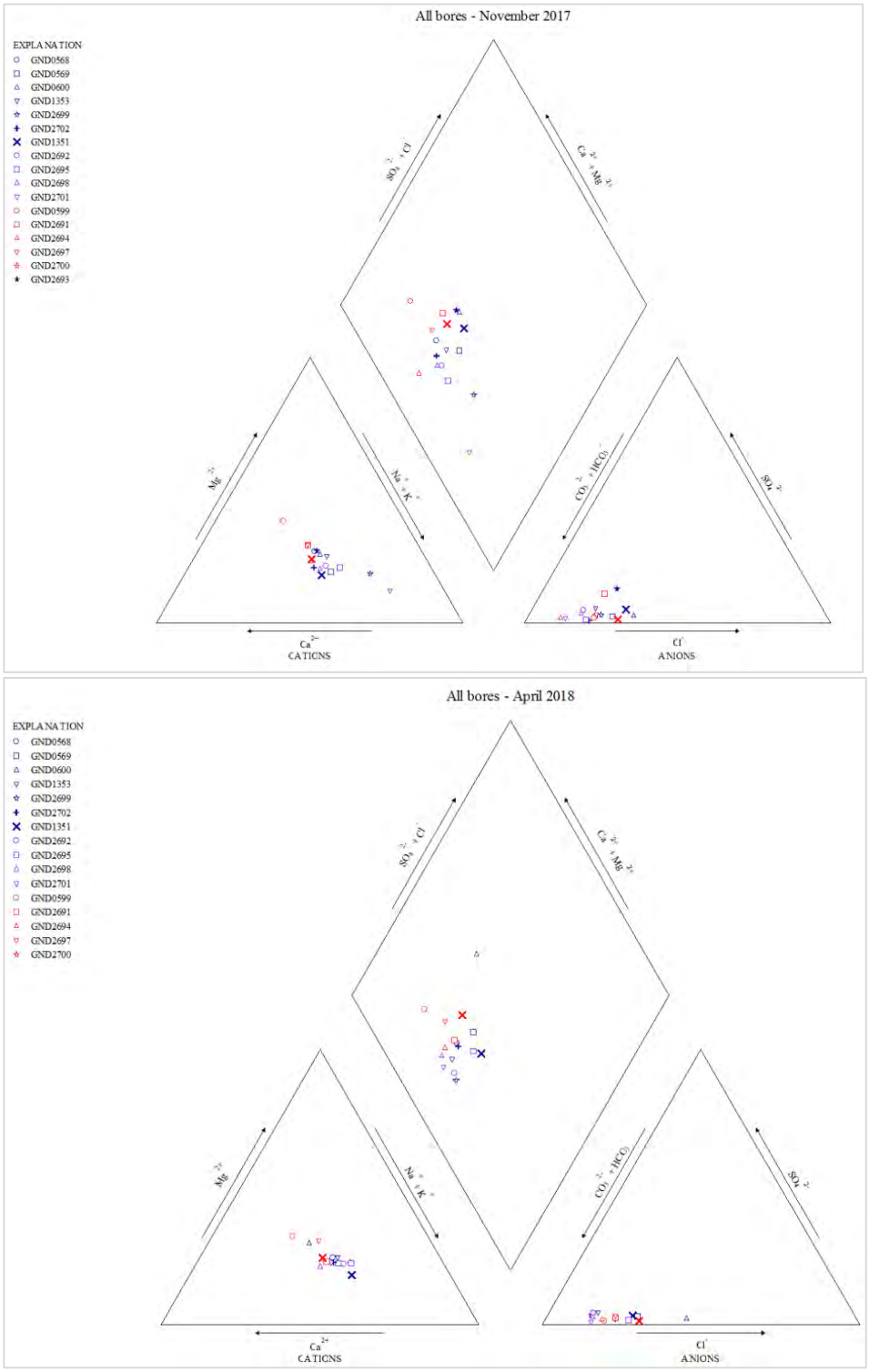

Figure 15 Piper plots for all bores in November/December 2017 and April 2018

The plots provide an indication of the water type at each depth during November 2017 and April 2018 and indicate the following:

- There is no clear distinction between shallow, intermediate and deep groundwater quality;
- There is no clear distinction between water quality reported in November 2017 and April 2018 Shallow bores GND2699, and GND0600 and intermediate bore GND2701 exhibit some slight changes in water quality between November 2017 and April 2018 which may be linked to seasonal effects;
- The majority of bores exhibit generally stable water quality; and
- More data is required to establish whether there are any seasonal or depth related trends.

2.2.3.5 Chemical parameters

Chemical monitoring of the groundwater had been put in abeyance until two years prior to the construction activities commencing. During the year under review, the monitoring programme included sampling of 19 bores on two occasions. At the time of the sampling surveys it was found that bore GND2696 was dry (on both occasions) and bore GND2699 was dry at the time of the April survey. Therefore 18 groundwater samples were collected between late October and early December 2017 and 17 were collected in April 2018. The results for selected parameters are given in Table 7 and Table 8, with the full results included in Appendix V.

There were no organonitrogen or phosphorus pesticides, or semi volatile organic compounds detected in any of the samples collected from any of the bores. In terms of gasses in groundwater, a methane concentration of 0.65 g/m^3 was found on one occasion in bore GND0599, and the only volatile organic compound detected was toluene at a concentration of 0.0012 g/m^3 in GND0599 and 0.0003 g/m^3 in GND2700. The presence of methane and toluene at these low levels indicates the presence of immature hydrocarbons (peats), likely to have been deposited in this former ox bow lake.

The nitrate nitrogen was found to be elevated in some of the bores at the time of either both or one of the surveys. COD was also elevated in GND0600 at the time of the spring survey. This indicates that the bores are showing some impacts from the agricultural activities occurring in the basin prior to the establishment of the landfill, as could be expected in this pre-existing environment. It is noted that there are some elevations observed in shallow, intermediate and deep bores, which may support the possibility of interconnectivity between the various aquifer intervals in some locations

Table 7 A selection of groundwater results, Spring 2017

Site	Collected	Alkalinity g/m³ $CaCO_3$	Ammonia-N g/m³ N	Benzene g/m³	Boron* g/m³	Chloride g/m³	CODF g/m³	Condy mS/m @25°C	Iron* g/m³	Manganese* g/m³	Nitrate-N g/m³ N	pH	Zinc* g/m³
Shallow													
GND0568	31-Oct-17	43	<0.003	<0.0003	0.017	27	<5	23.0	<0.02	<0.0005	5.2	6.4	0.0010
GND0569	1-Nov-17	36	<0.003	<00003	0.013	30	<5	20.5	<0.02	0.0054	3.3	6.6	0.0107
GND0600	31-Oct-17	38	0.031	<0.0003	0.017	45	58	36.6	<0.02	0.0087	14.6	6.4	0.33
GND0826	24-Nov-17	73	0.013	<0.0003	0.018	43	<5	35.0	<0.02	0.0024	7.9	6.7	0.0053
GND1351	2-Nov-17	36	<0.003	<0.0003	0.017	34	<5	21.6	<0.02	0.0007	2.6	6.3	<0.0010
GND1353	31-Oct-17	48	<0.003	<0.0003	0.019	29	<5	25.2	<0.02	<0.0005	4.1	6.9	0.0019
GND2693	31-Oct-17	28	<0.003	<0.0003	0.02	22	<5	18.7	<0.02	<0.0005	2.2	6.45	0.023
GND2696		-	-	-	-	-	-	-	-	-	-	-	-
GND2699	30-Oct-17	131	<0.003	<0.0003	0.023	98	<5	66.8	<0.02	0.0027	2.1	7.2	0.0038
GND2702	1-Nov-17	78	<0.003	<0.0003	0.016	43	<5	35.9	<0.02	0.0015	8.7	6.9	0.0024

Site	Collected	Alkalinity g/m³ $CaCO_3$	Ammonia-N g/m³ N	Benzene g/m³	Boron* g/m³	Chloride g/m³	CODF g/m³	Condy mS/m @25°C	Iron* g/m³	Manganese* g/m³	Nitrate-N g/m³ N	pH	Zinc* g/m³
Intermediate													
GND2692		42	<0.003	<0.0003	0.019	19.2	<5	18.0	<0.02	0.0039	2.1	6.65	0.0035
GND2695	31-Oct-17	55	0.005	<0.0003	0.021	28	<5	24.8	<0.02	0.0047	5.0	6.5	0.0016
GND2698	30-Oct-17	44	0.008	<0.0003	0.016	21	<5	18.0	<0.02	0.0150	0.95	6.2	0.0015
GND2701	1-Nov-17	125	0.029	<0.0003	0.021	39	<5	41.5	<0.02	0.0010	5.6	7.7	<0.0010
Deep													
GND0599	8-Dec-17	100	0.468	<0.0003	0.021	57	<5	38.5	<0.02	0.095	0.129	8.2	0.0098
GND2691		40	<0.003	<0.0003	0.019	26	<5	22	<0.02	0.0046	1.41	6.7	0.0057
GND2694	30-Nov-17	108	0.016	<0.0003	0.019	28	<5	32.9	<0.02	0.0140	0.90	8.4	0.0092
GND2697		55	0.047	<0.0003	0.016	34	<5	24.6	<0.02	0.0178	1.75	6.65	0.0041
GND2700	28-Nov-17	46	0.012	<0.0003	0.011	41	<5	30.1	<0.02	0.0035	8.8	7.0	0.0023

Table 8 A selection of groundwater results, April 2018

Site	Collected	Alkalinity g/m³ $CaCO_3$	Ammonia-N g/m³ N	Benzene g/m³	Boron* g/m³	Chloride g/m³	CODF g/m³	Condy mS/m @25°C	Iron* g/m³	Manganese* g/m³	Nitrate-N g/m³ N	pH	Zinc* g/m³
Shallow													
GND0568	18-Apr-18	47	<0.003	<0.0003	0.016	29	<6	25.6	<0.02	<0.0005	6.2	6.5	<0.0010
GND0569	12-Apr-18	38	<0.003	<0.0003	0.013	33	<6	24.3	<0.02	0.003	5.2	6.6	0.0038
GND0600	11-Apr-18	40	0.47	<0.0003	0.015	71	<6	53.6	<0.02	0.043	24	6.5	2.7
GND0826	19-Apr-18	70	<0.003	<0.0003	0.019	42	<6	34.7	<0.02	<0.0005	7.9	6.8	0.0016
GND1351	19-Apr-18	34	<0.003	<0.0003	0.013	28	<6	19.0	<0.02	<0.0005	2.2	6.8	<0.0010
GND1353	18-Apr-18	53	<0.003	<0.0003	0.019	22	<6	22.3	<0.02	<0.0005	3.1	6.8	<0.0010
GND2693	18-Apr-18	45	<0.003	<0.0003	0.02	15.6	<6	16.6	<0.02	0.0005	1.9	6.7	<0.0010
GND2696		-	-	-	-	-	-	-	-	-	-	-	-
GND2699		-	-	-	-	-	-	-	-	-	-	-	-
GND2702	17-Apr-18	50	<0.003	<0.0003	0.015	31	<6	24.9	<0.02	0.0021	5	7.1	0.0029

Site	Collected	Alkalinity g/m³ $CaCO_3$	Ammonia-N g/m³ N	Benzene g/m³	Boron* g/m³	Chloride g/m³	CODF g/m³	Condy mS/m @25°C	Iron* g/m³	Manganese* g/m³	Nitrate-N g/m³ N	pH	Zinc* g/m³
Intermediate													
GND2692	12-Apr-18	45	<0.003	<0.0003	0.019	16.1	<5	16.7	<0.02	0.0028	1.45	7.4	0.004
GND2695	11-Apr-18	57	<0.003	<0.0003	0.022	44	18	30.9	<0.02	0.0028	6.3	7.0	0.0172
GND2698	11-Apr-18	56	0.019	<0.0003	0.015	21	<5	20.7	<0.02	0.004	2.0	7.0	0.0011
GND2701	12-Apr-18	98	<0.003	<0.0003	0.017	37	<5	38.4	<0.02	0.0073	7.9	7.8	<0.0005
Deep													
GND0599	17-Apr-18	99	0.32	<0.0003	0.024	50	<5	35.9	<0.02	0.107	0.008	8.0	0.0014
GND2691	18-Apr-18	49	<0.003	<0.0003	0.014	30	<5	23.2	<0.02	0.0009	3.3	6.6	0.0019
GND2694	12-Apr-18	121	0.069	<0.0003	0.019	56	<5	44.1	<0.02	0.0037	0.35	8.1	<0.0005
GND2697	12-Apr-18	57	<0.003	<0.0003	0.017	34	<5	26.7	<0.02	0.0061	1.85	7.1	0.0146
GND2700	17-Apr-18	43	<0.003	<0.0003	0.012	40	<5	30.2	<0.02	0.0021	8.8	6.9	0.0011

As previously discussed, chemical monitoring of the groundwater was undertaken at this site between the 2005-2006 and 2013-2014 years, before being put into abeyance, recommencing in the year under review. The graphs provided in Figure 16 to Figure 19 illustrate the trends over time for selected parameters. The data collected so far is baseline data prior to any consented activity at the site. The variations in groundwater quality can therefore be considered as natural, or at most, the results of pressures exerted on groundwater quality by the grazing and dairying activities currently undertaken at the site.

Conductivity levels over the whole site generally range between 15 and 35 mS/m. This indicates that the groundwater has relatively low levels of dissolved solids and that groundwater quality is quite good in this regard. For those bores with a larger dataset, over the period that the groundwater has been monitored, the conductivity level for each bore also appears to be relatively stable (Figure 16). The exceptions to this are bores GND0599and GND0600, which have exhibited a tendency to increase over time. Based on the two samples collected from these sites during the year under review, bores GND0600, GND2691, GND2694, and GND0272 appear to show the larger seasonal variations in conductivity, however further monitoring will be required to confirm this.

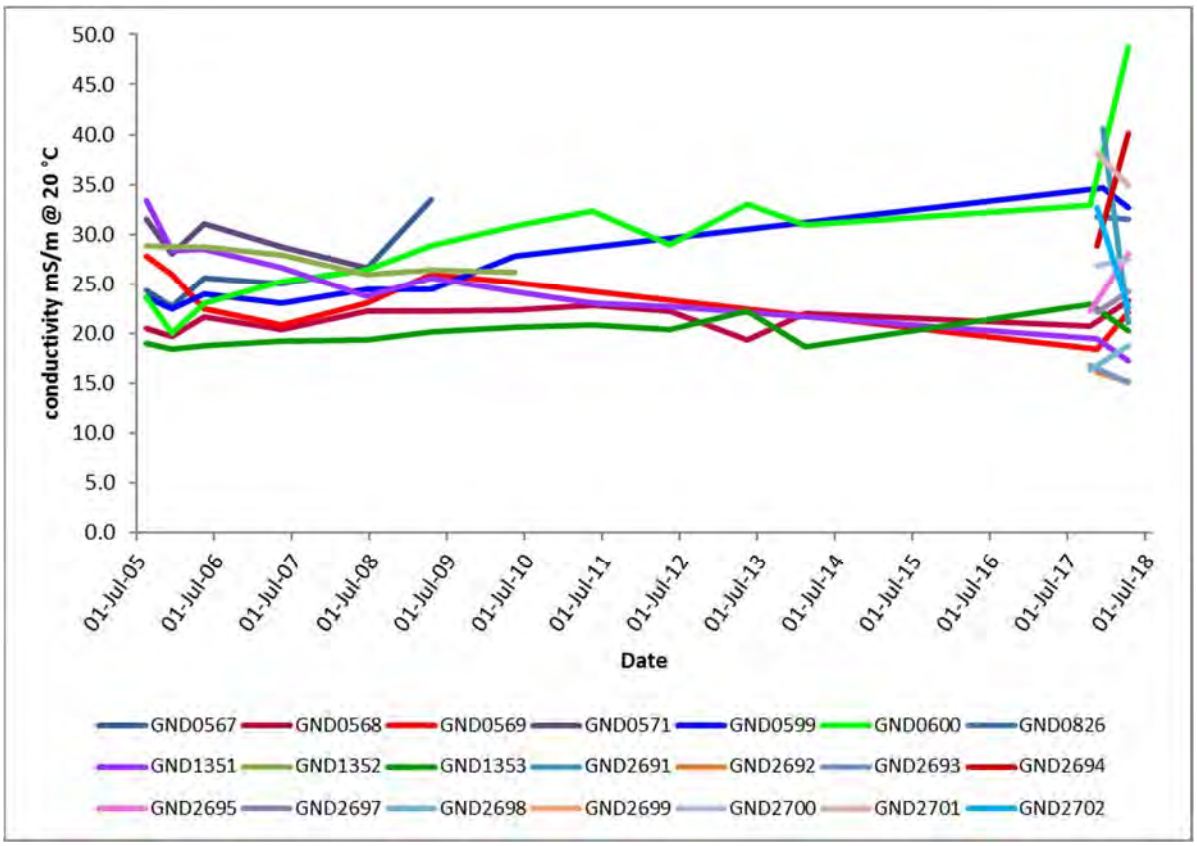

Figure 16 Conductivity found in the groundwater at Eltham Central landfill

Nitrite and nitrate levels show some variability with some sites showing increases and others showing decreases in concentration (Figure 17). Bore GND0599 has had very low and stable levels of nitrite/nitrate (and a higher pH) when compared to the other sites. However, this bore is far deeper than the other older bores (83 m) The highest nitrate/nitrite nitrogen concentration was found in bore GND0600, which was above the calculated maximum acceptable value for drinking water of 11.3 g/m^3 from April 2009 onwards. This bore is located south west of the landfill footprint and is a shallow bore that is topographically relatively low below an area of grazing land that is approximately 9 ha. The baseline monitoring therefore showed some impact from the agricultural activities occurring up gradient of the bore, however there are no known drinking water bores in the immediate vicinity of this monitoring location.

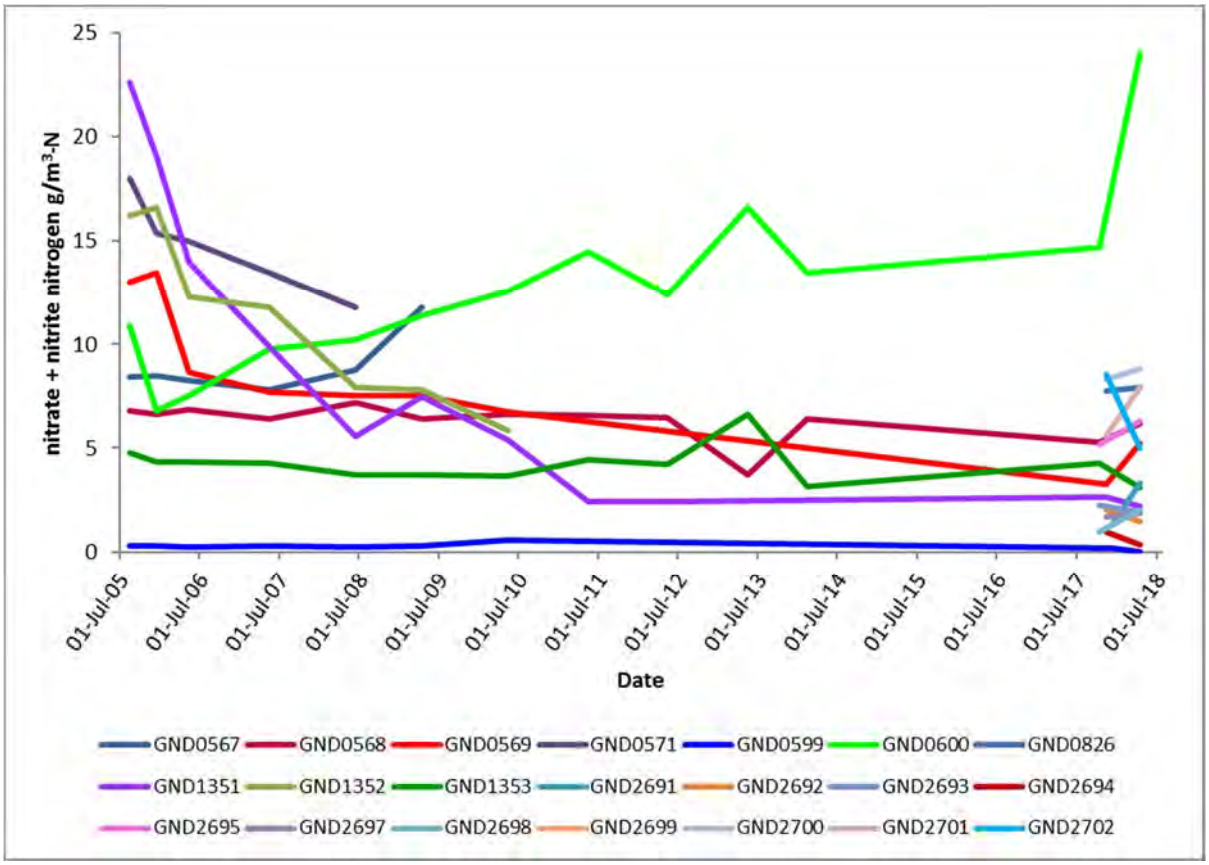

Figure 17 Nitrate/nitrite levels found in the groundwater at Eltham Central landfill

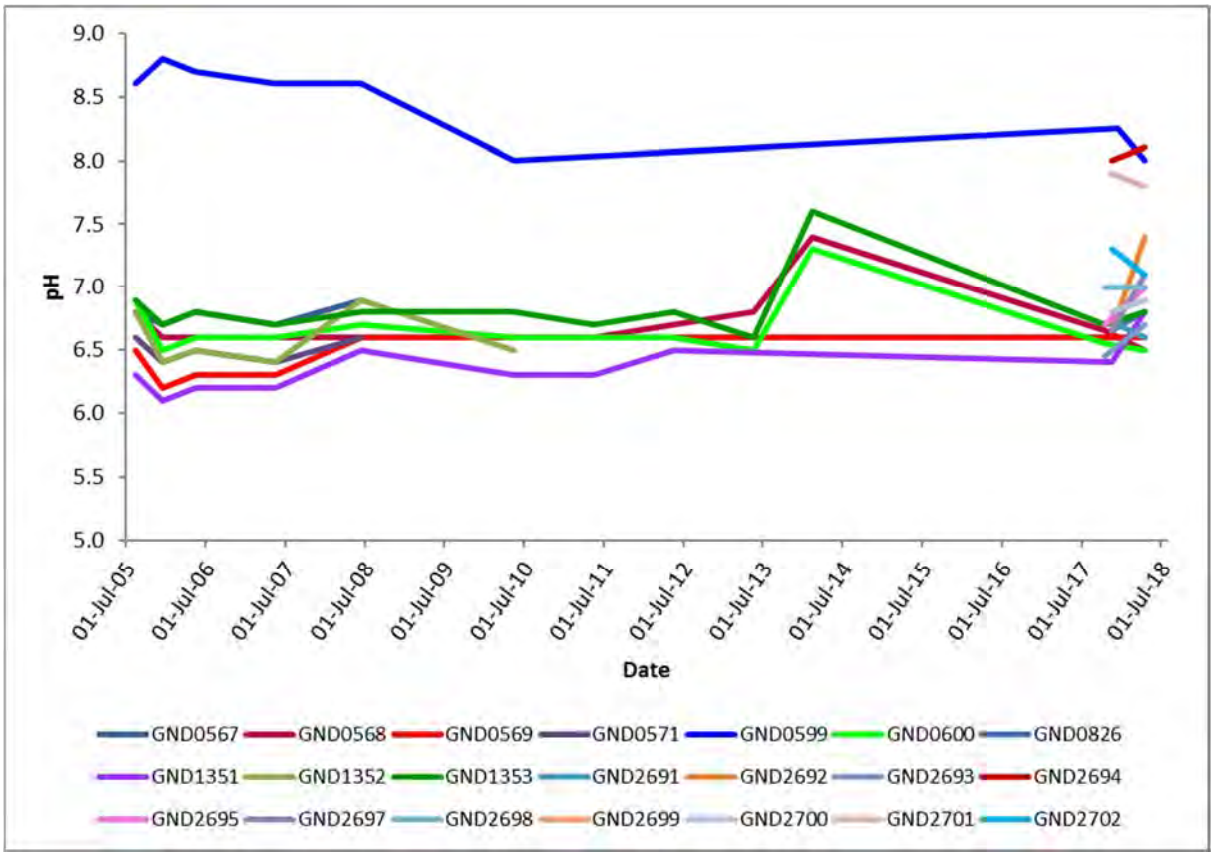

Figure 18 pH found in the groundwater at Eltham Central landfill

As the graph in Figure 18 shows, the pH level of the shallow aquifer appears generally quite stable over time for the bore with the longer monitoring history. The deeper original bore (GND0599) exhibits a significantly higher pH, as does the new intermediate bore GND2701 and the new deep bore GND269.

Chlorides and hardness are in the normal ranges for Taranaki groundwater (Figure 19). It is noted that there appears to be a trend of increasing chlorides pre-landfilling in bores GND0599 and GND0600, with the possibility of large seasonal variations at sited GND0600 and GND2694.

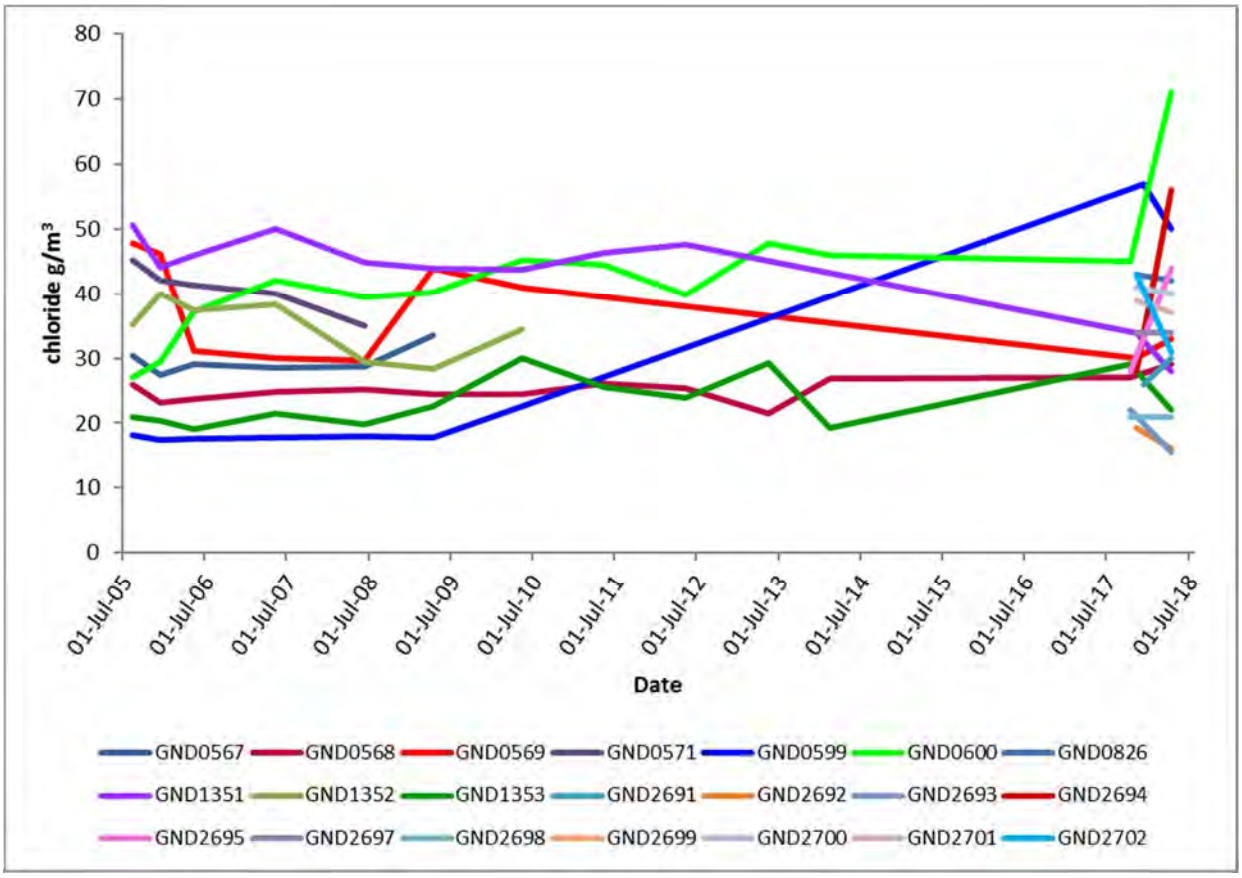

Figure 19 Chloride levels found in the groundwater at Eltham Central landfill

2.2.4 Monitoring of neighbouring water supplies

Condition 17 (h) of consent 5347-1 requires the annual sampling and testing of surface water supplies and bores on neighbouring properties, and condition 20 (d) requires that STDC provides an alternative supply in the case of any of these becoming significantly affected. For this reason, the neighbourhood water supply monitoring commenced during the year under review, so that it could be determined if any of the supplies had become significantly affected after the landfill became operational. At the time of the application, there were 16 water supplies on the neighbouring properties. As the consent was granted over 15 years ago, and consultation with the neighbourhood liaison committee had commenced, the owners of the surrounding properties were visited during the sampling survey to update the water supply records. It was confirmed that there were no groundwater or surface water supplies on two of the properties, and three of the water supplies on record no longer existed. Samples were collected from the 13 sites shown in Figure 10 during November and December 2017. The samples were analysed for the parameters that would be required by the consent: alkalinity, ammonia-N, benzene, boron, chloride, COD, conductivity, iron, pH, manganese, nitrate-N, nitrite-N, and zinc. In addition to these parameters, bacterial testing in the form of an *E.Coli* count was also undertaken on each of the water supplies.

It was found that some of the water supplies exceeded guideline values and/or drinking water maximum acceptable values for *E.Coli* and/or nitrate-N, which is not uncommon for shallow groundwater in an agricultural area. As the Council was effectively contracted by STDC to undertake this monitoring, the results were discussed with them and it was agreed that they would notify the landowners The results were forwarded to STDC, along with a copy of Chapter 19 of the drinking water guidelines, which provides information and advice for small, individual and roof water supplies.

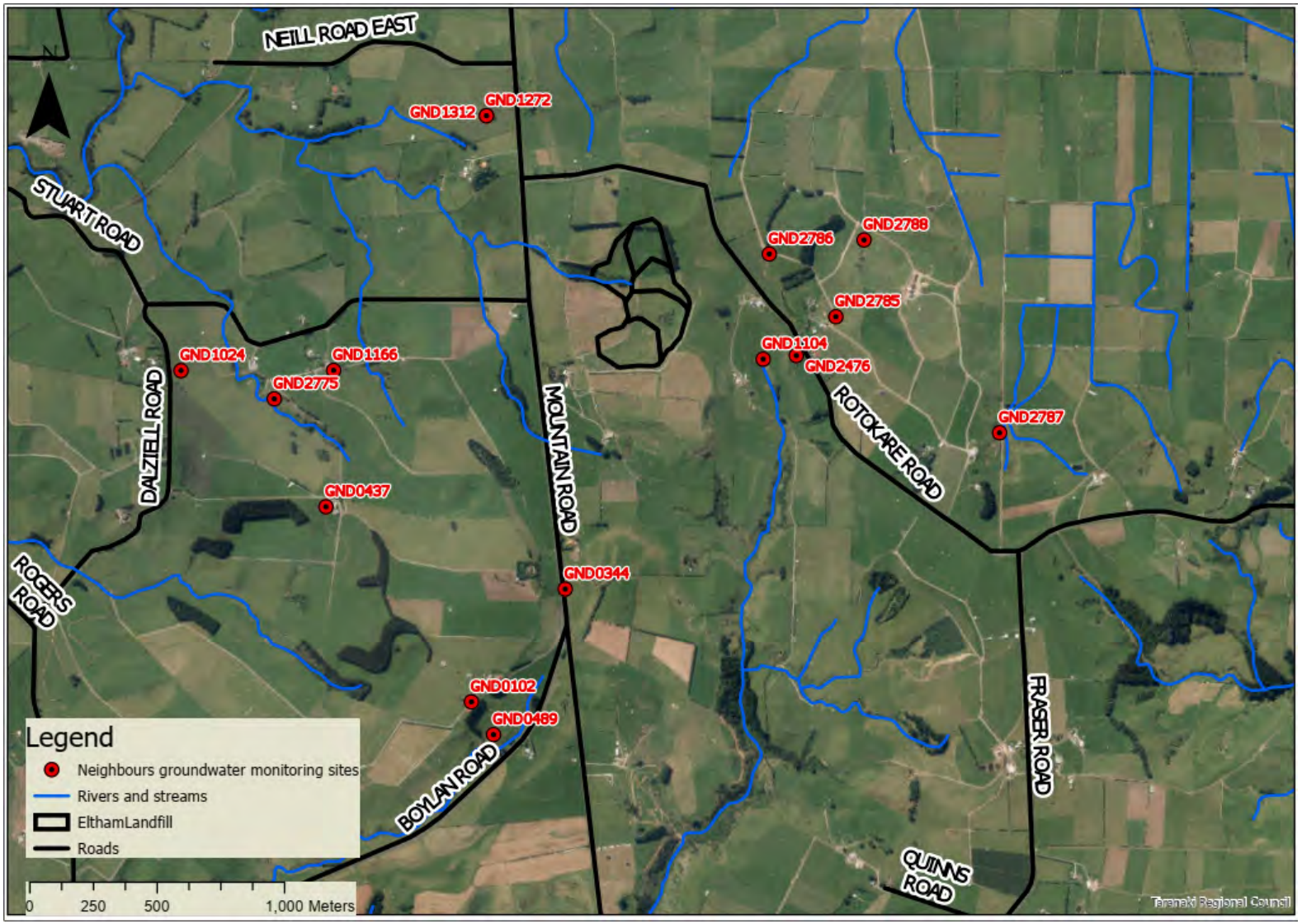

Figure 20 Location of neighbours' water supplies

Table 9 Groundwater results from water supplies on neighbouring properties, sampled November and December 2017

Site	Collected	Level m	Alkalinity g/m³ $CaCO_3$	Ammonia-N g/m³ N	Benzene g/m³	Boron g/m³	Chloride g/m³	CODF g/m³	Condy mS/m @20°C	E.Coli cfu/100ml	Iron* g/m³	Manganese* g/m³	Nitrate-N g/m³ N	Nitrate-N g/m³ N	pH	Zinc* g/m³
Drinking-water standards (Revised 2018) for supply schemes			-	*1.5 (odour in alkaline conditions)*	*0.01[a]*	*1.4[a]*	*250 (taste, corrosion)*	-	-	*<1[b]*	*0.2 (staining - laundry and sanitary ware)*	*0.4[a]*	*11.3[a]*	*0.2[a]*	*7.0-8.5*	*1.5 (taste)*
Livestock drinking water standards			-			*5.8*				*550*			*93*	*9.1*		*20*
GND0836	Bore covered by landslide	-	-	-	-	-	-	-	-		-	-	-		-	-
GND1024	No longer exists	-	-	-	-	-	-	-	-		-	-	-		-	-
GND1166	No longer exists	-	-	-	-	-	-	-	-		-	-	-		-	-
GND2775	23-11-17	spring	62	0.104	< 0.0010	0.05	18.4	9	23.7	**1990**	0.41	0.09	2.91	0.047	6.9	0.056
GND0437	23-11-17	-	99	0.258	< 0.0010	0.04	23.6	<5	24.1	<1	0.06	0.21	0.42	0.004	7.2	0.047
GND0102	23-11-17	-	91	0.009	< 0.0010	0.05	25	<5	25.9	<1	<0.03	<0.01	3.44	0.002	7.3	0.033
GND0489	23-11-17	-	77	0.009	< 0.0010	0.02	21.3	<5	22.9	<1	0.04	<0.01	3.55	0.002	7.6	0.061
GND2787	28-11-17	spring	61	0.034	< 0.0010	0.05	42.7	<5	37.3	**77**	<0.03	0.02	**16.8**	0.029	6.5	0.026
GND2788	28-11-17	spring	44	0.003	< 0.0010	0.03	23.7	<5	20.5	<1	<0.03	<0.01	5.18	<0.001	6.7	<0.005
GND1272	6-12-17	-	41	0.003	< 0.0010	0.02	11.4	<5	14.4	<1	<0.03	<0.01	5.05	<0.001	6.6	<0.005
GND1312	6-12-17	-	535	18.0	< 0.0010	0.19	15.1	38	91.5	<1	3.51	0.26	0.005	0.005	7.1	0.012

Site	Collected	Level m	Alkalinity g/m³ $CaCO_3$	Ammonia-N g/m³ N	Benzene g/m³	Boron g/m³	Chloride g/m³	CODF g/m³	Condy mS/m @20°C	E.Coli cfu/100ml	Iron* g/m³	Manganese* g/m³	Nitrate-N g/m³ N	Nitrate-N g/m³ N	pH	Zinc* g/m³
Drinking-water standards (Revised 2018) for supply schemes			-	*1.5 (odour in alkaline conditions)*	*0.01[a]*	*1.4[a]*	*250 (taste, corrosion)*	-	-	*<1[b]*	*0.2 (staining - laundry and sanitary ware)*	*0.4[a]*	*11.3[a]*	*0.2[a]*	*7.0-8.5*	*1.5 (taste)*
Livestock drinking water standards			-			*5.8*				*550*			*93*	*9.1*		*20*
GND2786	8-12-17	2.6	64	0.008	< 0.0010	0.01	35.4	<5	31.6	<1	<0.03	<0.01	**12.1**	<0.001	6.7	0.026
GND2476	11-12-17	-	428	5.86	< 0.0010	0.34	15.3	13	71.9	<1	0.11	<0.01	0.004	0.001	8.0	0.102
GND1104	11-12-17	0.895	29	0.017	< 0.0010	0.02	29.2	<5	24.1	<1	<0.03	<0.01	4.46	0.002	6.4	<0.005
GND2785	11-12-17	-	110	0.042	< 0.0010	0.01	24.2	<5	25.7	<1	0.46	0.30	0.019	0.001	7.7	0.048
GND0344	13-12-17	-	64	<0.003	< 0.0010	<0.01	23.2	11	23.3	<1	<0.03	<0.01	5.95	0.002	6.8	0.017

* metals are dissolved

a Maximum acceptable value

b Regulatory compliance for water supply scheme, rather that health effect

2.2.5 Biological monitoring

The Council's 'vegetation sweep' or a combination of the 'vegetation sweep' and 'kick-sampling' techniques were used to collect streambed macroinvertebrates from five sites in two unnamed tributaries of the Waingongoro River on 28 November 2017 and 4 April 2018. This has provided baseline data to assess any impacts the operation of the Eltham Central landfill may cause in these two unnamed tributaries. Samples were processed to provide number of taxa (richness), MCI and $SQMCI_S$ scores for each site.

Taxa richness is the most robust index when determining whether a macroinvertebrate community has been exposed to toxic discharges. When exposed to toxic discharges, macroinvertebrates may die and be swept downstream or may deliberately drift downstream as an avoidance mechanism (catastrophic drift). The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. THE $SQMCI_S$ takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities, particularly if non-organic impacts are occurring. However, it is also influenced by the 'patchiness' of macroinvertebrates on the streambed, and as such must be considered in the context of all three metrics. Significant differences in either the MCI or $SQMCI_S$ scores between sites may indicate the degree of adverse effects (if any) of the discharge being monitored.

Overall, the results of November 2017 survey were indicative of 'poor' to 'very poor' biological health in the two unnamed tributaries of the Waingongoro River. The upstream site in the 'northern' tributary, WGG000647, recorded the poorest invertebrate metrics of the sites, which is likely related to the sediment controls in the stream near to the sampling site altering habitat conditions. $SQMCI_S$ scores in the 'northern' tributary were lower than in the other unnamed tributary. The MCI score decreased significantly downstream of the 'southern ephemeral' tributary confluence, but increased again downstream of the 'northern' tributary confluence.

The results of this April 2018 survey were indicative of 'poor' to 'fair' biological health in the two unnamed tributaries of the Waingongoro River. Invertebrate metrics varied between sites, with site WGG000648 in the 'northern' tributary recording the poorest results for all metrics. However, the MCI score at this site was not significantly lower than site WGG000654. In both tributaries, a decrease in macroinvertebrate community health was observed in a downstream direction.

The results of both surveys are consistent with previous surveys carried out in relation to Eltham Central landfill, which have recorded communities dominated by lower scoring 'moderately sensitive' and 'tolerant' taxa typical of small, seepage-fed, macrophyte dominated, soft-bottomed farmland streams. There was no conclusive evidence provided by this survey that any activities associated with the Eltham Central landfill had impacted on the macroinvertebrate communities of these two unnamed tributaries of the Waingongoro River.

2.3 Air monitoring

No specific air monitoring was carried out during the 2017-2018 year as the landfill was not in operation. Although air discharge matters were considered during the inspections of the construction work.

Once the Eltham Central landfill commences operations an air quality monitoring programme will be implemented to monitor dust deposition, particulate matter, methane levels, hydrogen sulphide levels and odour. However, it is noted that the consent holder is required to undertake landfill gas dispersion modelling prior to the discharge consents being exercised.

To support this modelling, STDC has had a weather station in place at the site since 2000. However, it has been ascertained that the initial data may not be suitable for the purpose of odour dispersion modelling, as the weather station was only serviced once per year. This matter has been raised with the consent holder

and they have undertaken to collect more robust data prior to the site being developed, as per condition 11 of consent 5348-1. The proposed location for the new station was confirmed as acceptable to the Council in July 2014. A new weather station was installed as proposed, however this was subsequently struck by lightning. STDC consulted with Council regarding the specifications required for the data collection from a further new weather station, and the installation was completed in October 2016. Council has been advised that annual calibration of the site is undertaken by their consultants, and that routine maintenance is undertaken by the Rural Fire Service. The monitoring programme was updated during 2017-2018 to include a review of the data collected and an annual inspection of the weather station to confirm that it is being adequately maintained.

2.3.1 Inspections

29 August 2017

The air discharge consent requires that a weather monitoring station be installed at the site, with data collection commencing a minimum of 12 months prior to development of the site. The consent conditions also referenced the application documentation for the specific requirements of the monitoring to be undertaken. A site inspection was undertaken to assess the monitoring station that had been installed by STDC to meet these requirements.

Photo 12 Eltham Central landfill weather station, September 2017

At the time of inspection it was found that:

Net Radiation

The application information referenced stated that the net radiation was to be measured at 2 m above ground level. The instrumentation was measured as having been set up at about 1.83 m above the ground.

Temperature

The application information referenced stated that the air temp was to be measured at 2 m above ground. The thermometer was measured as having been installed at about 2 m above ground level. A reference check was undertaken and the data was found to be of the required accuracy.

Wind speed/ direction

It was found that the wind arm was pointing at magnetic North instead of true North. This would require either a correction to be applied to the data, or for the wind arm position to be corrected.

Rainfall

The rainfall measuring device (tipping bucket) was situated on flat topography. There were no obstructions (other than the wind pole) in close proximity to the tipping bucket that would prevent rainfall collection. The tipping bucket was installed at the correct height with the correct orifice diameter to comply with the National Environmental Monitoring Standard (NEMS). The resolution of the data was 0.2 mm, which also complied with NEMS and the requirements of the consent. The measurement interval was at every 10 minutes which should be sufficient for the purpose of this weather station, however the STDC was advised that NEMS recommends that the measurement intervals are equal to or less than one minute for rainfall data. It was observed that there was no primary reference gauge to check rainfall readings, however it was considered that, providing that the tipping bucket was set up correctly, and is regularly verified and cleaned (at least annually), for the propose of this project this would be acceptable.

Further actions required

STDC were asked to reposition the wind arm or apply a correction to the wind direction data.

It is noted, that since the consents were granted an Air Quality National Environmental Standard has come into effect. This standard requires that the landfill gas generated from a landfill of this size is collected and either flared, or used as a fuel for generating electricity. This requirement impacts on both the design concept provided to Council at the time of the consent application, and the assessment of environmental effects. As such, the conditions of the current consent will need to be reviewed and/or changed prior to the exercise of the consent.

2.4 Investigations, interventions, and incidents

The monitoring programme for the year was based on what was considered to be an appropriate level of monitoring, review of data, and liaison with STDC. During the year matters may arise which require additional activity by the Council, for example provision of advice and information, or investigation of potential or actual causes of non-compliance or failure to maintain good practices. A pro-active approach that in the first instance avoids issues occurring is favoured.

The Council operates and maintains a register of all complaints or reported and discovered excursions from acceptable limits and practices, including non-compliance with consents, which may damage the environment. The incident register includes events where the consent holder concerned has itself notified the Council. The register contains details of any investigation and corrective action taken.

Complaints may be alleged to be associated with a particular site. If there is potentially an issue of legal liability, the Council must be able to prove by investigation that the identified company is indeed the source of the incident (or that the allegation cannot be proven).

In the 2017-2018 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents at this site, in association with STDC's conditions in resource consents or provisions in Regional Plans.

3 Discussion

3.1 Discussion of site performance

The Eltham Central landfill site baseline results are not remarkable in themselves. Surrounding farming activities exert subtle and varying pressures on surface water and groundwater quality as would be expected. The results show that there are no unusually high values for any given water quality indicator, with the exception of the occasional high faecal coliform count. Water quality overall is good for the headwaters of small stream tributaries in a dairying catchment, however, there may be an emerging trend of increasing conductivity and faecal coliform counts upstream of the northern landfill tributary.

STDC initiated the Neighbourhood Liaison Group meetings and employed the Technical Expert to support the Council as required by consent. There was good consultation occurring between STDC and both the neighbours and the Council during the year under review as the design, operational plans and site enabling works progressed.

At the time of writing the report, the Council had been advised that, in light of the decision by the three district councils to take their refuse to Bonny Glen, the design work has been put on hold.

3.2 Evaluation of performance

A tabular summary of the consent holder's compliance record for the year under review is set out in Table 10 to Table 14. As the consents have not been exercised many of the conditions are not applicable.

Table 10 Summary of performance for discharge to land consent 5347-1.3

Purpose: ***To discharge contaminants onto and into land at the South Taranaki District Council Central Landfill, Eltham***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. The consent holder shall prepare and comply with a landfill management plan. Plan to be updated at least every two years	To be provided prior to exercise of consent	Draft plan reviewed by Council
2. The consent holder and all staff shall adhere to the management plan	Consent not exercised	N/A
3. The consent holder shall meet cost of a technical advisor on development and operations	Technical Adviser provided	Yes
4. The consent holder shall construct a landfill liner to given specifications and provide for the collection of leachate	Consent not exercised. Liner design updated to current best practice during detailed design phase. Consent change required	N/A
5. The landfill liner must be certified by a registered engineer	Consent not exercised	N/A
6. The consent holder shall keep records of wastes accepted	Consent not exercised	N/A
7. Certain wastes to be handled by specified guidelines.	Consent not exercised	N/A

Purpose: *To discharge contaminants onto and into land at the South Taranaki District Council Central Landfill, Eltham*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
8. Contaminated soils accepted at site shall be covered as soon as practical	Consent not exercised	N/A
9. Appointment of person to control entry of waste to the site	Consent not exercised	N/A
10. Certain wastes not to be accepted	Consent not exercised	N/A
11. Other special wastes to meet certain criteria	Consent not exercised	N/A
12. Wastes that do not meet TCLP test or exceed certain contaminant limits not to be accepted	Consent not exercised	N/A
13. Special waste to handled as specified	Consent not exercised	N/A
14. Measures to prevent contaminants entering surrounding land	Consent not exercised	N/A
15. Compact and cover waste to certain specifications	Consent not exercised	N/A
16. Supply report on stage closure in relation to compliance with condition 15	Consent not exercised	N/A
17. Provide, comply with and maintain an STDC annual monitoring plan	To be provided at least six months prior to exercise of consent. Baseline monitoring requirements reviewed and increased for 2017-2018. STDC monitoring plan was being drafted The Technical Advisor has also been appointed	Baseline monitoring in progress
18. Results of STDC monitoring to be supplied annually by 31 August	Consent not exercised	N/A
19. Prevent surface run-off into tributaries	Consent not exercised	N/A
20. Undertake review and remedial actions should leachate cause contamination	Consent not exercised	N/A
21. Inspect landfill for leachate breakout at least once a month	Consent not exercised	N/A
22. Keep records on any remedial actions taken	Consent not exercised	N/A

Purpose: *To discharge contaminants onto and into land at the South Taranaki District Council Central Landfill, Eltham*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
23. Keep records on any investigations and engineering works	Consent not exercised	N/A
24. Liaise and meet with Neighbourhood Liaison Group	Consent not due to be exercised yet, however meetings were held at more than the required frequency	Yes
25. Lapse provision	Lapse not due until 2020	N/A
26. Limits areas from which refuse can originate from. Taranaki including Mokau and Awakino	Consent not exercised	N/A
27. Review condition	Next optional review in June 2019, recommendation attached in section 3.5	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**N/A**
Overall assessment of administrative performance in respect of this consent		**High**

Table 11 Summary of performance for air discharge consent 5348-1

Purpose: *To discharge emissions into the air from landfilling activities at the South Taranaki District Council Central Landfill, Eltham*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. The consent holder shall prepare and comply with a landfill management plan. Plan to be updated at least every two years	To be provided three months prior to exercise of consent	Draft plan reviewed by Council
2. The consent holder shall adopt best practical option	Consent not exercised	N/A
3. Discharges not to result in objectionable or offensive odours or airborne contaminants beyond the boundary	Consent not exercised	N/A
4. Discharges not to result in objectionable or offensive levels of dust, beyond the boundary	Consent not exercised	N/A
5. Dust controlled on access roads and landfill	Consent not exercised	N/A
6. No burning of waste at the site	Consent not exercised	N/A
7. No composting of waste at the site	Consent not exercised	N/A
8. No extraction venting of landfill gas within 200 metres of site boundary	Consent not exercised	N/A

Purpose: *To discharge emissions into the air from landfilling activities at the South Taranaki District Council Central Landfill, Eltham*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
9. Avoid discharges of waste or contaminants to the surrounding environment	Consent not exercised	N/A
10. Provide, comply with and maintain an STDC annual monitoring plan	To be provided at least six months prior to exercise of consent	Baseline monitoring in progress
11. Establish meteorological station and use data to undertake dispersion modelling	Inspection and liaison with consent holder – 12 months data required commencing within one year of exercise of consent. Consent not exercised	Weather station replaced and relocated. Data quality to be assessed. More data required
12. Modelling to be done to parameters supplied in appendix 10 of the application	Review of Council records – 12 months data required commencing within one year of exercise of consent. Consent would not be exercised with the 2017-2018 year, but was expected to be exercised within the 2018-2019 year	N/A-modelling not done yet
13. Keep records on any complaints received relating to air discharges	Consent not exercised	N/A
14. Provide results of monitoring plan, complaints and meteorological data annually by 31 August	Consent not exercised	N/A
15. Keep records of any site investigations and engineering works	Consent not exercised	N/A
16. Liaise and meet with a Neighbourhood Liaison Group	Liaison with consent holder – consent not exercised, however meetings were held at more than the required frequency. The Technical Advisor has also been appointed	Yes
17. Lapse provision	Lapse not due until 2020	N/A
18. Limits areas from which refuse can originate from. Taranaki including Mokau and Awakino	Liaison with consent holder – consent not exercised	N/A
19. Review condition	Next optional review in June 2019, recommendation attached in section 3.5	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**N/A**
Overall assessment of administrative performance in respect of this consent		**High**

Table 12 Summary of performance for stormwater discharge consent 5349-1

Purpose: ***To discharge up to 15,000 m³/day of uncontaminated stormwater and 4,000 m³/day of treated stormwater from the South Taranaki District Council Central Landfill, Eltham, onto and into land and into an unnamed tributary of the Waingongoro River***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. The consent holder shall prepare and comply with a landfill management plan. Plan to be updated at least every two years	To be provided prior to exercise of the consent	Draft plan reviewed by Council
2. No leachate to be discharged	Consent not exercised	N/A
3. Leachate storage lagoon bunded to prevent stormwater infiltration	Consent not exercised	N/A
4. Adopt best practical option	Consent not exercised	N/A
5. No direct discharge of contaminated stormwater to receiving waters	Consent not exercised	N/A
6. Stormwater treatment pond be installed	Consent not exercised	N/A
7. Discharge not give rise to certain effects in receiving waters	Consent not exercised	Baseline monitoring in progress
8. Contaminants in receiving waters not to exceed certain limits	Consent not exercised	Baseline monitoring in progress
9. System designed to minimise erosion in channels	Consent not exercised	N/A
10. System designed to minimise land instability	Consent not exercised	N/A
11. Rehabilitation of any land made unstable	Consent not exercised	N/A
12. Minimise disturbance of riparian plants and undertake planting as set out in application	Consent not exercised	N/A
13. Provide, comply with and maintain an STDC annual monitoring plan	Review of Council records – to be provided at least six months prior to exercise of consent Baseline monitoring requirements increased for 2017-2018 The Technical Advisor has also been appointed	Baseline monitoring in progress
14. Results of STDC monitoring to be supplied	Consent not exercised	N/A
15. Design and construction of system to be certified by registered engineer	Consent not exercised	N/A

Purpose: *To discharge up to 15,000 m^3/day of uncontaminated stormwater and 4,000 m^3/day of treated stormwater from the South Taranaki District Council Central Landfill, Eltham, onto and into land and into an unnamed tributary of the Waingongoro River*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
16. Liaise and meet with Neighbourhood Liaison Group	Consent not exercised, however meetings were held at more than the required frequency	Yes
17. Lapse provision	Lapse not due until 2020	N/A
18. Limits areas from which refuse can originate from to Taranaki including Mokau and Awakino	Consent not exercised	N/A
19. Review condition	Next optional review in June 2018, recommendation attached in section 3.5	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**N/A**
Overall assessment of administrative performance in respect of this consent		**High**

Table 13 Summary of performance for dam and diversion consent 5350-1

Purpose: *To dam and divert water around the South Taranaki District Council Central Landfill, Eltham, in the headwaters of an unnamed tributary of the Waingongoro River*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. The consent holder shall prepare and comply with a landfill management plan. Plan to be updated at least every two years	To be provided three months prior to exercise of consent	Draft plan reviewed by Council
2. System designed to minimise erosion in channels	Consent not exercised	N/A
3. System designed to minimise land instability	Consent not exercised	N/A
4. Rehabilitation of any land made unstable	Consent not exercised	N/A
5. Provide, comply with and maintain an STDC annual monitoring plan	To be provided at least six months prior to exercise of consent	Baseline monitoring in progress
6. Design and construction of system to be certified by registered engineer	Consent not exercised	N/A
7. Liaise and meet with Neighbourhood Liaison Group	Consent not exercised, however meetings were held at more than the required frequency The Technical Advisor has also been appointed	N/A
8. Lapse provision	Lapse not due until 2020	N/A
9. Limits areas from which refuse can originate from to Taranaki including Mokau and Awakino	Inspection and liaison with consent holder – consent not exercised	N/A

Purpose: *To dam and divert water around the South Taranaki District Council Central Landfill, Eltham, in the headwaters of an unnamed tributary of the Waingongoro River*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
10. Review condition	Next optional review in June 2019, recommendation attached in section 3.5	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**N/A**
Overall assessment of administrative performance in respect of this consent		**High**

Table 14 Summary of performance for structures consent 5351-1

Purpose: *To erect, place and maintain structures in the beds of unnamed tributaries of the Waingongoro River for the construction and maintenance of the South Taranaki District Council Central Landfill, Eltham*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. The consent holder shall prepare and comply with a landfill management plan. Plan to be updated at least every two years	To be provided three months prior to exercise of consent	Draft plan reviewed by Council
2. Construction and maintenance not give rise to certain effects	Consent not exercised	N/A
3. Structures designed to minimise land instability	Consent not exercised	N/A
4. Rehabilitation of any eroded areas	Consent not exercised	N/A
5. Minimise disturbance of riparian plants and undertake planting as set out in application	Consent not exercised	N/A
6. Provide, comply with and maintain an STDC annual monitoring plan	To be provided at least six months prior to exercise of consent	Baseline monitoring in progress
7. Design and construction of system to certified by registered engineer	Consent not exercised	N/A
8. Removal of structures and reinstatement when structures no longer required	Consent not exercised	N/A
9. Liaise and meet with Neighbourhood Liaison Group	Consent not exercised, however meetings were held at more than the required frequency The Technical Advisor has also been appointed	Yes
10. Lapse provision	Lapse not due until 2020	N/A
11. Limits areas from which refuse can originate from to Taranaki including Mokau and Awakino	Consent not exercised	N/A

Purpose: *To erect, place and maintain structures in the beds of unnamed tributaries of the Waingongoro River for the construction and maintenance of the South Taranaki District Council Central Landfill, Eltham*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
12. Review condition	Next optional review in June 2019, recommendation attached in section 3.5	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**N/A**
Overall assessment of administrative performance in respect of this consent		**High**

STDC demonstrated a high level of administrative compliance with its resource consents as defined in Section 1.1.4. No rating is given for environmental effects as no discharges, or stream works authorised by consents 5350 and 5351, have occurred.

3.3 Recommendations from the 2016-2017 Annual Report

In the 2016-2017 Annual Report, it was recommended:

1. STDC install the additional bores and undertake any necessary maintenance work required on any of the existing bores listed in Table 5 of the report, prior to October 2017.
2. STDC survey all bores to provide accurate ground reduced levels and casing heights.
3. STDC locate and appropriately retire all groundwater bores from within the landfill foot print that will not be used for monitoring, as identified in Table 6 of the report.
4. The baseline monitoring of the Eltham Central landfill site in 2017-2018 be amended from that of 2016-2017 to include:
    a. Provision for attendance at the neighbourhood liaison group meetings, ad-hoc meetings and liaison/consultation with consent holder.
    b. Additional receiving water sites for physicochemical and biological baseline monitoring in the main tributary upstream of any discharges from the sites, and in the southern landfill tributary, as appropriate and dictated by the timing of the on site works.
    c. Expansion of the physicochemical and biological parameters to include those listed in the consent for on-going monitoring, those deemed necessary for surface water characterisation, and those identified as possible landfill contaminants.
    d. Water level monitoring to be commenced as soon as possible, and undertaken at least quarterly in the majority of bores to monitor seasonal effects, and using downhole loggers in at least three (shallow, moderate, deep) bores, at 15 minute intervals, to provide a more comprehensive dataset.
    e. Recommencement of groundwater physicochemical baseline monitoring in all bores listed in Table 5, on a biannual basis, with the parameters for baseline monitoring including those listed in the consent for on-going monitoring, those deemed necessary for groundwater characterisation, and those identified as possible landfill contaminants. This baseline monitoring is to be commenced in October 2017 and be carried out at times of high and low groundwater levels to capture any seasonal differences.
    f. Baseline monitoring of the neighbours water supplies as identified in condition 17 (h) of consent 5347-1.
    g. Recommencement of biannual macroinvertebrate surveys.

h. An annual inspection of the weather station and review of the data collected.

i. Increased time for writing the annual report due to the expanded baseline monitoring programme.

5. THAT the option for a review of resource consents 5347-1, 5348-1, 5349-1, 5350-1, and 5351-1 in December 2017 and/or June 2018 and/or within 18 months of the exercise of the consents, as set out in conditions 27, 19, 19, 10 and 12 of the consents, be exercised if and when there is sufficient certainty regarding the landfill design, and operation and management practices to be implemented at the site, and the potential adverse effects of any changes have been evaluated.

These recommendations were implemented, with STDC committed to continuing to appropriately abandon the bores within the landfill footprint prior to them becoming impacted by site development works.

3.4 Alterations to monitoring programmes for 2018-2019

In designing and implementing the monitoring programmes for air/water discharges in the region, the Council has taken into account:

- the extent of information already made available through monitoring or other means to date;
- its relevance under the RMA;
- the Council's obligations to monitor consented activities and their effects under the RMA;
- the record of administrative and environmental performances of the consent holder; and
- reporting to the regional community.

The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki exercising resource consents.

It is proposed that for 2018-2019 the programme remains unchanged.

It should be noted that the proposed programme represents a reasonable and risk-based level of monitoring for the site in question. The Council reserves the right to subsequently adjust the programme from that initially prepared, should the need arise if potential or actual non-compliance is determined at any time during 2018-2019.

3.5 Exercise of optional review of consent

Resource consents **5347-1, 5348-1, 5349-1, 5350-1, and 5351-1** all provide for an optional review of the consent in June 2019. Conditions 27, 19, 19, 10 and 12 respectively allow the Council to review the consents, for the purpose of:

i. assessing the ongoing adequacy of the Monitoring Programme and methods of implementation outlined in the Annual Monitoring Plan required by each of the consents; and

ii. assessing the effectiveness of conditions in avoiding, remedying or mitigating adverse effects on the environment from the:

- discharge of contaminants to the various media, or
- the damming and diversion of water, or
- the construction or maintenance of structures.

Although the consents are yet to be exercised, the detailed designs are being developed. It is recommended that the review only be pursued should there be sufficient information to allow the consent conditions to be aligned with the changes in design, landfill operation and management methodology, National Regulations and current best practice.

4 Recommendations

1. THAT in the first instance, the baseline monitoring for the consented activities at Eltham Central landfill in the 2018-2019 year continue at the same level as in 2017-2018.
2. THAT should there be issues with environmental or administrative performance in 2018-2019, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.
3. THAT the option for a review of resource consents 5347-1, 5348-1, 5349-1, 5350-1, and 5351-1 in June 2019, as set out in conditions 27, 19, 19, 10 and 12 of the consents, be exercised if and when there is sufficient certainty regarding the landfill design, and operation and management practices to be implemented at the site, and the potential adverse effects of any changes have been evaluated.
4. STDC continue to locate and appropriately retire all groundwater bores from within the landfill foot print that will not be used for monitoring, as identified in Table 5 of this report.

Glossary of common terms and abbreviations

The following abbreviations and terms may be used within this report:

Biomonitoring	Assessing the health of the environment using aquatic organisms.
BOD	Biochemical oxygen demand. A measure of the presence of degradable organic matter, taking into account the biological conversion of ammonia to nitrate.
BODCF	Carbonaceous biochemical oxygen demand of a filtered sample. A measure of the presence of degradable dissolved organic matter, excluding the biological conversion of ammonia to nitrate.
cfu	Colony forming units. A measure of the concentration of bacteria usually expressed as per 100 millilitre sample.
Conductivity	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 20°C and expressed in mS/m.
Cu*	Copper.
DO	Dissolved oxygen.
DRP	Dissolved reactive phosphorus.
FC	Faecal coliforms, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample.
Fresh	Elevated flow in a stream, such as after heavy rainfall.
g/m^3	Grams per cubic metre, and equivalent to milligrams per litre (mg/L). In water, this is also equivalent to parts per million (ppm), but the same does not apply to gaseous mixtures.
GIS	Geographical information system. A system designed to capture, store, manipulate, manage, and present spatial or geographic data. It can be used to visualize, question, analyse, and interpret data to understand relationships, patterns, and trends.
Incident	An event that is alleged or is found to have occurred that may have actual or potential environmental consequences or may involve non-compliance with a consent or rule in a regional plan. Registration of an incident by the Council does not automatically mean such an outcome had actually occurred.
Intervention	Action/s taken by Council to instruct or direct actions be taken to avoid or reduce the likelihood of an incident occurring.
Investigation	Action taken by Council to establish what were the circumstances/events surrounding an incident including any allegations of an incident.
Incident register	The incident register contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan.
L/s	Litres per second.
m^2	Square metres.
MCI	Macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the sensitivity of the taxa present to organic pollution in stony habitats.
mS/m	Millisiemens per metre.

Mixing zone	The zone below a discharge point where the discharge is not fully mixed with the receiving environment. For a stream, conventionally taken as a length equivalent to seven times the width of the stream at the discharge point.
NH_4	Ammonium, normally expressed in terms of the mass of nitrogen (N).
NH_3	Unionised ammonia.
NO_3	Nitrate, normally expressed in terms of the mass of nitrogen (N).
pH	A numerical system for measuring acidity in solutions, with 7 as neutral. Numbers lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength. For example, a pH of 4 is ten times more acidic than a pH of 5.
Physicochemical	Measurement of both physical properties (e.g. temperature, clarity, density) and chemical determinants (e.g. metals and nutrients) to characterise the state of an environment.
PM_{10}	Relatively fine airborne particles (less than 10 micrometre diameter).
Resource consent	Refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15).
RMA	*Resource Management Act* 1991 and including all subsequent amendments.
SS	Suspended solids.
SQMCI	Semi quantitative macroinvertebrate community index.
SVOC	Semi volatile organic compounds.
TCLP	Toxicity characteristic leaching procedure is a soil sample extraction method using an appropriately buffered acidic solution. Chemical analysis of the extract is undertaken. This is employed as an analytical method to simulate leaching through a landfill.
Taradise	Council geographical information system.
Temp	Temperature, measured in °C (degrees Celsius).
Turb	Turbidity, expressed in NTU.
VOC	Volatile organic compounds.
Zn*	Zinc.

*an abbreviation for a metal or other analyte may be followed by the letters 'As', to denote the amount of metal recoverable in acidic conditions. This is taken as indicating the total amount of metal that might be solubilised under extreme environmental conditions. The abbreviation may alternatively be followed by the letter 'D', denoting the amount of the metal present in dissolved form rather than in particulate or solid form.

For further information on analytical methods, contact a Science Services Manager.

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Appendix I

Resource consents held by STDC for the Eltham Central landfill

(For a copy of the signed resource consent
please contact the TRC Consents department)

Consent	Purpose	Review	Expiry	Frodo number	Changes from 2016-2017
5347-1.2	To discharge contaminants onto and into land	June 2019 June 2023 June 2029 Within 18 months of the exercise of the consent	June 2034	1920609	Reviewed consent
5348-1.3	To discharge emissions into the air			1920693	Reviewed consent
5349-1.3	To discharge stormwater			1982728	Varied consent
5350-1.2	To dam and divert water			1920863	Reviewed consent
5351-1.2	To erect, place and maintain structures in the beds of the unnamed tributaries			1920876	Reviewed consent

Discharge Permit

Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of Consent Holder:	South Taranaki District Council Private Bag 902 Hawera 4640
Decision Date (Review):	24 August 2017
Commencement Date (Review):	24 August 2017 (Granted Date: 15 March 2000)

Conditions of Consent

Consent Granted:	To discharge contaminants onto and into land at the South Taranaki District Council Central Landfill, Eltham
Expiry Date:	1 June 2034
Review Date(s):	December 2017, June 2018, June 2019, June 2023, June 2029
Site Location:	Central Landfill, Rotokare Road, Eltham
Grid Reference (NZTM)	1712140E-5631866N
Catchment:	Waingongoro

For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document

General condition

a. The consent holder shall pay to the Taranaki Regional Council all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. That:

    a) the consent holder shall prepare a Landfill Management Plan addressing proposed operation, management and monitoring at the landfill for the purpose of demonstrating among other things the means by which compliance with the conditions set in this consent shall be achieved, such Plan (excluding that part of the Plan that deals with contingency events) to be prepared to the reasonable satisfaction of the General Manager, Taranaki Regional Council three months prior to the exercise of this consent. The initial Management Plan shall be reviewed by the General Manager in consultation with the Neighbourhood Liaison Group. The adverse environmental effects arising from implementation of the Management Plan, and any subsequent version required under Condition 1(b), shall be no greater than those arising from the implementation of the draft plan provided with the application dated May 1998 and in any case shall be within the limits set by the conditions on this consent;

    b) the Management Plan shall be reviewed and updated at not greater than two yearly intervals, in consultation with the General Manager, Taranaki Regional Council, and the Neighbourhood Liaison Group;

    c) the consent holder shall adhere to and comply with the procedures, requirements, obligations and all other matters specified in the management plan, unless it can be demonstrated to the reasonable satisfaction of the General Manager, Taranaki Regional Council, that any changes in those procedures, requirements, and obligations will result in the same or any lesser adverse environmental effect than already allowed; and

    d) in case of any contradiction between the management plan and the conditions of this resource consent, the conditions of this resource consent shall prevail.

2. That the consent holder shall ensure that:

    a) the operation of the landfill and the disposal of wastes shall be carried out at all times in accordance with the requirements of the Landfill Management Plan prepared as required in Condition (1) above or subsequent version of that document which does not lessen environmental protection standards;

    b) all site staff working at the landfill are regularly trained on the content and implementation of the Landfill Management Plan, the maximum period between training sessions being 12 months. New staff are to be trained on recruitment and the training record made available to the General Manager, Taranaki Regional Council upon request; and

    c) in order to avoid adverse effects arising from the exercise of this consent, all site staff are advised immediately of any revision or additions to the Landfill Management Plan.

3. That the consent holder shall meet the reasonable cost of the Taranaki Regional Council retaining a Technical Advisor, suitably qualified and knowledgeable in landfill development and operational procedures, to advise the General Manager, Taranaki Regional Council on aspects of the operation of the landfill related to disposal of solid waste and the installation and maintenance of the leachate collection system, and the ability to achieve compliance with the conditions of consent. Apart from other activities undertaken by the Technical Advisor, the Advisor shall undertake annual reviews, or other such reviews as reasonably determined by the General Manager, Taranaki Regional Council, of the landfill operations for the first 6 years and thereafter at a frequency determined by the General Manager, Taranaki Regional Council, in consultation with the Neighbourhood Liaison Group.

4. That the consent holder shall:

   a) construct a composite liner in all areas where refuse is to be placed. The liner shall be constructed with a layer of compacted clay with a permeability of less than $1x10^{-8}$ m/sec and a minimum thickness of 600 mm, overlain by a membrane of high density polyethylene HDPE at least 1.5 mm thick. The consent holder may use materials and a specification other than described above, provided that any such materials shall perform to the same or higher standard than those specified and provided further that the consent holder shall first obtain the written approval of the General Manager, Taranaki Regional Council; and

   b) provide for collecting leachate from the liner and transferring it to a pond within the landfill property boundary, such pond to be lined with a composite liner as specified in Condition 4(a) above;

   c) ensure there is no discharge of refuse or leachate to land or water in any area without the liner as required in Conditions 4a and 4b above; and

   d) remove sufficient daily cover and remove at least 20% of the intermediate cover to ensure downward migration of leachate, before placing refuse on an existing cell.

5. That the construction, installation, placement, integrity and expected performance of landfill lining systems, groundwater drainage systems, and leachate interception, collection, holding and recirculation systems on any part of the site shall be certified by a registered engineer, a copy of such certification to be provided to General Manager, Taranaki Regional Council, prior to discharge of waste in those areas.

6. That the consent holder shall maintain a manifest/declaration system that shall record the following information on the waste received for disposal. This information is to be forwarded to the General Manager, Taranaki Regional Council on a 6-monthly basis no later than the 10th working day of the following month:

   a) general description in volume or quantity in cubic metres or kilograms per day of domestic, commercial and industrial waste received from other than transfer stations; and

   b) general description in volume or quantity (in cubic metres or kilograms) of all waste received at the landfill from transfer stations.

   Where the consent holder reasonably considers any information required under this condition is confidential, it may notify the General Manager, Taranaki Regional Council, accordingly so that reasonable measures can be taken to protect confidentiality.

7. That the consent holder shall ensure that:

   a) Medical waste is managed in accordance with NZS4304;

   b) Animal parts are buried immediately upon receipt

   c) Asbestos is managed in accordance with the Asbestos Regulations;

   d) Waste that is potentially a health hazard shall be placed in a hole specifically excavated and immediately covered with appropriate cover material. The location of special waste holes shall be recorded by survey.

8. That any contaminated soils that are accepted at the landfill and whose contaminant concentration exceeds those levels specified in any New Zealand Standard or guidelines as being appropriate for industrial unpaved sites shall be covered over as soon as practicable such that the risk to human and environmental health is avoided.

9. That the consent holder shall appoint a person to control entry of waste into the landfill.

10. That the consent holder shall not dispose of waste of an explosive, flammable, reactive, toxic, radioactive, corrosive or infectious nature other than minor quantities of such waste where they are ordinarily part of and found in general wastes. In addition, the consent holder shall not dispose of wastes deemed unacceptable under Conditions 11 and 12.

11. That further to Condition 10 of this consent, the wastes which are acceptable or unacceptable are as follows:

   a) General waste is solid waste generated from residential, commercial and industrial sources. General waste covers all waste not otherwise defined below. It is acceptable and may contain minor quantities of special or prohibited waste which are normally part of the waste stream;

   b) Difficult wastes are wastes which are acceptable but due to their physical nature require specific disposal management. These wastes include offal, dead animal bodies, wire rope, documents and bulky items;

   c) Special Wastes contain substances that may adversely affect the final landfill or leachate or landfill gas quality. Their acceptance in the landfill shall be based on an assessment of the nature of the waste and its effects on the landfill and its receiving environment in accordance with the requirements of Condition 12 of this consent;

   d) Liquid wastes shall not be accepted other than those liquids which are in small containers that are impractical to empty ;

   e) Sludges may be accepted, as long as they contain no separated liquids.

12. That no waste shall be accepted for disposal which may cause a significant potential or actual adverse environmental effect. In the absence of other criteria, no wastes shall be accepted:

    a) if a TCLP test extract exceeds 2,500 times the level specified in any New Zealand Standard or guideline as being appropriate for stock watering purposes; or

    b) if containing any contaminant exceeding 300 times the level specified in any New Zealand Standard or guideline as being appropriate for soil for agricultural use unless such wastes have been treated so as to comply with conditions as above and are not placed within the top 4 metres lift of refuse beneath any final landfill cap at any point.

13. That in order to maintain the integrity of the liner and to minimise the risk of discharge of contaminants, the consent holder shall ensure that special wastes as defined in Condition 11(c) shall not be deposited within 5 metres of the liner or the top 4 metres lift of refuse beneath the final landfill cap at any point or within 10 metres of the edge of the landfill.

14. That the consent holder shall take all practicable measures to avoid the discharge of contaminants from within the landfill site to surrounding land. To this end, the consent holder shall ensure:

    a) refuse is spread in thin layers and is compacted on the same day refuse is received;

    b) the amount of refuse exposed at any one time is confined to a practicable minimum; and

    c) exposed refuse is covered regularly with appropriate material and in any case no less frequently than daily.

15. That the consent holder shall:

    a) compact refuse to such an extent that post closure settlement is minimised, targeting a compacted refuse density averaging at least 700 kg/m^3 as far as practicable;

    b) progressively, as parts of the landfill are completed, cover exposed refuse with not less than 650 mm of earth material, of which 500 mm is compacted to a permeability of less than $1x10^{-7}$m/sec, and no less than 150 mm comprises topsoil, and establish and maintain pasture on those completed areas at the landfill; and

    c) within two months following the closure of any landfill stage, grade the tipping face to achieve a final slope less than or equal to 1V:3H (1 in 3) on any face.

16. That within one month following completion of each stage at the landfill, the consent holder shall report in writing to the General Manager, Taranaki Regional Council of the consent holder's compliance with Condition 15 of this consent.

17. That the consent holder shall maintain and comply with an Annual Monitoring Plan prepared to the reasonable satisfaction of the General Manager, Taranaki Regional Council and prepared in consultation with the Neighbourhood Liaison Group. The Annual Monitoring Plan may be amended by the General Manager following consultation with the consent holder. The Plan shall describe in detail practices for water and soil chemistry monitoring, shall contain guidelines for the determination of whether contamination is occurring including "alert" and "response" levels for individual contaminants and shall make reference to the Management Plan, to be prepared as required in Condition 1 of this consent. The initial Monitoring Plan is to be received by the General Manager, Taranaki Regional Council, at least six months prior to any discharge of solid wastes authorised by this consent. The initial Monitoring Plan is to include:

    a) further baseline monitoring [biological, chemical and physical] of surface water quality and groundwater prior to commencement of landfilling;
    b) quarterly monitoring of groundwater levels and water quality of each of the existing monitoring bores shown in Figure 4 of the application documentation dated May 1998, plus the installation and monitoring of at least one further bore downslope of the leachate storage lagoon at a site approved by the General Manager, Taranaki Regional Council;
    c) biological, physical and chemical monitoring of surface water quality twice per year in the two unnamed tributaries of the Waingongoro River at site(s) approved by the General Manager, Taranaki Regional Council;
    d) measurement of volume of leachate removed from the site monthly;
    e) annual testing of leachate for the following components: pH, conductivity, alkalinity, chloride, sulphate, carbonate, bicarbonate, ammonia–N, nitrate-N, reactive dissolved phosphorus; COD, BOD_5; aluminium, arsenic, boron, cadmium, calcium, chromium, copper, iron, magnesium, manganese, mercury, sodium, nickel, potassium, lead, zinc; volatile organic compounds, semi-volatile organic compounds [volatile and semi-volatile organic compound scans to include but not be restricted to benzene, benzo-a-pyrene, phenol, perchlorethylene, and napthalene], organochlorine pesticides screen, organophosphate pesticide screen, and polyaromatic hydrocarbon screen;
    f) quarterly testing of leachate for the following components: pH, conductivity, alkalinity, chloride, sulphate, carbonate, bicarbonate, ammonia–N, nitrate-N, reactive dissolved phosphorus; COD, BOD_5; aluminium, arsenic, boron, cadmium, calcium, chromium, copper, iron, magnesium, manganese, mercury, sodium, nickel, potassium, lead, zinc;
    g) quarterly sampling and testing of groundwater from on-site bores as noted in Condition 17(b) above as follows: Comprehensive testing (April) - pH, conductivity, alkalinity, chloride, sulphate, carbonate, bicarbonate, ammonia–N, nitrate-N, reactive dissolved phosphorus; COD, BOD_5; aluminium, arsenic, boron, cadmium, calcium, chromium, copper, iron, magnesium, manganese, mercury, sodium, nickel, potassium, lead, zinc, benzo-a-pyrene, benzene, phenol, perchlorethylene, and napthalene; Indicator testing (July, October, January) - pH, conductivity, COD, boron, iron, manganese, chloride, ammonia-N, nitrate-N;
    h) annual sampling and testing of surface water supplies and bores on neighbouring properties, located as noted in Appendix 10 of the application documentation dated May 1998, subject to the agreement of the respective owners, as follows: pH, benzene, zinc, alkalinity, conductivity, chloride, ammonia–N, nitrate-N, nitrite-N, boron, COD, iron, manganese; and
    i) analysis shall be conducted by a laboratory with appropriate accreditation for those parameters measured.

18. That the results of the Annual Monitoring Programme for the year ending 30 June be provided to the General Manager Taranaki Regional Council by 31 August of each year following the monitoring, and be made available to the Neighbourhood Liaison Group, and to any other interested party.

19. That the consent holder shall prevent surface runoff of water or contaminants to the unnamed tributaries of the Waingongoro River from any surface area being used or previously used for the deposition of refuse, or for extraction of soil, clay, or other cover material, or prepared for the deposition of refuse, unless such surface area has been covered and rehabilitated.

20. That where any leachate or other contaminants associated with the consent holder's activities or processes associated with the landfill significantly affect surface and ground water, the consent holder shall:

    a) undertake appropriate remedial action as soon as practicable as described in the consent holder's Management Plan required by Condition 1, or other such action reasonably required by the General Manager, Taranaki Regional Council;

    b) as soon as reasonably practicable, notify the General Manager, Taranaki Regional Council, of the escape of wastes;

    c) shall review the Monitoring Programme and Management Plan and incorporate such reasonable modifications as are considered necessary by the General Manager, Taranaki Regional Council; and

    d) where water supplies are significantly affected, immediately provide alternative supplies as reasonably required by the General Manager, Taranaki Regional Council.

    "Significantly affected" for the purposes of this condition shall be determined by the General Manager Taranaki Regional Council, by reference to the monitoring data and taking into account the purpose for which the water is to be used.

21. That the consent holder shall inspect the landfill for leachate break out, settlement and other adverse environmental effects at least once per month until such time as discharge of refuse to the landfill ceases. Thereafter, the frequency of inspection shall be determined in consultation with the General Manager, Taranaki Regional Council.

22. That the consent holder shall record the date, time, observations and any remedial action as a result of Condition 21. The record shall be made available to the Neighbourhood Liaison Group and the General Manager, Taranaki Regional Council on an annual basis.

23. That the consent holder shall ensure that records are kept of any site investigations for any engineering works associated with this consent, and that these records are forwarded to the General Manager, Taranaki Regional Council.

24. That the consent holder and staff of the Taranaki Regional Council shall meet, with representatives of the Neighbourhood Liaison Group to discuss any matter relating to the exercise of this resource consent, in order to facilitate ongoing consultation, such meetings to be according to the following schedule:

    (a) one month prior to the exercise of this consent;

    (b) thereafter at intervals of three months for the first eighteen months after the date of exercise;

    (c) thereafter at one interval of no more than six months; and

    (d) thereafter at intervals of no more than twelve months;

    unless all parties agree that changes to the intervals are acceptable.

    The Technical Adviser may attend one meeting per year for the first six years and thereafter at a frequency determined by the General Manager, Taranaki Regional Council

25. That this consent shall lapse on the expiry of twenty [20] years after the date of commencement of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.

26. That the consent holder shall not apply for any further variation of its resource consent seeking to permit the discharge of waste into the Eltham landfill from beyond Taranaki Region (i.e. beyond the waste-stream presently accepted by New Plymouth, South Taranaki and Stratford District Councils) and for avoidance of doubt includes the peripheral townships of Awakino and Mokau. Any further variations will be restricted to health and safety and/or applications to enhance the environmental performance of the Eltham landfill due to improvements in engineering methods and available technology relevant to landfill construction and operation or as a result of monitoring.

27. That the Taranaki Regional Council may, under section 128(1)(a) of the Resource Management Act 1991, serve notice of review of conditions of this consent in June 2005, June 2011, June 2017, December 2017, June 2018, June 2019, June 2023, and June 2029 and within 18 months of the date this consent is first exercised, for the purpose of:

    i) ensuring the ongoing adequacy of the Monitoring Programme and methods of implementation outlined in Condition 17 of this consent; and

    ii) ensuring the effectiveness of conditions in avoiding, remedying or mitigating adverse effects on the environment from the discharge of contaminants to land.

    The review of conditions may allow for:

    a) modification of the Monitoring Programme and methods of implementation outlined in Condition 17 of this consent;

    b) deletion, additions or changes to Conditions 3, 4, 7, 8, 11, 13, 14, 15 and 20.

Signed at Stratford on 24 August 2017

For and on behalf of
Taranaki Regional Council

_____

A D McLay
Director - Resource Management

Discharge Permit

Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of Consent Holder:	South Taranaki District Council Private Bag 902 Hawera 4640
Decision Date (Review):	24 August 2017
Commencement Date (Review):	24 August 2017 (Granted Date: 15 March 2000)

Conditions of Consent

Consent Granted:	To discharge emissions into the air from landfilling activities at the South Taranaki District Council Central Landfill, Eltham
Expiry Date:	1 June 2034
Review Date(s):	December 2017, June 2018, June 2019, June 2023, June 2029
Site Location:	Central Landfill, Rotokare Road, Eltham
Grid Reference (NZTM)	1712140E-5631866N

For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document

General condition

a. The consent holder shall pay to the Taranaki Regional Council all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. That:

   a) the consent holder shall prepare a Landfill Management Plan addressing proposed operation, management and monitoring at the landfill for the purpose of demonstrating among other things the means by which compliance with the conditions set in this consent shall be achieved, such Plan (excluding that part of the Plan that deals with contingency events) to be prepared to the reasonable satisfaction of the General Manager, Taranaki Regional Council three months prior to the exercise of this consent. The initial Management Plan shall be reviewed by the General Manager in consultation with the Neighbourhood Liaison Group. The adverse environmental effects arising from implementation of the Management Plan, and any subsequent version required under Condition 1(b), shall be no greater than those arising from the implementation of the draft plan provided with the application dated May 1998 and in any case shall be within the limits set by the conditions on this consent;

   b) the Management Plan shall be reviewed and updated at not greater than two yearly intervals, in consultation with the General Manager, Taranaki Regional Council, and the Neighbourhood Liaison Group;

   c) The consent holder shall adhere to and comply with the procedures, requirements, obligations and all other matters specified in the management plan, unless it can be demonstrated to the reasonable satisfaction of the General Manager, Taranaki Regional Council, that any changes in those procedures, requirements, and obligations will result in the same or any lesser adverse environmental effect that already allowed; and

   d) in case of any contradiction between the management plan and the conditions of this resource consent, the conditions of this resource consent shall prevail.

2. That the consent holder shall at all times adopt the best practicable option [as defined in section 2 of the Act] to prevent or minimise any actual or likely adverse effect on the environment arising from emissions from the landfill operation.

3. That the discharge of contaminants into the air from the landfill shall not result in offensive or objectionable odours or dangerous or noxious ambient concentrations of any airborne contaminant, in the opinion of an appropriately qualified enforcement officer of the Taranaki Regional Council, at or beyond the boundary of the site.

4. That the discharge of contaminants into the air from the landfill shall not result in either dust or other particulate matter that is offensive or objectionable, in the opinion of an appropriately qualified enforcement officer of the Taranaki Regional Council, at or beyond the boundary of the site.

5. That the consent holder shall ensure that dust is controlled on access roads and on the landfill as necessary.

6. That there shall be no burning of waste at the site.

7. That there shall be no composting of waste at the site.

8. That there shall be no extraction venting of untreated landfill gases within 200 metres of the boundary of the site.

9. That the consent holder shall take all practicable measures to avoid the discharge of waste or contaminants from within the landfill site to the surrounding environment. To this end, the consent holder shall ensure:

   a) refuse is spread in thin layers and is compacted on the same day refuse is received;

   b) the amount of refuse exposed at any one time is confined to a practicable minimum; and

   c) exposed refuse is covered regularly with appropriate material and in any case no less frequently than daily.

10. That the consent holder shall maintain and comply with an Annual Monitoring Plan, prepared to the reasonable satisfaction of the General Manager, Taranaki Regional Council, and prepared in consultation with the Neighbourhood Liaison Group, setting out details of monitoring to be carried out and containing guidelines for the determination of whether contamination is occurring. The Annual Monitoring Plan may be amended by the General Manager following consultation with the consent holder. The initial Monitoring Plan is to be received by the General Manager, Taranaki Regional Council, at least six months prior to any discharge under this consent. The initial Monitoring Plan is to include:

    a) annual sampling of landfill gas constituents for a period of five years and thereafter at five yearly intervals from a suitable landfill gas well using a tech tube or equivalent method to the satisfaction of the General Manager Taranaki Regional Council. The head space in the water monitoring bores B1 and B3, as shown in Figures 5 and 8 of Appendix 4 of the application documentation dated May 1998, and in the leachate pump chamber shall also be sampled;

    b) samples shall be monitored and analysed for: hydrogen sulphide, methane and carbon dioxide, vinyl chloride, benzene, perchlorethlyene and xylene;

    c) every five years another landfill gas well shall be installed in waste placed in the preceding five years and monitored as in (a) and (b) above;

    d) monitoring of each well shall cease when there is a significant reduction in the level of landfill gas [to the reasonable satisfaction of the General Manager, Taranaki Regional Council];

    e) analysis shall be conducted by a laboratory with appropriate accreditation for those parameters measured; and

    f) monthly odour surveys around the perimeter of the site or a lesser frequency as agreed to by the Neighbourhood Liaison Group.

11. That a meteorological station be established, at a site to the reasonable satisfaction of the General Manager, Taranaki Regional Council, to measure and record, for a period of no less than 12 months commencing within one year of the development of the site, wind speed, wind direction, temperature and net radiation . The results are to be used to undertake dispersion modelling to predict ground level concentrations of hydrogen sulphide or other gaseous or airborne contaminants around the site.

12. That in fulfilment of Condition 11 above the meteorological parameters are to be measured as specified in Appendix 10 to the application documentation dated May 1998.

13. That the consent holder shall keep a record of any complaints received relating to discharges to air with respect to the landfill activity. The complaints record shall include the following where possible:

    a) name and address of complainant;

    b) nature of complaint;

    c) date and time of the complaint and alleged event;

    d) weather conditions at the time of the event; and

    e) any action taken in response to the complaint.

14. That the results of the Annual Monitoring Plan, the complaints record, and the meteorological data, for the year ending 30 June be provided to the General Manager Taranaki Regional Council by 31 August of each year following the monitoring, and be made available to the Neighbourhood Liaison Group, and to the public.

15. That the consent holder shall ensure that records are kept of any site investigations for any engineering works associated with this consent, and that these records are forwarded to the General Manager, Taranaki Regional Council.

16. That the consent holder and staff of the Taranaki Regional Council shall meet with representatives of the Neighbourhood Liaison Group to discuss any matter relating to the exercise of this resource consent, in order to facilitate ongoing consultation, such meetings to be according to the following schedule:

    (a) one month prior to the exercise of this consent;

    (b) thereafter at intervals of three months for the first eighteen months after the date of exercise;

    (c) thereafter at one interval of no more than six months; and

    (d) thereafter at intervals of no more than twelve months;

    unless all parties agree that changes to the intervals are acceptable.

    The Technical Adviser may attend one meeting per year for the first six years and thereafter a frequency determined by the General Manager, Taranaki Regional Council.

17. That this consent shall lapse on the expiry of twenty [20] years after the date of commencement of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.

18. That the consent holder shall not apply for any further variation of its resource consent seeking to permit the discharge of waste into the Eltham landfill from beyond Taranaki Region (i.e. beyond the waste-stream presently accepted by New Plymouth, South Taranaki and Stratford District Councils) and for avoidance of doubt includes the peripheral townships of Awakino and Mokau. Any further variations will be restricted to health and safety and/or applications to enhance the environmental performance of the Eltham landfill due to improvements in engineering methods and available technology relevant to landfill construction and operation or as a result of monitoring.

19. That the Taranaki Regional Council may, under section 128(1)(a) of the Resource Management Act 1991, serve notice of review of conditions of this consent in June 2005, June 2011, June 2017, December 2017, June 2018, June 2019, June 2023, and June 2029 and within 18 months of the exercise of this consent, for the purpose of:

    i) ensuring the ongoing adequacy of the Monitoring Programme and methods of implementation outlined in Condition 10 of this consent; and
    ii) ensuring the effectiveness of conditions in avoiding, remedying or mitigating adverse effects on the environment from the discharge of contaminants to air.

    The review of conditions may allow for:

    a) modification of the Monitoring Programme and methods of implementation outlined in Condition 10 of this consent; and
    b) deletion, additions or changes to conditions 2, 3, 4 and 9.

Signed at Stratford on 24 August 2017

For and on behalf of
Taranaki Regional Council

_____

A D McLay
Director - Resource Management

Discharge Permit

Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of Consent Holder:	South Taranaki District Council Private Bag 902 Hawera 4640
Decision Date (Change):	14 December 2017
Commencement Date (Change):	14 December 2017 (Granted Date: 15 March 2000)

Conditions of Consent

Consent Granted:	To discharge up to 15,000 cubic metres/day of uncontaminated stormwater and 4,000 cubic metres/day of treated stormwater from the South Taranaki District Council Central Landfill, Eltham, onto and into land and into an unnamed tributary of the Waingongoro River
Expiry Date:	1 June 2034
Review Date(s):	December 2017, June 2018, June 2019, June 2023, June 2029
Site Location:	Central Landfill, Rotokare Road, Eltham
Grid Reference (NZTM)	1712140E-5631870N
Catchment:	Waingongoro

For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document

General condition

a. The consent holder shall pay to the Taranaki Regional Council all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. That:

   a) the consent holder shall prepare a Landfill Management Plan addressing proposed operation, management and monitoring at the landfill for the purpose of demonstrating among other things the means by which compliance with the conditions set in this consent shall be achieved, such Plan (excluding that part of the Plan that deals with contingency events) to be prepared to the reasonable satisfaction of the General Manager, Taranaki Regional Council prior to the exercise of this consent. The initial Management Plan shall be reviewed by the General Manager in consultation with the Neighbourhood Liaison Group. The adverse environmental effects arising from implementation of the Management Plan, and any subsequent version required under Condition 1(b), shall be no greater than those arising from the implementation of the draft plan provided with the application dated May 1998 and in any case shall be within the limits set by the conditions on this consent;

   b) The Management Plan shall be updated at not greater than two yearly intervals, to the satisfaction of the General Manager, Taranaki Regional Council, and following consultation with the Neighbourhood Liaison Group;

   c) The consent holder shall adhere to and comply with the procedures, requirements, obligations and all other matters specified in the management plan, unless it can be demonstrated to the reasonable satisfaction of the General Manager, Taranaki Regional Council, that any changes in those procedures, requirements, and obligations will result in the same or any lesser adverse environmental effect than already allowed; and

   d) in case of any contradiction between the management plan and the conditions of this resource consent, the conditions of this resource consent shall prevail.

2. That no leachate discharge shall be permitted by the exercise of this consent.

3. That in order to give effect to Condition 2, the consent holder shall ensure that the leachate storage lagoon is bunded to ensure no entry of stormwater to that lagoon.

4. That the consent holder shall at all times adopt the best practicable option [as defined in section 2 of the Act] to keep uncontaminated stormwater separate from contaminated stormwater.

5. That no contaminated stormwater be discharged directly to the unnamed tributaries of the Waingongoro River.

6. That stormwater holding ponds be installed.

7. That after allowing for reasonable mixing in a zone that extends downstream no further than the western boundary of the site ["the mixing zone"], the discharge shall not give rise to all or any of the following effects in the receiving water:

   (a) the production of conspicuous oil or grease films, scums or foams, or floatable or suspended materials;

   (b) any conspicuous change in the colour or visual clarity;

   (c) any emission of objectionable odour;

   (d) the rendering of freshwater unsuitable for consumption by farm animals; and

   (e) any significant adverse effects on aquatic life.

8. That the exercise of this consent shall not cause the water quality of the tributary streams, beyond the mixing zone, to exceed the following criteria:

Parameter	**Limit**
pH	6.0-9.0
Copper (dissolved)	0.01 g/m^3
Iron (dissolved)	1.0 g/m^3
Manganese (dissolved)	0.01 g/m^3
Zinc (dissolved)	0.1 g/m^3
Dissolved reactive phosphorus	0.5 g/m^3
Nitrate nitrogen	10 g/m^3
Ammonia nitrogen	1.8 g/m^3
Suspended solids	100 g/m^3
Faecal coliforms	1000 n/100 ml

9. That all stormwater diversion and containment channels shall be designed, constructed and maintained so as to prevent or minimise erosion of the channel.

10. That the earthworks and construction associated with the landfill and the stormwater diversion and containment channels shall be designed, constructed and maintained so as to minimise instability of the surrounding land.

11. That the consent holder shall repair and rehabilitate any land made unstable and any erosion occurring due to the construction or maintenance of the diversion channels or landfilling operations associated with the exercise of this consent.

12. That the consent holder shall minimise disturbance to riparian vegetation during the exercise of this consent, and shall undertake, at a minimum, planting within the site in accordance with those areas shown in Figures 5a, 5b, 5c, and 5d of the Assessment of Environmental Effects accompanying the application dated May 1998.

13. That the consent holder shall maintain and comply with an Annual Monitoring Plan prepared to the reasonable satisfaction of the General Manager, Taranaki Regional Council and prepared in consultation with the Neighbourhood Liaison Group. The Plan shall describe in detail practices for water monitoring. The Annual Monitoring Plan may be amended by the General Manager following consultation with the consent holder. The initial Monitoring Plan is to be received by the General Manager, Taranaki Regional Council, at least six months prior to any discharge under this consent. The initial Monitoring Plan is to include:

    a) biological and water quality monitoring twice per year in the two unnamed tributaries of the Waingongoro River at site(s) to the reasonable satisfaction of the General Manager, Taranaki Regional Council;

    b) monitoring of the parameters as set out in Condition 8 above, and also alkalinity, BOD_5, and conductivity; and

    c) analysis shall be conducted by a laboratory with appropriate accreditation for those parameters measured.

14. That the results of the Annual Monitoring Programme for the year ending 30 June be provided to the General Manager Taranaki Regional Council by 31 August of each year following the monitoring, and be made available to the Neighbourhood Liaison Group, and to any other interested party, and to the public.

15. That the construction, installation, placement, integrity and expected performance of stormwater collection, drainage and holding systems on any part of the site shall be certified by a registered engineer, a copy of such certification to be provided to the General Manager, Taranaki Regional Council, prior to and on completion of construction of any such systems, and prior to the disposal of any waste in those areas.

16. That the consent holder and staff of the Taranaki Regional Council shall meet as appropriate, and at least once per year, with representatives of the Neighbourhood Liaison Group to discuss any matter relating to the exercise of this resource consent, in order to facilitate ongoing consultation, such meetings to be according to the following schedule:

    (a) one month prior to the exercise of this consent;

    (b) thereafter at intervals of three months for the first eighteen months after the date of exercise;

    (c) thereafter at one interval of no more than six months; and

    (d) thereafter at intervals of no more than twelve months;

    unless all parties agree that changes to the intervals are acceptable.

    The Technical Adviser may attend one meeting per year for the first six years and thereafter at a frequency determined by the General Manager, Taranaki Regional Council.

17. That this consent shall lapse on the expiry of twenty [20] years after the date of commencement of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.

18. That the consent holder shall not apply for any further variation of its resource consent seeking to permit the discharge of waste into the Eltham landfill from beyond Taranaki Region (i.e. beyond the waste-stream presently accepted by New Plymouth, South Taranaki and Stratford District Councils) and for avoidance of doubt includes the peripheral townships of Awakino and Mokau. Any further variations will be restricted to health and safety and/or applications to enhance the environmental performance of the Eltham landfill due to improvements in engineering methods and available technology relevant to landfill construction and operation or as a result of monitoring.

19. That the Taranaki Regional Council may, under section 128(1)(a) of the Resource Management Act 1991, serve notice of review of conditions of this consent June 2005, June 2011, June 2017, December 2017, June 2018, June 2019, June 2023, and June 2029 and within 18 months of the exercise of this consent, for the purpose of:

    i) ensuring the ongoing adequacy of the Monitoring Programme and methods of implementation outlined in Condition 13 of this consent; and
    ii) ensuring the effectiveness of conditions in avoiding, remedying or mitigating adverse effects on the environment from the discharge of contaminants to land and water.

    The review of conditions may allow for:

    a) modification of the Monitoring Programme and methods of implementation outlined in Condition 13 of this consent; and
    b) deletion, additions or changes to Conditions 7 and 8.

Signed at Stratford on 14 December 2017

For and on behalf of
Taranaki Regional Council

_____

A D McLay
Director - Resource Management

Land Use Consent

Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of Consent Holder:	South Taranaki District Council Private Bag 902 Hawera 4640
Decision Date (Review):	24 August 2017
Commencement Date (Review):	24 August 2017 (Granted Date: 15 March 2000)

Conditions of Consent

Consent Granted:	To dam and divert water around the South Taranaki District Council Central Landfill, Eltham, in the headwaters of an unnamed tributary of the Waingongoro River
Expiry Date:	1 June 2034
Review Date(s):	December 2017, June 2018, June 2019, June 2023, June 2029
Site Location:	Central Landfill, Rotokare Road, Eltham
Grid Reference (NZTM)	1712140E-5631866N
Catchment:	Waingongoro

For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document

General condition

a. The consent holder shall pay to the Taranaki Regional Council all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. That:

   a) the consent holder shall prepare a Landfill Management Plan addressing proposed operation, management and monitoring at the landfill for the purpose of demonstrating among other things the means by which compliance with the conditions set in this consent shall be achieved, such Plan (excluding that part of the Plan that deals with contingency events) to be prepared to the reasonable satisfaction of the General Manager, Taranaki Regional Council three months prior to the exercise of this consent. The initial Management Plan shall be reviewed by the General Manager in consultation with the Neighbourhood Liaison Group. The adverse environmental effects arising from implementation of the Management Plan, and any subsequent version required under Condition 1(b), shall be no greater than those arising from the implementation of the draft plan provided with the application dated May 1998 and in any case shall be within the limits set by the conditions on this consent;

   b) the Management Plan shall be reviewed and updated at not greater than two yearly intervals, in consultation with the General Manager, Taranaki Regional Council, and the Neighbourhood Liaison Group;

   c) the consent holder shall adhere to and comply with the procedures, requirements, obligations and all other matters specified in the management plan, unless it can be demonstrated to the reasonable satisfaction of the General Manager, Taranaki Regional Council, that any changes in those procedures, requirements, and obligations will result in the same or any lesser adverse environmental effect than already allowed; and

   d) in case of any contradiction between the management plan and the conditions of this resource consent, the conditions of this resource consent shall prevail.

2. That all stormwater diversion and containment channels shall be designed, constructed and maintained so as to prevent or minimise erosion of the channel in all circumstances.

3. That the earthworks and construction associated with the landfill and the stormwater diversion and containment channels shall be designed, constructed and maintained so as to minimise instability of the surrounding land.

4. That the consent holder shall repair and rehabilitate any land made unstable and any erosion occurring due to the construction or maintenance of the diversion channels or landfilling operations associated with the exercise of this consent.

5. That the consent holder shall maintain and comply with an Annual Monitoring Plan prepared to the reasonable satisfaction of the General Manager, Taranaki Regional Council and prepared in consultation with the Neighbourhood Liaison Group. The Annual Monitoring Plan may be amended by the General Manager following consultation with the consent holder. The initial Monitoring Plan is to be received by the General Manager, Taranaki Regional Council, at least six months prior to any dam construction under this consent. The initial Monitoring Plan shall describe in detail practices and sites for water monitoring.

6. That the construction, installation, placement, integrity and expected performance of the damming and diversion systems on any part of the site shall be certified by a registered engineer, a copy of such certification to be provided to the General Manager, Taranaki Regional Council, prior to and on completion of the construction of any such systems in those areas.

7. That the consent holder and staff of the Taranaki Regional Council shall meet with representatives of the Neighbourhood Liaison Group to discuss any matter relating to the exercise of this resource consent, in order to facilitate ongoing consultation, such meetings to be according to the following schedule:

   (a) one month prior to the exercise of this consent;

   (b) thereafter at intervals of three months for the first eighteen months after the date of exercise;

   (c) thereafter at one interval of no more than six months; and

   (d) thereafter at intervals of no more than twelve months;

   unless all parties agree that changes to the intervals are acceptable.

   The Technical Adviser may attend one meeting per year for the first six years and thereafter a frequency determined by the General Manager, Taranaki Regional Council.

8. That this consent shall lapse on the expiry of twenty [20] years after the date of commencement of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.

9. That the consent holder shall not apply for any further variation of its resource consent seeking to permit the discharge of waste into the Eltham landfill from beyond Taranaki Region (i.e. beyond the waste-stream presently accepted by New Plymouth, South Taranaki and Stratford District Councils) and for avoidance of doubt includes the peripheral townships of Awakino and Mokau. Any further variations will be restricted to health and safety and/or applications to enhance the environmental performance of the Eltham landfill due to improvements in engineering methods and available technology relevant to landfill construction and operation or as a result of monitoring.

10. That the Taranaki Regional Council may, under section 128(1)(a) of the Resource Management Act 1991, serve notice of review of conditions of this consent in June 2005, June 2011, June 2017, December 2017, June 2018, June 2019, June 2023, and June 2029 and within 18 months of the exercise of this consent, for the purpose of:

    i) ensuring the ongoing adequacy of the Monitoring Programme and methods of implementation outlined in Condition 5 of this consent; and
    ii) ensuring the effectiveness of conditions in avoiding, remedying or mitigating adverse effects on the environment from the damming and diversion of water.

    The review of conditions may allow for:

    a) modification of the Monitoring Programme and methods of implementation outlined in Condition 5 of this consent.

Signed at Stratford on 24 August 2017

For and on behalf of
Taranaki Regional Council

_____

A D McLay
Director - Resource Management

Land Use Consent

Pursuant to the Resource Management Act 1991
a resource consent is hereby granted by the
Taranaki Regional Council

Name of Consent Holder:	South Taranaki District Council Private Bag 902 Hawera 4640	
Decision Date (Review):	24 August 2017	
Commencement Date (Review):	24 August 2017	(Granted Date: 15 March 2000)

Conditions of Consent

Consent Granted:	To erect, place and maintain structures in the beds of unnamed tributaries of the Waingongoro River for the construction and maintenance of the South Taranaki District Council Central Landfill, Eltham
Expiry Date:	1 June 2034
Review Date(s):	December 2017, June 2018, June 2019, June 2023, June 2029
Site Location:	Central Landfill, Rotokare Road, Eltham
Grid Reference (NZTM)	1712140E-5631866N
Catchment:	Waingongoro

For General, Standard and Special conditions
pertaining to this consent please see reverse side of this document

General condition

a. The consent holder shall pay to the Taranaki Regional Council all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. That:

   a) the consent holder shall prepare a Landfill Management Plan addressing proposed operation, management and monitoring at the landfill for the purpose of demonstrating among other things the means by which compliance with the conditions set in this consent shall be achieved, such Plan (excluding that part of the Plan that deals with contingency events) to be prepared to the reasonable satisfaction of the General Manager, Taranaki Regional Council three months prior to the exercise of this consent. The initial Management Plan shall be reviewed by the General Manager in consultation with the Neighbourhood Liaison Group. The adverse environmental effects arising from implementation of the Management Plan, and any subsequent version required under Condition 1(b), shall be no greater than those arising from the implementation of the draft plan provided with the application dated May 1998 and in any case shall be within the limits set by the conditions on this consent;

   b) the Management Plan shall be updated at not greater than two yearly intervals, in consultation with the General Manager, Taranaki Regional Council, and the Neighbourhood Liaison Group;

   c) the consent holder shall adhere to and comply with the procedures, requirements, obligations and all other matters specified in the management plan, unless it can be demonstrated to the reasonable satisfaction of the General Manager, Taranaki Regional Council, that any changes in those procedures, requirements, and obligations will result in the same or any lesser adverse environmental effect than already allowed; and

   d) in case of any contradiction between the management plan and the conditions of this resource consent, the conditions of this resource consent shall prevail.

2. That the construction and maintenance authorised by this consent, in conjunction with the exercise of any other consent associated with the landfill, shall not give rise to all or any of the following effects in the unnamed tributaries of the Waingongoro River at the western boundary of the site:

   a) the production of conspicuous oil or grease films, scums or foams, or floatable or suspended materials;

   b) any conspicuous change in the colour or visual clarity;

   c) any emission of objectionable odour;

   d) the rendering of freshwater unsuitable for consumption by farm animals; and

   e) any significant adverse effects on aquatic life.

3. That the earthworks and construction associated with the erection, placement and maintenance of structures shall be designed, constructed and maintained so as to minimise instability of the stream banks and the surrounding land.

4. That the consent holder shall repair and rehabilitate any land made unstable and any erosion occurring due to the construction or maintenance of the structures.

5. That the consent holder shall minimise disturbance to riparian vegetation during the exercise of this consent, and that any areas of such vegetation disturbed shall be reinstated and additional areas planted within the site in accordance with those areas shown in Figures 5a, 5b, 5c, and 5d of the Assessment of Environmental Effects accompanying the application dated May 1998.

6. That the consent holder shall maintain and comply with an Annual Monitoring Plan prepared to the reasonable satisfaction of the General Manager, Taranaki Regional Council and prepared in consultation with the Neighbourhood Liaison Group. The Annual Monitoring Plan may be amended by the General Manager following consultation with the consent holder. The initial Monitoring Plan is to be received by the General Manager, Taranaki Regional Council, at least six months prior to any streambed structure construction under this consent. The initial Monitoring Plan shall describe in detail practices and sites for water monitoring.

7. That the construction, installation, placement, integrity and expected performance of the structures in the streambeds on any part of the site shall be certified by a registered engineer, a copy of such certification to be provided to the General Manager, Taranaki Regional Council, prior to and on completion of the construction of any structures in those areas.

8. That the consent holder shall remove any structure(s) in waterways and reinstate the area if and when any structure(s) is no longer required.

9. That the consent holder and staff of the Taranaki Regional Council shall meet as appropriate, and at least once per year, with representatives of the Neighbourhood Liaison Group to discuss any matter relating to the exercise of this resource consent, in order to facilitate ongoing consultation, such meetings to be according to the following schedule:

   a) one month prior to the exercise of this consent;

   b) thereafter at intervals of three months for the first eighteen months after the date of exercise;

   c) thereafter at one interval of no more than six months; and

   d) thereafter at intervals of no more than twelve months;

   unless all parties agree that changes to the intervals are acceptable.

   The Technical Adviser may attend one meeting per year for the first six years and thereafter at a frequency determined by the General Manager, Taranaki Regional Council.

10. That this consent shall lapse on the expiry of twenty [20] years after the date of commencement of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.

11. That the consent holder shall not apply for any further variation of its resource consent seeking to permit the discharge of waste into the Eltham landfill from beyond Taranaki Region (i.e. beyond the waste-stream presently accepted by New Plymouth, South Taranaki and Stratford District Councils) and for avoidance of doubt includes the peripheral townships of Awakino and Mokau. Any further variations will be restricted to health and safety and/or applications to enhance the environmental performance of the Eltham landfill due to improvements in engineering methods and available technology relevant to landfill construction and operation or as a result of monitoring.

12. That the Taranaki Regional Council may, under section 128(1)(a) of the Resource Management Act 1991, serve notice of review of conditions of this consent June 2005, June 2011, June 2017, December 2017, June 2018, June 2019, June 2023, and June 2029 and within 18 months of the exercise of this consent, for the purpose of:

    i) ensuring the ongoing adequacy of the Monitoring Programme and methods of implementation outlined in Condition 6 of this consent; and
    ii) ensuring the effectiveness of conditions in avoiding, remedying or mitigating adverse effects on the environment from the construction and maintenance of structures.

    The review of conditions may allow for:

    a) modification of the Monitoring Programme and methods of implementation outlined in Condition 6 of this consent; and
    b) deletion, additions or changes to Condition 2.

Signed at Stratford on 24 August 2017

For and on behalf of
Taranaki Regional Council

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A D McLay
Director - Resource Management

Appendix II

Surface water chemical monitoring results

Hill Laboratories
TRIED, TESTED AND TRUSTED

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

T 0508 HILL LAB (44 555 22)
T +64 7 858 2000
E mail@hill-labs.co.nz
W www.hill-laboratories.com

Certificate of Analysis

Client:	Taranaki Regional Council	**Lab No:**	1938172 POPv1
Contact:	L Smith C/- Taranaki Regional Council Private Bag 713 Stratford 4352	**Date Received:**	07-Mar-2018
		Date Reported:	26-Mar-2018
		Quote No:	90190
		Order No:	
		Client Reference:	Eltham central landfill surface waters
		Submitted By:	Rae West

Sample Type: Aqueous

Sample Name:	WGG000647 06-Mar-2018 10:10 am	WGG000649 06-Mar-2018 12:40 pm	WGG000651 06-Mar-2018 11:50 am	WGG000653 06-Mar-2018 10:40 am	WGG000654 06-Mar-2018 11:10 am
Lab Number:	1938172.1	1938172.2	1938172.3	1938172.4	1938172.5
Faecal Coliforms and E. coli profile					
Analytes Detected:	2	2	2	2	2
Faecal Coliforms MPN / 100mL	1,100	350	1,600	5,400	700
Escherichia coli MPN / 100mL	700	350	1,600	5,400	700
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS					
Analytes Detected:	None	None	None	None	None
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn					
Analytes Detected:	2	1	2	2	2
Dissolved Chromium g/m³				0.0005	
Dissolved Copper g/m³	0.0008		0.0006	0.0005	0.0010
Dissolved Zinc g/m³	0.0013	0.0018	0.0015		0.0015 #1
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn					
Analytes Detected:	4	2	2	3	1
Total Chromium g/m³	0.00077			0.00062	
Total Copper g/m³	0.0026	0.00076	0.00097	0.00065	0.00093
Total Lead g/m³	0.00016				
Total Zinc g/m³	0.0061	0.0067	0.0046	0.0019	
Haloethers Trace in SVOC Water Samples by GC-MS					
Analytes Detected:	None	None	None	None	None
Nitrogen containing compounds Trace in SVOC Water Samples, GC-MS					
Analytes Detected:	None	None	None	None	None
Organochlorine Pesticides Trace in SVOC Water Samples by GC-MS					
Analytes Detected:	None	None	None	None	None
Polycyclic Aromatic Hydrocarbons Trace in SVOC Water Samples					
Analytes Detected:	None	None	None	None	None
Phenols Trace (drinkingwater) in SVOC Water Samples by GC-MS					
Analytes Detected:	None	None	None	None	None
Phenols Trace (non-drinkingwater) in SVOC Water Samples by GC-MS					
Analytes Detected:	None	None	None	None	None
Plasticisers Trace (non-drinkingwater) in SVOC Water by GCMS					
Analytes Detected:	None	None	None	None	None
Plasticisers Trace (drinkingwater) in SVOC Water Samples by GCMS					
Analytes Detected:	None	None	None	None	None
Other Halogenated compounds Trace (drinkingwater) in SVOC Water					
Analytes Detected:	None	None	None	None	None

Sample Type: Aqueous					
Sample Name:	WGG000647 06-Mar-2018 10:10 am	WGG000649 06-Mar-2018 12:40 pm	WGG000651 06-Mar-2018 11:50 am	WGG000653 06-Mar-2018 10:40 am	WGG000654 06-Mar-2018 11:10 am
Lab Number:	1938172.1	1938172.2	1938172.3	1938172.4	1938172.5
Other Halogenated compounds Trace (non-drinkingwater) in SVOC					
Analytes Detected:	None	None	None	None	None
Other SVOC Trace in SVOC Water Samples by GC-MS					
Analytes Detected:	None	None	None	None	None
BTEX in VOC Water by Headspace GC-MS					
Analytes Detected:	None	None	None	None	None
Halogenated Aliphatics in VOC Water by Headspace GC-MS					
Analytes Detected:	None	None	None	None	None
Halogenated Aromatics in VOC Water by Headspace GC-MS					
Analytes Detected:	None	None	None	None	None
Monoaromatic Hydrocarbons in VOC Water by Headspace GC-MS					
Analytes Detected:	None	None	None	None	None
Ketones in VOC Water by Headspace GC-MS					
Analytes Detected:	None	None	None	None	None
Trihalomethanes in VOC Water by Headspace GC-MS					
Analytes Detected:	None	None	None	None	None
Other VOC in Water by Headspace GC-MS					
Analytes Detected:	None	None	None	None	None

Sample Type: Aqueous						
Sample Name:		WGG000647 06-Mar-2018 10:10 am	WGG000649 06-Mar-2018 12:40 pm	WGG000651 06-Mar-2018 11:50 am	WGG000653 06-Mar-2018 10:40 am	WGG000654 06-Mar-2018 11:10 am
Lab Number:		1938172.1	1938172.2	1938172.3	1938172.4	1938172.5
Individual Tests						
Free Ammonia*	g/m^3 at Client Temperature	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Sum of Anions	meq/L	2.4	3.0	3.1	2.6	2.3
Sum of Cations	meq/L	2.5	3.1	3.3	2.6	2.4
Turbidity	NTU	4.0	5.1	4.5	1.05	1.25
pH	pH Units	7.7	8.0	7.8	7.7	7.8
Total Alkalinity	g/m^3 as $CaCO_3$	58	99	104	74	63
Bicarbonate	g/m^3 at 25°C	71	120	126	90	77
Total Hardness	g/m^3 as $CaCO_3$	71	97	101	79	71
Electrical Conductivity (EC)	mS/m	26.2	32.0	32.7	27.5	25.9
Total Suspended Solids	g/m^3	4	14	3	< 3	< 3
Total Dissolved Solids (TDS)	g/m^3	199	200	210	194	190
Sample Temperature*	°C	20.0	20.0	20.0	20.0	20.0
Dissolved Aluminium	g/m^3	0.010	0.007	0.012	0.006	0.008
Total Aluminium	g/m^3	0.32	0.108	0.117	0.023	0.049
Total Beryllium	g/m^3	< 0.00011	< 0.00011	< 0.00011	< 0.00011	< 0.00011
Dissolved Boron	g/m^3	0.014	0.018	0.018	0.014	0.014
Total Boron	g/m^3	0.0155	0.0182	0.0179	0.0154	0.0147
Dissolved Calcium	g/m^3	15.8	23	23	17.9	15.6
Total Cobalt	g/m^3	0.00071	< 0.00021	< 0.00021	< 0.00021	< 0.00021
Dissolved Iron	g/m^3	0.06	0.08	0.17	0.07	0.04
Total Iron	g/m^3	1.30	0.47	0.52	0.172	0.127
Dissolved Magnesium	g/m^3	7.5	9.9	10.5	8.4	7.7
Dissolved Manganese	g/m^3	0.0157	0.056	0.098	0.042	0.0125
Total Manganese	g/m^3	0.22	0.124	0.129	0.055	0.0192
Dissolved Mercury	g/m^3	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Dissolved Potassium	g/m^3	2.8	6.0	6.9	3.8	2.7
Dissolved Selenium	g/m^3	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Total Selenium	g/m^3	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011
Dissolved Sodium	g/m^3	22	24	24	22	21
Total Vanadium	g/m^3	0.0043	< 0.0011	< 0.0011	0.0025	0.0023
Chloride	g/m^3	29	31	32	27	26
Fluoride	g/m^3	0.07	0.08	0.09	0.08	0.08
Total Ammoniacal-N	g/m^3	0.010	0.013	0.038	0.017	< 0.010
Nitrite-N	g/m^3	0.011	< 0.002	0.007	0.009	0.007
Nitrate-N	g/m^3	3.1	0.51	0.32	2.7	2.7
Nitrate-N + Nitrite-N	g/m^3	3.1	0.51	0.33	2.7	2.7
Total Kjeldahl Nitrogen (TKN)	g/m^3	0.50	0.45	0.48	0.27	0.18
Dissolved Reactive Phosphorus	g/m^3	0.019	0.042	0.020	0.010	0.010
Phosphate	g/m^3	0.059	0.128	0.060	0.032	0.030
Total Phosphorus	g/m^3	0.051	0.083	0.053	0.021	0.018
Reactive Silica	g/m^3 as SiO_2	50	37	37	49	50
Sulphate	g/m^3	10.0	6.7	6.5	5.8	7.0
Dissolved C-Biochemical Oxygen Demand ($CBOD_5$)	$g\ O_2/m^3$	< 2	< 2	< 2	< 2	< 2
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	$g\ O_2/m^3$	< 2	< 2	< 2	< 2	< 2
Chemical Oxygen Demand (COD)	$g\ O_2/m^3$	8	16	18	< 6	< 6
Total Organic Carbon (TOC)	g/m^3	3.8	< 0.5	4.3	1.8	< 0.5

Please refer to the detection limits table for the list of analytes screened and their detection limits.

Analyst's Comments

#1 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.

Sample 3 Comment:
Please note that the level of Uncertainty of Measurement (UOM) for this result is significantly greater than that usually reported for this analyte (up to 100-200% at the 95% confidence level).

Sample 4 Comment:
Please note that the level of Uncertainty of Measurement (UOM) for this result is significantly greater than that usually reported for this analyte (up to 200-300% at the 95% confidence level).

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

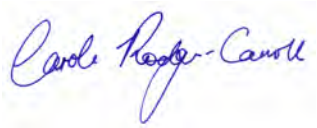
Test	Method Description	Default Detection Limit	Sample No
Individual Tests			
Free Ammonia*	Calculation from NH4N, pH, Temperature (Calculations based on data for distilled water). APHA Table 8010:VI 22nd ed. 2012.	0.010 g/m^3 at Client Temperature	1-5
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-5
Total Digestion	Nitric acid digestion. APHA 3030 E 22nd ed. 2012 (modified).	-	1-5
Total Kjeldahl Digestion	Sulphuric acid digestion with copper sulphate catalyst.	-	1-5
Total Phosphorus Digestion	Acid persulphate digestion.	-	1-5
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	1-5
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	1-5
Turbidity	Analysis using a Hach 2100N, Turbidity meter. APHA 2130 B 22nd ed. 2012.	0.05 NTU	1-5
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	1-5
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 $CaCO_3$	1-5
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	1-5
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-5
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1-5
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	1-5
Total Dissolved Solids (TDS)	Filtration through GF/C (1.2 µm), gravimetric. APHA 2540 C (modified; drying temperature of 103 - 105°C used rather than 180 ± 2°C) 22nd ed. 2012.	10 g/m^3	1-5
Sample Temperature*	Supplied by customer, otherwise 20°C.	0.1 °C	1-5
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 22nd ed. 2012.	-	1-5
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.003 g/m^3	1-5
Total Aluminium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.0032 g/m^3	1-5
Total Beryllium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00011 g/m^3	1-5
Dissolved Boron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.005 g/m^3	1-5
Total Boron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0053 g/m^3	1-5

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	1-5
Total Cobalt	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00021 g/m³	1-5
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-5
Total Iron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m³	1-5
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-5
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0005 g/m³	1-5
Total Manganese	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00053 g/m³	1-5
Dissolved Mercury	0.45µm filtration, bromine oxidation followed by atomic fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m³	1-5
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1-5
Dissolved Selenium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0010 g/m³	1-5
Total Selenium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.0011 g/m³	1-5
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-5
Total Vanadium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.0011 g/m³	1-5
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-5
Fluoride	Direct measurement, ion selective electrode. APHA 4500-F^- C 22nd ed. 2012.	0.05 g/m³	1-5
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	1-5
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-5
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m³	1-5
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	1-5
Total Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-N_{org} D. (modified) 4500 NH_3 F (modified) 22nd ed. 2012.	0.10 g/m³	1-5
Dissolved Reactive Phosphorus	Filtered sample. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified). 22nd ed. 2012.	0.004 g/m³	1-5
Phosphate from DRP	Calculation: from Dissolved Reactive Phosphorus * 3.065.	0.004 g/m³	1-5
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	1-5
Reactive Silica	Filtered sample. Heteropoly blue colorimetry. Discrete analyser. APHA 4500-SiO_2 F (modified from flow injection analysis) 22nd ed. 2012.	0.10 g/m³ as SiO_2	1-5
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-5
Dissolved C-Biochemical Oxygen Demand ($CBOD_5$)	Filtered sample (Advantec GC-50 1.2um or equivalent), Incubation 5 days, $CBOD_5$, DO meter, nitrification inhibitor, dilutions, seeded. APHA 5210 B (modified) 22nd ed. 2012.	2 g O_2/m³	1-5
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	1-5
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	1-5

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total Organic Carbon (TOC)	Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC.The uncertainty of the calculated result is a combination of the uncertainties of the two analytical determinands in the subtraction calculation. Where both determinands are similar in magnitude, the calculated result has a significantly higher uncertainty than would normally be achieved if one of the results was significantly less than the other. In such cases, the elevated uncertainty should be kept in mind when interpreting the data. APHA 5310 C (modified) 22nd ed. 2012.	0.5 g/m^3	1-5
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS	Liquid/liquid extraction, GPC (if required), GCMS analysis	-	1-5
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/m^3	1-5
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	1-5
Semivolatile Organic Compounds Trace in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	-	1-5
Volatile Organic Compounds Trace in Water by Headspace GC-MS	Headspace, GC-MS SIM analysis [KBIs:37857,37921]	0.00010 - 0.05 g/m^3	1-5
Faecal Coliforms and E. coli profile			
Faecal Coliforms	MPN count in LT Broth at 35°C for 48 hours, EC Broth at 44.5° C for 24 hours. APHA 9221 B, 9221 E 22nd ed. 2012.	2 MPN / 100mL	1-5
Escherichia coli	MPN count in LT Broth at 35°C for 48 hours, EC MUG Broth at 44.5°C for 24 hours. APHA 9221 B, 9221 F 22nd ed. 2012.	2 MPN / 100mL	1-5

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.



Carole Rodgers-Carroll BA, NZCS
Client Services Manager - Environmental

Detection Limits

Analytes	Detection Limit
Individual Tests	
Free Ammonia*	0.010 g/m³ at Client Temperature
Sum of Anions	0.07 meq/L
Sum of Cations	0.05 meq/L
Turbidity	0.05 NTU
pH	0.1 pH Units
Total Alkalinity	1.0 g/m³ as $CaCO_3$
Bicarbonate	1.0 g/m³ at 25°C
Total Hardness	1.0 g/m³ as $CaCO_3$
Electrical Conductivity (EC)	0.1 mS/m
Total Suspended Solids	3 g/m³
Total Dissolved Solids (TDS)	10 g/m³
Sample Temperature*	0.1 °C
Dissolved Aluminium	0.003 g/m³
Total Aluminium	0.0032 g/m³
Total Beryllium	0.00011 g/m³
Dissolved Boron	0.005 g/m³
Total Boron	0.0053 g/m³
Dissolved Calcium	0.05 g/m³
Total Cobalt	0.00021 g/m³
Dissolved Iron	0.02 g/m³
Total Iron	0.021 g/m³
Dissolved Magnesium	0.02 g/m³
Dissolved Manganese	0.0005 g/m³
Total Manganese	0.00053 g/m³
Dissolved Mercury	0.00008 g/m³
Dissolved Potassium	0.05 g/m³
Dissolved Selenium	0.0010 g/m³
Total Selenium	0.0011 g/m³
Dissolved Sodium	0.02 g/m³
Total Vanadium	0.0011 g/m³
Chloride	0.5 g/m³
Fluoride	0.05 g/m³
Total Ammoniacal-N	0.010 g/m³
Nitrite-N	0.002 g/m³
Nitrate-N	0.002 g/m³
Nitrate-N + Nitrite-N	0.002 g/m³
Total Kjeldahl Nitrogen (TKN)	0.10 g/m³
Dissolved Reactive Phosphorus	0.004 g/m³
Phosphate	0.013 g/m³
Total Phosphorus	0.004 g/m³
Reactive Silica	0.10 g/m³ as SiO_2
Sulphate	0.5 g/m³
Dissolved C-Biochemical Oxygen Demand ($CBOD_5$)	2 g O_2/m³
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	2 g O_2/m³
Chemical Oxygen Demand (COD)	6 g O_2/m³
Total Organic Carbon (TOC)	0.5 g/m³

Faecal Coliforms and E. coli profile	
Faecal Coliforms	2 MPN / 100mL
Escherichia coli	2 MPN / 100mL

Analytes	Detection Limit
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS	
Acetochlor	0.00004 g/m³
Alachlor	0.00004 g/m³
Atrazine	0.00004 g/m³
Atrazine-desethyl	0.00004 g/m³
Atrazine-desisopropyl	0.00008 g/m³
Azaconazole	0.00002 g/m³
Azinphos-methyl	0.00008 g/m³
Benalaxyl	0.00002 g/m³
Bitertanol	0.00008 g/m³
Bromacil	0.00004 g/m³
Bromopropylate	0.00004 g/m³
Butachlor	0.00004 g/m³
Captan	0.00008 g/m³
Carbaryl	0.00004 g/m³
Carbofenothion	0.00004 g/m³
Carbofuran	0.00004 g/m³
Chlorfluazuron	0.00004 g/m³
Chlorothalonil	0.00004 g/m³
Chlorpyrifos	0.00004 g/m³
Chlorpyrifos-methyl	0.00004 g/m³
Chlortoluron	0.00008 g/m³
Cyanazine	0.00004 g/m³
Cyfluthrin	0.00004 g/m³
Cyhalothrin	0.00004 g/m³
Cypermethrin	0.00008 g/m³
Deltamethrin (including Tralomethrin)	0.00006 g/m³
Diazinon	0.00002 g/m³
Dichlofluanid	0.00004 g/m³
Dichloran	0.0002 g/m³
Dichlorvos	0.00008 g/m³
Difenoconazole	0.00008 g/m³
Dimethoate	0.00008 g/m³
Diphenylamine	0.00008 g/m³
Diuron	0.00004 g/m³
Fenpropimorph	0.00004 g/m³
Fluazifop-butyl	0.00004 g/m³
Fluometuron	0.00004 g/m³
Flusilazole	0.00004 g/m³
Fluvalinate	0.00004 g/m³
Furalaxyl	0.00002 g/m³
Haloxyfop-methyl	0.00004 g/m³
Hexaconazole	0.00004 g/m³
Hexazinone	0.00002 g/m³
IPBC (3-Iodo-2-propynyl-n-butylcarbamate)	0.0002 g/m³
Kresoxim-methyl	0.00002 g/m³
Linuron	0.00005 g/m³
Malathion	0.00004 g/m³
Metalaxyl	0.00004 g/m³
Metolachlor	0.00004 g/m³
Metribuzin	0.00004 g/m³
Molinate	0.00008 g/m³
Myclobutanil	0.00004 g/m³
Naled	0.0002 g/m³
Norflurazon	0.00008 g/m³

Analytes	Detection Limit
Oxadiazon	0.00004 g/m³
Oxyfluorfen	0.00002 g/m³
Paclobutrazol	0.00004 g/m³
Parathion-ethyl	0.00004 g/m³
Parathion-methyl	0.00004 g/m³
Pendimethalin	0.00004 g/m³
Permethrin	0.00002 g/m³
Pirimicarb	0.00004 g/m³
Pirimiphos-methyl	0.00004 g/m³
Prochloraz	0.0002 g/m³
Procymidone	0.00004 g/m³
Prometryn	0.00002 g/m³
Propachlor	0.00004 g/m³
Propanil	0.0002 g/m³
Propazine	0.00002 g/m³
Propiconazole	0.00004 g/m³
Pyriproxyfen	0.00004 g/m³
Quizalofop-ethyl	0.00004 g/m³
Simazine	0.00004 g/m³
Simetryn	0.00004 g/m³
Sulfentrazone	0.0002 g/m³
TCMTB [2-(thiocyanomethylthio) benzothiazole,Busan]	0.00008 g/m³
Tebuconazole	0.00004 g/m³
Terbacil	0.00004 g/m³
Terbufos	0.00004 g/m³
Terbumeton	0.00004 g/m³
Terbuthylazine	0.00002 g/m³
Terbuthylazine-desethyl	0.00004 g/m³
Terbutryn	0.00004 g/m³
Thiabendazole	0.0002 g/m³
Thiobencarb	0.00004 g/m³
Tolylfluanid	0.00002 g/m³
Triazophos	0.00004 g/m³
Trifluralin	0.00004 g/m³
Vinclozolin	0.00004 g/m³

Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn	
Dissolved Arsenic	0.0010 g/m³
Dissolved Cadmium	0.00005 g/m³
Dissolved Chromium	0.0005 g/m³
Dissolved Copper	0.0005 g/m³
Dissolved Lead	0.00010 g/m³
Dissolved Nickel	0.0005 g/m³
Dissolved Zinc	0.0010 g/m³

Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	
Total Arsenic	0.0011 g/m³
Total Cadmium	0.000053 g/m³
Total Chromium	0.00053 g/m³
Total Copper	0.00053 g/m³
Total Lead	0.00011 g/m³
Total Nickel	0.00053 g/m³
Total Zinc	0.0011 g/m³

Analytes	Detection Limit
Haloethers Trace in SVOC Water Samples by GC-MS	
Bis(2-chloroethoxy) methane	0.0005 g/m³
Bis(2-chloroethyl)ether	0.0005 g/m³
Bis(2-chloroisopropyl)ether	0.0005 g/m³
4-Bromophenyl phenyl ether	0.0003 g/m³
4-Chlorophenyl phenyl ether	0.0005 g/m³
Nitrogen containing compounds Trace in SVOC Water Samples, GC-MS	
2,4-Dinitrotoluene	0.0010 g/m³
2,6-Dinitrotoluene	0.0010 g/m³
Nitrobenzene	0.0005 g/m³
N-Nitrosodi-n-propylamine	0.0010 g/m³
N-Nitrosodiphenylamine + Diphenylamine	0.0010 g/m3
Organochlorine Pesticides Trace in SVOC Water Samples by GC-MS	
Aldrin	0.0005 g/m³
alpha-BHC	0.0005 g/m³
beta-BHC	0.0005 g/m³
delta-BHC	0.0005 g/m³
gamma-BHC (Lindane)	0.0005 g/m³
4,4'-DDD	0.0005 g/m³
4,4'-DDE	0.0005 g/m³
4,4'-DDT	0.0010 g/m³
Dieldrin	0.0005 g/m³
Endosulfan I	0.0010 g/m³
Endosulfan II	0.0010 g/m³
Endosulfan sulfate	0.0010 g/m³
Endrin	0.0005 g/m³
Endrin ketone	0.0010 g/m³
Heptachlor	0.0005 g/m³
Heptachlor epoxide	0.0005 g/m³
Hexachlorobenzene	0.0005 g/m³
Polycyclic Aromatic Hydrocarbons Trace in SVOC Water Samples	
Acenaphthene	0.0003 g/m³
Acenaphthylene	0.0003 g/m³
Anthracene	0.0003 g/m³
Benzo[a]anthracene	0.0003 g/m³
Benzo[a]pyrene (BAP)	0.0003 g/m³
Benzo[b]fluoranthene + Benzo[j] fluoranthene	0.0003 g/m³
Benzo[g,h,i]perylene	0.0003 g/m³
Benzo[k]fluoranthene	0.0003 g/m³
1&2-Chloronaphthalene	0.0003 g/m³
Chrysene	0.0003 g/m³
Dibenzo[a,h]anthracene	0.0003 g/m³
Fluoranthene	0.0003 g/m³
Fluorene	0.0003 g/m³
Indeno(1,2,3-c,d)pyrene	0.0003 g/m³
2-Methylnaphthalene	0.0003 g/m³
Naphthalene	0.0003 g/m³
Phenanthrene	0.0003 g/m³
Pyrene	0.0003 g/m³
Phenols Trace (drinkingwater) in SVOC Water Samples by GC-MS	
2-Chlorophenol	0.0005 g/m³
2,4-Dichlorophenol	0.0005 g/m³
2,4,6-Trichlorophenol	0.0010 g/m³
Phenols Trace (non-drinkingwater) in SVOC Water Samples by GC-MS	
4-Chloro-3-methylphenol	0.0010 g/m³
2,4-Dimethylphenol	0.0005 g/m³
3 & 4-Methylphenol (m- + p-cresol)	0.0010 g/m³
2-Methylphenol (o-Cresol)	0.0005 g/m³
2-Nitrophenol	0.0010 g/m³
Pentachlorophenol (PCP)	0.010 g/m³
Phenol	0.0010 g/m³
2,4,5-Trichlorophenol	0.0010 g/m³
Plasticisers Trace (non-drinkingwater) in SVOC Water by GCMS	
Butylbenzylphthalate	0.0010 g/m³
Diethylphthalate	0.0010 g/m³
Dimethylphthalate	0.0010 g/m³
Di-n-butylphthalate	0.0010 g/m³
Di-n-octylphthalate	0.0010 g/m³
Plasticisers Trace (drinkingwater) in SVOC Water Samples by GCMS	
Bis(2-ethylhexyl)phthalate	0.003 g/m³
Di(2-ethylhexyl)adipate	0.0010 g/m³
Other Halogenated compounds Trace (drinkingwater) in SVOC Water	
1,2-Dichlorobenzene	0.0005 g/m³
1,3-Dichlorobenzene	0.0005 g/m³
1,4-Dichlorobenzene	0.0005 g/m³
Other Halogenated compounds Trace (non-drinkingwater) in SVOC	
Hexachlorobutadiene	0.0005 g/m³
Hexachloroethane	0.0005 g/m³
1,2,4-Trichlorobenzene	0.0005 g/m³
Other SVOC Trace in SVOC Water Samples by GC-MS	
Benzyl alcohol	0.005 g/m³
Carbazole	0.0005 g/m³
Dibenzofuran	0.0005 g/m³
Isophorone	0.0005 g/m³
BTEX in VOC Water by Headspace GC-MS	
Benzene	0.0003 g/m³
Ethylbenzene	0.0005 g/m³
Toluene	0.0003 g/m³
m&p-Xylene	0.0005 g/m³
o-Xylene	0.0003 g/m³
Halogenated Aliphatics in VOC Water by Headspace GC-MS	
Bromomethane (Methyl Bromide)	0.0003 g/m³
Carbon tetrachloride	0.0003 g/m³
Chloroethane	0.0003 g/m³
Chloromethane	0.0003 g/m³
1,2-Dibromo-3-chloropropane	0.0003 g/m³
1,2-Dibromoethane (ethylene dibromide, EDB)	0.0003 g/m³
Dibromomethane	0.0003 g/m³
Dichlorodifluoromethane	0.0003 g/m³
1,1-Dichloroethane	0.0003 g/m³
1,2-Dichloroethane	0.0003 g/m³
1,1-Dichloroethene	0.0003 g/m³
cis-1,2-Dichloroethene	0.0003 g/m³
trans-1,2-Dichloroethene	0.0003 g/m³
Dichloromethane (methylene chloride)	0.010 g/m³
1,2-Dichloropropane	0.0003 g/m³
1,3-Dichloropropane	0.0003 g/m³
1,1-Dichloropropene	0.0003 g/m³
cis-1,3-Dichloropropene	0.0005 g/m³
trans-1,3-Dichloropropene	0.0005 g/m³
Hexachlorobutadiene	0.0003 g/m³
1,1,1,2-Tetrachloroethane	0.0003 g/m³
1,1,2,2-Tetrachloroethane	0.0003 g/m³
Tetrachloroethene (tetrachloroethylene)	0.0003 g/m³
1,1,1-Trichloroethane	0.0003 g/m³
1,1,2-Trichloroethane	0.0003 g/m³
Trichloroethene (trichloroethylene)	0.0003 g/m³
Trichlorofluoromethane	0.0003 g/m³
1,2,3-Trichloropropane	0.0003 g/m³
1,1,2-Trichlorotrifluoroethane (Freon 113)	0.0003 g/m³
Vinyl chloride	0.0003 g/m³
Halogenated Aromatics in VOC Water by Headspace GC-MS	
Chlorobenzene (monochlorobenzene)	0.0003 g/m³
1,2-Dichlorobenzene	0.0003 g/m³
1,3-Dichlorobenzene	0.0003 g/m³
1,4-Dichlorobenzene	0.0003 g/m³
1,2,3-Trichlorobenzene	0.0003 g/m³
1,2,4-Trichlorobenzene	0.0003 g/m³
1,3,5-Trichlorobenzene	0.0003 g/m³
Bromobenzene	0.0003 g/m³
2-Chlorotoluene	0.0003 g/m³
4-Chlorotoluene	0.0003 g/m³
Monoaromatic Hydrocarbons in VOC Water by Headspace GC-MS	
n-Butylbenzene	0.0005 g/m³
tert-Butylbenzene	0.0003 g/m³
4-Isopropyltoluene (p-Cymene)	0.0005 g/m³
Isopropylbenzene (Cumene)	0.0003 g/m³
n-Propylbenzene	0.0005 g/m³
sec-Butylbenzene	0.0003 g/m³
Styrene	0.0005 g/m³
1,2,4-Trimethylbenzene	0.0003 g/m³
1,3,5-Trimethylbenzene	0.0003 g/m³
Ketones in VOC Water by Headspace GC-MS	
Acetone	0.05 g/m³
2-Butanone (MEK)	0.05 g/m³
Methyl tert-butylether (MTBE)	0.0003 g/m³
4-Methylpentan-2-one (MIBK)	0.010 g/m³
Trihalomethanes in VOC Water by Headspace GC-MS	
Bromodichloromethane	0.0003 g/m³
Bromoform (tribromomethane)	0.0003 g/m³
Chloroform (Trichloromethane)	0.0003 g/m³

Analytes	Detection Limit
Trihalomethanes in VOC Water by Headspace GC-MS	
Dibromochloromethane	0.0003 g/m³

Other VOC in Water by Headspace GC-MS	
Carbon disulphide	0.00010 g/m³
Naphthalene	0.0005 g/m³

Hill Laboratories
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Certificate of Analysis

Client:	Taranaki Regional Council	**Lab No:**	2000046 SPv1
Contact:	L Smith	**Date Received:**	15-Jun-2018
	C/- Taranaki Regional Council	**Date Reported:**	02-Jul-2018
	Private Bag 713	**Quote No:**	90190
	Stratford 4352	**Order No:**	
		Client Reference:	Eltham central landfill surface waters
		Submitted By:	Rae West

Sample Type: Aqueous

Sample Name:	WGG000649 Temp=12.7°C 14-Jun-2018 1:30 pm	WGG000650 Temp=11.8°C 14-Jun-2018 12:45 pm	WGG000651 Temp=12.8°C 14-Jun-2018 2:00 pm	WGG000647 Temp=12.2°C 14-Jun-2018 10:20 am	WGG000653 Temp=13.6°C 14-Jun-2018 12:25 pm
Lab Number:	2000046.1	2000046.2	2000046.3	2000046.4	2000046.5
Individual Tests					
Free Ammonia* g/m³ at Client Temperature	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Sum of Anions meq/L	3.1	2.6	3.1	2.4	2.8
Sum of Cations meq/L	3.1	2.6	3.2	2.5	2.8
Turbidity NTU	10.2	14.0	7.2	24	10.9
pH pH Units	7.6	7.4	7.5	7.4	7.5
Total Alkalinity g/m³ as $CaCO_3$	68	57	68	51	63
Bicarbonate g/m³ at 25°C	83	69	83	62	77
Total Hardness g/m³ as $CaCO_3$	92	76	93	68	83
Electrical Conductivity (EC) mS/m	33.5	27.6	32.6	26.4	30.1
Total Suspended Solids g/m³	17	24	17	38	24
Total Dissolved Solids (TDS) g/m³	220	177	200	181	189
Sample Temperature* °C	12.7	11.8	12.8	12.2	13.6
Dissolved Aluminium g/m³	0.005	0.026	0.009	0.046	0.011
Total Aluminium g/m³	0.179	1.08	0.25	1.82	0.40
Total Beryllium g/m³	< 0.00011	< 0.00011	< 0.00011	< 0.00011	< 0.00011
Dissolved Boron g/m³	0.022 #1	0.021 #1	0.023 #1	0.017 #1	0.022 #1
Total Boron g/m³	0.021 #1	0.0190 #1	0.021 #1	0.0169 #1	0.020 #1
Dissolved Calcium g/m³	21	17.2	21	14.9	19.1
Total Cobalt g/m³	< 0.00021	0.00049	0.00022	0.00044	0.00030
Dissolved Iron g/m³	0.05	0.07	0.08	0.06	0.07
Total Iron g/m³	0.80	1.36	0.82	1.61	0.91
Dissolved Magnesium g/m³	9.5	8.0	9.5	7.4	8.5
Dissolved Manganese g/m³	0.0125	0.061	0.046	0.060	0.053
Total Manganese g/m³	0.107	0.124	0.118	0.115	0.112
Dissolved Mercury g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Dissolved Potassium g/m³	6.4	4.1	6.5	3.2	5.1
Dissolved Selenium g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Total Selenium g/m³	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011
Dissolved Sodium g/m³	25	21	26	24	23
Total Vanadium g/m³	< 0.0011	0.0037	< 0.0011	0.0057	0.0027
Chloride g/m³	38	31	37	32	33
Fluoride g/m³	0.07	0.07	0.07	0.07	0.07
Total Ammoniacal-N g/m³	< 0.010	0.016	0.012	0.015	0.025
Nitrite-N g/m³	0.005	0.008	0.007	0.007	0.008
Nitrate-N g/m³	4.3	4.2	4.2	4.4	4.2
Nitrate-N + Nitrite-N g/m³	4.3	4.2	4.2	4.4	4.3

Sample Type: Aqueous						
Sample Name:		WGG000649 Temp=12.7°C 14-Jun-2018 1:30 pm	WGG000650 Temp=11.8°C 14-Jun-2018 12:45 pm	WGG000651 Temp=12.8°C 14-Jun-2018 2:00 pm	WGG000647 Temp=12.2°C 14-Jun-2018 10:20 am	WGG000653 Temp=13.6°C 14-Jun-2018 12:25 pm
Lab Number:		2000046.1	2000046.2	2000046.3	2000046.4	2000046.5
Individual Tests						
Total Kjeldahl Nitrogen (TKN)	g/m³	0.66	0.60	0.64	0.64	0.71
Dissolved Reactive Phosphorus	g/m³	0.017	0.014	0.010	0.016	0.018
Phosphate	g/m³	0.051	0.043	0.032	0.050	0.056
Total Phosphorus	g/m³	0.075	0.106	0.070	0.152	0.108
Reactive Silica	g/m³ as SiO_2	33	41	33	48	41
Sulphate	g/m³	17.3	11.5	17.6	7.9	14.0
Dissolved C-Biochemical Oxygen Demand ($CBOD_5$)	g O_2/m³	< 2	< 2	< 2	< 2	< 2
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	g O_2/m³	< 2	< 2	< 2	< 2	< 2
Chemical Oxygen Demand (COD)	g O_2/m³	22	14	14	10	18
Total Organic Carbon (TOC)	g/m³	3.8	4.7	5.7	5.0	3.9
Faecal Coliforms and E. coli profile						
Faecal Coliforms	MPN / 100mL	700	540	350	540	540
Escherichia coli	MPN / 100mL	260	540	350	540	540
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Acetochlor	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Alachlor	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Atrazine	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Atrazine-desethyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Atrazine-desisopropyl	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Azaconazole	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Azinphos-methyl	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Benalaxyl	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Bitertanol	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Bromacil	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Bromopropylate	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Butachlor	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Captan	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Carbaryl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Carbofenothion	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Carbofuran	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Chlorfluazuron	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Chlorothalonil	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Chlorpyrifos	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Chlorpyrifos-methyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Chlortoluron	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Cyanazine	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Cyfluthrin	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Cyhalothrin	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Cypermethrin	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Deltamethrin (including Tralomethrin)	g/m³	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006
Diazinon	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Dichlofluanid	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Dichloran	g/m³	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Dichlorvos	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Difenoconazole	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Dimethoate	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Diphenylamine	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Diuron	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Fenpropimorph	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Fluazifop-butyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Fluometuron	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Flusilazole	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004

Sample Type: Aqueous						
Sample Name:		WGG000649 Temp=12.7°C 14-Jun-2018 1:30 pm	WGG000650 Temp=11.8°C 14-Jun-2018 12:45 pm	WGG000651 Temp=12.8°C 14-Jun-2018 2:00 pm	WGG000647 Temp=12.2°C 14-Jun-2018 10:20 am	WGG000653 Temp=13.6°C 14-Jun-2018 12:25 pm
Lab Number:		2000046.1	2000046.2	2000046.3	2000046.4	2000046.5
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Fluvalinate	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Furalaxyl	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Haloxyfop-methyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Hexaconazole	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Hexazinone	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
IPBC (3-Iodo-2-propynyl-n-butylcarbamate)	g/m³	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Kresoxim-methyl	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Linuron	g/m³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Malathion	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Metalaxyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Metolachlor	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Metribuzin	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Molinate	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Myclobutanil	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Naled	g/m³	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Norflurazon	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Oxadiazon	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Oxyfluorfen	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Paclobutrazol	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Parathion-ethyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Parathion-methyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Pendimethalin	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Permethrin	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Pirimicarb	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Pirimiphos-methyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Prochloraz	g/m³	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Procymidone	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Prometryn	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Propachlor	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Propanil	g/m³	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Propazine	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Propiconazole	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Pyriproxyfen	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Quizalofop-ethyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Simazine	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Simetryn	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Sulfentrazone	g/m³	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
TCMTB [2-(thiocyanomethylthio) benzothiazole,Busan]	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Tebuconazole	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Terbacil	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Terbufos	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Terbumeton	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Terbuthylazine	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Terbuthylazine-desethyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Terbutryn	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Thiabendazole	g/m³	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Thiobencarb	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Tolylfluanid	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Triazophos	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Trifluralin	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Vinclozolin	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004

Sample Type: Aqueous						
Sample Name:		WGG000649 Temp=12.7°C 14-Jun-2018 1:30 pm	WGG000650 Temp=11.8°C 14-Jun-2018 12:45 pm	WGG000651 Temp=12.8°C 14-Jun-2018 2:00 pm	WGG000647 Temp=12.2°C 14-Jun-2018 10:20 am	WGG000653 Temp=13.6°C 14-Jun-2018 12:25 pm
Lab Number:		2000046.1	2000046.2	2000046.3	2000046.4	2000046.5
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Dissolved Cadmium	g/m³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Chromium	g/m³	< 0.0005	< 0.0005	< 0.0005	0.0005	< 0.0005
Dissolved Copper	g/m³	0.0005	0.0010	0.0007	0.0007	0.0007
Dissolved Lead	g/m³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Nickel	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Zinc	g/m³	0.0017	< 0.0010	0.0024	< 0.0010	0.0017
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Arsenic	g/m³	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011
Total Cadmium	g/m³	< 0.000053	< 0.000053	< 0.000053	< 0.000053	< 0.000053
Total Chromium	g/m³	< 0.00053	0.00121	< 0.00053	0.00193	0.00083
Total Copper	g/m³	0.00118	0.0032	0.00136	0.0052	0.00179
Total Lead	g/m³	0.00015	0.00033	0.00018	0.00045	0.00023
Total Nickel	g/m³	< 0.00053	< 0.00053	< 0.00053	< 0.00053	< 0.00053
Total Zinc	g/m³	0.0088	0.0057	0.0076	0.0041	0.0061
Haloethers Trace in SVOC Water Samples by GC-MS						
Bis(2-chloroethoxy) methane	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Bis(2-chloroethyl)ether	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Bis(2-chloroisopropyl)ether	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
4-Bromophenyl phenyl ether	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
4-Chlorophenyl phenyl ether	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Nitrogen containing compounds Trace in SVOC Water Samples, GC-MS						
2,4-Dinitrotoluene	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2,6-Dinitrotoluene	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Nitrobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
N-Nitrosodi-n-propylamine	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
N-Nitrosodiphenylamine + Diphenylamine	g/m3	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Organochlorine Pesticides Trace in SVOC Water Samples by GC-MS						
Aldrin	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
alpha-BHC	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
beta-BHC	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
delta-BHC	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
gamma-BHC (Lindane)	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
4,4'-DDD	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
4,4'-DDE	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
4,4'-DDT	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Dieldrin	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Endosulfan I	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan II	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan sulfate	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Endrin ketone	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Heptachlor epoxide	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Hexachlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Polycyclic Aromatic Hydrocarbons Trace in SVOC Water Samples						
Acenaphthene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Acenaphthylene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Anthracene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Benzo[a]anthracene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Benzo[a]pyrene (BAP)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003

Sample Type: Aqueous						
Sample Name:		WGG000649 Temp=12.7°C 14-Jun-2018 1:30 pm	WGG000650 Temp=11.8°C 14-Jun-2018 12:45 pm	WGG000651 Temp=12.8°C 14-Jun-2018 2:00 pm	WGG000647 Temp=12.2°C 14-Jun-2018 10:20 am	WGG000653 Temp=13.6°C 14-Jun-2018 12:25 pm
Lab Number:		2000046.1	2000046.2	2000046.3	2000046.4	2000046.5
Polycyclic Aromatic Hydrocarbons Trace in SVOC Water Samples						
Benzo[g,h,i]perylene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Benzo[k]fluoranthene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1&2-Chloronaphthalene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Chrysene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Dibenzo[a,h]anthracene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Fluoranthene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Fluorene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Indeno(1,2,3-c,d)pyrene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
2-Methylnaphthalene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Naphthalene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Phenanthrene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Pyrene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Phenols Trace (drinkingwater) in SVOC Water Samples by GC-MS						
2-Chlorophenol	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
2,4-Dichlorophenol	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
2,4,6-Trichlorophenol	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Phenols Trace (non-drinkingwater) in SVOC Water Samples by GC-MS						
4-Chloro-3-methylphenol	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2,4-Dimethylphenol	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
3 & 4-Methylphenol (m- + p-cresol)	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2-Methylphenol (o-Cresol)	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
2-Nitrophenol	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Pentachlorophenol (PCP)	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Phenol	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2,4,5-Trichlorophenol	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Plasticisers Trace (non-drinkingwater) in SVOC Water by GCMS						
Butylbenzylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Diethylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Dimethylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Di-n-butylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Di-n-octylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Plasticisers Trace (drinkingwater) in SVOC Water Samples by GCMS						
Bis(2-ethylhexyl)phthalate	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Di(2-ethylhexyl)adipate	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Other Halogenated compounds Trace (drinkingwater) in SVOC Water						
1,2-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,3-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,4-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Other Halogenated compounds Trace (non-drinkingwater) in SVOC						
Hexachlorobutadiene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Hexachloroethane	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,2,4-Trichlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Other SVOC Trace in SVOC Water Samples by GC-MS						
Benzyl alcohol	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Carbazole	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dibenzofuran	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Isophorone	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
BTEX in VOC Water by Headspace GC-MS						
Benzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Ethylbenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Toluene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
m&p-Xylene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005

Sample Type: Aqueous						
Sample Name:		WGG000649 Temp=12.7°C 14-Jun-2018 1:30 pm	WGG000650 Temp=11.8°C 14-Jun-2018 12:45 pm	WGG000651 Temp=12.8°C 14-Jun-2018 2:00 pm	WGG000647 Temp=12.2°C 14-Jun-2018 10:20 am	WGG000653 Temp=13.6°C 14-Jun-2018 12:25 pm
Lab Number:		2000046.1	2000046.2	2000046.3	2000046.4	2000046.5
BTEX in VOC Water by Headspace GC-MS						
o-Xylene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
Bromomethane (Methyl Bromide)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Carbon tetrachloride	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Chloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Chloromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,2-Dibromo-3-chloropropane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,2-Dibromoethane (ethylene dibromide, EDB)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Dibromomethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Dichlorodifluoromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,1-Dichloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,2-Dichloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,1-Dichloroethene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
cis-1,2-Dichloroethene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
trans-1,2-Dichloroethene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Dichloromethane (methylene chloride)	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
1,2-Dichloropropane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,3-Dichloropropane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,1-Dichloropropene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
cis-1,3-Dichloropropene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
trans-1,3-Dichloropropene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Hexachlorobutadiene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,1,1,2-Tetrachloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,1,2,2-Tetrachloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Tetrachloroethene (tetrachloroethylene)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,1,1-Trichloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,1,2-Trichloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Trichloroethene (trichloroethylene)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Trichlorofluoromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,2,3-Trichloropropane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,1,2-Trichlorotrifluoroethane (Freon 113)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Vinyl chloride	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Halogenated Aromatics in VOC Water by Headspace GC-MS						
Chlorobenzene (monochlorobenzene)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,2-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,3-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,4-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,2,3-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,2,4-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,3,5-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Bromobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
2-Chlorotoluene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
4-Chlorotoluene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Monoaromatic Hydrocarbons in VOC Water by Headspace GC-MS						
n-Butylbenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
tert-Butylbenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
4-Isopropyltoluene (p-Cymene)	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Isopropylbenzene (Cumene)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
n-Propylbenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
sec-Butylbenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Styrene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,2,4-Trimethylbenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003

Sample Type: Aqueous						
Sample Name:		WGG000649 Temp=12.7°C 14-Jun-2018 1:30 pm	WGG000650 Temp=11.8°C 14-Jun-2018 12:45 pm	WGG000651 Temp=12.8°C 14-Jun-2018 2:00 pm	WGG000647 Temp=12.2°C 14-Jun-2018 10:20 am	WGG000653 Temp=13.6°C 14-Jun-2018 12:25 pm
Lab Number:		2000046.1	2000046.2	2000046.3	2000046.4	2000046.5
Monoaromatic Hydrocarbons in VOC Water by Headspace GC-MS						
1,3,5-Trimethylbenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Ketones in VOC Water by Headspace GC-MS						
Acetone	g/m³	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Butanone (MEK)	g/m³	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Methyl tert-butylether (MTBE)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
4-Methylpentan-2-one (MIBK)	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Trihalomethanes in VOC Water by Headspace GC-MS						
Bromodichloromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Bromoform (tribromomethane)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Chloroform (Trichloromethane)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Dibromochloromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Other VOC in Water by Headspace GC-MS						
Carbon disulphide	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

Sample Name:		WGG000654 Temp=13.7°C 14-Jun-2018 10:50 am				
Lab Number:		2000046.6				
Individual Tests						
Free Ammonia*	g/m³ at Client Temperature	< 0.010	-	-	-	-
Sum of Anions	meq/L	2.9	-	-	-	-
Sum of Cations	meq/L	2.9	-	-	-	-
Turbidity	NTU	44	-	-	-	-
pH	pH Units	7.4	-	-	-	-
Total Alkalinity	g/m³ as $CaCO_3$	69	-	-	-	-
Bicarbonate	g/m³ at 25°C	84	-	-	-	-
Total Hardness	g/m³ as $CaCO_3$	91	-	-	-	-
Electrical Conductivity (EC)	mS/m	31.0	-	-	-	-
Total Suspended Solids	g/m³	54	-	-	-	-
Total Dissolved Solids (TDS)	g/m³	190	-	-	-	-
Sample Temperature*	°C	13.7	-	-	-	-
Dissolved Aluminium	g/m³	0.029	-	-	-	-
Total Aluminium	g/m³	8.7	-	-	-	-
Total Beryllium	g/m³	0.00014	-	-	-	-
Dissolved Boron	g/m³	0.023 #1	-	-	-	-
Total Boron	g/m³	0.022 #1	-	-	-	-
Dissolved Calcium	g/m³	22	-	-	-	-
Total Cobalt	g/m³	0.00114	-	-	-	-
Dissolved Iron	g/m³	0.04	-	-	-	-
Total Iron	g/m³	7.0	-	-	-	-
Dissolved Magnesium	g/m³	8.8	-	-	-	-
Dissolved Manganese	g/m³	0.0086	-	-	-	-
Total Manganese	g/m³	0.169	-	-	-	-
Dissolved Mercury	g/m³	< 0.00008	-	-	-	-
Dissolved Potassium	g/m³	6.8	-	-	-	-
Dissolved Selenium	g/m³	< 0.0010	-	-	-	-
Total Selenium	g/m³	< 0.0011	-	-	-	-
Dissolved Sodium	g/m³	21	-	-	-	-
Total Vanadium	g/m³	0.0114	-	-	-	-
Chloride	g/m³	33	-	-	-	-
Fluoride	g/m³	0.07	-	-	-	-
Total Ammoniacal-N	g/m³	0.012	-	-	-	-
Nitrite-N	g/m³	0.004	-	-	-	-

Sample Type: Aqueous						
Sample Name:		WGG000654 Temp=13.7°C 14-Jun-2018 10:50 am				
Lab Number:		2000046.6				
Individual Tests						
Nitrate-N	g/m³	1.69	-	-	-	-
Nitrate-N + Nitrite-N	g/m³	1.69	-	-	-	-
Total Kjeldahl Nitrogen (TKN)	g/m³	1.49	-	-	-	-
Dissolved Reactive Phosphorus	g/m³	0.007	-	-	-	-
Phosphate	g/m³	0.022	-	-	-	-
Total Phosphorus	g/m³	0.24	-	-	-	-
Reactive Silica	g/m³ as SiO_2	29	-	-	-	-
Sulphate	g/m³	19.8	-	-	-	-
Dissolved C-Biochemical Oxygen Demand ($CBOD_5$)	g O_2/m³	< 2	-	-	-	-
Carbonaceous Biochemical Oxygen Demand ($cBOD_5$)	g O_2/m³	< 2	-	-	-	-
Chemical Oxygen Demand (COD)	g O_2/m³	34	-	-	-	-
Total Organic Carbon (TOC)	g/m³	10.3	-	-	-	-
Faecal Coliforms and E. coli profile						
Faecal Coliforms	MPN / 100mL	49	-	-	-	-
Escherichia coli	MPN / 100mL	49	-	-	-	-
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Acetochlor	g/m³	< 0.00004	-	-	-	-
Alachlor	g/m³	< 0.00004	-	-	-	-
Atrazine	g/m³	< 0.00004	-	-	-	-
Atrazine-desethyl	g/m³	< 0.00004	-	-	-	-
Atrazine-desisopropyl	g/m³	< 0.00008	-	-	-	-
Azaconazole	g/m³	< 0.00002	-	-	-	-
Azinphos-methyl	g/m³	< 0.00008	-	-	-	-
Benalaxyl	g/m³	< 0.00002	-	-	-	-
Bitertanol	g/m³	< 0.00008	-	-	-	-
Bromacil	g/m³	< 0.00004	-	-	-	-
Bromopropylate	g/m³	< 0.00004	-	-	-	-
Butachlor	g/m³	< 0.00004	-	-	-	-
Captan	g/m³	< 0.00008	-	-	-	-
Carbaryl	g/m³	< 0.00004	-	-	-	-
Carbofenothion	g/m³	< 0.00004	-	-	-	-
Carbofuran	g/m³	< 0.00004	-	-	-	-
Chlorfluazuron	g/m³	< 0.00004	-	-	-	-
Chlorothalonil	g/m³	< 0.00004	-	-	-	-
Chlorpyrifos	g/m³	< 0.00004	-	-	-	-
Chlorpyrifos-methyl	g/m³	< 0.00004	-	-	-	-
Chlortoluron	g/m³	< 0.00008	-	-	-	-
Cyanazine	g/m³	< 0.00004	-	-	-	-
Cyfluthrin	g/m³	< 0.00004	-	-	-	-
Cyhalothrin	g/m³	< 0.00004	-	-	-	-
Cypermethrin	g/m³	< 0.00008	-	-	-	-
Deltamethrin (including Tralomethrin)	g/m³	< 0.00006	-	-	-	-
Diazinon	g/m³	< 0.00002	-	-	-	-
Dichlofluanid	g/m³	< 0.00004	-	-	-	-
Dichloran	g/m³	< 0.0002	-	-	-	-
Dichlorvos	g/m³	< 0.00008	-	-	-	-
Difenoconazole	g/m³	< 0.00008	-	-	-	-
Dimethoate	g/m³	< 0.00008	-	-	-	-
Diphenylamine	g/m³	< 0.00008	-	-	-	-
Diuron	g/m³	< 0.00004	-	-	-	-
Fenpropimorph	g/m³	< 0.00004	-	-	-	-
Fluazifop-butyl	g/m³	< 0.00004	-	-	-	-

Sample Type: Aqueous						
Sample Name:	WGG000654 Temp=13.7°C 14-Jun-2018 10:50 am					
Lab Number:	2000046.6					
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Fluometuron	g/m³	< 0.00004	-	-	-	-
Flusilazole	g/m³	< 0.00004	-	-	-	-
Fluvalinate	g/m³	< 0.00004	-	-	-	-
Furalaxyl	g/m³	< 0.00002	-	-	-	-
Haloxyfop-methyl	g/m³	< 0.00004	-	-	-	-
Hexaconazole	g/m³	< 0.00004	-	-	-	-
Hexazinone	g/m³	< 0.00002	-	-	-	-
IPBC (3-Iodo-2-propynyl-n-butylcarbamate)	g/m³	< 0.0002	-	-	-	-
Kresoxim-methyl	g/m³	< 0.00002	-	-	-	-
Linuron	g/m³	< 0.00005	-	-	-	-
Malathion	g/m³	< 0.00004	-	-	-	-
Metalaxyl	g/m³	< 0.00004	-	-	-	-
Metolachlor	g/m³	< 0.00004	-	-	-	-
Metribuzin	g/m³	< 0.00004	-	-	-	-
Molinate	g/m³	< 0.00008	-	-	-	-
Myclobutanil	g/m³	< 0.00004	-	-	-	-
Naled	g/m³	< 0.0002	-	-	-	-
Norflurazon	g/m³	< 0.00008	-	-	-	-
Oxadiazon	g/m³	< 0.00004	-	-	-	-
Oxyfluorfen	g/m³	< 0.00002	-	-	-	-
Paclobutrazol	g/m³	< 0.00004	-	-	-	-
Parathion-ethyl	g/m³	< 0.00004	-	-	-	-
Parathion-methyl	g/m³	< 0.00004	-	-	-	-
Pendimethalin	g/m³	< 0.00004	-	-	-	-
Permethrin	g/m³	< 0.00002	-	-	-	-
Pirimicarb	g/m³	< 0.00004	-	-	-	-
Pirimiphos-methyl	g/m³	< 0.00004	-	-	-	-
Prochloraz	g/m³	< 0.0002	-	-	-	-
Procymidone	g/m³	< 0.00004	-	-	-	-
Prometryn	g/m³	< 0.00002	-	-	-	-
Propachlor	g/m³	< 0.00004	-	-	-	-
Propanil	g/m³	< 0.0002	-	-	-	-
Propazine	g/m³	< 0.00002	-	-	-	-
Propiconazole	g/m³	< 0.00004	-	-	-	-
Pyriproxyfen	g/m³	< 0.00004	-	-	-	-
Quizalofop-ethyl	g/m³	< 0.00004	-	-	-	-
Simazine	g/m³	< 0.00004	-	-	-	-
Simetryn	g/m³	< 0.00004	-	-	-	-
Sulfentrazone	g/m³	< 0.0002	-	-	-	-
TCMTB [2-(thiocyanomethylthio) benzothiazole,Busan]	g/m³	< 0.00008	-	-	-	-
Tebuconazole	g/m³	< 0.00004	-	-	-	-
Terbacil	g/m³	< 0.00004	-	-	-	-
Terbufos	g/m³	< 0.00004	-	-	-	-
Terbumeton	g/m³	< 0.00004	-	-	-	-
Terbuthylazine	g/m³	< 0.00002	-	-	-	-
Terbuthylazine-desethyl	g/m³	< 0.00004	-	-	-	-
Terbutryn	g/m³	< 0.00004	-	-	-	-
Thiabendazole	g/m³	< 0.0002	-	-	-	-
Thiobencarb	g/m³	< 0.00004	-	-	-	-
Tolylfluanid	g/m³	< 0.00002	-	-	-	-
Triazophos	g/m³	< 0.00004	-	-	-	-
Trifluralin	g/m³	< 0.00004	-	-	-	-

Sample Type: Aqueous						
Sample Name:		WGG000654 Temp=13.7°C 14-Jun-2018 10:50 am				
Lab Number:		2000046.6				
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Vinclozolin	g/m³	< 0.00004	-	-	-	-
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m³	< 0.0010	-	-	-	-
Dissolved Cadmium	g/m³	< 0.00005	-	-	-	-
Dissolved Chromium	g/m³	< 0.0005	-	-	-	-
Dissolved Copper	g/m³	0.0027	-	-	-	-
Dissolved Lead	g/m³	< 0.00010	-	-	-	-
Dissolved Nickel	g/m³	< 0.0005	-	-	-	-
Dissolved Zinc	g/m³	< 0.0010	-	-	-	-
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Arsenic	g/m³	< 0.0011	-	-	-	-
Total Cadmium	g/m³	< 0.000053	-	-	-	-
Total Chromium	g/m³	0.00183	-	-	-	-
Total Copper	g/m³	0.0169	-	-	-	-
Total Lead	g/m³	0.00185	-	-	-	-
Total Nickel	g/m³	0.00124	-	-	-	-
Total Zinc	g/m³	0.0131	-	-	-	-
Haloethers Trace in SVOC Water Samples by GC-MS						
Bis(2-chloroethoxy) methane	g/m³	< 0.0005	-	-	-	-
Bis(2-chloroethyl)ether	g/m³	< 0.0005	-	-	-	-
Bis(2-chloroisopropyl)ether	g/m³	< 0.0005	-	-	-	-
4-Bromophenyl phenyl ether	g/m³	< 0.0003	-	-	-	-
4-Chlorophenyl phenyl ether	g/m³	< 0.0005	-	-	-	-
Nitrogen containing compounds Trace in SVOC Water Samples, GC-MS						
2,4-Dinitrotoluene	g/m³	< 0.0010	-	-	-	-
2,6-Dinitrotoluene	g/m³	< 0.0010	-	-	-	-
Nitrobenzene	g/m³	< 0.0005	-	-	-	-
N-Nitrosodi-n-propylamine	g/m³	< 0.0010	-	-	-	-
N-Nitrosodiphenylamine + Diphenylamine	g/m3	< 0.0010	-	-	-	-
Organochlorine Pesticides Trace in SVOC Water Samples by GC-MS						
Aldrin	g/m³	< 0.0005	-	-	-	-
alpha-BHC	g/m³	< 0.0005	-	-	-	-
beta-BHC	g/m³	< 0.0005	-	-	-	-
delta-BHC	g/m³	< 0.0005	-	-	-	-
gamma-BHC (Lindane)	g/m³	< 0.0005	-	-	-	-
4,4'-DDD	g/m³	< 0.0005	-	-	-	-
4,4'-DDE	g/m³	< 0.0005	-	-	-	-
4,4'-DDT	g/m³	< 0.0010	-	-	-	-
Dieldrin	g/m³	< 0.0005	-	-	-	-
Endosulfan I	g/m³	< 0.0010	-	-	-	-
Endosulfan II	g/m³	< 0.0010	-	-	-	-
Endosulfan sulfate	g/m³	< 0.0010	-	-	-	-
Endrin	g/m³	< 0.0005	-	-	-	-
Endrin ketone	g/m³	< 0.0010	-	-	-	-
Heptachlor	g/m³	< 0.0005	-	-	-	-
Heptachlor epoxide	g/m³	< 0.0005	-	-	-	-
Hexachlorobenzene	g/m³	< 0.0005	-	-	-	-
Polycyclic Aromatic Hydrocarbons Trace in SVOC Water Samples						
Acenaphthene	g/m³	< 0.0003	-	-	-	-
Acenaphthylene	g/m³	< 0.0003	-	-	-	-
Anthracene	g/m³	< 0.0003	-	-	-	-
Benzo[a]anthracene	g/m³	< 0.0003	-	-	-	-
Benzo[a]pyrene (BAP)	g/m³	< 0.0003	-	-	-	-

Sample Type: Aqueous						
Sample Name:		WGG000654 Temp=13.7°C 14-Jun-2018 10:50 am				
Lab Number:		2000046.6				
Polycyclic Aromatic Hydrocarbons Trace in SVOC Water Samples						
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m³	< 0.0003	-	-	-	-
Benzo[g,h,i]perylene	g/m³	< 0.0003	-	-	-	-
Benzo[k]fluoranthene	g/m³	< 0.0003	-	-	-	-
1&2-Chloronaphthalene	g/m³	< 0.0003	-	-	-	-
Chrysene	g/m³	< 0.0003	-	-	-	-
Dibenzo[a,h]anthracene	g/m³	< 0.0003	-	-	-	-
Fluoranthene	g/m³	< 0.0003	-	-	-	-
Fluorene	g/m³	< 0.0003	-	-	-	-
Indeno(1,2,3-c,d)pyrene	g/m³	< 0.0003	-	-	-	-
2-Methylnaphthalene	g/m³	< 0.0003	-	-	-	-
Naphthalene	g/m³	< 0.0003	-	-	-	-
Phenanthrene	g/m³	< 0.0003	-	-	-	-
Pyrene	g/m³	< 0.0003	-	-	-	-
Phenols Trace (drinkingwater) in SVOC Water Samples by GC-MS						
2-Chlorophenol	g/m³	< 0.0005	-	-	-	-
2,4-Dichlorophenol	g/m³	< 0.0005	-	-	-	-
2,4,6-Trichlorophenol	g/m³	< 0.0010	-	-	-	-
Phenols Trace (non-drinkingwater) in SVOC Water Samples by GC-MS						
4-Chloro-3-methylphenol	g/m³	< 0.0010	-	-	-	-
2,4-Dimethylphenol	g/m³	< 0.0005	-	-	-	-
3 & 4-Methylphenol (m- + p-cresol)	g/m³	< 0.0010	-	-	-	-
2-Methylphenol (o-Cresol)	g/m³	< 0.0005	-	-	-	-
2-Nitrophenol	g/m³	< 0.0010	-	-	-	-
Pentachlorophenol (PCP)	g/m³	< 0.010	-	-	-	-
Phenol	g/m³	< 0.0010	-	-	-	-
2,4,5-Trichlorophenol	g/m³	< 0.0010	-	-	-	-
Plasticisers Trace (non-drinkingwater) in SVOC Water by GCMS						
Butylbenzylphthalate	g/m³	< 0.0010	-	-	-	-
Diethylphthalate	g/m³	< 0.0010	-	-	-	-
Dimethylphthalate	g/m³	< 0.0010	-	-	-	-
Di-n-butylphthalate	g/m³	< 0.0010	-	-	-	-
Di-n-octylphthalate	g/m³	< 0.0010	-	-	-	-
Plasticisers Trace (drinkingwater) in SVOC Water Samples by GCMS						
Bis(2-ethylhexyl)phthalate	g/m³	< 0.003	-	-	-	-
Di(2-ethylhexyl)adipate	g/m³	< 0.0010	-	-	-	-
Other Halogenated compounds Trace (drinkingwater) in SVOC Water						
1,2-Dichlorobenzene	g/m³	< 0.0005	-	-	-	-
1,3-Dichlorobenzene	g/m³	< 0.0005	-	-	-	-
1,4-Dichlorobenzene	g/m³	< 0.0005	-	-	-	-
Other Halogenated compounds Trace (non-drinkingwater) in SVOC						
Hexachlorobutadiene	g/m³	< 0.0005	-	-	-	-
Hexachloroethane	g/m³	< 0.0005	-	-	-	-
1,2,4-Trichlorobenzene	g/m³	< 0.0005	-	-	-	-
Other SVOC Trace in SVOC Water Samples by GC-MS						
Benzyl alcohol	g/m³	< 0.005	-	-	-	-
Carbazole	g/m³	< 0.0005	-	-	-	-
Dibenzofuran	g/m³	< 0.0005	-	-	-	-
Isophorone	g/m³	< 0.0005	-	-	-	-
BTEX in VOC Water by Headspace GC-MS						
Benzene	g/m³	< 0.0003	-	-	-	-
Ethylbenzene	g/m³	< 0.0005	-	-	-	-
Toluene	g/m³	< 0.0003	-	-	-	-

Sample Type: Aqueous						
Sample Name:		WGG000654 Temp=13.7°C 14-Jun-2018 10:50 am				
Lab Number:		2000046.6				
BTEX in VOC Water by Headspace GC-MS						
m&p-Xylene	g/m³	< 0.0005	-	-	-	-
o-Xylene	g/m³	< 0.0003	-	-	-	-
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
Bromomethane (Methyl Bromide)	g/m³	< 0.0003	-	-	-	-
Carbon tetrachloride	g/m³	< 0.0003	-	-	-	-
Chloroethane	g/m³	< 0.0003	-	-	-	-
Chloromethane	g/m³	< 0.0003	-	-	-	-
1,2-Dibromo-3-chloropropane	g/m³	< 0.0003	-	-	-	-
1,2-Dibromoethane (ethylene dibromide, EDB)	g/m³	< 0.0003	-	-	-	-
Dibromomethane	g/m³	< 0.0003	-	-	-	-
Dichlorodifluoromethane	g/m³	< 0.0003	-	-	-	-
1,1-Dichloroethane	g/m³	< 0.0003	-	-	-	-
1,2-Dichloroethane	g/m³	< 0.0003	-	-	-	-
1,1-Dichloroethene	g/m³	< 0.0003	-	-	-	-
cis-1,2-Dichloroethene	g/m³	< 0.0003	-	-	-	-
trans-1,2-Dichloroethene	g/m³	< 0.0003	-	-	-	-
Dichloromethane (methylene chloride)	g/m³	< 0.010	-	-	-	-
1,2-Dichloropropane	g/m³	< 0.0003	-	-	-	-
1,3-Dichloropropane	g/m³	< 0.0003	-	-	-	-
1,1-Dichloropropene	g/m³	< 0.0003	-	-	-	-
cis-1,3-Dichloropropene	g/m³	< 0.0005	-	-	-	-
trans-1,3-Dichloropropene	g/m³	< 0.0005	-	-	-	-
Hexachlorobutadiene	g/m³	< 0.0003	-	-	-	-
1,1,1,2-Tetrachloroethane	g/m³	< 0.0003	-	-	-	-
1,1,2,2-Tetrachloroethane	g/m³	< 0.0003	-	-	-	-
Tetrachloroethene (tetrachloroethylene)	g/m³	< 0.0003	-	-	-	-
1,1,1-Trichloroethane	g/m³	< 0.0003	-	-	-	-
1,1,2-Trichloroethane	g/m³	< 0.0003	-	-	-	-
Trichloroethene (trichloroethylene)	g/m³	< 0.0003	-	-	-	-
Trichlorofluoromethane	g/m³	< 0.0003	-	-	-	-
1,2,3-Trichloropropane	g/m³	< 0.0003	-	-	-	-
1,1,2-Trichlorotrifluoroethane (Freon 113)	g/m³	< 0.0003	-	-	-	-
Vinyl chloride	g/m³	< 0.0003	-	-	-	-
Halogenated Aromatics in VOC Water by Headspace GC-MS						
Chlorobenzene (monochlorobenzene)	g/m³	< 0.0003	-	-	-	-
1,2-Dichlorobenzene	g/m³	< 0.0003	-	-	-	-
1,3-Dichlorobenzene	g/m³	< 0.0003	-	-	-	-
1,4-Dichlorobenzene	g/m³	< 0.0003	-	-	-	-
1,2,3-Trichlorobenzene	g/m³	< 0.0003	-	-	-	-
1,2,4-Trichlorobenzene	g/m³	< 0.0003	-	-	-	-
1,3,5-Trichlorobenzene	g/m³	< 0.0003	-	-	-	-
Bromobenzene	g/m³	< 0.0003	-	-	-	-
2-Chlorotoluene	g/m³	< 0.0003	-	-	-	-
4-Chlorotoluene	g/m³	< 0.0003	-	-	-	-
Monoaromatic Hydrocarbons in VOC Water by Headspace GC-MS						
n-Butylbenzene	g/m³	< 0.0005	-	-	-	-
tert-Butylbenzene	g/m³	< 0.0003	-	-	-	-
4-Isopropyltoluene (p-Cymene)	g/m³	< 0.0005	-	-	-	-
Isopropylbenzene (Cumene)	g/m³	< 0.0003	-	-	-	-
n-Propylbenzene	g/m³	< 0.0005	-	-	-	-
sec-Butylbenzene	g/m³	< 0.0003	-	-	-	-
Styrene	g/m³	< 0.0005	-	-	-	-

Sample Type: Aqueous						
Sample Name:		WGG000654 Temp=13.7°C 14-Jun-2018 10:50 am				
Lab Number:		2000046.6				
Monoaromatic Hydrocarbons in VOC Water by Headspace GC-MS						
1,2,4-Trimethylbenzene	g/m³	< 0.0003	-	-	-	-
1,3,5-Trimethylbenzene	g/m³	< 0.0003	-	-	-	-
Ketones in VOC Water by Headspace GC-MS						
Acetone	g/m³	< 0.05	-	-	-	-
2-Butanone (MEK)	g/m³	< 0.05	-	-	-	-
Methyl tert-butylether (MTBE)	g/m³	< 0.0003	-	-	-	-
4-Methylpentan-2-one (MIBK)	g/m³	< 0.010	-	-	-	-
Trihalomethanes in VOC Water by Headspace GC-MS						
Bromodichloromethane	g/m³	< 0.0003	-	-	-	-
Bromoform (tribromomethane)	g/m³	< 0.0003	-	-	-	-
Chloroform (Trichloromethane)	g/m³	< 0.0003	-	-	-	-
Dibromochloromethane	g/m³	< 0.0003	-	-	-	-
Other VOC in Water by Headspace GC-MS						
Carbon disulphide	g/m³	< 0.00010	-	-	-	-
Naphthalene	g/m³	< 0.0005	-	-	-	-

Analyst's Comments

#1 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.

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Individual Tests			
Free Ammonia*	Calculation from NH4N, pH, Temperature (Calculations based on data for distilled water). APHA Table 8010:VI 22nd ed. 2012.	0.010 g/m³ at Client Temperature	1-6
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-6
Total Digestion	Nitric acid digestion. APHA 3030 E 22nd ed. 2012 (modified).	-	1-6
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	1-6
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	1-6
Turbidity	Analysis using a Hach 2100N, Turbidity meter. APHA 2130 B 22nd ed. 2012.	0.05 NTU	1-6
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	1-6
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 $CaCO_3$	1-6
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	1-6
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m³ as $CaCO_3$	1-6
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1-6
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	1-6

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total Dissolved Solids (TDS)	Filtration through GF/C (1.2 µm), gravimetric. APHA 2540 C (modified; drying temperature of 103 - 105°C used rather than 180 ± 2°C) 22nd ed. 2012.	10 g/m³	1-6
Sample Temperature*	Supplied by customer, otherwise 20°C.	0.1 °C	1-6
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 22nd ed. 2012.	-	1-6
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.003 g/m³	1-6
Total Aluminium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.0032 g/m³	1-6
Total Beryllium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00011 g/m³	1-6
Dissolved Boron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.005 g/m³	1-6
Total Boron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0053 g/m³	1-6
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1-6
Total Cobalt	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00021 g/m³	1-6
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-6
Total Iron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.021 g/m³	1-6
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-6
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0005 g/m³	1-6
Total Manganese	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.00053 g/m³	1-6
Dissolved Mercury	0.45µm filtration, bromine oxidation followed by atomic fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m³	1-6
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1-6
Dissolved Selenium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0010 g/m³	1-6
Total Selenium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.0011 g/m³	1-6
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-6
Total Vanadium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012 / US EPA 200.8.	0.0011 g/m³	1-6
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-6
Fluoride	Direct measurement, ion selective electrode. APHA 4500-F^- C 22nd ed. 2012.	0.05 g/m³	1-6
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	1-6
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-6
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m³	1-6
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	1-6
Total Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-Norg D. (modified) 4500 NH_3 F (modified) 22nd ed. 2012.	0.10 g/m³	1-6
Dissolved Reactive Phosphorus	Filtered sample. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified). 22nd ed. 2012.	0.004 g/m³	1-6
Phosphate from DRP	Calculation: from Dissolved Reactive Phosphorus * 3.065.	0.004 g/m³	1-6
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	1-6
Reactive Silica	Filtered sample. Heteropoly blue colorimetry. Discrete analyser. APHA 4500-SiO_2 F (modified from flow injection analysis) 22nd ed. 2012.	0.10 g/m³ as SiO_2	1-6

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m^3	1-6
Dissolved C-Biochemical Oxygen Demand ($CBOD_5$)	Filtered sample (Advantec GC-50 1.2um or equivalent), Incubation 5 days, $CBOD_5$, DO meter, nitrification inhibitor, dilutions, seeded. APHA 5210 B (modified) 22nd ed. 2012.	2 g O_2/m^3	1-6
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	1-6
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	1-6
Total Organic Carbon (TOC)	Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC.The uncertainty of the calculated result is a combination of the uncertainties of the two analytical determinands in the subtraction calculation. Where both determinands are similar in magnitude, the calculated result has a significantly higher uncertainty than would normally be achieved if one of the results was significantly less than the other. In such cases, the elevated uncertainty should be kept in mind when interpreting the data. APHA 5310 C (modified) 22nd ed. 2012.	0.5 g/m^3	1-6
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS	Liquid/liquid extraction, GPC (if required), GCMS analysis	-	1-6
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/m^3	1-6
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	1-6
Semivolatile Organic Compounds Trace in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	-	1-6
Volatile Organic Compounds Trace in Water by Headspace GC-MS	Headspace, GC-MS SIM analysis [KBIs:37857,37921]	0.00010 - 0.05 g/m^3	1-6
Faecal Coliforms and E. coli profile			
Faecal Coliforms	MPN count in LT Broth at 35°C for 48 hours, EC Broth at 44.5° C for 24 hours. APHA 9221 B, 9221 E 22nd ed. 2012.	2 MPN / 100mL	1-6
Escherichia coli	MPN count in LT Broth at 35°C for 48 hours, EC MUG Broth at 44.5°C for 24 hours. APHA 9221 B, 9221 F 22nd ed. 2012.	2 MPN / 100mL	1-6

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 III

Biomonitoring reports

To	Job Manager, Lorraine Smith
From	Environmental Scientist, Katie Blakemore
Report No	KB046
Document	2049723
Date	08 May 2018

Biomonitoring of unnamed tributaries of the Waingongoro River in relation to the Eltham Central Landfill, November 2017

Introduction

In 1996, South Taranaki District Council (STDC) instigated plans to develop a landfill (Central landfill) just south of Eltham township, for the purpose of accepting waste from South Taranaki and Stratford Districts. More recently, these proposed plans were modified to allow for a regionalised approach to waste disposal which included the acceptance of waste from the New Plymouth district once the existing Colson Road landfill has reached capacity. At the time of this survey, a realignment of SH3 had been completed and construction of the landfill access road was underway.
STDC holds resource consents to authorise discharges to land and to water in relation to the operations of the Eltham Central landfill. The consents of specific interest to this survey are:

- 5347-1 to discharge contaminants onto and into land
- 5349-1 to discharge treated and untreated stormwater to an unnamed tributary of the Waingongoro River

A number of other consents are associated with the landfill, including consents for the realignment of SH3, construction of the access road and construction of the landfill. However, only the consents associated with the future landfill operations are discussed here. It should be noted that it is possible that activities associated with the exercise of these other consents may have impacted on the results of the current survey.

To date, a total of eleven three site biomonitoring surveys have been undertaken in the vicinity of the site to provide baseline data prior to the establishment of the proposed Eltham Central landfill. Prior to this survey, biomonitoring was scheduled to occur once every three years with the most recent survey on this schedule carried out in the 2011-2012 monitoring period. A further survey was undertaken in the 2016-2017 monitoring year. Two further biomonitoring sites were added in the current year, due to the planned construction of stage 1, in the headwaters of the 'southern ephemeral' tributary. Results from surveys performed since the since the 1995-1996 monitoring year are also discussed in this report.

Methods

This biomonitoring survey was undertaken at three established sites in an unnamed tributary of the Waingongoro River and two sites which were established at the time of sampling. These sites include two sites in the 'northern tributary'; a site 450m downstream of the Eltham Central landfill site (WGG000647), a site 600m downstream of the Eltham Central landfill site (WGG000648); and three sites in another tributary; a site upstream of the 'southern ephemeral tributary' confluence (WGG000649), a site downstream of the 'southern ephemeral tributary' confluence (WGG000651). The final site is 200m downstream of the

'northern tributary' confluence (WGG000654), and is downstream of both the 'northern' and 'southern ephemeral' tributaries (Table 1 and Figure 1).

Table 1 Biomonitoring sites in two unnamed tributaries of the Waingongoro River sampled in relation to the Eltham Central landfill

Site code	Grid reference (NZTM)	Location	Altitude (masl)
WGG000647	E1711817 N5631668	450m D/S Eltham Central landfill; 10m U/S SHS	200
WGG000648	E1711631 N5631714	600m D/S Eltham Central landfill; 175m D/S SH3	200
WGG000649	E1711690 N5631256	U/S 'southern tributary' confluence; 250m U/S Dalziell Rd	200
WGG000651	E1711647 N5631350	D/S 'southern tributary' confluence; 75m U/S Dalziell Rd	200
WGG000654	E1711549 N5631711	200m D/S 'northern tributary' confluence	200

The 'vegetation sweep' technique was used to collect streambed macroinvertebrates at WGG000651, while a combination of 'kick sampling' and 'vegetation sweep' techniques were used at the remaining four sites in this survey. The 'kick-sampling' and 'vegetation sweep' techniques are very similar to Protocols C1 (hard-bottomed, semi-quantitative) and C2 (soft-bottomed, semi-quantitative) of the New Zealand Macroinvertebrate Working Group (NZWMG) protocols for macroinvertebrate samples in wadeable streams (Stark et al. 2001).

Samples were preserved with Kahle's Fluid for later sorting and identification under a stereomicroscope according to Taranaki Regional Council methodology using protocol P1 of NZMWG protocols for sampling macroinvertebrates in wadeable streams (Stark et al. 2001). Macroinvertebrate taxa found in each sample were recorded based on the abundance categories in Table 2.

Table 2 Macroinvertebrate abundance categories

Abundance category	Number of individuals
R (rare)	1-4
C (common)	5-19
A (abundant)	20-99
VA (very abundant)	100-499
XA (extremely abundant)	>499

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams. Highly 'sensitive' taxa were assigned the highest scores of 9 or 10, while the most 'tolerant' forms scored 1. Sensitivity scores for certain taxa have been modified in accordance with Taranaki experience. By averaging the scores obtained from a list of taxa taken from one site and multiplying by a scaling factor of 20, a Macroinvertebrate Community Index (MCI) value was obtained. The MCI is a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. However, other physical variables such as sedimentation, temperatures, water velocity, and dissolved oxygen levels may also affect the MCI scores because the taxa that are able to tolerate extremes in these variables generally have lower sensitivity scores. More 'sensitive' communities inhabit less polluted waterways. A gradation of biological water quality conditions based upon MCI ranges has been adapted for Taranaki Streams and rivers (TRC, 2013) from Stark's classification (Stark, 1985; Boothroyd and

Stark 2000) is shown in Table 3. A difference of eleven or more MCI units is considered statistically significant (Stark 1998).

Table 3 Macroinvertebrate community health based on MCI ranges adapted for Taranaki streams and rivers (TRC, 2013) from Stark's classification (Stark, 1985; Boothroyd and Stark, 2000)

Grading	MCI
Excellent	>140
Very Good	120-140
Good	100-119
Fair	80-99
Poor	60-79
Very Poor	<60

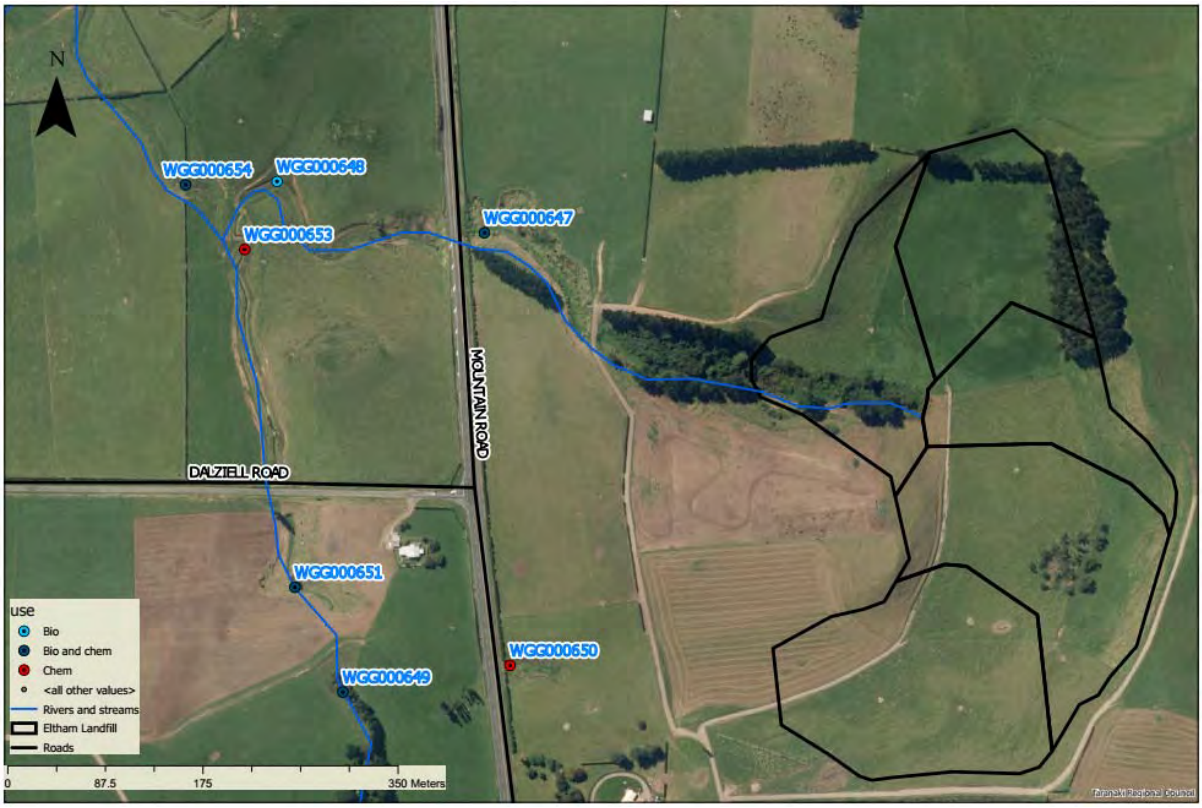

Figure 1 Biomonitoring sites in unnamed tributaries of the Waingongoro River sampled in relation to Eltham Central Landfill

Results

This November 2017 survey followed a period of 20 days since a fresh in excess of both 3x median and 7x median flow (based on the recorder station Tawhiti Stream at Duffy's, which has more similar hydrological characteristics to these tributaries than the nearby Waingongoro River). Water temperatures ranged from 15.3 °C to 16.7 °C. Flows were low, clear and uncoloured at all sites with slow water velocity at WGG000647, very slow/still at WGG000649 and steady at the remaining three sites. The substrate at site WGG000647 was dominated by fine gravel, silt and sand with small amounts of coarse gravel and hard clay present. Site

WGG000648 was dominated by silt and fine gravel with small amounts of sand and coarse gravel present. Site WGG000649 was dominated by silt, with small amounts of sand and fine gravel. Site WGG000651 had mainly silt and fine gravel with some sand present. Site WGG000654 had hard clay as the dominant substrate with some silt and sand present.

It should be noted that at the time of the survey silt controls were present in the stream almost immediately downstream of site WGG00647, however a silt coating was present on the streambed at WGG000647, WGG000649 and WGG000651. The substrate was embedded at site WGG000647 but not at any other site.

Macrophytes were present on the streambed at all five sites. Periphyton mats were present at WGG000648 but absent at the remaining four sites, while filamentous periphyton was present in patches that were epiphytic on macrophytes at WGG000647 and WGG000654. Moss was patchy on the streambed at WGG000654 only. All sites had partial shading provided by overhanging vegetation (mostly rank pasture grasses) and steep banks.

Macroinvertebrate communities

A summary of the results from previous surveys, together with the current survey are presented in Table 4. This is the inaugural survey for sites WGG000649 and WGG000651 so no previous data is available for these sites.

Table 4 Summary of previous macroinvertebrate taxa numbers, MCI and $SQMCI_S$ values for the current survey and previous surveys performed between July 1995 and December 2016

Site	N	Number of taxa			MCI values			$SQMCI_S$ values			
		Median	Range	Current Survey	Median	Range	Current Survey	N	Median	Range	Current Survey
WGG000647	10	14	8-16	10	81	73-95	54	7	4.6	3.4-5.2	2.7
WGG000648	10	14	6-22	13	76	66-87	71	7	4.5	3.7-4.8	3.3
WGG000649	0			12			78	0			4.5
WGG000651	0			13			66	0			4.2
WGG000654	10	14	9-16	15	73	60-80	76	7	4.3	3.7-4.8	4.0

Table 5 provides a summary of various macroinvertebrate indices for 'control' sites at similar altitudinal range in smaller (lowland) hill country streams in Taranaki.

Table 5 Range and median number of taxa, MCI and $SQMCI_S$ scores for 'control' sites in Taranaki smaller (lowland) hill country rivers/streams at altitudes 200-249 m asl (TRC 2017)

	No. of taxa	MCI value	$SQMCI_S$ value
No. Samples	193	193	114
Range	5-33	52-108	1.2-6.3
Median	18	79	4.1

Table 6 provides the full macroinvertebrate fauna recorded in the current survey.

Table 6 Macroinvertebrate fauna of two unnamed tributaries of the Waingongoro River sampled in relation to Eltham Central landfill on 28 November 2017

Taxa List	Site Code	MCI	WGG000647	WGG000648	WGG000649	WGG000651	WGG000654
	Sample Number	Score	FWB17423	FWB17424	FWB17425	FWB17426	FWB17427
PLATYHELMINTHES (FLATWORMS)	*Cura*	3	-	-	R	R	-
ANNELIDA (WORMS)	Oligochaeta	1	VA	C	C	VA	C
MOLLUSCA	*Potamopyrgus*	4	A	A	XA	XA	XA
	Sphaeriidae	3	R	-	-	C	-
CRUSTACEA	Ostracoda	1	VA	A	A	A	C
	Paracalliope	5	XA	VA	XA	XA	XA
	Paraleptamphopidae	5	C	R	C	C	R
EPHEMEROPTERA (MAYFLIES)	*Zephlebia group*	7	-	R	A	A	R
PLECOPTERA (STONEFLIES)	*Zelandobius*	5	-	-	-	-	R
ODONATA (DRAGONFLIES)	*Xanthocnemis*	4	-	R	-	-	C
COLEOPTERA (BEETLES)	Dytiscidae	5	-	-	-	-	R
TRICHOPTERA (CADDISFLIES)	*Hydrobiosis*	5	-	R	-	-	R
	Psilochorema	6	-	R	R	C	-
	Oxyethira	2	C	C	-	R	VA
DIPTERA (TRUE FLIES)	*Paralimnophila*	6	-	-	R	-	-
	Chironomus	1	XA	R	-	R	-
	Corynoneura	3	-	-	-	-	C
	Orthocladiinae	2	C	VA	R	C	VA
	Paradixa	4	-	-	C	-	-
	Muscidae	3	R	-	-	-	-
	Austrosimulium	3	-	C	C	C	A
ACARINA (MITES)	Acarina	5	-	-	-	-	R
		No of taxa	10	13	12	13	15
		MCI	54	71	78	66	76
		SQMCIs	2.7	3.3	4.5	4.2	4.0
		EPT (taxa)	0	3	2	2	3
		%EPT (taxa)	0	23	17	15	20

'Tolerant' taxa | 'Moderately sensitive' taxa | 'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant

Site WGG000647

A moderately low macroinvertebrate community richness of 10 taxa was recorded at this site. This is three taxa less than the previously recorded median for this site, and eight taxa less than the median for smaller hill country streams at similar altitude (Table 4, Table 5, Figure 2). The macroinvertebrate community was characterised by five taxa, one 'moderately sensitive' taxon [amphipod (*Paracalliope*)] and four 'tolerant' taxa [oligochaete worms, mud snail (*Potamopyrgus*), seed shrimp (Ostracoda) and midge larvae (*Chironomus*)] (Table 6).

The recorded MCI score of 54 units categorised the site as having 'very poor' macroinvertebrate community health and was the lowest score recorded at this site to date (Table 4, Table 5, Figure 2). This score was significantly lower (Stark 1998) than both the median score for this site and the median score for smaller hill country streams at similar altitude (Table 4, Table 5, Figure 2).

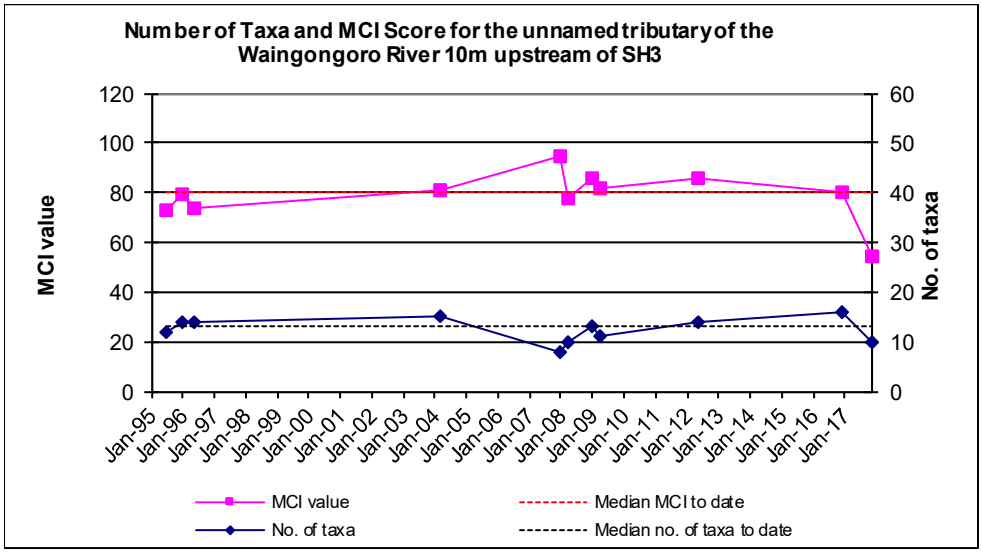

Figure 2 Taxa richness and MCI scores recorded at site WGG000647 since 1996

A low $SQMCI_S$ score of 2.7 was recorded, the lowest score recorded to date at this site (Table 4). This score is significantly lower (Stark 1998) than the median $SQMCI_S$ score for this site and the median $SQMCI_S$ score for smaller hill country streams at similar altitude (Table 4, Table 5). This low score reflects the dominance of 'tolerant' taxa in the macroinvertebrate community.

Site WGG000648

A moderately low macroinvertebrate community richness of 13 taxa was recorded at this site. This is only one taxon less than the previously recorded median richness for this site, and five taxa less than the median for smaller hill country streams at similar altitude (Table 4, Table 5, Figure 3). However, it is a substantial seven taxa more than was recorded by the preceding survey (Figure 3). The macroinvertebrate community was characterised by four taxa, one 'moderately sensitive' taxon [amphipod (*Paracalliope*)] and three 'tolerant' taxa [mud snail (*Potamopyrgus*), seed shrimp (Ostracoda) and midge larvae (Orthocladiinae)] (Table 6).

The recorded MCI score of 71 units categorised the site as having 'poor' macroinvertebrate community health. This score is slightly lower than both the median score for the site, and the median score for smaller hill country streams at similar altitude (Table 4, Table 5, Figure 3). It is only one unit lower than the score recorded in the preceding survey (Figure 3).

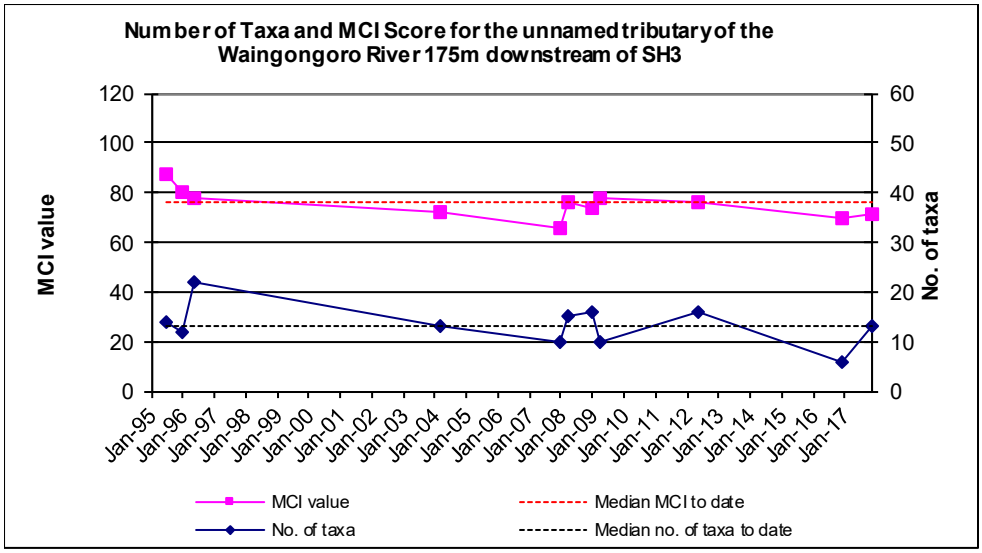

Figure 3 Taxa richness and MCI scores recorded at site WGG000648 since 1996

The $SQMCI_S$ score of 3.3 units was the lowest score recorded to date at this site (Table 4). The score is significantly (Stark 1998) lower than the median score for this site but is not significantly (Stark 1998) lower than the median score for smaller hill country streams at similar altitude (Table 4, Table 5).

Site WGG000649

A moderately low taxa richness of 12 taxa was recorded at this site. This is six taxa less than the median score for smaller hill country streams at similar altitude (Table 5). The macroinvertebrate community was characterised by four taxa, two 'moderately sensitive' taxa [amphipod (*Paracalliope*) and mayfly (*Zephlebia* group)] and two 'tolerant' taxa [mud snail (*Potamopyrgus*) and seed shrimp (Ostracoda)] (Table 6).

A MCI score of 78 units was recorded, categorising the site as having 'poor' macroinvertebrate community health. This score is an insignificant (Stark 1998) one unit lower than the median score for smaller lowland hill country streams at similar altitude (Table 5). The $SQMCI_S$ score of 4.5 units was an insignificant 0.4 unit higher than the median score for smaller hill country streams at similar altitude (Table 5).

Site WGG000651

A moderately low taxa richness of 13 taxa was recorded at this site, 5 taxa less than the median for smaller hill country streams at similar altitude (Table 5). The macroinvertebrate community was characterised by five taxa, two 'moderately sensitive' taxa [amphipod (*Paracalliope*) and mayfly (*Zephlebia* group)] and three 'tolerant' taxa [oligochaete worms, mud snail (*Potamopyrgus*) and seed shrimp (Ostracoda)] (Table 6).

A MCI score of 66 units was recorded, categorising the site as having 'poor' macroinvertebrate community health. This score is a significant (Stark 1998) 13 units lower than the median score for smaller hill country streams at comparable altitude (Table 5). The recorded $SQMCI_S$ score of 4.2 units is very similar to the median $SQMCI_S$ score for smaller hill country streams at similar altitude (Table 5).

Site WGG000654

A moderately low macroinvertebrate community richness of 15 taxa was recorded at this site, one taxon more than the previously recorded median richness for this site and three taxa less than the median richness for smaller hill country streams at comparable altitude (Table 4, Table 5, Figure 4). This is a substantial six taxa more than the previously recorded richness at this site (Figure 4). The macroinvertebrate community was characterised by five taxa, one 'moderately sensitive' taxon [amphipod (*Paracalliope*)] and

four 'tolerant' taxa [snail (*Potamopyrgus*), purse caddis (*Oxyethira*), midge larvae (Orthocladiinae) and sandfly larvae (*Austrosimulium*)] (Table 6).

A MCI score of 76 units was recorded, categorising the site as having 'poor' macroinvertebrate community health. This score is a significant (Stark 1998) 16 units higher than the score recorded in the preceding survey but is similar to the previously recorded median score for this site and to the median richness for smaller hill country streams at similar altitude (Table 4, Table 5, Figure 4).

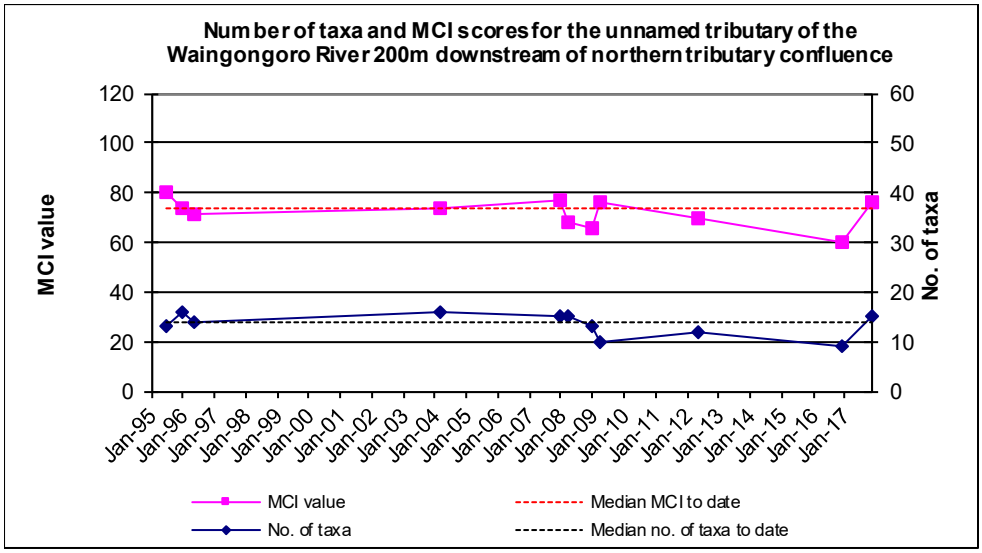

Figure 4 Taxa richness and MCI scores recorded at site WGG000654 since 1996

The $SQMCI_S$ score of 4.0 units is similar both to the previously recorded median score for this site and to the median score for smaller lowland hill country streams at comparable altitude (Table 4, Table 5).

Discussion and conclusions

The Council's 'vegetation sweep' or a combination of the 'vegetation sweep' and 'kick-sampling' techniques were used to collect streambed macroinvertebrates from five sites in two unnamed tributaries of the Waingongoro River on 28 November 2017. This has provided baseline data to assess any impacts the operation of the Eltham Central Landfill may cause in these two unnamed tributaries. Samples were processed to provide number of taxa (richness), MCI and $SQMCI_S$ scores for each site.

Taxa richness is the most robust index when determining whether a macroinvertebrate community has been exposed to toxic discharges. When exposed to toxic discharges, macroinvertebrates may die and be swept downstream or may deliberately drift downstream as an avoidance mechanism (catastrophic drift). The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. THE $SQMCI_S$ takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities, particularly if non-organic impacts are occurring. However, it is also influenced by the 'patchiness' of macroinvertebrates on the streambed, and as such must be considered in the context of all three metrics. Significant differences in either the MCI or $SQMCI_S$ scores between sites may indicate the degree of adverse effects (if any) of the discharge being monitored.

This survey recorded moderately low taxa richness, with a range from 10-15 taxa across the 5 sites. Further, those taxa recorded are typically associated with macrophyte beds. All five sites surveyed were characterised by the 'moderately sensitive' taxon *Paracalliope* and the 'tolerant' taxon *Potamopyrgus*. This is consistent with previous surveys carried out in relation to Eltham Central landfill, which have recorded communities dominated by lower scoring 'moderately sensitive' and 'tolerant' taxa typical of small, seepage-fed, macrophyte dominated, soft-bottomed farmland streams.

Site WGG000647, the uppermost site in the 'northern' tributary recorded the lowest scores of all sites surveyed for all three invertebrate metrics. Both the MCI and $SQMCI_S$ scores were the lowest scores recorded at this site to date. It is possible that the observed results at this site were influenced by the silt controls associated with the road realignment, which were in place immediately downstream of the sampling site, and may have caused a reduction in flow velocities and silt deposition to occur at this site. Site WGG000648, also located in the 'northern' tributary, recorded a slightly higher taxa richness and $SQMCI_S$ score, and a significantly higher MCI score compared to site WGG000647. This difference is most likely a result of habitat differences between the sites, with faster flow velocities recorded at this downstream site.

Site WGG000649, located upstream of the confluence with the 'southern ephemeral' tributary recorded MCI and $SQMCI_S$ scores of 78, and 4.5 respectively, both of which are the highest results recorded of any site in this survey. Site WGG000651, downstream of the 'southern ephemeral' tributary confluence, recorded a significantly lower MCI score than above the confluence, and a slightly lower $SQMCI_S$ score.

Site WGG000654, located downstream of the 'northern' tributary confluence, recorded the highest taxa richness of the five sites. A MCI score of 76 units and a $SQMCI_S$ score of 4.0 units were recorded, which were similar to all other sites except WGG000647.

In general, this survey recorded similar macroinvertebrate metrics between sites, with the exception of WGG000647, which recorded lower MCI and $SQMCI_S$ scores than the other sites. The $SQMCI_S$ scores in the northern tributary were significantly lower than those recorded upstream of this confluence at sites WGG000649 and WGG000651. It is plausible that the lower results at the furthest upstream site may result from habitat modification associated with the silt controls used during the road realignment, however there is insufficient evidence to conclusively state that this is the case.

Summary

Overall, the results of November 2017 survey were indicative of 'poor' to 'very poor' biological health in the two unnamed tributaries of the Waingongoro River. However, this is consistent with previous surveys carried out in relation to Eltham Central landfill, which have recorded communities dominated by lower scoring 'moderately sensitive' and 'tolerant' taxa typical of small, seepage-fed, macrophyte dominated, soft-bottomed farmland streams. The upstream site in the 'northern' tributary, WGG000647, recorded the poorest invertebrate metrics of the sites, which is likely related to the sediment controls in the stream near to the sampling site altering habitat conditions. $SQMCI_S$ scores in the 'northern' tributary were lower than in the other unnamed tributary. The MCI score decreased significantly downstream of the 'southern ephemeral' tributary confluence, but increased again downstream of the 'northern' tributary confluence. There was no conclusive evidence provided by this survey that any activities associated with the Eltham Central Landfill had impacted on the macroinvertebrate communities of these two unnamed tributaries of the Waingongoro River.

References

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To	Job Manager, Lorraine Smith
From	Environmental Scientist, Katie Blakemore
Report No	KB057
Document	2075987
Date	22 June 2016

Biomonitoring of unnamed tributaries of the Waingongoro River in relation to the Eltham Central Landfill, April 2018

Introduction

In 1996, South Taranaki District Council (STDC) instigated plans to develop a landfill (Central landfill) just south of Eltham township, for the purpose of accepting waste from South Taranaki and Stratford Districts. More recently, these proposed plans were modified to allow for a regionalised approach to waste disposal which included the acceptance of waste from the New Plymouth district once the existing Colson Road landfill has reached capacity. At the time of this survey, construction of the landfill access road was continuing and soil stripping in preparation for stage 1 of the landfill construction was underway. STDC holds resource consents to authorise discharges to land and to water in relation to the operations of the Eltham Central landfill. The consents of specific interest to this survey are:

- 5347-1 to discharge contaminants onto and into land
- 5349-1 to discharge treated and untreated stormwater to an unnamed tributary of the Waingongoro River

A number of other consents are associated with the landfill, including consents for the realignment of SH3, construction of the access road and construction of the landfill. However, only the consents associated with the future landfill operations are discussed here. It should be noted that it is possible that activities associated with the exercise of these other consents may have impacted on the results of the current survey.

To date, a total of eleven three site biomonitoring surveys have been undertaken in the vicinity of the site to provide baseline data prior to the establishment of the proposed Eltham Central landfill. This survey is the second of two five site surveys scheduled for the current monitoring year. Two further biomonitoring sites were added in the current year, due to the planned construction of stage 1, in the headwaters of the 'southern ephemeral' tributary. Results from surveys performed since the since the 1995-1996 monitoring year are also discussed in this report.

Methods

This biomonitoring survey was undertaken at five established sites in an unnamed tributary of the Waingongoro River. These sites include two sites in the 'northern tributary'; a site 450m downstream of the Eltham Central landfill site (WGG000647), a site 600m downstream of the Eltham Central landfill site (WGG000648); and three sites in another tributary; a site upstream of the 'southern ephemeral tributary' confluence (WGG000649), a site downstream of the 'southern ephemeral tributary' confluence (WGG000651). The final site is 200m downstream of the 'northern tributary' confluence (WGG000654), and is downstream of both the 'northern' and 'southern ephemeral' tributaries (Table 1 and Figure 1).

Table 1 Biomonitoring sites in two unnamed tributaries of the Waingongoro River sampled in relation to the Eltham Central landfill

Site code	Grid reference (NZTM)	Location	Altitude (masl)
WGG000647	E1711817 N5631668	450m D/S Eltham Central landfill; 10m U/S SHS	200
WGG000648	E1711631 N5631714	600m D/S Eltham Central landfill; 175m D/S SH3	200
WGG000649	E1711690 N5631256	U/S 'southern tributary' confluence; 250m U/S Dalziell Rd	200
WGG000651	E1711647 N5631350	D/S 'southern tributary' confluence; 75m U/S Dalziell Rd	200
WGG000654	E1711549 N5631711	200m D/S 'northern tributary' confluence	200

The 'vegetation sweep' technique was used to collect streambed macroinvertebrates at WGG000647, WGG000648 and WGG000649, while a combination of 'kick sampling' and 'vegetation sweep' techniques was used at the remaining two sites in this survey. The 'kick-sampling' and 'vegetation sweep' techniques are very similar to Protocols C1 (hard-bottomed, semi-quantitative) and C2 (soft-bottomed, semi-quantitative) of the New Zealand Macroinvertebrate Working Group (NZWMG) protocols for macroinvertebrate samples in wadeable streams (Stark et al. 2001).

Samples were preserved with Kahle's Fluid for later sorting and identification under a stereomicroscope according to Taranaki Regional Council methodology using protocol P1 of NZMWG protocols for sampling macroinvertebrates in wadeable streams (Stark et al. 2001). Macroinvertebrate taxa found in each sample were recorded based on the abundance categories in Table 2.

Table 2 Macroinvertebrate abundance categories

Abundance category	Number of individuals
R (rare)	1-4
C (common)	5-19
A (abundant)	20-99
VA (very abundant)	100-499
XA (extremely abundant)	>499

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams. Highly 'sensitive' taxa were assigned the highest scores of 9 or 10, while the most 'tolerant' forms scored 1. Sensitivity scores for certain taxa have been modified in accordance with Taranaki experience. By averaging the scores obtained from a list of taxa taken from one site and multiplying by a scaling factor of 20, a Macroinvertebrate Community Index (MCI) value was obtained. The MCI is a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. However, other physical variables such as sedimentation, temperatures, water velocity, and dissolved oxygen levels may also affect the MCI scores because the taxa that are able to tolerate extremes in these variables generally have lower sensitivity scores. More 'sensitive' communities inhabit less polluted waterways. A gradation of biological water quality conditions based upon MCI ranges has been adapted for Taranaki Streams and rivers (TRC, 2013) from Stark's classification (Stark, 1985; Boothroyd and

Stark 2000) is shown in Table 3. A difference of eleven or more MCI units is considered statistically significant (Stark 1998).

Table 3 Macroinvertebrate community health based on MCI ranges adapted for Taranaki streams and rivers (TRC, 2013) from Stark's classification (Stark, 1985; Boothroyd and Stark, 2000)

Grading	MCI
Excellent	>140
Very Good	120-140
Good	100-119
Fair	80-99
Poor	60-79
Very Poor	<60

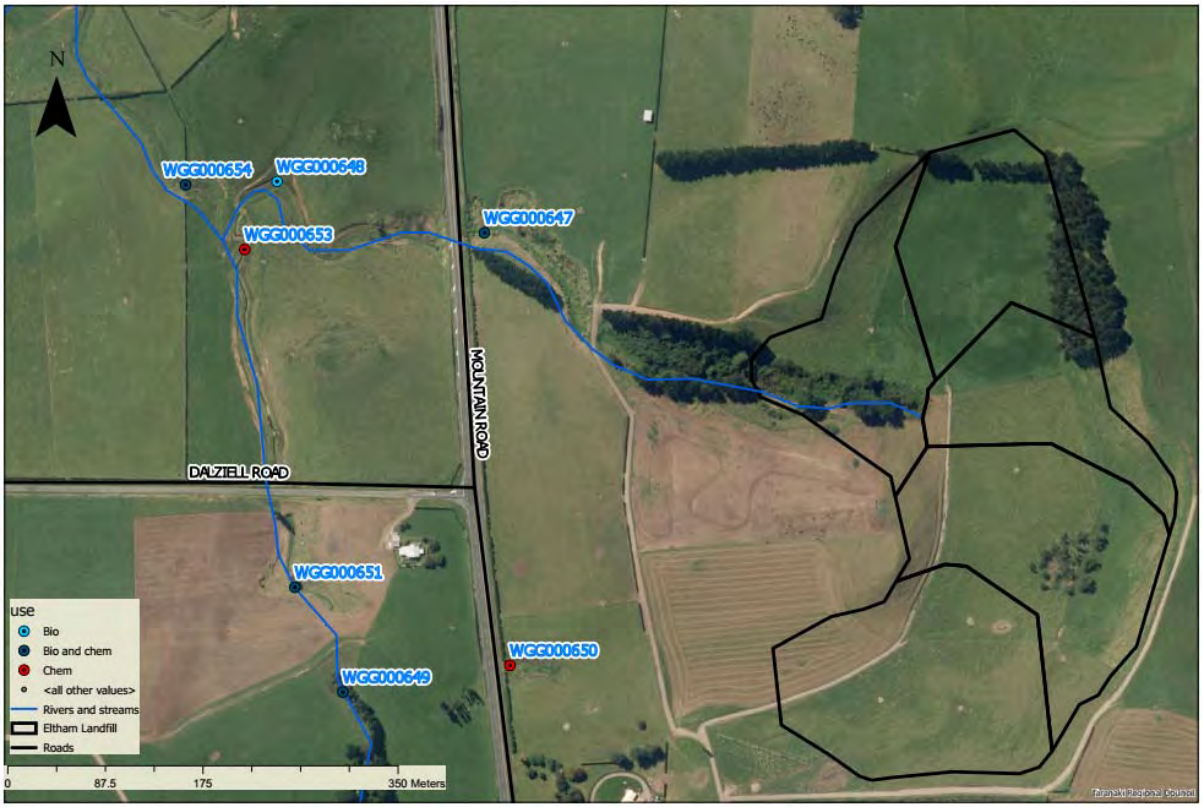

Figure 1 Surface water monitoring sites in unnamed tributaries of the Waingongoro River sampled in relation to Eltham Central Landfill

Results

This April 2018 survey followed a period of 26 days since a fresh in excess of 3x median flow and and 218 days since a fresh of 7x median flow (based on the recorder station Tawhiti Stream at Duffy's, which has more similar hydrological characteristics to these tributaries than the nearby Waingongoro River). Water temperatures ranged from 15.9 °C to 17.6 °C. Flows were moderate, clear and uncoloured at sites WGG000647, WGG000648 and WGG000654, while WGG000649 and WGG000651 had moderate flow with a cloudy brown colouration. Flow velocities were slow at WGG000647 and steady at the remaining four sites.

The substrate at site WGG000647 was dominated by silt and hard clay with small amounts of sand and fine gravel present. Site WGG000648 was dominated by silt with small amounts of sand, hard clay and wood/root present. Site WGG000649 was dominated by silt and hard clay, with small amounts of sand and fine gravel. Site WGG000651 had mainly silt and hard clay with some sand and wood/root present. Site WGG000654 had silt, sand and hard clay as the dominant substrate with some fine gravel present.

At the time of this survey, the silt controls in place almost immediately downstream of site WGG000647 during the road realignment had been removed.

Macrophytes were present on the streambed at all five sites. Periphyton mats were slippery and filamentous periphyton was patchy at WGG000654 but absent at the remaining four sites. Leaves were patchy on the streambed at WGG000651 only. No shading was present at any of the five sites, with only minimal overhanging pasture grass present.

Macroinvertebrate communities

A summary of the results from previous surveys, together with the current survey are presented in Table 4. This is the second survey for sites WGG000649 and WGG000651 so historic medians are not available for these two sites.

Table 4 Summary of previous macroinvertebrate taxa numbers, MCI and $SQMCI_S$ values for the current survey and previous surveys performed between July 1995 and December 2017

Site	N	Number of taxa			MCI values			$SQMCI_s$ values			
		Median	Range	Current Survey	Median	Range	Current Survey	N	Median	Range	Current Survey
WGG000647	11	13	8-16	16	80	54-95	81	8	4.6	2.7-5.2	4.2
WGG000648	11	13	6-22	10	76	66-87	62	8	4.5	3.3-4.8	2.4
WGG000649	1		12	15		78	80	1		4.5	4.1
WGG000651	1		13	14		66	73	1		4.2	4.2
WGG000654	11	14	9-16	15	74	60-80	67	8	4.3	3.7-4.8	3.8

Table 5 provides a summary of various macroinvertebrate indices for 'control' sites at similar altitudinal range in smaller (lowland) hill country streams in Taranaki.

Table 5 Range and median number of taxa, MCI and $SQMCI_S$ scores for 'control' sites in Taranaki smaller (lowland) hill country rivers/streams at altitudes 200-249 m asl (TRC 2017)

	No. of taxa	MCI value	$SQMCI_s$ value
No. Samples	193	193	114
Range	5-33	52-108	1.2-6.3
Median	18	79	4.1

Table 6 provides the full macroinvertebrate fauna recorded in the current survey.

Table 6 Macroinvertebrate fauna of two unnamed tributaries of the Waingongoro River sampled in relation to Eltham Central landfill on 4 April 2018

Taxa List	Site Code	MCI	WGG000647	WGG000648	WGG000649	WGG000651	WGG000654
	Sample Number	score	FWB18201	FWB18202	FWB18203	FWB18204	FWB18205
PLATYHELMINTHES (FLATWORMS)	*Cura*	3	R	-	-	R	-
NEMERTEA	Nemertea	3	R	-	-	-	-
NEMATODA	Nematoda	3	-	A	-	-	C
ANNELIDA (WORMS)	Oligochaeta	1	A	XA	A	C	VA
	Lumbricidae	5	-	-	C	-	-
MOLLUSCA	*Potamopyrgus*	4	VA	A	XA	XA	C
	Sphaeriidae	3	-	R	A	R	R
CRUSTACEA	Ostracoda	1	VA	XA	VA	A	VA
	Paracalliope	5	XA	XA	XA	VA	XA
	Paraleptamphopidae	5	R	-	-	VA	A
	Talitridae	5	R	-	-	-	-
EPHEMEROPTERA (MAYFLIES)	*Zephlebia group*	7	R	-	C	A	-
PLECOPTERA (STONEFLIES)	*Megaleptoperla*	9	R	-	-	-	-
ODONATA (DRAGONFLIES)	*Xanthocnemis*	4	-	R	-	-	-
HEMIPTERA (BUGS)	*Microvelia*	3	R	-	-	-	-
COLEOPTERA (BEETLES)	Dytiscidae	5	-	R	R	-	-
TRICHOPTERA (CADDISFLIES)	*Psilochorema*	6	-	-	R	R	R
	Oxyethira	2	-	-	-	-	A
DIPTERA (TRUE FLIES)	Hexatomini	5	R	-	-	-	-
	Paralimnophila	6	-	-	R	-	R
	Zelandotipula	6	R	-	-	-	-
	Chironomus	1	-	-	-	-	R
	Corynoneura	3	-	C	-	-	-
	Orthocladiinae	2	C	C	A	C	A
	Tanypodinae	5	-	-	C	-	-
	Paradixa	4	-	-	R	-	-
	Empididae	3	-	-	R	R	R
	Psychodidae	1	R	-	-	-	-
	Sciomyzidae	3	-	-	-	R	-
	Austrosimulium	3	-	-	R	R	A
	Stratiomyidae	5	-	-	-	R	-
ACARINA (MITES)	Acarina	5	C	-	-	-	R
		No of taxa	16	10	15	14	15
		MCI	81	62	80	73	67
		SQMCIs	4.2	2.4	4.1	4.2	3.8
		EPT (taxa)	2	0	2	2	1
		%EPT (taxa)	13	0	13	14	7
'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa					

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant

Site WGG000647

A moderate macroinvertebrate community richness of 16 taxa was recorded at this site. This is three taxa more than the previously recorded median for this site, and six taxa more than the median for smaller hill country streams at similar altitude (Table 4, Table 5, Figure 2). The macroinvertebrate community was characterised by four taxa, one 'moderately sensitive' taxon [amphipod (*Paracalliope*)] and three 'tolerant' taxa [oligochaete worms, mud snail (*Potamopyrgus*) and seed shrimp (Ostracoda)] (Table 6).

The recorded MCI score of 81 units categorised the site as having 'fair' macroinvertebrate community health (Table 4, Table 5, Figure 2). This score was similar to the both the median score for this site and the median score for smaller hill country streams at similar altitude, and represented a significant (Stark 1998) improvement from the preceding result of 54 units (Table 4, Table 5, Figure 2).

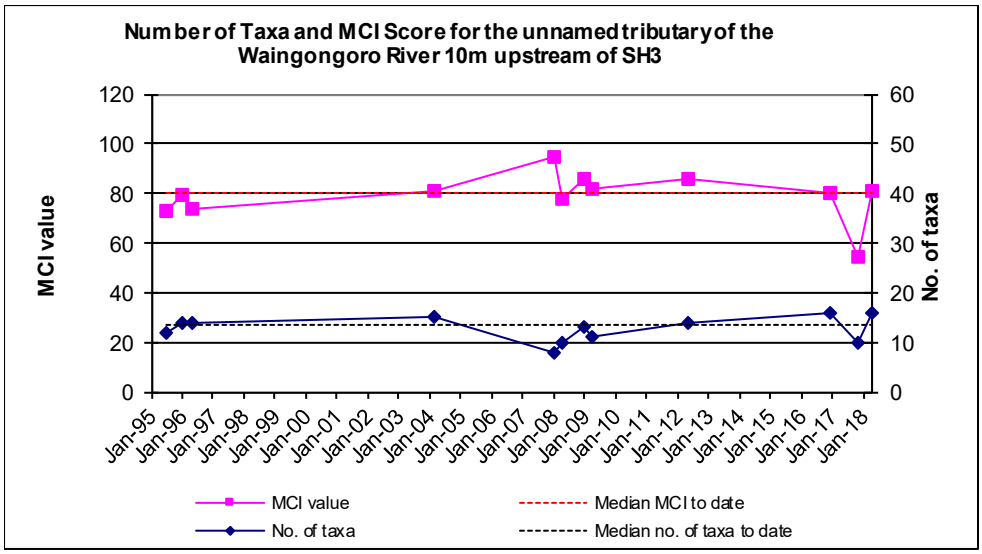

Figure 2 Taxa richness and MCI scores recorded at site WGG000647 since 1996

A $SQMCI_S$ score of 4.2 was recorded, a significant improvement (Stark 1998) from the preceding survey which recorded the lowest score to date at this site (Table 4). The current score is similar to the median $SQMCI_S$ score for this site and the median $SQMCI_S$ score for smaller hill country streams at similar altitude (Table 4, Table 5).

Site WGG000648

A moderately low macroinvertebrate community richness of 10 taxa was recorded at this site. This is three taxa less than the previously recorded median richness for this site, and a substantial eight taxa less than the median for smaller hill country streams at similar altitude (Table 4, Table 5, Figure 3). However, this was only three taxa less than was recorded by the preceding survey (Figure 3). The macroinvertebrate community was characterised by five taxa, one 'moderately sensitive' taxon [amphipod (*Paracalliope*)] and four 'tolerant' taxa [mud snail (*Potamopyrgus*), seed shrimp (Ostracoda) and worms (Oligochaete and Nematoda)] (Table 6).

The recorded MCI score of 62 units categorised the site as having 'poor' macroinvertebrate community health. This score is significantly (Stark 1998) lower than both the median score for the site, and the median score for smaller hill country streams at similar altitude (Table 4, Table 5, Figure 3). It is a non-significant 9 units lower than the score recorded in the preceding survey and is the lowest MCI score recorded at this site to date (Figure 3).

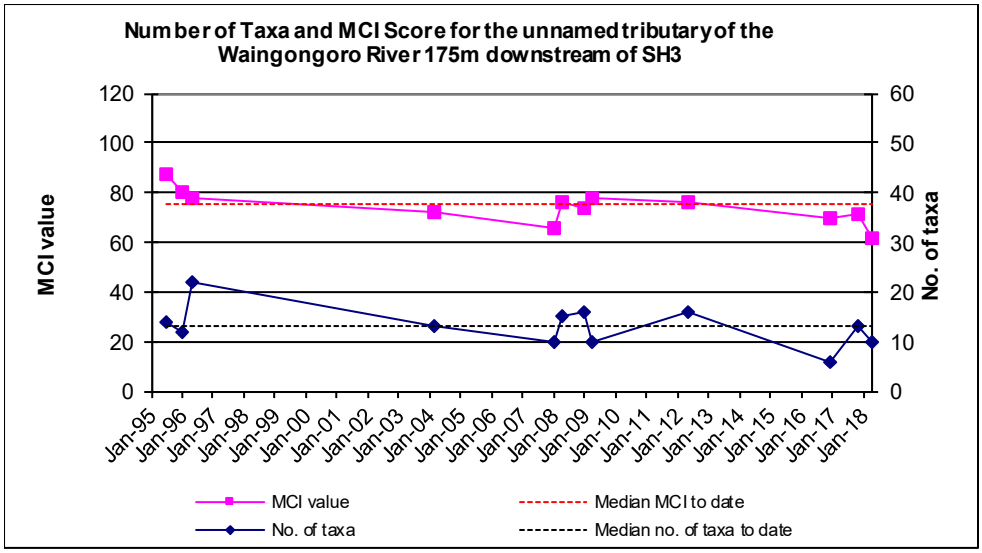

Figure 3 Taxa richness and MCI scores recorded at site WGG000648 since 1996

The $SQMCI_S$ score of 2.4 units was the lowest score recorded to date at this site (Table 4). This score is significantly (Stark 1998) lower than the score recorded in the preceding survey, the median score for this site and the median score for smaller hill country streams at similar altitude (Table 4, Table 5).

Site WGG000649

A moderate taxa richness of 15 taxa was recorded at this site. This is three taxa less than the median score for smaller hill country streams at similar altitude and three taxa more than was recorded in the preceding survey (Table 4, Table 5). The macroinvertebrate community was characterised by six taxa, one 'moderately sensitive' taxon [amphipod (*Paracalliope*)] and five 'tolerant' taxa [mud snail (*Potamopyrgus*), oligochaete worms, pea clam (Sphaeriidae), seed shrimp (Ostracoda) and midges (Orthocladiinae)] (Table 6).

A MCI score of 78 units was recorded categorising the site as having 'fair' macroinvertebrate community health. This score is an insignificant (Stark 1998) one unit higher than the median score for smaller lowland hill country streams at similar altitude and two units higher than the score recorded in the preceding survey (Table 4, Table 5). The $SQMCI_S$ score of 4.1 units was an insignificant 0.4 unit lower than the preceding result and equal to the median score for smaller hill country streams at similar altitude (Table 4, Table 5).

Site WGG000651

A moderately low taxa richness of 14 taxa was recorded at this site, 4 taxa less than the median for smaller hill country streams at similar altitude and one taxon more than was recorded in the preceding survey (Table 4, Table 5). The macroinvertebrate community was characterised by five taxa, three 'moderately sensitive' taxa [amphipods (*Paracalliope*) and (Paraleptamphoidae), and mayfly (*Zephlebia* group)] and two 'tolerant' taxa [mud snail (*Potamopyrgus*) and seed shrimp (Ostracoda)] (Table 6).

A MCI score of 73 units was recorded, categorising the site as having 'poor' macroinvertebrate community health. This score is a non-significant (Stark 1998) six units lower than the median score for smaller hill country streams at comparable altitude and seven units more than was recorded in the preceding survey (Table 4, Table 5). The recorded $SQMCI_S$ score of 4.2 units is very similar to the median $SQMCI_S$ score for smaller hill country streams at similar altitude and equal to the score recorded in the preceding survey (Table 5).

Site WGG000654

A moderately low macroinvertebrate community richness of 15 taxa was recorded at this site, one taxon more than the previously recorded median richness for this site and three taxa less than the median richness for smaller hill country streams at comparable altitude (Table 4, Table 5, Figure 4). This is equal to the previously recorded richness at this site (Figure 4). The macroinvertebrate community was characterised by seven taxa, two 'moderately sensitive' taxa [amphipods (*Paracalliope*) and (Paraleptamphopidae)] and five 'tolerant' taxa [oligochaete worms, seed shrimp (Ostracoda), purse caddis (*Oxyethira*), midge larvae (Orthocladiinae) and sandfly larvae (*Austrosimulium*)] (Table 6).

A MCI score of 67 units was recorded, categorising the site as having 'poor' macroinvertebrate community health. This score is a non-significant (Stark 1998) nine units lower than the score recorded in the preceding survey and is similar to the previously recorded median score for this site, but is significantly lower than the median richness for smaller hill country streams at similar altitude (Table 4, Table 5, Figure 4).

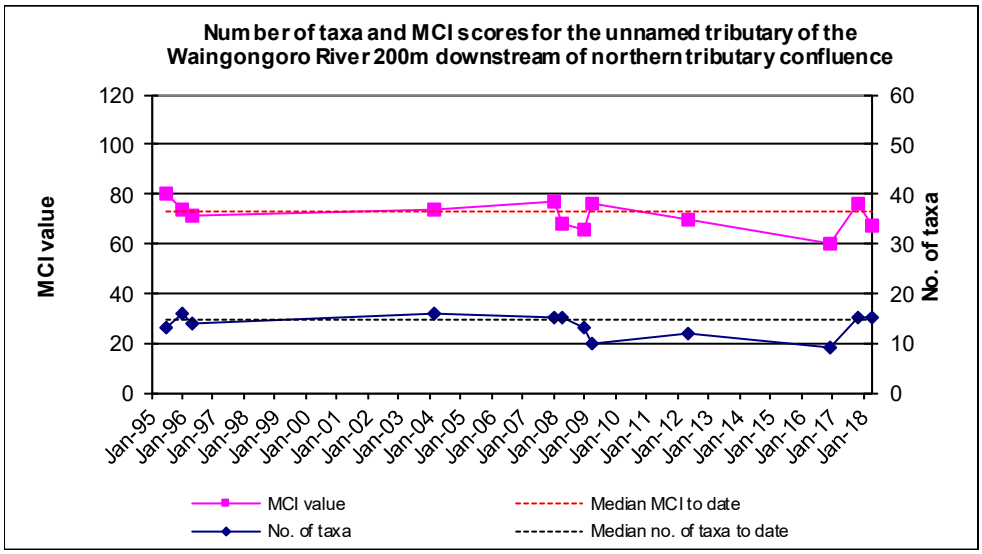

Figure 4 Taxa richness and MCI scores recorded at site WGG000654 since 1996

The $SQMCI_S$ score of 3.8 units is similar both to the previously recorded median score for this site and to the median score for smaller lowland hill country streams at comparable altitude (Table 4, Table 5).

Discussion and conclusions

The Council's 'vegetation sweep' or a combination of 'vegetation sweep' and 'kick-sampling' techniques were used to collect streambed macroinvertebrates from five sites in two unnamed tributaries of the Waingongoro River on 4 April 2018. This has provided baseline data to assess any impacts the development of the Eltham Central Landfill may cause in these two unnamed tributaries. Samples were processed to provide number of taxa (richness), MCI and $SQMCI_S$ scores for each site.

Taxa richness is the most robust index when determining whether a macroinvertebrate community has been exposed to toxic discharges. When exposed to toxic discharges, macroinvertebrates may die and be swept downstream or may deliberately drift downstream as an avoidance mechanism (catastrophic drift). The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The $SQMCI_S$ takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities, particularly if non-organic impacts are occurring. However, it is also influenced by the 'patchiness' of macroinvertebrates on the streambed, and as such must

be considered in the context of all three metrics. Significant differences in either the MCI or $SQMCI_S$ scores between sites may indicate the degree of adverse effects (if any) of the discharge being monitored.

This survey recorded moderately low taxa richness, with a range from 10-16 taxa across the 5 sites. Further, those taxa recorded are typically associated with macrophyte beds. All five sites surveyed were characterised by the 'moderately sensitive' taxon *Paracalliope* and the 'tolerant' taxon Ostracoda. This is consistent with previous surveys carried out in relation to Eltham Central landfill, which have recorded communities dominated by lower scoring 'moderately sensitive' and 'tolerant' taxa typical of small, seepage-fed, macrophyte dominated, soft-bottomed farmland streams.

Site WGG000647, the uppermost site in the 'northern' tributary recorded the highest scores of all sites surveyed for all three invertebrate metrics, in contrast to the previous survey which recorded the lowest invertebrate metric results of the surveyed sites. It is possible that the improvements at this site were related to the removal of the silt controls associated with the road realignment, which were in place immediately downstream of the sampling site in the previous survey, but had been removed prior to the current survey. Site WGG000648, also located in the 'northern' tributary, recorded the lowest scores of the five sites in the current survey. All three scores were significantly lower than scores at WGG000647. This difference is most likely a result of habitat differences between the site, with greater bank instability and a higher proportion of silt substrate at this downstream site. The $SQMCI_S$ score was significantly lower than at any other site, while the MCI score was significantly lower than any other site except WGG000654. The results at this site may have also been influenced by the removal of the silt controls upstream of this site.

Site WGG000649, located upstream of the confluence with the 'southern ephemeral' tributary recorded MCI and $SQMCI_S$ scores of 80, and 4.1 respectively, both of which are similar to those recorded in the preceding survey. Site WGG000651, downstream of the 'southern ephemeral' tributary confluence, recorded MCI and $SQMCI_S$ scores of 73 and 4.2 respectively, neither of which are significantly different to the preceding survey results of or to the results recorded at site WGG000649.

Site WGG000654, located downstream of the 'northern' tributary confluence, recorded a MCI score of 67 units and a $SQMCI_S$ score of 3.8 units were recorded. This MCI score was similar to those at WGG000648 and WGG000651, but significantly lower than WGG000647 and WGG000649.

In general, this survey recorded similar macroinvertebrate metrics between sites, with the exception of site WGG000648 which had the lowest result for all three metrics. There was a general decrease in macroinvertebrate community health in a downstream direction in both the 'northern' tributary and the 'southern' tributary. Site WGG000647, which recorded lower scores than the other sites in the preceding survey, showed signs of recovery in the current survey.

Summary

Overall, the results of this April 2018 survey were indicative of 'poor' to 'fair' biological health in the two unnamed tributaries of the Waingongoro River. This is consistent with previous surveys carried out in relation to Eltham Central landfill, which have recorded communities dominated by lower scoring 'moderately sensitive' and 'tolerant' taxa typical of small, seepage-fed, macrophyte dominated, soft-bottomed farmland streams. Invertebrate metrics varied between sites, with site WGG000648 in the 'northern' tributary recording the poorest results for all metrics. However, the MCI score at this site was not significantly lower than site WGG000654. In both tributaries, a decrease in macroinvertebrate community health was observed in a downstream direction. The results of this survey provided no evidence that any activities associated with the Eltham Central Landfill had impacted on the macroinvertebrate communities of these two unnamed tributaries of the Waingongoro River.

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TRC, 2017: Some statistics from the Taranaki Regional Council database (FWB) of freshwater macroinvertebrate surveys performed during the period from January 1980 to 30 September 2017.

Appendix IV

Groundwater monitoring locations shown in Figure 4 of the application documentation dated May 1998

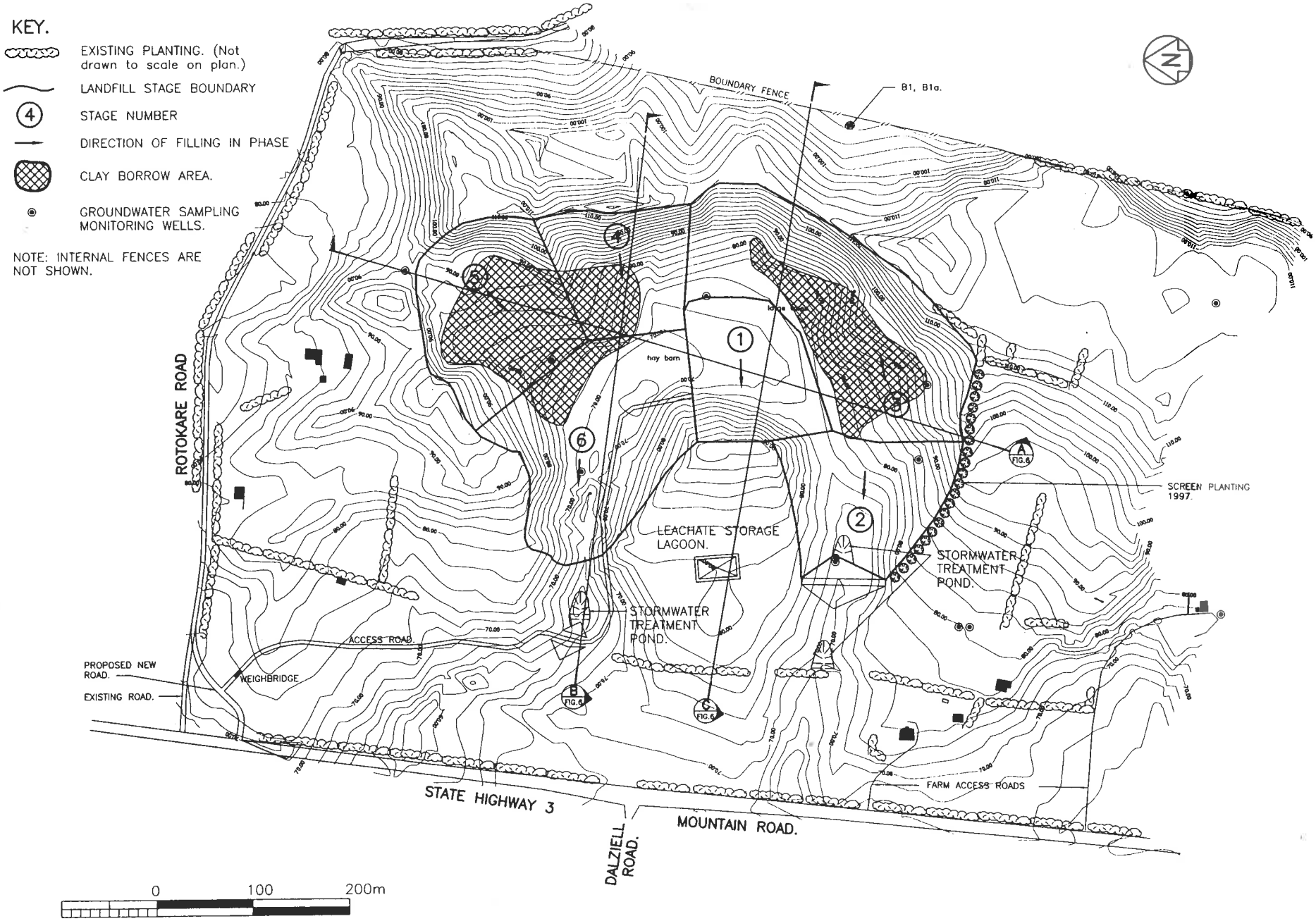
MONTGOMERY WATSON

LANDFILL DEVELOPMENT GENERAL LAYOUT.

FIG. 4

STDC CENTRAL LANDFILL

88553\CAD\DP553002.DWG



LANDFILL DEVELOPMENT GENERAL LAYOUT.

FIG. 4

N

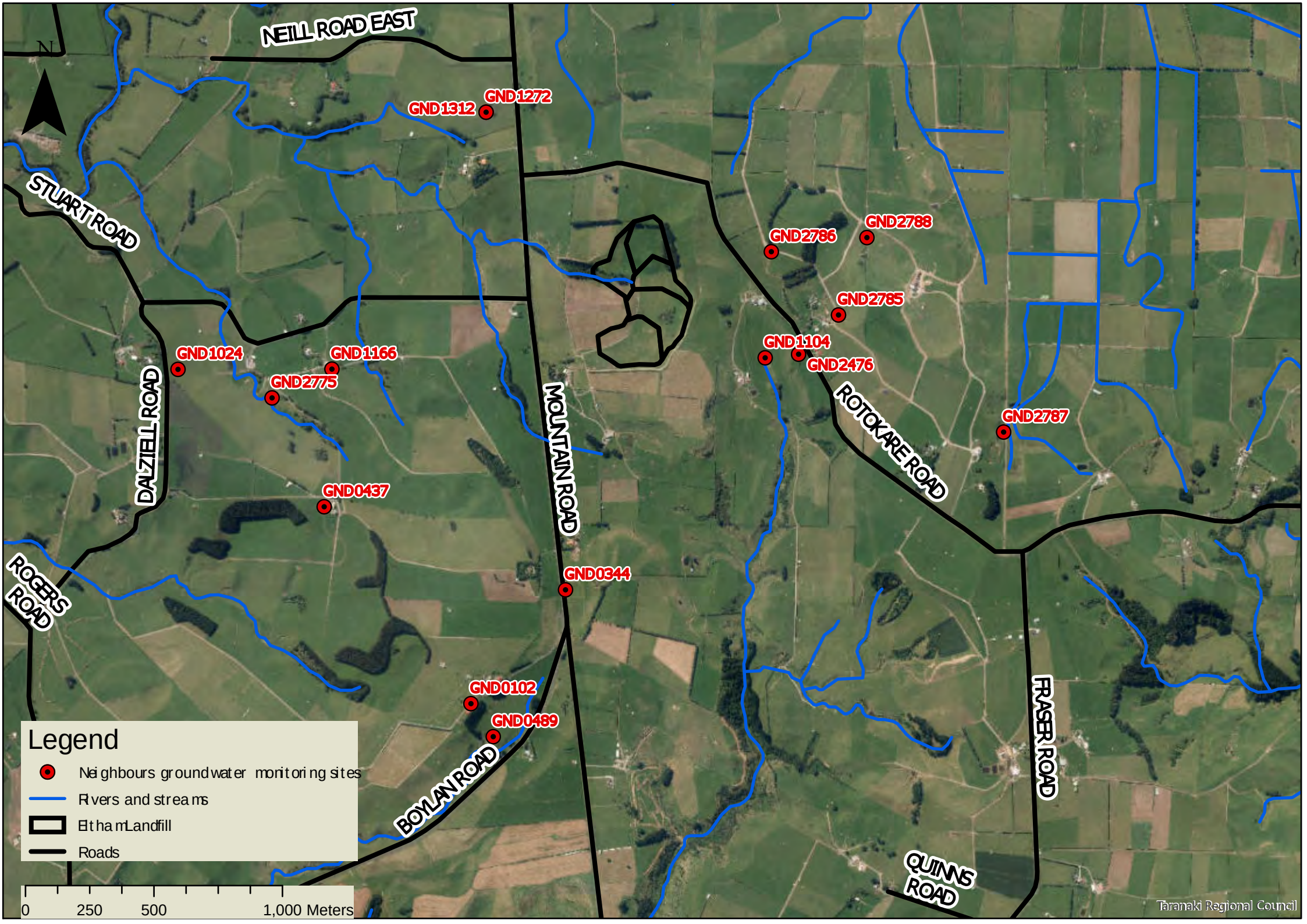
GND2699
GND2698
GND2697
GND2695
GND2696
GND2694
GND0568
GND1353
GND2702
GND2700
GND2701
GND0569
GND1351
GND2692
GND2693
GND2691
GND0600
GND0599
GND0826

DALZIELL ROAD
MOUNTAIN ROAD
ROTOKARE ROAD

Legend
Ground water monitoring sites
Rivers and streams
Eltham Landfill
Roads

0 100 200 400 Meters


N
WGG000654
WGG000648
WGG000653
WGG000647
MOUNTAIN ROAD
DALZIELL ROAD
WGG000651
WGG000650
WGG000649
use
Bio
Bio and chem
Chem
<all other values>
Rivers and streams
Eltham Landfill
Roads
0
87.5
175
350 Meters
Taranaki Regional Council


N
NEILL ROAD EAST
GND1312
GND1272
STUART ROAD
GND2786
GND2788
GND2785
GND1104
GND2476
GND1024
GND1166
GND2775
DALZIEL ROAD
MOUNTAIN ROAD
ROTOKARE ROAD
GND2787
GND0437
ROGERS ROAD
GND0344
GND0102
GND0489
BOYLAN ROAD
FRASER ROAD
QUINNS ROAD
Legend
Neighbours groundwater monitoring sites
Rivers and streams
Eltham Landfill
Roads
0
250
500
1,000 Meters
Taranaki Regional Council

Appendix V

Groundwater chemical monitoring results

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

ANALYSIS REPORT

Client:	Taranaki Regional Council	**Lab No:**	1868436 SPv1
Contact:	L Smith	**Date Received:**	31-Oct-2017
	C/- Taranaki Regional Council	**Date Reported:**	16-Nov-2017
	Private Bag 713	**Quote No:**	83292
	Stratford 4352	**Order No:**	
		Client Reference:	Eltham central landfill groundwaters
		Submitted By:	David Olson

Sample Type: Aqueous

Sample Name:		GND2698 30-Oct-2017 1:45 pm	GND2699 30-Oct-2017 2:45 pm			
Lab Number:		1868436.1	1868436.2			
Individual Tests						
Sum of Anions	meq/L	1.73	6.2	-	-	-
Sum of Cations	meq/L	1.69	5.2	-	-	-
pH	pH Units	6.9	7.4	-	-	-
Total Alkalinity	g/m³ as $CaCO_3$	47	146	-	-	-
Bicarbonate	g/m³ at 25°C	57	177	-	-	-
Total Hardness	g/m³ as $CaCO_3$	48	104	-	-	-
Electrical Conductivity (EC)	mS/m	18.0	66.8	-	-	-
Total Dissolved Solids (TDS)	g/m³	120	380	-	-	-
Dissolved Aluminium	g/m³	0.011	0.004	-	-	-
Dissolved Boron	g/m³	0.016	0.023	-	-	-
Dissolved Calcium	g/m³	12.3	22	-	-	-
Dissolved Iron	g/m³	< 0.02	< 0.02	-	-	-
Dissolved Magnesium	g/m³	4.2	11.9	-	-	-
Dissolved Manganese	g/m³	0.0150	0.0027	-	-	-
Dissolved Mercury	g/m³	< 0.00008	< 0.00008	-	-	-
Dissolved Potassium	g/m³	2.6	4.8	-	-	-
Dissolved Selenium	g/m³	< 0.0010	< 0.0010	-	-	-
Dissolved Sodium	g/m³	15.2	70	-	-	-
Chloride	g/m³	21	98	-	-	-
Fluoride	g/m³	< 0.05	0.13	-	-	-
Nitrite-N	g/m³	< 0.002	< 0.002	-	-	-
Nitrate-N	g/m³	0.95	2.1	-	-	-
Nitrate-N + Nitrite-N	g/m³	0.95	2.1	-	-	-
Total Kjeldahl Nitrogen (TKN)	g/m³	0.19	0.24	-	-	-
Dissolved Reactive Phosphorus	g/m³	0.025	0.038	-	-	-
Phosphate	g/m³	0.077	0.117	-	-	-
Total Phosphorus	g/m³	0.28	0.125	-	-	-
Reactive Silica	g/m³ as SiO_2	47	34	-	-	-
Sulphate	g/m³	6.1	18.3	-	-	-
Total Organic Carbon (TOC)	g/m³	1.7	< 0.5	-	-	-
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Acetochlor	g/m³	< 0.00004	< 0.00004	-	-	-
Alachlor	g/m³	< 0.00004	< 0.00004	-	-	-
Atrazine	g/m³	< 0.00004	< 0.00004	-	-	-
Atrazine-desethyl	g/m³	< 0.00004	< 0.00004	-	-	-
Atrazine-desisopropyl	g/m³	< 0.00008	< 0.00008	-	-	-
Azaconazole	g/m³	< 0.00002	< 0.00002	-	-	-

Sample Type: Aqueous						
Sample Name:		GND2698 30-Oct-2017 1:45 pm	GND2699 30-Oct-2017 2:45 pm			
Lab Number:		1868436.1	1868436.2			
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Azinphos-methyl	g/m³	< 0.00008	< 0.00008	-	-	-
Benalaxyl	g/m³	< 0.00002	< 0.00002	-	-	-
Bitertanol	g/m³	< 0.00008	< 0.00008	-	-	-
Bromacil	g/m³	< 0.00004	< 0.00004	-	-	-
Bromopropylate	g/m³	< 0.00004	< 0.00004	-	-	-
Butachlor	g/m³	< 0.00004	< 0.00004	-	-	-
Captan	g/m³	< 0.00008	< 0.00008	-	-	-
Carbaryl	g/m³	< 0.00004	< 0.00004	-	-	-
Carbofenothion	g/m³	< 0.00004	< 0.00004	-	-	-
Carbofuran	g/m³	< 0.00004	< 0.00004	-	-	-
Chlorfluazuron	g/m³	< 0.00004	< 0.00004	-	-	-
Chlorothalonil	g/m³	< 0.00004	< 0.00004	-	-	-
Chlorpyrifos	g/m³	< 0.00004	< 0.00004	-	-	-
Chlorpyrifos-methyl	g/m³	< 0.00004	< 0.00004	-	-	-
Chlortoluron	g/m³	< 0.00008	< 0.00008	-	-	-
Cyanazine	g/m³	< 0.00004	< 0.00004	-	-	-
Cyfluthrin	g/m³	< 0.00004	< 0.00004	-	-	-
Cyhalothrin	g/m³	< 0.00004	< 0.00004	-	-	-
Cypermethrin	g/m³	< 0.00008	< 0.00008	-	-	-
Deltamethrin (including Tralomethrin)	g/m³	< 0.00006	< 0.00006	-	-	-
Diazinon	g/m³	< 0.00002	< 0.00002	-	-	-
Dichlofluanid	g/m³	< 0.00004	< 0.00004	-	-	-
Dichloran	g/m³	< 0.0002	< 0.0002	-	-	-
Dichlorvos	g/m³	< 0.00008	< 0.00008	-	-	-
Difenoconazole	g/m³	< 0.00008	< 0.00008	-	-	-
Dimethoate	g/m³	< 0.00008	< 0.00008	-	-	-
Diphenylamine	g/m³	< 0.00008	< 0.00008	-	-	-
Diuron	g/m³	< 0.00004	< 0.00004	-	-	-
Fenpropimorph	g/m³	< 0.00004	< 0.00004	-	-	-
Fluazifop-butyl	g/m³	< 0.00004	< 0.00004	-	-	-
Fluometuron	g/m³	< 0.00004	< 0.00004	-	-	-
Flusilazole	g/m³	< 0.00004	< 0.00004	-	-	-
Fluvalinate	g/m³	< 0.00004	< 0.00004	-	-	-
Furalaxyl	g/m³	< 0.00002	< 0.00002	-	-	-
Haloxyfop-methyl	g/m³	< 0.00004	< 0.00004	-	-	-
Hexaconazole	g/m³	< 0.00004	< 0.00004	-	-	-
Hexazinone	g/m³	< 0.00002	< 0.00002	-	-	-
IPBC (3-Iodo-2-propynyl-n-butylcarbamate)	g/m³	< 0.0002	< 0.0002	-	-	-
Kresoxim-methyl	g/m³	< 0.00002	< 0.00002	-	-	-
Linuron	g/m³	< 0.00005	< 0.00005	-	-	-
Malathion	g/m³	< 0.00004	< 0.00004	-	-	-
Metalaxyl	g/m³	< 0.00004	< 0.00004	-	-	-
Metolachlor	g/m³	< 0.00004	< 0.00004	-	-	-
Metribuzin	g/m³	< 0.00004	< 0.00004	-	-	-
Molinate	g/m³	< 0.00008	< 0.00008	-	-	-
Myclobutanil	g/m³	< 0.00004	< 0.00004	-	-	-
Naled	g/m³	< 0.0002	< 0.0002	-	-	-
Norflurazon	g/m³	< 0.00008	< 0.00008	-	-	-
Oxadiazon	g/m³	< 0.00004	< 0.00004	-	-	-
Oxyfluorfen	g/m³	< 0.00002	< 0.00002	-	-	-
Paclobutrazol	g/m³	< 0.00004	< 0.00004	-	-	-
Parathion-ethyl	g/m³	< 0.00004	< 0.00004	-	-	-
Parathion-methyl	g/m³	< 0.00004	< 0.00004	-	-	-
Pendimethalin	g/m³	< 0.00004	< 0.00004	-	-	-

Sample Type: Aqueous						
Sample Name:		GND2698 30-Oct-2017 1:45 pm	GND2699 30-Oct-2017 2:45 pm			
Lab Number:		1868436.1	1868436.2			
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Permethrin	g/m³	< 0.00002	< 0.00002	-	-	-
Pirimicarb	g/m³	< 0.00004	< 0.00004	-	-	-
Pirimiphos-methyl	g/m³	< 0.00004	< 0.00004	-	-	-
Prochloraz	g/m³	< 0.0002	< 0.0002	-	-	-
Procymidone	g/m³	< 0.00004	< 0.00004	-	-	-
Prometryn	g/m³	< 0.00002	< 0.00002	-	-	-
Propachlor	g/m³	< 0.00004	< 0.00004	-	-	-
Propanil	g/m³	< 0.0002	< 0.0002	-	-	-
Propazine	g/m³	< 0.00002	< 0.00002	-	-	-
Propiconazole	g/m³	< 0.00004	< 0.00004	-	-	-
Pyriproxyfen	g/m³	< 0.00004	< 0.00004	-	-	-
Quizalofop-ethyl	g/m³	< 0.00004	< 0.00004	-	-	-
Simazine	g/m³	< 0.00004	< 0.00004	-	-	-
Simetryn	g/m³	< 0.00004	< 0.00004	-	-	-
Sulfentrazone	g/m³	< 0.0002	< 0.0002	-	-	-
TCMTB [2-(thiocyanomethylthio) benzothiazole,Busan]	g/m³	< 0.00008	< 0.00008	-	-	-
Tebuconazole	g/m³	< 0.00004	< 0.00004	-	-	-
Terbacil	g/m³	< 0.00004	< 0.00004	-	-	-
Terbufos	g/m³	< 0.00004	< 0.00004	-	-	-
Terbumeton	g/m³	< 0.00004	< 0.00004	-	-	-
Terbuthylazine	g/m³	0.00002	0.00003	-	-	-
Terbuthylazine-desethyl	g/m³	< 0.00004	< 0.00004	-	-	-
Terbutryn	g/m³	< 0.00004	< 0.00004	-	-	-
Thiabendazole	g/m³	< 0.0002	< 0.0002	-	-	-
Thiobencarb	g/m³	< 0.00004	< 0.00004	-	-	-
Tolylfluanid	g/m³	< 0.00002	< 0.00002	-	-	-
Triazophos	g/m³	< 0.00004	< 0.00004	-	-	-
Trifluralin	g/m³	< 0.00004	< 0.00004	-	-	-
Vinclozolin	g/m³	< 0.00004	< 0.00004	-	-	-
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m³	< 0.0010	< 0.0010	-	-	-
Dissolved Cadmium	g/m³	0.00005	< 0.00005	-	-	-
Dissolved Chromium	g/m³	0.0015	0.0010	-	-	-
Dissolved Copper	g/m³	< 0.0005	0.0016	-	-	-
Dissolved Lead	g/m³	< 0.00010	< 0.00010	-	-	-
Dissolved Nickel	g/m³	0.0008	< 0.0005	-	-	-
Dissolved Zinc	g/m³	0.0015	0.0038	-	-	-
Gases in groundwater						
Ethane	g/m³	< 0.003	< 0.003	-	-	-
Ethylene	g/m³	< 0.004	< 0.004	-	-	-
Methane	g/m³	< 0.002	< 0.002	-	-	-
Haloethers Trace in SVOC Water Samples by GC-MS						
Bis(2-chloroethoxy) methane	g/m³	< 0.0005	< 0.0005	-	-	-
Bis(2-chloroethyl)ether	g/m³	< 0.0005	< 0.0005	-	-	-
Bis(2-chloroisopropyl)ether	g/m³	< 0.0005	< 0.0005	-	-	-
4-Bromophenyl phenyl ether	g/m³	< 0.0003	< 0.0003	-	-	-
4-Chlorophenyl phenyl ether	g/m³	< 0.0005	< 0.0005	-	-	-
Nitrogen containing compounds Trace in SVOC Water Samples, GC-MS						
2,4-Dinitrotoluene	g/m³	< 0.0010	< 0.0010	-	-	-
2,6-Dinitrotoluene	g/m³	< 0.0010	< 0.0010	-	-	-
Nitrobenzene	g/m³	< 0.0005	< 0.0005	-	-	-
N-Nitrosodi-n-propylamine	g/m³	< 0.0010	< 0.0010	-	-	-
N-Nitrosodiphenylamine + Diphenylamine	g/m3	< 0.0010	< 0.0010	-	-	-

Sample Type: Aqueous						
Sample Name:		GND2698 30-Oct-2017 1:45 pm	GND2699 30-Oct-2017 2:45 pm			
Lab Number:		1868436.1	1868436.2			
Organochlorine Pesticides Trace in SVOC Water Samples by GC-MS						
Aldrin	g/m³	< 0.0005	< 0.0005	-	-	-
alpha-BHC	g/m³	< 0.0005	< 0.0005	-	-	-
beta-BHC	g/m³	< 0.0005	< 0.0005	-	-	-
delta-BHC	g/m³	< 0.0005	< 0.0005	-	-	-
gamma-BHC (Lindane)	g/m³	< 0.0005	< 0.0005	-	-	-
4,4'-DDD	g/m³	< 0.0005	< 0.0005	-	-	-
4,4'-DDE	g/m³	< 0.0005	< 0.0005	-	-	-
4,4'-DDT	g/m³	< 0.0010	< 0.0010	-	-	-
Dieldrin	g/m³	< 0.0005	< 0.0005	-	-	-
Endosulfan I	g/m³	< 0.0010	< 0.0010	-	-	-
Endosulfan II	g/m³	< 0.0010	< 0.0010	-	-	-
Endosulfan sulfate	g/m³	< 0.0010	< 0.0010	-	-	-
Endrin	g/m³	< 0.0005	< 0.0005	-	-	-
Endrin ketone	g/m³	< 0.0010	< 0.0010	-	-	-
Heptachlor	g/m³	< 0.0005	< 0.0005	-	-	-
Heptachlor epoxide	g/m³	< 0.0005	< 0.0005	-	-	-
Hexachlorobenzene	g/m³	< 0.0005	< 0.0005	-	-	-
Polycyclic Aromatic Hydrocarbons Trace in SVOC Water Samples						
Acenaphthene	g/m³	< 0.0003	< 0.0003	-	-	-
Acenaphthylene	g/m³	< 0.0003	< 0.0003	-	-	-
Anthracene	g/m³	< 0.0003	< 0.0003	-	-	-
Benzo[a]anthracene	g/m³	< 0.0003	< 0.0003	-	-	-
Benzo[a]pyrene (BAP)	g/m³	< 0.0003	< 0.0003	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m³	< 0.0003	< 0.0003	-	-	-
Benzo[g,h,i]perylene	g/m³	< 0.0003	< 0.0003	-	-	-
Benzo[k]fluoranthene	g/m³	< 0.0003	< 0.0003	-	-	-
1&2-Chloronaphthalene	g/m³	< 0.0003	< 0.0003	-	-	-
Chrysene	g/m³	< 0.0003	< 0.0003	-	-	-
Dibenzo[a,h]anthracene	g/m³	< 0.0003	< 0.0003	-	-	-
Fluoranthene	g/m³	< 0.0003	< 0.0003	-	-	-
Fluorene	g/m³	< 0.0003	< 0.0003	-	-	-
Indeno(1,2,3-c,d)pyrene	g/m³	< 0.0003	< 0.0003	-	-	-
2-Methylnaphthalene	g/m³	< 0.0003	< 0.0003	-	-	-
Naphthalene	g/m³	< 0.0003	< 0.0003	-	-	-
Phenanthrene	g/m³	< 0.0003	< 0.0003	-	-	-
Pyrene	g/m³	< 0.0003	< 0.0003	-	-	-
Phenols Trace (drinkingwater) in SVOC Water Samples by GC-MS						
2-Chlorophenol	g/m³	< 0.0005	< 0.0005	-	-	-
2,4-Dichlorophenol	g/m³	< 0.0005	< 0.0005	-	-	-
2,4,6-Trichlorophenol	g/m³	< 0.0010	< 0.0010	-	-	-
Phenols Trace (non-drinkingwater) in SVOC Water Samples by GC-MS						
4-Chloro-3-methylphenol	g/m³	< 0.0010	< 0.0010	-	-	-
2,4-Dimethylphenol	g/m³	< 0.0005	< 0.0005	-	-	-
3 & 4-Methylphenol (m- + p-cresol)	g/m³	< 0.0010	< 0.0010	-	-	-
2-Methylphenol (o-Cresol)	g/m³	< 0.0005	< 0.0005	-	-	-
2-Nitrophenol	g/m³	< 0.0010	< 0.0010	-	-	-
Pentachlorophenol (PCP)	g/m³	< 0.010	< 0.010	-	-	-
Phenol	g/m³	< 0.0010	< 0.0010	-	-	-
2,4,5-Trichlorophenol	g/m³	< 0.0010	< 0.0010	-	-	-
Plasticisers Trace (non-drinkingwater) in SVOC Water by GCMS						
Butylbenzylphthalate	g/m³	< 0.0010	< 0.0010	-	-	-
Diethylphthalate	g/m³	< 0.0010	< 0.0010	-	-	-
Dimethylphthalate	g/m³	< 0.0010	< 0.0010	-	-	-

Sample Type: Aqueous						
Sample Name:		GND2698 30-Oct-2017 1:45 pm	GND2699 30-Oct-2017 2:45 pm			
Lab Number:		1868436.1	1868436.2			
Plasticisers Trace (non-drinkingwater) in SVOC Water by GCMS						
Di-n-butylphthalate	g/m³	< 0.002	< 0.002	-	-	-
Di-n-octylphthalate	g/m³	< 0.0010	< 0.0010	-	-	-
Plasticisers Trace (drinkingwater) in SVOC Water Samples by GCMS						
Bis(2-ethylhexyl)phthalate	g/m³	< 0.003	< 0.003	-	-	-
Di(2-ethylhexyl)adipate	g/m³	< 0.0010	< 0.0010	-	-	-
Other Halogenated compounds Trace (drinkingwater) in SVOC Water						
1,2-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	-	-	-
1,3-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	-	-	-
1,4-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	-	-	-
Other Halogenated compounds Trace (non-drinkingwater) in SVOC						
Hexachlorobutadiene	g/m³	< 0.0005	< 0.0005	-	-	-
Hexachloroethane	g/m³	< 0.0005	< 0.0005	-	-	-
1,2,4-Trichlorobenzene	g/m³	< 0.0005	< 0.0005	-	-	-
Other SVOC Trace in SVOC Water Samples by GC-MS						
Benzyl alcohol	g/m³	< 0.005	< 0.005	-	-	-
Carbazole	g/m³	< 0.0005	< 0.0005	-	-	-
Dibenzofuran	g/m³	< 0.0005	< 0.0005	-	-	-
Isophorone	g/m³	< 0.0005	< 0.0005	-	-	-
BTEX in VOC Water by Headspace GC-MS						
Benzene	g/m³	< 0.0003	< 0.0003	-	-	-
Ethylbenzene	g/m³	< 0.0005	< 0.0005	-	-	-
Toluene	g/m³	0.0008	< 0.0003	-	-	-
m&p-Xylene	g/m³	< 0.0005	< 0.0005	-	-	-
o-Xylene	g/m³	< 0.0003	< 0.0003	-	-	-
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
Bromomethane (Methyl Bromide)	g/m³	< 0.0003	< 0.0003	-	-	-
Carbon tetrachloride	g/m³	< 0.0003	< 0.0003	-	-	-
Chloroethane	g/m³	< 0.0003	< 0.0003	-	-	-
Chloromethane	g/m³	< 0.0003	< 0.0003	-	-	-
1,2-Dibromo-3-chloropropane	g/m³	< 0.0003	< 0.0003	-	-	-
1,2-Dibromoethane (ethylene dibromide, EDB)	g/m³	< 0.0003	< 0.0003	-	-	-
Dibromomethane	g/m³	< 0.0003	< 0.0003	-	-	-
Dichlorodifluoromethane	g/m³	< 0.0003	< 0.0003	-	-	-
1,1-Dichloroethane	g/m³	< 0.0003	< 0.0003	-	-	-
1,2-Dichloroethane	g/m³	< 0.0003	< 0.0003	-	-	-
1,1-Dichloroethene	g/m³	< 0.0003	< 0.0003	-	-	-
cis-1,2-Dichloroethene	g/m³	< 0.0003	< 0.0003	-	-	-
trans-1,2-Dichloroethene	g/m³	< 0.0003	< 0.0003	-	-	-
Dichloromethane (methylene chloride)	g/m³	< 0.010	< 0.010	-	-	-
1,2-Dichloropropane	g/m³	< 0.0003	< 0.0003	-	-	-
1,3-Dichloropropane	g/m³	< 0.0003	< 0.0003	-	-	-
1,1-Dichloropropene	g/m³	< 0.0003	< 0.0003	-	-	-
cis-1,3-Dichloropropene	g/m³	< 0.0005	< 0.0005	-	-	-
trans-1,3-Dichloropropene	g/m³	< 0.0005	< 0.0005	-	-	-
Hexachlorobutadiene	g/m³	< 0.0003	< 0.0003	-	-	-
1,1,1,2-Tetrachloroethane	g/m³	< 0.0003	< 0.0003	-	-	-
1,1,2,2-Tetrachloroethane	g/m³	< 0.0003	< 0.0003	-	-	-
Tetrachloroethene (tetrachloroethylene)	g/m³	< 0.0003	< 0.0003	-	-	-
1,1,1-Trichloroethane	g/m³	< 0.0003	< 0.0003	-	-	-
1,1,2-Trichloroethane	g/m³	< 0.0003	< 0.0003	-	-	-
Trichloroethene (trichloroethylene)	g/m³	< 0.0003	< 0.0003	-	-	-
Trichlorofluoromethane	g/m³	< 0.0003	< 0.0003	-	-	-
1,2,3-Trichloropropane	g/m³	< 0.0003	< 0.0003	-	-	-

Sample Type: Aqueous						
Sample Name:		GND2698 30-Oct-2017 1:45 pm	GND2699 30-Oct-2017 2:45 pm			
Lab Number:		1868436.1	1868436.2			
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
1,1,2-Trichlorotrifluoroethane (Freon 113)	g/m³	< 0.0003	< 0.0003	-	-	-
Vinyl chloride	g/m³	< 0.0003	< 0.0003	-	-	-
Halogenated Aromatics in VOC Water by Headspace GC-MS						
Chlorobenzene (monochlorobenzene)	g/m³	< 0.0003	< 0.0003	-	-	-
1,2-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	-	-	-
1,3-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	-	-	-
1,4-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	-	-	-
1,2,3-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	-	-	-
1,2,4-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	-	-	-
1,3,5-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	-	-	-
Bromobenzene	g/m³	< 0.0003	< 0.0003	-	-	-
2-Chlorotoluene	g/m³	< 0.0003	< 0.0003	-	-	-
4-Chlorotoluene	g/m³	< 0.0003	< 0.0003	-	-	-
Monoaromatic Hydrocarbons in VOC Water by Headspace GC-MS						
n-Butylbenzene	g/m³	< 0.0005	< 0.0005	-	-	-
tert-Butylbenzene	g/m³	< 0.0003	< 0.0003	-	-	-
4-Isopropyltoluene (p-Cymene)	g/m³	< 0.0005	< 0.0005	-	-	-
Isopropylbenzene (Cumene)	g/m³	< 0.0003	< 0.0003	-	-	-
n-Propylbenzene	g/m³	< 0.0005	< 0.0005	-	-	-
sec-Butylbenzene	g/m³	< 0.0003	< 0.0003	-	-	-
Styrene	g/m³	< 0.0005	< 0.0005	-	-	-
1,2,4-Trimethylbenzene	g/m³	< 0.0003	< 0.0003	-	-	-
1,3,5-Trimethylbenzene	g/m³	< 0.0003	< 0.0003	-	-	-
Ketones in VOC Water by Headspace GC-MS						
Acetone	g/m³	< 0.05	< 0.05	-	-	-
2-Butanone (MEK)	g/m³	< 0.05	< 0.05	-	-	-
Methyl tert-butylether (MTBE)	g/m³	< 0.0003	< 0.0003	-	-	-
4-Methylpentan-2-one (MIBK)	g/m³	< 0.010	< 0.010	-	-	-
Trihalomethanes in VOC Water by Headspace GC-MS						
Bromodichloromethane	g/m³	< 0.0003	< 0.0003	-	-	-
Bromoform (tribromomethane)	g/m³	< 0.0003	< 0.0003	-	-	-
Chloroform (Trichloromethane)	g/m³	< 0.0003	< 0.0003	-	-	-
Dibromochloromethane	g/m³	< 0.0003	< 0.0003	-	-	-
Other VOC in Water by Headspace GC-MS						
Carbon disulphide	g/m³	< 0.0010	< 0.0010	-	-	-
Naphthalene	g/m³	< 0.0005	< 0.0005	-	-	-

Analyst's Comments

The detection limit for Carbon disulfide and Dichloromethane was raised due to an elevated residual level found during the analysis.

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**
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS	Liquid/liquid extraction, GPC (if required), GCMS analysis	-	1-2
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	1-2
Gases in groundwater	Manual headspace creation and sub-sampling, GC-FID analysis.	0.002 - 0.003 g/m³	1-2
Semivolatile Organic Compounds Trace in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	-	1-2

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Volatile Organic Compounds Trace in Water by Headspace GC-MS	Headspace, GC-MS SIM analysis [KBIs:37857,37921]	0.00010 - 0.05 g/m^3	1-2
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-2
Total Kjeldahl Digestion	Sulphuric acid digestion with copper sulphate catalyst.	-	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
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.	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 Dissolved Solids (TDS)	Filtration through GF/C (1.2 µm), gravimetric. APHA 2540 C (modified; drying temperature of 103 - 105°C used rather than 180 ± 2°C) 22nd ed. 2012.	10 g/m^3	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
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.003 g/m^3	1-2
Dissolved Boron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.005 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
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 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
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0005 g/m^3	1-2
Dissolved Mercury	0.45µm filtration, bromine oxidation followed by atomic fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 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
Dissolved Selenium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0010 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
Chloride	Filtered sample. Ferric thiocyanate colorimetry. Discrete Analyser. APHA 4500 Cl^- E (modified from continuous flow analysis) 22nd ed. 2012.	0.5 g/m^3	1-2
Fluoride	Direct measurement, ion selective electrode. APHA 4500-F^- C 22nd ed. 2012.	0.05 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 Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-N_{org} D. (modified) 4500 NH_3 F (modified) 22nd ed. 2012.	0.10 g/m^3	1-2
Dissolved Reactive Phosphorus	Filtered sample. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified). 22nd ed. 2012.	0.004 g/m^3	1-2
Phosphate from DRP	Calculation: from Dissolved Reactive Phosphorus * 3.065.	0.004 g/m^3	1-2

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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
Reactive Silica	Filtered sample. Heteropoly blue colorimetry. Discrete analyser. APHA 4500-SiO_2 F (modified from flow injection analysis) 22nd ed. 2012.	0.10 g/m^3 as SiO_2	1-2
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B 22nd ed. 2012.	0.5 g/m^3	1-2
Total Organic Carbon (TOC)	Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) 22nd ed. 2012.	0.5 g/m^3	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

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ANALYSIS REPORT

Client:	Taranaki Regional Council	**Lab No:**	1870734 SPv1
Contact:	David Olson	**Date Received:**	02-Nov-2017
	C/- Taranaki Regional Council	**Date Reported:**	16-Nov-2017
	Private Bag 713	**Quote No:**	83292
	Stratford 4352	**Order No:**	
		Client Reference:	Eltham central landfill groundwaters
		Submitted By:	David Olson

Sample Type: Aqueous

Sample Name:		GND0569 01-Nov-2017 11:30 am	GND2701 01-Nov-2017 2:35 pm	GND2702 01-Nov-2017 2:20 pm		
Lab Number:		1870734.1	1870734.2	1870734.3		
Individual Tests						
Sum of Anions	meq/L	1.90	4.2	3.5	-	-
Sum of Cations	meq/L	1.71	3.9	3.3	-	-
pH	pH Units	6.6	7.9	7.3	-	-
Total Alkalinity	g/m³ as $CaCO_3$	36	126	77	-	-
Bicarbonate	g/m³ at 25°C	44	152	94	-	-
Total Hardness	g/m³ as $CaCO_3$	45	59	97	-	-
Electrical Conductivity (EC)	mS/m	20.5	41.5	35.9	-	-
Total Dissolved Solids (TDS)	g/m³	157	300	260	-	-
Dissolved Aluminium	g/m³	0.042	0.038	0.005	-	-
Dissolved Boron	g/m³	0.013	0.021	0.016	-	-
Dissolved Calcium	g/m³	11.5	13.9	25	-	-
Dissolved Iron	g/m³	< 0.02	< 0.02	< 0.02	-	-
Dissolved Magnesium	g/m³	4.0	5.9	8.3	-	-
Dissolved Manganese	g/m³	0.0054	0.0010	0.0015	-	-
Dissolved Mercury	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Dissolved Potassium	g/m³	3.1	4.6	3.0	-	-
Dissolved Selenium	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Dissolved Sodium	g/m³	16.7	60	29	-	-
Chloride	g/m³	30	39	43	-	-
Fluoride	g/m³	< 0.05	0.18	0.08	-	-
Nitrite-N	g/m³	< 0.002	< 0.002	0.033	-	-
Nitrate-N	g/m³	3.3	5.6	8.7	-	-
Nitrate-N + Nitrite-N	g/m³	3.3	5.6	8.8	-	-
Total Kjeldahl Nitrogen (TKN)	g/m³	< 0.10	0.20	< 0.10	-	-
Dissolved Reactive Phosphorus	g/m³	0.024	0.191	0.045	-	-
Phosphate	g/m³	0.075	0.59	0.139	-	-
Total Phosphorus	g/m³	0.055	0.52	0.108	-	-
Reactive Silica	g/m³ as SiO_2	49	44	53	-	-
Sulphate	g/m³	3.8	8.3	3.6	-	-
Total Organic Carbon (TOC)	g/m³	1.0	< 0.5	< 0.5	-	-
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Acetochlor	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Alachlor	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Atrazine	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Atrazine-desethyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Atrazine-desisopropyl	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Azaconazole	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-

Sample Type: Aqueous						
Sample Name:		GND0569 01-Nov-2017 11:30 am	GND2701 01-Nov-2017 2:35 pm	GND2702 01-Nov-2017 2:20 pm		
Lab Number:		1870734.1	1870734.2	1870734.3		
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Azinphos-methyl	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Benalaxyl	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Bitertanol	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Bromacil	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Bromopropylate	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Butachlor	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Captan	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Carbaryl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Carbofenothion	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Carbofuran	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Chlorfluazuron	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Chlorothalonil	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Chlorpyrifos	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Chlorpyrifos-methyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Chlortoluron	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Cyanazine	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Cyfluthrin	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Cyhalothrin	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Cypermethrin	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Deltamethrin (including Tralomethrin)	g/m³	< 0.00006	< 0.00006	< 0.00006	-	-
Diazinon	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Dichlofluanid	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Dichloran	g/m³	< 0.0002	< 0.0002	< 0.0002	-	-
Dichlorvos	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Difenoconazole	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Dimethoate	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Diphenylamine	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Diuron	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Fenpropimorph	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Fluazifop-butyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Fluometuron	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Flusilazole	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Fluvalinate	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Furalaxyl	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Haloxyfop-methyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Hexaconazole	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Hexazinone	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
IPBC (3-Iodo-2-propynyl-n-butylcarbamate)	g/m³	< 0.0002	< 0.0002	< 0.0002	-	-
Kresoxim-methyl	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Linuron	g/m³	< 0.00005	< 0.00005	< 0.00005	-	-
Malathion	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Metalaxyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Metolachlor	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Metribuzin	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Molinate	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Myclobutanil	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Naled	g/m³	< 0.0002	< 0.0002	< 0.0002	-	-
Norflurazon	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Oxadiazon	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Oxyfluorfen	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Paclobutrazol	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Parathion-ethyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Parathion-methyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Pendimethalin	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-

Sample Type: Aqueous						
Sample Name:		GND0569 01-Nov-2017 11:30 am	GND2701 01-Nov-2017 2:35 pm	GND2702 01-Nov-2017 2:20 pm		
Lab Number:		1870734.1	1870734.2	1870734.3		
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Permethrin	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Pirimicarb	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Pirimiphos-methyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Prochloraz	g/m³	< 0.0002	< 0.0002	< 0.0002	-	-
Procymidone	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Prometryn	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Propachlor	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Propanil	g/m³	< 0.0002	< 0.0002	< 0.0002	-	-
Propazine	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Propiconazole	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Pyriproxyfen	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Quizalofop-ethyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Simazine	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Simetryn	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Sulfentrazone	g/m³	< 0.0002	< 0.0002	< 0.0002	-	-
TCMTB [2-(thiocyanomethylthio) benzothiazole,Busan]	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Tebuconazole	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Terbacil	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Terbufos	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Terbumeton	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Terbuthylazine	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Terbuthylazine-desethyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Terbutryn	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Thiabendazole	g/m³	< 0.0002	< 0.0002	< 0.0002	-	-
Thiobencarb	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Tolylfluanid	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Triazophos	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Trifluralin	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Vinclozolin	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m³	< 0.0010	0.0014	< 0.0010	-	-
Dissolved Cadmium	g/m³	0.00010	< 0.00005	< 0.00005	-	-
Dissolved Chromium	g/m³	0.0024	0.0010	0.0017	-	-
Dissolved Copper	g/m³	0.0011	0.0022	< 0.0005	-	-
Dissolved Lead	g/m³	0.00016	< 0.00010	< 0.00010	-	-
Dissolved Nickel	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Dissolved Zinc	g/m³	0.0107	< 0.0010	0.0024	-	-
Gases in groundwater						
Ethane	g/m³	< 0.003	< 0.003	< 0.003	-	-
Ethylene	g/m³	< 0.004	< 0.004	< 0.004	-	-
Methane	g/m³	< 0.002	< 0.002	< 0.002	-	-
Haloethers Trace in SVOC Water Samples by GC-MS						
Bis(2-chloroethoxy) methane	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Bis(2-chloroethyl)ether	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Bis(2-chloroisopropyl)ether	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
4-Bromophenyl phenyl ether	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
4-Chlorophenyl phenyl ether	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Nitrogen containing compounds Trace in SVOC Water Samples, GC-MS						
2,4-Dinitrotoluene	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
2,6-Dinitrotoluene	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Nitrobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
N-Nitrosodi-n-propylamine	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
N-Nitrosodiphenylamine + Diphenylamine	g/m3	< 0.0010	< 0.0010	< 0.0010	-	-

Sample Type: Aqueous						
Sample Name:		GND0569 01-Nov-2017 11:30 am	GND2701 01-Nov-2017 2:35 pm	GND2702 01-Nov-2017 2:20 pm		
Lab Number:		1870734.1	1870734.2	1870734.3		
Organochlorine Pesticides Trace in SVOC Water Samples by GC-MS						
Aldrin	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
alpha-BHC	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
beta-BHC	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
delta-BHC	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
gamma-BHC (Lindane)	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
4,4'-DDD	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
4,4'-DDE	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
4,4'-DDT	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Dieldrin	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Endosulfan I	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Endosulfan II	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Endosulfan sulfate	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Endrin	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Endrin ketone	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Heptachlor	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Heptachlor epoxide	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Hexachlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Polycyclic Aromatic Hydrocarbons Trace in SVOC Water Samples						
Acenaphthene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Acenaphthylene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Anthracene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Benzo[a]anthracene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Benzo[a]pyrene (BAP)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Benzo[g,h,i]perylene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Benzo[k]fluoranthene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1&2-Chloronaphthalene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Chrysene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Dibenzo[a,h]anthracene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Fluoranthene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Fluorene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Indeno(1,2,3-c,d)pyrene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
2-Methylnaphthalene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Naphthalene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Phenanthrene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Pyrene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Phenols Trace (drinkingwater) in SVOC Water Samples by GC-MS						
2-Chlorophenol	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
2,4-Dichlorophenol	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
2,4,6-Trichlorophenol	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Phenols Trace (non-drinkingwater) in SVOC Water Samples by GC-MS						
4-Chloro-3-methylphenol	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
2,4-Dimethylphenol	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
3 & 4-Methylphenol (m- + p-cresol)	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
2-Methylphenol (o-Cresol)	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
2-Nitrophenol	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Pentachlorophenol (PCP)	g/m³	< 0.010	< 0.010	< 0.010	-	-
Phenol	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
2,4,5-Trichlorophenol	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Plasticisers Trace (non-drinkingwater) in SVOC Water by GCMS						
Butylbenzylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Diethylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Dimethylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-

Sample Type: Aqueous						
Sample Name:		GND0569 01-Nov-2017 11:30 am	GND2701 01-Nov-2017 2:35 pm	GND2702 01-Nov-2017 2:20 pm		
Lab Number:		1870734.1	1870734.2	1870734.3		
Plasticisers Trace (non-drinkingwater) in SVOC Water by GCMS						
Di-n-butylphthalate	g/m³	< 0.003	< 0.0010	< 0.0010	-	-
Di-n-octylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Plasticisers Trace (drinkingwater) in SVOC Water Samples by GCMS						
Bis(2-ethylhexyl)phthalate	g/m³	< 0.003	< 0.003	< 0.003	-	-
Di(2-ethylhexyl)adipate	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Other Halogenated compounds Trace (drinkingwater) in SVOC Water						
1,2-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
1,3-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
1,4-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Other Halogenated compounds Trace (non-drinkingwater) in SVOC						
Hexachlorobutadiene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Hexachloroethane	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
1,2,4-Trichlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Other SVOC Trace in SVOC Water Samples by GC-MS						
Benzyl alcohol	g/m³	< 0.005	< 0.005	< 0.005	-	-
Carbazole	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Dibenzofuran	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Isophorone	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
BTEX in VOC Water by Headspace GC-MS						
Benzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Ethylbenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Toluene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
m&p-Xylene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
o-Xylene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
Bromomethane (Methyl Bromide)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Carbon tetrachloride	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Chloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Chloromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,2-Dibromo-3-chloropropane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,2-Dibromoethane (ethylene dibromide, EDB)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Dibromomethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Dichlorodifluoromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,1-Dichloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,2-Dichloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,1-Dichloroethene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
cis-1,2-Dichloroethene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
trans-1,2-Dichloroethene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Dichloromethane (methylene chloride)	g/m³	< 0.010	< 0.010	< 0.010	-	-
1,2-Dichloropropane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,3-Dichloropropane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,1-Dichloropropene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
cis-1,3-Dichloropropene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
trans-1,3-Dichloropropene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Hexachlorobutadiene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,1,1,2-Tetrachloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,1,2,2-Tetrachloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Tetrachloroethene (tetrachloroethylene)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,1,1-Trichloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,1,2-Trichloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Trichloroethene (trichloroethylene)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Trichlorofluoromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,2,3-Trichloropropane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-

Sample Type: Aqueous						
Sample Name:		GND0569 01-Nov-2017 11:30 am	GND2701 01-Nov-2017 2:35 pm	GND2702 01-Nov-2017 2:20 pm		
Lab Number:		1870734.1	1870734.2	1870734.3		
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
1,1,2-Trichlorotrifluoroethane (Freon 113)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Vinyl chloride	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Halogenated Aromatics in VOC Water by Headspace GC-MS						
Chlorobenzene (monochlorobenzene)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,2-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,3-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,4-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,2,3-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,2,4-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,3,5-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Bromobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
2-Chlorotoluene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
4-Chlorotoluene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Monoaromatic Hydrocarbons in VOC Water by Headspace GC-MS						
n-Butylbenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
tert-Butylbenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
4-Isopropyltoluene (p-Cymene)	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Isopropylbenzene (Cumene)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
n-Propylbenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
sec-Butylbenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Styrene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
1,2,4-Trimethylbenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,3,5-Trimethylbenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Ketones in VOC Water by Headspace GC-MS						
Acetone	g/m³	< 0.05	< 0.05	< 0.05	-	-
2-Butanone (MEK)	g/m³	< 0.05	< 0.05	< 0.05	-	-
Methyl tert-butylether (MTBE)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
4-Methylpentan-2-one (MIBK)	g/m³	< 0.010	< 0.010	< 0.010	-	-
Trihalomethanes in VOC Water by Headspace GC-MS						
Bromodichloromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Bromoform (tribromomethane)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Chloroform (Trichloromethane)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Dibromochloromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Other VOC in Water by Headspace GC-MS						
Carbon disulphide	g/m³	< 0.00010	< 0.00010	< 0.00010	-	-
Naphthalene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-

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**
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS	Liquid/liquid extraction, GPC (if required), GCMS analysis	-	1-3
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	1-3
Gases in groundwater	Manual headspace creation and sub-sampling, GC-FID analysis.	0.002 - 0.003 g/m³	1-3
Semivolatile Organic Compounds Trace in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	-	1-3
Volatile Organic Compounds Trace in Water by Headspace GC-MS	Headspace, GC-MS SIM analysis [KBIs:37857,37921]	0.00010 - 0.05 g/m³	1-3
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-3
Total Kjeldahl Digestion	Sulphuric acid digestion with copper sulphate catalyst.	-	1-3
Total Phosphorus Digestion	Acid persulphate digestion.	-	1-3

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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	1-3
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	1-3
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.	0.1 pH Units	1-3
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 $CaCO_3$	1-3
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	1-3
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m³ as $CaCO_3$	1-3
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1-3
Total Dissolved Solids (TDS)	Filtration through GF/C (1.2 µm), gravimetric. APHA 2540 C (modified; drying temperature of 103 - 105°C used rather than 180 ± 2°C) 22nd ed. 2012.	10 g/m³	1-3
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 22nd ed. 2012.	-	1-3
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.003 g/m³	1-3
Dissolved Boron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.005 g/m³	1-3
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1-3
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-3
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-3
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0005 g/m³	1-3
Dissolved Mercury	0.45µm filtration, bromine oxidation followed by atomic fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m³	1-3
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1-3
Dissolved Selenium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0010 g/m³	1-3
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-3
Chloride	Filtered sample. Ferric thiocyanate colorimetry. Discrete Analyser. APHA 4500 Cl^- E (modified from continuous flow analysis) 22nd ed. 2012.	0.5 g/m³	1-3
Fluoride	Direct measurement, ion selective electrode. APHA 4500-F^- C 22nd ed. 2012.	0.05 g/m³	1-3
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-3
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m³	1-3
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	1-3
Total Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-N_{org} D. (modified) 4500 NH_3 F (modified) 22nd ed. 2012.	0.10 g/m³	1-3
Dissolved Reactive Phosphorus	Filtered sample. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified). 22nd ed. 2012.	0.004 g/m³	1-3
Phosphate from DRP	Calculation: from Dissolved Reactive Phosphorus * 3.065.	0.004 g/m³	1-3
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	1-3

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Reactive Silica	Filtered sample. Heteropoly blue colorimetry. Discrete analyser. APHA 4500-SiO_2 F (modified from flow injection analysis) 22nd ed. 2012.	0.10 g/m^3 as SiO_2	1-3
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B 22nd ed. 2012.	0.5 g/m^3	1-3
Total Organic Carbon (TOC)	Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) 22nd ed. 2012.	0.5 g/m^3	1-3

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

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TRIED, TESTED AND TRUSTED

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ANALYSIS REPORT

Client:	Taranaki Regional Council	**Lab No:**	1871220 SPv1
Contact:	L Smith	**Date Received:**	03-Nov-2017
	C/- Taranaki Regional Council	**Date Reported:**	17-Nov-2017
	Private Bag 713	**Quote No:**	83292
	Stratford 4352	**Order No:**	
		Client Reference:	Eltham central landfill groundwaters
		Submitted By:	David Olson

Sample Type: Aqueous

Sample Name:		GND1351 02-Nov-2017 1:55 pm	GND2692 02-Nov-2017 12:10 pm			
Lab Number:		1871220.1	1871220.2			
Individual Tests						
Sum of Anions	meq/L	1.98	1.68	-	-	-
Sum of Cations	meq/L	1.81	1.56	-	-	-
pH	pH Units	6.5	6.7	-	-	-
Total Alkalinity	g/m³ as $CaCO_3$	34	42	-	-	-
Bicarbonate	g/m³ at 25°C	41	51	-	-	-
Total Hardness	g/m³ as $CaCO_3$	50	43	-	-	-
Electrical Conductivity (EC)	mS/m	21.6	18.0	-	-	-
Total Dissolved Solids (TDS)	g/m³	152	140	-	-	-
Dissolved Aluminium	g/m³	< 0.003	0.004	-	-	-
Dissolved Boron	g/m³	0.017	0.019	-	-	-
Dissolved Calcium	g/m³	13.5	10.6	-	-	-
Dissolved Iron	g/m³	< 0.02	< 0.02	-	-	-
Dissolved Magnesium	g/m³	4.0	4.1	-	-	-
Dissolved Manganese	g/m³	0.0007	0.0039	-	-	-
Dissolved Mercury	g/m³	< 0.00008	< 0.00008	-	-	-
Dissolved Potassium	g/m³	3.5	1.55	-	-	-
Dissolved Selenium	g/m³	< 0.0010	< 0.0010	-	-	-
Dissolved Sodium	g/m³	16.6	15.1	-	-	-
Chloride	g/m³	34	19.2	-	-	-
Fluoride	g/m³	< 0.05	< 0.05	-	-	-
Nitrite-N	g/m³	< 0.002	< 0.002	-	-	-
Nitrate-N	g/m³	2.6	2.1	-	-	-
Nitrate-N + Nitrite-N	g/m³	2.6	2.1	-	-	-
Total Kjeldahl Nitrogen (TKN)	g/m³	0.10	< 0.10	-	-	-
Dissolved Reactive Phosphorus	g/m³	0.012	0.021	-	-	-
Phosphate	g/m³	0.037	0.064	-	-	-
Total Phosphorus	g/m³	0.016	0.056	-	-	-
Reactive Silica	g/m³ as SiO_2	43	46	-	-	-
Sulphate	g/m³	7.6	7.4	-	-	-
Total Organic Carbon (TOC)	g/m³	0.5	< 0.5	-	-	-
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Acetochlor	g/m³	< 0.00004	< 0.00004	-	-	-
Alachlor	g/m³	< 0.00004	< 0.00004	-	-	-
Atrazine	g/m³	< 0.00004	< 0.00004	-	-	-
Atrazine-desethyl	g/m³	< 0.00004	< 0.00004	-	-	-
Atrazine-desisopropyl	g/m³	< 0.00008	< 0.00008	-	-	-
Azaconazole	g/m³	< 0.00002	< 0.00002	-	-	-

Sample Type: Aqueous						
Sample Name:		GND1351 02-Nov-2017 1:55 pm	GND2692 02-Nov-2017 12:10 pm			
Lab Number:		1871220.1	1871220.2			
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Azinphos-methyl	g/m³	< 0.00008	< 0.00008	-	-	-
Benalaxyl	g/m³	< 0.00002	< 0.00002	-	-	-
Bitertanol	g/m³	< 0.00008	< 0.00008	-	-	-
Bromacil	g/m³	< 0.00004	< 0.00004	-	-	-
Bromopropylate	g/m³	< 0.00004	< 0.00004	-	-	-
Butachlor	g/m³	< 0.00004	< 0.00004	-	-	-
Captan	g/m³	< 0.00008	< 0.00008	-	-	-
Carbaryl	g/m³	< 0.00004	< 0.00004	-	-	-
Carbofenothion	g/m³	< 0.00004	< 0.00004	-	-	-
Carbofuran	g/m³	< 0.00004	< 0.00004	-	-	-
Chlorfluazuron	g/m³	< 0.00004	< 0.00004	-	-	-
Chlorothalonil	g/m³	< 0.00004	< 0.00004	-	-	-
Chlorpyrifos	g/m³	< 0.00004	< 0.00004	-	-	-
Chlorpyrifos-methyl	g/m³	< 0.00004	< 0.00004	-	-	-
Chlortoluron	g/m³	< 0.00008	< 0.00008	-	-	-
Cyanazine	g/m³	< 0.00004	< 0.00004	-	-	-
Cyfluthrin	g/m³	< 0.00004	< 0.00004	-	-	-
Cyhalothrin	g/m³	< 0.00004	< 0.00004	-	-	-
Cypermethrin	g/m³	< 0.00008	< 0.00008	-	-	-
Deltamethrin (including Tralomethrin)	g/m³	< 0.00006	< 0.00006	-	-	-
Diazinon	g/m³	< 0.00002	< 0.00002	-	-	-
Dichlofluanid	g/m³	< 0.00004	< 0.00004	-	-	-
Dichloran	g/m³	< 0.0002	< 0.0002	-	-	-
Dichlorvos	g/m³	< 0.00008	< 0.00008	-	-	-
Difenoconazole	g/m³	< 0.00008	< 0.00008	-	-	-
Dimethoate	g/m³	< 0.00008	< 0.00008	-	-	-
Diphenylamine	g/m³	< 0.00008	< 0.00008	-	-	-
Diuron	g/m³	< 0.00004	< 0.00004	-	-	-
Fenpropimorph	g/m³	< 0.00004	< 0.00004	-	-	-
Fluazifop-butyl	g/m³	< 0.00004	< 0.00004	-	-	-
Fluometuron	g/m³	< 0.00004	< 0.00004	-	-	-
Flusilazole	g/m³	< 0.00004	< 0.00004	-	-	-
Fluvalinate	g/m³	< 0.00004	< 0.00004	-	-	-
Furalaxyl	g/m³	< 0.00002	< 0.00002	-	-	-
Haloxyfop-methyl	g/m³	< 0.00004	< 0.00004	-	-	-
Hexaconazole	g/m³	< 0.00004	< 0.00004	-	-	-
Hexazinone	g/m³	< 0.00002	< 0.00002	-	-	-
IPBC (3-Iodo-2-propynyl-n-butylcarbamate)	g/m³	< 0.0002	< 0.0002	-	-	-
Kresoxim-methyl	g/m³	< 0.00002	< 0.00002	-	-	-
Linuron	g/m³	< 0.00005	< 0.00005	-	-	-
Malathion	g/m³	< 0.00004	< 0.00004	-	-	-
Metalaxyl	g/m³	< 0.00004	< 0.00004	-	-	-
Metolachlor	g/m³	< 0.00004	< 0.00004	-	-	-
Metribuzin	g/m³	< 0.00004	< 0.00004	-	-	-
Molinate	g/m³	< 0.00008	< 0.00008	-	-	-
Myclobutanil	g/m³	< 0.00004	< 0.00004	-	-	-
Naled	g/m³	< 0.0002	< 0.0002	-	-	-
Norflurazon	g/m³	< 0.00008	< 0.00008	-	-	-
Oxadiazon	g/m³	< 0.00004	< 0.00004	-	-	-
Oxyfluorfen	g/m³	< 0.00002	< 0.00002	-	-	-
Paclobutrazol	g/m³	< 0.00004	< 0.00004	-	-	-
Parathion-ethyl	g/m³	< 0.00004	< 0.00004	-	-	-
Parathion-methyl	g/m³	< 0.00004	< 0.00004	-	-	-
Pendimethalin	g/m³	< 0.00004	< 0.00004	-	-	-

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Lab Number:		1871220.1	1871220.2			
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Permethrin	g/m³	< 0.00002	< 0.00002	-	-	-
Pirimicarb	g/m³	< 0.00004	< 0.00004	-	-	-
Pirimiphos-methyl	g/m³	< 0.00004	< 0.00004	-	-	-
Prochloraz	g/m³	< 0.0002	< 0.0002	-	-	-
Procymidone	g/m³	< 0.00004	< 0.00004	-	-	-
Prometryn	g/m³	< 0.00002	< 0.00002	-	-	-
Propachlor	g/m³	< 0.00004	< 0.00004	-	-	-
Propanil	g/m³	< 0.0002	< 0.0002	-	-	-
Propazine	g/m³	< 0.00002	< 0.00002	-	-	-
Propiconazole	g/m³	< 0.00004	< 0.00004	-	-	-
Pyriproxyfen	g/m³	< 0.00004	< 0.00004	-	-	-
Quizalofop-ethyl	g/m³	< 0.00004	< 0.00004	-	-	-
Simazine	g/m³	< 0.00004	< 0.00004	-	-	-
Simetryn	g/m³	< 0.00004	< 0.00004	-	-	-
Sulfentrazone	g/m³	< 0.0002	< 0.0002	-	-	-
TCMTB [2-(thiocyanomethylthio) benzothiazole,Busan]	g/m³	< 0.00008	< 0.00008	-	-	-
Tebuconazole	g/m³	< 0.00004	< 0.00004	-	-	-
Terbacil	g/m³	< 0.00004	< 0.00004	-	-	-
Terbufos	g/m³	< 0.00004	< 0.00004	-	-	-
Terbumeton	g/m³	< 0.00004	< 0.00004	-	-	-
Terbuthylazine	g/m³	< 0.00002	< 0.00002	-	-	-
Terbuthylazine-desethyl	g/m³	< 0.00004	< 0.00004	-	-	-
Terbutryn	g/m³	< 0.00004	< 0.00004	-	-	-
Thiabendazole	g/m³	< 0.0002	< 0.0002	-	-	-
Thiobencarb	g/m³	< 0.00004	< 0.00004	-	-	-
Tolylfluanid	g/m³	< 0.00002	< 0.00002	-	-	-
Triazophos	g/m³	< 0.00004	< 0.00004	-	-	-
Trifluralin	g/m³	< 0.00004	< 0.00004	-	-	-
Vinclozolin	g/m³	< 0.00004	< 0.00004	-	-	-
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m³	< 0.0010	< 0.0010	-	-	-
Dissolved Cadmium	g/m³	< 0.00005	< 0.00005	-	-	-
Dissolved Chromium	g/m³	0.0017	0.0028	-	-	-
Dissolved Copper	g/m³	< 0.0005	< 0.0005	-	-	-
Dissolved Lead	g/m³	< 0.00010	< 0.00010	-	-	-
Dissolved Nickel	g/m³	< 0.0005	< 0.0005	-	-	-
Dissolved Zinc	g/m³	< 0.0010	0.0035	-	-	-
Gases in groundwater						
Ethane	g/m³	< 0.003	< 0.003	-	-	-
Ethylene	g/m³	< 0.004	< 0.004	-	-	-
Methane	g/m³	< 0.002	< 0.002	-	-	-
Haloethers Trace in SVOC Water Samples by GC-MS						
Bis(2-chloroethoxy) methane	g/m³	< 0.0005	< 0.0005	-	-	-
Bis(2-chloroethyl)ether	g/m³	< 0.0005	< 0.0005	-	-	-
Bis(2-chloroisopropyl)ether	g/m³	< 0.0005	< 0.0005	-	-	-
4-Bromophenyl phenyl ether	g/m³	< 0.0003	< 0.0003	-	-	-
4-Chlorophenyl phenyl ether	g/m³	< 0.0005	< 0.0005	-	-	-
Nitrogen containing compounds Trace in SVOC Water Samples, GC-MS						
2,4-Dinitrotoluene	g/m³	< 0.0010	< 0.0010	-	-	-
2,6-Dinitrotoluene	g/m³	< 0.0010	< 0.0010	-	-	-
Nitrobenzene	g/m³	< 0.0005	< 0.0005	-	-	-
N-Nitrosodi-n-propylamine	g/m³	< 0.0010	< 0.0010	-	-	-
N-Nitrosodiphenylamine + Diphenylamine	g/m3	< 0.0010	< 0.0010	-	-	-

Sample Type: Aqueous						
Sample Name:		GND1351 02-Nov-2017 1:55 pm	GND2692 02-Nov-2017 12:10 pm			
Lab Number:		1871220.1	1871220.2			
Organochlorine Pesticides Trace in SVOC Water Samples by GC-MS						
Aldrin	g/m³	< 0.0005	< 0.0005	-	-	-
alpha-BHC	g/m³	< 0.0005	< 0.0005	-	-	-
beta-BHC	g/m³	< 0.0005	< 0.0005	-	-	-
delta-BHC	g/m³	< 0.0005	< 0.0005	-	-	-
gamma-BHC (Lindane)	g/m³	< 0.0005	< 0.0005	-	-	-
4,4'-DDD	g/m³	< 0.0005	< 0.0005	-	-	-
4,4'-DDE	g/m³	< 0.0005	< 0.0005	-	-	-
4,4'-DDT	g/m³	< 0.0010	< 0.0010	-	-	-
Dieldrin	g/m³	< 0.0005	< 0.0005	-	-	-
Endosulfan I	g/m³	< 0.0010	< 0.0010	-	-	-
Endosulfan II	g/m³	< 0.0010	< 0.0010	-	-	-
Endosulfan sulfate	g/m³	< 0.0010	< 0.0010	-	-	-
Endrin	g/m³	< 0.0005	< 0.0005	-	-	-
Endrin ketone	g/m³	< 0.0010	< 0.0010	-	-	-
Heptachlor	g/m³	< 0.0005	< 0.0005	-	-	-
Heptachlor epoxide	g/m³	< 0.0005	< 0.0005	-	-	-
Hexachlorobenzene	g/m³	< 0.0005	< 0.0005	-	-	-
Polycyclic Aromatic Hydrocarbons Trace in SVOC Water Samples						
Acenaphthene	g/m³	< 0.0003	< 0.0003	-	-	-
Acenaphthylene	g/m³	< 0.0003	< 0.0003	-	-	-
Anthracene	g/m³	< 0.0003	< 0.0003	-	-	-
Benzo[a]anthracene	g/m³	< 0.0003	< 0.0003	-	-	-
Benzo[a]pyrene (BAP)	g/m³	< 0.0003	< 0.0003	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m³	< 0.0003	< 0.0003	-	-	-
Benzo[g,h,i]perylene	g/m³	< 0.0003	< 0.0003	-	-	-
Benzo[k]fluoranthene	g/m³	< 0.0003	< 0.0003	-	-	-
1&2-Chloronaphthalene	g/m³	< 0.0003	< 0.0003	-	-	-
Chrysene	g/m³	< 0.0003	< 0.0003	-	-	-
Dibenzo[a,h]anthracene	g/m³	< 0.0003	< 0.0003	-	-	-
Fluoranthene	g/m³	< 0.0003	< 0.0003	-	-	-
Fluorene	g/m³	< 0.0003	< 0.0003	-	-	-
Indeno(1,2,3-c,d)pyrene	g/m³	< 0.0003	< 0.0003	-	-	-
2-Methylnaphthalene	g/m³	< 0.0003	< 0.0003	-	-	-
Naphthalene	g/m³	< 0.0003	< 0.0003	-	-	-
Phenanthrene	g/m³	< 0.0003	< 0.0003	-	-	-
Pyrene	g/m³	< 0.0003	< 0.0003	-	-	-
Phenols Trace (drinkingwater) in SVOC Water Samples by GC-MS						
2-Chlorophenol	g/m³	< 0.0005	< 0.0005	-	-	-
2,4-Dichlorophenol	g/m³	< 0.0005	< 0.0005	-	-	-
2,4,6-Trichlorophenol	g/m³	< 0.0010	< 0.0010	-	-	-
Phenols Trace (non-drinkingwater) in SVOC Water Samples by GC-MS						
4-Chloro-3-methylphenol	g/m³	< 0.0010	< 0.0010	-	-	-
2,4-Dimethylphenol	g/m³	< 0.0005	< 0.0005	-	-	-
3 & 4-Methylphenol (m- + p-cresol)	g/m³	< 0.0010	< 0.0010	-	-	-
2-Methylphenol (o-Cresol)	g/m³	< 0.0005	< 0.0005	-	-	-
2-Nitrophenol	g/m³	< 0.0010	< 0.0010	-	-	-
Pentachlorophenol (PCP)	g/m³	< 0.010	< 0.010	-	-	-
Phenol	g/m³	< 0.0010	< 0.0010	-	-	-
2,4,5-Trichlorophenol	g/m³	< 0.0010	< 0.0010	-	-	-
Plasticisers Trace (non-drinkingwater) in SVOC Water by GCMS						
Butylbenzylphthalate	g/m³	< 0.0010	< 0.0010	-	-	-
Diethylphthalate	g/m³	< 0.0010	< 0.0010	-	-	-
Dimethylphthalate	g/m³	< 0.0010	< 0.0010	-	-	-

Sample Type: Aqueous						
Sample Name:		GND1351 02-Nov-2017 1:55 pm	GND2692 02-Nov-2017 12:10 pm			
Lab Number:		1871220.1	1871220.2			
Plasticisers Trace (non-drinkingwater) in SVOC Water by GCMS						
Di-n-butylphthalate	g/m³	< 0.0010	< 0.0010	-	-	-
Di-n-octylphthalate	g/m³	< 0.0010	< 0.0010	-	-	-
Plasticisers Trace (drinkingwater) in SVOC Water Samples by GCMS						
Bis(2-ethylhexyl)phthalate	g/m³	< 0.003	< 0.003	-	-	-
Di(2-ethylhexyl)adipate	g/m³	< 0.0010	< 0.0010	-	-	-
Other Halogenated compounds Trace (drinkingwater) in SVOC Water						
1,2-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	-	-	-
1,3-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	-	-	-
1,4-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	-	-	-
Other Halogenated compounds Trace (non-drinkingwater) in SVOC						
Hexachlorobutadiene	g/m³	< 0.0005	< 0.0005	-	-	-
Hexachloroethane	g/m³	< 0.0005	< 0.0005	-	-	-
1,2,4-Trichlorobenzene	g/m³	< 0.0005	< 0.0005	-	-	-
Other SVOC Trace in SVOC Water Samples by GC-MS						
Benzyl alcohol	g/m³	< 0.005	< 0.005	-	-	-
Carbazole	g/m³	< 0.0005	< 0.0005	-	-	-
Dibenzofuran	g/m³	< 0.0005	< 0.0005	-	-	-
Isophorone	g/m³	< 0.0005	< 0.0005	-	-	-
BTEX in VOC Water by Headspace GC-MS						
Benzene	g/m³	< 0.0003	< 0.0003	-	-	-
Ethylbenzene	g/m³	< 0.0005	< 0.0005	-	-	-
Toluene	g/m³	< 0.0003	< 0.0003	-	-	-
m&p-Xylene	g/m³	< 0.0005	< 0.0005	-	-	-
o-Xylene	g/m³	< 0.0003	< 0.0003	-	-	-
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
Bromomethane (Methyl Bromide)	g/m³	< 0.0003	< 0.0003	-	-	-
Carbon tetrachloride	g/m³	< 0.0003	< 0.0003	-	-	-
Chloroethane	g/m³	< 0.0003	< 0.0003	-	-	-
Chloromethane	g/m³	< 0.0003	< 0.0003	-	-	-
1,2-Dibromo-3-chloropropane	g/m³	< 0.0003	< 0.0003	-	-	-
1,2-Dibromoethane (ethylene dibromide, EDB)	g/m³	< 0.0003	< 0.0003	-	-	-
Dibromomethane	g/m³	< 0.0003	< 0.0003	-	-	-
Dichlorodifluoromethane	g/m³	< 0.0003	< 0.0003	-	-	-
1,1-Dichloroethane	g/m³	< 0.0003	< 0.0003	-	-	-
1,2-Dichloroethane	g/m³	< 0.0003	< 0.0003	-	-	-
1,1-Dichloroethene	g/m³	< 0.0003	< 0.0003	-	-	-
cis-1,2-Dichloroethene	g/m³	< 0.0003	< 0.0003	-	-	-
trans-1,2-Dichloroethene	g/m³	< 0.0003	< 0.0003	-	-	-
Dichloromethane (methylene chloride)	g/m³	< 0.010	< 0.010	-	-	-
1,2-Dichloropropane	g/m³	< 0.0003	< 0.0003	-	-	-
1,3-Dichloropropane	g/m³	< 0.0003	< 0.0003	-	-	-
1,1-Dichloropropene	g/m³	< 0.0003	< 0.0003	-	-	-
cis-1,3-Dichloropropene	g/m³	< 0.0005	< 0.0005	-	-	-
trans-1,3-Dichloropropene	g/m³	< 0.0005	< 0.0005	-	-	-
Hexachlorobutadiene	g/m³	< 0.0003	< 0.0003	-	-	-
1,1,1,2-Tetrachloroethane	g/m³	< 0.0003	< 0.0003	-	-	-
1,1,2,2-Tetrachloroethane	g/m³	< 0.0003	< 0.0003	-	-	-
Tetrachloroethene (tetrachloroethylene)	g/m³	< 0.0003	< 0.0003	-	-	-
1,1,1-Trichloroethane	g/m³	< 0.0003	< 0.0003	-	-	-
1,1,2-Trichloroethane	g/m³	< 0.0003	< 0.0003	-	-	-
Trichloroethene (trichloroethylene)	g/m³	< 0.0003	< 0.0003	-	-	-
Trichlorofluoromethane	g/m³	< 0.0003	< 0.0003	-	-	-
1,2,3-Trichloropropane	g/m³	< 0.0003	< 0.0003	-	-	-

Sample Type: Aqueous						
Sample Name:		GND1351 02-Nov-2017 1:55 pm	GND2692 02-Nov-2017 12:10 pm			
Lab Number:		1871220.1	1871220.2			
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
1,1,2-Trichlorotrifluoroethane (Freon 113)	g/m³	< 0.0003	< 0.0003	-	-	-
Vinyl chloride	g/m³	< 0.0003	< 0.0003	-	-	-
Halogenated Aromatics in VOC Water by Headspace GC-MS						
Chlorobenzene (monochlorobenzene)	g/m³	< 0.0003	< 0.0003	-	-	-
1,2-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	-	-	-
1,3-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	-	-	-
1,4-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	-	-	-
1,2,3-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	-	-	-
1,2,4-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	-	-	-
1,3,5-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	-	-	-
Bromobenzene	g/m³	< 0.0003	< 0.0003	-	-	-
2-Chlorotoluene	g/m³	< 0.0003	< 0.0003	-	-	-
4-Chlorotoluene	g/m³	< 0.0003	< 0.0003	-	-	-
Monoaromatic Hydrocarbons in VOC Water by Headspace GC-MS						
n-Butylbenzene	g/m³	< 0.0005	< 0.0005	-	-	-
tert-Butylbenzene	g/m³	< 0.0003	< 0.0003	-	-	-
4-Isopropyltoluene (p-Cymene)	g/m³	< 0.0005	< 0.0005	-	-	-
Isopropylbenzene (Cumene)	g/m³	< 0.0003	< 0.0003	-	-	-
n-Propylbenzene	g/m³	< 0.0005	< 0.0005	-	-	-
sec-Butylbenzene	g/m³	< 0.0003	< 0.0003	-	-	-
Styrene	g/m³	< 0.0005	< 0.0005	-	-	-
1,2,4-Trimethylbenzene	g/m³	< 0.0003	< 0.0003	-	-	-
1,3,5-Trimethylbenzene	g/m³	< 0.0003	< 0.0003	-	-	-
Ketones in VOC Water by Headspace GC-MS						
Acetone	g/m³	< 0.05	< 0.05	-	-	-
2-Butanone (MEK)	g/m³	< 0.05	< 0.05	-	-	-
Methyl tert-butylether (MTBE)	g/m³	< 0.0003	< 0.0003	-	-	-
4-Methylpentan-2-one (MIBK)	g/m³	< 0.010	< 0.010	-	-	-
Trihalomethanes in VOC Water by Headspace GC-MS						
Bromodichloromethane	g/m³	< 0.0003	< 0.0003	-	-	-
Bromoform (tribromomethane)	g/m³	< 0.0003	< 0.0003	-	-	-
Chloroform (Trichloromethane)	g/m³	< 0.0003	< 0.0003	-	-	-
Dibromochloromethane	g/m³	< 0.0003	< 0.0003	-	-	-
Other VOC in Water by Headspace GC-MS						
Carbon disulphide	g/m³	< 0.00010	< 0.00010	-	-	-
Naphthalene	g/m³	< 0.0005	< 0.0005	-	-	-

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**
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS	Liquid/liquid extraction, GPC (if required), GCMS analysis	-	1-2
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	1-2
Gases in groundwater	Manual headspace creation and sub-sampling, GC-FID analysis.	0.002 - 0.003 g/m³	1-2
Semivolatile Organic Compounds Trace in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	-	1-2
Volatile Organic Compounds Trace in Water by Headspace GC-MS	Headspace, GC-MS SIM analysis [KBIs:37857,37921]	0.00010 - 0.05 g/m³	1-2
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-2
Total Kjeldahl Digestion	Sulphuric acid digestion with copper sulphate catalyst.	-	1-2
Total Phosphorus Digestion	Acid persulphate digestion.	-	1-2

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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
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.	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/m³ 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/m³ at 25°C	1-2
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m³ 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 Dissolved Solids (TDS)	Filtration through GF/C (1.2 µm), gravimetric. APHA 2540 C (modified; drying temperature of 103 - 105°C used rather than 180 ± 2°C) 22nd ed. 2012.	10 g/m³	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
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.003 g/m³	1-2
Dissolved Boron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.005 g/m³	1-2
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1-2
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-2
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-2
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0005 g/m³	1-2
Dissolved Mercury	0.45µm filtration, bromine oxidation followed by atomic fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m³	1-2
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1-2
Dissolved Selenium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0010 g/m³	1-2
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-2
Chloride	Filtered sample. Ferric thiocyanate colorimetry. Discrete Analyser. APHA 4500 Cl^- E (modified from continuous flow analysis) 22nd ed. 2012.	0.5 g/m³	1-2
Fluoride	Direct measurement, ion selective electrode. APHA 4500-F^- C 22nd ed. 2012.	0.05 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 Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-N_{org} D. (modified) 4500 NH_3 F (modified) 22nd ed. 2012.	0.10 g/m³	1-2
Dissolved Reactive Phosphorus	Filtered sample. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified). 22nd ed. 2012.	0.004 g/m³	1-2
Phosphate from DRP	Calculation: from Dissolved Reactive Phosphorus * 3.065.	0.004 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

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Reactive Silica	Filtered sample. Heteropoly blue colorimetry. Discrete analyser. APHA 4500-SiO_2 F (modified from flow injection analysis) 22nd ed. 2012.	0.10 g/m^3 as SiO_2	1-2
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B 22nd ed. 2012.	0.5 g/m^3	1-2
Total Organic Carbon (TOC)	Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) 22nd ed. 2012.	0.5 g/m^3	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

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ANALYSIS REPORT

Client:	Taranaki Regional Council	**Lab No:**	1869242 SPv1
Contact:	L Smith	**Date Received:**	01-Nov-2017
	C/- Taranaki Regional Council	**Date Reported:**	16-Nov-2017
	Private Bag 713	**Quote No:**	83292
	Stratford 4352	**Order No:**	
		Client Reference:	Eltham central landfill groundwaters
		Submitted By:	David Olson

Sample Type: Aqueous

Sample Name:		GND0568 31-Oct-2017 3:00 pm	GND0600 31-Oct-2017 11:50 am	GND1353 31-Oct-2017 12:50 pm	GND2693 31-Oct-2017 11:00 am	GND2695 31-Oct-2017 3:00 pm
Lab Number:		1869242.1	1869242.2	1869242.3	1869242.4	1869242.5
Individual Tests						
Sum of Anions	meq/L	2.1	3.2	2.3	1.68	2.3
Sum of Cations	meq/L	2.1	3.1	2.1	1.64	2.3
pH	pH Units	6.9	6.7	6.8	6.6	6.8
Total Alkalinity	g/m³ as $CaCO_3$	44	38	49	28	54
Bicarbonate	g/m³ at 25°C	53	47	60	34	66
Total Hardness	g/m³ as $CaCO_3$	64	94	61	50	58
Electrical Conductivity (EC)	mS/m	23.0	36.6	25.2	18.7	24.8
Total Dissolved Solids (TDS)	g/m³	169	270	182	142	179
Dissolved Aluminium	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	0.004
Dissolved Boron	g/m³	0.017	0.017	0.019	0.020	0.021
Dissolved Calcium	g/m³	14.5	21	13.6	11.2	13.6
Dissolved Iron	g/m³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Magnesium	g/m³	6.7	9.8	6.5	5.4	5.8
Dissolved Manganese	g/m³	< 0.0005	0.0087	< 0.0005	< 0.0005	0.0047
Dissolved Mercury	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Dissolved Potassium	g/m³	3.0	3.3	3.1	1.38	3.2
Dissolved Selenium	g/m³	< 0.0010	< 0.0010	< 0.0010	0.0012	< 0.0010
Dissolved Sodium	g/m³	16.2	27	19.3	13.8	24
Chloride	g/m³	27	45	29	22	28
Fluoride	g/m³	< 0.05	< 0.05	0.07	< 0.05	0.10
Nitrite-N	g/m³	< 0.002	0.006	< 0.002	< 0.002	< 0.002
Nitrate-N	g/m³	5.2	14.6	4.1	2.2	5.0
Nitrate-N + Nitrite-N	g/m³	5.2	14.6	4.1	2.2	5.0
Total Kjeldahl Nitrogen (TKN)	g/m³	< 0.10	0.24	< 0.10	0.10	< 0.10
Dissolved Reactive Phosphorus	g/m³	0.017	0.027	0.045	0.011	0.048
Phosphate	g/m³	0.053	0.083	0.139	0.035	0.146
Total Phosphorus	g/m³	0.020	0.045	0.045	0.040	0.064
Reactive Silica	g/m³ as SiO_2	50	53	52	37	52
Sulphate	g/m³	4.3	5.3	10.8	16.2	2.7
Total Organic Carbon (TOC)	g/m³	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Acetochlor	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Alachlor	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Atrazine	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Atrazine-desethyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Atrazine-desisopropyl	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Azaconazole	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002

Sample Type: Aqueous						
Sample Name:		GND0568 31-Oct-2017 3:00 pm	GND0600 31-Oct-2017 11:50 am	GND1353 31-Oct-2017 12:50 pm	GND2693 31-Oct-2017 11:00 am	GND2695 31-Oct-2017 3:00 pm
Lab Number:		1869242.1	1869242.2	1869242.3	1869242.4	1869242.5
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Azinphos-methyl	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Benalaxyl	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Bitertanol	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Bromacil	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Bromopropylate	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Butachlor	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Captan	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Carbaryl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Carbofenothion	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Carbofuran	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Chlorfluazuron	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Chlorothalonil	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Chlorpyrifos	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Chlorpyrifos-methyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Chlortoluron	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Cyanazine	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Cyfluthrin	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Cyhalothrin	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Cypermethrin	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Deltamethrin (including Tralomethrin)	g/m³	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006
Diazinon	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Dichlofluanid	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Dichloran	g/m³	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Dichlorvos	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Difenoconazole	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Dimethoate	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Diphenylamine	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Diuron	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Fenpropimorph	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Fluazifop-butyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Fluometuron	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Flusilazole	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Fluvalinate	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Furalaxyl	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Haloxyfop-methyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Hexaconazole	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Hexazinone	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
IPBC (3-Iodo-2-propynyl-n-butylcarbamate)	g/m³	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Kresoxim-methyl	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Linuron	g/m³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Malathion	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Metalaxyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Metolachlor	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Metribuzin	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Molinate	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Myclobutanil	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Naled	g/m³	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Norflurazon	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Oxadiazon	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Oxyfluorfen	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Paclobutrazol	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Parathion-ethyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Parathion-methyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Pendimethalin	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004

Sample Type: Aqueous						
Sample Name:		GND0568 31-Oct-2017 3:00 pm	GND0600 31-Oct-2017 11:50 am	GND1353 31-Oct-2017 12:50 pm	GND2693 31-Oct-2017 11:00 am	GND2695 31-Oct-2017 3:00 pm
Lab Number:		1869242.1	1869242.2	1869242.3	1869242.4	1869242.5
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Permethrin	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Pirimicarb	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Pirimiphos-methyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Prochloraz	g/m³	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Procymidone	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Prometryn	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Propachlor	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Propanil	g/m³	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Propazine	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Propiconazole	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Pyriproxyfen	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Quizalofop-ethyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Simazine	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Simetryn	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Sulfentrazone	g/m³	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
TCMTB [2-(thiocyanomethylthio) benzothiazole,Busan]	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Tebuconazole	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Terbacil	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Terbufos	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Terbumeton	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Terbuthylazine	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Terbuthylazine-desethyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Terbutryn	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Thiabendazole	g/m³	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Thiobencarb	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Tolylfluanid	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Triazophos	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Trifluralin	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Vinclozolin	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Dissolved Cadmium	g/m³	< 0.00005	0.00012	< 0.00005	< 0.00005	< 0.00005
Dissolved Chromium	g/m³	0.0023	0.0015	0.0033	0.0024	0.0011
Dissolved Copper	g/m³	< 0.0005	0.0045	0.0033	< 0.0005	< 0.0005
Dissolved Lead	g/m³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Nickel	g/m³	< 0.0005	< 0.0005	< 0.0005	0.0006	< 0.0005
Dissolved Zinc	g/m³	0.0010	0.33	0.0019	0.023	0.0016
Gases in groundwater						
Ethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Ethylene	g/m³	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004
Methane	g/m³	< 0.002	0.058	< 0.002	< 0.002	< 0.002
Haloethers Trace in SVOC Water Samples by GC-MS						
Bis(2-chloroethoxy) methane	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Bis(2-chloroethyl)ether	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Bis(2-chloroisopropyl)ether	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
4-Bromophenyl phenyl ether	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
4-Chlorophenyl phenyl ether	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Nitrogen containing compounds Trace in SVOC Water Samples, GC-MS						
2,4-Dinitrotoluene	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2,6-Dinitrotoluene	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Nitrobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
N-Nitrosodi-n-propylamine	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
N-Nitrosodiphenylamine + Diphenylamine	g/m3	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010

Sample Type: Aqueous						
Sample Name:		GND0568 31-Oct-2017 3:00 pm	GND0600 31-Oct-2017 11:50 am	GND1353 31-Oct-2017 12:50 pm	GND2693 31-Oct-2017 11:00 am	GND2695 31-Oct-2017 3:00 pm
Lab Number:		1869242.1	1869242.2	1869242.3	1869242.4	1869242.5
Organochlorine Pesticides Trace in SVOC Water Samples by GC-MS						
Aldrin	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
alpha-BHC	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
beta-BHC	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
delta-BHC	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
gamma-BHC (Lindane)	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
4,4'-DDD	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
4,4'-DDE	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
4,4'-DDT	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Dieldrin	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Endosulfan I	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan II	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan sulfate	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Endrin ketone	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Heptachlor epoxide	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Hexachlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Polycyclic Aromatic Hydrocarbons Trace in SVOC Water Samples						
Acenaphthene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Acenaphthylene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Anthracene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Benzo[a]anthracene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Benzo[a]pyrene (BAP)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Benzo[g,h,i]perylene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Benzo[k]fluoranthene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1&2-Chloronaphthalene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Chrysene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Dibenzo[a,h]anthracene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Fluoranthene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Fluorene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Indeno(1,2,3-c,d)pyrene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
2-Methylnaphthalene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Naphthalene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Phenanthrene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Pyrene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Phenols Trace (drinkingwater) in SVOC Water Samples by GC-MS						
2-Chlorophenol	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
2,4-Dichlorophenol	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
2,4,6-Trichlorophenol	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Phenols Trace (non-drinkingwater) in SVOC Water Samples by GC-MS						
4-Chloro-3-methylphenol	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2,4-Dimethylphenol	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
3 & 4-Methylphenol (m- + p-cresol)	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2-Methylphenol (o-Cresol)	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
2-Nitrophenol	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Pentachlorophenol (PCP)	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Phenol	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2,4,5-Trichlorophenol	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Plasticisers Trace (non-drinkingwater) in SVOC Water by GCMS						
Butylbenzylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Diethylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Dimethylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010

Sample Type: Aqueous						
Sample Name:		GND0568 31-Oct-2017 3:00 pm	GND0600 31-Oct-2017 11:50 am	GND1353 31-Oct-2017 12:50 pm	GND2693 31-Oct-2017 11:00 am	GND2695 31-Oct-2017 3:00 pm
Lab Number:		1869242.1	1869242.2	1869242.3	1869242.4	1869242.5
Plasticisers Trace (non-drinkingwater) in SVOC Water by GCMS						
Di-n-butylphthalate	g/m³	< 0.003	< 0.003	< 0.003	< 0.0010	< 0.003
Di-n-octylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Plasticisers Trace (drinkingwater) in SVOC Water Samples by GCMS						
Bis(2-ethylhexyl)phthalate	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Di(2-ethylhexyl)adipate	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Other Halogenated compounds Trace (drinkingwater) in SVOC Water						
1,2-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,3-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,4-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Other Halogenated compounds Trace (non-drinkingwater) in SVOC						
Hexachlorobutadiene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Hexachloroethane	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,2,4-Trichlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Other SVOC Trace in SVOC Water Samples by GC-MS						
Benzyl alcohol	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Carbazole	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dibenzofuran	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Isophorone	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
BTEX in VOC Water by Headspace GC-MS						
Benzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Ethylbenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Toluene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
m&p-Xylene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
o-Xylene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
Bromomethane (Methyl Bromide)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Carbon tetrachloride	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Chloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Chloromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,2-Dibromo-3-chloropropane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,2-Dibromoethane (ethylene dibromide, EDB)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Dibromomethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Dichlorodifluoromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,1-Dichloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,2-Dichloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,1-Dichloroethene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
cis-1,2-Dichloroethene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
trans-1,2-Dichloroethene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Dichloromethane (methylene chloride)	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
1,2-Dichloropropane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,3-Dichloropropane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,1-Dichloropropene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
cis-1,3-Dichloropropene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
trans-1,3-Dichloropropene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Hexachlorobutadiene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,1,1,2-Tetrachloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,1,2,2-Tetrachloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Tetrachloroethene (tetrachloroethylene)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,1,1-Trichloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,1,2-Trichloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Trichloroethene (trichloroethylene)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Trichlorofluoromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,2,3-Trichloropropane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003

Sample Type: Aqueous						
Sample Name:		GND0568 31-Oct-2017 3:00 pm	GND0600 31-Oct-2017 11:50 am	GND1353 31-Oct-2017 12:50 pm	GND2693 31-Oct-2017 11:00 am	GND2695 31-Oct-2017 3:00 pm
Lab Number:		1869242.1	1869242.2	1869242.3	1869242.4	1869242.5
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
1,1,2-Trichlorotrifluoroethane (Freon 113)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Vinyl chloride	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Halogenated Aromatics in VOC Water by Headspace GC-MS						
Chlorobenzene (monochlorobenzene)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,2-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,3-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,4-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,2,3-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,2,4-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,3,5-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Bromobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
2-Chlorotoluene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
4-Chlorotoluene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Monoaromatic Hydrocarbons in VOC Water by Headspace GC-MS						
n-Butylbenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
tert-Butylbenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
4-Isopropyltoluene (p-Cymene)	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Isopropylbenzene (Cumene)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
n-Propylbenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
sec-Butylbenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Styrene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,2,4-Trimethylbenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,3,5-Trimethylbenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Ketones in VOC Water by Headspace GC-MS						
Acetone	g/m³	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Butanone (MEK)	g/m³	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Methyl tert-butylether (MTBE)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
4-Methylpentan-2-one (MIBK)	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Trihalomethanes in VOC Water by Headspace GC-MS						
Bromodichloromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Bromoform (tribromomethane)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Chloroform (Trichloromethane)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Dibromochloromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Other VOC in Water by Headspace GC-MS						
Carbon disulphide	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

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**
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS	Liquid/liquid extraction, GPC (if required), GCMS analysis	-	1-5
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	1-5
Gases in groundwater	Manual headspace creation and sub-sampling, GC-FID analysis.	0.002 - 0.003 g/m³	1-5
Semivolatile Organic Compounds Trace in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	-	1-5
Volatile Organic Compounds Trace in Water by Headspace GC-MS	Headspace, GC-MS SIM analysis [KBIs:37857,37921]	0.00010 - 0.05 g/m³	1-5
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-5
Total Kjeldahl Digestion	Sulphuric acid digestion with copper sulphate catalyst.	-	1-5
Total Phosphorus Digestion	Acid persulphate digestion.	-	1-5

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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	1-5
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	1-5
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.	0.1 pH Units	1-5
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 $CaCO_3$	1-5
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	1-5
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m³ as $CaCO_3$	1-5
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1-5
Total Dissolved Solids (TDS)	Filtration through GF/C (1.2 µm), gravimetric. APHA 2540 C (modified; drying temperature of 103 - 105°C used rather than 180 ± 2°C) 22nd ed. 2012.	10 g/m³	1-5
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 22nd ed. 2012.	-	1-5
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.003 g/m³	1-5
Dissolved Boron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.005 g/m³	1-5
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1-5
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-5
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-5
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0005 g/m³	1-5
Dissolved Mercury	0.45µm filtration, bromine oxidation followed by atomic fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m³	1-5
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1-5
Dissolved Selenium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0010 g/m³	1-5
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-5
Chloride	Filtered sample. Ferric thiocyanate colorimetry. Discrete Analyser. APHA 4500 Cl^- E (modified from continuous flow analysis) 22nd ed. 2012.	0.5 g/m³	1-5
Fluoride	Direct measurement, ion selective electrode. APHA 4500-F^- C 22nd ed. 2012.	0.05 g/m³	1-5
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-5
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m³	1-5
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	1-5
Total Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-N_{org} D. (modified) 4500 NH_3 F (modified) 22nd ed. 2012.	0.10 g/m³	1-5
Dissolved Reactive Phosphorus	Filtered sample. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified). 22nd ed. 2012.	0.004 g/m³	1-5
Phosphate from DRP	Calculation: from Dissolved Reactive Phosphorus * 3.065.	0.004 g/m³	1-5
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	1-5

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Reactive Silica	Filtered sample. Heteropoly blue colorimetry. Discrete analyser. APHA 4500-SiO_2 F (modified from flow injection analysis) 22nd ed. 2012.	0.10 g/m^3 as SiO_2	1-5
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B 22nd ed. 2012.	0.5 g/m^3	1-5
Total Organic Carbon (TOC)	Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) 22nd ed. 2012.	0.5 g/m^3	1-5

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

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ANALYSIS REPORT

Client:	Taranaki Regional Council	**Lab No:**	1883660 SPv1
Contact:	L Smith	**Date Received:**	25-Nov-2017
	C/- Taranaki Regional Council	**Date Reported:**	12-Dec-2017
	Private Bag 713	**Quote No:**	83292
	Stratford 4352	**Order No:**	
		Client Reference:	Eltham central landfill groundwaters
		Submitted By:	David Olson

Sample Type: Aqueous

Sample Name:		GND0826 24-Nov-2017 10:45 am	GND2697 24-Nov-2017 9:25 am			
Lab Number:		1883660.1	1883660.2			
Individual Tests						
Sum of Anions	meq/L	3.3	2.3	-	-	-
Sum of Cations	meq/L	3.2	2.2	-	-	-
pH	pH Units	6.7	6.7	-	-	-
Total Alkalinity	g/m³ as $CaCO_3$	72	55	-	-	-
Bicarbonate	g/m³ at 25°C	87	67	-	-	-
Total Hardness	g/m³ as $CaCO_3$	103	73	-	-	-
Electrical Conductivity (EC)	mS/m	35.0	24.6	-	-	-
Total Dissolved Solids (TDS)	g/m³	270	184	-	-	-
Dissolved Aluminium	g/m³	< 0.003	0.003	-	-	-
Dissolved Boron	g/m³	0.018	0.016	-	-	-
Dissolved Calcium	g/m³	23	16.0	-	-	-
Dissolved Iron	g/m³	< 0.02	< 0.02	-	-	-
Dissolved Magnesium	g/m³	11.1	8.0	-	-	-
Dissolved Manganese	g/m³	0.0024	0.0178	-	-	-
Dissolved Mercury	g/m³	< 0.00008	< 0.00008	-	-	-
Dissolved Potassium	g/m³	3.3	3.1	-	-	-
Dissolved Selenium	g/m³	< 0.0010	< 0.0010	-	-	-
Dissolved Sodium	g/m³	23	16.0	-	-	-
Chloride	g/m³	43	34	-	-	-
Fluoride	g/m³	< 0.05	< 0.05	-	-	-
Nitrite-N	g/m³	< 0.002	< 0.002	-	-	-
Nitrate-N	g/m³	7.9	1.75	-	-	-
Nitrate-N + Nitrite-N	g/m³	7.9	1.75	-	-	-
Total Kjeldahl Nitrogen (TKN)	g/m³	< 0.10	0.15	-	-	-
Dissolved Reactive Phosphorus	g/m³	0.050 #1	0.026	-	-	-
Phosphate	g/m³	0.154	0.081	-	-	-
Total Phosphorus	g/m³	0.044 #1	0.052	-	-	-
Reactive Silica	g/m³ as SiO_2	60	47	-	-	-
Sulphate	g/m³	6.6	7.4	-	-	-
Total Organic Carbon (TOC)	g/m³	< 0.5	0.6	-	-	-
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Acetochlor	g/m³	< 0.00004	< 0.00004	-	-	-
Alachlor	g/m³	< 0.00004	< 0.00004	-	-	-
Atrazine	g/m³	< 0.00004	< 0.00004	-	-	-
Atrazine-desethyl	g/m³	< 0.00004	< 0.00004	-	-	-
Atrazine-desisopropyl	g/m³	< 0.00008	< 0.00008	-	-	-
Azaconazole	g/m³	< 0.00002	< 0.00002	-	-	-

Sample Type: Aqueous						
Sample Name:		GND0826 24-Nov-2017 10:45 am	GND2697 24-Nov-2017 9:25 am			
Lab Number:		1883660.1	1883660.2			
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Azinphos-methyl	g/m³	< 0.00008	< 0.00008	-	-	-
Benalaxyl	g/m³	< 0.00002	< 0.00002	-	-	-
Bitertanol	g/m³	< 0.00008	< 0.00008	-	-	-
Bromacil	g/m³	< 0.00004	< 0.00004	-	-	-
Bromopropylate	g/m³	< 0.00004	< 0.00004	-	-	-
Butachlor	g/m³	< 0.00004	< 0.00004	-	-	-
Captan	g/m³	< 0.00008	< 0.00008	-	-	-
Carbaryl	g/m³	< 0.00004	< 0.00004	-	-	-
Carbofenothion	g/m³	< 0.00004	< 0.00004	-	-	-
Carbofuran	g/m³	< 0.00004	< 0.00004	-	-	-
Chlorfluazuron	g/m³	< 0.00004	< 0.00004	-	-	-
Chlorothalonil	g/m³	< 0.00004	< 0.00004	-	-	-
Chlorpyrifos	g/m³	< 0.00004	< 0.00004	-	-	-
Chlorpyrifos-methyl	g/m³	< 0.00004	< 0.00004	-	-	-
Chlortoluron	g/m³	< 0.00008	< 0.00008	-	-	-
Cyanazine	g/m³	< 0.00004	< 0.00004	-	-	-
Cyfluthrin	g/m³	< 0.00004	< 0.00004	-	-	-
Cyhalothrin	g/m³	< 0.00004	< 0.00004	-	-	-
Cypermethrin	g/m³	< 0.00008	< 0.00008	-	-	-
Deltamethrin (including Tralomethrin)	g/m³	< 0.00006	< 0.00006	-	-	-
Diazinon	g/m³	< 0.00002	< 0.00002	-	-	-
Dichlofluanid	g/m³	< 0.00004	< 0.00004	-	-	-
Dichloran	g/m³	< 0.0002	< 0.0002	-	-	-
Dichlorvos	g/m³	< 0.00008	< 0.00008	-	-	-
Difenoconazole	g/m³	< 0.00008	< 0.00008	-	-	-
Dimethoate	g/m³	< 0.00008	< 0.00008	-	-	-
Diphenylamine	g/m³	< 0.00008	< 0.00008	-	-	-
Diuron	g/m³	< 0.00004	< 0.00004	-	-	-
Fenpropimorph	g/m³	< 0.00004	< 0.00004	-	-	-
Fluazifop-butyl	g/m³	< 0.00004	< 0.00004	-	-	-
Fluometuron	g/m³	< 0.00004	< 0.00004	-	-	-
Flusilazole	g/m³	< 0.00004	< 0.00004	-	-	-
Fluvalinate	g/m³	< 0.00004	< 0.00004	-	-	-
Furalaxyl	g/m³	< 0.00002	< 0.00002	-	-	-
Haloxyfop-methyl	g/m³	< 0.00004	< 0.00004	-	-	-
Hexaconazole	g/m³	< 0.00004	< 0.00004	-	-	-
Hexazinone	g/m³	< 0.00002	< 0.00002	-	-	-
IPBC (3-Iodo-2-propynyl-n-butylcarbamate)	g/m³	< 0.0002	< 0.0002	-	-	-
Kresoxim-methyl	g/m³	< 0.00002	< 0.00002	-	-	-
Linuron	g/m³	< 0.00005	< 0.00005	-	-	-
Malathion	g/m³	< 0.00004	< 0.00004	-	-	-
Metalaxyl	g/m³	< 0.00004	< 0.00004	-	-	-
Metolachlor	g/m³	< 0.00004	< 0.00004	-	-	-
Metribuzin	g/m³	< 0.00004	< 0.00004	-	-	-
Molinate	g/m³	< 0.00008	< 0.00008	-	-	-
Myclobutanil	g/m³	< 0.00004	< 0.00004	-	-	-
Naled	g/m³	< 0.0002	< 0.0002	-	-	-
Norflurazon	g/m³	< 0.00008	< 0.00008	-	-	-
Oxadiazon	g/m³	< 0.00004	< 0.00004	-	-	-
Oxyfluorfen	g/m³	< 0.00002	< 0.00002	-	-	-
Paclobutrazol	g/m³	< 0.00004	< 0.00004	-	-	-
Parathion-ethyl	g/m³	< 0.00004	< 0.00004	-	-	-
Parathion-methyl	g/m³	< 0.00004	< 0.00004	-	-	-
Pendimethalin	g/m³	< 0.00004	< 0.00004	-	-	-

Sample Type: Aqueous						
Sample Name:		GND0826 24-Nov-2017 10:45 am	GND2697 24-Nov-2017 9:25 am			
Lab Number:		1883660.1	1883660.2			
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Permethrin	g/m³	< 0.00002	< 0.00002	-	-	-
Pirimicarb	g/m³	< 0.00004	< 0.00004	-	-	-
Pirimiphos-methyl	g/m³	< 0.00004	< 0.00004	-	-	-
Prochloraz	g/m³	< 0.0002	< 0.0002	-	-	-
Procymidone	g/m³	< 0.00004	< 0.00004	-	-	-
Prometryn	g/m³	< 0.00002	< 0.00002	-	-	-
Propachlor	g/m³	< 0.00004	< 0.00004	-	-	-
Propanil	g/m³	< 0.0002	< 0.0002	-	-	-
Propazine	g/m³	< 0.00002	< 0.00002	-	-	-
Propiconazole	g/m³	< 0.00004	< 0.00004	-	-	-
Pyriproxyfen	g/m³	< 0.00004	< 0.00004	-	-	-
Quizalofop-ethyl	g/m³	< 0.00004	< 0.00004	-	-	-
Simazine	g/m³	< 0.00004	< 0.00004	-	-	-
Simetryn	g/m³	< 0.00004	< 0.00004	-	-	-
Sulfentrazone	g/m³	< 0.0002	< 0.0002	-	-	-
TCMTB [2-(thiocyanomethylthio) benzothiazole,Busan]	g/m³	< 0.00008	< 0.00008	-	-	-
Tebuconazole	g/m³	< 0.00004	< 0.00004	-	-	-
Terbacil	g/m³	< 0.00004	< 0.00004	-	-	-
Terbufos	g/m³	< 0.00004	< 0.00004	-	-	-
Terbumeton	g/m³	< 0.00004	< 0.00004	-	-	-
Terbuthylazine	g/m³	< 0.00002	< 0.00002	-	-	-
Terbuthylazine-desethyl	g/m³	< 0.00004	< 0.00004	-	-	-
Terbutryn	g/m³	< 0.00004	< 0.00004	-	-	-
Thiabendazole	g/m³	< 0.0002	< 0.0002	-	-	-
Thiobencarb	g/m³	< 0.00004	< 0.00004	-	-	-
Tolylfluanid	g/m³	< 0.00002	< 0.00002	-	-	-
Triazophos	g/m³	< 0.00004	< 0.00004	-	-	-
Trifluralin	g/m³	< 0.00004	< 0.00004	-	-	-
Vinclozolin	g/m³	< 0.00004	< 0.00004	-	-	-
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m³	< 0.0010	< 0.0010	-	-	-
Dissolved Cadmium	g/m³	< 0.00005	0.00005	-	-	-
Dissolved Chromium	g/m³	0.0023	0.0014	-	-	-
Dissolved Copper	g/m³	0.0017	< 0.0005	-	-	-
Dissolved Lead	g/m³	< 0.00010	< 0.00010	-	-	-
Dissolved Nickel	g/m³	< 0.0005	< 0.0005	-	-	-
Dissolved Zinc	g/m³	0.0053	0.0041	-	-	-
Gases in groundwater						
Ethane	g/m³	< 0.003	< 0.003	-	-	-
Ethylene	g/m³	< 0.003	< 0.003	-	-	-
Methane	g/m³	< 0.002	< 0.002	-	-	-
Haloethers Trace in SVOC Water Samples by GC-MS						
Bis(2-chloroethoxy) methane	g/m³	< 0.0005	< 0.0005	-	-	-
Bis(2-chloroethyl)ether	g/m³	< 0.0005	< 0.0005	-	-	-
Bis(2-chloroisopropyl)ether	g/m³	< 0.0005	< 0.0005	-	-	-
4-Bromophenyl phenyl ether	g/m³	< 0.0003	< 0.0003	-	-	-
4-Chlorophenyl phenyl ether	g/m³	< 0.0005	< 0.0005	-	-	-
Nitrogen containing compounds Trace in SVOC Water Samples, GC-MS						
2,4-Dinitrotoluene	g/m³	< 0.0010	< 0.0010	-	-	-
2,6-Dinitrotoluene	g/m³	< 0.0010	< 0.0010	-	-	-
Nitrobenzene	g/m³	< 0.0005	< 0.0005	-	-	-
N-Nitrosodi-n-propylamine	g/m³	< 0.0010	< 0.0010	-	-	-
N-Nitrosodiphenylamine + Diphenylamine	g/m3	< 0.0010	< 0.0010	-	-	-

Sample Type: Aqueous						
Sample Name:		GND0826 24-Nov-2017 10:45 am	GND2697 24-Nov-2017 9:25 am			
Lab Number:		1883660.1	1883660.2			
Organochlorine Pesticides Trace in SVOC Water Samples by GC-MS						
Aldrin	g/m³	< 0.0005	< 0.0005	-	-	-
alpha-BHC	g/m³	< 0.0005	< 0.0005	-	-	-
beta-BHC	g/m³	< 0.0005	< 0.0005	-	-	-
delta-BHC	g/m³	< 0.0005	< 0.0005	-	-	-
gamma-BHC (Lindane)	g/m³	< 0.0005	< 0.0005	-	-	-
4,4'-DDD	g/m³	< 0.0005	< 0.0005	-	-	-
4,4'-DDE	g/m³	< 0.0005	< 0.0005	-	-	-
4,4'-DDT	g/m³	< 0.0010	< 0.0010	-	-	-
Dieldrin	g/m³	< 0.0005	< 0.0005	-	-	-
Endosulfan I	g/m³	< 0.0010	< 0.0010	-	-	-
Endosulfan II	g/m³	< 0.0010	< 0.0010	-	-	-
Endosulfan sulfate	g/m³	< 0.0010	< 0.0010	-	-	-
Endrin	g/m³	< 0.0005	< 0.0005	-	-	-
Endrin ketone	g/m³	< 0.0010	< 0.0010	-	-	-
Heptachlor	g/m³	< 0.0005	< 0.0005	-	-	-
Heptachlor epoxide	g/m³	< 0.0005	< 0.0005	-	-	-
Hexachlorobenzene	g/m³	< 0.0005	< 0.0005	-	-	-
Polycyclic Aromatic Hydrocarbons Trace in SVOC Water Samples						
Acenaphthene	g/m³	< 0.0003	< 0.0003	-	-	-
Acenaphthylene	g/m³	< 0.0003	< 0.0003	-	-	-
Anthracene	g/m³	< 0.0003	< 0.0003	-	-	-
Benzo[a]anthracene	g/m³	< 0.0003	< 0.0003	-	-	-
Benzo[a]pyrene (BAP)	g/m³	< 0.0003	< 0.0003	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m³	< 0.0003	< 0.0003	-	-	-
Benzo[g,h,i]perylene	g/m³	< 0.0003	< 0.0003	-	-	-
Benzo[k]fluoranthene	g/m³	< 0.0003	< 0.0003	-	-	-
1&2-Chloronaphthalene	g/m³	< 0.0003	< 0.0003	-	-	-
Chrysene	g/m³	< 0.0003	< 0.0003	-	-	-
Dibenzo[a,h]anthracene	g/m³	< 0.0003	< 0.0003	-	-	-
Fluoranthene	g/m³	< 0.0003	< 0.0003	-	-	-
Fluorene	g/m³	< 0.0003	< 0.0003	-	-	-
Indeno(1,2,3-c,d)pyrene	g/m³	< 0.0003	< 0.0003	-	-	-
2-Methylnaphthalene	g/m³	< 0.0003	< 0.0003	-	-	-
Naphthalene	g/m³	< 0.0003	< 0.0003	-	-	-
Phenanthrene	g/m³	< 0.0003	< 0.0003	-	-	-
Pyrene	g/m³	< 0.0003	< 0.0003	-	-	-
Phenols Trace (drinkingwater) in SVOC Water Samples by GC-MS						
2-Chlorophenol	g/m³	< 0.0005	< 0.0005	-	-	-
2,4-Dichlorophenol	g/m³	< 0.0005	< 0.0005	-	-	-
2,4,6-Trichlorophenol	g/m³	< 0.0010	< 0.0010	-	-	-
Phenols Trace (non-drinkingwater) in SVOC Water Samples by GC-MS						
4-Chloro-3-methylphenol	g/m³	< 0.0010	< 0.0010	-	-	-
2,4-Dimethylphenol	g/m³	< 0.0005	< 0.0005	-	-	-
3 & 4-Methylphenol (m- + p-cresol)	g/m³	< 0.0010	< 0.0010	-	-	-
2-Methylphenol (o-Cresol)	g/m³	< 0.0005	< 0.0005	-	-	-
2-Nitrophenol	g/m³	< 0.0010	< 0.0010	-	-	-
Pentachlorophenol (PCP)	g/m³	< 0.010	< 0.010	-	-	-
Phenol	g/m³	< 0.0010	< 0.0010	-	-	-
2,4,5-Trichlorophenol	g/m³	< 0.0010	< 0.0010	-	-	-
Plasticisers Trace (non-drinkingwater) in SVOC Water by GCMS						
Butylbenzylphthalate	g/m³	< 0.0010	< 0.0010	-	-	-
Diethylphthalate	g/m³	< 0.0010	< 0.0010	-	-	-
Dimethylphthalate	g/m³	< 0.0010	< 0.0010	-	-	-

Sample Type: Aqueous						
Sample Name:		GND0826 24-Nov-2017 10:45 am	GND2697 24-Nov-2017 9:25 am			
Lab Number:		1883660.1	1883660.2			
Plasticisers Trace (non-drinkingwater) in SVOC Water by GCMS						
Di-n-butylphthalate	g/m³	< 0.0010	< 0.0010	-	-	-
Di-n-octylphthalate	g/m³	< 0.0010	< 0.0010	-	-	-
Plasticisers Trace (drinkingwater) in SVOC Water Samples by GCMS						
Bis(2-ethylhexyl)phthalate	g/m³	< 0.003	< 0.003	-	-	-
Di(2-ethylhexyl)adipate	g/m³	< 0.0010	< 0.0010	-	-	-
Other Halogenated compounds Trace (drinkingwater) in SVOC Water						
1,2-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	-	-	-
1,3-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	-	-	-
1,4-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	-	-	-
Other Halogenated compounds Trace (non-drinkingwater) in SVOC						
Hexachlorobutadiene	g/m³	< 0.0005	< 0.0005	-	-	-
Hexachloroethane	g/m³	< 0.0005	< 0.0005	-	-	-
1,2,4-Trichlorobenzene	g/m³	< 0.0005	< 0.0005	-	-	-
Other SVOC Trace in SVOC Water Samples by GC-MS						
Benzyl alcohol	g/m³	< 0.005	< 0.005	-	-	-
Carbazole	g/m³	< 0.0005	< 0.0005	-	-	-
Dibenzofuran	g/m³	< 0.0005	< 0.0005	-	-	-
Isophorone	g/m³	< 0.0005	< 0.0005	-	-	-
BTEX in VOC Water by Headspace GC-MS						
Benzene	g/m³	< 0.0003	< 0.0003	-	-	-
Ethylbenzene	g/m³	< 0.0005	< 0.0005	-	-	-
Toluene	g/m³	< 0.0003	0.0003	-	-	-
m&p-Xylene	g/m³	< 0.0005	< 0.0005	-	-	-
o-Xylene	g/m³	< 0.0003	< 0.0003	-	-	-
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
Bromomethane (Methyl Bromide)	g/m³	< 0.0003	< 0.0003	-	-	-
Carbon tetrachloride	g/m³	< 0.0003	< 0.0003	-	-	-
Chloroethane	g/m³	< 0.0003	< 0.0003	-	-	-
Chloromethane	g/m³	< 0.0003	< 0.0003	-	-	-
1,2-Dibromo-3-chloropropane	g/m³	< 0.0005	< 0.0005	-	-	-
1,2-Dibromoethane (ethylene dibromide, EDB)	g/m³	< 0.0003	< 0.0003	-	-	-
Dibromomethane	g/m³	< 0.0003	< 0.0003	-	-	-
Dichlorodifluoromethane	g/m³	< 0.0005	< 0.0005	-	-	-
1,1-Dichloroethane	g/m³	< 0.0003	< 0.0003	-	-	-
1,2-Dichloroethane	g/m³	< 0.0003	< 0.0003	-	-	-
1,1-Dichloroethene	g/m³	< 0.0003	< 0.0003	-	-	-
cis-1,2-Dichloroethene	g/m³	< 0.0003	< 0.0003	-	-	-
trans-1,2-Dichloroethene	g/m³	< 0.0003	< 0.0003	-	-	-
Dichloromethane (methylene chloride)	g/m³	< 0.0010	< 0.0010	-	-	-
1,2-Dichloropropane	g/m³	< 0.0003	< 0.0003	-	-	-
1,3-Dichloropropane	g/m³	< 0.0003	< 0.0003	-	-	-
1,1-Dichloropropene	g/m³	< 0.0003	< 0.0003	-	-	-
cis-1,3-Dichloropropene	g/m³	< 0.0005	< 0.0005	-	-	-
trans-1,3-Dichloropropene	g/m³	< 0.0005	< 0.0005	-	-	-
Hexachlorobutadiene	g/m³	< 0.0003	< 0.0003	-	-	-
1,1,1,2-Tetrachloroethane	g/m³	< 0.0003	< 0.0003	-	-	-
1,1,2,2-Tetrachloroethane	g/m³	< 0.0003	< 0.0003	-	-	-
Tetrachloroethene (tetrachloroethylene)	g/m³	< 0.0003	< 0.0003	-	-	-
1,1,1-Trichloroethane	g/m³	< 0.0003	< 0.0003	-	-	-
1,1,2-Trichloroethane	g/m³	< 0.0003	< 0.0003	-	-	-
Trichloroethene (trichloroethylene)	g/m³	< 0.0003	< 0.0003	-	-	-
Trichlorofluoromethane	g/m³	< 0.0003	< 0.0003	-	-	-
1,2,3-Trichloropropane	g/m³	< 0.0005	< 0.0005	-	-	-

Sample Type: Aqueous						
Sample Name:		GND0826 24-Nov-2017 10:45 am	GND2697 24-Nov-2017 9:25 am			
Lab Number:		1883660.1	1883660.2			
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
1,1,2-Trichlorotrifluoroethane (Freon 113)	g/m³	< 0.0003	< 0.0003	-	-	-
Vinyl chloride	g/m³	< 0.0003	< 0.0003	-	-	-
Halogenated Aromatics in VOC Water by Headspace GC-MS						
Chlorobenzene (monochlorobenzene)	g/m³	< 0.0003	< 0.0003	-	-	-
1,2-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	-	-	-
1,3-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	-	-	-
1,4-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	-	-	-
1,2,3-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	-	-	-
1,2,4-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	-	-	-
1,3,5-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	-	-	-
Bromobenzene	g/m³	< 0.0003	< 0.0003	-	-	-
2-Chlorotoluene	g/m³	< 0.0003	< 0.0003	-	-	-
4-Chlorotoluene	g/m³	< 0.0003	< 0.0003	-	-	-
Monoaromatic Hydrocarbons in VOC Water by Headspace GC-MS						
n-Butylbenzene	g/m³	< 0.0005	< 0.0005	-	-	-
tert-Butylbenzene	g/m³	< 0.0003	< 0.0003	-	-	-
4-Isopropyltoluene (p-Cymene)	g/m³	< 0.0005	< 0.0005	-	-	-
Isopropylbenzene (Cumene)	g/m³	< 0.0003	< 0.0003	-	-	-
n-Propylbenzene	g/m³	< 0.0005	< 0.0005	-	-	-
sec-Butylbenzene	g/m³	< 0.0003	< 0.0003	-	-	-
Styrene	g/m³	< 0.0005	< 0.0005	-	-	-
1,2,4-Trimethylbenzene	g/m³	< 0.0003	< 0.0003	-	-	-
1,3,5-Trimethylbenzene	g/m³	< 0.0003	< 0.0003	-	-	-
Ketones in VOC Water by Headspace GC-MS						
Acetone	g/m³	< 0.05	< 0.05	-	-	-
2-Butanone (MEK)	g/m³	< 0.05	< 0.05	-	-	-
Methyl tert-butylether (MTBE)	g/m³	< 0.0003	< 0.0003	-	-	-
4-Methylpentan-2-one (MIBK)	g/m³	< 0.010	< 0.010	-	-	-
Trihalomethanes in VOC Water by Headspace GC-MS						
Bromodichloromethane	g/m³	< 0.0003	< 0.0003	-	-	-
Bromoform (tribromomethane)	g/m³	< 0.0005	< 0.0005	-	-	-
Chloroform (Trichloromethane)	g/m³	< 0.0003	< 0.0003	-	-	-
Dibromochloromethane	g/m³	< 0.0003	< 0.0003	-	-	-
Other VOC in Water by Headspace GC-MS						
Carbon disulphide	g/m³	< 0.00010	< 0.00010	-	-	-
Naphthalene	g/m³	< 0.0005	< 0.0005	-	-	-

Analyst's Comments

#1 It has been noted that the result for Dissolved Reactive Phosphorus was greater than that for Total Phosphorus, but within the analytical variation of these 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.

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS	Liquid/liquid extraction, GPC (if required), GCMS analysis	-	1-2
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	1-2
Gases in groundwater	Manual headspace creation and sub-sampling, GC-FID analysis.	0.002 - 0.003 g/m³	1-2
Semivolatile Organic Compounds Trace in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	-	1-2

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Volatile Organic Compounds Trace in Water by Headspace GC-MS	Headspace, GC-MS SIM analysis [KBIs:37857,37921]	0.00010 - 0.05 g/m^3	1-2
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-2
Total Kjeldahl Digestion	Sulphuric acid digestion with copper sulphate catalyst.	-	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
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.	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 Dissolved Solids (TDS)	Filtration through GF/C (1.2 µm), gravimetric. APHA 2540 C (modified; drying temperature of 103 - 105°C used rather than 180 ± 2°C) 22nd ed. 2012.	10 g/m^3	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
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.003 g/m^3	1-2
Dissolved Boron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.005 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
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 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
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0005 g/m^3	1-2
Dissolved Mercury	0.45µm filtration, bromine oxidation followed by atomic fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 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
Dissolved Selenium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0010 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
Chloride	Filtered sample. Ferric thiocyanate colorimetry. Discrete Analyser. APHA 4500 Cl^- E (modified from continuous flow analysis) 22nd ed. 2012.	0.5 g/m^3	1-2
Fluoride	Direct measurement, ion selective electrode. APHA 4500-F^- C 22nd ed. 2012.	0.05 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 Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-N_{org} D. (modified) 4500 NH_3 F (modified) 22nd ed. 2012.	0.10 g/m^3	1-2
Dissolved Reactive Phosphorus	Filtered sample. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified). 22nd ed. 2012.	0.004 g/m^3	1-2
Phosphate from DRP	Calculation: from Dissolved Reactive Phosphorus * 3.065.	0.004 g/m^3	1-2

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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
Reactive Silica	Filtered sample. Heteropoly blue colorimetry. Discrete analyser. APHA 4500-SiO_2 F (modified from flow injection analysis) 22nd ed. 2012.	0.10 g/m^3 as SiO_2	1-2
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B 22nd ed. 2012.	0.5 g/m^3	1-2
Total Organic Carbon (TOC)	Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) 22nd ed. 2012.	0.5 g/m^3	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

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ANALYSIS REPORT

Client:	Taranaki Regional Council	**Lab No:**	1889410 SPv1
Contact:	L Smith	**Date Received:**	05-Dec-2017
	C/- Taranaki Regional Council	**Date Reported:**	19-Dec-2017
	Private Bag 713	**Quote No:**	83292
	Stratford 4352	**Order No:**	
		Client Reference:	Eltham central landfill groundwaters
		Submitted By:	David Olson

Sample Type: Aqueous

Sample Name:		GND2691 04-Dec-2017 11:00 am				
Lab Number:		1889410.1				
Individual Tests						
Sum of Anions	meq/L	2.0	-	-	-	-
Sum of Cations	meq/L	1.91	-	-	-	-
pH	pH Units	6.9	-	-	-	-
Total Alkalinity	g/m³ as $CaCO_3$	40	-	-	-	-
Bicarbonate	g/m³ at 25°C	49	-	-	-	-
Total Hardness	g/m³ as $CaCO_3$	62	-	-	-	-
Electrical Conductivity (EC)	mS/m	22.0	-	-	-	-
Total Dissolved Solids (TDS)	g/m³	161	-	-	-	-
Dissolved Aluminium	g/m³	0.004	-	-	-	-
Dissolved Boron	g/m³	0.019	-	-	-	-
Dissolved Calcium	g/m³	13.8	-	-	-	-
Dissolved Iron	g/m³	< 0.02	-	-	-	-
Dissolved Magnesium	g/m³	6.8	-	-	-	-
Dissolved Manganese	g/m³	0.0046	-	-	-	-
Dissolved Mercury	g/m³	< 0.00008	-	-	-	-
Dissolved Potassium	g/m³	2.3	-	-	-	-
Dissolved Selenium	g/m³	< 0.0010	-	-	-	-
Dissolved Sodium	g/m³	14.0	-	-	-	-
Chloride	g/m³	26	-	-	-	-
Fluoride	g/m³	0.08	-	-	-	-
Nitrite-N	g/m³	< 0.002	-	-	-	-
Nitrate-N	g/m³	1.41	-	-	-	-
Nitrate-N + Nitrite-N	g/m³	1.41	-	-	-	-
Total Kjeldahl Nitrogen (TKN)	g/m³	0.10	-	-	-	-
Dissolved Reactive Phosphorus	g/m³	0.009	-	-	-	-
Phosphate	g/m³	0.028	-	-	-	-
Total Phosphorus	g/m³	0.019	-	-	-	-
Reactive Silica	g/m³ as SiO_2	39	-	-	-	-
Sulphate	g/m³	18.8	-	-	-	-
Total Organic Carbon (TOC)	g/m³	0.5	-	-	-	-
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Acetochlor	g/m³	< 0.00004	-	-	-	-
Alachlor	g/m³	< 0.00004	-	-	-	-
Atrazine	g/m³	< 0.00004	-	-	-	-
Atrazine-desethyl	g/m³	< 0.00004	-	-	-	-
Atrazine-desisopropyl	g/m³	< 0.00008	-	-	-	-
Azaconazole	g/m³	< 0.00002	-	-	-	-

Sample Type: Aqueous						
Sample Name:		GND2691 04-Dec-2017 11:00 am				
Lab Number:		1889410.1				
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Azinphos-methyl	g/m³	< 0.00008	-	-	-	-
Benalaxyl	g/m³	< 0.00002	-	-	-	-
Bitertanol	g/m³	< 0.00008	-	-	-	-
Bromacil	g/m³	< 0.00004	-	-	-	-
Bromopropylate	g/m³	< 0.00004	-	-	-	-
Butachlor	g/m³	< 0.00004	-	-	-	-
Captan	g/m³	< 0.00008	-	-	-	-
Carbaryl	g/m³	< 0.00004	-	-	-	-
Carbofenothion	g/m³	< 0.00004	-	-	-	-
Carbofuran	g/m³	< 0.00004	-	-	-	-
Chlorfluazuron	g/m³	< 0.00004	-	-	-	-
Chlorothalonil	g/m³	< 0.00004	-	-	-	-
Chlorpyrifos	g/m³	< 0.00004	-	-	-	-
Chlorpyrifos-methyl	g/m³	< 0.00004	-	-	-	-
Chlortoluron	g/m³	< 0.00008	-	-	-	-
Cyanazine	g/m³	< 0.00004	-	-	-	-
Cyfluthrin	g/m³	< 0.00004	-	-	-	-
Cyhalothrin	g/m³	< 0.00004	-	-	-	-
Cypermethrin	g/m³	< 0.00008	-	-	-	-
Deltamethrin (including Tralomethrin)	g/m³	< 0.00006	-	-	-	-
Diazinon	g/m³	< 0.00002	-	-	-	-
Dichlofluanid	g/m³	< 0.00004	-	-	-	-
Dichloran	g/m³	< 0.0002	-	-	-	-
Dichlorvos	g/m³	< 0.00008	-	-	-	-
Difenoconazole	g/m³	< 0.00008	-	-	-	-
Dimethoate	g/m³	< 0.00008	-	-	-	-
Diphenylamine	g/m³	< 0.00008	-	-	-	-
Diuron	g/m³	< 0.00004	-	-	-	-
Fenpropimorph	g/m³	< 0.00004	-	-	-	-
Fluazifop-butyl	g/m³	< 0.00004	-	-	-	-
Fluometuron	g/m³	< 0.00004	-	-	-	-
Flusilazole	g/m³	< 0.00004	-	-	-	-
Fluvalinate	g/m³	< 0.00004	-	-	-	-
Furalaxyl	g/m³	< 0.00002	-	-	-	-
Haloxyfop-methyl	g/m³	< 0.00004	-	-	-	-
Hexaconazole	g/m³	< 0.00004	-	-	-	-
Hexazinone	g/m³	< 0.00002	-	-	-	-
IPBC (3-Iodo-2-propynyl-n-butylcarbamate)	g/m³	< 0.0002	-	-	-	-
Kresoxim-methyl	g/m³	< 0.00002	-	-	-	-
Linuron	g/m³	< 0.00005	-	-	-	-
Malathion	g/m³	< 0.00004	-	-	-	-
Metalaxyl	g/m³	< 0.00004	-	-	-	-
Metolachlor	g/m³	< 0.00004	-	-	-	-
Metribuzin	g/m³	< 0.00004	-	-	-	-
Molinate	g/m³	< 0.00008	-	-	-	-
Myclobutanil	g/m³	< 0.00004	-	-	-	-
Naled	g/m³	< 0.0002	-	-	-	-
Norflurazon	g/m³	< 0.00008	-	-	-	-
Oxadiazon	g/m³	< 0.00004	-	-	-	-
Oxyfluorfen	g/m³	< 0.00002	-	-	-	-
Paclobutrazol	g/m³	< 0.00004	-	-	-	-
Parathion-ethyl	g/m³	< 0.00004	-	-	-	-
Parathion-methyl	g/m³	< 0.00004	-	-	-	-
Pendimethalin	g/m³	< 0.00004	-	-	-	-

Sample Type: Aqueous						
Sample Name:	GND2691 04-Dec-2017 11:00 am					
Lab Number:	1889410.1					
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Permethrin	g/m³	< 0.00002	-	-	-	-
Pirimicarb	g/m³	< 0.00004	-	-	-	-
Pirimiphos-methyl	g/m³	< 0.00004	-	-	-	-
Prochloraz	g/m³	< 0.0002	-	-	-	-
Procymidone	g/m³	< 0.00004	-	-	-	-
Prometryn	g/m³	< 0.00002	-	-	-	-
Propachlor	g/m³	< 0.00004	-	-	-	-
Propanil	g/m³	< 0.0002	-	-	-	-
Propazine	g/m³	< 0.00002	-	-	-	-
Propiconazole	g/m³	< 0.00004	-	-	-	-
Pyriproxyfen	g/m³	< 0.00004	-	-	-	-
Quizalofop-ethyl	g/m³	< 0.00004	-	-	-	-
Simazine	g/m³	< 0.00004	-	-	-	-
Simetryn	g/m³	< 0.00004	-	-	-	-
Sulfentrazone	g/m³	< 0.0002	-	-	-	-
TCMTB [2-(thiocyanomethylthio) benzothiazole,Busan]	g/m³	< 0.00008	-	-	-	-
Tebuconazole	g/m³	< 0.00004	-	-	-	-
Terbacil	g/m³	< 0.00004	-	-	-	-
Terbufos	g/m³	< 0.00004	-	-	-	-
Terbumeton	g/m³	< 0.00004	-	-	-	-
Terbuthylazine	g/m³	< 0.00002	-	-	-	-
Terbuthylazine-desethyl	g/m³	< 0.00004	-	-	-	-
Terbutryn	g/m³	< 0.00004	-	-	-	-
Thiabendazole	g/m³	< 0.0002	-	-	-	-
Thiobencarb	g/m³	< 0.00004	-	-	-	-
Tolylfluanid	g/m³	< 0.00002	-	-	-	-
Triazophos	g/m³	< 0.00004	-	-	-	-
Trifluralin	g/m³	< 0.00004	-	-	-	-
Vinclozolin	g/m³	< 0.00004	-	-	-	-
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m³	< 0.0010	-	-	-	-
Dissolved Cadmium	g/m³	< 0.00005	-	-	-	-
Dissolved Chromium	g/m³	0.0011	-	-	-	-
Dissolved Copper	g/m³	< 0.0005	-	-	-	-
Dissolved Lead	g/m³	< 0.00010	-	-	-	-
Dissolved Nickel	g/m³	0.0005	-	-	-	-
Dissolved Zinc	g/m³	0.0057	-	-	-	-
Gases in groundwater						
Ethane	g/m³	< 0.003	-	-	-	-
Ethylene	g/m³	< 0.004	-	-	-	-
Methane	g/m³	< 0.002	-	-	-	-
Haloethers Trace in SVOC Water Samples by GC-MS						
Bis(2-chloroethoxy) methane	g/m³	< 0.0005	-	-	-	-
Bis(2-chloroethyl)ether	g/m³	< 0.0005	-	-	-	-
Bis(2-chloroisopropyl)ether	g/m³	< 0.0005	-	-	-	-
4-Bromophenyl phenyl ether	g/m³	< 0.0003	-	-	-	-
4-Chlorophenyl phenyl ether	g/m³	< 0.0005	-	-	-	-
Nitrogen containing compounds Trace in SVOC Water Samples, GC-MS						
2,4-Dinitrotoluene	g/m³	< 0.0010	-	-	-	-
2,6-Dinitrotoluene	g/m³	< 0.0010	-	-	-	-
Nitrobenzene	g/m³	< 0.0005	-	-	-	-
N-Nitrosodi-n-propylamine	g/m³	< 0.0010	-	-	-	-
N-Nitrosodiphenylamine + Diphenylamine	g/m3	< 0.0010	-	-	-	-

Sample Type: Aqueous						
Sample Name:		GND2691 04-Dec-2017 11:00 am				
Lab Number:		1889410.1				
Organochlorine Pesticides Trace in SVOC Water Samples by GC-MS						
Aldrin	g/m³	< 0.0005	-	-	-	-
alpha-BHC	g/m³	< 0.0005	-	-	-	-
beta-BHC	g/m³	< 0.0005	-	-	-	-
delta-BHC	g/m³	< 0.0005	-	-	-	-
gamma-BHC (Lindane)	g/m³	< 0.0005	-	-	-	-
4,4'-DDD	g/m³	< 0.0005	-	-	-	-
4,4'-DDE	g/m³	< 0.0005	-	-	-	-
4,4'-DDT	g/m³	< 0.0010	-	-	-	-
Dieldrin	g/m³	< 0.0005	-	-	-	-
Endosulfan I	g/m³	< 0.0010	-	-	-	-
Endosulfan II	g/m³	< 0.0010	-	-	-	-
Endosulfan sulfate	g/m³	< 0.0010	-	-	-	-
Endrin	g/m³	< 0.0005	-	-	-	-
Endrin ketone	g/m³	< 0.0010	-	-	-	-
Heptachlor	g/m³	< 0.0005	-	-	-	-
Heptachlor epoxide	g/m³	< 0.0005	-	-	-	-
Hexachlorobenzene	g/m³	< 0.0005	-	-	-	-
Polycyclic Aromatic Hydrocarbons Trace in SVOC Water Samples						
Acenaphthene	g/m³	< 0.0003	-	-	-	-
Acenaphthylene	g/m³	< 0.0003	-	-	-	-
Anthracene	g/m³	< 0.0003	-	-	-	-
Benzo[a]anthracene	g/m³	< 0.0003	-	-	-	-
Benzo[a]pyrene (BAP)	g/m³	< 0.0003	-	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m³	< 0.0003	-	-	-	-
Benzo[g,h,i]perylene	g/m³	< 0.0003	-	-	-	-
Benzo[k]fluoranthene	g/m³	< 0.0003	-	-	-	-
1&2-Chloronaphthalene	g/m³	< 0.0003	-	-	-	-
Chrysene	g/m³	< 0.0003	-	-	-	-
Dibenzo[a,h]anthracene	g/m³	< 0.0003	-	-	-	-
Fluoranthene	g/m³	< 0.0003	-	-	-	-
Fluorene	g/m³	< 0.0003	-	-	-	-
Indeno(1,2,3-c,d)pyrene	g/m³	< 0.0003	-	-	-	-
2-Methylnaphthalene	g/m³	< 0.0003	-	-	-	-
Naphthalene	g/m³	< 0.0003	-	-	-	-
Phenanthrene	g/m³	< 0.0003	-	-	-	-
Pyrene	g/m³	< 0.0003	-	-	-	-
Phenols Trace (drinkingwater) in SVOC Water Samples by GC-MS						
2-Chlorophenol	g/m³	< 0.0005	-	-	-	-
2,4-Dichlorophenol	g/m³	< 0.0005	-	-	-	-
2,4,6-Trichlorophenol	g/m³	< 0.0010	-	-	-	-
Phenols Trace (non-drinkingwater) in SVOC Water Samples by GC-MS						
4-Chloro-3-methylphenol	g/m³	< 0.0010	-	-	-	-
2,4-Dimethylphenol	g/m³	< 0.0005	-	-	-	-
3 & 4-Methylphenol (m- + p-cresol)	g/m³	< 0.0010	-	-	-	-
2-Methylphenol (o-Cresol)	g/m³	< 0.0005	-	-	-	-
2-Nitrophenol	g/m³	< 0.0010	-	-	-	-
Pentachlorophenol (PCP)	g/m³	< 0.010	-	-	-	-
Phenol	g/m³	< 0.0010	-	-	-	-
2,4,5-Trichlorophenol	g/m³	< 0.0010	-	-	-	-
Plasticisers Trace (non-drinkingwater) in SVOC Water by GCMS						
Butylbenzylphthalate	g/m³	< 0.0010	-	-	-	-
Diethylphthalate	g/m³	< 0.0010	-	-	-	-
Dimethylphthalate	g/m³	< 0.0010	-	-	-	-

Sample Type: Aqueous						
Sample Name:		GND2691 04-Dec-2017 11:00 am				
Lab Number:		1889410.1				
Plasticisers Trace (non-drinkingwater) in SVOC Water by GCMS						
Di-n-butylphthalate	g/m³	< 0.0010	-	-	-	-
Di-n-octylphthalate	g/m³	< 0.0010	-	-	-	-
Plasticisers Trace (drinkingwater) in SVOC Water Samples by GCMS						
Bis(2-ethylhexyl)phthalate	g/m³	< 0.003	-	-	-	-
Di(2-ethylhexyl)adipate	g/m³	< 0.0010	-	-	-	-
Other Halogenated compounds Trace (drinkingwater) in SVOC Water						
1,2-Dichlorobenzene	g/m³	< 0.0005	-	-	-	-
1,3-Dichlorobenzene	g/m³	< 0.0005	-	-	-	-
1,4-Dichlorobenzene	g/m³	< 0.0005	-	-	-	-
Other Halogenated compounds Trace (non-drinkingwater) in SVOC						
Hexachlorobutadiene	g/m³	< 0.0005	-	-	-	-
Hexachloroethane	g/m³	< 0.0005	-	-	-	-
1,2,4-Trichlorobenzene	g/m³	< 0.0005	-	-	-	-
Other SVOC Trace in SVOC Water Samples by GC-MS						
Benzyl alcohol	g/m³	< 0.005	-	-	-	-
Carbazole	g/m³	< 0.0005	-	-	-	-
Dibenzofuran	g/m³	< 0.0005	-	-	-	-
Isophorone	g/m³	< 0.0005	-	-	-	-
BTEX in VOC Water by Headspace GC-MS						
Benzene	g/m³	< 0.0003	-	-	-	-
Ethylbenzene	g/m³	< 0.0005	-	-	-	-
Toluene	g/m³	0.0014 #1	-	-	-	-
m&p-Xylene	g/m³	< 0.0005	-	-	-	-
o-Xylene	g/m³	< 0.0003	-	-	-	-
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
Bromomethane (Methyl Bromide)	g/m³	< 0.0003	-	-	-	-
Carbon tetrachloride	g/m³	< 0.0003	-	-	-	-
Chloroethane	g/m³	< 0.0003	-	-	-	-
Chloromethane	g/m³	< 0.0003	-	-	-	-
1,2-Dibromo-3-chloropropane	g/m³	< 0.0003	-	-	-	-
1,2-Dibromoethane (ethylene dibromide, EDB)	g/m³	< 0.0003	-	-	-	-
Dibromomethane	g/m³	< 0.0003	-	-	-	-
Dichlorodifluoromethane	g/m³	< 0.0003	-	-	-	-
1,1-Dichloroethane	g/m³	< 0.0003	-	-	-	-
1,2-Dichloroethane	g/m³	< 0.0003	-	-	-	-
1,1-Dichloroethene	g/m³	< 0.0003	-	-	-	-
cis-1,2-Dichloroethene	g/m³	< 0.0003	-	-	-	-
trans-1,2-Dichloroethene	g/m³	< 0.0003	-	-	-	-
Dichloromethane (methylene chloride)	g/m³	< 0.0003	-	-	-	-
1,2-Dichloropropane	g/m³	< 0.0003	-	-	-	-
1,3-Dichloropropane	g/m³	< 0.0003	-	-	-	-
1,1-Dichloropropene	g/m³	< 0.0003	-	-	-	-
cis-1,3-Dichloropropene	g/m³	< 0.0005	-	-	-	-
trans-1,3-Dichloropropene	g/m³	< 0.0005	-	-	-	-
Hexachlorobutadiene	g/m³	< 0.0003	-	-	-	-
1,1,1,2-Tetrachloroethane	g/m³	< 0.0003	-	-	-	-
1,1,2,2-Tetrachloroethane	g/m³	< 0.0003	-	-	-	-
Tetrachloroethene (tetrachloroethylene)	g/m³	< 0.0003	-	-	-	-
1,1,1-Trichloroethane	g/m³	< 0.0003	-	-	-	-
1,1,2-Trichloroethane	g/m³	< 0.0003	-	-	-	-
Trichloroethene (trichloroethylene)	g/m³	< 0.0003	-	-	-	-
Trichlorofluoromethane	g/m³	< 0.0003	-	-	-	-
1,2,3-Trichloropropane	g/m³	< 0.0003	-	-	-	-

Sample Type: Aqueous						
Sample Name:		GND2691 04-Dec-2017 11:00 am				
Lab Number:		1889410.1				
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
1,1,2-Trichlorotrifluoroethane (Freon 113)	g/m³	< 0.0003	-	-	-	-
Vinyl chloride	g/m³	< 0.0003	-	-	-	-
Halogenated Aromatics in VOC Water by Headspace GC-MS						
Chlorobenzene (monochlorobenzene)	g/m³	< 0.0003	-	-	-	-
1,2-Dichlorobenzene	g/m³	< 0.0003	-	-	-	-
1,3-Dichlorobenzene	g/m³	< 0.0003	-	-	-	-
1,4-Dichlorobenzene	g/m³	< 0.0003	-	-	-	-
1,2,3-Trichlorobenzene	g/m³	< 0.0003	-	-	-	-
1,2,4-Trichlorobenzene	g/m³	< 0.0003	-	-	-	-
1,3,5-Trichlorobenzene	g/m³	< 0.0003	-	-	-	-
Bromobenzene	g/m³	< 0.0003	-	-	-	-
2-Chlorotoluene	g/m³	< 0.0003	-	-	-	-
4-Chlorotoluene	g/m³	< 0.0003	-	-	-	-
Monoaromatic Hydrocarbons in VOC Water by Headspace GC-MS						
n-Butylbenzene	g/m³	< 0.0005	-	-	-	-
tert-Butylbenzene	g/m³	< 0.0003	-	-	-	-
4-Isopropyltoluene (p-Cymene)	g/m³	< 0.0005	-	-	-	-
Isopropylbenzene (Cumene)	g/m³	< 0.0003	-	-	-	-
n-Propylbenzene	g/m³	< 0.0005	-	-	-	-
sec-Butylbenzene	g/m³	< 0.0003	-	-	-	-
Styrene	g/m³	< 0.0005	-	-	-	-
1,2,4-Trimethylbenzene	g/m³	< 0.0003	-	-	-	-
1,3,5-Trimethylbenzene	g/m³	< 0.0003	-	-	-	-
Ketones in VOC Water by Headspace GC-MS						
Acetone	g/m³	< 0.05	-	-	-	-
2-Butanone (MEK)	g/m³	< 0.05	-	-	-	-
Methyl tert-butylether (MTBE)	g/m³	< 0.0003	-	-	-	-
4-Methylpentan-2-one (MIBK)	g/m³	< 0.010	-	-	-	-
Trihalomethanes in VOC Water by Headspace GC-MS						
Bromodichloromethane	g/m³	< 0.0003	-	-	-	-
Bromoform (tribromomethane)	g/m³	< 0.0003	-	-	-	-
Chloroform (Trichloromethane)	g/m³	< 0.0003	-	-	-	-
Dibromochloromethane	g/m³	< 0.0003	-	-	-	-
Other VOC in Water by Headspace GC-MS						
Carbon disulphide	g/m³	< 0.00010	-	-	-	-
Naphthalene	g/m³	< 0.0005	-	-	-	-

Analyst's Comments

#1 Confirmed by re-analysis.

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.

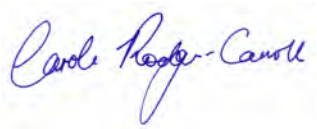
Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS	Liquid/liquid extraction, GPC (if required), GCMS analysis	-	1
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn	0.45µm filtration, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.00005 - 0.0010 g/m³	1
Gases in groundwater	Manual headspace creation and sub-sampling, GC-FID analysis.	0.002 - 0.003 g/m³	1
Semivolatile Organic Compounds Trace in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	-	1
Volatile Organic Compounds Trace in Water by Headspace GC-MS	Headspace, GC-MS SIM analysis [KBIs:37857,37921]	0.00010 - 0.05 g/m³	1

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1
Total Kjeldahl Digestion	Sulphuric acid digestion with copper sulphate catalyst.	-	1
Total Phosphorus Digestion	Acid persulphate digestion.	-	1
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
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
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.	0.1 pH Units	1
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
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
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m³ as $CaCO_3$	1
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1
Total Dissolved Solids (TDS)	Filtration through GF/C (1.2 µm), gravimetric. APHA 2540 C (modified; drying temperature of 103 - 105°C used rather than 180 ± 2°C) 22nd ed. 2012.	10 g/m³	1
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 22nd ed. 2012.	-	1
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.003 g/m³	1
Dissolved Boron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.005 g/m³	1
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0005 g/m³	1
Dissolved Mercury	0.45µm filtration, bromine oxidation followed by atomic fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m³	1
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1
Dissolved Selenium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0010 g/m³	1
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1
Chloride	Filtered sample. Ferric thiocyanate colorimetry. Discrete Analyser. APHA 4500 Cl^- E (modified from continuous flow analysis) 22nd ed. 2012.	0.5 g/m³	1
Fluoride	Direct measurement, ion selective electrode. APHA 4500-F^- C 22nd ed. 2012.	0.05 g/m³	1
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m³	1
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
Total Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-N_{org} D. (modified) 4500 NH_3 F (modified) 22nd ed. 2012.	0.10 g/m³	1
Dissolved Reactive Phosphorus	Filtered sample. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified). 22nd ed. 2012.	0.004 g/m³	1
Phosphate from DRP	Calculation: from Dissolved Reactive Phosphorus * 3.065.	0.004 g/m³	1

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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
Reactive Silica	Filtered sample. Heteropoly blue colorimetry. Discrete analyser. APHA 4500-SiO_2 F (modified from flow injection analysis) 22nd ed. 2012.	0.10 g/m^3 as SiO_2	1
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B 22nd ed. 2012.	0.5 g/m^3	1
Total Organic Carbon (TOC)	Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) 22nd ed. 2012.	0.5 g/m^3	1

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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ANALYSIS REPORT

Client:	Taranaki Regional Council	**Lab No:**	1893172 SPv1
Contact:	L Smith	**Date Received:**	09-Dec-2017
	C/- Taranaki Regional Council	**Date Reported:**	27-Dec-2017
	Private Bag 713	**Quote No:**	83292
	Stratford 4352	**Order No:**	
		Client Reference:	Eltham central landfill groundwaters
		Submitted By:	David Olson

Sample Type: Aqueous

Sample Name:		GND0599 08-Dec-2017 12:55 pm				
Lab Number:		1893172.1				
Individual Tests						
Sum of Anions	meq/L	3.6	-	-	-	-
Sum of Cations	meq/L	3.9	-	-	-	-
pH	pH Units	8.2	-	-	-	-
Total Alkalinity	g/m³ as $CaCO_3$	94	-	-	-	-
Bicarbonate	g/m³ at 25°C	113	-	-	-	-
Total Hardness	g/m³ as $CaCO_3$	152	-	-	-	-
Electrical Conductivity (EC)	mS/m	38.5	-	-	-	-
Total Dissolved Solids (TDS)	g/m³	250	-	-	-	-
Dissolved Aluminium	g/m³	0.004	-	-	-	-
Dissolved Boron	g/m³	0.021	-	-	-	-
Dissolved Calcium	g/m³	31	-	-	-	-
Dissolved Iron	g/m³	< 0.02	-	-	-	-
Dissolved Magnesium	g/m³	18.3	-	-	-	-
Dissolved Manganese	g/m³	0.095	-	-	-	-
Dissolved Mercury	g/m³	< 0.00008	-	-	-	-
Dissolved Potassium	g/m³	4.0	-	-	-	-
Dissolved Selenium	g/m³	< 0.0010	-	-	-	-
Dissolved Sodium	g/m³	17.8	-	-	-	-
Chloride	g/m³	57	-	-	-	-
Fluoride	g/m³	0.16	-	-	-	-
Nitrite-N	g/m³	0.069	-	-	-	-
Nitrate-N	g/m³	0.129	-	-	-	-
Nitrate-N + Nitrite-N	g/m³	0.198	-	-	-	-
Total Kjeldahl Nitrogen (TKN)	g/m³	0.64	-	-	-	-
Dissolved Reactive Phosphorus	g/m³	0.198	-	-	-	-
Phosphate	g/m³	0.61	-	-	-	-
Total Phosphorus	g/m³	0.22	-	-	-	-
Reactive Silica	g/m³ as SiO_2	40	-	-	-	-
Sulphate	g/m³	6.6	-	-	-	-
Total Organic Carbon (TOC)	g/m³	1.4	-	-	-	-
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Acetochlor	g/m³	< 0.00004	-	-	-	-
Alachlor	g/m³	< 0.00004	-	-	-	-
Atrazine	g/m³	< 0.00004	-	-	-	-
Atrazine-desethyl	g/m³	< 0.00004	-	-	-	-
Atrazine-desisopropyl	g/m³	< 0.00008	-	-	-	-
Azaconazole	g/m³	< 0.00002	-	-	-	-

Sample Type: Aqueous						
Sample Name:		GND0599 08-Dec-2017 12:55 pm				
Lab Number:		1893172.1				
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Azinphos-methyl	g/m³	< 0.00008	-	-	-	-
Benalaxyl	g/m³	< 0.00002	-	-	-	-
Bitertanol	g/m³	< 0.00008	-	-	-	-
Bromacil	g/m³	< 0.00004	-	-	-	-
Bromopropylate	g/m³	< 0.00004	-	-	-	-
Butachlor	g/m³	< 0.00004	-	-	-	-
Captan	g/m³	< 0.00008	-	-	-	-
Carbaryl	g/m³	< 0.00004	-	-	-	-
Carbofenothion	g/m³	< 0.00004	-	-	-	-
Carbofuran	g/m³	< 0.00004	-	-	-	-
Chlorfluazuron	g/m³	< 0.00004	-	-	-	-
Chlorothalonil	g/m³	< 0.00004	-	-	-	-
Chlorpyrifos	g/m³	< 0.00004	-	-	-	-
Chlorpyrifos-methyl	g/m³	< 0.00004	-	-	-	-
Chlortoluron	g/m³	< 0.00008	-	-	-	-
Cyanazine	g/m³	< 0.00004	-	-	-	-
Cyfluthrin	g/m³	< 0.00004	-	-	-	-
Cyhalothrin	g/m³	< 0.00004	-	-	-	-
Cypermethrin	g/m³	< 0.00008	-	-	-	-
Deltamethrin (including Tralomethrin)	g/m³	< 0.00006	-	-	-	-
Diazinon	g/m³	< 0.00002	-	-	-	-
Dichlofluanid	g/m³	< 0.00004	-	-	-	-
Dichloran	g/m³	< 0.0002	-	-	-	-
Dichlorvos	g/m³	< 0.00008	-	-	-	-
Difenoconazole	g/m³	< 0.00008	-	-	-	-
Dimethoate	g/m³	< 0.00008	-	-	-	-
Diphenylamine	g/m³	< 0.00008	-	-	-	-
Diuron	g/m³	< 0.00004	-	-	-	-
Fenpropimorph	g/m³	< 0.00004	-	-	-	-
Fluazifop-butyl	g/m³	< 0.00004	-	-	-	-
Fluometuron	g/m³	< 0.00004	-	-	-	-
Flusilazole	g/m³	< 0.00004	-	-	-	-
Fluvalinate	g/m³	< 0.00004	-	-	-	-
Furalaxyl	g/m³	< 0.00002	-	-	-	-
Haloxyfop-methyl	g/m³	< 0.00004	-	-	-	-
Hexaconazole	g/m³	< 0.00004	-	-	-	-
Hexazinone	g/m³	< 0.00002	-	-	-	-
IPBC (3-Iodo-2-propynyl-n-butylcarbamate)	g/m³	< 0.0002	-	-	-	-
Kresoxim-methyl	g/m³	< 0.00002	-	-	-	-
Linuron	g/m³	< 0.00005	-	-	-	-
Malathion	g/m³	< 0.00004	-	-	-	-
Metalaxyl	g/m³	< 0.00004	-	-	-	-
Metolachlor	g/m³	< 0.00004	-	-	-	-
Metribuzin	g/m³	< 0.00004	-	-	-	-
Molinate	g/m³	< 0.00008	-	-	-	-
Myclobutanil	g/m³	< 0.00004	-	-	-	-
Naled	g/m³	< 0.0002	-	-	-	-
Norflurazon	g/m³	< 0.00008	-	-	-	-
Oxadiazon	g/m³	< 0.00004	-	-	-	-
Oxyfluorfen	g/m³	< 0.00002	-	-	-	-
Paclobutrazol	g/m³	< 0.00004	-	-	-	-
Parathion-ethyl	g/m³	< 0.00004	-	-	-	-
Parathion-methyl	g/m³	< 0.00004	-	-	-	-
Pendimethalin	g/m³	< 0.00004	-	-	-	-

Sample Type: Aqueous						
Sample Name:	GND0599 08-Dec-2017 12:55 pm					
Lab Number:	1893172.1					
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Permethrin	g/m³	< 0.00002	-	-	-	-
Pirimicarb	g/m³	< 0.00004	-	-	-	-
Pirimiphos-methyl	g/m³	< 0.00004	-	-	-	-
Prochloraz	g/m³	< 0.0002	-	-	-	-
Procymidone	g/m³	< 0.00004	-	-	-	-
Prometryn	g/m³	< 0.00002	-	-	-	-
Propachlor	g/m³	< 0.00004	-	-	-	-
Propanil	g/m³	< 0.0002	-	-	-	-
Propazine	g/m³	< 0.00002	-	-	-	-
Propiconazole	g/m³	< 0.00004	-	-	-	-
Pyriproxyfen	g/m³	< 0.00004	-	-	-	-
Quizalofop-ethyl	g/m³	< 0.00004	-	-	-	-
Simazine	g/m³	< 0.00004	-	-	-	-
Simetryn	g/m³	< 0.00004	-	-	-	-
Sulfentrazone	g/m³	< 0.0002	-	-	-	-
TCMTB [2-(thiocyanomethylthio) benzothiazole,Busan]	g/m³	< 0.00008	-	-	-	-
Tebuconazole	g/m³	< 0.00004	-	-	-	-
Terbacil	g/m³	< 0.00004	-	-	-	-
Terbufos	g/m³	< 0.00004	-	-	-	-
Terbumeton	g/m³	< 0.00004	-	-	-	-
Terbuthylazine	g/m³	< 0.00002	-	-	-	-
Terbuthylazine-desethyl	g/m³	< 0.00004	-	-	-	-
Terbutryn	g/m³	< 0.00004	-	-	-	-
Thiabendazole	g/m³	< 0.0002	-	-	-	-
Thiobencarb	g/m³	< 0.00004	-	-	-	-
Tolylfluanid	g/m³	< 0.00002	-	-	-	-
Triazophos	g/m³	< 0.00004	-	-	-	-
Trifluralin	g/m³	< 0.00004	-	-	-	-
Vinclozolin	g/m³	< 0.00004	-	-	-	-
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m³	0.0103	-	-	-	-
Dissolved Cadmium	g/m³	< 0.00005	-	-	-	-
Dissolved Chromium	g/m³	< 0.0005	-	-	-	-
Dissolved Copper	g/m³	< 0.0005	-	-	-	-
Dissolved Lead	g/m³	< 0.00010	-	-	-	-
Dissolved Nickel	g/m³	0.0006	-	-	-	-
Dissolved Zinc	g/m³	0.0098	-	-	-	-
Gases in groundwater						
Ethane	g/m³	< 0.003	-	-	-	-
Ethylene	g/m³	< 0.004	-	-	-	-
Methane	g/m³	0.65	-	-	-	-
Haloethers Trace in SVOC Water Samples by GC-MS						
Bis(2-chloroethoxy) methane	g/m³	< 0.0005	-	-	-	-
Bis(2-chloroethyl)ether	g/m³	< 0.0005	-	-	-	-
Bis(2-chloroisopropyl)ether	g/m³	< 0.0005	-	-	-	-
4-Bromophenyl phenyl ether	g/m³	< 0.0003	-	-	-	-
4-Chlorophenyl phenyl ether	g/m³	< 0.0005	-	-	-	-
Nitrogen containing compounds Trace in SVOC Water Samples, GC-MS						
2,4-Dinitrotoluene	g/m³	< 0.0010	-	-	-	-
2,6-Dinitrotoluene	g/m³	< 0.0010	-	-	-	-
Nitrobenzene	g/m³	< 0.0005	-	-	-	-
N-Nitrosodi-n-propylamine	g/m³	< 0.0010	-	-	-	-
N-Nitrosodiphenylamine + Diphenylamine	g/m3	< 0.0010	-	-	-	-

Sample Type: Aqueous						
Sample Name:		GND0599 08-Dec-2017 12:55 pm				
Lab Number:		1893172.1				
Organochlorine Pesticides Trace in SVOC Water Samples by GC-MS						
Aldrin	g/m³	< 0.0005	-	-	-	-
alpha-BHC	g/m³	< 0.0005	-	-	-	-
beta-BHC	g/m³	< 0.0005	-	-	-	-
delta-BHC	g/m³	< 0.0005	-	-	-	-
gamma-BHC (Lindane)	g/m³	< 0.0005	-	-	-	-
4,4'-DDD	g/m³	< 0.0005	-	-	-	-
4,4'-DDE	g/m³	< 0.0005	-	-	-	-
4,4'-DDT	g/m³	< 0.0010	-	-	-	-
Dieldrin	g/m³	< 0.0005	-	-	-	-
Endosulfan I	g/m³	< 0.0010	-	-	-	-
Endosulfan II	g/m³	< 0.0010	-	-	-	-
Endosulfan sulfate	g/m³	< 0.0010	-	-	-	-
Endrin	g/m³	< 0.0005	-	-	-	-
Endrin ketone	g/m³	< 0.0010	-	-	-	-
Heptachlor	g/m³	< 0.0005	-	-	-	-
Heptachlor epoxide	g/m³	< 0.0005	-	-	-	-
Hexachlorobenzene	g/m³	< 0.0005	-	-	-	-
Polycyclic Aromatic Hydrocarbons Trace in SVOC Water Samples						
Acenaphthene	g/m³	< 0.0003	-	-	-	-
Acenaphthylene	g/m³	< 0.0003	-	-	-	-
Anthracene	g/m³	< 0.0003	-	-	-	-
Benzo[a]anthracene	g/m³	< 0.0003	-	-	-	-
Benzo[a]pyrene (BAP)	g/m³	< 0.0003	-	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m³	< 0.0003	-	-	-	-
Benzo[g,h,i]perylene	g/m³	< 0.0003	-	-	-	-
Benzo[k]fluoranthene	g/m³	< 0.0003	-	-	-	-
1&2-Chloronaphthalene	g/m³	< 0.0003	-	-	-	-
Chrysene	g/m³	< 0.0003	-	-	-	-
Dibenzo[a,h]anthracene	g/m³	< 0.0003	-	-	-	-
Fluoranthene	g/m³	< 0.0003	-	-	-	-
Fluorene	g/m³	< 0.0003	-	-	-	-
Indeno(1,2,3-c,d)pyrene	g/m³	< 0.0003	-	-	-	-
2-Methylnaphthalene	g/m³	< 0.0003	-	-	-	-
Naphthalene	g/m³	< 0.0003	-	-	-	-
Phenanthrene	g/m³	< 0.0003	-	-	-	-
Pyrene	g/m³	< 0.0003	-	-	-	-
Phenols Trace (drinkingwater) in SVOC Water Samples by GC-MS						
2-Chlorophenol	g/m³	< 0.0005	-	-	-	-
2,4-Dichlorophenol	g/m³	< 0.0005	-	-	-	-
2,4,6-Trichlorophenol	g/m³	< 0.0010	-	-	-	-
Phenols Trace (non-drinkingwater) in SVOC Water Samples by GC-MS						
4-Chloro-3-methylphenol	g/m³	< 0.0010	-	-	-	-
2,4-Dimethylphenol	g/m³	< 0.0005	-	-	-	-
3 & 4-Methylphenol (m- + p-cresol)	g/m³	< 0.0010	-	-	-	-
2-Methylphenol (o-Cresol)	g/m³	< 0.0005	-	-	-	-
2-Nitrophenol	g/m³	< 0.0010	-	-	-	-
Pentachlorophenol (PCP)	g/m³	< 0.010	-	-	-	-
Phenol	g/m³	< 0.0010	-	-	-	-
2,4,5-Trichlorophenol	g/m³	< 0.0010	-	-	-	-
Plasticisers Trace (non-drinkingwater) in SVOC Water by GCMS						
Butylbenzylphthalate	g/m³	< 0.0010	-	-	-	-
Diethylphthalate	g/m³	< 0.0010	-	-	-	-
Dimethylphthalate	g/m³	< 0.0010	-	-	-	-

Sample Type: Aqueous						
Sample Name:		GND0599 08-Dec-2017 12:55 pm				
Lab Number:		1893172.1				
Plasticisers Trace (non-drinkingwater) in SVOC Water by GCMS						
Di-n-butylphthalate	g/m³	< 0.0010	-	-	-	-
Di-n-octylphthalate	g/m³	< 0.0010	-	-	-	-
Plasticisers Trace (drinkingwater) in SVOC Water Samples by GCMS						
Bis(2-ethylhexyl)phthalate	g/m³	< 0.003	-	-	-	-
Di(2-ethylhexyl)adipate	g/m³	< 0.0010	-	-	-	-
Other Halogenated compounds Trace (drinkingwater) in SVOC Water						
1,2-Dichlorobenzene	g/m³	< 0.0005	-	-	-	-
1,3-Dichlorobenzene	g/m³	< 0.0005	-	-	-	-
1,4-Dichlorobenzene	g/m³	< 0.0005	-	-	-	-
Other Halogenated compounds Trace (non-drinkingwater) in SVOC						
Hexachlorobutadiene	g/m³	< 0.0005	-	-	-	-
Hexachloroethane	g/m³	< 0.0005	-	-	-	-
1,2,4-Trichlorobenzene	g/m³	< 0.0005	-	-	-	-
Other SVOC Trace in SVOC Water Samples by GC-MS						
Benzyl alcohol	g/m³	< 0.005	-	-	-	-
Carbazole	g/m³	< 0.0005	-	-	-	-
Dibenzofuran	g/m³	< 0.0005	-	-	-	-
Isophorone	g/m³	< 0.0005	-	-	-	-
BTEX in VOC Water by Headspace GC-MS						
Benzene	g/m³	< 0.0003	-	-	-	-
Ethylbenzene	g/m³	< 0.0005	-	-	-	-
Toluene	g/m³	0.0012	-	-	-	-
m&p-Xylene	g/m³	< 0.0005	-	-	-	-
o-Xylene	g/m³	< 0.0003	-	-	-	-
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
Bromomethane (Methyl Bromide)	g/m³	< 0.0003	-	-	-	-
Carbon tetrachloride	g/m³	< 0.0003	-	-	-	-
Chloroethane	g/m³	< 0.0003	-	-	-	-
Chloromethane	g/m³	< 0.0003	-	-	-	-
1,2-Dibromo-3-chloropropane	g/m³	< 0.0003	-	-	-	-
1,2-Dibromoethane (ethylene dibromide, EDB)	g/m³	< 0.0003	-	-	-	-
Dibromomethane	g/m³	< 0.0003	-	-	-	-
Dichlorodifluoromethane	g/m³	< 0.0003	-	-	-	-
1,1-Dichloroethane	g/m³	< 0.0003	-	-	-	-
1,2-Dichloroethane	g/m³	< 0.0003	-	-	-	-
1,1-Dichloroethene	g/m³	< 0.0003	-	-	-	-
cis-1,2-Dichloroethene	g/m³	< 0.0003	-	-	-	-
trans-1,2-Dichloroethene	g/m³	< 0.0003	-	-	-	-
Dichloromethane (methylene chloride)	g/m³	< 0.0003	-	-	-	-
1,2-Dichloropropane	g/m³	< 0.0003	-	-	-	-
1,3-Dichloropropane	g/m³	< 0.0003	-	-	-	-
1,1-Dichloropropene	g/m³	< 0.0003	-	-	-	-
cis-1,3-Dichloropropene	g/m³	< 0.0005	-	-	-	-
trans-1,3-Dichloropropene	g/m³	< 0.0005	-	-	-	-
Hexachlorobutadiene	g/m³	< 0.0003	-	-	-	-
1,1,1,2-Tetrachloroethane	g/m³	< 0.0003	-	-	-	-
1,1,2,2-Tetrachloroethane	g/m³	< 0.0003	-	-	-	-
Tetrachloroethene (tetrachloroethylene)	g/m³	< 0.0003	-	-	-	-
1,1,1-Trichloroethane	g/m³	< 0.0003	-	-	-	-
1,1,2-Trichloroethane	g/m³	< 0.0003	-	-	-	-
Trichloroethene (trichloroethylene)	g/m³	< 0.0003	-	-	-	-
Trichlorofluoromethane	g/m³	< 0.0003	-	-	-	-
1,2,3-Trichloropropane	g/m³	< 0.0003	-	-	-	-

Sample Type: Aqueous						
Sample Name:		GND0599 08-Dec-2017 12:55 pm				
Lab Number:		1893172.1				
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
1,1,2-Trichlorotrifluoroethane (Freon 113)	g/m³	< 0.0003	-	-	-	-
Vinyl chloride	g/m³	< 0.0003	-	-	-	-
Halogenated Aromatics in VOC Water by Headspace GC-MS						
Chlorobenzene (monochlorobenzene)	g/m³	< 0.0003	-	-	-	-
1,2-Dichlorobenzene	g/m³	< 0.0003	-	-	-	-
1,3-Dichlorobenzene	g/m³	< 0.0003	-	-	-	-
1,4-Dichlorobenzene	g/m³	< 0.0003	-	-	-	-
1,2,3-Trichlorobenzene	g/m³	< 0.0003	-	-	-	-
1,2,4-Trichlorobenzene	g/m³	< 0.0003	-	-	-	-
1,3,5-Trichlorobenzene	g/m³	< 0.0003	-	-	-	-
Bromobenzene	g/m³	< 0.0003	-	-	-	-
2-Chlorotoluene	g/m³	< 0.0003	-	-	-	-
4-Chlorotoluene	g/m³	< 0.0003	-	-	-	-
Monoaromatic Hydrocarbons in VOC Water by Headspace GC-MS						
n-Butylbenzene	g/m³	< 0.0005	-	-	-	-
tert-Butylbenzene	g/m³	< 0.0003	-	-	-	-
4-Isopropyltoluene (p-Cymene)	g/m³	< 0.0005	-	-	-	-
Isopropylbenzene (Cumene)	g/m³	< 0.0003	-	-	-	-
n-Propylbenzene	g/m³	< 0.0005	-	-	-	-
sec-Butylbenzene	g/m³	< 0.0003	-	-	-	-
Styrene	g/m³	< 0.0005	-	-	-	-
1,2,4-Trimethylbenzene	g/m³	< 0.0003	-	-	-	-
1,3,5-Trimethylbenzene	g/m³	< 0.0003	-	-	-	-
Ketones in VOC Water by Headspace GC-MS						
Acetone	g/m³	< 0.05	-	-	-	-
2-Butanone (MEK)	g/m³	< 0.05	-	-	-	-
Methyl tert-butylether (MTBE)	g/m³	< 0.0003	-	-	-	-
4-Methylpentan-2-one (MIBK)	g/m³	< 0.010	-	-	-	-
Trihalomethanes in VOC Water by Headspace GC-MS						
Bromodichloromethane	g/m³	< 0.0003	-	-	-	-
Bromoform (tribromomethane)	g/m³	< 0.0003	-	-	-	-
Chloroform (Trichloromethane)	g/m³	< 0.0003	-	-	-	-
Dibromochloromethane	g/m³	< 0.0003	-	-	-	-
Other VOC in Water by Headspace GC-MS						
Carbon disulphide	g/m³	< 0.00010	-	-	-	-
Naphthalene	g/m³	< 0.0005	-	-	-	-

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**
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS	Liquid/liquid extraction, GPC (if required), GCMS analysis	-	1
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
Gases in groundwater	Manual headspace creation and sub-sampling, GC-FID analysis.	0.002 - 0.003 g/m³	1
Semivolatile Organic Compounds Trace in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	-	1
Volatile Organic Compounds Trace in Water by Headspace GC-MS	Headspace, GC-MS SIM analysis [KBIs:37857,37921]	0.00010 - 0.05 g/m³	1
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1
Total Kjeldahl Digestion	Sulphuric acid digestion with copper sulphate catalyst.	-	1
Total Phosphorus Digestion	Acid persulphate digestion.	-	1

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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
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
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.	0.1 pH Units	1
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
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
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m³ as $CaCO_3$	1
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1
Total Dissolved Solids (TDS)	Filtration through GF/C (1.2 µm), gravimetric. APHA 2540 C (modified; drying temperature of 103 - 105°C used rather than 180 ± 2°C) 22nd ed. 2012.	10 g/m³	1
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 22nd ed. 2012.	-	1
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.003 g/m³	1
Dissolved Boron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.005 g/m³	1
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0005 g/m³	1
Dissolved Mercury	0.45µm filtration, bromine oxidation followed by atomic fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m³	1
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1
Dissolved Selenium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0010 g/m³	1
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1
Chloride	Filtered sample. Ferric thiocyanate colorimetry. Discrete Analyser. APHA 4500 Cl^- E (modified from continuous flow analysis) 22nd ed. 2012.	0.5 g/m³	1
Fluoride	Direct measurement, ion selective electrode. APHA 4500-F^- C 22nd ed. 2012.	0.05 g/m³	1
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m³	1
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
Total Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-N_{org} D. (modified) 4500 NH_3 F (modified) 22nd ed. 2012.	0.10 g/m³	1
Dissolved Reactive Phosphorus	Filtered sample. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified). 22nd ed. 2012.	0.004 g/m³	1
Phosphate from DRP	Calculation: from Dissolved Reactive Phosphorus * 3.065.	0.004 g/m³	1
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

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Reactive Silica	Filtered sample. Heteropoly blue colorimetry. Discrete analyser. APHA 4500-SiO_2 F (modified from flow injection analysis) 22nd ed. 2012.	0.10 g/m^3 as SiO_2	1
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B 22nd ed. 2012.	0.5 g/m^3	1
Total Organic Carbon (TOC)	Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) 22nd ed. 2012.	0.5 g/m^3	1

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

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ANALYSIS REPORT

Client:	Taranaki Regional Council	**Lab No:**	1886536 SPv1
Contact:	L Smith	**Date Received:**	30-Nov-2017
	C/- Taranaki Regional Council	**Date Reported:**	14-Dec-2017
	Private Bag 713	**Quote No:**	83292
	Stratford 4352	**Order No:**	
		Client Reference:	Eltham central landfill groundwaters
		Submitted By:	David Olson

Sample Type: Aqueous

Sample Name:		GND2700 28-Nov-2017 1:15 pm				
Lab Number:		1886536.1				
Individual Tests						
Sum of Anions	meq/L	2.7	-	-	-	-
Sum of Cations	meq/L	2.7	-	-	-	-
pH	pH Units	6.8	-	-	-	-
Total Alkalinity	g/m³ as $CaCO_3$	45	-	-	-	-
Bicarbonate	g/m³ at 25°C	54	-	-	-	-
Total Hardness	g/m³ as $CaCO_3$	83	-	-	-	-
Electrical Conductivity (EC)	mS/m	30.1	-	-	-	-
Total Dissolved Solids (TDS)	g/m³	220	-	-	-	-
Dissolved Aluminium	g/m³	0.004	-	-	-	-
Dissolved Boron	g/m³	0.011	-	-	-	-
Dissolved Calcium	g/m³	20	-	-	-	-
Dissolved Iron	g/m³	< 0.02	-	-	-	-
Dissolved Magnesium	g/m³	7.8	-	-	-	-
Dissolved Manganese	g/m³	0.0035	-	-	-	-
Dissolved Mercury	g/m³	< 0.00008	-	-	-	-
Dissolved Potassium	g/m³	2.7	-	-	-	-
Dissolved Selenium	g/m³	< 0.0010	-	-	-	-
Dissolved Sodium	g/m³	22	-	-	-	-
Chloride	g/m³	41	-	-	-	-
Fluoride	g/m³	0.06	-	-	-	-
Nitrite-N	g/m³	< 0.002	-	-	-	-
Nitrate-N	g/m³	8.8	-	-	-	-
Nitrate-N + Nitrite-N	g/m³	8.8	-	-	-	-
Total Kjeldahl Nitrogen (TKN)	g/m³	< 0.10	-	-	-	-
Dissolved Reactive Phosphorus	g/m³	0.031	-	-	-	-
Phosphate	g/m³	0.097	-	-	-	-
Total Phosphorus	g/m³	0.038	-	-	-	-
Reactive Silica	g/m³ as SiO_2	51	-	-	-	-
Sulphate	g/m³	2.4	-	-	-	-
Total Organic Carbon (TOC)	g/m³	< 0.5	-	-	-	-
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Acetochlor	g/m³	< 0.00004	-	-	-	-
Alachlor	g/m³	< 0.00004	-	-	-	-
Atrazine	g/m³	< 0.00004	-	-	-	-
Atrazine-desethyl	g/m³	< 0.00004	-	-	-	-
Atrazine-desisopropyl	g/m³	< 0.00008	-	-	-	-
Azaconazole	g/m³	< 0.00002	-	-	-	-

Sample Type: Aqueous						
Sample Name:		GND2700 28-Nov-2017 1:15 pm				
Lab Number:		1886536.1				
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Azinphos-methyl	g/m³	< 0.00008	-	-	-	-
Benalaxyl	g/m³	< 0.00002	-	-	-	-
Bitertanol	g/m³	< 0.00008	-	-	-	-
Bromacil	g/m³	< 0.00004	-	-	-	-
Bromopropylate	g/m³	< 0.00004	-	-	-	-
Butachlor	g/m³	< 0.00004	-	-	-	-
Captan	g/m³	< 0.00008	-	-	-	-
Carbaryl	g/m³	< 0.00004	-	-	-	-
Carbofenothion	g/m³	< 0.00004	-	-	-	-
Carbofuran	g/m³	< 0.00004	-	-	-	-
Chlorfluazuron	g/m³	< 0.00004	-	-	-	-
Chlorothalonil	g/m³	< 0.00004	-	-	-	-
Chlorpyrifos	g/m³	< 0.00004	-	-	-	-
Chlorpyrifos-methyl	g/m³	< 0.00004	-	-	-	-
Chlortoluron	g/m³	< 0.00008	-	-	-	-
Cyanazine	g/m³	< 0.00004	-	-	-	-
Cyfluthrin	g/m³	< 0.00004	-	-	-	-
Cyhalothrin	g/m³	< 0.00004	-	-	-	-
Cypermethrin	g/m³	< 0.00008	-	-	-	-
Deltamethrin (including Tralomethrin)	g/m³	< 0.00006	-	-	-	-
Diazinon	g/m³	< 0.00002	-	-	-	-
Dichlofluanid	g/m³	< 0.00004	-	-	-	-
Dichloran	g/m³	< 0.0002	-	-	-	-
Dichlorvos	g/m³	< 0.00008	-	-	-	-
Difenoconazole	g/m³	< 0.00008	-	-	-	-
Dimethoate	g/m³	< 0.00008	-	-	-	-
Diphenylamine	g/m³	< 0.00008	-	-	-	-
Diuron	g/m³	< 0.00004	-	-	-	-
Fenpropimorph	g/m³	< 0.00004	-	-	-	-
Fluazifop-butyl	g/m³	< 0.00004	-	-	-	-
Fluometuron	g/m³	< 0.00004	-	-	-	-
Flusilazole	g/m³	< 0.00004	-	-	-	-
Fluvalinate	g/m³	< 0.00004	-	-	-	-
Furalaxyl	g/m³	< 0.00002	-	-	-	-
Haloxyfop-methyl	g/m³	< 0.00004	-	-	-	-
Hexaconazole	g/m³	< 0.00004	-	-	-	-
Hexazinone	g/m³	< 0.00002	-	-	-	-
IPBC (3-Iodo-2-propynyl-n-butylcarbamate)	g/m³	< 0.0002	-	-	-	-
Kresoxim-methyl	g/m³	< 0.00002	-	-	-	-
Linuron	g/m³	< 0.00005	-	-	-	-
Malathion	g/m³	< 0.00004	-	-	-	-
Metalaxyl	g/m³	< 0.00004	-	-	-	-
Metolachlor	g/m³	< 0.00004	-	-	-	-
Metribuzin	g/m³	< 0.00004	-	-	-	-
Molinate	g/m³	< 0.00008	-	-	-	-
Myclobutanil	g/m³	< 0.00004	-	-	-	-
Naled	g/m³	< 0.0002	-	-	-	-
Norflurazon	g/m³	< 0.00008	-	-	-	-
Oxadiazon	g/m³	< 0.00004	-	-	-	-
Oxyfluorfen	g/m³	< 0.00002	-	-	-	-
Paclobutrazol	g/m³	< 0.00004	-	-	-	-
Parathion-ethyl	g/m³	< 0.00004	-	-	-	-
Parathion-methyl	g/m³	< 0.00004	-	-	-	-
Pendimethalin	g/m³	< 0.00004	-	-	-	-

Sample Type: Aqueous						
Sample Name:		GND2700 28-Nov-2017 1:15 pm				
Lab Number:		1886536.1				
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Permethrin	g/m³	< 0.00002	-	-	-	-
Pirimicarb	g/m³	< 0.00004	-	-	-	-
Pirimiphos-methyl	g/m³	< 0.00004	-	-	-	-
Prochloraz	g/m³	< 0.0002	-	-	-	-
Procymidone	g/m³	< 0.00004	-	-	-	-
Prometryn	g/m³	< 0.00002	-	-	-	-
Propachlor	g/m³	< 0.00004	-	-	-	-
Propanil	g/m³	< 0.0002	-	-	-	-
Propazine	g/m³	< 0.00002	-	-	-	-
Propiconazole	g/m³	< 0.00004	-	-	-	-
Pyriproxyfen	g/m³	< 0.00004	-	-	-	-
Quizalofop-ethyl	g/m³	< 0.00004	-	-	-	-
Simazine	g/m³	< 0.00004	-	-	-	-
Simetryn	g/m³	< 0.00004	-	-	-	-
Sulfentrazone	g/m³	< 0.0002	-	-	-	-
TCMTB [2-(thiocyanomethylthio) benzothiazole,Busan]	g/m³	< 0.00008	-	-	-	-
Tebuconazole	g/m³	< 0.00004	-	-	-	-
Terbacil	g/m³	< 0.00004	-	-	-	-
Terbufos	g/m³	< 0.00004	-	-	-	-
Terbumeton	g/m³	< 0.00004	-	-	-	-
Terbuthylazine	g/m³	< 0.00002	-	-	-	-
Terbuthylazine-desethyl	g/m³	< 0.00004	-	-	-	-
Terbutryn	g/m³	< 0.00004	-	-	-	-
Thiabendazole	g/m³	< 0.0002	-	-	-	-
Thiobencarb	g/m³	< 0.00004	-	-	-	-
Tolylfluanid	g/m³	< 0.00002	-	-	-	-
Triazophos	g/m³	< 0.00004	-	-	-	-
Trifluralin	g/m³	< 0.00004	-	-	-	-
Vinclozolin	g/m³	< 0.00004	-	-	-	-
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m³	< 0.0010	-	-	-	-
Dissolved Cadmium	g/m³	< 0.00005	-	-	-	-
Dissolved Chromium	g/m³	0.0020	-	-	-	-
Dissolved Copper	g/m³	< 0.0005	-	-	-	-
Dissolved Lead	g/m³	< 0.00010	-	-	-	-
Dissolved Nickel	g/m³	< 0.0005	-	-	-	-
Dissolved Zinc	g/m³	0.0023	-	-	-	-
Gases in groundwater						
Ethane	g/m³	< 0.003	-	-	-	-
Ethylene	g/m³	< 0.004	-	-	-	-
Methane	g/m³	< 0.002	-	-	-	-
Haloethers Trace in SVOC Water Samples by GC-MS						
Bis(2-chloroethoxy) methane	g/m³	< 0.0005	-	-	-	-
Bis(2-chloroethyl)ether	g/m³	< 0.0005	-	-	-	-
Bis(2-chloroisopropyl)ether	g/m³	< 0.0005	-	-	-	-
4-Bromophenyl phenyl ether	g/m³	< 0.0003	-	-	-	-
4-Chlorophenyl phenyl ether	g/m³	< 0.0005	-	-	-	-
Nitrogen containing compounds Trace in SVOC Water Samples, GC-MS						
2,4-Dinitrotoluene	g/m³	< 0.0010	-	-	-	-
2,6-Dinitrotoluene	g/m³	< 0.0010	-	-	-	-
Nitrobenzene	g/m³	< 0.0005	-	-	-	-
N-Nitrosodi-n-propylamine	g/m³	< 0.0010	-	-	-	-
N-Nitrosodiphenylamine + Diphenylamine	g/m3	< 0.0010	-	-	-	-

Sample Type: Aqueous						
Sample Name:		GND2700 28-Nov-2017 1:15 pm				
Lab Number:		1886536.1				
Organochlorine Pesticides Trace in SVOC Water Samples by GC-MS						
Aldrin	g/m³	< 0.0005	-	-	-	-
alpha-BHC	g/m³	< 0.0005	-	-	-	-
beta-BHC	g/m³	< 0.0005	-	-	-	-
delta-BHC	g/m³	< 0.0005	-	-	-	-
gamma-BHC (Lindane)	g/m³	< 0.0005	-	-	-	-
4,4'-DDD	g/m³	< 0.0005	-	-	-	-
4,4'-DDE	g/m³	< 0.0005	-	-	-	-
4,4'-DDT	g/m³	< 0.0010	-	-	-	-
Dieldrin	g/m³	< 0.0005	-	-	-	-
Endosulfan I	g/m³	< 0.0010	-	-	-	-
Endosulfan II	g/m³	< 0.0010	-	-	-	-
Endosulfan sulfate	g/m³	< 0.0010	-	-	-	-
Endrin	g/m³	< 0.0005	-	-	-	-
Endrin ketone	g/m³	< 0.0010	-	-	-	-
Heptachlor	g/m³	< 0.0005	-	-	-	-
Heptachlor epoxide	g/m³	< 0.0005	-	-	-	-
Hexachlorobenzene	g/m³	< 0.0005	-	-	-	-
Polycyclic Aromatic Hydrocarbons Trace in SVOC Water Samples						
Acenaphthene	g/m³	< 0.0003	-	-	-	-
Acenaphthylene	g/m³	< 0.0003	-	-	-	-
Anthracene	g/m³	< 0.0003	-	-	-	-
Benzo[a]anthracene	g/m³	< 0.0003	-	-	-	-
Benzo[a]pyrene (BAP)	g/m³	< 0.0003	-	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m³	< 0.0003	-	-	-	-
Benzo[g,h,i]perylene	g/m³	< 0.0003	-	-	-	-
Benzo[k]fluoranthene	g/m³	< 0.0003	-	-	-	-
1&2-Chloronaphthalene	g/m³	< 0.0003	-	-	-	-
Chrysene	g/m³	< 0.0003	-	-	-	-
Dibenzo[a,h]anthracene	g/m³	< 0.0003	-	-	-	-
Fluoranthene	g/m³	< 0.0003	-	-	-	-
Fluorene	g/m³	< 0.0003	-	-	-	-
Indeno(1,2,3-c,d)pyrene	g/m³	< 0.0003	-	-	-	-
2-Methylnaphthalene	g/m³	< 0.0003	-	-	-	-
Naphthalene	g/m³	< 0.0003	-	-	-	-
Phenanthrene	g/m³	< 0.0003	-	-	-	-
Pyrene	g/m³	< 0.0003	-	-	-	-
Phenols Trace (drinkingwater) in SVOC Water Samples by GC-MS						
2-Chlorophenol	g/m³	< 0.0005	-	-	-	-
2,4-Dichlorophenol	g/m³	< 0.0005	-	-	-	-
2,4,6-Trichlorophenol	g/m³	< 0.0010	-	-	-	-
Phenols Trace (non-drinkingwater) in SVOC Water Samples by GC-MS						
4-Chloro-3-methylphenol	g/m³	< 0.0010	-	-	-	-
2,4-Dimethylphenol	g/m³	< 0.0005	-	-	-	-
3 & 4-Methylphenol (m- + p-cresol)	g/m³	< 0.0010	-	-	-	-
2-Methylphenol (o-Cresol)	g/m³	< 0.0005	-	-	-	-
2-Nitrophenol	g/m³	< 0.0010	-	-	-	-
Pentachlorophenol (PCP)	g/m³	< 0.010	-	-	-	-
Phenol	g/m³	< 0.0010	-	-	-	-
2,4,5-Trichlorophenol	g/m³	< 0.0010	-	-	-	-
Plasticisers Trace (non-drinkingwater) in SVOC Water by GCMS						
Butylbenzylphthalate	g/m³	< 0.0010	-	-	-	-
Diethylphthalate	g/m³	< 0.0010	-	-	-	-
Dimethylphthalate	g/m³	< 0.0010	-	-	-	-

Sample Type: Aqueous						
Sample Name:		GND2700 28-Nov-2017 1:15 pm				
Lab Number:		1886536.1				
Plasticisers Trace (non-drinkingwater) in SVOC Water by GCMS						
Di-n-butylphthalate	g/m³	< 0.0010	-	-	-	-
Di-n-octylphthalate	g/m³	< 0.0010	-	-	-	-
Plasticisers Trace (drinkingwater) in SVOC Water Samples by GCMS						
Bis(2-ethylhexyl)phthalate	g/m³	< 0.003	-	-	-	-
Di(2-ethylhexyl)adipate	g/m³	< 0.0010	-	-	-	-
Other Halogenated compounds Trace (drinkingwater) in SVOC Water						
1,2-Dichlorobenzene	g/m³	< 0.0005	-	-	-	-
1,3-Dichlorobenzene	g/m³	< 0.0005	-	-	-	-
1,4-Dichlorobenzene	g/m³	< 0.0005	-	-	-	-
Other Halogenated compounds Trace (non-drinkingwater) in SVOC						
Hexachlorobutadiene	g/m³	< 0.0005	-	-	-	-
Hexachloroethane	g/m³	< 0.0005	-	-	-	-
1,2,4-Trichlorobenzene	g/m³	< 0.0005	-	-	-	-
Other SVOC Trace in SVOC Water Samples by GC-MS						
Benzyl alcohol	g/m³	< 0.005	-	-	-	-
Carbazole	g/m³	< 0.0005	-	-	-	-
Dibenzofuran	g/m³	< 0.0005	-	-	-	-
Isophorone	g/m³	< 0.0005	-	-	-	-
BTEX in VOC Water by Headspace GC-MS						
Benzene	g/m³	< 0.0003	-	-	-	-
Ethylbenzene	g/m³	< 0.0005	-	-	-	-
Toluene	g/m³	0.0003	-	-	-	-
m&p-Xylene	g/m³	< 0.0005	-	-	-	-
o-Xylene	g/m³	< 0.0003	-	-	-	-
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
Bromomethane (Methyl Bromide)	g/m³	< 0.0003	-	-	-	-
Carbon tetrachloride	g/m³	< 0.0003	-	-	-	-
Chloroethane	g/m³	< 0.0003	-	-	-	-
Chloromethane	g/m³	< 0.0003	-	-	-	-
1,2-Dibromo-3-chloropropane	g/m³	< 0.0003	-	-	-	-
1,2-Dibromoethane (ethylene dibromide, EDB)	g/m³	< 0.0003	-	-	-	-
Dibromomethane	g/m³	< 0.0003	-	-	-	-
Dichlorodifluoromethane	g/m³	< 0.0003	-	-	-	-
1,1-Dichloroethane	g/m³	< 0.0003	-	-	-	-
1,2-Dichloroethane	g/m³	< 0.0003	-	-	-	-
1,1-Dichloroethene	g/m³	< 0.0003	-	-	-	-
cis-1,2-Dichloroethene	g/m³	< 0.0003	-	-	-	-
trans-1,2-Dichloroethene	g/m³	< 0.0003	-	-	-	-
Dichloromethane (methylene chloride)	g/m³	< 0.010	-	-	-	-
1,2-Dichloropropane	g/m³	< 0.0003	-	-	-	-
1,3-Dichloropropane	g/m³	< 0.0003	-	-	-	-
1,1-Dichloropropene	g/m³	< 0.0003	-	-	-	-
cis-1,3-Dichloropropene	g/m³	< 0.0005	-	-	-	-
trans-1,3-Dichloropropene	g/m³	< 0.0005	-	-	-	-
Hexachlorobutadiene	g/m³	< 0.0003	-	-	-	-
1,1,1,2-Tetrachloroethane	g/m³	< 0.0003	-	-	-	-
1,1,2,2-Tetrachloroethane	g/m³	< 0.0003	-	-	-	-
Tetrachloroethene (tetrachloroethylene)	g/m³	< 0.0003	-	-	-	-
1,1,1-Trichloroethane	g/m³	< 0.0003	-	-	-	-
1,1,2-Trichloroethane	g/m³	< 0.0003	-	-	-	-
Trichloroethene (trichloroethylene)	g/m³	< 0.0003	-	-	-	-
Trichlorofluoromethane	g/m³	< 0.0003	-	-	-	-
1,2,3-Trichloropropane	g/m³	< 0.0003	-	-	-	-

Sample Type: Aqueous						
Sample Name:		GND2700 28-Nov-2017 1:15 pm				
Lab Number:		1886536.1				
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
1,1,2-Trichlorotrifluoroethane (Freon 113)	g/m³	< 0.0003	-	-	-	-
Vinyl chloride	g/m³	< 0.0003	-	-	-	-
Halogenated Aromatics in VOC Water by Headspace GC-MS						
Chlorobenzene (monochlorobenzene)	g/m³	< 0.0003	-	-	-	-
1,2-Dichlorobenzene	g/m³	< 0.0003	-	-	-	-
1,3-Dichlorobenzene	g/m³	< 0.0003	-	-	-	-
1,4-Dichlorobenzene	g/m³	< 0.0003	-	-	-	-
1,2,3-Trichlorobenzene	g/m³	< 0.0003	-	-	-	-
1,2,4-Trichlorobenzene	g/m³	< 0.0003	-	-	-	-
1,3,5-Trichlorobenzene	g/m³	< 0.0003	-	-	-	-
Bromobenzene	g/m³	< 0.0003	-	-	-	-
2-Chlorotoluene	g/m³	< 0.0003	-	-	-	-
4-Chlorotoluene	g/m³	< 0.0003	-	-	-	-
Monoaromatic Hydrocarbons in VOC Water by Headspace GC-MS						
n-Butylbenzene	g/m³	< 0.0005	-	-	-	-
tert-Butylbenzene	g/m³	< 0.0003	-	-	-	-
4-Isopropyltoluene (p-Cymene)	g/m³	< 0.0005	-	-	-	-
Isopropylbenzene (Cumene)	g/m³	< 0.0003	-	-	-	-
n-Propylbenzene	g/m³	< 0.0005	-	-	-	-
sec-Butylbenzene	g/m³	< 0.0003	-	-	-	-
Styrene	g/m³	< 0.0005	-	-	-	-
1,2,4-Trimethylbenzene	g/m³	< 0.0003	-	-	-	-
1,3,5-Trimethylbenzene	g/m³	< 0.0003	-	-	-	-
Ketones in VOC Water by Headspace GC-MS						
Acetone	g/m³	< 0.05	-	-	-	-
2-Butanone (MEK)	g/m³	< 0.05	-	-	-	-
Methyl tert-butylether (MTBE)	g/m³	< 0.0003	-	-	-	-
4-Methylpentan-2-one (MIBK)	g/m³	< 0.010	-	-	-	-
Trihalomethanes in VOC Water by Headspace GC-MS						
Bromodichloromethane	g/m³	< 0.0003	-	-	-	-
Bromoform (tribromomethane)	g/m³	< 0.0003	-	-	-	-
Chloroform (Trichloromethane)	g/m³	< 0.0003	-	-	-	-
Dibromochloromethane	g/m³	< 0.0003	-	-	-	-
Other VOC in Water by Headspace GC-MS						
Carbon disulphide	g/m³	< 0.00010	-	-	-	-
Naphthalene	g/m³	< 0.0005	-	-	-	-

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**
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS	Liquid/liquid extraction, GPC (if required), GCMS analysis	-	1
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
Gases in groundwater	Manual headspace creation and sub-sampling, GC-FID analysis.	0.002 - 0.003 g/m³	1
Semivolatile Organic Compounds Trace in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	-	1
Volatile Organic Compounds Trace in Water by Headspace GC-MS	Headspace, GC-MS SIM analysis [KBIs:37857,37921]	0.00010 - 0.05 g/m³	1
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1
Total Kjeldahl Digestion	Sulphuric acid digestion with copper sulphate catalyst.	-	1
Total Phosphorus Digestion	Acid persulphate digestion.	-	1

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
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
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
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.	0.1 pH Units	1
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
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
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m³ as $CaCO_3$	1
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1
Total Dissolved Solids (TDS)	Filtration through GF/C (1.2 µm), gravimetric. APHA 2540 C (modified; drying temperature of 103 - 105°C used rather than 180 ± 2°C) 22nd ed. 2012.	10 g/m³	1
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 22nd ed. 2012.	-	1
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.003 g/m³	1
Dissolved Boron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.005 g/m³	1
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0005 g/m³	1
Dissolved Mercury	0.45µm filtration, bromine oxidation followed by atomic fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m³	1
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1
Dissolved Selenium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0010 g/m³	1
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1
Chloride	Filtered sample. Ferric thiocyanate colorimetry. Discrete Analyser. APHA 4500 Cl^- E (modified from continuous flow analysis) 22nd ed. 2012.	0.5 g/m³	1
Fluoride	Direct measurement, ion selective electrode. APHA 4500-F^- C 22nd ed. 2012.	0.05 g/m³	1
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m³	1
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
Total Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-N_{org} D. (modified) 4500 NH_3 F (modified) 22nd ed. 2012.	0.10 g/m³	1
Dissolved Reactive Phosphorus	Filtered sample. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified). 22nd ed. 2012.	0.004 g/m³	1
Phosphate from DRP	Calculation: from Dissolved Reactive Phosphorus * 3.065.	0.004 g/m³	1
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

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Reactive Silica	Filtered sample. Heteropoly blue colorimetry. Discrete analyser. APHA 4500-SiO_2 F (modified from flow injection analysis) 22nd ed. 2012.	0.10 g/m^3 as SiO_2	1
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B 22nd ed. 2012.	0.5 g/m^3	1
Total Organic Carbon (TOC)	Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) 22nd ed. 2012.	0.5 g/m^3	1

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

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ANALYSIS REPORT

Client:	Taranaki Regional Council	**Lab No:**	1887362	SPv1
Contact:	L Smith	**Date Received:**	01-Dec-2017	
	C/- Taranaki Regional Council	**Date Reported:**	14-Dec-2017	
	Private Bag 713	**Quote No:**	83292	
	Stratford 4352	**Order No:**		
		Client Reference:	Eltham central landfill groundwaters	
		Submitted By:	David Olson	

Sample Type: Aqueous

		Sample Name:	GND2694 30-Nov-2017 12:05 pm				
		Lab Number:	1887362.1				
Individual Tests							
Sum of Anions	meq/L		3.1	-	-	-	-
Sum of Cations	meq/L		3.1	-	-	-	-
pH	pH Units		8.0	-	-	-	-
Total Alkalinity	g/m³ as $CaCO_3$		106	-	-	-	-
Bicarbonate	g/m³ at 25°C		128	-	-	-	-
Total Hardness	g/m³ as $CaCO_3$		96	-	-	-	-
Electrical Conductivity (EC)	mS/m		32.9	-	-	-	-
Total Dissolved Solids (TDS)	g/m³		250	-	-	-	-
Dissolved Aluminium	g/m³		0.006	-	-	-	-
Dissolved Boron	g/m³		0.019	-	-	-	-
Dissolved Calcium	g/m³		24	-	-	-	-
Dissolved Iron	g/m³		< 0.02	-	-	-	-
Dissolved Magnesium	g/m³		8.9	-	-	-	-
Dissolved Manganese	g/m³		0.0140	-	-	-	-
Dissolved Mercury	g/m³		< 0.00008	-	-	-	-
Dissolved Potassium	g/m³		3.2	-	-	-	-
Dissolved Selenium	g/m³		< 0.0010	-	-	-	-
Dissolved Sodium	g/m³		26	-	-	-	-
Chloride	g/m³		28	-	-	-	-
Fluoride	g/m³		0.17	-	-	-	-
Nitrite-N	g/m³		< 0.002	-	-	-	-
Nitrate-N	g/m³		0.90	-	-	-	-
Nitrate-N + Nitrite-N	g/m³		0.90	-	-	-	-
Total Kjeldahl Nitrogen (TKN)	g/m³		< 0.10	-	-	-	-
Dissolved Reactive Phosphorus	g/m³		0.104	-	-	-	-
Phosphate	g/m³		0.32	-	-	-	-
Total Phosphorus	g/m³		0.118	-	-	-	-
Reactive Silica	g/m³ as SiO_2		46	-	-	-	-
Sulphate	g/m³		6.6	-	-	-	-
Total Organic Carbon (TOC)	g/m³		< 0.5 #1	-	-	-	-
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS							
Acetochlor	g/m³		< 0.00004	-	-	-	-
Alachlor	g/m³		< 0.00004	-	-	-	-
Atrazine	g/m³		< 0.00004	-	-	-	-
Atrazine-desethyl	g/m³		< 0.00004	-	-	-	-
Atrazine-desisopropyl	g/m³		< 0.00008	-	-	-	-
Azaconazole	g/m³		< 0.00002	-	-	-	-

Sample Type: Aqueous						
Sample Name:		GND2694 30-Nov-2017 12:05 pm				
Lab Number:		1887362.1				
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Azinphos-methyl	g/m³	< 0.00008	-	-	-	-
Benalaxyl	g/m³	< 0.00002	-	-	-	-
Bitertanol	g/m³	< 0.00008	-	-	-	-
Bromacil	g/m³	< 0.00004	-	-	-	-
Bromopropylate	g/m³	< 0.00004	-	-	-	-
Butachlor	g/m³	< 0.00004	-	-	-	-
Captan	g/m³	< 0.00008	-	-	-	-
Carbaryl	g/m³	< 0.00004	-	-	-	-
Carbofenothion	g/m³	< 0.00004	-	-	-	-
Carbofuran	g/m³	< 0.00004	-	-	-	-
Chlorfluazuron	g/m³	< 0.00004	-	-	-	-
Chlorothalonil	g/m³	< 0.00004	-	-	-	-
Chlorpyrifos	g/m³	< 0.00004	-	-	-	-
Chlorpyrifos-methyl	g/m³	< 0.00004	-	-	-	-
Chlortoluron	g/m³	< 0.00008	-	-	-	-
Cyanazine	g/m³	< 0.00004	-	-	-	-
Cyfluthrin	g/m³	< 0.00004	-	-	-	-
Cyhalothrin	g/m³	< 0.00004	-	-	-	-
Cypermethrin	g/m³	< 0.00008	-	-	-	-
Deltamethrin (including Tralomethrin)	g/m³	< 0.00006	-	-	-	-
Diazinon	g/m³	< 0.00002	-	-	-	-
Dichlofluanid	g/m³	< 0.00004	-	-	-	-
Dichloran	g/m³	< 0.0002	-	-	-	-
Dichlorvos	g/m³	< 0.00008	-	-	-	-
Difenoconazole	g/m³	< 0.00008	-	-	-	-
Dimethoate	g/m³	< 0.00008	-	-	-	-
Diphenylamine	g/m³	< 0.00008	-	-	-	-
Diuron	g/m³	< 0.00004	-	-	-	-
Fenpropimorph	g/m³	< 0.00004	-	-	-	-
Fluazifop-butyl	g/m³	< 0.00004	-	-	-	-
Fluometuron	g/m³	< 0.00004	-	-	-	-
Flusilazole	g/m³	< 0.00004	-	-	-	-
Fluvalinate	g/m³	< 0.00004	-	-	-	-
Furalaxyl	g/m³	< 0.00002	-	-	-	-
Haloxyfop-methyl	g/m³	< 0.00004	-	-	-	-
Hexaconazole	g/m³	< 0.00004	-	-	-	-
Hexazinone	g/m³	< 0.00002	-	-	-	-
IPBC (3-Iodo-2-propynyl-n-butylcarbamate)	g/m³	< 0.0002	-	-	-	-
Kresoxim-methyl	g/m³	< 0.00002	-	-	-	-
Linuron	g/m³	< 0.00005	-	-	-	-
Malathion	g/m³	< 0.00004	-	-	-	-
Metalaxyl	g/m³	< 0.00004	-	-	-	-
Metolachlor	g/m³	< 0.00004	-	-	-	-
Metribuzin	g/m³	< 0.00004	-	-	-	-
Molinate	g/m³	< 0.00008	-	-	-	-
Myclobutanil	g/m³	< 0.00004	-	-	-	-
Naled	g/m³	< 0.0002	-	-	-	-
Norflurazon	g/m³	< 0.00008	-	-	-	-
Oxadiazon	g/m³	< 0.00004	-	-	-	-
Oxyfluorfen	g/m³	< 0.00002	-	-	-	-
Paclobutrazol	g/m³	< 0.00004	-	-	-	-
Parathion-ethyl	g/m³	< 0.00004	-	-	-	-
Parathion-methyl	g/m³	< 0.00004	-	-	-	-
Pendimethalin	g/m³	< 0.00004	-	-	-	-

Sample Type: Aqueous						
Sample Name:		GND2694 30-Nov-2017 12:05 pm				
Lab Number:		1887362.1				
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Permethrin	g/m³	< 0.00002	-	-	-	-
Pirimicarb	g/m³	< 0.00004	-	-	-	-
Pirimiphos-methyl	g/m³	< 0.00004	-	-	-	-
Prochloraz	g/m³	< 0.0002	-	-	-	-
Procymidone	g/m³	< 0.00004	-	-	-	-
Prometryn	g/m³	< 0.00002	-	-	-	-
Propachlor	g/m³	< 0.00004	-	-	-	-
Propanil	g/m³	< 0.0002	-	-	-	-
Propazine	g/m³	< 0.00002	-	-	-	-
Propiconazole	g/m³	< 0.00004	-	-	-	-
Pyriproxyfen	g/m³	< 0.00004	-	-	-	-
Quizalofop-ethyl	g/m³	< 0.00004	-	-	-	-
Simazine	g/m³	< 0.00004	-	-	-	-
Simetryn	g/m³	< 0.00004	-	-	-	-
Sulfentrazone	g/m³	< 0.0002	-	-	-	-
TCMTB [2-(thiocyanomethylthio) benzothiazole,Busan]	g/m³	< 0.00008	-	-	-	-
Tebuconazole	g/m³	< 0.00004	-	-	-	-
Terbacil	g/m³	< 0.00004	-	-	-	-
Terbufos	g/m³	< 0.00004	-	-	-	-
Terbumeton	g/m³	< 0.00004	-	-	-	-
Terbuthylazine	g/m³	< 0.00002	-	-	-	-
Terbuthylazine-desethyl	g/m³	< 0.00004	-	-	-	-
Terbutryn	g/m³	< 0.00004	-	-	-	-
Thiabendazole	g/m³	< 0.0002	-	-	-	-
Thiobencarb	g/m³	< 0.00004	-	-	-	-
Tolylfluanid	g/m³	< 0.00002	-	-	-	-
Triazophos	g/m³	< 0.00004	-	-	-	-
Trifluralin	g/m³	< 0.00004	-	-	-	-
Vinclozolin	g/m³	< 0.00004	-	-	-	-
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m³	0.0031	-	-	-	-
Dissolved Cadmium	g/m³	< 0.00005	-	-	-	-
Dissolved Chromium	g/m³	0.0011	-	-	-	-
Dissolved Copper	g/m³	< 0.0005	-	-	-	-
Dissolved Lead	g/m³	< 0.00010	-	-	-	-
Dissolved Nickel	g/m³	< 0.0005	-	-	-	-
Dissolved Zinc	g/m³	0.0092	-	-	-	-
Gases in groundwater						
Ethane	g/m³	< 0.003	-	-	-	-
Ethylene	g/m³	< 0.004	-	-	-	-
Methane	g/m³	< 0.002	-	-	-	-
Haloethers Trace in SVOC Water Samples by GC-MS						
Bis(2-chloroethoxy) methane	g/m³	< 0.0005	-	-	-	-
Bis(2-chloroethyl)ether	g/m³	< 0.0005	-	-	-	-
Bis(2-chloroisopropyl)ether	g/m³	< 0.0005	-	-	-	-
4-Bromophenyl phenyl ether	g/m³	< 0.0003	-	-	-	-
4-Chlorophenyl phenyl ether	g/m³	< 0.0005	-	-	-	-
Nitrogen containing compounds Trace in SVOC Water Samples, GC-MS						
2,4-Dinitrotoluene	g/m³	< 0.0010	-	-	-	-
2,6-Dinitrotoluene	g/m³	< 0.0010	-	-	-	-
Nitrobenzene	g/m³	< 0.0005	-	-	-	-
N-Nitrosodi-n-propylamine	g/m³	< 0.0010	-	-	-	-
N-Nitrosodiphenylamine + Diphenylamine	g/m3	< 0.0010	-	-	-	-

Sample Type: Aqueous						
Sample Name:		GND2694 30-Nov-2017 12:05 pm				
Lab Number:		1887362.1				
Organochlorine Pesticides Trace in SVOC Water Samples by GC-MS						
Aldrin	g/m³	< 0.0005	-	-	-	-
alpha-BHC	g/m³	< 0.0005	-	-	-	-
beta-BHC	g/m³	< 0.0005	-	-	-	-
delta-BHC	g/m³	< 0.0005	-	-	-	-
gamma-BHC (Lindane)	g/m³	< 0.0005	-	-	-	-
4,4'-DDD	g/m³	< 0.0005	-	-	-	-
4,4'-DDE	g/m³	< 0.0005	-	-	-	-
4,4'-DDT	g/m³	< 0.0010	-	-	-	-
Dieldrin	g/m³	< 0.0005	-	-	-	-
Endosulfan I	g/m³	< 0.0010	-	-	-	-
Endosulfan II	g/m³	< 0.0010	-	-	-	-
Endosulfan sulfate	g/m³	< 0.0010	-	-	-	-
Endrin	g/m³	< 0.0005	-	-	-	-
Endrin ketone	g/m³	< 0.0010	-	-	-	-
Heptachlor	g/m³	< 0.0005	-	-	-	-
Heptachlor epoxide	g/m³	< 0.0005	-	-	-	-
Hexachlorobenzene	g/m³	< 0.0005	-	-	-	-
Polycyclic Aromatic Hydrocarbons Trace in SVOC Water Samples						
Acenaphthene	g/m³	< 0.0003	-	-	-	-
Acenaphthylene	g/m³	< 0.0003	-	-	-	-
Anthracene	g/m³	< 0.0003	-	-	-	-
Benzo[a]anthracene	g/m³	< 0.0003	-	-	-	-
Benzo[a]pyrene (BAP)	g/m³	< 0.0003	-	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m³	< 0.0003	-	-	-	-
Benzo[g,h,i]perylene	g/m³	< 0.0003	-	-	-	-
Benzo[k]fluoranthene	g/m³	< 0.0003	-	-	-	-
1&2-Chloronaphthalene	g/m³	< 0.0003	-	-	-	-
Chrysene	g/m³	< 0.0003	-	-	-	-
Dibenzo[a,h]anthracene	g/m³	< 0.0003	-	-	-	-
Fluoranthene	g/m³	< 0.0003	-	-	-	-
Fluorene	g/m³	< 0.0003	-	-	-	-
Indeno(1,2,3-c,d)pyrene	g/m³	< 0.0003	-	-	-	-
2-Methylnaphthalene	g/m³	< 0.0003	-	-	-	-
Naphthalene	g/m³	< 0.0003	-	-	-	-
Phenanthrene	g/m³	< 0.0003	-	-	-	-
Pyrene	g/m³	< 0.0003	-	-	-	-
Phenols Trace (drinkingwater) in SVOC Water Samples by GC-MS						
2-Chlorophenol	g/m³	< 0.0005	-	-	-	-
2,4-Dichlorophenol	g/m³	< 0.0005	-	-	-	-
2,4,6-Trichlorophenol	g/m³	< 0.0010	-	-	-	-
Phenols Trace (non-drinkingwater) in SVOC Water Samples by GC-MS						
4-Chloro-3-methylphenol	g/m³	< 0.0010	-	-	-	-
2,4-Dimethylphenol	g/m³	< 0.0005	-	-	-	-
3 & 4-Methylphenol (m- + p-cresol)	g/m³	< 0.0010	-	-	-	-
2-Methylphenol (o-Cresol)	g/m³	< 0.0005	-	-	-	-
2-Nitrophenol	g/m³	< 0.0010	-	-	-	-
Pentachlorophenol (PCP)	g/m³	< 0.010	-	-	-	-
Phenol	g/m³	< 0.0010	-	-	-	-
2,4,5-Trichlorophenol	g/m³	< 0.0010	-	-	-	-
Plasticisers Trace (non-drinkingwater) in SVOC Water by GCMS						
Butylbenzylphthalate	g/m³	< 0.0010	-	-	-	-
Diethylphthalate	g/m³	< 0.0010	-	-	-	-
Dimethylphthalate	g/m³	< 0.0010	-	-	-	-

Sample Type: Aqueous						
Sample Name:		GND2694 30-Nov-2017 12:05 pm				
Lab Number:		1887362.1				
Plasticisers Trace (non-drinkingwater) in SVOC Water by GCMS						
Di-n-butylphthalate	g/m³	< 0.0010	-	-	-	-
Di-n-octylphthalate	g/m³	< 0.0010	-	-	-	-
Plasticisers Trace (drinkingwater) in SVOC Water Samples by GCMS						
Bis(2-ethylhexyl)phthalate	g/m³	0.007	-	-	-	-
Di(2-ethylhexyl)adipate	g/m³	< 0.0010	-	-	-	-
Other Halogenated compounds Trace (drinkingwater) in SVOC Water						
1,2-Dichlorobenzene	g/m³	< 0.0005	-	-	-	-
1,3-Dichlorobenzene	g/m³	< 0.0005	-	-	-	-
1,4-Dichlorobenzene	g/m³	< 0.0005	-	-	-	-
Other Halogenated compounds Trace (non-drinkingwater) in SVOC						
Hexachlorobutadiene	g/m³	< 0.0005	-	-	-	-
Hexachloroethane	g/m³	< 0.0005	-	-	-	-
1,2,4-Trichlorobenzene	g/m³	< 0.0005	-	-	-	-
Other SVOC Trace in SVOC Water Samples by GC-MS						
Benzyl alcohol	g/m³	< 0.005	-	-	-	-
Carbazole	g/m³	< 0.0005	-	-	-	-
Dibenzofuran	g/m³	< 0.0005	-	-	-	-
Isophorone	g/m³	< 0.0005	-	-	-	-
BTEX in VOC Water by Headspace GC-MS						
Benzene	g/m³	< 0.0003	-	-	-	-
Ethylbenzene	g/m³	< 0.0005	-	-	-	-
Toluene	g/m³	0.0003	-	-	-	-
m&p-Xylene	g/m³	< 0.0005	-	-	-	-
o-Xylene	g/m³	< 0.0003	-	-	-	-
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
Bromomethane (Methyl Bromide)	g/m³	< 0.0003	-	-	-	-
Carbon tetrachloride	g/m³	< 0.0003	-	-	-	-
Chloroethane	g/m³	< 0.0003	-	-	-	-
Chloromethane	g/m³	< 0.0003	-	-	-	-
1,2-Dibromo-3-chloropropane	g/m³	< 0.0003	-	-	-	-
1,2-Dibromoethane (ethylene dibromide, EDB)	g/m³	< 0.0003	-	-	-	-
Dibromomethane	g/m³	< 0.0003	-	-	-	-
Dichlorodifluoromethane	g/m³	< 0.0003	-	-	-	-
1,1-Dichloroethane	g/m³	< 0.0003	-	-	-	-
1,2-Dichloroethane	g/m³	< 0.0003	-	-	-	-
1,1-Dichloroethene	g/m³	< 0.0003	-	-	-	-
cis-1,2-Dichloroethene	g/m³	< 0.0003	-	-	-	-
trans-1,2-Dichloroethene	g/m³	< 0.0003	-	-	-	-
Dichloromethane (methylene chloride)	g/m³	< 0.010	-	-	-	-
1,2-Dichloropropane	g/m³	< 0.0003	-	-	-	-
1,3-Dichloropropane	g/m³	< 0.0003	-	-	-	-
1,1-Dichloropropene	g/m³	< 0.0003	-	-	-	-
cis-1,3-Dichloropropene	g/m³	< 0.0005	-	-	-	-
trans-1,3-Dichloropropene	g/m³	< 0.0005	-	-	-	-
Hexachlorobutadiene	g/m³	< 0.0003	-	-	-	-
1,1,1,2-Tetrachloroethane	g/m³	< 0.0003	-	-	-	-
1,1,2,2-Tetrachloroethane	g/m³	< 0.0003	-	-	-	-
Tetrachloroethene (tetrachloroethylene)	g/m³	< 0.0003	-	-	-	-
1,1,1-Trichloroethane	g/m³	< 0.0003	-	-	-	-
1,1,2-Trichloroethane	g/m³	< 0.0003	-	-	-	-
Trichloroethene (trichloroethylene)	g/m³	< 0.0003	-	-	-	-
Trichlorofluoromethane	g/m³	< 0.0003	-	-	-	-
1,2,3-Trichloropropane	g/m³	< 0.0003	-	-	-	-

Sample Type: Aqueous						
Sample Name:		GND2694 30-Nov-2017 12:05 pm				
Lab Number:		1887362.1				
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
1,1,2-Trichlorotrifluoroethane (Freon 113)	g/m³	< 0.0003	-	-	-	-
Vinyl chloride	g/m³	< 0.0003	-	-	-	-
Halogenated Aromatics in VOC Water by Headspace GC-MS						
Chlorobenzene (monochlorobenzene)	g/m³	< 0.0003	-	-	-	-
1,2-Dichlorobenzene	g/m³	< 0.0003	-	-	-	-
1,3-Dichlorobenzene	g/m³	< 0.0003	-	-	-	-
1,4-Dichlorobenzene	g/m³	< 0.0003	-	-	-	-
1,2,3-Trichlorobenzene	g/m³	< 0.0003	-	-	-	-
1,2,4-Trichlorobenzene	g/m³	< 0.0003	-	-	-	-
1,3,5-Trichlorobenzene	g/m³	< 0.0003	-	-	-	-
Bromobenzene	g/m³	< 0.0003	-	-	-	-
2-Chlorotoluene	g/m³	< 0.0003	-	-	-	-
4-Chlorotoluene	g/m³	< 0.0003	-	-	-	-
Monoaromatic Hydrocarbons in VOC Water by Headspace GC-MS						
n-Butylbenzene	g/m³	< 0.0005	-	-	-	-
tert-Butylbenzene	g/m³	< 0.0003	-	-	-	-
4-Isopropyltoluene (p-Cymene)	g/m³	< 0.0005	-	-	-	-
Isopropylbenzene (Cumene)	g/m³	< 0.0003	-	-	-	-
n-Propylbenzene	g/m³	< 0.0005	-	-	-	-
sec-Butylbenzene	g/m³	< 0.0003	-	-	-	-
Styrene	g/m³	< 0.0005	-	-	-	-
1,2,4-Trimethylbenzene	g/m³	< 0.0003	-	-	-	-
1,3,5-Trimethylbenzene	g/m³	< 0.0003	-	-	-	-
Ketones in VOC Water by Headspace GC-MS						
Acetone	g/m³	< 0.05	-	-	-	-
2-Butanone (MEK)	g/m³	< 0.05	-	-	-	-
Methyl tert-butylether (MTBE)	g/m³	< 0.0003	-	-	-	-
4-Methylpentan-2-one (MIBK)	g/m³	< 0.010	-	-	-	-
Trihalomethanes in VOC Water by Headspace GC-MS						
Bromodichloromethane	g/m³	< 0.0003	-	-	-	-
Bromoform (tribromomethane)	g/m³	< 0.0003	-	-	-	-
Chloroform (Trichloromethane)	g/m³	< 0.0003	-	-	-	-
Dibromochloromethane	g/m³	< 0.0003	-	-	-	-
Other VOC in Water by Headspace GC-MS						
Carbon disulphide	g/m³	< 0.00010	-	-	-	-
Naphthalene	g/m³	< 0.0005	-	-	-	-

Analyst's Comments

#1 It should be noted that the level of uncertainty of measurement (UoM) for the Total Organic Carbon (TOC) determination is significant due to the high level of Inorganic Carbon relative to Total Carbon present in this sample. TOC is determined by subtracting a result obtained for Total Inorganic Carbon (TIC) from a result obtained for Total Carbon (TC). There may be an uncertainty of measurement of up to 10% in each of these measurements (at the 95% confidence level). The high inorganic carbon, and the relatively small difference between TC and TIC for these samples mean that the TOC has a higher uncertainty than would normally be achieved for natural waters.

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**
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS	Liquid/liquid extraction, GPC (if required), GCMS analysis	-	1
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

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Gases in groundwater	Manual headspace creation and sub-sampling, GC-FID analysis.	0.002 - 0.003 g/m^3	1
Semivolatile Organic Compounds Trace in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	-	1
Volatile Organic Compounds Trace in Water by Headspace GC-MS	Headspace, GC-MS SIM analysis [KBIs:37857,37921]	0.00010 - 0.05 g/m^3	1
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1
Total Kjeldahl Digestion	Sulphuric acid digestion with copper sulphate catalyst.	-	1
Total Phosphorus Digestion	Acid persulphate digestion.	-	1
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
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
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.	0.1 pH Units	1
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
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
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1
Total Dissolved Solids (TDS)	Filtration through GF/C (1.2 µm), gravimetric. APHA 2540 C (modified; drying temperature of 103 - 105°C used rather than 180 ± 2°C) 22nd ed. 2012.	10 g/m^3	1
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 22nd ed. 2012.	-	1
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.003 g/m^3	1
Dissolved Boron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.005 g/m^3	1
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3	1
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m^3	1
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m^3	1
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0005 g/m^3	1
Dissolved Mercury	0.45µm filtration, bromine oxidation followed by atomic fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m^3	1
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3	1
Dissolved Selenium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0010 g/m^3	1
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m^3	1
Chloride	Filtered sample. Ferric thiocyanate colorimetry. Discrete Analyser. APHA 4500 Cl^- E (modified from continuous flow analysis) 22nd ed. 2012.	0.5 g/m^3	1
Fluoride	Direct measurement, ion selective electrode. APHA 4500-F^- C 22nd ed. 2012.	0.05 g/m^3	1
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m^3	1
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m^3	1
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
Total Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-N_{org} D. (modified) 4500 NH_3 F (modified) 22nd ed. 2012.	0.10 g/m^3	1

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Dissolved Reactive Phosphorus	Filtered sample. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified). 22nd ed. 2012.	0.004 g/m^3	1
Phosphate from DRP	Calculation: from Dissolved Reactive Phosphorus * 3.065.	0.004 g/m^3	1
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
Reactive Silica	Filtered sample. Heteropoly blue colorimetry. Discrete analyser. APHA 4500-SiO_2 F (modified from flow injection analysis) 22nd ed. 2012.	0.10 g/m^3 as SiO_2	1
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B 22nd ed. 2012.	0.5 g/m^3	1
Total Organic Carbon (TOC)	Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC. APHA 5310 C (modified) 22nd ed. 2012.	0.5 g/m^3	1

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

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Certificate of Analysis

Client:	Taranaki Regional Council	**Lab No:**	1966036	SPv2
Contact:	Jane Harvey	**Date Received:**	19-Apr-2018	
	C/- Taranaki Regional Council	**Date Reported:**	15-May-2018	**(Amended)**
	Private Bag 713	**Quote No:**	83292	
	Stratford 4352	**Order No:**		
		Client Reference:	Eltham central landfill groundwaters	
		Submitted By:	Jane Harvey	

Sample Type: Aqueous

Sample Name:	GND0568 18-Apr-2018 11:35 am	GND1353 18-Apr-2018 10:20 am	GND2691 18-Apr-2018 11:10 am	GND2693 18-Apr-2018 1:15 pm	
Lab Number:	1966036.1	1966036.2	1966036.3	1966036.4	
Individual Tests					
Free Ammonia* g/m³ at Client Temperature	< 0.010	< 0.010	< 0.010	< 0.010	-
Sum of Anions meq/L	2.3	2.1	2.1	1.60	-
Sum of Cations meq/L	2.3	2.1	2.1	1.58	-
Turbidity NTU	0.60	0.88	25	158	-
pH pH Units	6.5	6.8	6.6	6.7	-
Total Alkalinity g/m³ as $CaCO_3$	47	53	49	45	-
Bicarbonate g/m³ at 25°C	57	65	60	55	-
Total Hardness g/m³ as $CaCO_3$	66	59	63	41	-
Electrical Conductivity (EC) mS/m	25.6	22.3	23.2	16.6	-
Total Dissolved Solids (TDS) g/m³	188	161	170	134	-
Sample Temperature* °C	13.4	12.9	13.1	13.3	-
Dissolved Aluminium g/m³	< 0.003	< 0.003	< 0.003	0.005	-
Dissolved Boron g/m³	0.016	0.019	0.014	0.020	-
Dissolved Calcium g/m³	15.4	13.3	15.4	9.2	-
Dissolved Iron g/m³	< 0.02	< 0.02	< 0.02	< 0.02	-
Dissolved Magnesium g/m³	6.8	6.2	5.9	4.3	-
Dissolved Manganese g/m³	< 0.0005	< 0.0005	0.0009	0.0005	-
Dissolved Mercury g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	-
Dissolved Potassium g/m³	3.4	3.2	2.7	1.51	-
Dissolved Selenium g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	-
Dissolved Sodium g/m³	20	18.8	18.0	16.5	-
Chloride g/m³	29	22	30	15.6	-
Fluoride g/m³	0.06	0.08	0.10	0.05	-
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	6.2	3.1	3.3	1.90	-
Nitrate-N + Nitrite-N g/m³	6.2	3.1	3.3	1.90	-
Total Kjeldahl Nitrogen (TKN) g/m³	< 0.10	0.12	< 0.10	0.13	-
Dissolved Reactive Phosphorus g/m³	0.025	0.033	0.037	0.012	-
Phosphate g/m³	0.076	0.101	0.112	0.035	-
Total Phosphorus g/m³	0.034	0.044	0.094	0.38	-
Reactive Silica g/m³ as SiO_2	51	49	46	47	-
Sulphate g/m³	4.3	8.7	4.6	5.8	-
Dissolved Total Biochemical Oxygen Demand ($TBOD_5$) g O_2/m³	< 2	< 2	< 2	< 2	-
Dissolved Chemical Oxygen Demand g O_2/m³	< 6	< 6	< 6	< 6	-
Total Organic Carbon (TOC) g/m³	< 0.5	< 0.5	< 0.5	< 0.5	-

Sample Type: Aqueous						
Sample Name:		GND0568 18-Apr-2018 11:35 am	GND1353 18-Apr-2018 10:20 am	GND2691 18-Apr-2018 11:10 am	GND2693 18-Apr-2018 1:15 pm	
Lab Number:		1966036.1	1966036.2	1966036.3	1966036.4	
Individual Tests						
Escherichia coli	MPN / 100mL	1	< 1 [#1]	< 1	< 1	-
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Acetochlor	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Alachlor	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Atrazine	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Atrazine-desethyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Atrazine-desisopropyl	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	-
Azaconazole	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	-
Azinphos-methyl	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	-
Benalaxyl	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	-
Bitertanol	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	-
Bromacil	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Bromopropylate	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Butachlor	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Captan	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	-
Carbaryl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Carbofenothion	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Carbofuran	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Chlorfluazuron	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Chlorothalonil	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Chlorpyrifos	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Chlorpyrifos-methyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Chlortoluron	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	-
Cyanazine	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Cyfluthrin	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Cyhalothrin	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Cypermethrin	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	-
Deltamethrin (including Tralomethrin)	g/m³	< 0.00006	< 0.00006	< 0.00006	< 0.00006	-
Diazinon	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	-
Dichlofluanid	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Dichloran	g/m³	< 0.0002	< 0.0002	< 0.0002	< 0.0002	-
Dichlorvos	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	-
Difenoconazole	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	-
Dimethoate	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	-
Diphenylamine	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	-
Diuron	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Fenpropimorph	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Fluazifop-butyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Fluometuron	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Flusilazole	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Fluvalinate	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Furalaxyl	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	-
Haloxyfop-methyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Hexaconazole	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Hexazinone	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	-
IPBC (3-Iodo-2-propynyl-n-butylcarbamate)	g/m³	< 0.0002	< 0.0002	< 0.0002	< 0.0002	-
Kresoxim-methyl	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	-
Linuron	g/m³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	-
Malathion	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Metalaxyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Metolachlor	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Metribuzin	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Molinate	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	-

Sample Type: Aqueous						
Sample Name:		GND0568 18-Apr-2018 11:35 am	GND1353 18-Apr-2018 10:20 am	GND2691 18-Apr-2018 11:10 am	GND2693 18-Apr-2018 1:15 pm	
Lab Number:		1966036.1	1966036.2	1966036.3	1966036.4	
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Myclobutanil	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Naled	g/m³	< 0.0002	< 0.0002	< 0.0002	< 0.0002	-
Norflurazon	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	-
Oxadiazon	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Oxyfluorfen	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	-
Paclobutrazol	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Parathion-ethyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Parathion-methyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Pendimethalin	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Permethrin	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	-
Pirimicarb	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Pirimiphos-methyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Prochloraz	g/m³	< 0.0002	< 0.0002	< 0.0002	< 0.0002	-
Procymidone	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Prometryn	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	-
Propachlor	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Propanil	g/m³	< 0.0002	< 0.0002	< 0.0002	< 0.0002	-
Propazine	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	-
Propiconazole	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Pyriproxyfen	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Quizalofop-ethyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Simazine	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Simetryn	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Sulfentrazone	g/m³	< 0.0002	< 0.0002	< 0.0002	< 0.0002	-
TCMTB [2-(thiocyanomethylthio) benzothiazole,Busan]	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	-
Tebuconazole	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Terbacil	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Terbufos	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Terbumeton	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Terbuthylazine	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	-
Terbuthylazine-desethyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Terbutryn	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Thiabendazole	g/m³	< 0.0002	< 0.0002	< 0.0002	< 0.0002	-
Thiobencarb	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Tolylfluanid	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	-
Triazophos	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Trifluralin	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Vinclozolin	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	-
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	-
Dissolved Cadmium	g/m³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	-
Dissolved Chromium	g/m³	0.0022	0.0029	0.0007	0.0029	-
Dissolved Copper	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
Dissolved Lead	g/m³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	-
Dissolved Nickel	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
Dissolved Zinc	g/m³	< 0.0010	< 0.0010	0.0019	< 0.0010	-
Gases in groundwater						
Ethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Ethylene	g/m³	< 0.004	< 0.004	< 0.004	< 0.004	-
Methane	g/m³	< 0.002	< 0.002	< 0.002	< 0.002	-
Haloethers Trace in SVOC Water Samples by GC-MS						
Bis(2-chloroethoxy) methane	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
Bis(2-chloroethyl)ether	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-

Sample Type: Aqueous						
Sample Name:		GND0568 18-Apr-2018 11:35 am	GND1353 18-Apr-2018 10:20 am	GND2691 18-Apr-2018 11:10 am	GND2693 18-Apr-2018 1:15 pm	
Lab Number:		1966036.1	1966036.2	1966036.3	1966036.4	
Haloethers Trace in SVOC Water Samples by GC-MS						
Bis(2-chloroisopropyl)ether	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
4-Bromophenyl phenyl ether	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
4-Chlorophenyl phenyl ether	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
Nitrogen containing compounds Trace in SVOC Water Samples, GC-MS						
2,4-Dinitrotoluene	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	-
2,6-Dinitrotoluene	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	-
Nitrobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
N-Nitrosodi-n-propylamine	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	-
N-Nitrosodiphenylamine + Diphenylamine	g/m3	< 0.0010	< 0.0010	< 0.0010	< 0.0010	-
Organochlorine Pesticides Trace in SVOC Water Samples by GC-MS						
Aldrin	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
alpha-BHC	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
beta-BHC	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
delta-BHC	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
gamma-BHC (Lindane)	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
4,4'-DDD	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
4,4'-DDE	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
4,4'-DDT	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	-
Dieldrin	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
Endosulfan I	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	-
Endosulfan II	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	-
Endosulfan sulfate	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	-
Endrin	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
Endrin ketone	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	-
Heptachlor	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
Heptachlor epoxide	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
Hexachlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
Polycyclic Aromatic Hydrocarbons Trace in SVOC Water Samples						
Acenaphthene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Acenaphthylene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Anthracene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Benzo[a]anthracene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Benzo[a]pyrene (BAP)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Benzo[g,h,i]perylene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Benzo[k]fluoranthene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
1&2-Chloronaphthalene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Chrysene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Dibenzo[a,h]anthracene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Fluoranthene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Fluorene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Indeno(1,2,3-c,d)pyrene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
2-Methylnaphthalene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Naphthalene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Phenanthrene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Pyrene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Phenols Trace (drinkingwater) in SVOC Water Samples by GC-MS						
2-Chlorophenol	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
2,4-Dichlorophenol	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
2,4,6-Trichlorophenol	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	-
Phenols Trace (non-drinkingwater) in SVOC Water Samples by GC-MS						
4-Chloro-3-methylphenol	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	-
2,4-Dimethylphenol	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-

Sample Type: Aqueous						
Sample Name:		GND0568 18-Apr-2018 11:35 am	GND1353 18-Apr-2018 10:20 am	GND2691 18-Apr-2018 11:10 am	GND2693 18-Apr-2018 1:15 pm	
Lab Number:		1966036.1	1966036.2	1966036.3	1966036.4	
Phenols Trace (non-drinkingwater) in SVOC Water Samples by GC-MS						
3 & 4-Methylphenol (m- + p-cresol)	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	-
2-Methylphenol (o-Cresol)	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
2-Nitrophenol	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	-
Pentachlorophenol (PCP)	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Phenol	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	-
2,4,5-Trichlorophenol	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	-
Plasticisers Trace (non-drinkingwater) in SVOC Water by GCMS						
Butylbenzylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	-
Diethylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	-
Dimethylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	-
Di-n-butylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	-
Di-n-octylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	-
Plasticisers Trace (drinkingwater) in SVOC Water Samples by GCMS						
Bis(2-ethylhexyl)phthalate	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	-
Di(2-ethylhexyl)adipate	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	-
Other Halogenated compounds Trace (drinkingwater) in SVOC Water						
1,2-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
1,3-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
1,4-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
Other Halogenated compounds Trace (non-drinkingwater) in SVOC						
Hexachlorobutadiene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
Hexachloroethane	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
1,2,4-Trichlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
Other SVOC Trace in SVOC Water Samples by GC-MS						
Benzyl alcohol	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	-
Carbazole	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
Dibenzofuran	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
Isophorone	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
BTEX in VOC Water by Headspace GC-MS						
Benzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Ethylbenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
Toluene	g/m³	< 0.0003	< 0.0003	0.0003	< 0.0003	-
m&p-Xylene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
o-Xylene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
Bromomethane (Methyl Bromide)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Carbon tetrachloride	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Chloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Chloromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
1,2-Dibromo-3-chloropropane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
1,2-Dibromoethane (ethylene dibromide, EDB)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Dibromomethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Dichlorodifluoromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
1,1-Dichloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
1,2-Dichloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
1,1-Dichloroethene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
cis-1,2-Dichloroethene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
trans-1,2-Dichloroethene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Dichloromethane (methylene chloride)	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
1,2-Dichloropropane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
1,3-Dichloropropane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
1,1-Dichloropropene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
cis-1,3-Dichloropropene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-

Sample Type: Aqueous						
Sample Name:		GND0568 18-Apr-2018 11:35 am	GND1353 18-Apr-2018 10:20 am	GND2691 18-Apr-2018 11:10 am	GND2693 18-Apr-2018 1:15 pm	
Lab Number:		1966036.1	1966036.2	1966036.3	1966036.4	
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
trans-1,3-Dichloropropene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
Hexachlorobutadiene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
1,1,1,2-Tetrachloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
1,1,2,2-Tetrachloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Tetrachloroethene (tetrachloroethylene)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
1,1,1-Trichloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
1,1,2-Trichloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Trichloroethene (trichloroethylene)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Trichlorofluoromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
1,2,3-Trichloropropane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
1,1,2-Trichlorotrifluoroethane (Freon 113)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Vinyl chloride	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Halogenated Aromatics in VOC Water by Headspace GC-MS						
Chlorobenzene (monochlorobenzene)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
1,2-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
1,3-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
1,4-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
1,2,3-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
1,2,4-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
1,3,5-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Bromobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
2-Chlorotoluene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
4-Chlorotoluene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Monoaromatic Hydrocarbons in VOC Water by Headspace GC-MS						
n-Butylbenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
tert-Butylbenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
4-Isopropyltoluene (p-Cymene)	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
Isopropylbenzene (Cumene)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
n-Propylbenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
sec-Butylbenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Styrene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-
1,2,4-Trimethylbenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
1,3,5-Trimethylbenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Ketones in VOC Water by Headspace GC-MS						
Acetone	g/m³	< 0.05	< 0.05	< 0.05	< 0.05	-
2-Butanone (MEK)	g/m³	< 0.05	< 0.05	< 0.05	< 0.05	-
Methyl tert-butylether (MTBE)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
4-Methylpentan-2-one (MIBK)	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	-
Trihalomethanes in VOC Water by Headspace GC-MS						
Bromodichloromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Bromoform (tribromomethane)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Chloroform (Trichloromethane)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Dibromochloromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	-
Other VOC in Water by Headspace GC-MS						
Carbon disulphide	g/m³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	-
Naphthalene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	-

Analyst's Comments

[#1] Please interpret this microbiological result with caution as the sample was > 24 hours old at the time of testing in the laboratory. The sample was receipted by the laboratory within 24 hrs of sample collection, but due to processing delays it was not processed until 24.5 hours after sampling.

Amended Report: This certificate of analysis replaces an earlier certificate issued on 08 May 2018 at 5:31 pm
Reason for amendment: The sample temperatures from the client have been added.

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
Free Ammonia*	Calculation from NH4N, pH, Temperature (Calculations based on data for distilled water). APHA Table 8010:VI 22nd ed. 2012.	0.010 g/m³ at Client Temperature	1-4
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS	Liquid/liquid extraction, GPC (if required), GCMS analysis	-	1-4
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	1-4
Gases in groundwater	Manual headspace creation and sub-sampling, GC-FID analysis.	0.002 - 0.003 g/m³	1-4
Semivolatile Organic Compounds Trace in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	-	1-4
Volatile Organic Compounds Trace in Water by Headspace GC-MS	Headspace, GC-MS SIM analysis [KBIs:37857,37921]	0.00010 - 0.05 g/m³	1-4
Filtration for DKN, Soluble COD*	Sample filtration through 0.45µm membrane filter prior to Dissolved Kjeldahl Nitrogen or Soluble COD analysis.	-	1-4
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	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 Dissolved Solids (TDS)	Filtration through GF/C (1.2 µm), gravimetric. APHA 2540 C (modified; drying temperature of 103 - 105°C used rather than 180 ± 2°C) 22nd ed. 2012.	10 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
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.003 g/m³	1-4
Dissolved Boron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.005 g/m³	1-4
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1-4
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-4
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-4
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0005 g/m³	1-4
Dissolved Mercury	0.45µm filtration, bromine oxidation followed by atomic fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m³	1-4
Dissolved Potassium	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**
Dissolved Selenium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0010 g/m³	1-4
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-4
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-4
Fluoride	Direct measurement, ion selective electrode. APHA 4500-F^- C 22nd ed. 2012.	0.05 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 Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-Norg D. (modified) 4500 NH_3 F (modified) 22nd ed. 2012.	0.10 g/m³	1-4
Dissolved Reactive Phosphorus	Filtered sample. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified). 22nd ed. 2012.	0.004 g/m³	1-4
Phosphate from DRP	Calculation: from Dissolved Reactive Phosphorus * 3.065.	0.004 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
Reactive Silica	Filtered sample. Heteropoly blue colorimetry. Discrete analyser. APHA 4500-SiO_2 F (modified from flow injection analysis) 22nd ed. 2012.	0.10 g/m³ as SiO_2	1-4
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-4
Dissolved Total Biochemical Oxygen Demand ($TBOD_5$)	Filtered sample, Incubation 5 days, DO meter, no nitrification inhibitor added, no dilutions, seeded. APHA 5210 B (modified) 22nd ed. 2012.	2 g O_2/m³	1-4
Dissolved COD, trace level	Filtered sample. Dichromate/sulphuric acid digestion, colorimetry. Trace Level method. APHA 5220 D 22nd ed. 2012.	6 g O_2/m³	1-4
Total Organic Carbon (TOC)	Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC.The uncertainty of the calculated result is a combination of the uncertainties of the two analytical determinands in the subtraction calculation. Where both determinands are similar in magnitude, the calculated result has a significantly higher uncertainty than would normally be achieved if one of the results was significantly less than the other. In such cases, the elevated uncertainty should be kept in mind when interpreting the data. APHA 5310 C (modified) 22nd ed. 2012.	0.5 g/m³	1-4
Escherichia coli	MPN count using Colilert , Incubated at 35°C for 24 hours. APHA 9223 B (2004), 22nd ed. 2012.	1 MPN / 100mL	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

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Certificate of Analysis

Client:	Taranaki Regional Council	**Lab No:**	1962405 SPv3
Contact:	Jane Harvey	**Date Received:**	13-Apr-2018
	C/- Taranaki Regional Council	**Date Reported:**	18-May-2018 **(Amended)**
	Private Bag 713	**Quote No:**	83292
	Stratford 4352	**Order No:**	
		Client Reference:	Eltham central landfill groundwaters
		Submitted By:	Jane Harvey

Sample Type: Aqueous

Sample Name:	GND2694 12-Apr-2018 12:10 pm	GND2697 12-Apr-2018 9:50 am	GND2701 12-Apr-2018 2:50 pm	GND2692 12-Apr-2018 3:00 pm	GND 0569 12-Apr-2018 10:30 am
Lab Number:	1962405.1	1962405.2	1962405.3	1962405.4	1962405.5
Individual Tests					
Free Ammonia* g/m³ at Client Temperature	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Sum of Anions meq/L	4.2	2.4	3.6	1.59	2.2
Sum of Cations meq/L	3.2 #1	2.4	3.4	1.53	2.1
Turbidity NTU	22	18.9	520	14.6	19.4
pH pH Units	8.1	7.1	7.8	7.4	6.6
Total Alkalinity g/m³ as $CaCO_3$	121	57	98	45	38
Bicarbonate g/m³ at 25°C	146	69	119	54	46
Total Hardness g/m³ as $CaCO_3$	99	78	99	41	58
Electrical Conductivity (EC) mS/m	44.1	26.7	38.4	16.7	24.3
Total Dissolved Solids (TDS) g/m³	260	184	250	130	182
Sample Temperature* °C	13.5	14.8	12.7	12.6	13.7
Dissolved Aluminium g/m³	0.005	0.003	0.006	0.004	0.003
Dissolved Arsenic g/m³	0.0031	-	-	-	-
Dissolved Boron g/m³	0.019	0.017	0.017	0.019	0.013
Dissolved Cadmium g/m³	< 0.00005	-	-	-	-
Dissolved Calcium g/m³	24	16.7	24	9.7	13.9
Dissolved Chromium g/m³	0.0010	-	-	-	-
Dissolved Copper g/m³	< 0.0005	-	-	-	-
Dissolved Iron g/m³	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Dissolved Lead g/m³	< 0.00010	-	-	-	-
Dissolved Magnesium g/m³	9.3	8.8	9.4	4.1	5.7
Dissolved Manganese g/m³	0.0037	0.0061	0.0073	0.0028	0.0030
Dissolved Mercury g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Dissolved Nickel g/m³	< 0.0005	-	-	-	-
Dissolved Potassium g/m³	3.2	3.1	3.4	1.43	3.2
Dissolved Selenium g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Dissolved Sodium g/m³	27	16.8	31	15.6	19.9
Dissolved Zinc g/m³	< 0.0010	-	-	-	-
Chloride g/m³	56	34	37	16.1	33
Fluoride g/m³	0.25	0.07	0.09	0.06	< 0.05
Total Ammoniacal-N g/m³	0.069	< 0.010	< 0.010	< 0.010	< 0.010
Nitrite-N g/m³	0.034	< 0.002	< 0.002	< 0.002	< 0.002
Nitrate-N g/m³	0.31	1.85	7.9	1.45	5.2
Nitrate-N + Nitrite-N g/m³	0.35	1.85	7.9	1.45	5.2
Total Kjeldahl Nitrogen (TKN) g/m³	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dissolved Reactive Phosphorus g/m³	0.108	0.026	0.140	0.019	0.020
Phosphate g/m³	0.33	0.079	0.43	0.057	0.062

Sample Type: Aqueous						
Sample Name:		GND2694 12-Apr-2018 12:10 pm	GND2697 12-Apr-2018 9:50 am	GND2701 12-Apr-2018 2:50 pm	GND2692 12-Apr-2018 3:00 pm	GND 0569 12-Apr-2018 10:30 am
Lab Number:		1962405.1	1962405.2	1962405.3	1962405.4	1962405.5
Individual Tests						
Total Phosphorus	g/m^3	0.148	0.055	0.80	0.046	0.059
Reactive Silica	g/m^3 as SiO_2	37	45	44	47	48
Sulphate	g/m^3	9.0	7.5	3.5	6.5	5.2
Dissolved Total Biochemical Oxygen Demand ($TBOD_5$)	$g\ O_2/m^3$	< 2	< 2	< 2	< 2	< 2
Dissolved Chemical Oxygen Demand	$g\ O_2/m^3$	< 6	< 6	< 6	< 6	< 6
Total Organic Carbon (TOC)	g/m^3	< 0.5	< 0.5	< 0.5	< 0.5	< 1.0
Escherichia coli	MPN / 100mL	< 1	< 1	< 1	< 1	< 1 [#2]
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Acetochlor	g/m^3	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Alachlor	g/m^3	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Atrazine	g/m^3	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Atrazine-desethyl	g/m^3	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Atrazine-desisopropyl	g/m^3	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Azaconazole	g/m^3	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Azinphos-methyl	g/m^3	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Benalaxyl	g/m^3	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Bitertanol	g/m^3	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Bromacil	g/m^3	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Bromopropylate	g/m^3	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Butachlor	g/m^3	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Captan	g/m^3	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Carbaryl	g/m^3	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Carbofenothion	g/m^3	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Carbofuran	g/m^3	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Chlorfluazuron	g/m^3	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Chlorothalonil	g/m^3	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Chlorpyrifos	g/m^3	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Chlorpyrifos-methyl	g/m^3	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Chlortoluron	g/m^3	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Cyanazine	g/m^3	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Cyfluthrin	g/m^3	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Cyhalothrin	g/m^3	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Cypermethrin	g/m^3	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Deltamethrin (including Tralomethrin)	g/m^3	< 0.00006	< 0.00006	< 0.00006	< 0.00006	< 0.00006
Diazinon	g/m^3	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Dichlofluanid	g/m^3	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Dichloran	g/m^3	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Dichlorvos	g/m^3	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Difenoconazole	g/m^3	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Dimethoate	g/m^3	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Diphenylamine	g/m^3	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Diuron	g/m^3	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Fenpropimorph	g/m^3	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Fluazifop-butyl	g/m^3	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Fluometuron	g/m^3	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Flusilazole	g/m^3	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Fluvalinate	g/m^3	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Furalaxyl	g/m^3	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Haloxyfop-methyl	g/m^3	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Hexaconazole	g/m^3	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Hexazinone	g/m^3	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
IPBC (3-Iodo-2-propynyl-n-butylcarbamate)	g/m^3	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Kresoxim-methyl	g/m^3	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002

Sample Type: Aqueous						
Sample Name:		GND2694 12-Apr-2018 12:10 pm	GND2697 12-Apr-2018 9:50 am	GND2701 12-Apr-2018 2:50 pm	GND2692 12-Apr-2018 3:00 pm	GND 0569 12-Apr-2018 10:30 am
Lab Number:		1962405.1	1962405.2	1962405.3	1962405.4	1962405.5
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Linuron	g/m³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Malathion	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Metalaxyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Metolachlor	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Metribuzin	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Molinate	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Myclobutanil	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Naled	g/m³	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Norflurazon	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Oxadiazon	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Oxyfluorfen	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Paclobutrazol	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Parathion-ethyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Parathion-methyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Pendimethalin	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Permethrin	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Pirimicarb	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Pirimiphos-methyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Prochloraz	g/m³	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Procymidone	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Prometryn	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Propachlor	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Propanil	g/m³	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Propazine	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Propiconazole	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Pyriproxyfen	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Quizalofop-ethyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Simazine	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Simetryn	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Sulfentrazone	g/m³	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
TCMTB [2-(thiocyanomethylthio) benzothiazole,Busan]	g/m³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Tebuconazole	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Terbacil	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Terbufos	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Terbumeton	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Terbuthylazine	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Terbuthylazine-desethyl	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Terbutryn	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Thiabendazole	g/m³	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Thiobencarb	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Tolylfluanid	g/m³	< 0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002
Triazophos	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Trifluralin	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Vinclozolin	g/m³	< 0.00004	< 0.00004	< 0.00004	< 0.00004	< 0.00004
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m³	-	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Dissolved Cadmium	g/m³	-	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Chromium	g/m³	-	0.0012	0.0011	0.0033	0.0020
Dissolved Copper	g/m³	-	0.0006	0.0008	< 0.0005	< 0.0005
Dissolved Lead	g/m³	-	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Nickel	g/m³	-	0.0006	< 0.0005	< 0.0005	< 0.0005
Dissolved Zinc	g/m³	-	0.0146	< 0.0010	0.0040	0.0038

Sample Type: Aqueous						
Sample Name:		GND2694 12-Apr-2018 12:10 pm	GND2697 12-Apr-2018 9:50 am	GND2701 12-Apr-2018 2:50 pm	GND2692 12-Apr-2018 3:00 pm	GND 0569 12-Apr-2018 10:30 am
Lab Number:		1962405.1	1962405.2	1962405.3	1962405.4	1962405.5
Gases in groundwater						
Ethane	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Ethylene	g/m³	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004
Methane	g/m³	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Haloethers Trace in SVOC Water Samples by GC-MS						
Bis(2-chloroethoxy) methane	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Bis(2-chloroethyl)ether	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Bis(2-chloroisopropyl)ether	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
4-Bromophenyl phenyl ether	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
4-Chlorophenyl phenyl ether	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Nitrogen containing compounds Trace in SVOC Water Samples, GC-MS						
2,4-Dinitrotoluene	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2,6-Dinitrotoluene	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Nitrobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
N-Nitrosodi-n-propylamine	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
N-Nitrosodiphenylamine + Diphenylamine	g/m3	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Organochlorine Pesticides Trace in SVOC Water Samples by GC-MS						
Aldrin	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
alpha-BHC	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
beta-BHC	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
delta-BHC	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
gamma-BHC (Lindane)	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
4,4'-DDD	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
4,4'-DDE	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
4,4'-DDT	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Dieldrin	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Endosulfan I	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan II	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endosulfan sulfate	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Endrin	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Endrin ketone	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Heptachlor	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Heptachlor epoxide	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Hexachlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Polycyclic Aromatic Hydrocarbons Trace in SVOC Water Samples						
Acenaphthene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Acenaphthylene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Anthracene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Benzo[a]anthracene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Benzo[a]pyrene (BAP)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Benzo[g,h,i]perylene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Benzo[k]fluoranthene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1&2-Chloronaphthalene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Chrysene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Dibenzo[a,h]anthracene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Fluoranthene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Fluorene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Indeno(1,2,3-c,d)pyrene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
2-Methylnaphthalene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Naphthalene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Phenanthrene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Pyrene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003

Sample Type: Aqueous						
Sample Name:		GND2694 12-Apr-2018 12:10 pm	GND2697 12-Apr-2018 9:50 am	GND2701 12-Apr-2018 2:50 pm	GND2692 12-Apr-2018 3:00 pm	GND 0569 12-Apr-2018 10:30 am
Lab Number:		1962405.1	1962405.2	1962405.3	1962405.4	1962405.5
Phenols Trace (drinkingwater) in SVOC Water Samples by GC-MS						
2-Chlorophenol	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
2,4-Dichlorophenol	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
2,4,6-Trichlorophenol	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Phenols Trace (non-drinkingwater) in SVOC Water Samples by GC-MS						
4-Chloro-3-methylphenol	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2,4-Dimethylphenol	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
3 & 4-Methylphenol (m- + p-cresol)	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2-Methylphenol (o-Cresol)	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
2-Nitrophenol	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Pentachlorophenol (PCP)	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Phenol	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
2,4,5-Trichlorophenol	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Plasticisers Trace (non-drinkingwater) in SVOC Water by GCMS						
Butylbenzylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Diethylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Dimethylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Di-n-butylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Di-n-octylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Plasticisers Trace (drinkingwater) in SVOC Water Samples by GCMS						
Bis(2-ethylhexyl)phthalate	g/m³	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Di(2-ethylhexyl)adipate	g/m³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Other Halogenated compounds Trace (drinkingwater) in SVOC Water						
1,2-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,3-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,4-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Other Halogenated compounds Trace (non-drinkingwater) in SVOC						
Hexachlorobutadiene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Hexachloroethane	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,2,4-Trichlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Other SVOC Trace in SVOC Water Samples by GC-MS						
Benzyl alcohol	g/m³	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Carbazole	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dibenzofuran	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Isophorone	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
BTEX in VOC Water by Headspace GC-MS						
Benzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Ethylbenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Toluene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
m&p-Xylene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
o-Xylene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
Bromomethane (Methyl Bromide)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Carbon tetrachloride	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Chloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Chloromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,2-Dibromo-3-chloropropane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,2-Dibromoethane (ethylene dibromide, EDB)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Dibromomethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Dichlorodifluoromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,1-Dichloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,2-Dichloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,1-Dichloroethene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
cis-1,2-Dichloroethene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003

Sample Type: Aqueous						
Sample Name:		GND2694 12-Apr-2018 12:10 pm	GND2697 12-Apr-2018 9:50 am	GND2701 12-Apr-2018 2:50 pm	GND2692 12-Apr-2018 3:00 pm	GND 0569 12-Apr-2018 10:30 am
Lab Number:		1962405.1	1962405.2	1962405.3	1962405.4	1962405.5
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
trans-1,2-Dichloroethene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Dichloromethane (methylene chloride)	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
1,2-Dichloropropane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,3-Dichloropropane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,1-Dichloropropene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
cis-1,3-Dichloropropene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
trans-1,3-Dichloropropene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Hexachlorobutadiene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,1,1,2-Tetrachloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,1,2,2-Tetrachloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Tetrachloroethene (tetrachloroethylene)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,1,1-Trichloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,1,2-Trichloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Trichloroethene (trichloroethylene)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Trichlorofluoromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,2,3-Trichloropropane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,1,2-Trichlorotrifluoroethane (Freon 113)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Vinyl chloride	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Halogenated Aromatics in VOC Water by Headspace GC-MS						
Chlorobenzene (monochlorobenzene)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,2-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,3-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,4-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,2,3-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,2,4-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,3,5-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Bromobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
2-Chlorotoluene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
4-Chlorotoluene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Monoaromatic Hydrocarbons in VOC Water by Headspace GC-MS						
n-Butylbenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
tert-Butylbenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
4-Isopropyltoluene (p-Cymene)	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Isopropylbenzene (Cumene)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
n-Propylbenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
sec-Butylbenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Styrene	g/m³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
1,2,4-Trimethylbenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
1,3,5-Trimethylbenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Ketones in VOC Water by Headspace GC-MS						
Acetone	g/m³	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
2-Butanone (MEK)	g/m³	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Methyl tert-butylether (MTBE)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
4-Methylpentan-2-one (MIBK)	g/m³	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Trihalomethanes in VOC Water by Headspace GC-MS						
Bromodichloromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Bromoform (tribromomethane)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Chloroform (Trichloromethane)	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Dibromochloromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Other VOC in Water by Headspace GC-MS						
Carbon disulphide	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

Analyst's Comments

#1 It was observed that the result for the 'Sum of Cations' was low with respect to that of the 'Sum of Anions' and Electrical Conductivity. This has been confirmed by re-analysis from both the unpreserved and metals containers, indicating the presence of an unidentified cation.

#2 Please interpret this microbiological result with caution as the sample was > 24 hours old at the time of testing in the laboratory. The sample was receipted by the laboratory within 24 hrs of sample collection, but due to processing delays it was not processed until 28 hours after sampling.

Amended Report: This certificate of analysis replaces an earlier certificate issued on 15 May 2018 at 12:01 pm
Reason for amendment: The Sample ID of 1962405.5 has been corrected.

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

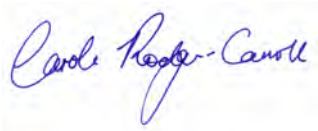
Test	Method Description	Default Detection Limit	Sample No
Free Ammonia*	Calculation from NH4N, pH, Temperature (Calculations based on data for distilled water). APHA Table 8010:VI 22nd ed. 2012.	0.010 g/m³ at Client Temperature	1-5
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS	Liquid/liquid extraction, GPC (if required), GCMS analysis	-	1-5
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	1-5
Gases in groundwater	Manual headspace creation and sub-sampling, GC-FID analysis.	0.002 - 0.003 g/m³	1-5
Semivolatile Organic Compounds Trace in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	-	1-5
Volatile Organic Compounds Trace in Water by Headspace GC-MS	Headspace, GC-MS SIM analysis [KBIs:37857,37921]	0.00010 - 0.05 g/m³	1-5
Filtration for DKN, Soluble COD*	Sample filtration through 0.45µm membrane filter prior to Dissolved Kjeldahl Nitrogen or Soluble COD analysis.	-	1-5
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-5
Total Kjeldahl Digestion	Sulphuric acid digestion with copper sulphate catalyst.	-	1-5
Total Phosphorus Digestion	Acid persulphate digestion.	-	1-5
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	1-5
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	1-5
Turbidity	Analysis using a Hach 2100N, Turbidity meter. APHA 2130 B 22nd ed. 2012.	0.05 NTU	1-5
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	1-5
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 $CaCO_3$	1-5
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	1-5
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m³ as $CaCO_3$	1-5
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1-5
Total Dissolved Solids (TDS)	Filtration through GF/C (1.2 µm), gravimetric. APHA 2540 C (modified; drying temperature of 103 - 105°C used rather than 180 ± 2°C) 22nd ed. 2012.	10 g/m³	1-5
Sample Temperature*	Supplied by customer, otherwise 20°C.	0.1 °C	1-5
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 22nd ed. 2012.	-	1-5
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.003 g/m³	1-5

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Dissolved Arsenic	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0010 g/m³	1
Dissolved Boron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.005 g/m³	1-5
Dissolved Cadmium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.00005 g/m³	1
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1-5
Dissolved Chromium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0005 g/m³	1
Dissolved Copper	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0005 g/m³	1
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-5
Dissolved Lead	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.00010 g/m³	1
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-5
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0005 g/m³	1-5
Dissolved Mercury	0.45µm filtration, bromine oxidation followed by atomic fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m³	1-5
Dissolved Nickel	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0005 g/m³	1
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1-5
Dissolved Selenium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0010 g/m³	1-5
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-5
Dissolved Zinc	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0010 g/m³	1
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-5
Fluoride	Direct measurement, ion selective electrode. APHA 4500-F^- C 22nd ed. 2012.	0.05 g/m³	1-5
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	1-5
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-5
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m³	1-5
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	1-5
Total Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-Norg D. (modified) 4500 NH_3 F (modified) 22nd ed. 2012.	0.10 g/m³	1-5
Dissolved Reactive Phosphorus	Filtered sample. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified). 22nd ed. 2012.	0.004 g/m³	1-5
Phosphate from DRP	Calculation: from Dissolved Reactive Phosphorus * 3.065.	0.004 g/m³	1-5
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	1-5
Reactive Silica	Filtered sample. Heteropoly blue colorimetry. Discrete analyser. APHA 4500-SiO_2 F (modified from flow injection analysis) 22nd ed. 2012.	0.10 g/m³ as SiO_2	1-5
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-5
Dissolved Total Biochemical Oxygen Demand ($TBOD_5$)	Filtered sample, Incubation 5 days, DO meter, no nitrification inhibitor added, no dilutions, seeded. APHA 5210 B (modified) 22nd ed. 2012.	2 g O_2/m³	1-5
Dissolved COD, trace level	Filtered sample. Dichromate/sulphuric acid digestion, colorimetry. Trace Level method. APHA 5220 D 22nd ed. 2012.	6 g O_2/m³	1-5

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Total Organic Carbon (TOC)	Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC.The uncertainty of the calculated result is a combination of the uncertainties of the two analytical determinands in the subtraction calculation. Where both determinands are similar in magnitude, the calculated result has a significantly higher uncertainty than would normally be achieved if one of the results was significantly less than the other. In such cases, the elevated uncertainty should be kept in mind when interpreting the data. APHA 5310 C (modified) 22nd ed. 2012.	0.5 g/m^3	1-5
Escherichia coli	MPN count using Colilert , Incubated at 35°C for 24 hours. APHA 9223 B (2004), 22nd ed. 2012.	1 MPN / 100mL	1-5

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.



Carole Rodgers-Carroll BA, NZCS
Client Services Manager - Environmental

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Certificate of Analysis

Client:	Taranaki Regional Council	**Lab No:**	1961558 SPv2
Contact:	Jane Harvey C/- Taranaki Regional Council Private Bag 713 Stratford 4352	**Date Received:**	12-Apr-2018
		Date Reported:	15-May-2018 **(Amended)**
		Quote No:	83292
		Order No:	
		Client Reference:	Eltham central landfill groundwaters
		Submitted By:	Jane Harvey

Sample Type: Aqueous

Sample Name:	GND2695 11-Apr-2018 1:30 pm	GND2698 [11:45-12:15] 11-Apr-2018	GND0600 11-Apr-2018 2:50 pm		
Lab Number:	1961558.1	1961558.2	1961558.3		
Individual Tests					
Free Ammonia* g/m³ at Client Temperature	< 0.010	< 0.010	< 0.010	-	-
Sum of Anions meq/L	2.9	1.97	4.6	-	-
Sum of Cations meq/L	2.8	1.91	4.5	-	-
Turbidity NTU	270	340	250	-	-
pH pH Units	7.0	7.0	6.5	-	-
Total Alkalinity g/m³ as $CaCO_3$	57	56	40	-	-
Bicarbonate g/m³ at 25°C	69	68	49	-	-
Total Hardness g/m³ as $CaCO_3$	72	58	151	-	-
Electrical Conductivity (EC) mS/m	30.9	20.7	53.6	-	-
Total Dissolved Solids (TDS) g/m³	230	166	430	-	-
Sample Temperature* °C	10.6	12.0	12.6	-	-
Dissolved Aluminium g/m³	< 0.003	0.006	0.005	-	-
Dissolved Boron g/m³	0.022	0.015	0.015	-	-
Dissolved Calcium g/m³	16.2	15.0	34	-	-
Dissolved Iron g/m³	< 0.02	< 0.02	< 0.02	-	-
Dissolved Magnesium g/m³	7.6	4.9	15.8	-	-
Dissolved Manganese g/m³	0.0028	0.0040	0.043	-	-
Dissolved Mercury g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Dissolved Potassium g/m³	3.6	2.7	3.9	-	-
Dissolved Selenium g/m³	< 0.0010	< 0.0010	0.0022	-	-
Dissolved Sodium g/m³	29	15.7	30	-	-
Chloride g/m³	44	21	71	-	-
Fluoride g/m³	0.09	< 0.05	< 0.05	-	-
Total Ammoniacal-N g/m³	< 0.010	0.019	0.47	-	-
Nitrite-N g/m³	< 0.002	< 0.002	0.013	-	-
Nitrate-N g/m³	6.3	2.0	24	-	-
Nitrate-N + Nitrite-N g/m³	6.3	2.0	24	-	-
Total Kjeldahl Nitrogen (TKN) g/m³	0.21	< 0.10	6.2	-	-
Dissolved Reactive Phosphorus g/m³	0.047	0.028	0.101	-	-
Phosphate g/m³	0.144	0.087	0.31	-	-
Total Phosphorus g/m³	12.1	0.76	2.6	-	-
Reactive Silica g/m³ as SiO_2	52	50	55	-	-
Sulphate g/m³	4.0	5.3	5.0	-	-
Dissolved Total Biochemical Oxygen Demand ($TBOD_5$) g O_2/m³	< 2	< 2	< 2	-	-
Dissolved Chemical Oxygen Demand g O_2/m³	18	< 6	< 6	-	-
Total Organic Carbon (TOC) g/m³	2.5	1.0	39	-	-

Sample Type: Aqueous						
Sample Name:		GND2695 11-Apr-2018 1:30 pm	GND2698 [11:45-12:15] 11-Apr-2018	GND0600 11-Apr-2018 2:50 pm		
Lab Number:		1961558.1	1961558.2	1961558.3		
Individual Tests						
Escherichia coli	MPN / 100mL	< 1	< 1	50	-	-
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Acetochlor	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Alachlor	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Atrazine	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Atrazine-desethyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Atrazine-desisopropyl	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Azaconazole	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Azinphos-methyl	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Benalaxyl	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Bitertanol	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Bromacil	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Bromopropylate	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Butachlor	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Captan	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Carbaryl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Carbofenothion	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Carbofuran	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Chlorfluazuron	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Chlorothalonil	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Chlorpyrifos	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Chlorpyrifos-methyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Chlortoluron	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Cyanazine	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Cyfluthrin	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Cyhalothrin	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Cypermethrin	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Deltamethrin (including Tralomethrin)	g/m³	< 0.00006	< 0.00006	< 0.00006	-	-
Diazinon	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Dichlofluanid	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Dichloran	g/m³	< 0.0002	< 0.0002	< 0.0002	-	-
Dichlorvos	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Difenoconazole	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Dimethoate	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Diphenylamine	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Diuron	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Fenpropimorph	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Fluazifop-butyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Fluometuron	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Flusilazole	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Fluvalinate	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Furalaxyl	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Haloxyfop-methyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Hexaconazole	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Hexazinone	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
IPBC (3-Iodo-2-propynyl-n-butylcarbamate)	g/m³	< 0.0002	< 0.0002	< 0.0002	-	-
Kresoxim-methyl	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Linuron	g/m³	< 0.00005	< 0.00005	< 0.00005	-	-
Malathion	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Metalaxyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Metolachlor	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Metribuzin	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Molinate	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-

Sample Type: Aqueous						
Sample Name:		GND2695 11-Apr-2018 1:30 pm	GND2698 [11:45-12:15] 11-Apr-2018	GND0600 11-Apr-2018 2:50 pm		
Lab Number:		1961558.1	1961558.2	1961558.3		
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Myclobutanil	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Naled	g/m³	< 0.0002	< 0.0002	< 0.0002	-	-
Norflurazon	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Oxadiazon	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Oxyfluorfen	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Paclobutrazol	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Parathion-ethyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Parathion-methyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Pendimethalin	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Permethrin	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Pirimicarb	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Pirimiphos-methyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Prochloraz	g/m³	< 0.0002	< 0.0002	< 0.0002	-	-
Procymidone	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Prometryn	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Propachlor	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Propanil	g/m³	< 0.0002	< 0.0002	< 0.0002	-	-
Propazine	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Propiconazole	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Pyriproxyfen	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Quizalofop-ethyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Simazine	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Simetryn	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Sulfentrazone	g/m³	< 0.0002	< 0.0002	< 0.0002	-	-
TCMTB [2-(thiocyanomethylthio) benzothiazole,Busan]	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Tebuconazole	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Terbacil	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Terbufos	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Terbumeton	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Terbuthylazine	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Terbuthylazine-desethyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Terbutryn	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Thiabendazole	g/m³	< 0.0002	< 0.0002	< 0.0002	-	-
Thiobencarb	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Tolylfluanid	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Triazophos	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Trifluralin	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Vinclozolin	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Dissolved Cadmium	g/m³	< 0.00005	< 0.00005	0.00012	-	-
Dissolved Chromium	g/m³	0.0012	0.0011	< 0.0005	-	-
Dissolved Copper	g/m³	< 0.0005	< 0.0005	0.0120	-	-
Dissolved Lead	g/m³	< 0.00010	< 0.00010	< 0.00010	-	-
Dissolved Nickel	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Dissolved Zinc	g/m³	0.0172	0.0011	2.7	-	-
Gases in groundwater						
Ethane	g/m³	< 0.003	< 0.003	< 0.003	-	-
Ethylene	g/m³	< 0.004	< 0.004	< 0.004	-	-
Methane	g/m³	< 0.002	< 0.002	0.023	-	-
Haloethers Trace in SVOC Water Samples by GC-MS						
Bis(2-chloroethoxy) methane	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Bis(2-chloroethyl)ether	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-

Sample Type: Aqueous						
Sample Name:		GND2695 11-Apr-2018 1:30 pm	GND2698 [11:45-12:15] 11-Apr-2018	GND0600 11-Apr-2018 2:50 pm		
Lab Number:		1961558.1	1961558.2	1961558.3		
Haloethers Trace in SVOC Water Samples by GC-MS						
Bis(2-chloroisopropyl)ether	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
4-Bromophenyl phenyl ether	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
4-Chlorophenyl phenyl ether	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Nitrogen containing compounds Trace in SVOC Water Samples, GC-MS						
2,4-Dinitrotoluene	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
2,6-Dinitrotoluene	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Nitrobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
N-Nitrosodi-n-propylamine	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
N-Nitrosodiphenylamine + Diphenylamine	g/m3	< 0.0010	< 0.0010	< 0.0010	-	-
Organochlorine Pesticides Trace in SVOC Water Samples by GC-MS						
Aldrin	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
alpha-BHC	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
beta-BHC	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
delta-BHC	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
gamma-BHC (Lindane)	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
4,4'-DDD	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
4,4'-DDE	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
4,4'-DDT	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Dieldrin	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Endosulfan I	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Endosulfan II	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Endosulfan sulfate	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Endrin	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Endrin ketone	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Heptachlor	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Heptachlor epoxide	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Hexachlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Polycyclic Aromatic Hydrocarbons Trace in SVOC Water Samples						
Acenaphthene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Acenaphthylene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Anthracene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Benzo[a]anthracene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Benzo[a]pyrene (BAP)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Benzo[g,h,i]perylene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Benzo[k]fluoranthene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1&2-Chloronaphthalene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Chrysene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Dibenzo[a,h]anthracene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Fluoranthene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Fluorene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Indeno(1,2,3-c,d)pyrene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
2-Methylnaphthalene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Naphthalene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Phenanthrene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Pyrene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Phenols Trace (drinkingwater) in SVOC Water Samples by GC-MS						
2-Chlorophenol	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
2,4-Dichlorophenol	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
2,4,6-Trichlorophenol	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Phenols Trace (non-drinkingwater) in SVOC Water Samples by GC-MS						
4-Chloro-3-methylphenol	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
2,4-Dimethylphenol	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-

Sample Type: Aqueous						
Sample Name:		GND2695 11-Apr-2018 1:30 pm	GND2698 [11:45-12:15] 11-Apr-2018	GND0600 11-Apr-2018 2:50 pm		
Lab Number:		1961558.1	1961558.2	1961558.3		
Phenols Trace (non-drinkingwater) in SVOC Water Samples by GC-MS						
3 & 4-Methylphenol (m- + p-cresol)	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
2-Methylphenol (o-Cresol)	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
2-Nitrophenol	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Pentachlorophenol (PCP)	g/m³	< 0.010	< 0.010	< 0.010	-	-
Phenol	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
2,4,5-Trichlorophenol	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Plasticisers Trace (non-drinkingwater) in SVOC Water by GCMS						
Butylbenzylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Diethylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Dimethylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Di-n-butylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Di-n-octylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Plasticisers Trace (drinkingwater) in SVOC Water Samples by GCMS						
Bis(2-ethylhexyl)phthalate	g/m³	< 0.003	< 0.003	< 0.003	-	-
Di(2-ethylhexyl)adipate	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Other Halogenated compounds Trace (drinkingwater) in SVOC Water						
1,2-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
1,3-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
1,4-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Other Halogenated compounds Trace (non-drinkingwater) in SVOC						
Hexachlorobutadiene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Hexachloroethane	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
1,2,4-Trichlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Other SVOC Trace in SVOC Water Samples by GC-MS						
Benzyl alcohol	g/m³	< 0.005	< 0.005	< 0.005	-	-
Carbazole	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Dibenzofuran	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Isophorone	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
BTEX in VOC Water by Headspace GC-MS						
Benzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Ethylbenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Toluene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
m&p-Xylene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
o-Xylene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
Bromomethane (Methyl Bromide)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Carbon tetrachloride	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Chloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Chloromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,2-Dibromo-3-chloropropane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,2-Dibromoethane (ethylene dibromide, EDB)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Dibromomethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Dichlorodifluoromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,1-Dichloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,2-Dichloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,1-Dichloroethene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
cis-1,2-Dichloroethene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
trans-1,2-Dichloroethene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Dichloromethane (methylene chloride)	g/m³	< 0.010	< 0.010	< 0.010	-	-
1,2-Dichloropropane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,3-Dichloropropane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,1-Dichloropropene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
cis-1,3-Dichloropropene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-

Sample Type: Aqueous						
Sample Name:		GND2695 11-Apr-2018 1:30 pm	GND2698 [11:45-12:15] 11-Apr-2018	GND0600 11-Apr-2018 2:50 pm		
Lab Number:		1961558.1	1961558.2	1961558.3		
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
trans-1,3-Dichloropropene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Hexachlorobutadiene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,1,1,2-Tetrachloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,1,2,2-Tetrachloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Tetrachloroethene (tetrachloroethylene)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,1,1-Trichloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,1,2-Trichloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Trichloroethene (trichloroethylene)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Trichlorofluoromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,2,3-Trichloropropane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,1,2-Trichlorotrifluoroethane (Freon 113)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Vinyl chloride	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Halogenated Aromatics in VOC Water by Headspace GC-MS						
Chlorobenzene (monochlorobenzene)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,2-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,3-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,4-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,2,3-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,2,4-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,3,5-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Bromobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
2-Chlorotoluene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
4-Chlorotoluene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Monoaromatic Hydrocarbons in VOC Water by Headspace GC-MS						
n-Butylbenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
tert-Butylbenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
4-Isopropyltoluene (p-Cymene)	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Isopropylbenzene (Cumene)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
n-Propylbenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
sec-Butylbenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Styrene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
1,2,4-Trimethylbenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,3,5-Trimethylbenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Ketones in VOC Water by Headspace GC-MS						
Acetone	g/m³	< 0.05	< 0.05	< 0.05	-	-
2-Butanone (MEK)	g/m³	< 0.05	< 0.05	< 0.05	-	-
Methyl tert-butylether (MTBE)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
4-Methylpentan-2-one (MIBK)	g/m³	< 0.010	< 0.010	< 0.010	-	-
Trihalomethanes in VOC Water by Headspace GC-MS						
Bromodichloromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Bromoform (tribromomethane)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Chloroform (Trichloromethane)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Dibromochloromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Other VOC in Water by Headspace GC-MS						
Carbon disulphide	g/m³	< 0.00010	< 0.00010	0.00010	-	-
Naphthalene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-

Analyst's Comments

Sample 1 Comment:
Please note that the level of Uncertainty of Measurement (UOM) for the TOC result is significantly greater than that usually reported for this analyte (up to 100-200% at the 95% confidence level).

Sample 2 Comment:
Please note that the level of Uncertainty of Measurement (UOM) for the TOC result is significantly greater than that usually reported for this analyte (>300% at the 95% confidence level).

Amended Report: This certificate of analysis replaces an earlier certificate issued on 07 May 2018 at 4:59 pm
Reason for amendment: The sample temperatures from the client have been added.

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
Free Ammonia*	Calculation from NH4N, pH, Temperature (Calculations based on data for distilled water). APHA Table 8010:VI 22nd ed. 2012.	0.010 g/m^3 at Client Temperature	1-3
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS	Liquid/liquid extraction, GPC (if required), GCMS analysis	-	1-3
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/m^3	1-3
Gases in groundwater	Manual headspace creation and sub-sampling, GC-FID analysis.	0.002 - 0.003 g/m^3	1-3
Semivolatile Organic Compounds Trace in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	-	1-3
Volatile Organic Compounds Trace in Water by Headspace GC-MS	Headspace, GC-MS SIM analysis [KBIs:37857,37921]	0.00010 - 0.05 g/m^3	1-3
Filtration for DKN, Soluble COD*	Sample filtration through 0.45µm membrane filter prior to Dissolved Kjeldahl Nitrogen or Soluble COD analysis.	-	1-3
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-3
Total Kjeldahl Digestion	Sulphuric acid digestion with copper sulphate catalyst.	-	1-3
Total Phosphorus Digestion	Acid persulphate digestion.	-	2-3
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	1-3
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	1-3
Turbidity	Analysis using a Hach 2100N, Turbidity meter. APHA 2130 B 22nd ed. 2012.	0.05 NTU	1-3
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	1-3
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 $CaCO_3$	1-3
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	1-3
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m^3 as $CaCO_3$	1-3
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1-3
Total Dissolved Solids (TDS)	Filtration through GF/C (1.2 µm), gravimetric. APHA 2540 C (modified; drying temperature of 103 - 105°C used rather than 180 ± 2°C) 22nd ed. 2012.	10 g/m^3	1-3
Sample Temperature*	Supplied by customer, otherwise 20°C.	0.1 °C	1-3
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 22nd ed. 2012.	-	1-3
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.003 g/m^3	1-3

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Dissolved Boron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.005 g/m³	1-3
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1-3
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-3
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-3
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0005 g/m³	1-3
Dissolved Mercury	0.45µm filtration, bromine oxidation followed by atomic fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m³	1-3
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1-3
Dissolved Selenium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0010 g/m³	1-3
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-3
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-3
Fluoride	Direct measurement, ion selective electrode. APHA 4500-F⁻ C 22nd ed. 2012.	0.05 g/m³	1-3
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	1-3
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m³	1-3
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m³	1-3
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	1-3
Total Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-Norg D. (modified) 4500 NH_3 F (modified) 22nd ed. 2012.	0.10 g/m³	1-3
Dissolved Reactive Phosphorus	Filtered sample. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified). 22nd ed. 2012.	0.004 g/m³	1-3
Phosphate from DRP	Calculation: from Dissolved Reactive Phosphorus * 3.065.	0.004 g/m³	1-3
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	1-3
Reactive Silica	Filtered sample. Heteropoly blue colorimetry. Discrete analyser. APHA 4500-SiO_2 F (modified from flow injection analysis) 22nd ed. 2012.	0.10 g/m³ as SiO_2	1-3
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-3
Dissolved Total Biochemical Oxygen Demand ($TBOD_5$)	Filtered sample, Incubation 5 days, DO meter, no nitrification inhibitor added, no dilutions, seeded. APHA 5210 B (modified) 22nd ed. 2012.	2 g O_2/m³	1-3
Dissolved COD, trace level	Filtered sample. Dichromate/sulphuric acid digestion, colorimetry. Trace Level method. APHA 5220 D 22nd ed. 2012.	6 g O_2/m³	1-3
Total Organic Carbon (TOC)	Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC.The uncertainty of the calculated result is a combination of the uncertainties of the two analytical determinands in the subtraction calculation. Where both determinands are similar in magnitude, the calculated result has a significantly higher uncertainty than would normally be achieved if one of the results was significantly less than the other. In such cases, the elevated uncertainty should be kept in mind when interpreting the data. APHA 5310 C (modified) 22nd ed. 2012.	0.5 g/m³	1-3
Escherichia coli	MPN count using Colilert , Incubated at 35°C for 24 hours. APHA 9223 B (2004), 22nd ed. 2012.	1 MPN / 100mL	1-3

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.

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.

Ara Heron BSc (Tech)
Client Services Manager - Environmental

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Certificate of Analysis

Client:	Taranaki Regional Council	**Lab No:**	1966956 SPv2
Contact:	Jane Harvey C/- Taranaki Regional Council Private Bag 713 Stratford 4352	**Date Received:**	20-Apr-2018
		Date Reported:	15-May-2018 **(Amended)**
		Quote No:	83292
		Order No:	
		Client Reference:	Eltham central landfill groundwaters
		Submitted By:	Jane Harvey

Sample Type: Aqueous

Sample Name:	GND0826 19-Apr-2018 2:00 pm	GND1351 19-Apr-2018 12:15 pm			
Lab Number:	1966956.1	1966956.2			
Individual Tests					
Free Ammonia* g/m³ at Client Temperature	< 0.010	< 0.010	-	-	-
Sum of Anions meq/L	3.3	1.73	-	-	-
Sum of Cations meq/L	3.2	1.70	-	-	-
Turbidity NTU	0.08	0.20	-	-	-
pH pH Units	6.8	6.8	-	-	-
Total Alkalinity g/m³ as $CaCO_3$	70	34	-	-	-
Bicarbonate g/m³ at 25°C	85	42	-	-	-
Total Hardness g/m³ as $CaCO_3$	102	42	-	-	-
Electrical Conductivity (EC) mS/m	34.7	19.0	-	-	-
Total Dissolved Solids (TDS) g/m³	260	141	-	-	-
Sample Temperature* °C	14.2	14.3	-	-	-
Dissolved Aluminium g/m³	< 0.003	< 0.003	-	-	-
Dissolved Boron g/m³	0.019	0.013	-	-	-
Dissolved Calcium g/m³	23	10.5	-	-	-
Dissolved Iron g/m³	< 0.02	< 0.02	-	-	-
Dissolved Magnesium g/m³	10.5	3.7	-	-	-
Dissolved Manganese g/m³	< 0.0005	< 0.0005	-	-	-
Dissolved Mercury g/m³	< 0.00008	< 0.00008	-	-	-
Dissolved Potassium g/m³	3.3	3.6	-	-	-
Dissolved Selenium g/m³	< 0.0010	< 0.0010	-	-	-
Dissolved Sodium g/m³	24	17.9	-	-	-
Chloride g/m³	42	28	-	-	-
Fluoride g/m³	0.05	0.05	-	-	-
Total Ammoniacal-N g/m³	< 0.010	< 0.010	-	-	-
Nitrite-N g/m³	< 0.002	< 0.002	-	-	-
Nitrate-N g/m³	7.9	2.2	-	-	-
Nitrate-N + Nitrite-N g/m³	7.9	2.2	-	-	-
Total Kjeldahl Nitrogen (TKN) g/m³	< 0.10	< 0.10	-	-	-
Dissolved Reactive Phosphorus g/m³	0.040	0.011	-	-	-
Phosphate g/m³	0.122	0.035	-	-	-
Total Phosphorus g/m³	0.042	0.042	-	-	-
Reactive Silica g/m³ as SiO_2	56	40	-	-	-
Sulphate g/m³	6.5	4.7	-	-	-
Dissolved Total Biochemical Oxygen Demand ($TBOD_5$) g O_2/m³	< 2	< 2	-	-	-
Dissolved Chemical Oxygen Demand g O_2/m³	< 6	< 6	-	-	-
Total Organic Carbon (TOC) g/m³	7.4	0.5	-	-	-

Sample Type: Aqueous						
Sample Name:		GND0826 19-Apr-2018 2:00 pm	GND1351 19-Apr-2018 12:15 pm			
Lab Number:		1966956.1	1966956.2			
Individual Tests						
Escherichia coli	MPN / 100mL	< 1	< 1	-	-	-
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Acetochlor	g/m³	< 0.00004	< 0.00004	-	-	-
Alachlor	g/m³	< 0.00004	< 0.00004	-	-	-
Atrazine	g/m³	< 0.00004	< 0.00004	-	-	-
Atrazine-desethyl	g/m³	< 0.00004	< 0.00004	-	-	-
Atrazine-desisopropyl	g/m³	< 0.00008	< 0.00008	-	-	-
Azaconazole	g/m³	< 0.00002	< 0.00002	-	-	-
Azinphos-methyl	g/m³	< 0.00008	< 0.00008	-	-	-
Benalaxyl	g/m³	< 0.00002	< 0.00002	-	-	-
Bitertanol	g/m³	< 0.00008	< 0.00008	-	-	-
Bromacil	g/m³	< 0.00004	< 0.00004	-	-	-
Bromopropylate	g/m³	< 0.00004	< 0.00004	-	-	-
Butachlor	g/m³	< 0.00004	< 0.00004	-	-	-
Captan	g/m³	< 0.00008	< 0.00008	-	-	-
Carbaryl	g/m³	< 0.00004	< 0.00004	-	-	-
Carbofenothion	g/m³	< 0.00004	< 0.00004	-	-	-
Carbofuran	g/m³	< 0.00004	< 0.00004	-	-	-
Chlorfluazuron	g/m³	< 0.00004	< 0.00004	-	-	-
Chlorothalonil	g/m³	< 0.00004	< 0.00004	-	-	-
Chlorpyrifos	g/m³	< 0.00004	< 0.00004	-	-	-
Chlorpyrifos-methyl	g/m³	< 0.00004	< 0.00004	-	-	-
Chlortoluron	g/m³	< 0.00008	< 0.00008	-	-	-
Cyanazine	g/m³	< 0.00004	< 0.00004	-	-	-
Cyfluthrin	g/m³	< 0.00004	< 0.00004	-	-	-
Cyhalothrin	g/m³	< 0.00004	< 0.00004	-	-	-
Cypermethrin	g/m³	< 0.00008	< 0.00008	-	-	-
Deltamethrin (including Tralomethrin)	g/m³	< 0.00006	< 0.00006	-	-	-
Diazinon	g/m³	< 0.00002	< 0.00002	-	-	-
Dichlofluanid	g/m³	< 0.00004	< 0.00004	-	-	-
Dichloran	g/m³	< 0.0002	< 0.0002	-	-	-
Dichlorvos	g/m³	< 0.00008	< 0.00008	-	-	-
Difenoconazole	g/m³	< 0.00008	< 0.00008	-	-	-
Dimethoate	g/m³	< 0.00008	< 0.00008	-	-	-
Diphenylamine	g/m³	< 0.00008	< 0.00008	-	-	-
Diuron	g/m³	< 0.00004	< 0.00004	-	-	-
Fenpropimorph	g/m³	< 0.00004	< 0.00004	-	-	-
Fluazifop-butyl	g/m³	< 0.00004	< 0.00004	-	-	-
Fluometuron	g/m³	< 0.00004	< 0.00004	-	-	-
Flusilazole	g/m³	< 0.00004	< 0.00004	-	-	-
Fluvalinate	g/m³	< 0.00004	< 0.00004	-	-	-
Furalaxyl	g/m³	< 0.00002	< 0.00002	-	-	-
Haloxyfop-methyl	g/m³	< 0.00004	< 0.00004	-	-	-
Hexaconazole	g/m³	< 0.00004	< 0.00004	-	-	-
Hexazinone	g/m³	< 0.00002	< 0.00002	-	-	-
IPBC (3-Iodo-2-propynyl-n-butylcarbamate)	g/m³	< 0.0002	< 0.0002	-	-	-
Kresoxim-methyl	g/m³	< 0.00002	< 0.00002	-	-	-
Linuron	g/m³	< 0.00005	< 0.00005	-	-	-
Malathion	g/m³	< 0.00004	< 0.00004	-	-	-
Metalaxyl	g/m³	< 0.00004	< 0.00004	-	-	-
Metolachlor	g/m³	< 0.00004	< 0.00004	-	-	-
Metribuzin	g/m³	< 0.00004	< 0.00004	-	-	-
Molinate	g/m³	< 0.00008	< 0.00008	-	-	-

Sample Type: Aqueous						
Sample Name:		GND0826 19-Apr-2018 2:00 pm	GND1351 19-Apr-2018 12:15 pm			
Lab Number:		1966956.1	1966956.2			
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Myclobutanil	g/m³	< 0.00004	< 0.00004	-	-	-
Naled	g/m³	< 0.0002	< 0.0002	-	-	-
Norflurazon	g/m³	< 0.00008	< 0.00008	-	-	-
Oxadiazon	g/m³	< 0.00004	< 0.00004	-	-	-
Oxyfluorfen	g/m³	< 0.00002	< 0.00002	-	-	-
Paclobutrazol	g/m³	< 0.00004	< 0.00004	-	-	-
Parathion-ethyl	g/m³	< 0.00004	< 0.00004	-	-	-
Parathion-methyl	g/m³	< 0.00004	< 0.00004	-	-	-
Pendimethalin	g/m³	< 0.00004	< 0.00004	-	-	-
Permethrin	g/m³	< 0.00002	< 0.00002	-	-	-
Pirimicarb	g/m³	< 0.00004	< 0.00004	-	-	-
Pirimiphos-methyl	g/m³	< 0.00004	< 0.00004	-	-	-
Prochloraz	g/m³	< 0.0002	< 0.0002	-	-	-
Procymidone	g/m³	< 0.00004	< 0.00004	-	-	-
Prometryn	g/m³	< 0.00002	< 0.00002	-	-	-
Propachlor	g/m³	< 0.00004	< 0.00004	-	-	-
Propanil	g/m³	< 0.0002	< 0.0002	-	-	-
Propazine	g/m³	< 0.00002	< 0.00002	-	-	-
Propiconazole	g/m³	< 0.00004	< 0.00004	-	-	-
Pyriproxyfen	g/m³	< 0.00004	< 0.00004	-	-	-
Quizalofop-ethyl	g/m³	< 0.00004	< 0.00004	-	-	-
Simazine	g/m³	< 0.00004	< 0.00004	-	-	-
Simetryn	g/m³	< 0.00004	< 0.00004	-	-	-
Sulfentrazone	g/m³	< 0.0002	< 0.0002	-	-	-
TCMTB [2-(thiocyanomethylthio) benzothiazole,Busan]	g/m³	< 0.00008	< 0.00008	-	-	-
Tebuconazole	g/m³	< 0.00004	< 0.00004	-	-	-
Terbacil	g/m³	< 0.00004	< 0.00004	-	-	-
Terbufos	g/m³	< 0.00004	< 0.00004	-	-	-
Terbumeton	g/m³	< 0.00004	< 0.00004	-	-	-
Terbuthylazine	g/m³	< 0.00002	< 0.00002	-	-	-
Terbuthylazine-desethyl	g/m³	< 0.00004	< 0.00004	-	-	-
Terbutryn	g/m³	< 0.00004	< 0.00004	-	-	-
Thiabendazole	g/m³	< 0.0002	< 0.0002	-	-	-
Thiobencarb	g/m³	< 0.00004	< 0.00004	-	-	-
Tolylfluanid	g/m³	< 0.00002	< 0.00002	-	-	-
Triazophos	g/m³	< 0.00004	< 0.00004	-	-	-
Trifluralin	g/m³	< 0.00004	< 0.00004	-	-	-
Vinclozolin	g/m³	< 0.00004	< 0.00004	-	-	-
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m³	< 0.0010	< 0.0010	-	-	-
Dissolved Cadmium	g/m³	< 0.00005	< 0.00005	-	-	-
Dissolved Chromium	g/m³	0.0024	0.0024	-	-	-
Dissolved Copper	g/m³	0.0006	< 0.0005	-	-	-
Dissolved Lead	g/m³	< 0.00010	< 0.00010	-	-	-
Dissolved Nickel	g/m³	0.0009	< 0.0005	-	-	-
Dissolved Zinc	g/m³	0.0016	< 0.0010	-	-	-
Gases in groundwater						
Ethane	g/m³	< 0.003	< 0.003	-	-	-
Ethylene	g/m³	< 0.004	< 0.004	-	-	-
Methane	g/m³	< 0.002	< 0.002	-	-	-
Haloethers Trace in SVOC Water Samples by GC-MS						
Bis(2-chloroethoxy) methane	g/m³	< 0.0005	< 0.0005	-	-	-
Bis(2-chloroethyl)ether	g/m³	< 0.0005	< 0.0005	-	-	-

Sample Type: Aqueous						
Sample Name:		GND0826 19-Apr-2018 2:00 pm	GND1351 19-Apr-2018 12:15 pm			
Lab Number:		1966956.1	1966956.2			
Haloethers Trace in SVOC Water Samples by GC-MS						
Bis(2-chloroisopropyl)ether	g/m³	< 0.0005	< 0.0005	-	-	-
4-Bromophenyl phenyl ether	g/m³	< 0.0003	< 0.0003	-	-	-
4-Chlorophenyl phenyl ether	g/m³	< 0.0005	< 0.0005	-	-	-
Nitrogen containing compounds Trace in SVOC Water Samples, GC-MS						
2,4-Dinitrotoluene	g/m³	< 0.0010	< 0.0010	-	-	-
2,6-Dinitrotoluene	g/m³	< 0.0010	< 0.0010	-	-	-
Nitrobenzene	g/m³	< 0.0005	< 0.0005	-	-	-
N-Nitrosodi-n-propylamine	g/m³	< 0.0010	< 0.0010	-	-	-
N-Nitrosodiphenylamine + Diphenylamine	g/m3	< 0.0010	< 0.0010	-	-	-
Organochlorine Pesticides Trace in SVOC Water Samples by GC-MS						
Aldrin	g/m³	< 0.0005	< 0.0005	-	-	-
alpha-BHC	g/m³	< 0.0005	< 0.0005	-	-	-
beta-BHC	g/m³	< 0.0005	< 0.0005	-	-	-
delta-BHC	g/m³	< 0.0005	< 0.0005	-	-	-
gamma-BHC (Lindane)	g/m³	< 0.0005	< 0.0005	-	-	-
4,4'-DDD	g/m³	< 0.0005	< 0.0005	-	-	-
4,4'-DDE	g/m³	< 0.0005	< 0.0005	-	-	-
4,4'-DDT	g/m³	< 0.0010	< 0.0010	-	-	-
Dieldrin	g/m³	< 0.0005	< 0.0005	-	-	-
Endosulfan I	g/m³	< 0.0010	< 0.0010	-	-	-
Endosulfan II	g/m³	< 0.0010	< 0.0010	-	-	-
Endosulfan sulfate	g/m³	< 0.0010	< 0.0010	-	-	-
Endrin	g/m³	< 0.0005	< 0.0005	-	-	-
Endrin ketone	g/m³	< 0.0010	< 0.0010	-	-	-
Heptachlor	g/m³	< 0.0005	< 0.0005	-	-	-
Heptachlor epoxide	g/m³	< 0.0005	< 0.0005	-	-	-
Hexachlorobenzene	g/m³	< 0.0005	< 0.0005	-	-	-
Polycyclic Aromatic Hydrocarbons Trace in SVOC Water Samples						
Acenaphthene	g/m³	< 0.0003	< 0.0003	-	-	-
Acenaphthylene	g/m³	< 0.0003	< 0.0003	-	-	-
Anthracene	g/m³	< 0.0003	< 0.0003	-	-	-
Benzo[a]anthracene	g/m³	< 0.0003	< 0.0003	-	-	-
Benzo[a]pyrene (BAP)	g/m³	< 0.0003	< 0.0003	-	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m³	< 0.0003	< 0.0003	-	-	-
Benzo[g,h,i]perylene	g/m³	< 0.0003	< 0.0003	-	-	-
Benzo[k]fluoranthene	g/m³	< 0.0003	< 0.0003	-	-	-
1&2-Chloronaphthalene	g/m³	< 0.0003	< 0.0003	-	-	-
Chrysene	g/m³	< 0.0003	< 0.0003	-	-	-
Dibenzo[a,h]anthracene	g/m³	< 0.0003	< 0.0003	-	-	-
Fluoranthene	g/m³	< 0.0003	< 0.0003	-	-	-
Fluorene	g/m³	< 0.0003	< 0.0003	-	-	-
Indeno(1,2,3-c,d)pyrene	g/m³	< 0.0003	< 0.0003	-	-	-
2-Methylnaphthalene	g/m³	< 0.0003	< 0.0003	-	-	-
Naphthalene	g/m³	< 0.0003	< 0.0003	-	-	-
Phenanthrene	g/m³	< 0.0003	< 0.0003	-	-	-
Pyrene	g/m³	< 0.0003	< 0.0003	-	-	-
Phenols Trace (drinkingwater) in SVOC Water Samples by GC-MS						
2-Chlorophenol	g/m³	< 0.0005	< 0.0005	-	-	-
2,4-Dichlorophenol	g/m³	< 0.0005	< 0.0005	-	-	-
2,4,6-Trichlorophenol	g/m³	< 0.0010	< 0.0010	-	-	-
Phenols Trace (non-drinkingwater) in SVOC Water Samples by GC-MS						
4-Chloro-3-methylphenol	g/m³	< 0.0010	< 0.0010	-	-	-
2,4-Dimethylphenol	g/m³	< 0.0005	< 0.0005	-	-	-

Sample Type: Aqueous						
Sample Name:		GND0826 19-Apr-2018 2:00 pm	GND1351 19-Apr-2018 12:15 pm			
Lab Number:		1966956.1	1966956.2			
Phenols Trace (non-drinkingwater) in SVOC Water Samples by GC-MS						
3 & 4-Methylphenol (m- + p-cresol)	g/m³	< 0.0010	< 0.0010	-	-	-
2-Methylphenol (o-Cresol)	g/m³	< 0.0005	< 0.0005	-	-	-
2-Nitrophenol	g/m³	< 0.0010	< 0.0010	-	-	-
Pentachlorophenol (PCP)	g/m³	< 0.010	< 0.010	-	-	-
Phenol	g/m³	< 0.0010	< 0.0010	-	-	-
2,4,5-Trichlorophenol	g/m³	< 0.0010	< 0.0010	-	-	-
Plasticisers Trace (non-drinkingwater) in SVOC Water by GCMS						
Butylbenzylphthalate	g/m³	< 0.0010	< 0.0010	-	-	-
Diethylphthalate	g/m³	< 0.0010	< 0.0010	-	-	-
Dimethylphthalate	g/m³	< 0.0010	< 0.0010	-	-	-
Di-n-butylphthalate	g/m³	< 0.0010	< 0.0010	-	-	-
Di-n-octylphthalate	g/m³	< 0.0010	< 0.0010	-	-	-
Plasticisers Trace (drinkingwater) in SVOC Water Samples by GCMS						
Bis(2-ethylhexyl)phthalate	g/m³	< 0.003	< 0.003	-	-	-
Di(2-ethylhexyl)adipate	g/m³	< 0.0010	< 0.0010	-	-	-
Other Halogenated compounds Trace (drinkingwater) in SVOC Water						
1,2-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	-	-	-
1,3-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	-	-	-
1,4-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	-	-	-
Other Halogenated compounds Trace (non-drinkingwater) in SVOC						
Hexachlorobutadiene	g/m³	< 0.0005	< 0.0005	-	-	-
Hexachloroethane	g/m³	< 0.0005	< 0.0005	-	-	-
1,2,4-Trichlorobenzene	g/m³	< 0.0005	< 0.0005	-	-	-
Other SVOC Trace in SVOC Water Samples by GC-MS						
Benzyl alcohol	g/m³	< 0.005	< 0.005	-	-	-
Carbazole	g/m³	< 0.0005	< 0.0005	-	-	-
Dibenzofuran	g/m³	< 0.0005	< 0.0005	-	-	-
Isophorone	g/m³	< 0.0005	< 0.0005	-	-	-
BTEX in VOC Water by Headspace GC-MS						
Benzene	g/m³	< 0.0003	< 0.0003	-	-	-
Ethylbenzene	g/m³	< 0.0005	< 0.0005	-	-	-
Toluene	g/m³	< 0.0003	< 0.0003	-	-	-
m&p-Xylene	g/m³	< 0.0005	< 0.0005	-	-	-
o-Xylene	g/m³	< 0.0003	< 0.0003	-	-	-
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
Bromomethane (Methyl Bromide)	g/m³	< 0.0003	< 0.0003	-	-	-
Carbon tetrachloride	g/m³	< 0.0003	< 0.0003	-	-	-
Chloroethane	g/m³	< 0.0003	< 0.0003	-	-	-
Chloromethane	g/m³	< 0.0003	< 0.0003	-	-	-
1,2-Dibromo-3-chloropropane	g/m³	< 0.0003	< 0.0003	-	-	-
1,2-Dibromoethane (ethylene dibromide, EDB)	g/m³	< 0.0003	< 0.0003	-	-	-
Dibromomethane	g/m³	< 0.0003	< 0.0003	-	-	-
Dichlorodifluoromethane	g/m³	< 0.0003	< 0.0003	-	-	-
1,1-Dichloroethane	g/m³	< 0.0003	< 0.0003	-	-	-
1,2-Dichloroethane	g/m³	< 0.0003	< 0.0003	-	-	-
1,1-Dichloroethene	g/m³	< 0.0003	< 0.0003	-	-	-
cis-1,2-Dichloroethene	g/m³	< 0.0003	< 0.0003	-	-	-
trans-1,2-Dichloroethene	g/m³	< 0.0003	< 0.0003	-	-	-
Dichloromethane (methylene chloride)	g/m³	< 0.010	< 0.010	-	-	-
1,2-Dichloropropane	g/m³	< 0.0003	< 0.0003	-	-	-
1,3-Dichloropropane	g/m³	< 0.0003	< 0.0003	-	-	-
1,1-Dichloropropene	g/m³	< 0.0003	< 0.0003	-	-	-
cis-1,3-Dichloropropene	g/m³	< 0.0005	< 0.0005	-	-	-

Sample Type: Aqueous						
Sample Name:		GND0826 19-Apr-2018 2:00 pm	GND1351 19-Apr-2018 12:15 pm			
Lab Number:		1966956.1	1966956.2			
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
trans-1,3-Dichloropropene	g/m³	< 0.0005	< 0.0005	-	-	-
Hexachlorobutadiene	g/m³	< 0.0003	< 0.0003	-	-	-
1,1,1,2-Tetrachloroethane	g/m³	< 0.0003	< 0.0003	-	-	-
1,1,2,2-Tetrachloroethane	g/m³	< 0.0003	< 0.0003	-	-	-
Tetrachloroethene (tetrachloroethylene)	g/m³	< 0.0003	< 0.0003	-	-	-
1,1,1-Trichloroethane	g/m³	< 0.0003	< 0.0003	-	-	-
1,1,2-Trichloroethane	g/m³	< 0.0003	< 0.0003	-	-	-
Trichloroethene (trichloroethylene)	g/m³	< 0.0003	< 0.0003	-	-	-
Trichlorofluoromethane	g/m³	< 0.0003	< 0.0003	-	-	-
1,2,3-Trichloropropane	g/m³	< 0.0003	< 0.0003	-	-	-
1,1,2-Trichlorotrifluoroethane (Freon 113)	g/m³	< 0.0003	< 0.0003	-	-	-
Vinyl chloride	g/m³	< 0.0003	< 0.0003	-	-	-
Halogenated Aromatics in VOC Water by Headspace GC-MS						
Chlorobenzene (monochlorobenzene)	g/m³	< 0.0003	< 0.0003	-	-	-
1,2-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	-	-	-
1,3-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	-	-	-
1,4-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	-	-	-
1,2,3-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	-	-	-
1,2,4-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	-	-	-
1,3,5-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	-	-	-
Bromobenzene	g/m³	< 0.0003	< 0.0003	-	-	-
2-Chlorotoluene	g/m³	< 0.0003	< 0.0003	-	-	-
4-Chlorotoluene	g/m³	< 0.0003	< 0.0003	-	-	-
Monoaromatic Hydrocarbons in VOC Water by Headspace GC-MS						
n-Butylbenzene	g/m³	< 0.0005	< 0.0005	-	-	-
tert-Butylbenzene	g/m³	< 0.0003	< 0.0003	-	-	-
4-Isopropyltoluene (p-Cymene)	g/m³	< 0.0005	< 0.0005	-	-	-
Isopropylbenzene (Cumene)	g/m³	< 0.0003	< 0.0003	-	-	-
n-Propylbenzene	g/m³	< 0.0005	< 0.0005	-	-	-
sec-Butylbenzene	g/m³	< 0.0003	< 0.0003	-	-	-
Styrene	g/m³	< 0.0005	< 0.0005	-	-	-
1,2,4-Trimethylbenzene	g/m³	< 0.0003	< 0.0003	-	-	-
1,3,5-Trimethylbenzene	g/m³	< 0.0003	< 0.0003	-	-	-
Ketones in VOC Water by Headspace GC-MS						
Acetone	g/m³	< 0.05	< 0.05	-	-	-
2-Butanone (MEK)	g/m³	< 0.05	< 0.05	-	-	-
Methyl tert-butylether (MTBE)	g/m³	< 0.0003	< 0.0003	-	-	-
4-Methylpentan-2-one (MIBK)	g/m³	< 0.010	< 0.010	-	-	-
Trihalomethanes in VOC Water by Headspace GC-MS						
Bromodichloromethane	g/m³	< 0.0003	< 0.0003	-	-	-
Bromoform (tribromomethane)	g/m³	< 0.0003	< 0.0003	-	-	-
Chloroform (Trichloromethane)	g/m³	< 0.0003	< 0.0003	-	-	-
Dibromochloromethane	g/m³	< 0.0003	< 0.0003	-	-	-
Other VOC in Water by Headspace GC-MS						
Carbon disulphide	g/m³	< 0.00010	< 0.00010	-	-	-
Naphthalene	g/m³	< 0.0005	< 0.0005	-	-	-

Analyst's Comments

Sample 2 Comment:
Please note that the level of Uncertainty of Measurement (UOM) for the TOC result is significantly greater than that usually reported for this analyte (>300% at the 95% confidence level).

Amended Report: This certificate of analysis replaces an earlier certificate issued on 08 May 2018 at 4:57 pm
Reason for amendment: The sample temperatures from the client have been added.

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
Free Ammonia*	Calculation from NH4N, pH, Temperature (Calculations based on data for distilled water). APHA Table 8010:VI 22nd ed. 2012.	0.010 g/m³ at Client Temperature	1-2
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS	Liquid/liquid extraction, GPC (if required), GCMS analysis	-	1-2
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	1-2
Gases in groundwater	Manual headspace creation and sub-sampling, GC-FID analysis.	0.002 - 0.003 g/m³	1-2
Semivolatile Organic Compounds Trace in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	-	1-2
Volatile Organic Compounds Trace in Water by Headspace GC-MS	Headspace, GC-MS SIM analysis [KBIs:37857,37921]	0.00010 - 0.05 g/m³	1-2
Filtration for DKN, Soluble COD*	Sample filtration through 0.45µm membrane filter prior to Dissolved Kjeldahl Nitrogen or Soluble COD analysis.	-	1-2
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	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/m³ 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/m³ at 25°C	1-2
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m³ 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 Dissolved Solids (TDS)	Filtration through GF/C (1.2 µm), gravimetric. APHA 2540 C (modified; drying temperature of 103 - 105°C used rather than 180 ± 2°C) 22nd ed. 2012.	10 g/m³	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
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.003 g/m³	1-2
Dissolved Boron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.005 g/m³	1-2
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1-2
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-2
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-2
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0005 g/m³	1-2
Dissolved Mercury	0.45µm filtration, bromine oxidation followed by atomic fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m³	1-2
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m³	1-2

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Dissolved Selenium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0010 g/m³	1-2
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m³	1-2
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-2
Fluoride	Direct measurement, ion selective electrode. APHA 4500-F^- C 22nd ed. 2012.	0.05 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 Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-Norg D. (modified) 4500 NH_3 F (modified) 22nd ed. 2012.	0.10 g/m³	1-2
Dissolved Reactive Phosphorus	Filtered sample. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified). 22nd ed. 2012.	0.004 g/m³	1-2
Phosphate from DRP	Calculation: from Dissolved Reactive Phosphorus * 3.065.	0.004 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
Reactive Silica	Filtered sample. Heteropoly blue colorimetry. Discrete analyser. APHA 4500-SiO_2 F (modified from flow injection analysis) 22nd ed. 2012.	0.10 g/m³ as SiO_2	1-2
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m³	1-2
Dissolved Total Biochemical Oxygen Demand ($TBOD_5$)	Filtered sample, Incubation 5 days, DO meter, no nitrification inhibitor added, no dilutions, seeded. APHA 5210 B (modified) 22nd ed. 2012.	2 g O_2/m³	1-2
Dissolved COD, trace level	Filtered sample. Dichromate/sulphuric acid digestion, colorimetry. Trace Level method. APHA 5220 D 22nd ed. 2012.	6 g O_2/m³	1-2
Total Organic Carbon (TOC)	Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC.The uncertainty of the calculated result is a combination of the uncertainties of the two analytical determinands in the subtraction calculation. Where both determinands are similar in magnitude, the calculated result has a significantly higher uncertainty than would normally be achieved if one of the results was significantly less than the other. In such cases, the elevated uncertainty should be kept in mind when interpreting the data. APHA 5310 C (modified) 22nd ed. 2012.	0.5 g/m³	1-2
Escherichia coli	MPN count using Colilert , Incubated at 35°C for 24 hours. APHA 9223 B (2004), 22nd ed. 2012.	1 MPN / 100mL	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

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TRIED, TESTED AND TRUSTED

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Certificate of Analysis

Client:	Taranaki Regional Council	**Lab No:**	1964935	SPv2
Contact:	Jane Harvey	**Date Received:**	18-Apr-2018	
	C/- Taranaki Regional Council	**Date Reported:**	15-May-2018	**(Amended)**
	Private Bag 713	**Quote No:**	83292	
	Stratford 4352	**Order No:**		
		Client Reference:	Eltham central landfill groundwaters	
		Submitted By:	Jane Harvey	

Sample Type: Aqueous

Sample Name:		GND0599 17-Apr-2018 9:30 am	GND2700 17-Apr-2018 1:50 pm	GND2702 17-Apr-2018 12:00 pm		
Lab Number:		1964935.1	1964935.2	1964935.3		
Individual Tests						
Free Ammonia*	g/m³ at Client Temperature	0.013	< 0.010	< 0.010	-	-
Sum of Anions	meq/L	3.5	2.7	2.3	-	-
Sum of Cations	meq/L	3.2	2.6	2.2	-	-
Turbidity	NTU	12.0	70	45	-	-
pH	pH Units	8.0	6.9	7.1	-	-
Total Alkalinity	g/m³ as $CaCO_3$	99	43	50	-	-
Bicarbonate	g/m³ at 25°C	120	53	61	-	-
Total Hardness	g/m³ as $CaCO_3$	119	82	64	-	-
Electrical Conductivity (EC)	mS/m	35.9	30.2	24.9	-	-
Total Dissolved Solids (TDS)	g/m³	240	230	188	-	-
Sample Temperature*	°C	16.7	15.7	13.3	-	-
Dissolved Aluminium	g/m³	0.003	0.004	< 0.003	-	-
Dissolved Boron	g/m³	0.024	0.012	0.015	-	-
Dissolved Calcium	g/m³	27	19.9	15.6	-	-
Dissolved Iron	g/m³	< 0.02	< 0.02	< 0.02	-	-
Dissolved Magnesium	g/m³	12.3	7.9	6.2	-	-
Dissolved Manganese	g/m³	0.107	0.0021	0.0021	-	-
Dissolved Mercury	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Dissolved Potassium	g/m³	4.0	2.8	2.2	-	-
Dissolved Selenium	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Dissolved Sodium	g/m³	16.2	22	21	-	-
Chloride	g/m³	50	40	31	-	-
Fluoride	g/m³	0.16	0.06	0.06	-	-
Total Ammoniacal-N	g/m³	0.32	< 0.010	< 0.010	-	-
Nitrite-N	g/m³	0.002	< 0.002	< 0.002	-	-
Nitrate-N	g/m³	0.006	8.8	5.0	-	-
Nitrate-N + Nitrite-N	g/m³	0.008	8.8	5.0	-	-
Total Kjeldahl Nitrogen (TKN)	g/m³	0.50	0.28	0.27	-	-
Dissolved Reactive Phosphorus	g/m³	0.25	0.029	0.039	-	-
Phosphate	g/m³	0.78	0.089	0.119	-	-
Total Phosphorus	g/m³	0.32	0.156	0.132	-	-
Reactive Silica	g/m³ as SiO_2	36	51	55	-	-
Sulphate	g/m³	5.2	2.4	4.4	-	-
Dissolved Total Biochemical Oxygen Demand ($TBOD_5$)	g O_2/m³	< 2	< 2	< 2	-	-
Dissolved Chemical Oxygen Demand	g O_2/m³	< 6	< 6	< 6	-	-
Total Organic Carbon (TOC)	g/m³	1.9	0.8	2.6	-	-

Sample Type: Aqueous						
Sample Name:		GND0599 17-Apr-2018 9:30 am	GND2700 17-Apr-2018 1:50 pm	GND2702 17-Apr-2018 12:00 pm		
Lab Number:		1964935.1	1964935.2	1964935.3		
Individual Tests						
Escherichia coli	MPN / 100mL	< 1	< 1 [#1]	< 1	-	-
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Acetochlor	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Alachlor	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Atrazine	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Atrazine-desethyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Atrazine-desisopropyl	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Azaconazole	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Azinphos-methyl	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Benalaxyl	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Bitertanol	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Bromacil	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Bromopropylate	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Butachlor	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Captan	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Carbaryl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Carbofenothion	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Carbofuran	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Chlorfluazuron	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Chlorothalonil	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Chlorpyrifos	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Chlorpyrifos-methyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Chlortoluron	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Cyanazine	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Cyfluthrin	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Cyhalothrin	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Cypermethrin	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Deltamethrin (including Tralomethrin)	g/m³	< 0.00006	< 0.00006	< 0.00006	-	-
Diazinon	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Dichlofluanid	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Dichloran	g/m³	< 0.0002	< 0.0002	< 0.0002	-	-
Dichlorvos	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Difenoconazole	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Dimethoate	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Diphenylamine	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Diuron	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Fenpropimorph	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Fluazifop-butyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Fluometuron	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Flusilazole	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Fluvalinate	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Furalaxyl	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Haloxyfop-methyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Hexaconazole	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Hexazinone	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
IPBC (3-Iodo-2-propynyl-n-butylcarbamate)	g/m³	< 0.0002	< 0.0002	< 0.0002	-	-
Kresoxim-methyl	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Linuron	g/m³	< 0.00005	< 0.00005	< 0.00005	-	-
Malathion	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Metalaxyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Metolachlor	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Metribuzin	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Molinate	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-

Sample Type: Aqueous						
Sample Name:		GND0599 17-Apr-2018 9:30 am	GND2700 17-Apr-2018 1:50 pm	GND2702 17-Apr-2018 12:00 pm		
Lab Number:		1964935.1	1964935.2	1964935.3		
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS						
Myclobutanil	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Naled	g/m³	< 0.0002	< 0.0002	< 0.0002	-	-
Norflurazon	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Oxadiazon	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Oxyfluorfen	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Paclobutrazol	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Parathion-ethyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Parathion-methyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Pendimethalin	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Permethrin	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Pirimicarb	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Pirimiphos-methyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Prochloraz	g/m³	< 0.0002	< 0.0002	< 0.0002	-	-
Procymidone	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Prometryn	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Propachlor	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Propanil	g/m³	< 0.0002	< 0.0002	< 0.0002	-	-
Propazine	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Propiconazole	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Pyriproxyfen	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Quizalofop-ethyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Simazine	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Simetryn	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Sulfentrazone	g/m³	< 0.0002	< 0.0002	< 0.0002	-	-
TCMTB [2-(thiocyanomethylthio) benzothiazole,Busan]	g/m³	< 0.00008	< 0.00008	< 0.00008	-	-
Tebuconazole	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Terbacil	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Terbufos	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Terbumeton	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Terbuthylazine	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Terbuthylazine-desethyl	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Terbutryn	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Thiabendazole	g/m³	< 0.0002	< 0.0002	< 0.0002	-	-
Thiobencarb	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Tolylfluanid	g/m³	< 0.00002	< 0.00002	< 0.00002	-	-
Triazophos	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Trifluralin	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Vinclozolin	g/m³	< 0.00004	< 0.00004	< 0.00004	-	-
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m³	0.0061	< 0.0010	< 0.0010	-	-
Dissolved Cadmium	g/m³	< 0.00005	< 0.00005	< 0.00005	-	-
Dissolved Chromium	g/m³	< 0.0005	0.0019	0.0025	-	-
Dissolved Copper	g/m³	< 0.0005	< 0.0005	0.0007	-	-
Dissolved Lead	g/m³	< 0.00010	< 0.00010	< 0.00010	-	-
Dissolved Nickel	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Dissolved Zinc	g/m³	0.0014	0.0011	0.0029	-	-
Gases in groundwater						
Ethane	g/m³	< 0.003	< 0.003	< 0.003	-	-
Ethylene	g/m³	< 0.004	< 0.004	< 0.004	-	-
Methane	g/m³	0.84	< 0.002	< 0.002	-	-
Haloethers Trace in SVOC Water Samples by GC-MS						
Bis(2-chloroethoxy) methane	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Bis(2-chloroethyl)ether	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-

Sample Type: Aqueous						
Sample Name:		GND0599 17-Apr-2018 9:30 am	GND2700 17-Apr-2018 1:50 pm	GND2702 17-Apr-2018 12:00 pm		
Lab Number:		1964935.1	1964935.2	1964935.3		
Haloethers Trace in SVOC Water Samples by GC-MS						
Bis(2-chloroisopropyl)ether	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
4-Bromophenyl phenyl ether	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
4-Chlorophenyl phenyl ether	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Nitrogen containing compounds Trace in SVOC Water Samples, GC-MS						
2,4-Dinitrotoluene	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
2,6-Dinitrotoluene	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Nitrobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
N-Nitrosodi-n-propylamine	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
N-Nitrosodiphenylamine + Diphenylamine	g/m3	< 0.0010	< 0.0010	< 0.0010	-	-
Organochlorine Pesticides Trace in SVOC Water Samples by GC-MS						
Aldrin	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
alpha-BHC	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
beta-BHC	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
delta-BHC	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
gamma-BHC (Lindane)	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
4,4'-DDD	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
4,4'-DDE	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
4,4'-DDT	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Dieldrin	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Endosulfan I	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Endosulfan II	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Endosulfan sulfate	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Endrin	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Endrin ketone	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Heptachlor	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Heptachlor epoxide	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Hexachlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Polycyclic Aromatic Hydrocarbons Trace in SVOC Water Samples						
Acenaphthene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Acenaphthylene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Anthracene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Benzo[a]anthracene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Benzo[a]pyrene (BAP)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Benzo[b]fluoranthene + Benzo[j] fluoranthene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Benzo[g,h,i]perylene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Benzo[k]fluoranthene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1&2-Chloronaphthalene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Chrysene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Dibenzo[a,h]anthracene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Fluoranthene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Fluorene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Indeno(1,2,3-c,d)pyrene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
2-Methylnaphthalene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Naphthalene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Phenanthrene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Pyrene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Phenols Trace (drinkingwater) in SVOC Water Samples by GC-MS						
2-Chlorophenol	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
2,4-Dichlorophenol	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
2,4,6-Trichlorophenol	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Phenols Trace (non-drinkingwater) in SVOC Water Samples by GC-MS						
4-Chloro-3-methylphenol	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
2,4-Dimethylphenol	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-

Sample Type: Aqueous						
Sample Name:		GND0599 17-Apr-2018 9:30 am	GND2700 17-Apr-2018 1:50 pm	GND2702 17-Apr-2018 12:00 pm		
Lab Number:		1964935.1	1964935.2	1964935.3		
Phenols Trace (non-drinkingwater) in SVOC Water Samples by GC-MS						
3 & 4-Methylphenol (m- + p-cresol)	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
2-Methylphenol (o-Cresol)	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
2-Nitrophenol	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Pentachlorophenol (PCP)	g/m³	< 0.010	< 0.010	< 0.010	-	-
Phenol	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
2,4,5-Trichlorophenol	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Plasticisers Trace (non-drinkingwater) in SVOC Water by GCMS						
Butylbenzylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Diethylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Dimethylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Di-n-butylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Di-n-octylphthalate	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Plasticisers Trace (drinkingwater) in SVOC Water Samples by GCMS						
Bis(2-ethylhexyl)phthalate	g/m³	< 0.003	< 0.003	< 0.003	-	-
Di(2-ethylhexyl)adipate	g/m³	< 0.0010	< 0.0010	< 0.0010	-	-
Other Halogenated compounds Trace (drinkingwater) in SVOC Water						
1,2-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
1,3-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
1,4-Dichlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Other Halogenated compounds Trace (non-drinkingwater) in SVOC						
Hexachlorobutadiene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Hexachloroethane	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
1,2,4-Trichlorobenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Other SVOC Trace in SVOC Water Samples by GC-MS						
Benzyl alcohol	g/m³	< 0.005	< 0.005	< 0.005	-	-
Carbazole	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Dibenzofuran	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Isophorone	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
BTEX in VOC Water by Headspace GC-MS						
Benzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Ethylbenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Toluene	g/m³	0.0004	0.0007	< 0.0003	-	-
m&p-Xylene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
o-Xylene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
Bromomethane (Methyl Bromide)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Carbon tetrachloride	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Chloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Chloromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,2-Dibromo-3-chloropropane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,2-Dibromoethane (ethylene dibromide, EDB)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Dibromomethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Dichlorodifluoromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,1-Dichloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,2-Dichloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,1-Dichloroethene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
cis-1,2-Dichloroethene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
trans-1,2-Dichloroethene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Dichloromethane (methylene chloride)	g/m³	< 0.010	< 0.010	< 0.010	-	-
1,2-Dichloropropane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,3-Dichloropropane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,1-Dichloropropene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
cis-1,3-Dichloropropene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-

Sample Type: Aqueous						
Sample Name:		GND0599 17-Apr-2018 9:30 am	GND2700 17-Apr-2018 1:50 pm	GND2702 17-Apr-2018 12:00 pm		
Lab Number:		1964935.1	1964935.2	1964935.3		
Halogenated Aliphatics in VOC Water by Headspace GC-MS						
trans-1,3-Dichloropropene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Hexachlorobutadiene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,1,1,2-Tetrachloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,1,2,2-Tetrachloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Tetrachloroethene (tetrachloroethylene)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,1,1-Trichloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,1,2-Trichloroethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Trichloroethene (trichloroethylene)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Trichlorofluoromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,2,3-Trichloropropane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,1,2-Trichlorotrifluoroethane (Freon 113)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Vinyl chloride	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Halogenated Aromatics in VOC Water by Headspace GC-MS						
Chlorobenzene (monochlorobenzene)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,2-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,3-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,4-Dichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,2,3-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,2,4-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,3,5-Trichlorobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Bromobenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
2-Chlorotoluene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
4-Chlorotoluene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Monoaromatic Hydrocarbons in VOC Water by Headspace GC-MS						
n-Butylbenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
tert-Butylbenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
4-Isopropyltoluene (p-Cymene)	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
Isopropylbenzene (Cumene)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
n-Propylbenzene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
sec-Butylbenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Styrene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-
1,2,4-Trimethylbenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
1,3,5-Trimethylbenzene	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Ketones in VOC Water by Headspace GC-MS						
Acetone	g/m³	< 0.05	< 0.05	< 0.05	-	-
2-Butanone (MEK)	g/m³	< 0.05	< 0.05	< 0.05	-	-
Methyl tert-butylether (MTBE)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
4-Methylpentan-2-one (MIBK)	g/m³	< 0.010	< 0.010	< 0.010	-	-
Trihalomethanes in VOC Water by Headspace GC-MS						
Bromodichloromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Bromoform (tribromomethane)	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Chloroform (Trichloromethane)	g/m³	0.0003	0.0004	< 0.0003	-	-
Dibromochloromethane	g/m³	< 0.0003	< 0.0003	< 0.0003	-	-
Other VOC in Water by Headspace GC-MS						
Carbon disulphide	g/m³	< 0.00010	< 0.00010	< 0.00010	-	-
Naphthalene	g/m³	< 0.0005	< 0.0005	< 0.0005	-	-

Analyst's Comments

#1 Please interpret this microbiological result with caution as the sample required repeat analysis. Due to incubation times it is not possible to perform a repeat analysis within 24 hours of sampling as required by the method. Repeats are typically due to unexpected analyte levels.

Sample 1 Comment:
Please note that the level of Uncertainty of Measurement (UOM) for the TOC result is significantly greater than that usually reported for this analyte (up to 200-300% at the 95% confidence level).

Sample 2 Comment:
Please note that the level of Uncertainty of Measurement (UOM) for the TOC result is significantly greater than that usually reported for this analyte (>300% at the 95% confidence level).

Sample 3 Comment:
Please note that the level of Uncertainty of Measurement (UOM) for the TOC result is significantly greater than that usually reported for this analyte (up to 100-200% at the 95% confidence level).

Amended Report: This certificate of analysis replaces an earlier certificate issued on 07 May 2018 at 5:14 pm
Reason for amendment: The sample temperatures from the client have been added.

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
Free Ammonia*	Calculation from NH4N, pH, Temperature (Calculations based on data for distilled water). APHA Table 8010:VI 22nd ed. 2012.	0.010 g/m³ at Client Temperature	1-3
OrganoNitrogen & Phosphorus pesticides, trace, liq/liq GCMS	Liquid/liquid extraction, GPC (if required), GCMS analysis	-	1-3
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	1-3
Gases in groundwater	Manual headspace creation and sub-sampling, GC-FID analysis.	0.002 - 0.003 g/m³	1-3
Semivolatile Organic Compounds Trace in Water by GC-MS	Liquid/Liquid extraction, GPC cleanup (if required), GC-MS FS analysis	-	1-3
Volatile Organic Compounds Trace in Water by Headspace GC-MS	Headspace, GC-MS SIM analysis [KBIs:37857,37921]	0.00010 - 0.05 g/m³	1-3
Filtration for DKN, Soluble COD*	Sample filtration through 0.45µm membrane filter prior to Dissolved Kjeldahl Nitrogen or Soluble COD analysis.	-	1-3
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-3
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	1-3
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	1-3
Turbidity	Analysis using a Hach 2100N, Turbidity meter. APHA 2130 B 22nd ed. 2012.	0.05 NTU	1-3
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	1-3
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 $CaCO_3$	1-3
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	1-3
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 22nd ed. 2012.	1.0 g/m³ as $CaCO_3$	1-3
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 22nd ed. 2012.	0.1 mS/m	1-3
Total Dissolved Solids (TDS)	Filtration through GF/C (1.2 µm), gravimetric. APHA 2540 C (modified; drying temperature of 103 - 105°C used rather than 180 ± 2°C) 22nd ed. 2012.	10 g/m³	1-3

Sample Type: Aqueous			
Test	**Method Description**	**Default Detection Limit**	**Sample No**
Sample Temperature*	Supplied by customer, otherwise 20°C.	0.1 °C	1-3
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 22nd ed. 2012.	-	1-3
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.003 g/m^3	1-3
Dissolved Boron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.005 g/m^3	1-3
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3	1-3
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m^3	1-3
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m^3	1-3
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0005 g/m^3	1-3
Dissolved Mercury	0.45µm filtration, bromine oxidation followed by atomic fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m^3	1-3
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.05 g/m^3	1-3
Dissolved Selenium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.0010 g/m^3	1-3
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 22nd ed. 2012.	0.02 g/m^3	1-3
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m^3	1-3
Fluoride	Direct measurement, ion selective electrode. APHA 4500-F$^-$ C 22nd ed. 2012.	0.05 g/m^3	1-3
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	1-3
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO_3^- I 22nd ed. 2012 (modified).	0.002 g/m^3	1-3
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO2N. In-House.	0.0010 g/m^3	1-3
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	1-3
Total Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-Norg D. (modified) 4500 NH_3 F (modified) 22nd ed. 2012.	0.10 g/m^3	1-3
Dissolved Reactive Phosphorus	Filtered sample. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified). 22nd ed. 2012.	0.004 g/m^3	1-3
Phosphate from DRP	Calculation: from Dissolved Reactive Phosphorus * 3.065.	0.004 g/m^3	1-3
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	1-3
Reactive Silica	Filtered sample. Heteropoly blue colorimetry. Discrete analyser. APHA 4500-SiO_2 F (modified from flow injection analysis) 22nd ed. 2012.	0.10 g/m^3 as SiO_2	1-3
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 22nd ed. 2012.	0.5 g/m^3	1-3
Dissolved Total Biochemical Oxygen Demand ($TBOD_5$)	Filtered sample, Incubation 5 days, DO meter, no nitrification inhibitor added, no dilutions, seeded. APHA 5210 B (modified) 22nd ed. 2012.	2 g O_2/m^3	1-3
Dissolved COD, trace level	Filtered sample. Dichromate/sulphuric acid digestion, colorimetry. Trace Level method. APHA 5220 D 22nd ed. 2012.	6 g O_2/m^3	1-3
Total Organic Carbon (TOC)	Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC -TIC.The uncertainty of the calculated result is a combination of the uncertainties of the two analytical determinands in the subtraction calculation. Where both determinands are similar in magnitude, the calculated result has a significantly higher uncertainty than would normally be achieved if one of the results was significantly less than the other. In such cases, the elevated uncertainty should be kept in mind when interpreting the data. APHA 5310 C (modified) 22nd ed. 2012.	0.5 g/m^3	1-3
Escherichia coli	MPN count using Colilert , Incubated at 35°C for 24 hours. APHA 9223 B (2004), 22nd ed. 2012.	1 MPN / 100mL	1-3

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.

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.

Ara Heron BSc (Tech)
Client Services Manager - Environmental