

Remediation NZ Ltd Uruti
Waitara and Pennington Road
Monitoring Programme
Annual Report
2017-2018

Technical Report 2018-79

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Executive summary

Remediation NZ Ltd (the Company) operates two worm farms which produce vermicast for fertiliser at two sites in Brixton, on Pennington and Waitara Roads in the Waiongana and Waitara catchment. The Company also operate a remediation, composting and vermiculture operation on the Mokau Road at Uruti, in the Mimitangiatua catchment.

This report for the period July 2017 to June 2018 describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess the Company's environmental and consent compliance performance during the period under review. The report also details the results of the monitoring undertaken and assesses the environmental effects of the Company's activities.

The Company holds eight resource consents, which include a total of 109 conditions setting out the requirements that the Company must satisfy. These eight consents cover the activities across the Company's three Taranaki sites.

During the monitoring period, the Company demonstrated an overall improvement required level of environmental performance.

The Council's monitoring programme for the year under review included 14 inspections, 93 water samples and six composite soil samples collected for physicochemical analysis, one biomonitoring survey and a fish netting survey of receiving waters.

The monitoring showed that at the Uruti site, the wetland treatment system was compliant with consent conditions across the six monitoring rounds undertaken. On one occasion surface water monitoring identified elevated contaminants at two monitoring locations, which resulted in an infringement fine. Groundwater monitoring identified the old lower irrigation area (area J and H) contained an elevated total dissolved salt concentration. Soil analysis identified a decreasing sodium absorption ratio (SAR) across all irrigation areas this period, however on two occasions the associated SAR within the wastewater was above the consented limit.

Biomonitoring and the associated fish netting survey did not find that the exercise of consents within the Haehanga catchment had any adverse effects on the biology of the stream, however naturally occurring low flows may be leading to a preferential of species composition. On one occasion saw dust was discharged into an unnamed tributary and on the same day, the drilling mud pad leachate was observed discharging in an uncontrolled manner into the duck pond. This resulted in the Company being given an abatement notice.

Significant riparian work and associated fencing had been undertaken during this period, with more planned in the upcoming monitoring period. A new culvert was installed in the centre of site to give the Company more operating space, lessen the potential for flooding and to make sure no sawdust or waste spill over. A new irrigation area was completed this monitoring period and additional groundwater monitoring bores (4) were installed by the consent holder.

Administration requires additional attention as the Company failed to provide adequate analysis of waste streams as defined by the consent. This is the second year in succession where this has not been provided.

The Waitara Road facility was found to be in breach of the Regional Air Quality Plan on two separate occasions during this monitoring period which resulted in an infringement fine for dust and an abatement notice for odour.

The Pennington Road facility was observed to be growing maize and is planned to be surrendered in the upcoming monitoring period.

There were four unauthorised incidents recording non-compliance in respect of this consent holder during the period under review, two at the Waitara Road and two at the Uruti facility. These issues were rectified during this period.

During the year, the Company demonstrated an improvement required level of environmental and administrative performance with the resource consents.

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.

In terms of overall environmental and compliance performance by the consent holder over the last several years, this report shows that the consent holder's performance has deteriorated in the year under review.

This report includes recommendations for the 2018-2019 year.

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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 Remediation NZ Ltd (the Company). The Company operates in Brixton at two locations, a worm farm located on the Waitara Road, while the other, which served as laydown area until recently, on Pennington Road, is proposed to be surrendered in the upcoming monitoring period. The Company also operate a remediation, composting and vermiculture facility on the Mokau Road, Uruti, in the Mimitangiata catchment.

The report includes the results and findings of the monitoring programme implemented by the Council in respect of the consents held by the Company that relate to discharges to land, water and air within the Mimitangitua, Waiongara and Waitara catchments.

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 of the Company's use of water, land and air, and is the 17th combined annual report by the Council for the Company.

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 through annual programmes;
- the resource consents held by the Company in the Mimitangitua, Waiongara and Waitara catchment;
- the nature of the monitoring programme in place for the period under review; and
- a description of the activities and operations conducted in the Company's site/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 the Company, 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 the Company'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

A range of waste streams are processed and converted, via vermiculture and composting, into a marketable biological product that can be safely used as a fertiliser and soil conditioner.

The Company's operation consists of a composting and vermiculture operation at Mokau Road, Uruti, and vermiculture operations at Waitara Road and Pennington Road. The Waitara Road site also has a fertiliser processing facility which blends and refines the finished products.

The Mokau Road, Uruti composting site was established in late 2001 following removal of composting operations from the old Winstone Aggregates quarry site, Manutahi Road, Bell Block (the Company no longer operates at this site). Closure of the composting operations was due to the incompatible nature of the activity with surrounding land use (nearby residential houses), which resulted in odour incidents. The vermiculture production facilities have been operating at Waitara Road since 1998 and at the Pennington Road site since 2001.

The current site at Uruti accepts a range of waste streams including, paunch grass, poultry waste, poultry mortalities, green waste and drilling waste. The full acceptable material list is provided in appendix I, consent 5838-2.2.

The composting operation and drilling mud processing at the Mokau Road site generates a significant amount of leachate and contaminated stormwater from three main processing areas. These are the drilling wastes pad (pad 3) and two composting pads (known as 'pad 1' and 'pad 2').

Drilling muds, fluids and cuttings are mixed with sawdust or other organic material and then piled up on the drilling wastes pad. Any rainfall runoff and leachate that is generated, drains into a series of ponds for treatment. Between each pond is a baffle that skims off any floating hydrocarbons as the leachate passes through. These ponds also treat the leachate and stormwater from pad 1 where green waste is routinely composted. The treated liquid from the pond treatment system (PTS) is then irrigated to cut and carry pasture on a number of irrigation areas.

Runoff and leachate from composting pad 2 which is the paunch grass maturation pad is pumped up to the top of a seven tier constructed wetland. Under dry conditions the water from the bottom pond of the wetland is reticulated back to the top tier of the wetland. Under high flow conditions the wetland discharges the treated stormwater/leachate to a tributary of the Haehanga Stream.

RNZ are also developing a pea gravel quarry at the Uruti site.

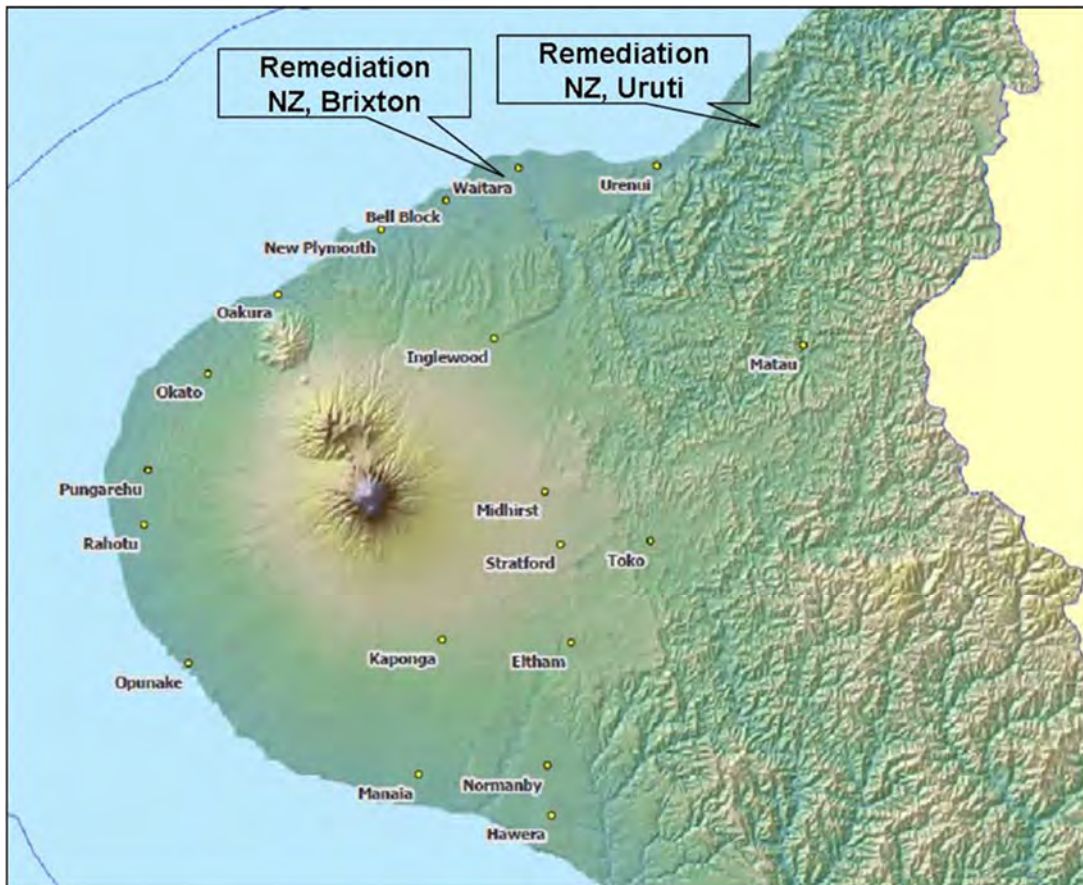


Figure 1 Regional location of the Company operations in Taranaki

1.3 Resource consents

Table 1 Resource consents held by the Company

Consent No.	Site	Purpose	Expiry Date	Review Date(s)
5838-2.2	Uruti	Discharge to land and water	June 2018	Yearly
5839-2	Uruti	Discharge emissions to air	June 2018	Yearly
5938-2.2	Uruti	Install culvert	June 2015	-
6211-1	Uruti	Divert stream	June 2021	-
6212-1	Uruti	Install culvert	June 2021	-
10063-1	Uruti	To discharge treated stormwater (quarry)	June 2033	June 2021
5892-2	Brixton	Discharge to land/water	June 2020	-
5893-2	Brixton	Discharge to land/water	June 2021	-

Summaries of these consents are provided in sections 1.3.1 to 1.3.4 below. 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 consents which are appended to this report.

1.3.1 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.

The Company holds air discharge permit **5839-2** to discharge emissions into the air, namely odour and dust, from composting operations.

This consent was issued to the Company on 30 June 2010. It is due to expire in June 2018

The consent has 20 special conditions attached to it.

- Special condition 1 requires that the consent holder adopt the best practical option.
- Special conditions 2 to 4 set restrictions on the types of waste accepted and the size of the composting pads, and condition 5 requires that records be kept of incoming waste.
- Special conditions 6 and 7 deal with the requirements for the submission of and adherence to a Site Practices Plan.
- Special conditions 8 and 9 require an independent report on the management of the site in regards to practices and air emissions, and special condition 10 requires that any recommendations from the report be adhered to.
- Special conditions 11, 12, and 13 set out the permitted limits on the effects of discharges to air arising from the exercise of this consent.
- Special conditions 14 and 15 deal with the requirements for weather monitoring and odour surveys.
- Special conditions 16 and 17 set out requirements for community liaison and complaints procedures.
- Special condition 18 and 19 set out the requirements for site reinstatement.
- Special condition 20 is a review condition.

The permit is attached to this report in Appendix I.

1.3.2 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.

The Company holds discharge permit **5838-2.2** to discharge:

- a. waste material to land for composting; and
- b. treated stormwater and leachate from composting operations; onto and into land in circumstances where contaminants may enter water in the Haehanga Stream catchment and directly into an unnamed tributary of the Haehanga Stream. This consent was issued to the Company on 30 June 2010. It is due to expire in June 2018.

Consent 5838-2 has 30 special conditions.

- Special condition 1 requires that the consent holder adopt the best practical option for reducing and minimising effects.
- Special conditions 2 set restrictions on the types of waste accepted.
- Special condition 3 define the pre-screening analysis criteria required for certain waste streams,
- Special condition 4 define that no material from dissolved air filtration be accepted
- Special condition 5 and 6 set out requirements for the maintenance of treatment systems.
- Special condition 7 relates to pond management.
- Special conditions 8-11 require the consent holder to keep irrigation records and defines the areas and extent of the irrigation.
- Special condition 12 and 13 define analysis pertaining to soil assessment.
- Special condition 14 defines the requirement for a management plan.
- Special conditions 15 to 19 relate to groundwater quality assessment and monitoring.
- Special conditions 20 and 21 deal with the maintenance and management of the pond treatment system.
- Special conditions 22 to 25 deal with the maintenance and management of the wetland treatment system.
- Special condition 26 requires that riparian planting be maintained in accordance with the riparian plan in place.
- Special condition 27 requires that the consent holder keep records of all complaints.
- Special conditions 28 and 29 deal with site reinstatement.
- Special condition 30 is a review condition.

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.

The Company holds discharge permit **5893-2** to cover the discharge of solid hydrocarbon exploration drilling wastes onto land, and to discharge stormwater from the worm farming operations onto and into land and into the unnamed tributary of the Waitara River at the Pennington Road, Brixton site. This permit was originally issued by the Council on October 2006 under Section 87(e) of the RMA. It is due to expire in June 2020.

There are 11 special conditions attached to the consent.

- Special condition 1 requires the consent be exercised in accordance with information submitted in the application.
- Special condition 2 and 3 requires, upon request, records of the nature and volume of wastes.
- Special condition 4 sets a maximum hydrocarbon content on solid drilling cuttings of 5%.
- Special condition 5 requires that there is no contamination of groundwater or surface water.
- Special condition 6 requires the stormwater treatment system to be maintained.
- Special condition 7 gives contaminant concentrations not to be exceeded in the discharge while special condition 8 describes visual effects which must not be observed below a mixing zone.
- Special condition 9 requires notification prior to undertaking changes to processes or operations which would change the nature or quantity of contaminants emitted from the site.
- Special condition 10 requires notification of reinstatement of the site and gives guidance as to how reinstatement should be carried out to minimise effects on stormwater.
- Special condition 11 explains review provisions.

The permit is attached to this report in Appendix I.

1.3.3 Water discharge permit

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.

The Company holds water discharge permit **10063-1** to discharge treated stormwater from a quarry site, into an unnamed tributary of the Haehanga Stream. This consent was issued to the consent holder on 9 March 2015. It is due to expire in June 2033.

It has 18 special conditions.

- Special condition 1 requires the consent be exercised in accordance with information supplied with the application.
- Special condition 2 requires the consent holder to notify Council prior to exercise of consent.
- Special condition 3 requires the consent holder to adopt best practice.
- Special condition 4 requires the consent to progressively reinstate the quarry site.
- Special condition 5 limits the area of disturbed soil.
- Special condition 6 limits the stormwater catchment area.
- Special conditions 7, 8, and 9 deal with stormwater treatment requirements.
- Special condition 10 details the discharge standards.
- Special conditions 11, 12, and 13 deal with discharge quality and effects on receiving waters.
- Special conditions 14 and 15 deal with management and contingency plans.
- Special condition 16 deals with notification of changes in site processes.
- Special conditions 17 and 18 are lapse and review conditions.

The Company holds discharge permit **5892-2** to cover the discharge of stormwater from the worm farming operations onto and into land and into the unnamed tributary of the Waiongana Stream at the Waitara Road, Brixton site. This permit was originally issued by the Council on 7 September 2006 under Section 87(e) of the RMA. It is due to expire in June 2020.

There are 10 special conditions attached to the consent.

- Special condition 1 requires the consent be exercised in accordance with information submitted in the application.
- Special condition 2 requires the consent holder adopt the best practicable option to prevent or minimise adverse effects on the environment.
- Special condition 3 requires the provision, upon request, of records of the nature and volume of wastes.
- Special condition 4 sets a maximum hydrocarbon content on solid drilling cuttings of 5%.
- Special condition 5 requires that there is no contamination of groundwater or surface water while condition 7 gives contaminant concentrations not to be exceeded in the discharge.
- Special condition 6 requires that the stormwater treatment system is maintained.
- Special condition 8 requires notification prior to undertaking changes to processes or operations which would change the nature or quantity of contaminants emitted from the site.
- Special condition 9 requires notification of reinstatement of the site and gives guidance as to how reinstatement should be carried out to minimise effects on stormwater.
- Special condition 10 explains review provisions.

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(s) which is/are appended to this report.

1.3.4 Land use permits

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. The Company holds three land use consents.

Consent **5938-2.2** relates to a culvert in the Haehanga Stream. This consent was granted on 5 December 2001. There are three special conditions attached to the consent.

- Special condition 1 requires the consent holder to make provision for fish passage.
- Special condition 2 requires that construction to be maintained.
- Special condition 3 deals with review of the consent.

Consent **6211-1** was granted as a retrospective consent on 26 September 2003. Relating to a diversion of the Haehanga Stream, the consent has six special conditions attached. It is due to expire in June 2021.

- Special condition 1 requires the consent holder to notify the Council prior to works.
- Special condition 2 requires that the realignment be carried out in accordance with the application.
- Special conditions 3 and 4 require the consent holder adopt the best practicable option to avoid or minimise erosion, scouring and the discharge of silt or contaminants to water.
- Special condition 5 deals with riverbed disturbance.
- Special condition 6 deals with review of the consent.

Consent **6212-1** is for a culvert in the Haehanga Stream was also granted as a retrospective consent on 26 September 2003. It is due to expire in June 2021.

There are eight special conditions included in the consent.

- Special condition 1 requires the consent holder to notify the Council prior to removal of the temporary culvert and installation of the new culvert.

- Special condition 2 requires that the temporary culvert be replaced by April 2004, and that the consent holder provide designs of the proposed culvert.
- Special condition 3 required that the culvert be constructed in accordance with the application and be maintained to ensure the conditions are met.
- Special condition 4 requires the adoption of best practicable option to avoid or minimise adverse effects on water quality.
- Special condition 5 deals with riverbed disturbance.
- Special condition 6 requires maintenance of fish passage.
- Special condition 7 concerns the removal of structures and reinstatement of the area.
- Special condition 8 deals with the review of the consent.

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 consents which are appended to this report.

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 Company facilities site consisted of four primary components.

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

The Uruti site was visited 14 times during the monitoring period. While the Waitara and Pennington Road facilities were visited on four occasions. With regard to consents for the abstraction of or discharge to water, the main points of interest were plant processes with potential or actual discharges to receiving watercourses, including contaminated stormwater and process wastewaters. Air inspections focused on plant processes with associated actual and potential emission sources and characteristics, including potential odour, dust, noxious or offensive emissions. Sources of data being collected by the Company were identified and accessed, so that performance in respect of operation, internal monitoring, and supervision could be reviewed by the Council. The neighbourhood was surveyed for environmental effects.

1.4.4 Chemical sampling

The Council undertook compliance sampling across the Company operations, primarily related to the Uruti facility in the 2017-2018 monitoring period. As the Company holds resource consents specifically related to discharges to land and water, the Council monitors the surface water, groundwater and soil at the Uruti site. There is also facility to undertake surface water sampling at their laydown areas in Brixton.

The analytes specifically related to the mediums of surface, groundwater and soil are provided in the following Table 2.

Surface water analysis

Surface water samples were collected from 13 specific monitoring locations on the unnamed tributary of the Haehanga Stream and the main stem (Figure 2 and 3) which bisects the Uruti site. The samples collected from these 13 locations were tested for a range of analytes which are detailed in Table 2. The Council assesses these 13 surface water locations six times per annum. Noting in Figure 3 are all the surface water sampling locations in relation to the Uruti site, of which 13 are monitored. Spot field parameters are also collected for field screening purposes. These are collected via Yellow Springs Instrument (YSi) multi-parameter probe and assessed for the following: pH, dissolved oxygen, conductivity, temperature and ORP.

Groundwater analysis

The Uruti site contains an active groundwater monitoring network, this network is a consented obligation of resource consent 5838-2.2. Originally it comprised of three groundwater monitoring wells (Figure 4). The monitoring network is monitored biannually and is assessed for the analytes provided in Table 2. In this monitoring period additional groundwater monitoring wells were installed, as required by the consent. By the end of this monitoring period the monitoring well network comprised seven wells.

Prior to sample collection, Council field staff will undertake a well stabilisation procedure, whereby the sample will not be collected until field parameters (which are assessed through the use of a YSi multiple parameter probe) have stabilised within 10% over a five minute period, or within three well volumes.

Table 2 Compliance analysis by medium

Surface Water Analytes	
Total Arsenic (irrigation pond discharge)	Calcium
Total Lead (irrigation pond discharge)	Chloride
pH	Conductivity
Sodium Adsorption ratio	Total Petroleum Hydrocarbons (TPH)
Biochemical Oxygen Demand (BOD)	Potassium
Benzene	Magnesium
Toluene	Un-ionised ammonia
Ethylene	Ammoniacal Nitrogen
Xylene	Nitrite-Nitrate Nitrogen
Temperature	Suspended Solids
Groundwater Analytes	
Benzene	Un-ionised ammonia
Toluene	Ammoniacal Nitrogen
Ethylene	Nitrite-Nitrate Nitrogen
Xylene	Total Dissolved Salts
Chloride	Temperature
Total Petroleum Hydrocarbon (TPH)	Level

Soil Analytes	
Calcium	Mercury
Chloride	Nickel
Conductivity	Zinc
Potassium	Magnesium
Moisture factor	Sodium
Sodium Absorption Ratio (SAR)	Ammoniacal Nitrogen
Arsenic	Nitrite-Nitrate Nitrogen
Cadmium	pH
Chromium	Total Petroleum Hydrocarbons (TPH)
Copper	Poly-cyclic aromatic hydrocarbons (PAH)
Lead	BTEX

Soil analysis

Representative soil sampling is undertaken on the site specific irrigation areas (Figure 5). The aim of the soil sample is to ascertain for any specific trends which may be emerging as a direct result of irrigation to these areas. Soil sampling is undertaken with a soil corer which is inserted to a depth of 400 mm +/- below ground level (BGL), whereby ten soil cores are collected across an irrigated area. The ten cores are then composted to gain one representative sample. The analysis undertaken by the Council in respect of the soil is provided in Table 2.

1.4.5 Biomonitoring surveys

A biological survey was performed on one occasion in the unnamed tributary of the Haehanga Stream and the main stem at seven locations (Appendix II for full report), in order to determine whether or not the discharge of treated stormwater and uncontaminated site and process effluent from the site has had a detrimental effect upon the communities of the stream. In addition to this, a fish netting survey was also undertaken. See section 2.1.2.7 and 2.1.2.8 for a synopsis of the monitoring. Both reports are attached in full in the appendices.



Figure 2 The Company's Uruti site map



Figure 3 Surface water monitoring locations



Figure 4 Groundwater monitoring locations

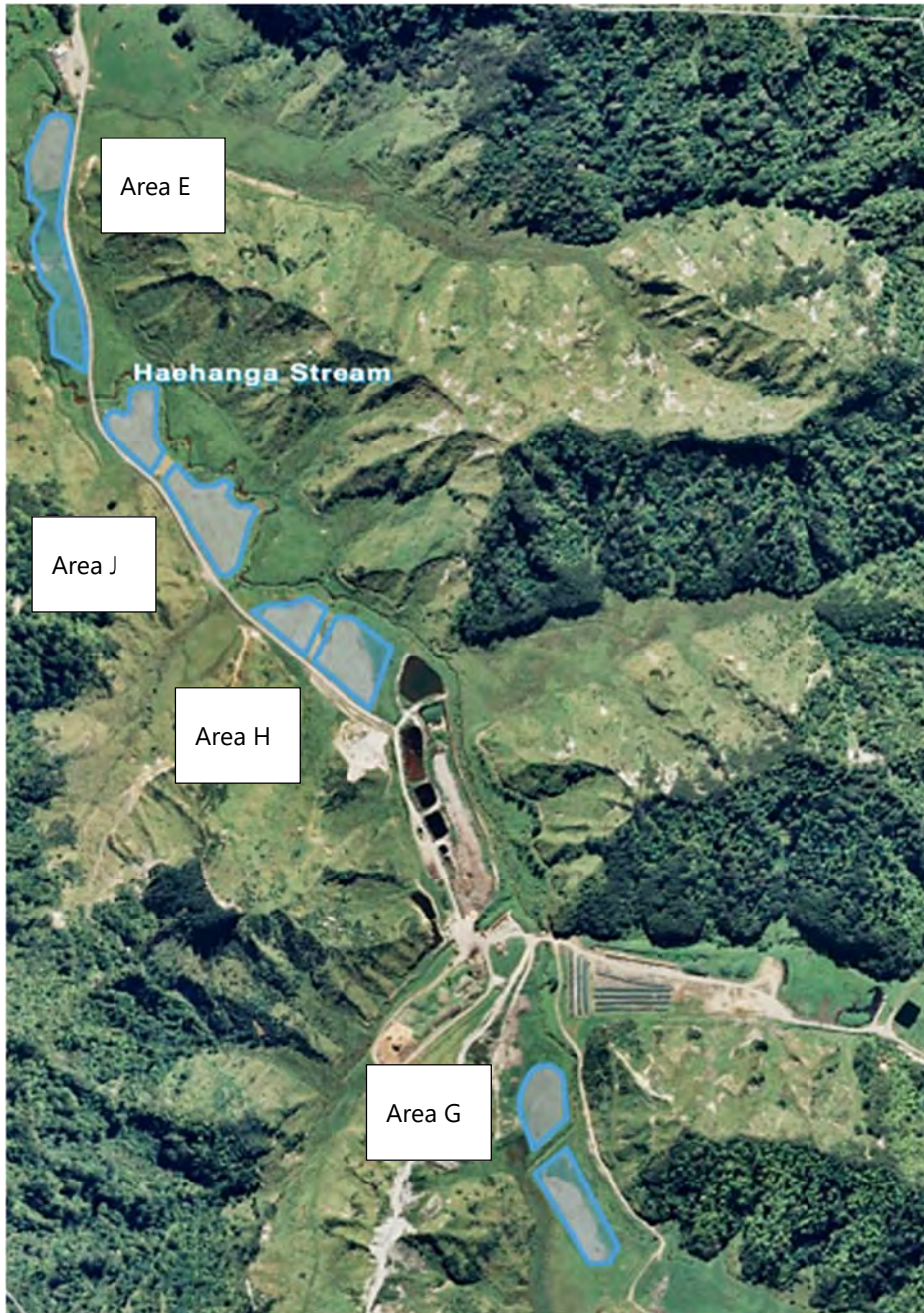


Figure 5 The Company's Uruti irrigation areas

2 Results

2.1 Water

2.1.1 Inspections

Remediation New Zealand facility Uruti composting inspections

27 July 2017

An inspection was undertaken during a period of fine weather, however it was noted that there had been significant rainfall events in the days prior to the inspection. Culvert inspections undertaken as part of routine compliance monitoring of the remediation site. The inspection found that the culverts had held up well during the recent rainfall events, however it was noted that some remedial works were required to ensure that they continue to operate as desired. There was evidence that the stream had over-topped the twin culvert and access track leading up to the main remediation facilities. It was recommended that this be monitored to ensure that the erosion on the edge of the track (downstream side of the culvert) is addressed to make sure that the erosion does not increase during subsequent rainfall events. Such instability would be detrimental to both the stability of the access track and also the receiving environment, as a result of the sediment discharge.

In relation to discharges to air, the inspection found that Pad 2 had not received any recent paunch products over recent weeks due to the winter period and no freezing works in operation. Some paunch remained within the paunch pit, however no detectable odours were observed around the perimeter of the paunch pad. An inspection of the lower drilling mud pad found that there was a strong odour in the immediate vicinity of the dump-pad/site where product was off-loaded.

An inspection found that this was likely to be due to the recent disposal of a number of dead chickens that were yet to be dealt with. A slight hydrocarbon odour was also detected at the base of the final/irrigation pond. Both odours were found to dissipate quickly and no odour was found to be detected approximately 50m from the pond system. An odour inspection at the culvert on the access track found that no odour was detected.

In relation to quarry operations. The inspection found that no material was being removed from the quarry at the time due to the winter and associated weather conditions. The extraction will likely resume in the summer months.

In relation to discharges to land and water, the inspection found that all stormwater from the upper pad (where one worm bed was set) was captured and directed to the paunch pond. A discussion was held highlighting the potential for excess amounts of stormwater which could result with the paunch pond becoming overwhelmed with the flow. The inspection found that there was capacity within the paunch pond to address any rainfall events in the near future. The collection ponds about the drilling mud pad were inspected and while capacity remained within the system it was strongly suggested that the walls of the ponds be build up to increase the freeboard available within the system.

17 August 2017

An inspection was undertaken following a number of heavy rainfall events.

Inspection of the stream re-alignment area found that the stream was reasonably stable with little sign of erosion or scour. Some erosion was observed on the banks of the re-alignment, however this was at a rate similar to the natural surrounding environment and was not considered significant. This area of stream was monitored by staff on site, as any significant erosion within the vicinity of the re-alignment works would place other infrastructure at risk.

An inspection of the culvert found that it was running free (slightly elevated). No sign of scour or erosion was detected as a result of the recent rainfall events. Fish passage was difficult to assess due to the high flow of the stream at the time of inspection and this will subsequently be assessed in further inspections during low flow conditions.

The inspection then focused on the air discharge portion of the consents held by the Company. The inspection found that a slight to moderate breeze was blowing. The weather was fine at the beginning of the inspection, however rain had set in prior to leaving site. An assessment of the odour found a decaying type odour at the truck tip off point by the drilling mud pad. This was noted within the immediate vicinity of the concrete tip pad, however the odour quickly dissipated and was not detected approximately 20m back from the tip of point. Chicken carcasses were observed about the tip off point and this may have been the main contributing source of odour within the vicinity. A sulphur odour was detected about the irrigation pond, however again this quickly dissipated a short distance from the pond.

No odour was detected about the paunch pit. Odour surveys were undertaken at the twin culvert location on the access track and again at the road frontage to the site. No odours were detected at either location.

In relation to discharges to land and water, a number of surface water and groundwater samples were collected to assess compliance with resource consent conditions. During the inspection it was found that a recent blockage of the culvert under the main portion of the site (referred to as the main culvert) had resulted in slight flooding within the immediate vicinity.

The blockage had occurred prior to the inspection and by the time of the occurrence of the inspection the blockage had been cleared and the culvert was running freely. A conversation was subsequently held discussing the likelihood of replacing the culvert with a larger one over the summer months, one which was consented (noting that this culvert had existed unconsented for some time and was undersized). Work had been undertaken about the 'irrigation pond' to ensure that during heavy rainfall events the system had sufficient capacity to cope with the increased volume. No irrigation was taking place at the time of inspection. The irrigation pond was near capacity. The wetland was discharging and subsequently sampled.

26 September 2017

Inspection undertaken as part of routine compliance monitoring. Inspection found that the re-alignment is stable in its current line. No accelerated erosion of the banks was observed. The stream was slightly elevated and flowing turbid in colour as a result of recent rainfall events within the catchment. The minimal gradient of the stream means that the flow is rather gentle with low energy.

25 October 2017

An inspection was undertaken as part of routine compliance monitoring of the Uruti site. A visual inspection was undertaken of the stream realignment during a normal sampling round. The inspection found that the stream was flowing freely through the realignment with no obstructions observed. The stream was of moderate flow and found to be reasonably clear compared to other streams within the catchment.

A visual inspection found no signs of significant erosion or obstructions to fish passage. No issues were identified at the time of the inspection. The inspection found that, at the time, the culvert was unobstructed, which allowed the stream to flow through the culvert as designed. No erosion was observed within the vicinity of the culvert. No obstructions were observed to fish passage within the vicinity.

Following the extensive wet period over recent months it would be beneficial to routinely check all culverts on the property to ensure that fish passage is provided for and that any erosion that may have occurred about the culvert is stabilised. In relation to discharges to the air, no odours were detectable at the road entrance nor along the site boundary. The inspection found that a slight odour was detected about the discharge site, near the top end of the pad and again near the irrigation pond. The odours were noted

within the immediate vicinity of the two aforementioned areas, however the odour was deemed to be of a lesser intensity than that noted on previous inspections.

In relation to discharges to land and water, a full surface water sampling run was undertaken. At the time of the inspection no irrigation was taking place. However, a new irrigator had recently been acquired by the Company and was being put through its testing phase. At this stage of the testing, the results appeared with the consent holder able to ensure that a controlled rate of application was achieved over a wide area.

At the time, the development of a further irrigation area was on-going with a plan to have the area seeded in the coming weeks to ensure that a good grass cover was achieved prior to irrigation. Some work had been carried out to ensure that clean and potentially contaminated stormwater were captured and directed to appropriate locations. It was noted that maintenance runs on the silt traps was to be undertaken.

04 December 2017

An inspection was undertaken during a long period of fine weather. The initial inspection focused on the state of the recent re-alignment of the unnamed tributary of the Heahanga Stream. At the time a minimum flow was observed within the tributary. The banks of the tributary were well vegetated with grass. There was very little sign of any erosion within the channel. The current flow path appeared to be reasonably stable.

At the time it appeared that fencing for stock exclusion and associated planting would greatly assist in the stability of this section of stream.

An inspection of culvert found that the culvert was sitting well in the stream bed, this would make sure that fish passage was not obstructed. The headwall on the upper side of the culvert appeared to be stable with no signs of erosion. No further work was required on this culvert at this stage.

In relation to discharges to air, it was observed during the inspection that drilling waste and paunch were being disposed of at their specific discharge locations. At the time the irrigation pond was dark in colour, however no odours or visible emissions were observed to be discharging from the pond. The usual sulphur odour was not noted. A very slight odour was noted at the upper end of the drilling waste pad. This odour was detected while a GPL truck was unloading waste into the upper pond while the digger was in operation turning the solid waste pile to encourage the composting process. This odour quickly dissipated and was not noted adjacent to the stream or Pad 1.

An earthen bund was in the process of being constructed across the valley floor near the location of the twin culverts and monitoring location HHG000150. The bund will then be planted out with shrubs and larger trees to create a passive environmental barrier, this is aimed at addressing the potential for odour impacts associated with cold air drainage (katabatic) situations.

In relation to quarry operations. The inspection found that the quarry on site had not been in operation over the wet winter months and was not yet in operation for the 2017/18 summer season. There were plans to again begin extracting metal from the quarry site over the summer, however the access track would require upgrading prior to the recommencement of quarry operations.

In reference to upgrading the access track it was suggested that adequate cut off drains placed at regular intervals along the track to ensure that any stormwater will be directed off the track and through grass to allow treatment prior to entering surface water.

This would allow minimal stormwater to be discharged at the base of the access track. It was also requested that the Company inform the Council prior to the commencement of extracting operations to ensure adequate sediment controls are in place.

In relation to discharges to water and land, a discussion was held with respect to works planned for the summer months with the Operations Manager. The completion of the planned works will seek to improve the sites resilience during periods of wet weather. The works were also part of the company plan for on-

going improvement to their site and associated operations. The inspection found that work had been undertaken on Pad 1 to ensure that a defined ring drain was in place to capture any stormwater and direct it to the irrigation pond for disposal via land application.

No irrigation was taking place at the time of the inspection. The irrigation paddocks below the duck pond were to be cut for silage that week and irrigation will recommence once the grass had been removed.

07 December 2017

The inspection was undertaken during an extended fine weather period. The inspection found that the stream was in low flow conditions with minimal flow through the realignment. A visual inspection of the realignment found that it appeared to be stable with no signs of accelerated erosion. The banks of the realignment are well vegetated with grass and stock have been excluded from this area. Future riparian planting along this portion of stream will assist with ongoing stabilisation of the banks.

The inspection found that there was no flow through the culvert as a result of the dry spell. A visual inspection found that there were no visual obstructions to fish passage. There were also no signs of erosion about the culvert noted. No issues were identified with the culvert at the time of the inspection.

In relation to discharges to the air from the site, the inspection found that the irrigation pond was reasonably clear with no odours detected in the immediate vicinity. A very slight odour was detected about the top area by the drilling mud disposal pad, however this quickly dissipated and was not detectable approximately 30m from the disposal pad.

The solid waste pile on the drilling mud pad had recently been turned with a digger to encourage the composting process. Some material near the bottom of the pad had been removed from site and deposited as compost near the irrigation area immediately below the duck pond. No odour was detected at or beyond the boundary of the site.

At the time the quarry was not in operation. There were no plans in the immediate future to recommence quarry operations.

In relation to discharges to land and water, a discussion was held with the site manager regarding on-going works which were required to be undertaken to ensure ongoing consent compliance for the site in general.

A work programme had subsequently been put in place by the company with the aim of completing a majority of these works over the summer period (through to approximately March 2018). These included aspects such as drainage work, bunding work and further development of the irrigation areas. During the inspection all product was being disposed of at the disposal pit on the drill mud pad. This was being blended and added to the composting windrow. The windrow had recently been turned with some of the composted material removed and used on the property for site development. At the time the wetland treatment system was not discharging. Observed with approximately 20cm free board below the discharge point for the final pond.

In relation to the twin culverts, a discussion was held regarding the best approach to ensure that fish passage was maintained through the twin culvert at all times. As a result, work will be undertaken during the summer months to ensure fish passage and also work on the approach to the culverts and head wall protection to ensure erosion does not occur during high flow events. At the time of the inspection the stream was in very low flow conditions with water only passing through one of the two culverts.

24 January 2018

An inspection was undertaken during fine weather conditions with a light northerly wind. The inspection found that the quarry was not currently in operation. It had been agreed that the consent holders will notify the Council prior to the recommencement of any quarry operations at the site. No adverse effects were observed within the receiving environment. The receiving tributary was sampled in relation to the

composting activities on the site. It was advised to continue to monitor the access track during periods of wet weather to ensure no rilling was occurring as a result of stormwater running down the steep track. If sediment mobilisation was observed on the access track it was advised to take appropriate action to mitigate it. In relation to discharges to land and water, surface water samples and soil samples were collected for analysis to assess compliance with resource consent conditions. Soil samples were also collected from the newly established irrigation area to provide background data prior to the application of liquid waste to the area.

The inspection found that all materials were stored within the appropriate designated areas, however more attention needs to be given to ensure the sawdust is unloaded in a careful manner to ensure that there is no spillage over the concrete blocks and into surface water. The consent holder was also asked to make sure that adequate free-board is maintained in both the irrigation pond and the leachate collection area about the drilling waste pad to prevent any uncontrolled discharge into the duck pond.

The area around pad 1 was observed and noted was stormwater, which was at the time captured and directed for treatment in the irrigation pond. It was noted that a number of works were currently being undertaken about the site to ensure that the facility was in a position to cope with large annual rainfall events and enable better management of the facility over-all. These works are on-going as per the work schedule that has been provided to the Council.

During the inspection the realigned section of stream was found in low flow conditions with stable banks. The banks were well grassed and there was no sign of accelerated erosion as a result of the realignment works.

In relation to discharges to air, no odour was detected at the State highway. About the site a slight odour was detected within the immediate vicinity of the irrigation pond and drilling mud pad. The odour however quickly dissipated and was not noticeable within 100m from the pond. No odour could be detected up wind by sampling point HHG000100. Works appeared to be undertaken on a regular basis at the top of the drilling mud pad to ensure that all fresh product was being quickly mixed and added to the solids pad. This would allow the composting procedure to commence in a timely manner. Work was on-going at the time to complete the lower bund near the twin culverts to assist in managing odour during weather conditions which may result in cold air drainage carrying odour down the valley towards the State Highway.

28 February 2018

An inspection was undertaken as part of routine compliance monitoring. The inspection was undertaken in warm calm weather conditions, with no detectable breeze. Inspection of the twin culvert found no signs of erosion within the vicinity or resulting from the presence of the culvert. The culvert was free of blockages and no issues with fish pass limitations were identified during the inspection.

An odour survey was undertaken at the property boundary (Mokau Road). No odour was detected. A second survey was undertaken at the site office and again no odour was detected. No odour was detected at the twin culverts on the site access track. Odour was detectable about the immediate vicinity of the drilling mud pad, however this was not considered to be strong. A slight sulphur odour was detected about the irrigation pond also. No odours were noted about the wetland treatment system or paunch pad. At the time of the inspection a digger was in operation turning the solid waste in the upper portion of the drill mud pad. The odour in this area was noticeable.

The quarry was not in operation. Inspections will recommence upon notice of the operations of the quarry recommencing.

Surface water samples and groundwater samples were collected during the site inspection in accordance with the monitoring programme. A further sample was collected from within the unnamed tributary of the Haehanga Stream, upstream of the culvert which passes beneath the pad area, adjacent to the drill mud pad. The inspection found that operations were being undertaken to blend with a digger. Work was also

being completed onsite to install a permanent sub surface irrigation pipe to the recently constructed lower irrigation field. This was proposed to enable the irrigation of liquid waste from the irrigation pond by travelling irrigator. At the time no irrigation of wastewater had occurred at the lower irrigation area. This area may commence irrigation once a new monitoring well had been installed down gradient of the irrigation area.

An open drain had been constructed below the drilling mud pad and irrigation pond area. This open drain was designed to allow for the better removal of clean stormwater from about the site. The open drain had been bunded to prevent any waste material from entering the clean stormwater system should an overflow from the pond system occur. It was requested that the company should pay attention to the level of the irrigation pond to ensure that there was sufficient free-board within the pond to cope with any rainfall events. It was also requested that the company continue to monitor the depositing of sawdust at the site to ensure that it is delivered and stored in the designated areas.

The paunch pad and associated wetland treatment system looked to be well managed at the time of the inspection.

In relation to the unconsented culvert in close proximity to the drilling mud pad, consent for a larger and longer culvert had recently been granted by the Council, with installation planned in the coming weeks.

The larger and longer culvert was proposed to allow the site to operate during winter months with a lesser risk of culvert over-flow, which had resulted previously with clean water entering the pond system and plausibly a reduced risk of blockage when compared to the previous version.

Works undertaken to ensure that fish passage with the site culverts had been achieved. This will be monitored over the winter months especially following high flow events. Inspection of the culverts found that they were both flowing freely and free of any obstructions. No new erosion was observed following the last inspection.

15 March 2018

An inspection was undertaken on a fine still morning with no detectable wind. Cloud cover was approximately 5/8 and 13°C. Dew was observed on the grass about the site.

Inspection found that the re-aligned section of stream appeared stable with no signs of accelerated erosion of the banks or stream bed. Inspection found that there were no obstructions about the culvert and no restrictions to fish passage was observed. An odour survey was undertaken on state highway 3 south, on the bridge, no odour was detected at this site. A second odour survey was undertaken at the site entrance. A very slight intermittent odour was detected for approximately 2 minutes during a 10 minute period. The odour detected was found to be within resource consent requirements, as it was not considered offensive and / or objectionable.

No activity was being undertaken on the site at the time of the inspection. Odour was detected between the twin culvert and the drill mud pad. No odour was detected about the paunch pad or wetland treatment system. It needs to be confirmed that cheese waste from Fonterra is a waste that is permitted to be discharged at the premise.

Inspection found that the quarry is not in operation and the access track has not been used for an extended period of time. The inspection found that the wetland pond treatment system was discharging at the time of the inspection. No samples of the discharge were taken during the inspection, however the discharge appeared to be visually clear with no foaming, sheens or odour about the point of discharge. There was no obvious change in colour observed within the mixing zone. A sample was taken below the mixing zone to ensure compliance with resource consent conditions.

An inspection of the drilling mud pad found that product had recently been turned on the pad and product had been moved further down the pad to create space at the top end. All liquids were being directed to the

pond treatment system and into the irrigation pond where it was then irrigated onto pasture. No irrigation was taking place at the time of the inspection. Inspection found that the irrigation pond, duck pond and leachate collection area about the drilling mud pad were all full and irrigation was required. Please ensure that the irrigation pond is pumped down to ensure that the site is being operated in accordance with the site management plan.

It was observed that some sawdust remained on the banks to the unnamed tributary adjacent to the disposal pad at the top end of the drilling mud pad. The material needed to be removed immediately to prevent discharge into the receiving environment. This may require a shovel and bucket to enable complete removal.

It was also observed that a pipe had been delivered to site for the installation of the new culvert within this vicinity. The completion of these works (new culvert installation) would greatly reduce the potential of further issues about this area of the site. Surface water samples were collected below wetland mixing zone, upstream and downstream within the unnamed tributary of the Haehanga Stream, adjacent to the drilling mud pad and below the twin culverts. These samples were taken as follow up to previous exceedances in parameters detected in the recent surface water sampling run (February 2018). Results will be advised in due course. It was also noted during the inspection that cheese waste from Fonterra was being disposed of at the site. The Company was requested to provide confirmation that this is an authorised material.

The inspection also found that the recent works undertaken to lift the water level below the culvert is working well in ensuring that fish pass is being maintained. Work had been undertaken immediately upstream of the culvert to better align the stream and the approach to the culvert. This appeared to have worked well to ensure that the stream approaches and flows through the twin culvert in a more aligned route to minimise potential erosion of the headwall about the approach to the culvert. The stream at the time of the inspection was flowing at a moderate rate and was found to be slightly turbid. No issues were identified at the time of the inspection.

26 April 2018

An inspection of the Uruti site was undertaken as part of routine compliance monitoring. The inspection was carried out in fine weather conditions with approximately 1/8 cloud cover. Upon entry to the site an odour survey was undertaken at the site entrance at State Highway 3 and at the site office. At the time of the surveys there was no detectable wind. No odours were detected at either location. A site inspection found that no activities were being carried out on site at the time of the inspection. The irrigation pond level was low, however the tip-off pond was found to contain a reasonable quantity of organic matter.

A slight odour was detected about the drill mud pad and associated treatment and storage ponds, however it was not found to be travelling down the valley towards the State Highway. The inspection found that the worm beds were in the process of being fed, however no odours were detected from the beds.

During the inspection a slight breeze began blowing up the valley. No issues were identified at the time of the inspection with regards to odour generation. The inspection found that the re-aligned portion of the stream appeared to be stable with well vegetated stream banks (grass). A sample was taken within the re-aligned stream in association with a discharge consent for the site. The stream and associated sample appeared to be visually clean and clear. The inspection found that the stream flowing through the culvert was in low flow conditions. The inspection of the culvert found that it was free of any obstructions and no issues were identified that would limit fish passage. No signs of erosion about the culvert were detected.

The on-site quarry was not currently in operation and had not been for some time. No adverse effects were observed as a result of stormwater run-off from the site or associated access track. Further detailed inspections will commence upon notification from Remediation (NZ) Limited of the re-commencement of quarrying activities at the site.

An inspection of the twin culverts was undertaken. A low flow rate was observed within the stream. An inspection of the twin culverts found that work had been completed within the stream immediately upstream of the culvert to ensure that the stream approaches the culvert in a direct manner. This work had assisted in ensuring that there is an even flow through each of the culverts and also minimises the potential for head wall erosion about the culvert. The works to lift the static water level below the culvert to enable fish passage appeared to be working well with the static water level now sitting above the base of the culvert. The stone work introduced to the stream appeared to be stable and did not show signs of movement as a result of recent high flow events. The stone work will be monitored in an ongoing nature to ensure that it continues to achieve its objectives, however at this stage the works undertaken have given a pleasing result.

23 May 2018

An inspection was undertaken as part of routine compliance monitoring. The inspection found that there was no detectable breeze at the time of inspection. High cloud cover was observed across the site. An odour survey was undertaken at the site entrance. No odour was detected at or beyond the boundary of the site. An inspection about the drilling mud pad found a very slight odour within the immediate vicinity of the pad. The odour was found to be much less than usually noted about this area. No odour was noted being emitted from the worm beds or the paunch pad.

The inspection found the stream to be in a low - mid flow condition. No erosion or scour was observed about the re-alignment with the section of stream appeared to be stable. Plenty of grass growth was observed on the banks of the re-alignment, which appeared to be assisting in the stabilisation.

The inspection also found that the culverts were operating as designed, with no blockages observed within the culverts. No erosion of the stream bed or banks were observed as a result of the culvert. No obstructions to fish passage was observed either.

The quarry extraction area is not currently being used and no operations have taken place at the site for an extended period of time. There are plans to recommence quarry operations on the site in the future.

The inspection found that the facility was operating as normal. The worm beds had been recently fed with new cloth placed upon the beds. The paunch pad was reasonably full and plans were to pump liquid stormwater through the wetland system later that day. The wetland appeared to be operating well with a good quality discharge observed discharging from the final pond into the receiving environment. No adverse effects were observed within the receiving environment as a result of the discharge. The drilling mud pad was found to be operating well with a good amount of free board observed within the irrigation pond. No issues were identified at the time of the inspection. The bores required for this consent are all installed and will be sampled going forward.

21 June 2018

An inspection was undertaken during routine compliance monitoring. Inspection found that the realignment appeared to remain stable. The banks were well grassed with no animals allowed to graze on the banks of the realigned section of stream. Riparian planting had occurred in sections of the stream further downstream, towards the main road (below the twin culverts). It is anticipated that this section of stream will be planted out in the future. This would be a positive action due to it being a realignment and possibly less stable than other areas on the property. The realigned section of stream also crossed between two irrigation areas on the property, thus planting would provide protection of the stream via erosion protection and the interception of any overland flows resulting from heavy rainfall events which may transport contaminants from recent irrigation activities. A sample was collected from within the stream at monitoring location HHG000099 in relation to the monitoring of other consents on the property. The sample appeared to be visually clear.

The inspection found that the stream was in mid flow conditions and reasonably clear, with very slight turbidity. The culverts and approaches appeared to be stable with no signs of accelerated erosion as a result of the structure within the stream bed. The culverts were free flowing with no signs of obstructions or blockages. No barriers to fish passage were observed during the inspection.

Inspection of the wider Remediation (NZ) facility was undertaken to assess compliance with resource consent conditions. Inspection found that no quarry operations are currently being undertaken at the site.

A full surface water sampling run was undertaken along with soil sampling of the irrigation fields. The inspection found that the site operations were running well with reasonable free board within the irrigation pond observed. No adverse effects were observed as a result of visual inspections of the surface waters. The new drainage about the site was working well to remove clean stormwater from the site. The drilling mud pad was well contained with free board observed within the ponds and product storage space currently available on the drilling mud pad. Plans were being made to remove silt from the first two ponds to increase capacity. Riparian planting was currently undertaken from the road frontage up to the twin culverts.

The inspection found that the rock work placed within the base of the stream to lift the static water level downstream of the culverts appeared to be stable, with no adverse effects observed to the works as a result of recent high flow events within the stream.

The static water level remained at a level within the culverts as not to obstruct fish passage. The works undertaken immediately upstream of the culverts, to allow the stream to approach the culverts at a more appropriate angle, appeared to be working well. No signs of further erosion of the headwall was observed, however it is noted that the culvert had been over-topped during high flows. Works are planned to address this and provide a more resilient spillway in the future.

Remediation New Zealand facilities Waitara and Pennington Road inspections

07 February 2018

A site inspection was undertaken as part of routine compliance monitoring at the RNZ Pennington Road storage site. The inspection found that the property is no longer in use for composting or associated activities. At the time of the inspection maize was being grown on the property. At this stage there were no plans to undertake further composting or associated activities at the site, or in the near future.

An inspection was undertaken to assess compliance with resource consent conditions at the RNZ Waitara Road facility. The inspection found that all worm beds were covered with a good density of grass about the beds. This would allow the filtering of any liquid discharges from the beds. Bark and compost was present on the site in reasonably large quantities.

The stormwater from the site is discharged via a pipe into a surface drain at the rear of the property. An inspection of the discharge point found that some bark and other material had been mobilised through to the discharge point. However, as the receiving drain is well vegetated, this material had settled out within the immediate vicinity of the discharge pipe and was not being transported through to surface water due to insufficient flow. The sump and discharge point is to be cleaned out on a regular basis.

15 May 2018

A site inspection was undertaken as part of routine compliance monitoring at the RNZ Pennington Road storage site. The inspection undertaken in overcast conditions with very light rain following a period of heavy rain the previous night. Inspection found that no worm farming activities were taking place on the property. No material is currently stored on site and the property is not being used for composting operations.

A site inspection was undertaken at the RNZ facility on Waitara Road. The site inspection was undertaken as part of routine compliance monitoring. The weather conditions were overcast, with very light rain following

a period of heavy rain the previous night. The inspection found that the concrete pad area about the shed entrances was capturing stormwater and directing it to the single stormwater grate on site.

The stormwater grate is cleaned out on a regular basis by staff on site. The stormwater discharges at the rear of the property. At the time of the inspection the discharge was slightly discoloured but cleared up within the swale as a result of the well vegetated material which the discharge passes through. There is no treatment or retention systems within the stormwater system and hence the quality of the discharge is directly proportional to the management of the site in ensuring the concrete pad and sump are cleaned on a regular basis and prior to rainfall events.

The site at the time held ten worm beds, these were located adjacent to the road, with a further six beds at the rear. All worm beds were covered with no discharges observed. It was requested to please monitor the large topsoil pile adjacent to the road boundary. It was observed that some soil had tracked onto the grass verge as a result of erosion from rainfall events. While this was not an issue at the time of inspection it should be monitored to ensure it does not discharge in any significant manner into the road side drain.

No odours were noted about the property at the time of the inspection. Both storage sheds on the property were reasonably empty and no odours were noted being emitted from the storage facilities.

2.1.2 Results of the discharge monitoring

2.1.2.1 Surface water monitoring - Wetland treatment system discharge

The consent holder holds consent 5838-2.2; to discharge waste material to land for composting and treated stormwater and leachate from composting operations onto and into land, in circumstances where contaminants may enter water in the Haehanga Stream catchment and directly into an unnamed tributary of the Haehanga Stream.

In this section of the report, the direct discharge monitoring to the unnamed tributary of the Haehanga Stream is reported.

The Wetland Treatment System (WTS) (Figure 2) functions by pumping primarily ammonia enriched fluid from the paunch mixing pond, to the top of a multi-tiered wetland treatment system which has been planted with the bullrush raupo. This effectively treats the ammonia enriched water through assimilation, while the dense planting of the raupo enables it to act as a filter. Post the tiered raupo wetland is sample location IND003008.

Consent 5838-2.2 stipulates specific concentrations which the discharge point must abide by.

Specifically Condition 24 of Consent 5838-2.2 states:

The discharge from the Wetland Treatment System shall meet the following standards (at monitoring site IND003008):

- a) *The suspended solids concentration shall not exceed 100 g/m³.*
- b) *The pH shall be between 6.0 and 9.0.*

Table 3 IND0003008 WTS discharge monitoring 2017-2018

Parameter	TEMP	CL	CONDY	NH ₄	NNN	NH ₃	pH	SS
Date/Unit	°C	g/m ³	mS/m@20°C	g/m ³ N	g/m ³ N	g/m ³	pH	g/m ³
17 Aug 2017	12	12.6	40.8	25.9	0.58	0.27	7.6	14
25 Oct 2017	17.3	11.2	22.3	3.9	1.94	0.09	7.8	8
24 Jan 2018	24.1	11.9	22.7	0.02	0.02	0.0004	7.5	19
28 Feb 2018	21.2	12.3	25.5	3.33	0.05	0.06	7.6	21

Parameter	TEMP	CL	CONDY	NH ₄	NNN	NH ₃	pH	SS
Date/Unit	°C	g/m ³	mS/m@20°C	g/m ³ N	g/m ³ N	g/m ³	pH	g/m ³
26 Apr 2018	15.6	19.2	43.7	44	0.18	0.47	7.5	32
21 Jun 2018	10	12.9	34.4	16	1.85	0.10	7.6	10

The WTS discharge was monitored on six occasions throughout the 2017-2018 period. Table 3 contains the analysis of IN0003008, Specifically the results indicate compliance with condition 24 of consent 5838-2.2.

- Analysis indicated that the pH was within the limit of 6-9 pH in the six samples reported.
- The concentration of suspended solids remained well below the limit of 100 g/m³.

2.1.2.2 Surface water monitoring - HHG000103 post mixing zone

The WTS (IND003008) discharges into the unnamed tributary of the Haehanga Stream. It is then monitored by consent 58383-2.2, condition 25, at surface water monitoring location HHG000103 (Figure 2).

Condition 25 states:

Discharges from the Wetland Treatment System shall not give rise to any of the following effects in the unnamed tributary of the Haehanga Stream, after a mixing zone of 40 m, at established monitoring site HHG000103

- A rise in filtered carbonaceous biochemical oxygen demand of more than 2.00 g/m³*
- A level of un-ionised ammonia greater than 0.025 g/m³*
- The production of any conspicuous oil or grease films, scums or foams or floatable or suspended materials;*
- Any conspicuous change in the colour or visual clarity;*
- Any emission of objectionable odour;*
- The rendering of fresh water unsuitable for consumption by farm animals; and*
- Any significant adverse effects on aquatic life.*

The following Table 4 details the results of the seven monitoring rounds undertaken this period.

Table 4 HHG000103 2017-2018 monitoring

HHG000103	TEMP	BODCF	CL	CONDY	NA	NH ₄	NH ₃	pH	SS
Collected	°C	g/m ³	g/m ³	mS/m@ 20°C	g/m ³	g/m ³ N	g/m ³	pH	g/m ³
17 Aug 2017	11.4	0.6	11.8	11.9		1.08	0.00682	7.4	120
25 Oct 2017	14.1	0.6	10.9	17.3		0.324	0.00199	7.3	32
24 Jan 2018	20.3	0.8	11.4	22.4		0.017	0.0001	7.1	10
28 Feb 2018	18	<0.5	10.6	23		0.168	0.00109	7.2	7
15 Mar 2018	15.8	0.7	11	20.7	13.2	1.77	0.00778	7.1	54
26 Apr 2018	11.1	<0.5	13.8	24.4		1.51	0.00589	7.2	11
21 Jun 2018	9.4	< 2	13.1	18.5		1.04	< 0.010	7.4	11

The monitoring undertaken in this period indicated compliance with consent condition 25.

- Filtered carbonaceous biochemical oxygen demand (BODCF) was reported below the prescribed limit of 2.0 g/m³ in the seven occasions it was monitored.

- The concentration of un-ionised ammonia (NH₃) remained below the limit of 0.025 g/m³ in the seven monitoring rounds. This limit is set for the protection of fish populations.
- This is an improvement from the 2016-2017 monitoring period, where on two occasions the limit of NH₃ was exceeded. For further information please find Technical report 2017-11 in the reference section of this report.

2.1.2.3 Surface water monitoring of the Haehanga Stream and associated unnamed tributaries

The Haehanga Stream and its associated unnamed tributaries were monitored on a bi-monthly schedule this period. The water course was assessed at 10 locations down its length (Figure 3). The analysis of the six compliance monitoring rounds undertaken this period and an additional follow up assessment at three sites, is provided in the following Tables 5 and 6 respectively.

The surface water monitoring is undertaken to firstly; assess the quality of the stream and associated tributaries. Secondly, to assess for any adverse effects which may be forcing on this water body through the exercise consents which allow through the application of wastewater to land in specified irrigation areas.

Table 5 Surface water monitoring August 2017- January 2018

Surface water	Parameter	NH ₃	TEMP	BODCF	CL	CONDY	HC	NA	NH ₄	NNN	PH	SS
Site	Collected	g/m ³	°C	g/m ³	g/m ³	mS/m@20°C	g/m ³	g/m ³	g/m ³ N	g/m ³ N	pH	g/m ³
Surface water 1												
HHG000093	17 Aug 2017	0.0004	12.2	<0.5	9.1	11.5	<0.5	9.4	0.057	0.12	7.4	34
HHG000097	17 Aug 2017	0.0004	11.3	0.5	9.2	12			0.052	0.03	7.5	310
HHG000098	17 Aug 2017	0.0002	11.3	0.5	9.6	9			0.031		7.4	50
HHG000100	17 Aug 2017	0.0004	11.8	<0.5	10.9	13	<0.5	9.4	0.058	0.09	7.4	92
HHG000099	17 Aug 2017	0.0005	11.8	<0.5	12.3	14.9			0.056		7.5	170
HHG000103	17 Aug 2017	0.0068	11.4	0.6	11.8	11.9			1.08		7.4	120
HHG000106	17 Aug 2017	0.001	12.5	<0.5	10.4	15.5			0.094		7.6	
HHG000109	17 Aug 2017	0.003	12.5	<0.5	12.2	14.1			0.346		7.5	
HHG000115	17 Aug 2017	0.0031	12.5	<0.5	12	14.2	<0.5	10.2	0.359	0.11	7.5	
HHG000150	17 Aug 2017	0.0026	12	0.5	14.2	14.4	<0.5	11.2	0.387	0.13	7.4	85
HHG000190	17 Aug 2017	0.0016	12		13.8	14.4			0.298		7.3	
Surface water 2												
HHG000093	25 Oct 2017	0.0011	16	0.6	9.8	15.1	<0.5	10.2	0.204	0.05	7.2	13
HHG000097	25 Oct 2017	0.0004	12.8	<0.5	10	15.5			0.096	0.14	7.2	7
HHG000098	25 Oct 2017	0.0005	14.8	0.7	10.8	16.7			0.094		7.2	36
HHG000099	25 Oct 2017	0.0003	14.4	0.5	13.9	21.5			0.036		7.4	5
HHG000100	25 Oct 2017	0.0003	15.2	<0.5	15.2	18.8	<0.5	11.7	0.058	0.03	7.2	6
HHG000103	25 Oct 2017	0.002	14.1	0.6	10.9	17.3			0.324		7.3	32
HHG000106	25 Oct 2017	0.0018	14.2	1	14.6	22.6			0.184		7.5	
HHG000109	25 Oct 2017	0.0008	14.1	0.5	17.4	20.2			0.131		7.3	
HHG000115	25 Oct 2017	0.0021	14	0.5	20.3	21.2	<0.5	14.2	0.34	0.15	7.3	

Surface water	Parameter	NH ₃	TEMP	BODCF	CL	CONDY	HC	NA	NH ₄	NNN	PH	SS
Site	Collected	g/m ³	°C	g/m ³	g/m ³	mS/m@20°C	g/m ³	g/m ³	g/m ³ N	g/m ³ N	pH	g/m ³
HHG000150	25 Oct 2017	0.0014	14.7	0.6	34.8	24.3	<0.5	17.6	0.344	0.2	7.1	14
HHG000190	25 Oct 2017	0.0026	14.8		31.3	23.8			0.51		7.2	
Surface water 3												
HHG000093	24 Jan 2018	0.0001	23	<0.5	10.6	19.8	<0.5	11.6	0.024	<0.01	6.9	3
HHG000097	24 Jan 2018	0.0004	18.6	<0.5	10.2	21.2			0.076	0.08	7.1	6
HHG000098	24 Jan 2018	0.0003	19.6	<0.5	10.8	21.3			0.055		7.1	9
HHG000099	24 Jan 2018	0.00006	20.1	0.7	11.8	25.5			0.006		7.3	6
HHG000100	24 Jan 2018	0.00009	21.8	0.9	13.4	22.4	<0.5	11.6	0.013	0.01	7.1	5
HHG000103	24 Jan 2018	0.0001	20.3	0.8	11.4	22.4			0.017		7.1	10
HHG000106	24 Jan 2018	0.004	21	<0.5	17.5	26			0.315		7.4	
HHG000109	24 Jan 2018	0.0006	22.4	0.9	15.3	24.3			0.064		7.2	
HHG000115	24 Jan 2018	0.0008	21.9	0.6	16.9	24.2	<0.5	13.2	0.088	0.05	7.2	
HHG000150	24 Jan 2018	0.0064	22.7	0.7	41.1	33.3	<0.5	23.5	0.871	0.28	7.1	8
HHG000190	24 Jan 2018	0.0047	22.1		40.1	31.1			0.666		7.1	

Table 6 Surface water monitoring February - June 2018

Surface water	Parameter	NH ₃	TEMP	BODCF	CL	CONDY	HC	NA	NH ₄	NNN	PH	SS
Site	Collected	g/m ³	°C	g/m ³	g/m ³	mS/m@20°C	g/m ³	g/m ³	g/m ³ N	g/m ³ N	pH	g/m ³
Surface water 4												
HHG000093	28 Feb 2018	0.00007	18.4	<0.5	15.7	21.8	<0.5	13.6	0.011	<0.01	7.2	<2
HHG000097	28 Feb 2018	0.00029	16.5	<0.5	10.2	22.3			0.062	0.16	7.1	10
HHG000098	28 Feb 2018	0.00015	18.8	<0.5	11.8	21.3			0.017		7.3	8
HHG000099	28 Feb 2018	0.00004	17.3	<0.5	13.2	25.8			0.005		7.3	2
HHG000100	28 Feb 2018	0.00007	18	<0.5	16.5	24.2		13	0.009	<0.01	7.3	2
HHG000103	28 Feb 2018	0.00109	18	<0.5	10.6	23			0.168		7.2	7
HHG000106	28 Feb 2018	0.04384	18.9	>23	31.4	40.6	<0.5		9.97		7	
HHG000109	28 Feb 2018	0.00391	19.4	2.5	18.4	26.5	<0.5		0.431		7.3	
HHG000115	28 Feb 2018	0.00395	19.4	1.6	20.6	26.3	<0.5	14.8	0.435	0.06	7.3	
HHG000150	28 Feb 2018	0.14004	19	2.6	176	135	<0.5	139	15.9	1.63	7.3	20
HHG000190	28 Feb 2018	0.00327	19.6		41.7	32.4			0.447		7.2	
Follow up to surface water 4												
HHG000103	15 Mar 2018	0.00778	15.8	0.7	11	20.7		13.2	1.77		7.1	54
HHG000106	15 Mar 2018	0.00723	15.6	<0.5	33.6	35		17.2	1.67		7.1	8
HHG000150	15 Mar 2018	0.00385	17.2	<0.5	45.5	30.8		23.6	1.25	0.52	6.9	12
Surface water 5												
HHG000093	26 Apr 2018	0.00014	12.6	<0.5	13	17.3	<0.5	12.2	0.039	0.03	7.1	4

Surface water	Parameter	NH ₃	TEMP	BODCF	CL	CONDY	HC	NA	NH ₄	NNN	PH	SS
Site	Collected	g/m ³	°C	g/m ³	g/m ³	mS/m@20°C	g/m ³	g/m ³	g/m ³ N	g/m ³ N	pH	g/m ³
HHG000097	26 Apr 2018	0.0004	10.6	<0.5	11.9	20.1			0.133	0.18	7.1	3
HHG000098	26 Apr 2018	0.00028	11.3	<0.5	13.3	24.1			0.142		6.9	6
HHG000099	26 Apr 2018	0.00023	12.3	<0.5	17.6	27.4			0.042		7.3	3
HHG000100	26 Apr 2018	0.00019	12	<0.5	17.1	21.2		13.2	0.046	0.06	7.2	<2
HHG000103	26 Apr 2018	0.00589	11.1	<0.5	13.8	24.4			1.51		7.2	11
HHG000106	26 Apr 2018	0.00443	14.9	<0.5	29.3	30.9	<0.5		0.856		7.2	
HHG000109	26 Apr 2018	0.00101	13.4	<0.5	21.4	24.5	<0.5		0.173		7.3	
HHG000115	26 Apr 2018	0.00158	13.1	<0.5	26	25.7	<0.5	16.1	0.349	0.37	7.2	
HHG000150	26 Apr 2018	0.0012	13.9	<0.5	41.7	30.4	<0.5	21.7	0.395	0.58	7	6
HHG000190	26 Apr 2018	0.00082	14.3		35.8	27.8			0.261		7	
Surface water 6												
HHG000093	21 Jun 2018	< 0.010	8.7	< 2	11.3	14.7	< 0.7	10.2	0.061	0.23	7.5	5
HHG000097	21 Jun 2018	< 0.010	9.3	< 2	12.8	18.2			0.092	0.081	7.4	26
HHG000098	21 Jun 2018	< 0.010	9.4	< 2	12.4	14.5			0.098		7	29
HHG000099	21 Jun 2018	< 0.010	9	< 2	13.8	21.8			0.059		7.1	4
HHG000100	21 Jun 2018	< 0.010	9	< 2	13.2	17.3		10.7	0.077	0.183	7.1	39
HHG000103	21 Jun 2018	< 0.010	9.4	< 2	13.1	18.5			1.04		7.4	11
HHG000106	21 Jun 2018	< 0.010	9.4	< 2	16.7	24.5	< 0.7		0.42		7.4	
HHG000115	21 Jun 2018	< 0.010	9.5	< 2	16.1	19.5	< 0.7	12.3	0.25	0.24	7.4	
HHG000150	21 Jun 2018	< 0.010	9.2	< 2	24	22.2	< 0.7	14.4	0.67	0.36	7.3	7
HHG000190	21 Jun 2018	< 0.010	9.8		23	21.7			0.61		7	

Consent 5838-2.2, condition 11 states the following:

Discharges irritated to land shall not give rise to any of the following adverse effects in the Haehanga Stream, after a mixing zone extending 30 meters from the downstream extent to the irrigation areas:

- a) *A rise in filtered carbonaceous biochemical oxygen demand of more than 2.00 g/m³;*
- b) *A level of un-ionised ammonia greater than 0.025 g/m³;*
- c) *An increase in total recoverable hydrocarbons;*
- d) *Chloride levels greater than 150 g/m³*
- e) *The production of any conspicuous change in colour or visual clarity;*
- f) *Any emission of objectionable odour;*
- g) *The rendering of fresh water unsuitable for consumption by farm animals; and*
- h) *Any significant adverse effects on aquatic life*

In this monitoring period, monitoring location HHG000150 was the monitoring location located 30 meters below the downstream extent of the irrigation areas.

The monitoring of the surface water indicated the following:

- Monitoring of filtered carbonaceous biochemical oxygen demand (BODCF) indicated that on one occasion, 28 February 2018, the value of 2.0 g/m³ was exceeded at three monitoring locations. The most elevated concentration was found at monitoring location HHG000106 with value of >23g/m³. In relation to monitoring location HHG000150, the value which was reported was 2.6 g/m³.
- Un-ionised ammonia concentrations (NH₃) indicated that on one occasion, 28 February 2018, at two locations, HHG000106 and HHG000150, the limit of 0.025 g/m³ NH₃ was exceeded. The largest exceedance was reported at location HHG000150 with value of 0.140 g/m³, with a corresponding ammonia (NH₄) of 15.9 g/m³, a pH of 7.2 and a temperature of 19°C.
- No petroleum hydrocarbons were reported above the limit of detection this period.
- In addition, benzene, toluene, ethylbenzene and xylenes (BTEX) analysis was undertaken at monitoring location HHG000115 on five occasions, total petroleum hydrocarbon (TPH) analysis was also undertaken at three sites HHG00093/115/150 on one occasion. TPH and BTEX analysis was also undertaken at HHG000106 on one occasion. The corresponding analysis indicated no analyses above the limit of detection for these additional analytes. Speciated TPH and BTEX analysis results were not recorded in the above tables as no values above the limit of detection were reported.
- Chloride, on one occasion, 28 February 2018, the consented value for chloride was exceeded at monitoring location HHG000150, with a value of 176 g/m³.
- Surface water monitoring round 4, 28 February 2018, as previously discussed, identified a significant input of ammonia at or around monitoring location HHG000106, which also had a corresponding elevated BODCF and un-ionised ammonia. The reason for this was due to a rupture in the bunding associated with holding leachate from the drilling mud pad and associated irrigation ponds. A follow up sample run was undertaken at three sites post this finding. The analysis undertaken on the 15 March 2018 indicated no values of concern.
- Values of un-ionised ammonia above the consent limit of 0.025 g/m³ N have the ability to adversely affect fish populations within a water course.

2.1.2.4 Drilling mud pad (Pad 3) - irrigation pond sampling

The irrigation pond is associated with the drilling mud pad (pad 3). It receives the leachate from the composting operations undertaken on pad 3 and pad 1. Fluids collected in the irrigation pond, after a series of sedimentation ponds, are irrigated across specific irrigation areas (Figure 5). There are two specific consent related conditions which must be met with respect to this irrigation of fluid.

Consent 5838-2.2, condition 9:

There shall be no direct discharge to water as a result of irrigating wastewater to land. This includes, but not necessarily limited, ensuring the following:

- *No irrigation shall occur closer than 25 m to any surface water body;*
- *The discharge does not result in surface ponding;*
- *No spray drift enters surface water;*
- *The discharge does not occur at a rate which cannot be assimilated by the soil/pasture system; and*
- *The pasture cover within the irrigation areas is maintained at all times*

Consent 5838-2.2, condition 10:

Treated wastewater discharged by irrigation to land shall not have a hydrocarbon content exceeding 5% total petroleum hydrocarbon or a sodium absorption ratio exceeding 18.

In this monitoring period six samples were collected. The results are provided in Table 7.

Table 7 Irrigation pond monitoring 2017-2018

IND002044	Parameter	NH ₃	NH ₄	NNN	SAR	TEMP	AST	BODC	CA	CL	CONDY	K	MG
Site	Date/Unit	g/m ³	g/m ³ N	g/m ³ N	None	°C	g/m ³	g/m ³	g/m ³	g/m ³	mS/m@20°C	g/m ³	g/m ³
IND002044	17 Aug 2017	0.39	138	0.05	3	13	0.005	4.6	84.5	398	262	265	16.6
IND002044	25 Oct 2017	10.89	291	0.2	15	17.1	0.003	550	164	1,880	797	1,060	26.6
IND002044	24 Jan 2018	15.80	460	0.05	39	25.2	0.02	430	404	558	1,920	1,040	38.3
IND002044	28 Feb 2018	25.59	559	0.44	24	26.1	0.03	270	783	6,350	2,030	1,096	66.8
IND002044	26 Apr 2018	5.46	373	0.18	10	16.6		190	440	2,110	880	478	35.6
IND002044	21 Jun 2018	2.4	165	0.011	9	10	0.026	330	500	< 0.5	1,289	1,990	18.1
IND002044	Parameter	NA	PBAS	pH	C ₇ -C ₃₆	C ₇ - C ₉	C ₁₀ - C ₁₄	C ₁₅ - C ₃₆	Benzene	Ethylbenzene	m&p-Xylene	o-Xylene	Toluene
Site	Date/unit	g/m ³	g/m ³	pH	g/m ³	g/m ³	g/m ³	g/m ³	g/m ³	g/m ³	g/m ³	g/m ³	g/m ³
IND002044	17 Aug 2017	119	<0.05	7	2.7				0.023	0.006	0.029	0.01	0.24
IND002044	25 Oct 2017	804	0.07	8	2.1				0.048	0.0036	0.018	0.0072	2.3
IND002044	24 Jan 2018	3,060	0.1	7.7	18				0.022	0.004	0.022	0.01	0.21
IND002044	28 Feb 2018	2,600	0.14	7.8	430				0.0088	0.0012	0.01	0.0044	0.044
IND002044	26 Apr 2018	823	0.1	7.6	2.4				0.0088	0.0026	0.015	0.0063	0.042
IND002044	21 Jun 2018	760	0.007	7.9	3.2	0.1	0.9	2.2	0.0095	0.0032	0.023	0.0091	0.046

The analysis provided by Table 7, the irrigation pond fluid, indicated the following.

- Total petroleum hydrocarbon (TPH) was reported below the consented maximum of 1% TPH (10,000 mg/kg). Ranging 2.1-430 g/m³ this period. Note that 430 g/m³ equates to 0.0430 % TPH.
- Sodium absorption ratio (SAR) was analysed on all six occasions this period and on two occasions of the six, it was found to be over the requisite condition of a maximum SAR of 18.
- Un-ionised ammonia (NH₃) ranged between 0.39 – 25.59 g/m³.
- Ammonia (NH₄) ranged significantly in the irrigation pond, 138-559 g/m³ N.
- Nitrite/nitrate nitrogen indicated low concentrations this period 0.011-0.44 g/m³ N.
- Temperature ranged 10-26°C.
- Total arsenic (AST) reported low concentrations, ranging 0.003- 0.03 g/m³.
- Carbonaceous biochemical oxygen demand (BODC) ranged 4.6 – 550 g/m³ across the six sample collected.
- Calcium ranged 84 – 783 g/m³.
- Chloride ranged 398 – 6,350 g/m³
- The conductivity of the irrigation fluid ranged 262 - 2,030 mS/m @20°C.
- Potassium results (K) indicated a range of 265 – 1,096 g/m³.
- Magnesium within the irrigation fluid ranged 16.6 - 66.8 g/m³ across the six samples this period.
- Sodium within the irrigation fluid reported a range of 119 – 3,060 g/m³.
- Acid soluble lead (PBAS) indicated a range of <0.05 – 0.14 g/m³.
- The pH of the irrigation fluid ranged between 7 – 8 pH.
- Total petroleum hydrocarbons (TPH) C₇-C₃₆ indicated a range this period of 2.4 – 430 g/m³.
 - o A solo speciated TPH result was undertaken this period with C₇-C₉ found at 0.1 g/m³, C₉-C₁₄ at 0.9 g/m³ and C₁₅-C₃₆ at 2.2 g/m³.
- Benzene was found in all six samples, with a range of 0.008 - 0.048 g/m³.

- Ethylbenzene was reported at low concentrations with a range across the six samples of 0.0012 – 0.006 g/m³.
- Xylene (M & P) ranged 0.01 – 0.029 g/m³.
- Xylene (O) ranged 0.0044 – 0.01 g/m³.
- Toluene ranged 0.042 – 2.3 g/m³.

2.1.2.5 Groundwater analysis

The Uruti site groundwater monitoring network grew in this monitoring period. Originally three monitoring wells were installed at the Uruti site. This was expanded to seven wells in total (Figure 4), with four additional wells installed towards the end of the monitoring period, of which one was sampled. This well was installed in the newly established lower irrigation area. The analysis is provided in Tables 8 – 11.

Table 8 GND2188 2017-2018

Parameter	Site	GND2188	GND2188	GND2188
	Unit/Date	17 Aug 2017	28 Feb 2018	26 Apr 2018
NH ₃	g/m ³	0.00006	0.00318	<0.00001
TDS	g/m ³	506.8	593.4	398.5
LEVEL	m	0.33	0.954	0.671
TEMP	°C	12.6	18.2	17
CL	g/m ³	102	89.9	71.9
CONDY	mS/m@20°C	65.5	76.7	51.5
NH ₄	g/m ³ N	0.253	1.91	0.006
NNN	g/m ³ N	<0.01	<0.01	7.46
pH	pH	5.9	6.6	5.4
Benzene	g/m ³	< 0.0010	< 0.0010	< 0.0010
C ₁₀ - C ₁₄	g/m ³	< 0.2	< 0.2	< 0.2
C ₁₅ - C ₃₆	g/m ³	< 0.4	< 0.4	< 0.4
C ₇ - C ₉	g/m ³	< 0.06	< 0.06	< 0.06
Ethylbenzene	g/m ³	< 0.0010	< 0.0010	< 0.0010
m&p-Xylene	g/m ³	< 0.002	< 0.002	< 0.002
o-Xylene	g/m ³	< 0.0010	< 0.0010	< 0.0010
Toluene	g/m ³	< 0.0010	< 0.0010	< 0.0010
Total hydrocarbons (C ₇ - C ₃₆)	g/m ³	< 0.7	< 0.7	< 0.7

Table 9 GND2189 2017-2018

Parameter	Site	GND2189	GND2189	GND2189
	Unit/Date	17 Aug 2017	28 Feb 2018	26 Apr 2018
NH ₃	g/m ³	0.00002	0.00014	0.00007
TDS	g/m ³	76.6	352	313.4

Parameter	Site	GND2189	GND2189	GND2189
	Unit/Date	17 Aug 2017	28 Feb 2018	26 Apr 2018
LEVEL	m	0.41	0.673	0.771
TEMP	°C	12.2	19	16.4
CL	g/m ³	5	91.4	101
CONDY	mS/m@20°C	9.9	45.5	40.5
NH ₄	g/m ³ N	0.02	0.402	0.289
NNN	g/m ³ N	0.04	<0.01	0.02
pH	pH	6.6	5.9	5.8
Benzene	g/m ³		< 0.0010	< 0.0010
C ₁₀ - C ₁₄	g/m ³		< 0.2	< 0.2
C ₁₅ - C ₃₆	g/m ³		< 0.4	< 0.4
C ₇ - C ₉	g/m ³		< 0.06	< 0.06
Ethylbenzene	g/m ³		< 0.0010	< 0.0010
m&p-Xylene	g/m ³		< 0.002	< 0.002
o-Xylene	g/m ³		< 0.0010	< 0.0010
Toluene	g/m ³		< 0.0010	< 0.0010
Total hydrocarbons (C ₇ - C ₃₆)	g/m ³		< 0.7	< 0.7

Table 10 GND2190 2017-2018

Parameter	Site	GND2190	GND2190	GND2190
	Unit/Date	17 Aug 2017	28 Feb 2018	26 Apr 2018
NH ₃	g/m ³	0.00002	0.00099	0.00023
TDS	g/m ³	2,414	2,932.4	2,104.5
LEVEL	m	0.45	0.812	1.006
TEMP	°C	12.7	19.5	17.1
CL	g/m ³	993	1,200	839
CONDY	mS/m@20°C	312	379	272
NH ₄	g/m ³ N	0.469	6.77	2.96
NNN	g/m ³ N	<0.01	<0.01	6.95
pH	pH	5.1	5.5	5.3
Benzene	g/m ³	< 0.0010	< 0.0010	< 0.0010
C ₁₀ - C ₁₄	g/m ³	< 0.2	< 0.2	< 0.2
C ₁₅ - C ₃₆	g/m ³	< 0.4	< 0.4	< 0.4
C ₇ - C ₉	g/m ³	< 0.06	< 0.06	< 0.06
Ethylbenzene	g/m ³	< 0.0010	< 0.0010	< 0.0010
m&p-Xylene	g/m ³	< 0.002	< 0.002	< 0.002

	Site	GND2190	GND2190	GND2190
Parameter	Unit/Date	17 Aug 2017	28 Feb 2018	26 Apr 2018
o-Xylene	g/m ³	< 0.0010	< 0.0010	< 0.0010
Toluene	g/m ³	< 0.0010	< 0.0010	< 0.0010
Total hydrocarbons (C ₇ - C ₃₆)	g/m ³	< 0.7	< 0.7	< 0.7

Table 11 GND2190 2017-2018

	Site	GND3007
Parameter	Unit/Date	26 Apr 2018
NH ₃	g/m ³	0.00182
TDS	g/m ³	248.4
LEVEL	m	2.702
TEMP	°C	17.1
CL	g/m ³	20.6
CONDY	mS/m@20°C	32.1
NH ₄	g/m ³ N	2.98
NNN	g/m ³ N	0.03
pH	pH	6.2
Benzene	g/m ³	< 0.0010
C ₁₀ - C ₁₄	g/m ³	< 0.2
C ₁₅ - C ₃₆	g/m ³	< 0.4
C ₇ - C ₉	g/m ³	< 0.06
Ethylbenzene	g/m ³	< 0.0010
m&p-Xylene	g/m ³	< 0.002
o-Xylene	g/m ³	< 0.0010
Toluene	g/m ³	< 0.0010
Total hydrocarbons (C ₇ - C ₃₆)	g/m ³	< 0.7

The analysis of the monitoring well network indicated the following in relation to groundwater quality.

- No total petroleum hydrocarbons (TPH) all chains, C₇-C₉, C₁₀-C₁₄, C₁₅-C₃₆ and C₇-C₃₆ were reported above the limit of detection (LOD) set by the laboratory this period.
- Correspondingly, no benzene, toluene, ethylbenzene or xylenes (m& p and o) (BTEX) were reported above the LOD.
- Chloride was reported in all four monitoring wells, with the most elevated concentration found in monitoring well GND2190. GND2190 ranged 839-1,200 g/m³ this period.
- Total dissolved solids (TDS) analysis indicated that well GND2190 contained the most elevated concentrations, with a range of 2,104 – 2,932 g/m³.

- Ammonia (NH₄) was found in all wells sampled this period, the most elevated result was observed in monitoring well GND2190, which ranged 0.469 – 6.77 g/m³ N. Noting this is the second most elevated result reported for this monitoring site, and the highest since February 2011.
- Un-ionised ammonia (NH₃) indicated trace concentrations across the monitoring wells sampled this period.
- Nitrate nitrite nitrogen (NNN) was reported on a few occasions across all wells. The most elevated result was found in monitoring well GND2188 with a value of 7.46 g/m³ N, recorded during the April 2018 sample round.
- Groundwater pH indicated a range of 5.1 – 6.6 pH across the four monitoring wells sampled. The lower values for pH were observed in monitoring well GND2190 (5.1 -5.3 pH).
- Groundwater conductivity analysis indicated that the most elevated conductivity reading was found in GND2190, ranging 272 – 379 mS/m@20°C.

2.1.2.6 Irrigation areas soil analysis

Six composite soil samples were collected this period from the Uruti irrigation areas. These areas receive applications of irrigation pond water (IND002044) via travelling irrigator and in some cases, honey wagon. The analysis is presented in the following Table 12. The irrigation areas are provided in Figure 5.

Table 12 Irrigation area soil samples 2017-2018

Soil analysis Uruti 2017-2018	Site	Area G Upper	Area G Upper	Area J & H Middle	Area J & H Middle	Area E Lower	Area E Lower
Parameter	Unit/ date	24/01/2018	21/06/2018	24/01/2018	21/06/2018	24/01/2018	21/06/2018
Calcium	mg/kg	33.5	5,000	279	9,600	103.7	13,100
Chloride	mg/kg	119.5	33	1,254.2	580	128.9	73
Potassium	mg/kg	23.7	1,620	466.9	2,200	40.4	1,470
Magnesium	mg/kg	4	4,900	24.3	4,700	13.5	4,500
Sodium	mg/kg	46.8	145	624.3	570	59.2	270
SAR	None	2.03	0.8	9.62	4.6	1.45	1.3
NH ₄	g/m ³ N	0.325		1.36		0.278	
NNN	g/m ³ N	0.64		1.51		1.09	
pH	pH	5.3	6.3	7.2	7.3	6.2	7.4
1-Methylnaphthalene	mg/kg dry wt	< 0.015	< 0.02	< 0.014	< 0.018	< 0.015	< 0.016
2-Methylnaphthalene	mg/kg dry wt	< 0.015	< 0.02	< 0.014	< 0.018	< 0.015	< 0.016
Acenaphthene	mg/kg dry wt	< 0.015	< 0.02	< 0.014	< 0.018	< 0.015	< 0.016
Acenaphthylene	mg/kg dry wt	< 0.015	< 0.02	< 0.014	< 0.018	< 0.015	< 0.016
Anthracene	mg/kg dry wt	< 0.015	< 0.02	< 0.014	< 0.018	< 0.015	< 0.016
Benzo[a]anthracene	mg/kg dry wt	< 0.015	< 0.02	< 0.014	< 0.018	< 0.015	< 0.016
Benzo[a]pyrene (BAP)	mg/kg dry wt	< 0.015	< 0.02	< 0.014	< 0.018	< 0.015	< 0.016
Benzo[a]pyrene Potency Equivalency Factor (PEF) NES	mg/kg dry wt	< 0.04	< 0.05	< 0.04	< 0.05	< 0.04	< 0.04
Benzo[a]pyrene Toxic Equivalence (TEF)	mg/kg dry wt	< 0.04	< 0.05	< 0.04	< 0.05	< 0.04	< 0.04
Benzo[b]fluoranthene + Benzo[j]fluoranthene	mg/kg dry wt	< 0.015	< 0.02	< 0.014	< 0.018	< 0.015	< 0.016

Soil analysis Uruti 2017-2018	Site	Area G Upper	Area G Upper	Area J & H Middle	Area J & H Middle	Area E Lower	Area E Lower
Parameter	Unit/ date	24/01/2018	21/06/2018	24/01/2018	21/06/2018	24/01/2018	21/06/2018
Benzo[e]pyrene	mg/kg dry wt	0.015	< 0.02	< 0.014	< 0.018	< 0.015	< 0.016
Benzo[g,h,i]perylene	mg/kg dry wt	< 0.015	< 0.02	< 0.014	< 0.018	< 0.015	< 0.016
Benzo[k]fluoranthene	mg/kg dry wt	< 0.015	< 0.02	< 0.014	< 0.018	< 0.015	< 0.016
Chrysene	mg/kg dry wt	< 0.015	< 0.02	< 0.014	< 0.018	< 0.015	< 0.016
Dibenzo[a,h]anthracene	mg/kg dry wt	< 0.015	< 0.02	< 0.014	< 0.018	< 0.015	< 0.016
Dry Matter (Env)	g/100g as rcvd	69	49	73	56	70	61
Fluoranthene	mg/kg dry wt	< 0.015	< 0.02	< 0.014	< 0.018	< 0.015	< 0.016
Fluorene	mg/kg dry wt	< 0.015	< 0.02	< 0.014	< 0.018	< 0.015	< 0.016
Indeno(1,2,3-c,d)pyrene	mg/kg dry wt	< 0.015	< 0.02	< 0.014	< 0.018	< 0.015	< 0.016
Naphthalene	mg/kg dry wt	< 0.08	< 0.10	< 0.07	< 0.09	< 0.08	< 0.08
Perylene	mg/kg dry wt	0.019	< 0.02	0.087	< 0.018	< 0.015	< 0.016
Phenanthrene	mg/kg dry wt	< 0.015	< 0.02	< 0.014	< 0.018	< 0.015	< 0.016
Pyrene	mg/kg dry wt	< 0.015	< 0.02	< 0.014	< 0.018	< 0.015	< 0.016
Benzene	mg/kg dry wt	< 0.07	< 0.17	< 0.06	< 0.15	< 0.07	< 0.13
Toluene	mg/kg dry wt	< 0.07	< 0.17	< 0.06	< 0.15	< 0.07	< 0.13
Ethylbenzene	mg/kg dry wt	< 0.07	< 0.17	< 0.06	< 0.15	< 0.07	< 0.13
m&p-Xylene	mg/kg dry wt	< 0.13	< 0.4	< 0.12	< 0.3	< 0.13	< 0.3
o-Xylene	mg/kg dry wt	< 0.07	< 0.17	< 0.06	< 0.15	< 0.07	< 0.13
Total hydrocarbons (C ₇ - C ₃₆)	mg/kg dry wt	< 70	< 90	157	< 80	69	105
C ₁₅ - C ₃₆	mg/kg dry wt	< 40	55	157	49	69	96
C ₁₀ - C ₁₄	mg/kg dry wt	< 20	< 30	< 20	< 30	< 20	< 20
C ₇ - C ₉	mg/kg dry wt	< 9	< 12	< 8	< 11	< 9	10
Total Recoverable Arsenic	mg/kg dry wt	5		5		4	
Total Recoverable Cadmium	mg/kg dry wt	< 0.10		< 0.10		0.21	
Total Recoverable Chromium	mg/kg dry wt	22		20		20	
Total Recoverable Copper	mg/kg dry wt	13		21		14	
Total Recoverable Lead	mg/kg dry wt	15.4		18.4		16.3	
Total Recoverable Mercury	mg/kg dry wt	< 0.10		< 0.10		< 0.10	
Total Recoverable Nickel	mg/kg dry wt	16		18		15	
Total Recoverable Zinc	mg/kg dry wt	66		75		73	

Two composite soil samples were collected from each of the three irrigation areas, the samples were collected in January and June 2018. The analysis indicated the following:

- Significant increases in the concentrations of calcium, potassium and magnesium were observed this period between the January and June sample dates.
- Chloride analysis indicated a decreasing concentration between sample dates.
- Sodium absorption ratio (SAR) indicated a decrease in SAR concentrations across all sites in the two monitoring rounds undertaken. The largest variation was observed in middle irrigation area, Sol000177, from 9.62- 4.6 SAR.
- Polycyclic aromatic hydrocarbons (PAH) reported three trace detects across the six soil samples this period. Area G reported benzo (e) pyrene at trace level with a value of 0.015 mg/kg during the January sample round, it also reported perylene at a similarly low concentration of 0.019 mg/kg. Areas J & H reported trace perylene during the January sample round with a value of 0.087 mg/kg.
- Benzene, toluene, ethylbenzene and xylenes (m, p and o) results were all below the limit of detection this period.
- Total petroleum hydrocarbon analysis indicated the following:
 - o C₇-C₉ results were found to be all below the LOD.
 - o C₁₀-C₁₄ results were similarly below the LOD.
 - o C₁₅-C₃₆ results indicated five results out of the six samples. The corresponding results were of low concentrations, ranging from 157 mg/kg (Area J & H, January 2018) to 49 mg/kg (also, June 2018).
- Total recoverable (TR) heavy metal concentrations indicated no results for mercury above the LOD this period. No results were found for cadmium in the upper and middle sites, above the LOD, while the lower area reported trace cadmium at a concentration of 0.21 mg/kg.
- TR arsenic was reported in each of the three samples analysed of each irrigation area, ranging between 4 – 5 mg/kg.
- TR chromium ranged 20 – 22 mg/kg.
- TR copper ranged 13 – 21 mg/kg.
- TR lead ranged 15.4 – 18.4 mg/kg.
- TR nickel ranged 15 – 18 mg/kg.
- TR zinc ranged 66 – 75 mg/kg.

2.1.2.7 Biological monitoring

The Council's standard 'streambed kick' and 'vegetation sweep' techniques were used at five established sites to collect streambed macroinvertebrates from the Haehanga Stream catchment in order to assess whether the Remediation (NZ) Ltd composting areas had had any adverse effects on the macroinvertebrate communities of these streams. Samples were processed to provide number of taxa (richness), MCI, and SQMCI₅ scores for each site. Due to a very dry spring and early summer, flows in the catchment were very low. As a result, sampling of the unnamed tributary was precluded by these low flows. These low flows also resulted in limited sampling habitat at the mainstem sites, and consequently a relatively small sample was collected at these sites, and in some cases, sampling methodology changed from that typically performed at these sites. It should be noted that where community health is discussed below, it is done so with reference to what would be expected in such low flow, habitat restricted conditions.

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 SQMCI₅ 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. Significant differences in either the MCI or the SQMCI₅ between sites indicate the degree of adverse effects (if any) of the discharges being monitored.

The macroinvertebrate survey conducted on 16 January 2018 observed flows in the Haehanga catchment to be very low, with no discernible flow at some sites. The water had a yellow tannin colouration at the head of the catchment, deteriorating to brown and cloudy at the most downstream site. The habitat limitation caused by the low flows resulted in reduced community richnesses at all sites, especially at site 6, where only nine taxa were recorded. This habitat limitation, coupled with a change in sampling method at some sites also contributed to reduced community health, as all sites recorded MCI scores lower than their respective medians and that recorded in the previous survey. Overall, this survey found that macroinvertebrate communities of the mainstem sites were of average to below average health. Undesirable heterotrophic growths were not recorded at any of the seven sites in this survey.

The two sites in the unnamed tributary were not sampled in the current survey. However, some previous water quality results indicate that unionised ammonia concentrations in the unnamed tributary have at times been toxic enough to reduce the abundance of, or eliminate entirely, some of the sensitive species usually found in this stream. Results of sampling undertaken in the year prior to this survey show that two of the five samples contained concentrations of unionised ammonia above the toxicity threshold of 0.025 g/m³. This shows management of the unionised ammonia concentrations has deteriorated since the previous monitoring survey. Should unionised ammonia concentrations continue to exceed the toxicity threshold on occasion, an additional macroinvertebrate survey at this time might be warranted. At the very least, the water quality monitoring will need to continue to assist with the interpretation of macroinvertebrate results.

In general, the communities in the Haehanga Stream sites had relatively low proportions of sensitive taxa. Low numbers of sensitive taxa are expected in small, silty bottomed streams such as the Haehanga Stream and the numbers of taxa were generally similar to other lowland hill country streams surveyed at similar altitude. The community richness at site 6 and 7 was lower than that recorded in the previous survey, but higher than that recorded in 2015, when significant deterioration was recorded. MCI values recorded in the Haehanga Stream varied in a downstream direction, somewhat atypical for this survey, which normally records a reducing MCI scores in a downstream direction. The lowest MCI score in the current survey was recorded at site 6 (60 units) and the highest at site 5 (73 units). With the exception of site 7, all sites recorded below average scores, significantly so for site 6.

Site 5 has exhibited poorer macroinvertebrate communities in the past compared to other sites upstream. This has suggested some level of impact from the composting operation, although the extent of adverse effects has been difficult to determine due to poor habitat quality. During the current survey, the MCI score for site 5 was one unit less than the median score for this site, but higher than that recorded at any other site in this survey. This indicates that the significant improvement recorded in the previous survey may still be present, but is suppressed by the low flow conditions. The SQMCI₅ score recorded at site 5 was reduced compared with that recorded at site 2. In addition, the results from the current survey indicate that *Chironomus* bloodworms were present, but only as a rarity. This suggests some deterioration from that recorded at site 2, but overall, the communities at site 5 were in average to above average health.

Unlike the other sites, the sample from site 6 was collected from a riffle with coarse and fine gravels, using the 'streambed kick' sampling technique. However, during the current survey this riffle had very little flow, and was subject to severe filamentous algal growth. This resulted in a low taxa richness of 6 taxa, ten fewer than in the previous survey. Furthermore, it resulted in an MCI score of 60 units, indicative of 'poor' water quality, and equal to the lowest recorded at this site of the eight surveys conducted there. This represents a significant deterioration from the previous survey, and a lesser deterioration from that recorded at site 5 upstream. It was also significantly less than the median for control sites in other lowland streams at a similar altitude. Although this MCI score was equal to that recorded in the 2015 survey, which coincided with the discovery of a number of dead eels near to this site, the SQMCI₅ score at this site was significantly higher than that recorded in 2015, and was also the highest recorded at this site to date. This supports the

conclusion that the lower than average MCI score is related to the low flows and high algal biomass observed at the time.

The surveys undertaken at this site sampled habitat that differed to the other Haehanga Stream sites, as it was a true riffle, with shallow flow tumbling over coarse and fine gravel, as opposed to deeper flow moving over macrophyte or submerged wood. This habitat difference can explain some of the differences in the taxa recorded and the increased abundance of worms. The current survey indicates that the water quality preceding this survey had been average to below average, with the main influence on the community being the low flows.

The lowest site (site 7) was sampled for the seventeenth time in this survey. There was an improvement in MCI score, and the SQMCI₅ score was higher than that recorded at site 6. When compared with historical data, the community at site 7 was in average to above average health, and not indicative of a deterioration in water quality. The SQMCI₅ score for this site (4.3) was equal to the highest recorded previously, but taxa richness (17) was lower than the long-term average. This also indicates that the community was in average to above average health.

During certain previous surveys, *Chironomus* bloodworms have been recorded as abundant at various sites. Abundance of this taxon is usually an indication of an organic discharge, although low dissolved oxygen in the stream can also allow this taxon to dominate the community, especially when this is associated with low flows. It may be then that the sporadic appearance of *Chironomus* in abundance is at least in part related to the dissolved oxygen concentrations. Dissolved oxygen concentrations in the Haehanga have been found to be depressed at times, and during the warmer months, when there is more aquatic weed growth, dissolved oxygen may be significantly depleted at night. This is a natural occurrence in some streams that are slow flowing and weedy. Any macroinvertebrate surveys undertaken when such conditions exist could potentially record a community with fewer sensitive species, and a more abundant population of *Chironomus*.

During the current survey, *Chironomus* was recorded as rare at sites 2 and 6, common at sites 5 and 7 and abundant at site 1, the control site. This possibly suggests a slight increase in the organic enrichment of the stream, but the abundance at the control site indicates that it is more likely a reflection of the very low flows, and as a consequence, low dissolved oxygen concentrations. It is understood that the issue of high chlorides at site 6 has been identified and is being addressed, and so water quality will hopefully improve with time. This would be further contributed to through any on-going works to the leachate and stormwater treatment system, and improved management of the riparian margin. Any works that improve water quality are also likely to lead to an improvement in freshwater macroinvertebrate communities below the discharges, and should continue to be encouraged.

This was the only macroinvertebrate programme scheduled for the 2017-2018 period. It is recommended that this level of monitoring continue, but that a provisional macroinvertebrate survey be retained in the programme, to be implemented should water quality monitoring indicate an issue.

2.1.2.8 Fish survey

On 16 and 17 January 2018, three sites were surveyed for freshwater fish in the Haehanga Stream in relation to the composting activities undertaken by Remediation NZ Ltd. Site 1 was located upstream of the site, site 2 located immediately downstream of the lowest extent of the irrigation area, and site 3 was located just upstream of State Highway 3. The survey method involved deploying baited fine and coarse mesh fyke nets and gee minnow traps at each site overnight. This survey also including trapping of the unnamed tributary that receives the wetland discharge, with two gee minnow traps set both upstream and downstream of the discharge. All nets and traps were recovered the following morning, with all fish identified, counted and measured, with eels greater than 300 mm weighed.

This survey is usually scheduled for December, to target the higher flows typically present in early summer. However, due to a very dry spring and early summer, the current survey was delayed in the hope that rains

would return and flows would recover. A rain event occurred ten days prior to this survey, but was not sufficient to restore groundwater levels to the point where there was improved flow in the Haehanga Stream. As a result, the current survey was undertaken in very low flows, with no discernible flow at site 1, and very little flow present at sites 2 and 3.

All sites contained moderate fish habitat, with deep pools, and good cover. It should be noted that water temperatures in this stream may occasionally exceed the thermal preference, and maximum thermal tolerance of a number of native fish species, with a water temperature of 28.2°C recorded during the current survey. Due to the reduced flow conditions, which resulted in less flow past the nets and traps and reduced distribution of bait odour downstream, fish abundance and number of species recorded was lower than that recorded in the previous survey. Over all sites, twenty-four fish were recorded across two species.

Unfortunately no fish were recorded in the unnamed tributary, where a banded kokopu was recorded in the previous survey.

Unlike in the 2015-2016 survey, when seven dead eels were observed at and downstream of site 2, there were no observations made that posed any concern. There was some discolouration noted at sites 2 and 3, but no obvious hydrocarbon contamination of the Haehanga Stream like that recorded in the 2014-2015 and 2015-2016 surveys. The degree of discolouration at sites 2 and 3 was minor, and likely a reflection of a lack of flushing due to the low flows. Upstream, the water was coloured yellow by dissolved tannins.

It is worth noting that the macroinvertebrate survey undertaken on the first day of the fish survey found that macroinvertebrate communities of five mainstream sites were in average to below average health. This was attributed primarily to the low flow causing habitat limitation, coupled with a change in sampling method at some sites.

The site that would be expected to experience the greatest impacts should there be any is site 2. At this site, two species were recorded, as was the highest abundance (13 fish) of the survey. Inanga were not present, despite being present in the previous survey. Natural variation will occur in inanga populations from year to year, as they recruit annually, and are therefore subject to numerous other factors. It should also be noted that there may be predation within the nets, as noted in the previous survey, when larger eels had clearly ingested smaller eels. It is very possible that smaller fish such as inanga has also been predated upon, although this was not obvious when handling the eels.

Site 3, further downstream also recorded two species, which is equal to that recorded in the previous survey. Inanga were absent, but have been recorded at this site previously.

Eels were recorded at all three sites, with the largest longfin eel being recorded at site 3. This individual was 825 mm long, and weighed 1.44 kg. The size class distribution of the eels was quite different to that recorded in the previous surveys, with no size class clearly dominating the community. This is probably a reflection of the reduced flow conditions during the current survey. This lower flow meant that the bait scent was not carried as far downstream, with fish attracted from a smaller area than during higher flows. This will have contributed to the reduced number of large eels in the nets, reducing the likelihood of predation in the nets. This allowed for an increased survival of smaller eels. It is likely that the community is still impacted by the commercial eeling that is understood to have occurred just prior to the 2013-14 survey. It is expected it will take over decade for the community to recover from this. The physical condition of the eels showed that most of the eels captured at all three sites were in average condition, although the condition of the longfin eels was better than would be expected. This is despite the low flows and likely stressful conditions that preceded this survey, reflecting their relatively robust nature. Overall, these fish condition results suggest that fish condition is better in early summer than late summer, including at site 2. This is consistent with the higher and cooler early summer flow conditions providing for improved habitat and food supply. The results from site 2 suggest that the eel community was in poorer health than the previous survey, although the eels were still of average condition i.e. not underweight. This suggests that the activities at the composting

facility had not affected this community. No observed fish exhibited any obvious physical damage or abnormalities during the current survey.

Three access culverts were assessed for fish passage during this survey, and all were found to present a barrier to fish passage at most if not all flows. Even in higher flows, it is likely that these culverts severely restrict the passage of swimming species such as inanga. The culvert located immediately above site 2 was perched, as the remedial works completed prior to the previous survey had scoured away. Remedial works are required on this culvert, and on the remaining two culverts, which have been identified as a barrier for a number of years.

In summary, the results of the current survey do not indicate that the composting activities and wastewater irrigation undertaken by Remediation NZ Ltd, alongside the Haehanga Stream, have had a deleterious impact on the fish communities of this stream. This is consistent with the findings of the macroinvertebrate survey, completed on the same day. However, the impact on fish passage caused by the three access culverts is likely to have contributed to the reduced species richness at site 1. It is important that the site operator is made aware that these culverts generally need ongoing maintenance, and that the provision of fish passage is a requirement that must be met at all times.

Although originally planned for early summer, this survey was delayed until mid-summer in the hope that flows would recover from the extended period of dry weather that occurred in late 2017. It is recommended that this survey continues to be scheduled for early summer, and that surveys continue on an annual basis. In addition, it is recommended consideration be given to installing continuous water temperature monitoring equipment over the summer months, to improve the understanding of how water temperature changes in the Haehanga Stream. It is also recommended that the company be reminded of their responsibilities regarding the provision for fish passage.

2.1.3 Provision of consent holder data

The consent holder provides data on an annual basis with respect to the following:

- Irrigation times from the wetland treatment system and irrigation pond.

This was provided by the Company.

- Irrigation quantities and location of irrigation.

This was provided by the Company.

- Incoming good register.

This was provided by the Company

- Analysis of specific compostable waste streams, as defined by consent 5838-2.2 condition 3.

Only one drilling waste analysis from one well source was received this period, though multiple drilling wastes were received from multiple locations.

Condition 3 of consent 5838-2.2

Before bringing drilling waste to the site the consent holder shall take a representative sample of each type of drilling waste permitted under condition two from each individual source and have it analysed for the following:

- a. total petroleum hydrocarbons (C7-C9, C10-C14, C15-C36);
- b. benzene, toluene, ethylbenzene and xylenes;
- c. polycyclic aromatic hydrocarbons screening; and
- d. chloride, nitrogen, pH, potassium and sodium.

The results of the analysis required by this condition shall be forwarded to the Chief Executive, Taranaki Regional Council every three months or upon request.

In this monitoring period only one analysis was provided by the consent holder, of one drilling mud source, which fulfilled the requirement bestowed by this condition in that instance. During this monitoring period the Company received additional drilling mud from a variety of sources, no analysis was supplied, though it was requested by the Council on multiple occasions.

2.2 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 the Company. 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 Company 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 required to undertake significant additional investigations and interventions, or record incidents, in association with the Company's conditions in resource consents or provisions in Regional Plans.

RNZ Uruti

IN/35590 16 January 2018

During a routine bio-monitoring survey it was observed that sawdust had recently been deposited in the vicinity of pad 3 (drilling mud pad). The unloading of saw dust at this location had resulted in a volume of material being dumped beyond the concrete blocks above the culvert and subsequently into an unnamed tributary.

It was also observed that the leachate that had collected in the bund about pad 3 (drilling mud pad) was discharging in an uncontrolled manner overland adjacent to the irrigation pond and into the larger 'duck pond'. The duck pond is not a facility designed to accept and contain contaminated waste/stormwater on a regular manner and should be managed as a clean water storage facility. The observed discharge from about Pad 3 was in contravention with the Pond Treatment System Management Plan.

A letter of explanation was received from the Company with respect to the incident and the Company received an abatement notice as a result. Whereby the Company were given notice to undertake the following action:

Undertake works to ensure that site operations are carried out in accordance with the pond treatment management plan in accordance with special condition 21 of consent 5838-2.2.

ENF-21502 28 February 2018

Following the analysis of routine compliance surface water sampling of the Haehanga Stream and associated unnamed tributaries, results indicated elevated concentrations of target contaminants at two locations within the RNZ Uruti site.

The details of the offence were as follows:

Discharge of contaminant, namely leachate from a composting facility, onto or into land in circumstances which may have resulted in that contaminant (or any other contaminant emanating as a result of natural processes from that contaminant) entering water, namely the Haehanga Stream, when the discharge was not expressly allowed by a national environmental standard or other regulations, a rule in a regional plan, or a resource consent.

This resulted in EAC-22034 and an infringement fine to the Company.

[IN/35804 05 March 2018](#)

A complaint was received concerning odours emanating from a composting site main road, Uruti.

An odour survey was undertaken in the vicinity of the composting site, at main road, Uruti, in response to a complaint.

Only slight intermittent noticeable odours were found at the gate entrance to the composting site. Odour surveys were also undertaken at the Uruti School, Jones Quarry site and a shingle storage site. No odour was discernible. The site was not entered during the inspection.

[IN/35835 14 March 2018](#)

A neighbour of the composting facility at Uruti complained of odours from the Haehanga valley.

An investigation found that no odours were occurring at the time of inspection. However, it was found that the composting heap had been 'turned' the previous morning and was still giving off odours on site at the location of the composting pad. Remediation NZ will work with the complainants moving forward by notifying them prior to 'turning' the compost heap and will also take into consideration weather conditions so that the heap is only 'turned' when it is raining or there is strong directional wind up the valley.

[RNZ Waitara Road](#)

[IN/35404 21 November 2017](#)

A complaint was received. It was concerned that offensive odours and sawdust were discharging beyond the boundary of the Revital site on Waitara Road.

An inspection of the complainant's property found noticeable odours not considered objectionable at the time of inspection. However, it was observed that a digger was at the time, loading sawdust onto a truck and sawdust was blowing across the boundary.

A significant volume of sawdust was observed in the neighbouring property. A strong wind from the southeast was blowing at the time. Sawdust blowing across the boundary is in breach of Rule 54 of the Regional Air Quality Plan, in that a resource consent would be required.

The discharge of sawdust is considered objectionable and action must be taken to prevent further discharges. Consideration must be given to wind direction and wind speed. An inspection of the Revital site found numerous areas where best practice was not being carried out. The site was unkempt and product was distributed over the site.

This resulted in an infringement fine to the company.

[IN/35438 27 November 2017](#)

A complaint was received regarding odour being emitted from the Remediation NZ site on Waitara Road, Brixton.

An inspection and an odour survey was undertaken in response to a complaint from a member of the public regarding odour being emitted from the site. An odour survey was undertaken and a consistent odour was detected off-site.

The survey found that an odour was detected and would be considered objectionable if it occurred on a regular or frequent basis or became continuous. An inspection of the site found that the odour was being generated from the rear of the site. The source of the odour appeared to be being discharged from the stock pile of product located at the rear of the main (large) building on site.

The site is being operated without a resource consent for an air discharge. This means that the operation must be compliant with section 15(1)(c) of the RMA meaning that 'No person may discharge any contaminant from any industrial or trade premises into air unless the discharge is expressly allowed by a national environmental standard or other regulations, a rule in a regional plan or a resource consent'.

This resulted in the issuance of an abatement notice to the company.

[EAC-21766: Whereby the action required was to:](#)

Undertake works to ensure that no odour discharges beyond the boundary of the site.

A follow up to the two investigations of the Waitara Road facility was undertaken on the 5 December 2017.

An inspection was undertaken following the two previous incidents at the site relating to odour discharges and the deposition of sawdust beyond the property boundary. The inspection found that the pile of saw dust that was creating issues had been removed from site.

Works had also been undertaken to remove a majority of the sawdust from the neighbouring property. A change of practice had also been implemented to ensure that no further sawdust was deposited at site and instead it will be carted directly to the Uruti facility. The inspection also found that the yard area had been cleaned up with the stormwater sump and drain cleaned out. The odorous material stored at the rear of the large shed on site had been moved to within the shed.

This resulted in minimised the odour about the facility. It was also noted that there are no doors on the sheds. The installation of doors would allow for better odour management and also prevent wind from drawing possible odours out of the shed entrance. At the time of the inspection the abatement notice was being complied with.

3 Discussion

3.1 Discussion of site performance

RNZ Uruti composting facility

The performance of the RNZ facility at Uruti in the 2017-2018 monitoring period. From an administrative perspective the facility failed to assess drilling waste, as required by consent 5838-2.2, condition 3. One analysis of material was provided this period, from one well source, while the facility continued to accept drilling waste from a variety of different sources. This is the second year where minimal analysis has been received, though it has been requested on multiple occasions.

Two of the Company consents are up for renewal this year, how well the Company is complying with the consent conditions will be assessed during this process. This may weigh whether this is to stay on the acceptable good list moving forward. Thus compliance with this condition cannot be emphasised enough.

Performance will now be discussed by item.

The wetland treatment system functions by pumping primarily ammonia enriched leachate from the paunch pond (pad 2) to the top of a multiple layered, raupo filled, treatment pond system. The raupo functions as a filter, as well as sequestering some of the ammonia, before it discharges into an unnamed tributary of the Haehanga Stream. At certain times this source can contain a significant concentration of ammonia which appears to correspond with the annual vegetation cycle of propagation. The corresponding analysis indicated compliance with consent conditions in the six monitoring rounds undertaken.

Surface water monitoring of the Haehanga Stream is undertaken to ascertain for any potential impacts to the water course from the exercise of consent in the Haehanga stream catchment. The initial monitoring location with respect to the wetland treatment system is HHG000103.

This monitoring site is situated post a mixing zone of 30 meters, within the unnamed tributary of the Haehanga Stream. The analysis of the six monitoring rounds indicated compliance with consent conditions, with no un-ionised ammonia (NH_3) or elevated BODCF found above consent limits, as set by consent.

This is an improvement from the previous monitoring period, where on two occasions of six, elevated NH_3 was recorded.

However, during the biomonitoring of the Haehanga Stream, conducted in January 2018, the observation was made of leachate discharging from the bund of the drilling mud pad and flowing overland into the clean water course which is the duck pond. This was coupled with poor material storage at the front end of the drilling mud pad, whereby sawdust which was piled up at the tip off point had egressed into an unnamed tributary of the Haehanga Stream. The Company, post these findings were issued with an abatement notice as previously discussed in Section 2.2.

Further, surface monitoring is undertaken at ten additional sites on the Haehanga Stream and associated unnamed tributaries. These sites were assessed this period on six occasions. On one occasion (February 2018) of six, elevated ammonia, chloride and BODCF was reported at two monitoring locations.

This was the result of a rupture in the bunding of the drilling mud pad. The Company were issued with an infringement fine, as they were already under an abatement notice due to poor leachate and material management, associated with the drilling mud pad. This at the time indicated that the facility was not operating within its consent conditions or displaying BPO.

Follow up analysis, post the elevated surface water finding, indicated that the rupture had been fixed, with analysis returning no concentrations of concern.

During the monitoring period a significant rainfall event caused a blockage of an existing unconsented culvert and hindered the sites ability to operate. To counter this, the consent holder applied for a new consent, and in doing so applied for a significantly larger, wider and longer culvert. This culvert was assessed by the Council's river engineer, with stormwater modelling undertaken for size calculations. This was installed during this monitoring period.

The irrigation pond, associated with the drilling mud pad (pad 3) and the green waste pad (pad1), receives leachate from both pads. It irrigates fluid from the final pond to pre-determined irrigation areas. The irrigation fluid is required to meet certain concentrations for target parameters within the fluid. In this period the value for sodium absorption ratio (SAR) was found elevated above the conditional limit of 18 SAR on two occasions of six.

In order to irrigate fluid over set irrigation areas, the consent holder trialled a new irrigation system this period. A travelling irrigator, as defined in inspections, was trialled (October 2017 inspection) and then put into the service. The new irrigator is proposed to allow more even irrigation across the irrigation areas, when compared to the older sprinkler type system.

Culverts and fish passage is an area which has been worked on by the consent holder this period. Regard has been given to maintaining safe fish passage across the site. The Company is now required to monitor fish passage specifically post heavy rainfall and flood events, where scouring may occur on the downstream edge of the culverts.

Riparian management and fencing is also an area which has been encouraged in recent years. In this monitoring period great progress has been made by the Company. Fencing of the irrigation areas and associated Haehanga Stream and associated unnamed tributaries has been undertaken. Riparian planting has been completed from the state highway, all the way up to the twin culverts of the site. Additional planting is planned for the upcoming monitoring period.

The drilling mud pad, with associated composted drilling waste and organics was cited in the previous monitoring period as increasing in size, however the fate of this material was unclear. The consent holder did utilise some of the material for bunding around the site, notably for the new lower irrigation area. However, further discussions with the Council required some additional testing requirements to be undertaken. Specifically, meeting the standards prescribed in the Regional Freshwater Plan Rule 29 is required prior to utilising any of this composted material for site filler or bunding, and this will be put into effect.

Quarry operations had been suspended by the Company this period, though stormwater management, specifically related to the access track has been discussed by the Council's investigating officer during inspections and will be monitored in the upcoming monitoring period.

[RNZ Waitara and Pennington Road facilities](#)

In the previous monitoring period the site appeared well managed with minimal offsite odour noted during inspections. In this period the facility was found to have been in breach of the Regional Air Quality Plan Rule 54, whereby sawdust, which was being loaded at the site was transported with the high wind at the time, to the neighbour's property and was found to have been a significant amount, similarly, on the site, the investigating officer identified non-best practice.

Following on from the dust complaint an odour complaint was received six days later. The Waitara Road facility does not hold a specific air discharge consent, as such it must hold one under Rule 55 of the Regional Air Quality plan if it is to discharge noticeable odour. This resulted in the issuance of an abatement notice to undertake works to ensure that no odour discharges beyond the boundary of the site.

After these two incidents within a short period of time, a follow up was undertaken by the investigating officer. The site management were reported to have returned to normal operations. Though site

management were requested to keep the drains clean and the associated mixing pad. The Pennington Road site was found to be growing maize mid-way through the monitoring year and this had been cropped by the end of the monitoring period. The consent holder is intending to surrender the Pennington Road site in the upcoming monitoring period, though additional soil analysis from the site will be requested before this can occur.

Material management (housekeeping) and specifically sawdust control is an area which the Company must improve. Two infringement fines were issued to the Company with respect to incidents this period. One case being the deposition of windblown sawdust to a neighbouring property in significant quantities at the Waitara facility. The second being related to a rupture of the drilling mud pad bunding causing elevated contaminants within the Haehanga Stream at Uruti.

3.2 Environmental effects of exercise of consents

RNZ Uruti composting facility

The effects will be discussed on a system basis.

The wetland treatment system (WTS) was monitored on six occasions this period. The resultant analysis as indicated by Section 2.1.2.1 found the discharge was within compliance standards in all six monitoring rounds. Minimal effects were noted as a function of this treatment system. Though the life cycle of raupo, the key vegetation to this system, may experience lesser abilities to sequester ammonia during its propagation cycle. The facility is aware of this and is attempting to lessen the inputs during that time of the year.

The second monitoring location, which further assesses the WTS discharge, was similarly monitored on six occasions, this was also found compliant with minimal effects noted, post the mixing zone. Compared to the previous period, where on two occasions of six, elevated un-ionised ammonia was identified. This is an improvement.

The Haehanga Stream and associated unnamed tributaries were sampled at a further ten monitoring locations. This occurred on six occasions on this period. During the February 2018 monitoring round, spot in-situ screening of the surface water identified areas of depleted oxygen within the Haehanga Stream. This was further quantified through the analysis of surface water samples collected at the same time.

These samples identified an excessive biochemical oxygen demand, ammonia, chloride and corresponding un-ionised ammonia at two locations of the sample sites. This was an effect in the surface water and was a result of a breach in the bunding wall associated with the drilling mud pad and associated leachate storage and transfer system. These findings led to an infringement fine to the Company, as they were found to have breached at least two consent conditions, with respect to preventing wastewater from entering surface water. Also the Company caused effects downstream of the irrigation areas, with elevated contaminant concentrations.

The groundwater monitoring network has finally been expanded to its consented requirement of seven monitoring wells. This was finalised at the end of this monitoring period, as such a complete monitoring run was not possible in this period. However, the existing groundwater wells (3) were sampled on three occasions this period, with one of the new wells also sampled on one occasion.

The analysis indicated that the old lower irrigation area (area J and H) bore continues to identify elevated total dissolved salt, chloride and more recently, ammonia concentrations, as a process of the exercise of consent. This area is planned to be rested for a period of time by the consent holder, to enable the effects of elevated TDS and chloride to reduce. Of note, the value recorded in this period of 2,932 g/m³ for TDS, is not the most elevated value recorded at this monitoring location (3,757 g/m³ TDS, March 2016). Thus the

reduction observed may suggest that this concentration is decreasing. Further monitoring and resting, as proposed by the Company, will assess this well location moving forward.

Of note, no petroleum hydrocarbon related effects were observed in any of the four monitoring wells sampled this period. All results were found to be below the laboratory limit of detection, this also included BTEX.

The irrigation areas soil analysis. The irrigation areas act as a sequestration area for applications of irrigation fluid from the associated irrigation pond. In a previous monitoring period (2015-2016) an elevated sodium absorption ratio (SAR) was identified within the soil of certain irrigation areas (the old lower area, areas J and H). The maximum observed for this area was a SAR of 12 in April 2016. The value observed in this period was reported as 9 SAR. Which is the third highest value observed in this area to date. Notably the follow up to the SAR of 9 undertaken in June 2018 found the value had dropped to 4.6 SAR. This also corresponded to a significant elevation in the values of calcium, magnesium and potassium, which would mitigate issues associated with an increasing sodium value. This would suggest that the Company is managing the effect of an elevated SAR with other irrigation areas also reporting a decrease in SAR values throughout the year.

Total heavy metal analysis was added to the soil sample regime this period. The resultant analysis indicated values which did not cause any concern when compared to the bio-solid guidelines. Of note was the slight elevation in arsenic values, however this was minimal and further analysis in upcoming monitoring periods will further assess heavy metals concentrations over time. Cadmium was reported in the new lower irrigation area with a value of 0.21 g/m³, however as one spot sample was collected, further analysis will further assess this parameter over time. Noting that grade A bio-solid limits are set at 1.0 mg/kg for cadmium.

Petroleum related results in the six soil samples collected this period identified the trace poly aromatic hydrocarbon perylene and benzo (e) pyrene in the upper (area G) and perylene in the old lower irrigation area (area J and H) on one occasion of two.

Total petroleum hydrocarbon related results identified heavy range TPH (C₁₅-C₃₆) in five of the six soil samples reported. Ranging at low concentrations (<160 g/m³ TPH C₁₅-C₃₆), across all three irrigation areas. This included the now new lower area. Noting that this area was formed from partially composted material, trace impacts were likely as a result of the origin of the material.

The largest effect of the irrigation to these specific areas has been observed in the increases observed in calcium, magnesium and potassium, between the January and June sampling rounds. This appears to have correspondingly increased the soil pH in all three areas.

In terms of effects on the biology of the Haehanga Stream. A biomonitoring and fish netting survey was undertaken on one occasion this period the biologist found the following:

During certain previous surveys, *Chironomus* bloodworms have been recorded as abundant at various sites. Abundance of this taxon is usually an indication of an organic discharge, although low dissolved oxygen in the stream can also allow this taxon to dominate the community, especially when this is associated with low flows.

It may be that the sporadic appearance of *Chironomus* in abundance is at least in part related to the dissolved oxygen concentrations. Dissolved oxygen concentrations in the Haehanga Stream and associated tributaries have been found to be depressed at times, and during the warmer months, when there is more aquatic weed growth, dissolved oxygen may be significantly depleted at night.

This is a natural occurrence in some streams that are slow flowing and weedy. Any macroinvertebrate surveys undertaken when such conditions exist could potentially record a community with fewer sensitive species, and a more abundant population of *Chironomus*.

During the current survey, *Chironomus* was recorded as rare at sites 2 and 6, common at sites 5 and 7 and abundant at site 1, the control site. This possibly suggests a slight increase in the organic enrichment of the stream, but the abundance at the control site indicates that it is more likely a reflection of the very low flows, and as a consequence, low dissolved oxygen concentrations. It is understood that the issue of high chlorides at site 6 has been identified and is being addressed, and so water quality will hopefully improve with time.

This would be further contributed to through any on-going works to the leachate and stormwater treatment system, and improved management of the riparian margin. Any works that improve water quality are also likely to lead to an improvement in freshwater macroinvertebrate communities below the discharges, and should continue to be encouraged.

In relation to the fish netting survey the biologist concluded with the following:

In summary, the results of the current survey do not indicate that the composting activities and wastewater irrigation undertaken by Remediation NZ Ltd, alongside the Haehanga Stream, have had a harmful impact on the fish communities of this stream. This is consistent with the findings of the macroinvertebrate survey, completed on the same day. However, the impact on fish passage caused by the three access culverts is likely to have contributed to the reduced species richness at site 1. It is important that the site operator is made aware that these culverts generally need ongoing maintenance, and that the provision of fish passage is a requirement that must be met at all times.

Odour related impacts were associated with two complaints this period, of which one identified the likely cause of noticeable odour. This was ascertained to be due to the turning of composting windrows on site, which have the potential to create odours of significance. Post this finding, site management practices were tweaked, to inform the neighbours when they are likely to undertake such an operation in future. Also to pay regard to the metrological conditions present at the time. This will make sure that odours produced are not transferred down the valley.

Further to this, and in respect to katabatic (cold air) drainage, the Company had constructed a cold air bund, this is aimed at lessening the potential of katabatic drainage and the planting of vegetation on the bund will seek to serve as vegetative environmental buffer (VEB) of sorts. The vegetation of the bund is currently developing and will be discussed in the following year's monitoring report.

[RNZ Waitara and Pennington Roads](#)

Environmental effects associated with these facilities were found to be a result of management practices. With two complaints received this period which resulted in an infringement fine for poor materials storage of sawdust and an abatement notice for the production of noticeable odour beyond the site boundary, without a specific air discharge permit. Site management was also found to be not displaying best practice. The site does not have a specific stormwater treatment system and discussions will be held in the upcoming monitoring period to develop a system. Discussions will also be held with respect to the recent odour complaint and whether the issuance of an air discharge permit may be required if noticeable odours are to become a frequent effect of business.

Overall, material management and housekeeping at both facilities (Uruti and Waitara Road) needs improvement and will be monitored moving forward as both facilities are under abatement notice. Further enforcement is also being considered with respect to the lack drilling waste assessment.

3.3 Evaluation of performance

A tabular summary of the consent holder's compliance record for the year under review is set out in Tables 13 -20.

Table 13 Summary of performance for consent 5838-2.2

Purpose 5838-2.2: <i>To discharge of waste material to land for composting; and treated stormwater and leachate from composting operations; onto and into land in circumstances where contaminants may enter water in the Haehanga Stream catchment and directly into an unnamed tributary of the Haehanga Stream</i>		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adopt best practical option	Programme management/site inspections <ul style="list-style-type: none"> - Saw dust found in unnamed tributary of Haehanga as a result of poor material management - Irrigation pond/ drilling mud pad leachate observed to be overflowing into duck pond during biomonitoring round - Abatement notice issued - Breach in drilling mud pad and associated leachate ring drain lead to elevated contaminates in Haehanga Stream - Infringement fine issued - Only one analysis of drilling waste provided though significant amounts received 	No
2. Only acceptable waste accepted onto site	Site inspections/review of supplied records	Yes
3. Representative sample of each type of drilling waste analysed for <ol style="list-style-type: none"> a. Total petroleum hydrocarbons b. Benzene, toluene, ethylbenzene and xylenes c. Polycyclic aromatic hydrocarbons d. Heavy metals e. Chloride, nitrogen, pH, potassium and sodium 	Only one result has been received with respect to screening analysis, though requested on multiple occasions Significant quantities received from multiple well sites with no associated analysis	No Only one provided. Significant material received and no associated analysis.
4. DAF residue not to be accepted	Site inspections/review of supplied records	Yes
5. Maintenance of stormwater systems	Inspections	Maintenance ongoing

Purpose 5838-2.2: To discharge of waste material to land for composting; and treated stormwater and leachate from composting operations; onto and into land in circumstances where contaminants may enter water in the Haehanga Stream catchment and directly into an unnamed tributary of the Haehanga Stream		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
6. Maintenance of treatment systems	Inspections and sampling. Some issues identified. -Irrigation pond overflowing leachate into duck pond -Drilling mud pad leaking into stream	No
7. Adequate pond construction	Inspections and monitoring - Irrigation pond overflowing into duck pond - Leak to Haehanga Stream resulted in elevated concentrations of target contaminates	No Breached on one occasion
8. Keep and supply irrigation records	Data supplied and reviewed	Yes
9. No direct discharges to occur as a result of irrigation	Site inspections /sampling	Yes
10. Irrigated fluids not to exceed 5% hydrocarbon content or SAR of 18	Site inspections /sampling indicated that on two occasions the limit of SAR was breached	No
11. Discharges not to cause adverse effects at downstream of irrigation areas	Sampling and inspection noted on the 28 February 2018, significantly elevated ammonia, chloride, sodium and BODCF at monitoring locations HHG000106 and 150	No
12. Soil sampling to be undertaken for TPH and BTEX	Undertaken by the Council	Yes
13. Soil sampling to be undertaken for chloride, sodium, magnesium, calcium, potassium, soluble salts and conductivity	Undertaken by Council	Yes
14. Adhere to composting facility management plan	Inspections, SAR reduced in lower irrigation area soil	No Storage dam not yet completed as defined in plan Increased irrigation area under construction
15. Establish groundwater monitoring bores	Site inspections identified additional monitoring wells are installed	Yes
16. Groundwater monitoring wells installed as per standard	Undertaken	Yes

Purpose 5838-2.2: To discharge of waste material to land for composting; and treated stormwater and leachate from composting operations; onto and into land in circumstances where contaminants may enter water in the Haehanga Stream catchment and directly into an unnamed tributary of the Haehanga Stream

Condition requirement	Means of monitoring during period under review	Compliance achieved?
17. Consent holder monitoring and record groundwater in each monitoring well each day for level, temperature, and conductivity	Not requested in this period	N/A
18. Groundwater sampled per six month interval: a. Total petroleum hydrocarbons b. BTEX	Undertaken by Council	Yes
19. Groundwater samples shall be collected from all wells for chloride, sodium, magnesium, calcium, TSS and conductivity	Undertaken by Council	Yes
20. Prepare Pond Treatment System Management Plan	Management plan currently under review by consent holder	Under review
21. Adhere to Pond Treatment System Management Plan	Management plan currently under review by consent holder	Under review
22. Prepare Wetland Treatment System Management Plan	Management plan currently under review by consent holder	Under review
23. Adhere to Wetland Treatment System Management Plan	Management plan currently under review by consent holder	Under review
24. Wetland discharge not to exceed certain parameters	Consented compliance parameters analysed, were found to be compliant	Yes
25. Wetland discharge not to cause certain effects at site HHG000103	Sampling	Yes
26. Maintain riparian plantings	Inspection identified that riparian planting is developing. This will be on-going	Developing
27. Notify the Council of significant incidents on site	No notifications received	N/A
28. Prepare a Site Exit Plan prior to site closure	N/A	N/A
29. Adhere to Site Exit Plan	N/A	N/A
30. Optional Review	Consent renewal to occur next year	N/A

Purpose 5838-2.2: <i>To discharge of waste material to land for composting; and treated stormwater and leachate from composting operations; onto and into land in circumstances where contaminants may enter water in the Haehanga Stream catchment and directly into an unnamed tributary of the Haehanga Stream</i>		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
Overall assessment of consent compliance and environmental performance in respect of this consent		Improvement required
Overall assessment of administrative performance in respect of this consent		Improvement required

Table 14 Summary of consent 5839-2

Purpose 5839-2: <i>To discharge emissions to air at Mokau Road, Uruti</i>		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adopt best practical option	Programme management/site inspections. Two odour complaints received, none were substantiated, although site practices have been adjusted as a result, with respect to environmental / climatic conditions, which will be assessed prior to turning windrow piles	For the most part
2. Composting area not to exceed certain limits	Programme management and site inspections identified significant increase in the size of both pads, which have effectively doubled in size	No
3. Only acceptable waste brought onto site	Site inspections/review of supplied records	Yes
4. DAF residue not to be accepted	Site inspections/review of supplied records	Yes
5. Maintain and supply an inwards good register	Data received and reviewed though descriptions could be better	Yes
6. Prepare a Site Practices Plan	Plan currently under review with AEE	Yes
7. Adhere to Site Practices Plan	Site inspections	Yes
8. Arrange professional assessment of Site Practices Plan	Supplied in 2010-2011 year	Yes
9. Submit Proposed Implementation Plan	Plan under review with consent holder	Under review
10. Adhere to Proposed Implementation Plan	Plan under review with consent holder	Under review
11. Dust deposition not to exceed certain limits	Not monitored- dust not noted as an issue during inspections	Not assessed

Purpose 5839-2: To discharge emissions to air at Mokau Road, Uruti		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
12. PM10 and suspended particulate not to exceed certain limits	Not monitored- dust not noted as an issue during inspections	Not assessed
13. No offensive or objectionable odour beyond the boundary	Inspection did not find objectionable odour beyond boundary, though two odour complaints were received, non-substantiated, though likely triggers now understood	Yes
14. Install a weather station and provide data	Inspection and weather updates. Last update 2 February 2017	Yes, though frequently faulty
15. Conduct odour surveys	Undertaken by the Council during inspections	Yes
16. Hold community meeting	Meeting held in 2011-no attendees, none have been proposed since. Upcoming consent renewal next year	Yes
17. Notify the Council of onsite incidents	No notification received	N/A
18. Prepare a Site Exit Plan prior to site closure	N/A	N/A
19. Adhere to Site Exit Plan upon site closure	N/A	N/A
20. Optional review	A review was not required	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		Good
Overall assessment of administrative performance in respect of this consent		Good

Table 15 Summary of consent 5893-2

Purpose 5893-2: The discharge of drilling solids at Pennington Road, Brixton		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Exercise of consent in accordance with information provided in application	Site inspections	Yes
2. Best practicable option as described by S2 of RMA	Site inspections	Yes
3. Records of source, nature and volume of wastes	Records reviewed	Yes
4. Solid drilling cuttings to be < 5 % hydrocarbon content	Hydrocarbons wastes no longer processed on this site	N/A
5. No contamination of ground or surface water	Samples were not collected during the period under review	N/A

Purpose 5893-2: The discharge of drilling solids at Pennington Road, Brixton		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
6. Maintenance of stormwater treatment system	Site inspections indicated that the stormwater system sump is regularly cleaned out by site management	Yes
7. Concentration limits on stormwater	Samples were not collected during the period under review	N/A
8. Post mixing zone effects	None observed on inspection	N/A
9. Alterations to processes and operations	Site inspections did not note any changes	Yes
10. Reinstatement of site	Soil samples to be provided in the upcoming monitoring period to allow the consent to be surrendered	N/A
11. Optional review of consent	N/A	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall administrative performance in respect of this consent		High

Table 16 Summary of consent 5892-2.0

Purpose 5892-2: To discharge storm water from the worm farming operations onto and into land and into an unnamed tributary of the Waiongana Stream		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Exercise of consent in accordance with information provided in application	Site inspections	Yes
2. Best practicable option as described by S2 of RMA	Site inspections following complaints resulted in an infringement fine for poor material storage (sawdust in neighbouring property) and an abatement notice for the discharge of odour without an air discharge consent	No
3. Stormwater management plan	Received	Yes
4. Records of source, nature and volume of wastes	Yes provided with main Uruti information	Yes
5. No contamination of ground or surface water	Site inspections, samples	Yes
6. Maintenance of stormwater treatment system and concentration limits	Site inspections undertaken though no samples collected this period. No specific stormwater treatment system	Yes
7. Post mixing zone stormwater effects	Samples were not collected during the period under review as there was no water in the tributary	N/A

Purpose 5892-2: To discharge storm water from the worm farming operations onto and into land and into an unnamed tributary of the Waiongana Stream		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
8. Windrows covered except when discharging	No visual impact observed during site visits	Yes
9. Alterations to processes and operations	Site inspections did not note any changes	Yes
10. Reinstatement of site	Sampling undertaken and indicated compliance with this condition. Site to be surrendered in upcoming monitoring period	Yes
11. Optional review of consent	No review due this period	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		Improvement required
Overall administrative compliance with this consent		Improvement required

Table 17 Summary of consent 5938-2.0

Purpose 5938-2.0 To use a twin culvert in the Haehanga Stream for vehicle access purposes		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Ensure stream bed downstream is adequately constructed and does not prevent fish passage	Inspections indicated that this is being adhered to. Continued adherence is requested moving forward as high flows may adversely affect the fish passage	Yes
2. Maintains the structure so: <ul style="list-style-type: none"> a. It does not become blocked and is free flowing b. Any erosion or instability of the stream bank is remedied by the consent holder 	Site inspections indicated the site manager is continually working on improving this aspect and regularly checks the culvert	Yes
3. Review condition	No review pursued	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall administrative performance with respect to this consent		High

Table 18 Summary of consent 6211-1

Purpose 6211-1 : To realign a stream at Mokau Road, Uruti		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Notification prior to commencement of works	Works undertaken and assessed by investigating officer	Yes
2. Realignment in accordance with application	Site inspections	Yes
3. Best practicable option	Site inspections	Yes
4. Minimisation of discharge	Site inspections	Yes
5. Minimisation of riverbed disturbance	Site inspections	Yes
6. Optional review of consent	No review due this period	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall administrative performance with respect to this consent		High

Table 19 Summary of consent 6212-1

Purpose 6212-1 : To establish and maintain a culvert at Mokau Road, Uruti		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Notification prior to commencement of works	No works undertaken this period	N/A
2. Replacement of temporary culvert	N/A	N/A
3. Construction in accordance with application	Site inspections	Yes
4. Best practicable option	Site inspections	Yes
5. Minimisation of riverbed disturbance	Site inspections	Yes
6. Provision of fish passage	Site inspections	Yes
7. Reinstatement of site	N/A	N/A
8. Optional review of consent	No review due this period	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall administrative performance with respect to this consent		High

Table 20 Summary of consent 10063-1.0

Purpose: To discharge treated stormwater from a quarry site, into an unnamed tributary of the Haehanga Stream		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Authorises the discharge of treated stormwater into unnamed trib of Haehanga Stream in line with original application	Inspection - (Quarry operations suspended by consent holder for the 2017-2018 monitoring period)	NA
2. Notification of quarry works	Notification- (Quarry operations suspended by consent holder for the 2017-2018 monitoring period)	NA
3. Adopt best practicable option	Inspection- (Quarry operations suspended by consent holder for the 2017-2018 monitoring period)	NA
4. Shall operate and progressively reinstate the quarry site in a manner which ensures exposed areas are kept to a minimum at all times	Inspection - (Quarry operations suspended by consent holder for the 2017-2018 monitoring period)	NA
5. Ensure no area greater than 1 ha is exposed at any one time	Inspection - (Quarry operations suspended by consent holder for the 2017-2018 monitoring period)	NA
6. The stormwater discharged shall not exceed 4 ha	Inspection - (Quarry operations suspended by consent holder for the 2017-2018 monitoring period)	NA
7. Stormwater treatment system shall be installed before any site works commence	Inspection - (Quarry operations suspended by consent holder for the 2017-2018 monitoring period)	NA
8. Stormwater treatment system shall be maintained for the life of the quarry operation	Inspection - (Quarry operations suspended by consent holder for the 2017-2018 monitoring period)	NA
9. All stormwater to be directed to stormwater treatment system prior to discharge to Haehanga Stream tributary	Inspection - (Quarry operations suspended by consent holder for the 2017-2018 monitoring period)	NA
10. Constituents of the discharge shall meet the following standards: a) pH: 6.0-9.0 b) suspended solids: <100g/m ³ c) total hydrocarbons: <15 g/m ³	Sampling - (Quarry operations suspended by consent holder for the 2017-2018 monitoring period)	NA
11. The pH may exceed 9.0 if the exceedance is the result of photosynthetic activity, however the discharge shall not alter the receiving waters by more than	Sampling - (Quarry operations suspended by consent holder for the 2017-2018 monitoring period)	NA

Purpose: To discharge treated stormwater from a quarry site, into an unnamed tributary of the Haehanga Stream		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
0.5 pH after a mixing zone of 25 m		
<p>12. After mixing the discharge shall not give rise to any of the following effects:</p> <p>a) Production of scums, films or foams</p> <p>b) Any conspicuous change in the colour or visual clarity</p> <p>c) Any emission of objectionable odour</p> <p>d) Rendering of fresh water unsuitable for farm animal</p> <p>e) Any significant adverse effects on aquatic life</p>	Inspection and sampling - (Quarry operations suspended by consent holder for the 2017-2018 monitoring period)	NA
<p>13. The discharge shall not give rise to any of the following effects:</p> <p>a) A change in turbidity measurements upstream of the discharge point and below the discharge point of more than 5NTU</p> <p>b) A change in turbidity measurements of greater than 5 NTU as a result of the discharge</p>	Inspection and sampling -(Quarry operations suspended by consent holder for the 2017-2018 monitoring period)	NA
14. Maintain and update Contingency plan	Notification and supply of records	NA
<p>15. Site shall be operated in a management plan which will contain the following:</p> <p>a) The loading and unloading of materials</p> <p>b) Maintenance of conveyance systems</p> <p>c) General housekeeping</p> <p>d) Management of the interceptor system</p>	Supply of management plan - (Quarry operations suspended by consent holder for the 2017-2018 monitoring period)	Not received
16. Notification pertaining to the change of nature of discharge	Notifications - (Quarry operations suspended by consent holder for the 2017-2018 monitoring period)	NA
17. Consent lapse	Consent in effect - (Quarry operations suspended by consent holder for the 2017-2018 monitoring period)	NA

Purpose: <i>To discharge treated stormwater from a quarry site, into an unnamed tributary of the Haehanga Stream</i>		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
18. Review condition	No review required (Quarry operations suspended by consent holder for the 2016 2017 monitoring period)	NA
Overall assessment of consent compliance and environmental performance in respect of this consent Overall administrative performance with respect to this consent		Not assessed this period as quarry operations suspended by consent holder

Table 21 RNZ consent compliance rating 2017-2018

Consent	Environmental Performance	Administrative performance
5838-2.2 (Discharge waste to land and water, Uruti)	Improvement required	Improvement required
5839-2 (Discharge emissions to air, Uruti)	Good	Good
5892-2 (Stormwater Waitara Road)	Improvement required	Improvement required
5893-2 (Discharge hydrocarbon Pennington Road)	High	High
5938-2.0 (Twin culvert Uruti)	High	High
6211-1 (Haehanga realignment Uruti)	High	High
6212-1 (Culvert, Uruti)	High	High
10063-1.0	Not assessed as quarry operation suspended this period	

Table 22 Consent environmental performance over time

Year	Consent no	High	Good	Improvement req	Poor
2013-2014	5838-2				1
	5839-2		1		
	5892-2	1			
	5893-2	1			
	5938-1	1			
	6211-1	1			
	6212-1		1		
2014-2015	5838-2			1	
	5839-2		1		
	5892-2	1			
	5893-2	1			

Year	Consent no	High	Good	Improvement req	Poor
	5938-1	1			
	6211-1	1			
	6212-1			1	
2015-2016	5838-2.2			1	
	5839-2	1			
	5893-2	1			
	5892-2	1			
	5938-2.2			1	
	6211-1	1			
	6212-1			1	
	10063-1.0				
2016-2017	5838-2.2		1		
	5839-2	1			
	5893-2	1			
	5892-2	1			
	5938-2.2			1	
	6211-1	1			
	6212-1			1	
	10063-1.0				
Totals		16	4	7	1

During the year, the Company demonstrated an improvement required level of environmental and administrative performance with the resource consents as defined in Section 1.1.4.

3.4 Recommendations from the 2016-2017 Annual Report

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

1. THAT in the first instance monitoring of consented activities at Waitara Road and Pennington Road, Brixton, in the 2017-2018 year continues at the same level as in 2016-2017.
2. THAT should there be issues with environmental or administrative performance in 2017-2018, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.
3. THAT the monitoring of consented activities at the Mokau Road, Uruti composting facility continues with the addition of two extra groundwater monitoring rounds. This will bring the groundwater monitoring to quarterly to encompass seasonality. The soil analysis parameters will also be extended to encompass the following specific analytes: This will be included in the 2018-2019 monitoring programme.
 - Total petroleum hydrocarbon analysis (C₇-C₉, C₁₀-C₁₄, C₁₅-C₃₆ and C₇-C₃₆);
 - Benzene, toluene, ethylbenzene and xylenes (BTEX);
 - Polycyclic aromatic hydrocarbons (PAH); and

- Total recoverable heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc).

Once the new lower irrigation area has been completed, the soil sampling programme will expand to encompass this area.

Additional surface water analytes to be added to monitoring locations HHG000106 and HHG000115.

- Benzene, toluene, ethylbenzene and xylenes (BTEX).
4. The implementation of in-situ temperature loggers to the Haehanga Stream is currently under consideration and will be undertaken in the 2018-2019 if required.

In reference to the recommendations. Recommendations 1, 2 and the majority of 3 were undertaken. Groundwater to remain at 6 monthly intervals in the 2018-2019 monitoring period.

Recommendation 4 has not been implemented, however the installation of an in-situ multi parameter probe to monitoring location HHG000150 is being considered.

3.5 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 monitoring period that the following is undertaken with respect to compliance monitoring of RNZ assets within Taranaki.

- Monitoring of the RNZ Waitara Road facility to continue with special consideration to site odour and housekeeping. Stormwater management upgrades to be discussed.
- Monitoring of the RNZ Pennington Road will cease upon successful surrender of the consent, post consent required analysis.
- Monitoring of the RNZ Uruti composting facility will continue unchanged from the 2017-2018 monitoring period with the inclusion of four additional monitoring well locations and one additional soil sampling location. Spot surface water monitoring via multi parameter probe for field screening parameters will also be included to surface water monitoring on all surface water monitoring rounds.
- A proposal for the in-situ multi-parameter probe/sonde for inclusion in the lower reaches of the Haehanaga Stream is being considered.

It should be noted that the proposed programme represents a reasonable and risk-based level of monitoring for the site(s) 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.

4 Recommendations

1. THAT in the first instance monitoring of consented activities at Waitara Road, Brixton, in the 2018-2019 year continues at the same level as in 2017-2018, with special consideration for site practice management and odour.
2. Monitoring of the RNZ Pennington Road will cease upon successful surrender of the consent, post consent required analysis, which will be provided in the upcoming monitoring period.
3. THAT should there be issues with environmental or administrative performance in 2017-2018, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.
4. Monitoring of the RNZ Uruti composting facility, Mokau Road, will continue unchanged from the 2017-2018 monitoring period with the inclusion of four additional monitoring well locations and one additional soil sampling location. Spot surface water monitoring via multi parameter probe for field screening parameters will also be included to surface water monitoring on all surface water monitoring rounds.
5. The implementation of in-situ multi-parameter probe/sonde be considered for installation in the lower reaches of the Haehanga Stream, below the irrigation areas to assess water quality continuously.

Glossary of common terms and abbreviations

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

Al*	Aluminium.
As*	Arsenic.
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.
BODF	Biochemical oxygen demand of a filtered sample.
Bund	A wall around a tank to contain its contents in the case of a leak.
CBOD	Carbonaceous biochemical oxygen demand. A measure of the presence of degradable 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.
COD	Chemical oxygen demand. A measure of the oxygen required to oxidise all matter in a sample by chemical reaction.
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.
Cumec	A volumetric measure of flow- 1 cubic metre per second (1 m ³ s ⁻¹).
DO	Dissolved oxygen.
DRP	Dissolved reactive phosphorus.
E.coli	Escherichia coli, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample.
F	Fluoride.
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 ² /day	grams/metre ² /day.
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.
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 7 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, normally expressed in terms of the mass of nitrogen (N).
NO ₃	Nitrate, normally expressed in terms of the mass of nitrogen (N).
NTU	Nephelometric Turbidity Unit, a measure of the turbidity of water.
O&G	Oil and grease, defined as anything that will dissolve into a particular organic solvent (e.g. hexane). May include both animal material (fats) and mineral matter (hydrocarbons).
Pb*	Lead.
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.
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	<i>Resource Management Act 1991</i> and including all subsequent amendments.
SS	Suspended solids.
SQMCI	Semi quantitative macroinvertebrate community index.
Temp	Temperature, measured in °C (degrees Celsius).
Turb	Turbidity, expressed in NTU.
UI	Unauthorised Incident.
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 Remediation NZ Limited

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

Consent No.	Site	Purpose	Expiry Date	Review Date(s)
5838-2.2	Uruti	Discharge to land and water	June 2018	Yearly
5839-2	Uruti	Discharge emissions to air	June 2018	Yearly
5938-2.2	Uruti	Install culvert	June 2015	-
6211-1	Uruti	Divert stream	June 2021	-
6212-1	Uruti	Install culvert	June 2021	-
10063-1	Uruti	To discharge treated stormwater (quarry)	June 2033	June 2021
5892-2	Brixton	Discharge to land/water	June 2020	-
5893-2	Brixton	Discharge to land/water	June 2021	-

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

Name of Consent Holder:	Remediation (NZ) Limited PO Box 8045 New Plymouth 4342
Decision Date (Change):	20 August 2015
Commencement Date (Change):	20 August 2015 (Granted Date: 27 May 2010)

Conditions of Consent

Consent Granted:	To discharge: a) waste material to land for composting; and b) treated stormwater and leachate from composting operations; onto and into land in circumstances where contaminants may enter water in the Haehanga Stream catchment and directly into an unnamed tributary of the Haehanga Stream
Expiry Date:	1 June 2018
Review Date(s):	June 2016, June 2017
Site Location:	1450 Mokau Road, Uruti
Legal Description:	Sec 34 Pt Sec 4 Blk II Upper Waitara SD (Discharge site)
Grid Reference (NZTM)	Between 1731656E-5686190N, 1733127E-5684809N, 1732277E-5685101N, 1732658E-5684545N & 1732056E-5684927N
Catchment:	Mimi
Tributary:	Haehanga

*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. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.

Acceptable wastes

2. The raw materials accepted onsite shall be limited to the following:
 - Paunch grass;
 - Animal manure from meat processing plant stock yards and dairy farm oxidation pond solids;
 - Green vegetative wastes;
 - Biosolids wastes including, but not limited to, pellets from wastewater treatment plants;
 - Mechanical pulping pulp and paper residue (excluding any pulping wastes that have been subject to chemical pulping or treated or mixed with any substance or material containing chlorine or chlorinated compounds);
 - Solid drilling cuttings from hydrocarbon exploration provided they are blended down to a maximum hydrocarbon content of 5.0% total petroleum hydrocarbon within 3 days of being received onsite;
 - Water based and synthetic based drilling fluids from hydrocarbon exploration provided they are blended down to a maximum hydrocarbon content of 5.0% total petroleum hydrocarbon content within 3 days of being brought onto the site;
 - Produced water from hydrocarbon exploration;
 - Vegetable waste solids (being processing by-products);
 - Grease trap waste (from food service industries);
 - Fish skeletal and muscle residue post filleting (free from offal); and
 - Poultry industry waste (eggshells, yolks, macerated chicks and chicken mortalities).

The acceptance of any other materials shall only occur if the Chief Executive, Taranaki Regional Council advises in writing that he is satisfied on reasonable grounds that the other materials will have minimal effects beyond those materials listed above.

Consent 5838-2.2

3. Before bringing waste to the site the consent holder shall take a representative sample of each type of drilling waste permitted under condition two from each individual source, and have it analysed for the following:
 - a. total petroleum hydrocarbons (C₆-C₉, C₁₀-C₁₄, C₁₅-C₃₆);
 - b. benzene, toluene, ethylbenzene, and xylenes;
 - c. polycyclic aromatic hydrocarbons screening;
 - d. heavy metals screening; and
 - e. chloride, nitrogen, pH, potassium, and sodium.

The results of the analysis require by this condition shall be forwarded to the Chief Executive, Taranaki Regional Council every three months or upon request.

4. Material produced as a result of a dissolved air flotation process shall not be accepted on site.

Maintenance of measures

5. All sediment ponds and silt traps on site, that are located upstream of the pond treatment system or wetland treatment system, shall be managed so that they are no more than 20% full of solids at any one time.

Note: For the purposes of this condition, the location of the pond treatment system and wetland treatment system are shown on Figure 1, attached as Appendix 1 of this consent.

6. All treatment measures on site shall be implemented and maintained so that:
 - clearwater runoff is prevented from entering Pad 1, Pad 2 and the Drill Mud Pad; and
 - all stormwater and/or leachate from Pad 1, Pad 2, the Drill Mud Pad and any other exposed areas within the composting site is directed for treatment through the Pond or Wetland Treatment System.

Note: For the purposes of this condition, the location and extent of Pad 1, Pad 2 and the Drill Mud Pad are shown on Figure 1, attached as Appendix 1 of this consent.

7. Any pond(s) used on site for the purposes of stormwater and leachate treatment shall be constructed and maintained in a manner which prevents the seepage of wastewater through the pond liners entering surface water or groundwater.

Irrigation

8. The consent holder shall record the following information in association with irrigating wastewater to land:
 - a) the date, time and hours of irrigation;
 - b) the volume of wastewater irrigated to land;
 - c) the conductivity of the irrigation fluid (measured in mS/m);
 - d) the source of the wastewater (e.g. Pond or Wetland Treatment System); and
 - e) the location and extent where the wastewater was irrigated.

The above records shall be made available to the Chief Executive, Taranaki Regional Council, on request.

Consent 5838-2.2

9. There shall be no direct discharge to water as a result of irrigating wastewater to land. This includes, but is not necessarily limited to, ensuring the following:
 - No irrigation shall occur closer than 25 metres to any surface water body;
 - The discharge does not result in surface ponding;
 - No spray drift enters surface water;
 - The discharge does not occur at a rate at which it cannot be assimilated by the soil/pasture system; and
 - The pasture cover within irrigation areas is maintained at all times.
10. Treated wastewater discharged by irrigation to land shall not have a hydrocarbon content exceeding 5% total petroleum hydrocarbon or a sodium adsorption ratio exceeding 18.
11. Discharges irrigated to land shall not give rise to any of the following adverse effects in the Haehanga Stream, after a mixing zone extending 30 metres from the downstream extent of the irrigation areas;
 - a) a rise in filtered carbonaceous biochemical oxygen demand of more than 2.00 gm⁻³;
 - b) a level of unionised ammonia greater than 0.025 gm⁻³;
 - c) an increase in total recoverable hydrocarbons;
 - d) chloride levels greater than 150 g/m³;
 - e) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
 - f) any conspicuous change in the colour or visual clarity;
 - g) any emission of objectionable odour;
 - h) the rendering of fresh water unsuitable for consumption by farm animals; and
 - i) any significant adverse effects on aquatic life.

Soil quality

12. Representative soil samples shall, be taken from each irrigation area at intervals not exceeding 6 months and analysed for total petroleum hydrocarbons, benzene, toluene, ethylbenzene, and xylene.
13. Representative soil samples shall be taken from each irrigation area at intervals not exceeding 3 months and analysed for chloride, sodium, magnesium, calcium, potassium, total, soluble salts, and conductivity.
14. Before 30 November 2015 the holder shall review and update the Uruti Composting Facility Management Plan supplied in support of application 5838-2.2 and any changes shall be submitted for approval to the Chief Executive, Taranaki Regional Council, acting in a certification capacity. The plan shall be adhered to and reviewed on an annual basis (or as required) and any changes shall be submitted for approval to the Chief Executive, Taranaki Regional Council, acting in a certification capacity. The shall plan include but not limited to:
 - a) Trigger limits for the three tier management system tiers set out in section 3.1 of the Uruti Composting Facility Management Plan;
 - b) Monitoring frequencies of soil and groundwater in Tiers one, two, and three;
 - c) Remediation options for Tier three irrigation areas;
 - d) Riparian planting of irrigation areas;
 - e) Stormwater improvements at the site ;
 - f) Water storage for dilution and remediation; and
 - g) Soil and groundwater data analysis.

Groundwater quality

15. The consent holder shall establish and maintain at least one groundwater monitoring well at each of the following locations for the purpose of monitoring the effect of the wastewater discharges on groundwater quality:
- a. up gradient of the irrigation areas in an un-impacted area;
 - b. down gradient of the extent of the irrigation of each area;
 - c. down gradient of the duck pond and drill mud pits and up gradient of irrigation area H for the purpose of assessing integrity clay liners of drilling waste treatment ponds, and
 - d. at NZTM 1731518N-5686536E (approximately 40 metres south of SH3) for the purpose of assess groundwater near the northern boundary.

For the purposes of clarification this condition requires four new bores to be installed for the purposes of establishing irrigation areas F & E and in accordance with the Uruti Composting Facility Management Plan 2015 supplied with application 5838-2.2.

16. Any new groundwater monitoring wells required by condition 15 shall be installed to the following standards;
- a) Prior to installation of any new wells, confirmed NZTM GPS locations shall be provided to the Taranaki Regional Council for approval;
 - b) All new wells shall be at least 25 metres from any water way (unless otherwise authorised by a separate consent) and be accessible by vehicle;
 - c) All new wells shall be installed by a qualified driller and designed to encounter groundwater and accommodate expected annual fluctuations in water level -i.e. screened sections and filter packs to be located next to the water bearing horizons;
 - d) Soils encountered during installation shall be logged by a suitably qualified and graphic logs of the soils and well construction are to be supplied to the Taranaki Regional Council;
 - e) All new wells shall be surveyed for topographical elevation by a suitably qualified person;
 - f) All wells shall completed with an appropriate riser, riser cap, toby and be fenced to prevent stock access;
 - g) Prior to any irrigation occurring in any new irrigation area, a groundwater sample shall be collected from the down gradient well by a suitably qualified person, using a method approved by the Chief Executive of the Taranaki Regional Council and analysed and analysed for sodium, calcium, magnesium, nitrate, ammoniacal nitrogen, pH, chloride, and conductivity.

Adherence to New Zealand Standard 4477:2001 will ensure compliance with this condition.

17. The consent holder shall undertake weekly groundwater level, temperature, and conductivity readings from each well within a single eight hour period using a method approved by the Chief Executive, Taranaki Regional Council. Results shall be recorded in a cumulative spread sheet, a copy of which shall be forwarded to the Taranaki Regional Council every three months, or upon request.

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18. Groundwater samples shall be collected from all monitoring wells required under condition 15 at intervals not exceeding 6 months by a suitably qualified person using a method approved by the Chief Executive, Taranaki Regional Council and analysed for; total petroleum hydrocarbons, benzene, toluene, ethylbenzene, xylene, lead and arsenic.
19. Groundwater samples shall be collected from all monitoring wells required under condition 15 at intervals not exceeding 3 months by a suitably qualified person using a method approved by the Chief Executive, Taranaki Regional Council and analysed for; chloride, sodium, magnesium, calcium, total soluble salts, and conductivity.

Pond Treatment System

20. The consent holder shall prepare a Pond Treatment System Management Plan which details management practices undertaken to maximise treatment capabilities of the system. The plan shall be submitted for approval to the Chief Executive, Taranaki Regional Council, acting in a certification capacity, within one month of the commencement date of this consent.

The Management Plan shall address, but not necessarily be limited to, the following matters:

- a) how the build up of sediment and/or sludge will be managed within the entire system, how the level of build-up will be monitored including factors that will trigger management, and the frequency of undertaking the identified measures or procedures;
 - b) how overloading of the system will be prevented; and
 - c) how any offensive or objectionable odours at or beyond the site boundary will be avoided in accordance with condition 13 of consent 5839-2.
21. Operations on site shall be undertaken in accordance with the Pond Treatment System Management Plan, approved under condition 20 above, except in circumstances when the Proposed Implementation Plan, approved under condition 9 of consent 5839-2, specifies otherwise.

Wetland Treatment System

22. The consent holder shall prepare a Wetland Treatment System Management Plan that details management practices undertaken to maximise treatment capabilities of the system. The plan shall be submitted for approval to the Chief Executive, Taranaki Regional Council, acting in a certification capacity, within one month of the commencement date of this consent.

The Management Plan shall address, but not necessarily be limited to, the following matters:

- a) how the build up of sediment and/or sludge will be managed within the entire system, how the level of build-up will be monitored including factors which will trigger management, and the frequency of undertaking the identified measures or procedures; and
- b) how plant die-off within the system will be managed, and the frequency and/or timing of undertaking the identified measures or procedures.

Consent 5838-2.2

23. Operations on site shall be undertaken in accordance with the Wetland Treatment System Management Plan, approved under condition 22 above.
24. The discharge from the Wetland Treatment System shall meet the following standards (at monitoring site IND003008):
 - a) the suspended solids concentration shall not exceed 100 g/m³; and
 - b) the pH shall be between 6.0 and 9.0.
25. Discharges from the Wetland Treatment System shall not give rise to any of the following effects in the unnamed tributary of the Haehanga Stream, after a mixing zone of 40 metres, at established monitoring site HHG000103 (at or about grid reference 1732695E-5685050N):
 - a) a rise in filtered carbonaceous biochemical oxygen demand of more than 2.00 gm⁻³;
 - b) a level of unionised ammonia greater than 0.025 gm⁻³;
 - c) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
 - d) any conspicuous change in the colour or visual clarity;
 - e) any emission of objectionable odour;
 - f) the rendering of fresh water unsuitable for consumption by farm animals; and
 - g) any significant adverse effects on aquatic life.

Riparian planting

26. The consent holder shall maintain the areas of riparian planting, undertaken in accordance with option 1 of riparian management plan RMP383, by ensuring the ongoing replacement of plants which do not survive, the eradication of weeds until the plants are well established, and the exclusion of stock from the planted areas.

Incident notification

27. The consent holder shall keep a permanent record of any incident related to this consent that results, or could result, in an adverse effect on the environment. The consent holder shall make the incident register available to the Taranaki Regional Council on request.

Details of any incident shall be forwarded to the Taranaki Regional Council immediately. At the grant date of this consent, the Taranaki Regional Council's phone number is 0800 736 222 (24 hour service).

Site reinstatement

28. The consent holder shall prepare a Site Exit Plan which details how the site is going to be reinstated prior to the consent expiring or being surrendered. The Plan shall be submitted for approval to the Chief Executive, Taranaki Regional Council, acting in a certification capacity, at least 6 months prior to this consent expiring or being surrendered.

The Site Exit Plan shall address, but not necessarily be limited to, the following matters:

- a) How the site will be reinstated so that no raw materials listed or approved under condition 2 of this consent remain on site;
- b) How the site will be reinstated so that no partially decomposed material remains on site;

Consent 5838-2.2

- c) How any remaining leachate or sludge, resulting from the operation, will be either removed from the site, buried, treated or otherwise to avoid any adverse effects on groundwater or surface water;
- d) The remediation of irrigated soils and groundwater; and
- e) Timeframes for undertaking the activities identified in association with a) to c) above.

Note: The requirement of this condition shall not apply if the consent holder applies for a new consent to replace this consent when it expires.

- 29. The consent holder shall reinstate the site in accordance with the plan approved under condition 28 above prior to this consent expiring or being surrendered.

Review

- 30. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review within one month of approving the plan required under condition 9 of consent 5839-2 and/or during the month of June in any year for any of the following purposes:
 - a) Ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, and in particular to address any more than minor adverse effects relating to odour discharges from the site and/or water quality issues;
 - b) To incorporate into the consent any modification to the operation and maintenance procedures or monitoring that may be necessary to deal with any adverse effects on the environment arising from changes in association with condition 9 of consent 5839-2; and
 - c) To determine any measures that may be appropriate to comply with condition 1 of this consent, and which are necessary to address any adverse effects relating to the wastewater discharges and/or odour from the site.

Signed at Stratford on 20 August 2015

For and on behalf of
Taranaki Regional Council

A D McLay
Director - Resource Management

Appendix 1 of consent 5838

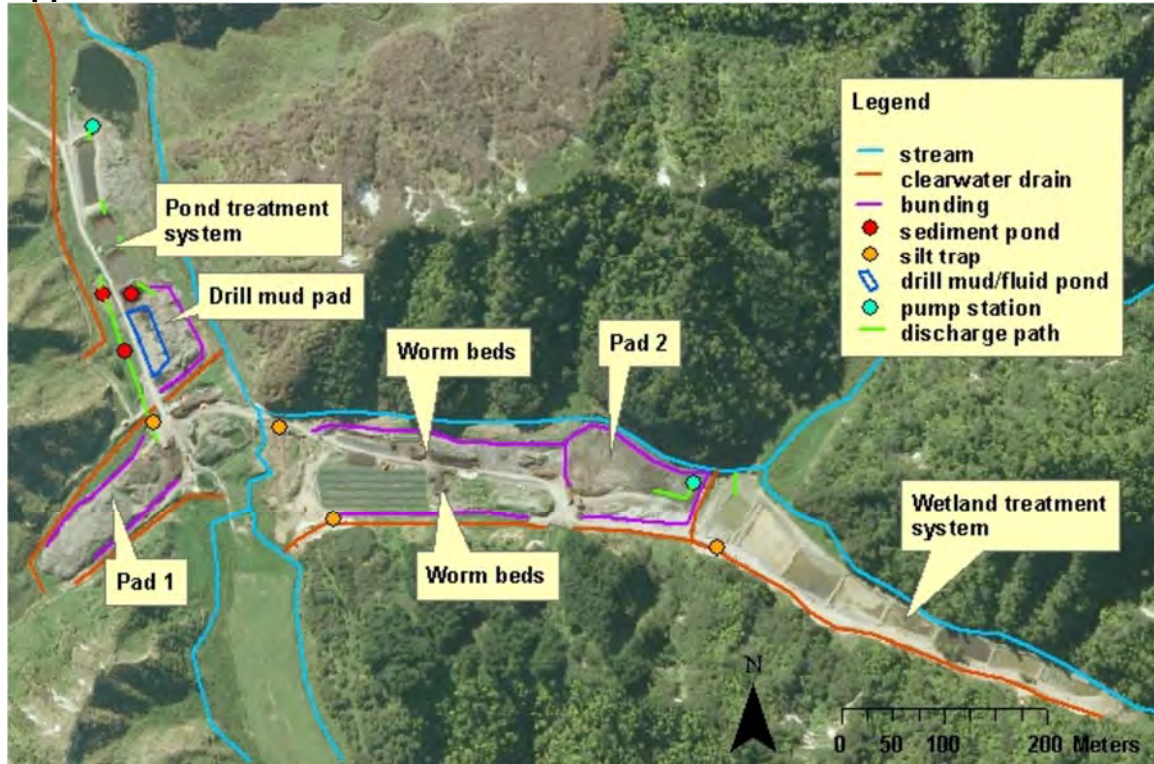


Figure 1 The location and extent of the Pond Treatment System, Wetland Treatment System, Pads 1 and 2, and the Drill Mud Pad.

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

Name of
Consent Holder: Remediation (NZ) Limited
P O Box 8045
NEW PLYMOUTH 4342

Decision Date: 27 May 2010

Commencement
Date: 18 June 2010

Conditions of Consent

Consent Granted: To discharge emissions into the air, namely odour and dust, from composting operations between (NZTM) 1731704E-5685796N, 1733127E-5684809N, 1732277E-5685101N, 1732451E-5684624N and 1732056E-5684927N

Expiry Date: 1 June 2018

Review Date(s): June 2011, June 2012, June 2013, June 2014, June 2015, June 2016, June 2017

Site Location: 1450 Mokau Road, Uruti

Legal Description: Sec 34 Pt Sec 4 Blk II Upper Waitara SD

General condition

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

General

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.
2. The surface areas of Pad 1 and Pad 2 shall not exceed 3,500 m² and 4,000 m², respectively.

Note: For the purposes of this condition, the location and extent of Pad 1 and Pad 2 are shown on Figure 1, attached as Appendix 1 of this consent.

Incoming material

3. The raw materials accepted onsite shall be limited to the following:
 - Paunch grass;
 - Animal manure from meat processing plant stock yards and dairy farm oxidation pond solids;
 - Green vegetative wastes;
 - Biosolids wastes including, but not limited to, pellets from wastewater treatment plants;
 - Mechanical pulping pulp and paper residue [excluding any pulping wastes that have been subject to chemical pulping or treated or mixed with any substance or material containing chlorine or chlorinated compounds];
 - Solid drilling cuttings from hydrocarbon exploration provided they are blended down to a maximum hydrocarbon content of 5.0 % total petroleum hydrocarbon within 3 days of being received onsite;
 - Water based and synthetic based drilling fluids from hydrocarbon exploration provided they are blended down to a maximum hydrocarbon content of 5.0 % total petroleum hydrocarbon content within 3 days of being brought onto the site;
 - Produced water from hydrocarbon exploration;
 - Vegetable waste solids [being processing by-products];
 - Grease trap waste [from food service industries];
 - Fish skeletal and muscle residue post filleting [free from offal]; and
 - Poultry industry waste [eggshells, yolks, macerated chicks and chicken mortalities].

The acceptance of any other materials shall only occur if the Chief Executive, Taranaki Regional Council advises in writing that he is satisfied on reasonable grounds that the other materials will have minimal effects beyond those materials listed above.

4. Material produced as a result of a dissolved air flotation process shall not be accepted on site.

Consent 5839-2

5. The consent holder shall record the following information in association with accepting all incoming material on site:
 - a) the date and time that the material is accepted;
 - b) description of the material; and
 - c) the approximate volumes of material.

The above records shall be made available to the Chief Executive, Taranaki Regional Council, on request.

Management practices

6. The consent holder shall prepare a Site Practices Management Plan which details management practices undertaken to ensure that offensive or objectionable odours at or beyond the site boundary will be avoided in accordance with condition 13 of this consent. The plan shall be submitted for approval to the Chief Executive, Taranaki Regional Council, acting in a certification capacity, within one month of the commencement date of this consent.

The Management Plan shall address, but not necessarily be limited to, the following matters:

- a) identification of all activities on site which have the potential to generate odour [e.g. turning compost piles, removing sludge from ponds];
 - b) the conditions and/or time of day when activities identified under a) above should be undertaken [e.g. during favourable weather conditions and the identification of those conditions] and/or measures that shall be implemented to avoid odours arising [e.g. containment measures];
 - c) measures undertaken to minimise odours during receiving and storing material on Pad 1 and Pad 2 and throughout the composting and vermiculture processes [e.g. method[s] used to cover material once received, how anaerobic conditions are maintained];
 - d) measures undertaken to minimise odours arising in the Wetland Treatment System, and identification of the time of year and/or frequency when undertaken;
 - e) measures undertaken to minimise odours arising in the Pond Treatment System and associated treatment measures [e.g. silt traps located upstream], and identification of the time of year and/or frequency when undertaken; and
 - f) details of how a complaint investigation procedure shall operate, including what data shall be collected and what feedback is to be provided to the complainant.
7. Operations on site shall be undertaken in accordance with the Site Practices Management Plan, approved under condition 6 above, except in circumstances when the Proposed Implementation Plan, approved under condition 9 of this consent, specifies otherwise.

Site audit and implementation

8. The consent holder shall engage a suitably qualified and experienced professional to prepare and submit an Odour Assessment Report for approval to the Chief Executive, Taranaki Regional Council, acting in a certification capacity, within three months of the commencement date of this consent. The professional that the consent holder engages shall be to the reasonable approval of the Chief Executive, Taranaki Regional Council.

The report shall include, but not necessarily be limited to, the following:

- a) The appropriateness of the management practices and control measures undertaken in avoiding offensive and/or objectionable odours arising beyond the property boundary in association with the composting processes on Pad 1;
- b) Recommendations in association with a) above;
- c) The appropriateness of the design and management of the Pond Treatment System and associated pre-treatment devices (e.g. silt ponds) in effectively managing odours arising from treating leachate derived from Pad 1 and avoiding offensive and/or objectionable odours arising beyond the property boundary; and
- d) Recommendations in association with c) above.

For assisting with the above assessment, the consent holder shall provide a copy of the documents listed below to the engaged and approved professional:

- The Taranaki Regional Council final officers report and hearing decision report for applications 5276 and 5277;
- Consent certificates [including conditions] for consents 5838-2 and 5839-2;
- The Pond Treatment System Management Plan approved under condition 18 of consent 5838-2; and
- The Site Practices Management Plan approved under condition 6 of this consent.

9. The consent holder shall prepare and submit a Proposed Implementation Plan for approval to the Chief Executive, Taranaki Regional Council, acting in a certification capacity, within one month of the Odour Assessment Report being approved under condition 8 above.

The Plan shall include, but not necessarily be limited to, the following:

- a) Management practices and/or control measures proposed to be implemented in association with the composting processes on Pad 1, of which are from the recommendations of the Odour Assessment Report, approved in accordance with condition 8;
- b) Management practices and/or control measures proposed to be implemented in association with the Pond Treatment System, of which are from the recommendations of the Odour Assessment Report, approved in accordance with condition 8;
- c) The reasons for the chosen practices and/or measures identified in accordance with a) and b) above
- d) A timeframe by when each of the practices and/or measures identified in accordance with a) and b) above will be implemented

Consent 5839-2

- e) Identification of appropriate management practices to ensure the on-going functionality of any chosen control measures identified in accordance with a) and b) above
10. Operations and activities on site shall be undertaken in accordance with the Proposed Implementation Plan, approved under condition 9 above.

Dust

11. The dust deposition rate beyond the boundary of the consent holder's site arising from the discharge shall be less than 4.0 g/m²/30 days.

Note: For the purposes of this condition, the consent holder's site is defined as Sec 34 Pt Sec 4 Blk II Upper Waitara SD.

12. Any discharge to air from the site shall not give rise to any offensive, objectionable, noxious or toxic levels of dust at or beyond the boundary of the consent holder's site, and in any case, total suspended particulate matter shall not exceed 120 µg/m³ as a 24 hour average [measured under ambient conditions] beyond the boundary of the consent holder's site.

Note: For the purposes of this condition, the consent holder's site is defined as Sec 34 Pt Sec 4 Blk II Upper Waitara SD.

Odour

13. The discharges authorised by this consent shall not give rise to an odour at or beyond the boundary of the consent holder's site that is offensive or objectionable.

Note: For the purposes of this condition:

- The consent holder's site is defined as Sec 34 Pt Sec 4 Blk II Upper Waitara SD; and
- Assessment under this condition shall be in accordance with the *Good Practice Guide for Assessing and Managing Odour in New Zealand, Air Quality Report 36, Ministry for the Environment, 2003.*

Monitoring

14. The consent holder shall install a monitoring device that continuously records wind speed and direction in the area of the composting activity. The device shall be capable of logging collected data for at least six months and shall be installed and be operational within three months of the commencement date of this consent.

The data shall be provided telemetrically to the Taranaki Regional Council. If this method is not technically feasible, the data shall be provided to the Taranaki Regional Council at a frequency and a form advised by the Chief Executive, Taranaki Regional Council until such a time it is technically feasible to telemetric the data.

Odour surveys

15. The consent holder shall undertake an odour survey within six months of the Plan approved under condition 9 of this consent being implemented and thereafter at yearly intervals during periods when metrological conditions are most likely to result in offsite odour. The methodology for the survey shall be consistent with German Standard VDI 3940 "Determination of Odorants in Ambient Air by Field Inspection", or similar. Prior to the survey being carried out, the methodology shall be approved by the Chief Executive, Taranaki Regional Council, acting in a certification capacity.

The results of the survey shall be provided to the Chief Executive, Taranaki Regional Council, within three months of the survey being completed.

Community liaison

16. The consent holder and the Director – Resource Management, Taranaki Regional Council, or his delegate, shall meet locally as appropriate, six monthly or at such other frequency as the parties may agree, with submitters to the application of this consent and any other interested party at the discretion of the Chief Executive, Taranaki Regional Council, to discuss any matter relating to the exercise of this consent, in order to facilitate ongoing community consultation.

Incident notification

17. The consent holder shall keep a permanent record of any incident related to this consent that results, or could result, in an adverse effect on the environment. The consent holder shall make the incident register available to the Taranaki Regional Council on request.

Details of any incident shall be forwarded to the Taranaki Regional Council immediately. At the grant date of this consent, the Council's phone number is 0800 736 222 [24 hour service].

Site reinstatement

18. The consent holder shall prepare a Site Exit Plan which details how the site is going to be reinstated prior to the consent expiring or being surrendered. The Plan shall be submitted for approval to the Chief Executive, Taranaki Regional Council, acting in a certification capacity, at least 3 months prior to this consent expiring or being surrendered.

The Site Exit Plan shall address, but not necessarily be limited to, the following matters:

- a) How the site will be reinstated so that no raw materials listed or approved under condition 3 of this consent remain on site;
- b) How the site will be reinstated so that no partially decomposed material remains on site;
- c) How any remaining leachate or sludge, resulting from the operation, will be either removed from the site, buried, treated or otherwise to avoid any adverse effects on groundwater or surface water; and

Consent 5839-2

- d) Timeframes for undertaking the activities identified in association with a) to c) above.

Note: The requirement of this condition shall not apply if the consent holder applies for a new consent to replace this consent when it expires.

19. The consent holder shall reinstate the site in accordance with the Plan approved under condition 18 above prior to this consent expiring or being surrendered.

Review

20. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review within one month of approving the plan required under condition 9 of this consent and/or during the month of June in any year for any of the following purposes:
 - a) Ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, and in particular to address any more than minor adverse effects relating to odour discharges from the site;
 - b) To incorporate into the consent any modification to the operation and maintenance procedures or monitoring that may be necessary to deal with any adverse effects on the environment arising from changes in association with condition 9 of this consent; and
 - c) To determine any measures that may be appropriate to comply with condition 1 of this consent, and which are necessary to address any adverse effects of odour from the site.

Signed at Stratford on 27 May 2010

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Appendix 1 of consent 5839-2

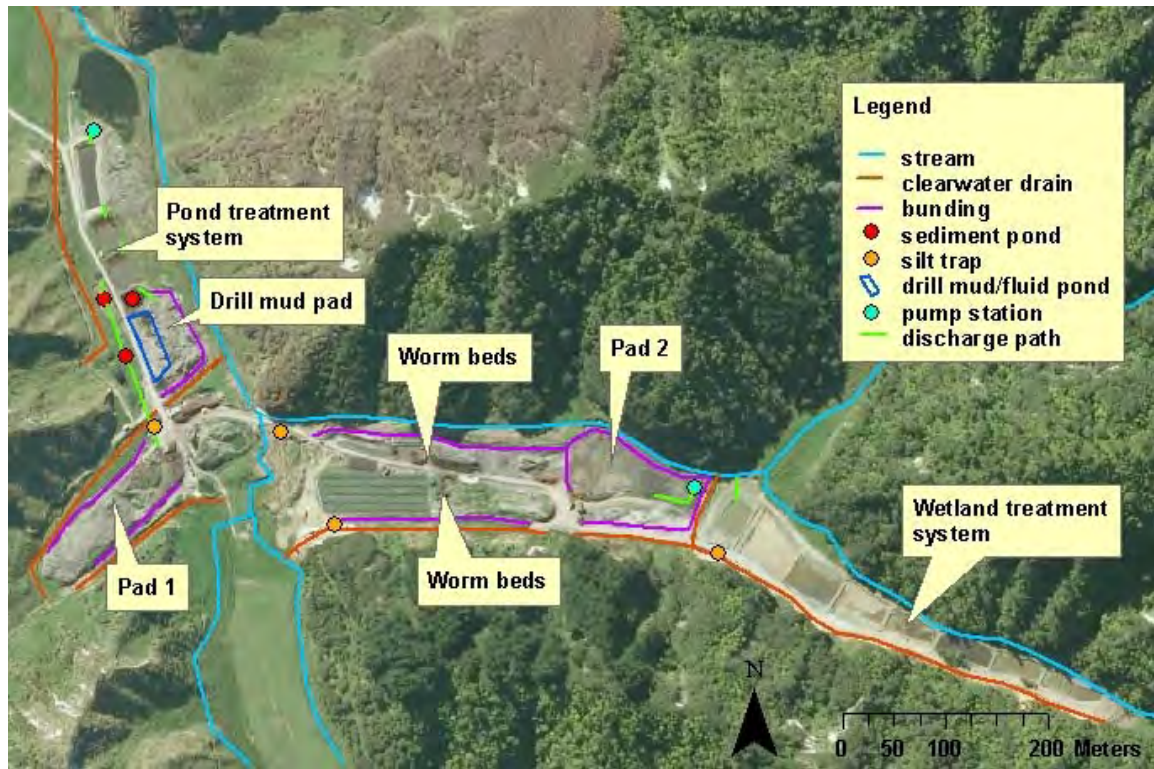


Figure 1 The location and extent of the composting operation including Pads 1 and 2.

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

Name of
Consent Holder: PEL Waste Services Limited
P O Box 3091
HAMILTON

Consent Granted
Date: 7 September 2006

Conditions of Consent

Consent Granted: To discharge stormwater from worm farming operations onto and into land and into an unnamed tributary of the Waiongana Stream at or about GR: Q19:160-416

Expiry Date: 1 June 2020

Review Date(s): June 2008, June 2014

Site Location: 96 Waitara Road, Brixton, Waitara

Legal Description: Lot 1 DP 19670 Blk III Paritutu SD

Catchment: Waiongana

General conditions

- a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

1. This consent shall be exercised generally in accordance with the information submitted in support of applications 1559 and 4037. In the case of any contradiction between the documentation submitted in support of applications 1559 and 4037 and the conditions of this consent, the conditions of this consent shall prevail.
2. At all times the consent holder shall 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 associated with worm farming activities and the discharge of stormwater onto and into land.
3. Within three months of granting of this consent the consent holder shall prepare and maintain a stormwater management plan to the satisfaction of the Chief Executive, Taranaki Regional Council. This plan shall be updated as required by any significant changes to plant processes.
4. The consent holder shall keep and make available to the Chief Executive, Taranaki Regional Council, upon request, records of the nature and volume of all wastes received at the site; such records to be kept for at least 12 months.
5. The exercise of this consent shall not result in any contamination of groundwater or surface water, other than as provided for in special condition 6 of this consent.
6. The stormwater treatment system shall be maintained to the satisfaction of the Chief Executive, Taranaki Regional Council.

The following concentrations shall not be exceeded within the discharge effluent:

Component	Concentration
pH (range)	6.5-8.5
suspended solids	100 gm ⁻³

Consent 5892-2

This condition shall apply prior to any stormwater prior to leaving the site into the neighbouring drain, at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

7. After allowing for reasonable mixing, with a mixing zone extending seven times the width of the receiving waters downstream of the discharge point, the discharge shall not give rise to any of the following effects in the receiving waters of the unnamed tributary:
 - a) the production of any 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 or objectionable odour;
 - d) the rendering of fresh water unsuitable for consumption by farm animals;
 - e) any significant adverse effects on aquatic life.
8. The consent holder shall ensure that except when discharging, windrows shall be covered at all times.
9. Prior to undertaking any alterations to the processes or operations which significantly change the nature or quantity of contaminants emitted from the site, the consent holder shall consult with the Chief Executive, Taranaki Regional Council, and shall obtain any necessary approvals under the Resource Management Act 1991.
10. The Chief Executive, Taranaki Regional Council, shall be advised in writing at least 48 hours prior to the reinstatement of the site and the reinstatement shall be carried out so as to minimise effects on stormwater quality, and to meet the criteria of Tables 4.11, 4.14 & 4.20 of the Ministry for the Environment (1999) document 'Guidelines for Assessing & Managing Petroleum Hydrocarbon Contaminated sites in N.Z.'.
11. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2008 and/or June 2014, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Transferred at Stratford on 12 December 2006

For and on behalf of
Taranaki Regional Council

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: Remediation (NZ) Limited
P O Box 8045
NEW PLYMOUTH 4342

Consent Granted
Date: 12 October 2006

Conditions of Consent

Consent Granted: To discharge solid hydrocarbon exploration drilling wastes onto land for worm farming operations and to discharge stormwater from worm farming operations onto and into land and into an unnamed tributary of the Waitara River at or about (NZTM) 1706208E-5679875N

Expiry Date: 1 June 2021

Review Date(s): June 2009, June 2015

Site Location: 6 Pennington Road, Waitara

Legal Description: Lot 1 DP 18170 Blk V Waitara SD

Catchment: Waitara

General conditions

- a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

1. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of applications 1560 and 4038. In the case of any contradiction between the documentation submitted in support of applications 1560 and 4038 and the conditions of this consent, the conditions of this consent shall prevail.
2. At all times the consent holder shall 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 associated with worm farming activities and the discharge of solid hydrocarbon exploration drilling wastes onto land including effects to surface water and groundwater.
3. The consent holder shall keep and make available to the Chief Executive, Taranaki Regional Council, upon request, records of the nature and volume of all wastes received at the site; such records to be kept for at least 12 months.
4. The solid drilling cuttings from hydrocarbon exploration shall not exceed a maximum hydrocarbon content of 5.0% total petroleum hydrocarbon prior to mixing or incorporation
5. The exercise of this consent shall not result in any contamination of groundwater or surface water, other than as provided for in special conditions 7 and 8 of this consent.
6. The stormwater treatment system shall be maintained to the satisfaction of the Chief Executive, Taranaki Regional Council.
7. The following concentrations shall not be exceeded within the discharge effluent:

Component	Concentration
pH (range)	6.5-8.5
suspended solids	100 gm ⁻³
total recoverable hydrocarbons [infrared spectroscopic technique]	15 gm ⁻³

Consent 5893-2

This condition shall apply prior to the entry of the stormwater into the receiving waters of the unnamed tributary, at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

8. After allowing for reasonable mixing within a mixing zone extending downstream of the discharge point to the Pennington Road culvert the discharge shall not give rise to any of the following effects in the receiving waters of the unnamed tributary:
 - a) the production of any 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 fresh water unsuitable for consumption by farm animals;
 - e) any significant adverse effects on aquatic life.
9. That prior to undertaking any alterations to the processes or operations which significantly change the nature or quantity of contaminants emitted from the site, the consent holder shall consult with the Chief Executive, Taranaki Regional Council, and shall obtain any necessary approvals under the Resource Management Act 1991.
10. The Chief Executive, Taranaki Regional Council, shall be advised in writing at least 48 hours prior to the reinstatement of the site and the reinstatement shall be carried out so as to minimise effects on stormwater quality, and to meet the criteria of Tables 4.11, 4.14 & 4.20 of the Ministry for the Environment (1999) document 'Guidelines for Assessing & Managing Petroleum Hydrocarbon Contaminated sites in N.Z.'.
11. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2009 and/or June 2015, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Transferred at Stratford on 22 September 2008

For and on behalf of
Taranaki Regional Council

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: Remediation (NZ) Limited
PO Box 8045
New Plymouth 4342

Decision Date: 01 September 2015

Commencement Date: 01 September 2015

Conditions of Consent

Consent Granted: To use a twin culvert in the Haehanga Stream for vehicle access purposes

Expiry Date: 01 June 2033

Review Date(s): June 2021 and June 2027

Site Location: 1460 Mokau Road, Uruti

Legal Description: Sec 34 Pt Sec 4 Blk II Upper Waitara (site of structure)

Grid Reference (NZTM) 1731706E - 5685779N

Catchment: Mimi

Tributary: Haehanga

*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. The consent holder shall ensure that the stream bed downstream from the structure is built up with appropriate material before 31 March 2016 to allow for fish passage and from this date forward the structure shall not prevent the passage of fish.
2. The consent holder shall maintain the structure so that:
 - (a) it does not become blocked and at all times allows the free flow of water through it;
 - (b) any erosion, scour or instability of the stream bed or banks is remedied by the consent holder.
3. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2021 and/or June 2027, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 01 September 2015

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: Remediation (NZ) Limited
 P O Box 8045
 NEW PLYMOUTH 4342

Consent Granted 26 September 2003
Date:

Conditions of Consent

Consent Granted: To realign and divert the Haehanga Stream in the Mimi
 catchment for land improvement purposes at or about
 (NZTM) 1732402E-5684777N

Expiry Date: 1 June 2021

Review Date(s): June 2009, June 2015

Site Location: 1460 Mokau Road, Uruti

Legal Description: Pt Sec 4 Blk II Upper Waitara SD

Catchment: Mimi

Tributary: Haehanga

General conditions

- a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

1. The consent holder shall notify the Taranaki Regional Council at least 48 hours prior to and upon completion of any subsequent maintenance works that would involve disturbance of or deposition to the riverbed or discharges to water.
2. The realignment authorised by this consent shall be undertaken generally in accordance with the documentation submitted in support of the application and shall be maintained to ensure the conditions of this consent are met.
3. The consent holder shall adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to avoid or minimise erosion and scouring as a result of channel realignment.
4. The consent holder shall adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to avoid or minimise the discharge of silt or other contaminants into water or onto the riverbed and to avoid or minimise the disturbance of the riverbed and any adverse effects on water quality.
5. The consent holder shall ensure that the area and volume of riverbed disturbance shall, so far as is practicable, be minimised and any areas which are disturbed shall, so far as is practicable, be reinstated.

Consent 6211-1

6. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2009 and/or June 2015, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Transferred at Stratford on 22 September 2008

For and on behalf of
Taranaki Regional Council

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: Remediation (NZ) Limited
 P O Box 8045
 NEW PLYMOUTH 4342

Consent Granted 26 September 2003
Date:

Conditions of Consent

Consent Granted: To erect, place, use and maintain a culvert and associated
 structure[s] in the bed of the Haehanga Stream in the Mimi
 catchment for access purposes at or about (NZTM)
 1732402E-5684777N

Expiry Date: 1 June 2021

Review Date(s): June 2009, June 2015

Site Location: 1460 Mokau Road, Uruti

Legal Description: Pt Sec 4 Blk II Upper Waitara SD

Catchment: Mimi

Tributary: Haehanga

General conditions

- a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

1. The consent holder shall notify the Taranaki Regional Council in writing at least 48 hours prior to the commencement and upon completion of removal of the temporary culvert [being the 800mm diameter culvert] and installation of the permanent culvert and associated structures, and again at least 48 hours prior to and upon completion of any subsequent maintenance works which would involve disturbance of or deposition to the riverbed or discharges to water.
2. The consent holder shall replace the existing temporary culvert with a permanent culvert and associated structure[s] by 1 April 2004. Prior to the installation of the permanent culvert and associated structure[s] the consent holder shall forward designs of the proposed culvert and associated structure[s] for the written approval of the Chief Executive.
3. The structures authorised by this consent shall be constructed generally in accordance with the documentation submitted in support of the application and shall be maintained to ensure the conditions of this consent are met.
4. The consent holder shall adopt the best practicable option to avoid or minimise the discharge of silt or other contaminants into water or onto the riverbed and to avoid or minimise the disturbance of the riverbed and any adverse effects on water quality.
5. The consent holder shall ensure that the area and volume of riverbed disturbance shall, so far as is practicable, be minimised and any areas which are disturbed shall, so far as is practicable, be reinstated.
6. The structures, which are the subject of this consent, shall not obstruct fish passage.
7. The structures authorised by this consent shall be removed and the area reinstated if and when the structures are no longer required. The consent holder shall notify the Taranaki Regional Council at least 48 hours prior to structures removal and reinstatement.

Consent 6212-1

8. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2009 and/or June 2015, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Transferred at Stratford on 22 September 2008

For and on behalf of
Taranaki Regional Council

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: Remediation New Zealand
107 Corbett Road
Bell Block 4373

Decision Date: 09 March 2015

Commencement Date: 09 March 2015

Conditions of Consent

Consent Granted: To discharge treated stormwater from a quarry site, into an unnamed tributary of the Haehanga Stream

Expiry Date: 01 June 2033

Review Date(s): June 2021 and/or June 2027

Site Location: 1460 Mokau Road, Uruti

Legal Description: Sec 34 Pt Sec 4 Blk II Upper Waitara SD (Discharge source & site)

Grid Reference (NZTM) 1732059E-5684796N

Catchment: Mimi

Tributary: Haehanga

*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. This consent authorises the discharge of treated stormwater into an unnamed tributary of the Haehanga Stream, as described in the information provided with the application, and specifically:
 - a) The Assessment of Environmental Effects prepared by BTW Company Limited dated 9 January 2015; and
 - b) Additional Information prepared by BTW Company Limited dated 16 February 2015.

In the case of any contradiction between the details of information provided and the conditions of this consent, the conditions of this consent shall prevail.

2. The consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing, at least 48 hours prior to the exercise of this consent (including vegetation removal). Notification shall include:
 - a) the consent number;
 - b) a brief description of the activity consented; and
 - c) the extent or stage of the activity to be commenced.

Notification shall be emailed to worknotification@trc.govt.nz.

3. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.
4. The consent holder shall operate and progressively reinstate the quarry site in a manner which ensures that the area of exposed, un-vegetated earth, within the quarry's stormwater catchment is kept to a minimum at all times.
5. The consent holder shall ensure that no area greater than 1 ha is exposed at any one time.
6. The stormwater discharged shall be from a catchment area not exceeding 4 ha.
7. This stormwater treatment system shall be installed before any site works commences.
8. The stormwater treatment system shall be maintained for the life of the quarry operation.
9. All stormwater shall be directed for treatment through the stormwater treatment system prior to discharge into the Haehanga Stream tributary.

10. Constituents of the discharge shall meet the standards shown in the following table.

Constituent	Standard
pH	Within the range 6.0 to 9.0
suspended solids	Concentration not greater than 100 gm ⁻³
total hydrocarbons	Concentration not greater than 15 gm ⁻³

This condition shall apply before entry of the treated stormwater into the receiving waters at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

11. The pH may exceed 9.0 if the exceedance is a result photosynthetic activity within the detention ponds, but in any case the discharge shall not result in the pH of the receiving water increasing by more than 0.5 pH units after allowing for a mixing zone of 25 metres.
12. After allowing for reasonable mixing, within a mixing zone extending 500 metres downstream of any discharge point, the discharge shall not give rise to any of the following effects in the receiving waters:
- a) the production of any 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 fresh water unsuitable for consumption by farm animals;
 - e) any significant adverse effects on aquatic life.
13. After allowing for reasonable mixing, within a mixing zone extending 500 metres downstream of any discharge point, the discharge shall not give rise to any of the following effects in the receiving waters:
- a) an increase in the suspended solids concentration within the unnamed tributary of the Haehanga Stream in excess of 10 grams per cubic metres when the turbidity as measured immediately upstream of the discharge point is equal to or less than 5 NTU (nephelometric turbidity units); or
 - b) an increase in the turbidity within the unnamed tributary of the Haehanga Stream of more than 50%, where the stream turbidity measured upstream if the discharge is greater than 5 NTU, as determined using NTU (nephelometric turbidity units).
14. The consent holder shall maintain and regularly update a 'Contingency Plan' that details measures and procedures that will be undertaken to prevent, and to avoid environmental effects from, a spillage or any discharge of contaminants not authorised by this consent. The plan shall be approved by the Chief Executive, Taranaki Regional Council, acting in a certification capacity.

Consent 10063-1.0

15. The site shall be operated in accordance with a 'Management Plan' prepared by the consent holder and approved by the Chief Executive, Taranaki Regional Council, acting in a certification capacity. The plan shall detail how the site is to be managed to minimise the contaminants that become entrained in the stormwater and shall include as minimum:
- a) the loading and unloading of materials;
 - b) maintenance of conveyance systems;
 - c) general housekeeping; and
 - d) management of the interceptor system.

A Stormwater Management Plan template is available in the Environment section of the Taranaki Regional Council's web site www.trc.govt.nz.

16. The consent holder shall notify the Chief Executive, Taranaki Regional Council, prior to making any changes to the processes or operations undertaken at the site, or the chemicals used or stored on site that could alter the nature of the discharge. Any such change shall then only occur following receipt of any necessary approval under the Resource Management Act. Notification shall include the consent number, a brief description of the activity consented and an assessment of the environmental effects of any changes, and be emailed to consents@trc.govt.nz.
17. This consent shall lapse on 31 March 2020, 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. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2021 and/or June 2027, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 09 March 2015

For and on behalf of
Taranaki Regional Council



A D McLay
Director - Resource Management

Appendix II

Biomonitoring reports

To Nathan Crook, Job Manager
From Bart Jansma; Environmental Scientist
Report No BJ308
Document No 2049001
Date 7 May 2018

Biomonitoring of the Haehanga Stream in relation to discharges from the Remediation (NZ) Limited composting site at Uruti, January 2018

Introduction

Remediation (NZ) Ltd operates a composting facility in the Haehanga Valley, Uruti. Raw materials are trucked to the site for composting, on a purpose built composting pad for a period of 35-40 days. Synthetic hydrocarbon contaminated drilling muds and cuttings are also received on site. They are piled up and the liquids are allowed to drain, then blended with green waste and other organic matter. Composted material is transported off site by trucks to Remediation (NZ) Ltd's worm farming operations at Waitara Road and Pennington Road.

This survey was the only survey scheduled for the 2017-2018 monitoring year. At the time of this survey, there were two composting pads. The south-west pad (referred to as composting pad 1 in this report) is where the synthetic muds are blended with green waste and other organic matter. A second pad northeast of the original composting pad, which became operational in the summer of 2005, is referred to as composting pad 2.

Both composting pads are bunded, with all surface stormwater and leachate contained and directed to treatment ponds. Water from the settling pond is recycled back to the composting material when required to maintain a moist composting environment. The runoff from composting pad 1 is treated in a series of ponds. Between each pond, there is a baffle that skims off any floating hydrocarbons as the leachate passes through. The treated liquid in the final pond, located just upstream of site 5 (HHG000115), is then irrigated to pasture. This irrigation system was installed prior to the November 2005 biological survey.

Prior to February 2008, no discharges of stormwater or leachate directly entered the Haehanga Stream or its tributaries. However, after that date, the site has been permitted to discharge treated stormwater and compost leachate to the unnamed tributary of the Haehanga Stream. This comes from composting pad 2, where leachate is pumped up to the top of a seven-tier wetland, which was constructed in late 2007. Under dry conditions, the wetland water from the bottom pond of the wetland is reticulated back to the upper tier of the wetland. Under high flow conditions the wetland discharges to a tributary of the Haehanga Stream.

In addition to this discharge from the wetland, there is some potential for seepage from the composting pads and irrigation area to enter groundwater, and for stormwater runoff to escape the collection system, and thus gravitate toward the surface watercourses at the site.

A baseline survey of five sites was conducted in October 2002 in relation to the composting operation (Dunning, 2003). At the time of this earlier survey, only composting pad 1 was operational, and sites were established for both the existing and proposed composting pads. Unnamed tributaries of the Haehanga Stream flow adjacent to (and down gradient of) both composting pads and flow into the Haehanga Stream downstream of the composting areas (Figure 1). Since this baseline survey, significant changes have occurred on site, leading to sampling sites being moved, or sampling at some sites to be discontinued. Any

changes to sampling sites made prior to the current survey have been discussed in previous reports, referenced below.

The current biological survey was conducted to monitor the effects of discharges from the composting site to the Haehanga Stream and tributaries in relation to composting areas (pads 1 & 2), the irrigation of treated liquid to land, and the discharge of treated stormwater and leachate to the unnamed tributary. During the May 2012 survey an additional site was included (HHG000150), at the downstream extent of the irrigation area. This site is now referred to as site 6, with HHG000112 now referred to as site 5. This constitutes a change, as HHG000112 was previously referred to as site 6.

Methods

This survey, completed on 16 January 2018 was preceded by a particularly dry start to the summer, resulting in significantly reduced flows in the Haehanga catchment. Consequently, invertebrate samples were not collected from sites T2 and T3 in the unnamed tributary. Sampling techniques were also impacted, due to reduced riffle habitat.

Two different sampling techniques were used to collect streambed macroinvertebrates in this survey. The 'vegetation sweep' sampling technique was used at sites 1, 2, 5 and 7 and the Council's standard 'streambed kick' sampling technique was used at site 6 (Table 1). The 'streambed kick' and 'vegetation sweep' techniques are very similar to Protocol C1 (hard-bottomed, semi-quantitative) and C2 (soft-bottomed, semi-quantitative) of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark *et al*, 2001).

Two of the sites surveyed were previously established in the baseline survey (sites 1 and 2) (Dunning, 2003).

Table 1 Biomonitoring sites in the Haehanga Stream catchment

Site	Site Code	Location	Sampling Method
1	HHG000093	Upstream of extended irrigation area	Vegetation sweep
2	HHG000100	Downstream of extended irrigation area	Vegetation sweep
T2	HHG000098	Upstream of wetland discharge point	Not sampled
T3	HHG000103	Downstream of wetland discharge point	Not sampled
5	HHG000115	25 m downstream of last pond and swale collection area	Vegetation sweep
6	HHG000150	30 m downstream of lower irrigation area	Streambed Kick
7	HHG000190	50 metres upstream of State Highway 3 bridge	Vegetation sweep

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 as:

R (rare)	= less than 5 individuals;
C (common)	= 5-19 individuals;
A (abundant)	= estimated 20-99 individuals;
VA (very abundant)	= estimated 100-499 individuals;
XA (extremely abundant)	= estimated 500 individuals or more.

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams (MCI). Recently, a similar scoring system has been developed for macroinvertebrate taxa found in soft bottomed streams (Stark and Maxted, 2004, 2007) (SBMCI). The SBMCI has been used in a number of biomonitoring reports since its inception, and results to date suggest that it is not as effective at assessing the impacts of organic pollution as the MCI. For example, results from the February 2008 Mangati survey found a relatively unchanged SBMCI score at a site that had thick growths of sewage fungus (Jansma, 2008c). Therefore, this index is considered less appropriate for the assessment of macroinvertebrate communities possibly affected by industrial discharges. Any subsequent reference to MCI refers to the MCI.

Highly 'sensitive' taxa were assigned the highest scores of 9 or 10, while the most 'tolerant' forms scored 1 and 0.1 in hard bottomed and soft bottomed streams respectively. The sensitivity scores for certain taxa found in hard bottomed streams 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. Communities that are more 'sensitive' inhabit less polluted waterways.

A semi-quantitative MCI value (SQMCI_s) has also been calculated for the taxa present at each site by multiplying each taxon score by a loading factor (related to its abundance), totalling these products, and dividing by the sum of the loading factors (Stark 1998 and 1999). The loading factors were 1 for rare (R), 5 for common (C), 20 for abundant (A), 100 for very abundant (VA) and 500 for extremely abundant (XA). Unlike the MCI, the SQMCI_s is not multiplied by a scaling factor of 20, so that its corresponding range of values is 20x lower.

HHG000190 ~1900m DS

HHG000150 ~ 675m DS



Figure 1 Location of biomonitoring sites in the Haehanga Stream catchment

Sub-samples of algal and detrital material taken from the macroinvertebrate samples, were scanned under 40-400x magnification to determine the presence or absence of any mats, plumes or dense growths of bacteria, fungi or protozoa ("undesirable biological growths") at a microscopic level. The presence of masses of these organisms is an indicator of organic enrichment within a stream.

Results and Discussion

During the present survey, water temperatures in the Haehanga Stream catchment ranged from 23.1°C to 28.2°C. Such warm temperatures have been recorded previously, with the January 2015 survey recording a temperature of 28.3°C, which is outside the upper thermal tolerances of some macroinvertebrate taxa, including some occasionally recorded in the Haehanga Stream catchment (Quinn et al, 1994)). Previous surveys have been undertaken earlier in the year, in an effort to survey at a time of higher flow in the Haehanga Stream. However, due to a very dry spring and early summer, the current survey was delayed in the hope that rains would return and flows would recover. A rain event occurred ten days prior to this survey, but was not sufficient to restore groundwater levels to the point where there was improved flow in the Haehanga Stream. As a result, the current survey was undertaken in very low flows, with sampling of the unnamed tributary precluded by these low flows. These low flows also resulted in limited sampling habitat at the mainstem sites, and consequently a relatively small sample was collected at these sites.

At sites 1 and 2, the Haehanga Stream was observed to be running clear but with a yellow tannin colour. At sites 5 and 6 the yellow tannin colouration was still apparent, but the stream had become cloudy while at site 7 the stream was observed to be brown and cloudy. The Haehanga Stream is frequently observed to be cloudy, with associated yellow to brown discolouration. Usually the cloudiness and discolouration is primarily caused through tannins and suspended solids entering via groundwater and tributary inflows, rather than a point source discharge from the wormfarm. However, at times tannins are also provided through the wetland discharge, which can also result in some discolouration. During the current survey, the wetland was observed to not be discharging, although discharge records indicate a discharge of 120 litres/minute was occurring six days prior, and a discharge of 80 litres/minute was occurring the day after this survey.

With the exception of site 1, the substrate at all sites was generally a mix of silt, sand and gravels, with some wood. The streambed at site 1 was covered in macrophytes, with an underlying bed of silt. All mainstem sites supported aquatic vegetation, with such growth observed at the edges of the stream at site 6, and throughout the stream at the other four sites. Although no samples were collected at sites T2 and T3, both sites supported aquatic vegetation, with small beds growing on the streambed. There was a relatively low algal biomass in the Haehanga Stream during this survey, with sites 2, 5 and 7 supporting only thin films of algae, and sites 1 and 6 supporting patches of algal filaments.

No undesirable heterotrophic growths were recorded at any of the seven sites in this survey.

Unlike the December 2015 survey, which noted dead eels on the stream bed and the January 2015 survey, which observed hydrocarbons being released from the streambed at site 7, no concerning observations were made while completing the current survey.

Macroinvertebrate communities

A moderate number of macroinvertebrate surveys have been conducted at these sites. Monitoring has been conducted in other small lowland hill country streams in Taranaki surveyed at similar altitudes (TRC, 1999 (statistics updated 2016)) and these have been compared with the current results in Table 2. Table 2 gives summary statistics for the sites, while Table 3 provides a complete taxa list for the current survey.

Table 2 Number of taxa, MCI and SQMCI, values recorded in the Haehanga Stream catchment together with a summary of results from control sites in other small lowland hill country streams (LOWL) between 25-49 MASL, in Taranaki (TRC, 1999) (Updated to October 2017).

Site	No. of previous surveys	Numbers of taxa			MCI values			SQMCI values		
		Median	Range	Current	Median	Range	Current	Median	Range	Current
LOWL*	25	22	17-30	-	78	68-109	-	4.0	2.7-7.2	-
1	13	21	17-27	17	71	68-78	62	3.9	2.7-4.2	2.6
2	21	19	17-23	15	75	62-99	68	4.0	2.7-5.7	4.1
5	20	19	6-28	18	74	53-88	73	2.9	1.1-4.1	3.7
6	7	19	6-24	9	73	60-88	60	2.9	1.0-3.1	3.4
7	16	21	12-30	17	71	59-82	71	3.3	1.3-4.3	4.3
T2	10	23	18-30	-	87	79-104	-	5.2	4.6-7.2	-
T3	10	27	23-32	-	84	78-93	-	4.5	3.5-5.4	-

*SQMCI, median and range based on only 24 samples

The current survey results for the Haehanga mainstem are also presented in Figure 2 and Figure 3, with these figures providing a catchment perspective.

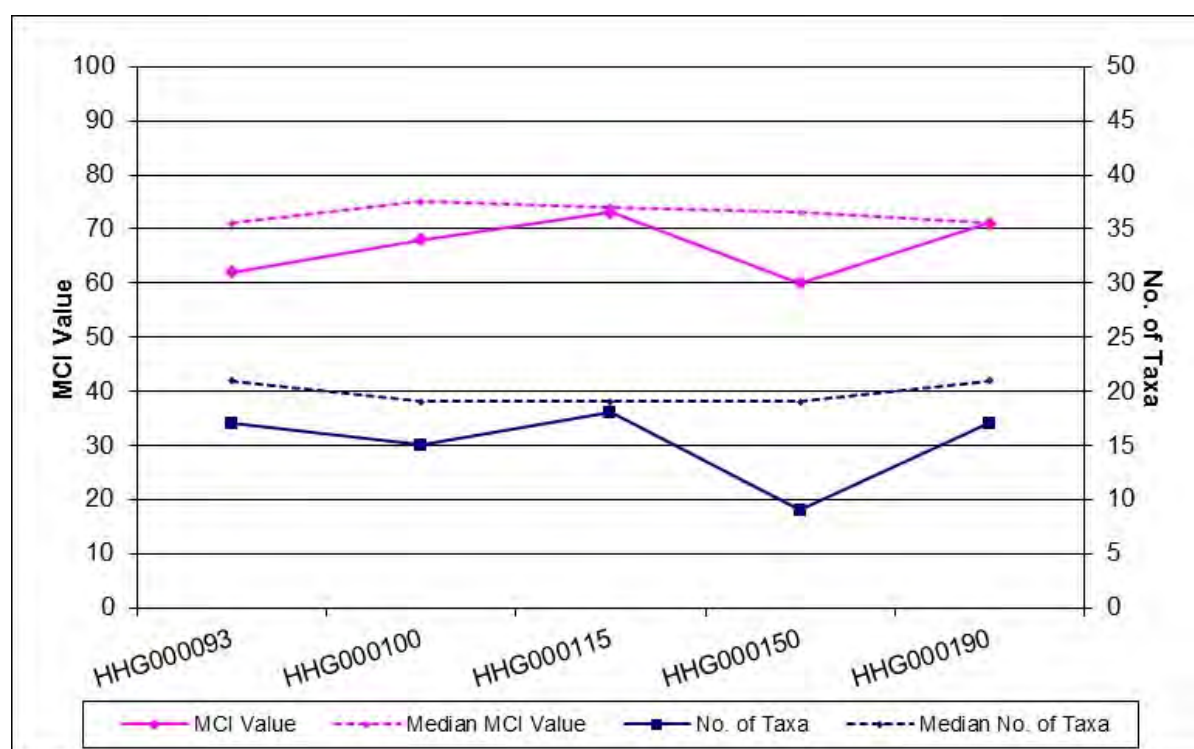


Figure 2 Number of taxa and MCI scores recorded at the Haehanga Stream sites during the current survey, compared with the respective medians for these sites.

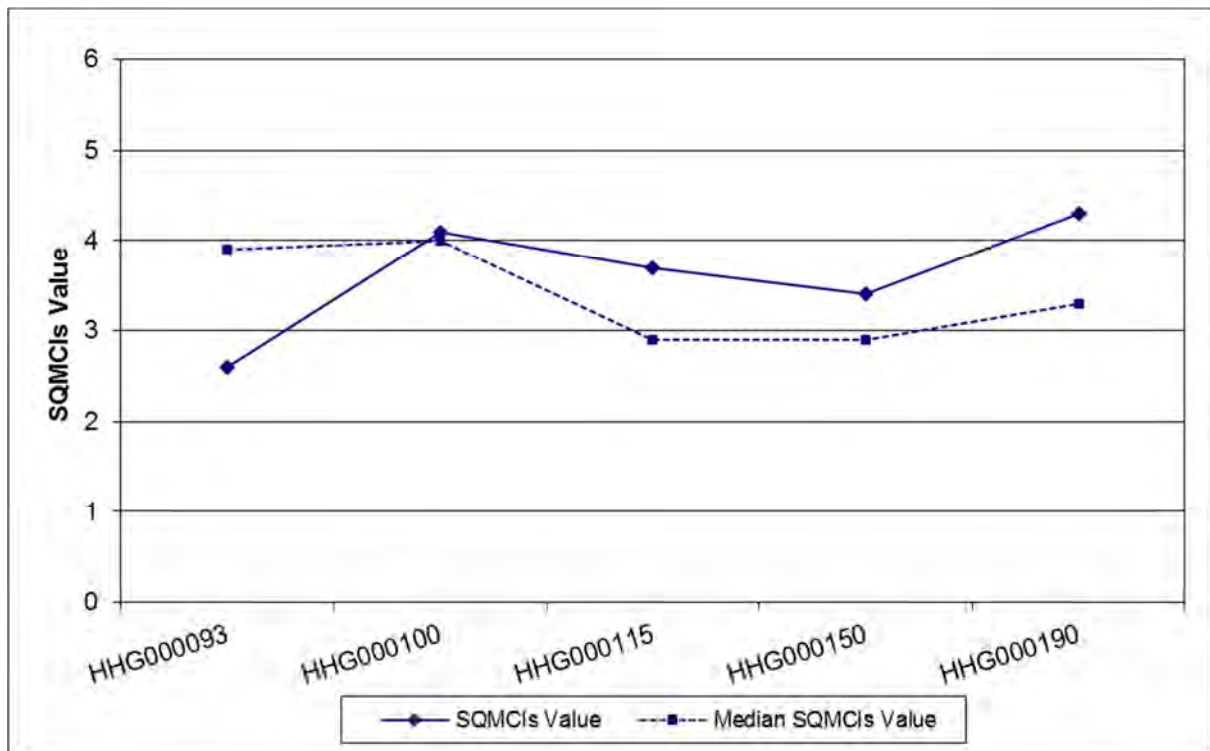


Figure 3 SQMCI_s scores recorded at the Haehanga Stream sites during the current survey, compared with the respective medians for these sites.

Site 1 – Upstream of expanded irrigation area

This site, sampled intermittently since 2002, was re-introduced to the monitoring programme in 2010, prior to the irrigation of wastewater onto land between sites 1 and 2. Irrigation on this land has since occurred, consequently site 1 becomes the upstream control site, and site 2 becomes an impact site.

A relatively low taxa richness was recorded at this site (17), which was four taxa less than the median, and the lowest richness recorded at this site to date, equal to that recorded in the two previous surveys (Figure 4). The low taxa richness recorded in the current survey may be related to the low flows that preceded this survey, coupled with the extensive macrophyte beds. These conditions can lead to warm water temperatures and low dissolved oxygen levels, which can lead to a reduction in taxa richness, with only the more resilient species remaining.

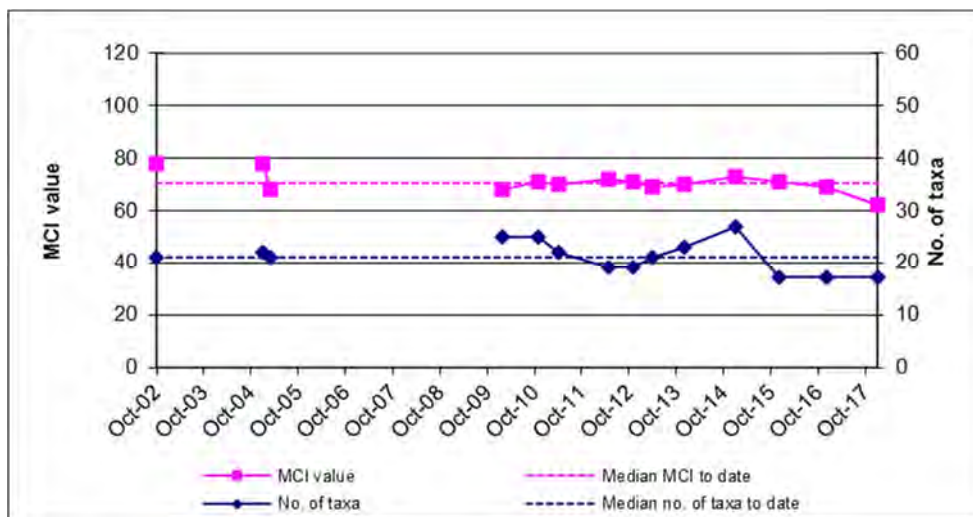


Figure 4 Taxa numbers and MCI recorded to date at site 1

Table 3 Macroinvertebrate fauna of the Haehanga Stream catchment, sampled in relation to Remediation (NZ) Ltd on 16 January 2018.

Taxa List	Site Number		MCI score	1	2	5	6	7
	Site Code	HHG000:		093	100	115	150	190
	Sample Number	FWB180:		16	17	18	19	20
ANNELIDA	Oligochaeta		1	R	C	-	VA	R
HIRUDINEA	Hirudinea		3	C	R	-	-	-
MOLLUSCA	<i>Physa</i>		3	A	A	A	C	C
	<i>Potamopyrgus</i>		4	XA	XA	XA	XA	A
	Sphaeriidae		3	R	-	-	-	-
CRUSTACEA	Cladocera		5	-	-	-	-	VA
	Ostracoda		1	XA	A	VA	A	A
	<i>Paracalliope</i>		5	R	VA	VA	-	C
EPHEMEROPTERA	<i>Deleatidium</i>		8	-	-	R	-	-
ODONATA	<i>Xanthocnemis</i>		4	VA	VA	A	-	VA
HEMIPTERA	<i>Anisops</i>		5	R	R	A	-	VA
	<i>Microvelia</i>		3	R	C	R	-	R
	<i>Saldula</i>		5	-	R	-	-	-
	<i>Sigara</i>		3	R	C	C	-	R
COLEOPTERA	Dytiscidae		5	-	-	R	-	-
	Hydrophilidae		5	-	R	-	R	-
TRICHOPTERA	<i>Oxyethira</i>		2	-	-	R	-	-
	<i>Paroxyethira</i>		2	R	-	-	-	-
	<i>Triplectides</i>		5	-	VA	A	-	A
DIPTERA	Hexatomiini		5	-	-	-	R	-
	<i>Paralimnophila</i>		6	-	-	-	-	R
	<i>Chironomus</i>		1	A	R	C	R	C
	<i>Corynoneura</i>		3	-	-	R	-	-
	Orthoclaadiinae		2	C	-	A	A	A
	<i>Polypedilum</i>		3	-	R	-	-	-
	Tanypodinae		5	C	-	A	R	C
	Culicidae		3	R	-	-	-	-
	<i>Paradixa</i>		4	-	-	R	-	R
Empididae		3	-	-	R	-	R	
	Stratiomyidae		5	R	-	-	-	-
No of taxa				17	15	18	9	17
MCI				62	68	73	60	71
SQMCIs				2.6	4.1	3.7	3.4	4.3
EPT (taxa)				0	1	2	0	1
%EPT (taxa)				0	7	11	0	6
'Tolerant' taxa		'Moderately sensitive' taxa			'Highly sensitive' taxa			

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

The community comprised a relatively high proportion of tolerant taxa (76%) which resulted in a 'poor' MCI score of 62 units. This is the lowest score recorded at this site to date and is nine units less than the median score (Table 2, Figure 4). Although this is a 'poor' score (TRC, 2015), it is a reflection of the very low and slow to still flows and vegetation habitat sampled, and is relatively consistent with that recorded at this site in recent years. This score is significantly less than the median MCI score for other similar lowland streams (Stark, 1998), indicating that the invertebrate community at this site was in poorer health than similar streams at this altitude.

The community was dominated by two extremely abundant 'tolerant' taxa, (snail (*Potamopyrgus*) and ostracod seed shrimps). Other dominant 'tolerant' taxa included *Physa* snails, damselfly larvae (*Xanthocnemis*) and *Chironomus* bloodworms. No 'sensitive' taxa were abundant at this site in the current survey. The dominance of 'tolerant' taxa resulted in a low SQMCI₅ score of 2.6 units, which is also the lowest record at this site to date (Table 2). It was also significantly lower than the median for this site and other sites in similar small lowland streams (Stark, 1997) (Table 2).

Overall, this indicates that the water quality of the Haehanga Stream prior to it flowing into the Remediation NZ composting site was of below average quality, and that the community was strongly influenced by the low and slow flows, and the shallow gradient of this stream.

Site 2 – Downstream of extended irrigation area

At site 2 in the Haehanga Stream, upstream of all composting areas, 15 macroinvertebrate taxa were recorded. This was two taxa fewer than that recorded in the previous survey and four taxa less than the median for this site (Table 2). The community was dominated by four 'tolerant' taxa, (snails (*Physa* and *Potamopyrgus*) ostracod seed shrimp and damselfly larvae (*Xanthocnemis*)), and two very abundant 'moderately sensitive' taxa, (*Paracalliope* amphipods and *Tripletides* caddisfly) (Table 3).

The MCI value of 68 units reflected a low proportion of sensitive taxa in the community at this site (33%). This score is more than thirty units less than that recorded in the previous survey, but not significantly different to the median score for this site, and is within the range of previous results (Stark 1998) (Table 2, Figure 3). The SQMCI₅ value at this site (4.1) was similar to the median value, and similar to that recorded in the previous survey, and reflecting the overall numerical dominance of the 'extremely abundant' *Potamopyrgus* snails.

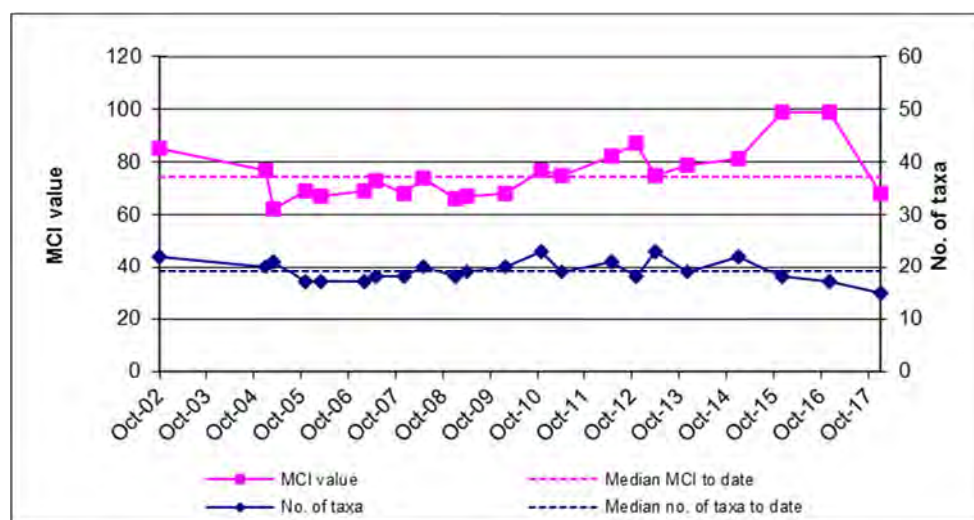


Figure 5 Taxa numbers and MCI recorded to date at site 2

Although this suggests that water quality at this site has deteriorated from the previous survey, it should be noted that the sampling technique differed to the two previous surveys. Historically, this site was sampled using the vegetation sweep technique, as it was in the current survey. However, the December 2015 and 2016 surveys used the kick sample technique, due to a lack of macrophyte habitat. The vegetation sweep technique samples habitat that tends to support more 'tolerant' taxa and therefore produces lower MCI and SQMCI_s scores. This also explains the similarity in MCI score between sites 1 and 2.

Overall, it is apparent that the primary influence on the community at this site is the variation in habitat, and the change in sampling technique. The fact that two 'moderately sensitive' taxa were recorded as 'very abundant' is supportive of the conclusion of reasonable preceding water quality with no discernible impacts from the irrigation of wastewater to land between sites 1 and 2.

Site 5 – downstream of all pond discharges

At site 5 in the Haehanga Stream, 25 m downstream of all wastewater ponds, 18 taxa were recorded, one taxon less the median of the twenty previous surveys, but eight taxa fewer than that recorded in the previous survey (Table 2, Figure 3). This reduced richness may be a reflection of the change in sampling technique from the previous survey, which employed the streambed kick methodology. Five 'tolerant' taxa (snails (*Physa* and *Potamopyrgus*), ostracod seed shrimps, damselfly larvae (*Xanthocnemis*) and orthoclad midge larvae) and four 'moderately sensitive' taxa (*Paracalliope* amphipods, backswimmer (*Anisops*), caddisfly larvae (*Triplectides*) and tanypod midge larvae) (Table 3). The numerical dominance of 'extremely abundant' 'tolerant' *Potamopyrgus* snails resulted in the SQMCI_s score of 3.7 units, a statistically insignificant 0.8 unit higher than the median for this site, and similar to that recorded at site 2. The MCI score (73) was very similar to the median score for this site, but fifteen units less than that recorded in the previous survey, which recorded the highest MCI score for this site to date. It was however, five units higher than that recorded at site 2 upstream in the current survey, despite an equivalent proportion of 'sensitive' taxa in the community (33%) (Table 2).

Some previous surveys have recorded changes in abundance of individual taxa, which can be interpreted as being an indication of organic enrichment of the stream. Such changes included *Chironomus* bloodworms becoming abundant at this site. The results from the current survey indicate that *Chironomus* bloodworms were present at the time of the survey, but only as common (five to nineteen individuals). In total, significant changes in abundance were recorded for only three taxa, including an increase in two 'sensitive' taxa. Overall, this community appears to be in average community health, but indicative of 'poor' water quality.

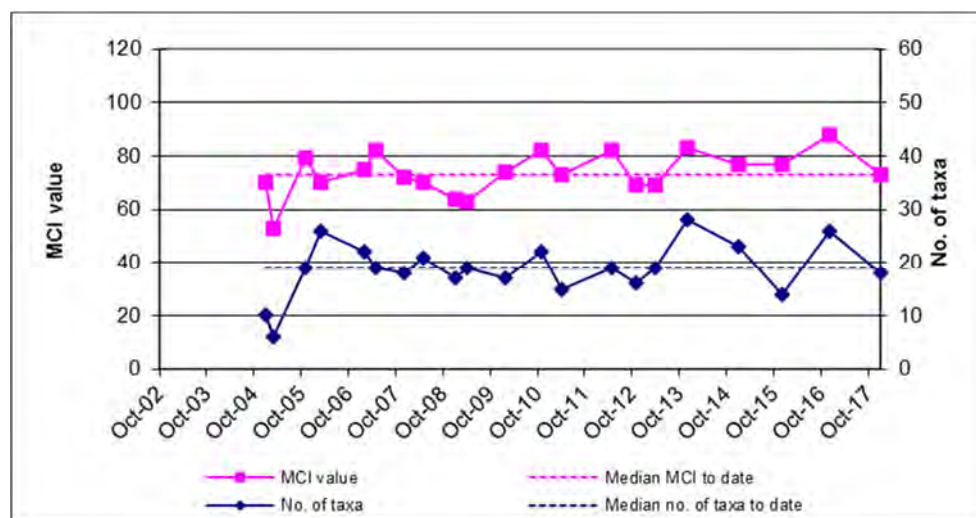


Figure 6 Number of taxa and MCI scores recorded to date at Site 5

Site 6 – Downstream of effluent irrigation area

A richness of nine taxa was recorded at this site, located downstream of the effluent irrigation area (Table 2, Figure 7). This represents a reduction on that recorded in the previous survey when sixteen taxa were recorded, which is considered a direct reflection of the habitat limitation caused by low flows and algal growth on the streambed (Photo 1).

The community was dominated by four 'tolerant' taxa (very abundant oligochaete worms, extremely abundant *Potamopyrgus* snails, ostracod seed shrimps and orthoclad midge larvae). Although this also represents a deterioration from the previous survey, it is also likely to be related to the habitat conditions present at the time of sampling.

The community consisted mainly of 'tolerant' taxa (67%), resulting in an MCI score of 60 units. This score is significantly lower than the median for this site, 28 units lower than that recorded in the previous survey, and equal to the previous minimum score recorded at this site (Table 2, Figure 2). Although this indicates that the community during the current survey was in well below average health, it does not necessarily indicate that this can be attributed to the monitored activities. The current result is indicative of 'poor' water quality (TRC, 2017).



Photo 1 Haehanga Stream at site 6, 16 January 2018

The SQMCI_s score was heavily influenced by the extremely abundant *Potamopyrgus* snails. This resulted in a SQMCI_s score of 3.4 units, slightly higher than the median for this site. Although this is the second lowest SQMCI_s score recorded in the current survey, it does not differ from what is usually recorded at this site, and is significantly better than that recorded in the previous two surveys (1.0 unit).

Previous surveys, had noted SQMCI_s scores at this site that were lower than could be expected. It was concluded that there may be a subtle deterioration in water quality at this site, but habitat differences also needed to be taken into account. This is because this site has habitat that differed to the other Haehanga Stream sites, as it was a true riffle, in that it was shallow flow tumbling over coarse and fine gravel, as opposed to deeper flow moving over macrophyte or submerged wood.

Overall, the results indicate that the community at this site was in average to below average health. Although the MCI score was equal to that recorded in the 2015 survey which coincided with the discovery of a number of dead eels immediately downstream of this site, the SQMCI_s score was significantly higher. This indicates that the lower than average MCI score is related to the low flows and high algal biomass observed at the time.

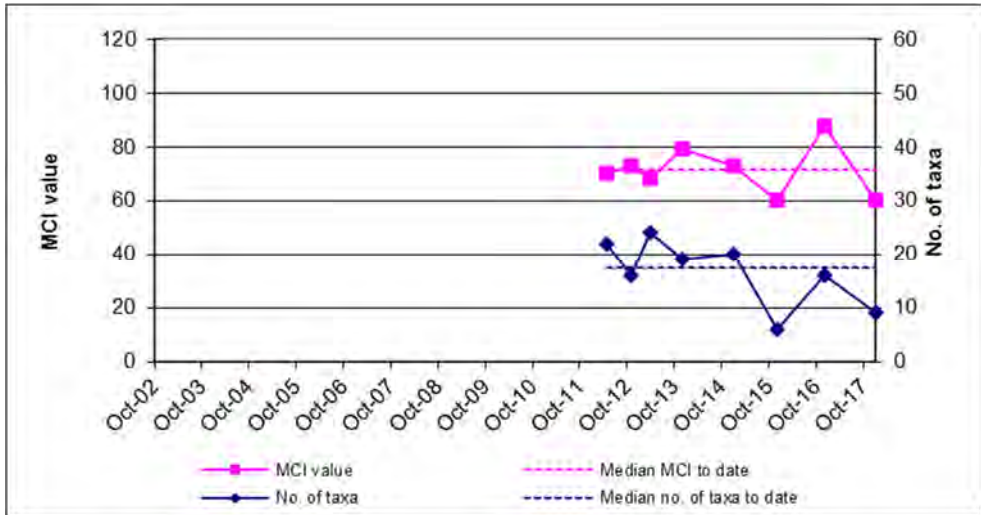


Figure 7 Number of taxa and MCI scores recorded to date at Site 6

Site 7 – Downstream of all site activities

This site exhibited below-average tax richness (17), four taxa fewer than the median, and seven more than the previous survey undertaken at this site. The 'poor' MCI score of 71 was due to the community comprising 65% 'tolerant' taxa, of which three were abundant (snail (*Potamopyrgus*), ostracod seed shrimp and orthoclad midge larvae) and one was very abundant (damselfly larvae (*Xanthocnemis*)). Two 'moderately sensitive' taxa were also recorded in abundance (water fleas (Cladocera) and backswimmers (*Anisops*)), suggesting moderate preceding water quality.

The MCI score of 71 was seven units less than that recorded in the previous survey, a statistically insignificant result (Stark, 1998), but equal to the median score for this site (Table 2, Figure 8). The numerical dominance of the two abundant 'moderately sensitive' taxa resulted in a SQMCI_s of 4.3 units, 1.0 unit higher than the median for this site and 0.8 unit higher than that recorded in the previous survey. This result was equal to the previous maximum SQMCI_s recorded at this site.

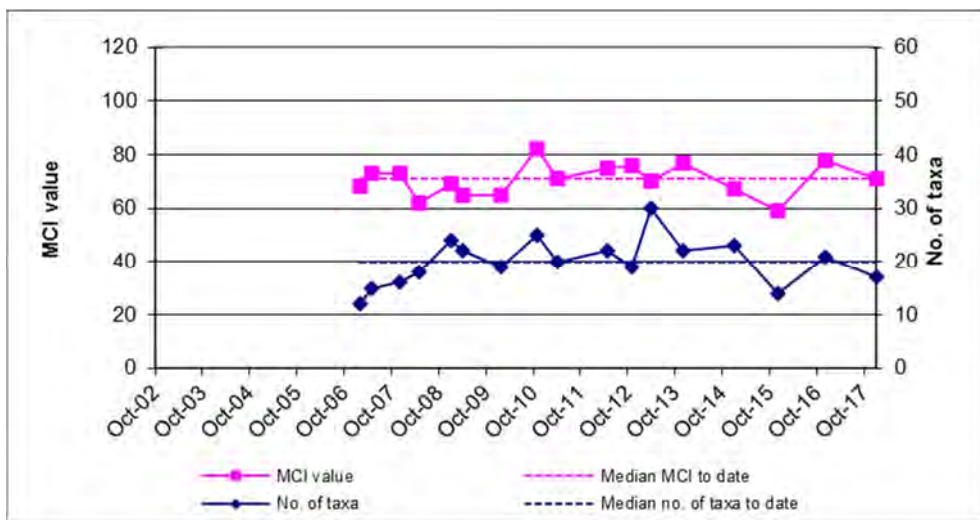


Figure 8 Number of taxa and MCI scores recorded to date at Site 7

When compared with site 6 upstream, the MCI score was significantly higher, as was the SQMCI_S score (Stark, 1998). This improvement was due mainly to an increase in the number of more sensitive taxa, and some significant changes in abundance of a number of taxa. There were seven significant differences in individual taxon abundance recorded between sites 6 and 7, with the majority of these differences reflecting the change in habitat and sampling methodology. Site 6 was a small shallow riffle sampled by kick sampling, while the habitat at site 7 (pool) was sampled using the macrophyte sweep method. This is illustrated in the taxa results, with a number of still or slow water taxa being recorded at site 7. The average MCI and above average SQMCI_S scores indicate that this community was also in average health and appeared to have recovered from the December 2015 survey.

During some previous surveys, concern was raised regarding an extreme abundance of *Chironomus* bloodworm larvae at this site. Such abundance usually only occurs where there is a significant organic discharge, which the *Chironomus* bloodworm larvae feed upon. It was noted that should this result be repeated in subsequent surveys, further investigation would be required. Dissolved oxygen readings were subsequently taken in the stream, and this found that there may be periods of low dissolved oxygen, especially when weed beds are well established, such as in summer. This is natural, and related to the shallow gradient of the stream, and can be exacerbated during low flows. It is likely that the sporadic abundance of *Chironomus* is related to the low dissolved oxygen concentrations within the stream, rather than the discharge of organic wastes upstream. *Chironomus* was recorded as 'common' at this site in the current survey.

Site T2 – upstream of the wetland discharge

Site T2 was not sampled in the current survey due to low flows and insufficient habitat. Figure 9 presents the data collected at this site to date.

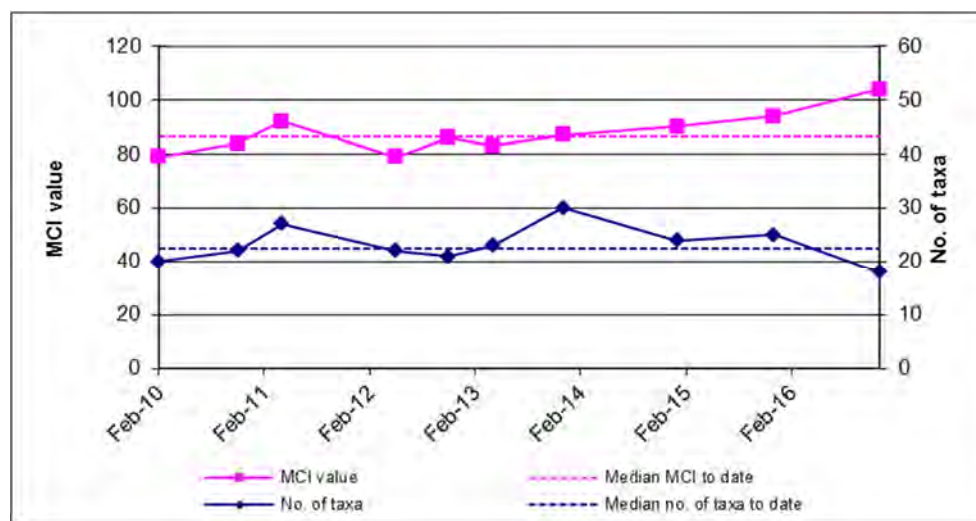


Figure 9 Taxa numbers and MCI recorded to date at site T2

Site T3 – downstream of the wetland discharge point

Site T3 was not sampled in the current survey due to low flows and insufficient habitat. Figure 10 presents the data collected at this site to date.

Some previous water quality results indicate that unionised ammonia concentrations in the unnamed tributary have at times been toxic enough to reduce the abundance of, or eliminate entirely, some of the sensitive species usually found in this stream. Results of sampling undertaken in the year prior to this survey show that two of the five samples contained concentrations of unionised ammonia above the toxicity threshold of 0.025 g/m³. This shows management of the unionised ammonia concentrations has

deteriorated since the previous monitoring survey. Should unionised ammonia concentrations continue to exceed the toxicity threshold on occasion, an additional macroinvertebrate survey at this time might be warranted. At the very least, the water quality monitoring will need to continue to assist with the interpretation of macroinvertebrate results.

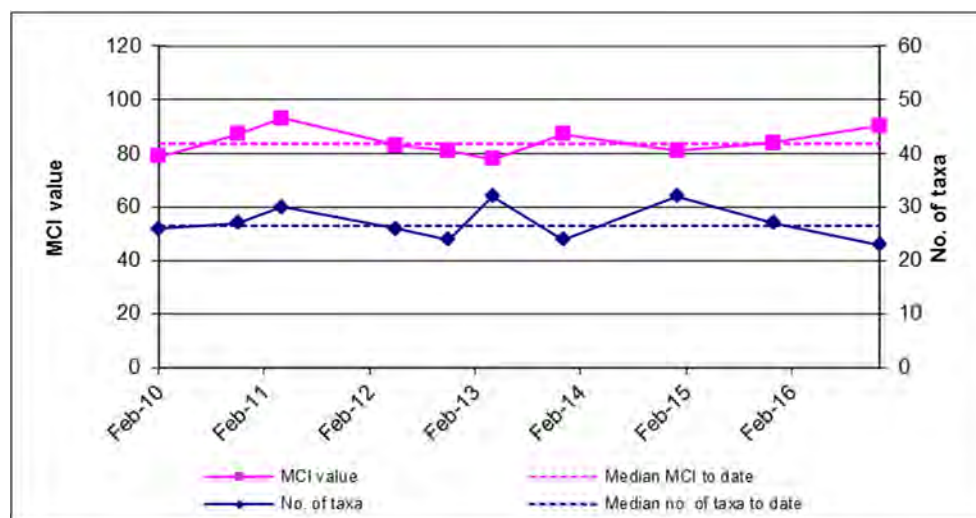


Figure 10 Taxa numbers and MCI recorded to date at site T3

Conclusions

The Council's standard 'streambed kick' and 'vegetation sweep' techniques were used at five established sites to collect streambed macroinvertebrates from the Haehanga Stream catchment in order to assess whether the Remediation (NZ) Ltd composting areas had had any adverse effects on the macroinvertebrate communities of these streams. Samples were processed to provide number of taxa (richness), MCI, and SQMCI₅ scores for each site. Due to a very dry spring and early summer, flows in the catchment were very low. As a result, sampling of the unnamed tributary was precluded by these low flows. These low flows also resulted in limited sampling habitat at the mainstem sites, and consequently a relatively small sample was collected at these sites, and in some cases, sampling methodology changed from that typically performed at these sites. It should be noted that where community health is discussed below, it is done so with reference to what would be expected in such low flow, habitat restricted conditions.

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 SQMCI₅ 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. Significant differences in either the MCI or the SQMCI₅ between sites indicate the degree of adverse effects (if any) of the discharges being monitored.

The macroinvertebrate survey conducted on 16 January 2018 observed flows in the Haehanga catchment observed to be very low, with no discernible flow at some sites. The water had a yellow tannin colouration at the head of the catchment, deteriorating to brown and cloudy at the most downstream site. The habitat limitation caused by the low flows resulted in reduced community richnesses at all sites, especially at site 6, where only nine taxa were recorded. This habitat limitation, coupled with a change in sampling method at some sites also contributed to reduced community health, as all sites recorded MCI scores lower than their respective medians and that recorded in the previous survey. Overall, this survey found that macroinvertebrate communities of the mainstem sites were of average to below average health. Undesirable heterotrophic growths were not recorded at any of the seven sites in this survey.

The two sites in the unnamed tributary were not sampled in the current survey. However, some previous water quality results indicate that unionised ammonia concentrations in the unnamed tributary have at times been toxic enough to reduce the abundance of, or eliminate entirely, some of the sensitive species usually found in this stream. Results of sampling undertaken in the year prior to this survey show that two of the five samples contained concentrations of unionised ammonia above the toxicity threshold of 0.025 g/m³. This shows management of the unionised ammonia concentrations has deteriorated since the previous monitoring survey. Should unionised ammonia concentrations continue to exceed the toxicity threshold on occasion, an additional macroinvertebrate survey at this time might be warranted. At the very least, the water quality monitoring will need to continue to assist with the interpretation of macroinvertebrate results.

In general, the communities in the Haehanga Stream sites had relatively low proportions of sensitive taxa. Low numbers of sensitive taxa are expected in small, silty bottomed streams such as the Haehanga Stream and the numbers of taxa were generally similar to other lowland hill country streams surveyed at similar altitude. The community richness at site 6 and 7 was lower than that recorded in the previous survey, but higher than that recorded in 2015, when significant deterioration was recorded. MCI values recorded in the Haehanga Stream varied in a downstream direction, somewhat atypical for this survey, which normally records a reducing MCI scores in a downstream direction. The lowest MCI score in the current survey was recorded at site 6 (60 units) and the highest at site 5 (73 units). With the exception of site 7, all sites recorded below average scores, significantly so for site 6.

Site 5 has exhibited poorer macroinvertebrate communities in the past compared to other sites upstream. This has suggested some level of impact from the composting operation, although the extent of adverse effects has been difficult to determine due to poor habitat quality. During the current survey, the MCI score for site 5 was one unit less than the median score for this site, but higher than that recorded at any other site in this survey. This indicates that the significant improvement recorded in the previous survey may still be present, but is suppressed by the low flow conditions. The SQMCI_s score recorded at site 5 was reduced compared with that recorded at site 2. In addition, the results from the current survey indicate that *Chironomus* bloodworms were present, but only as a rarity. This suggests some deterioration from that recorded at site 2, but overall, the communities at site 5 were in average to above average health.

Unlike the other sites, the sample from site 6 was collected from a riffle with coarse and fine gravels, using the 'streambed kick' sampling technique. However, during the current survey this riffle had very little flow, and was subject to severe filamentous algal growth. This resulted in a low taxa richness of 6 taxa, ten fewer than in the previous survey. Furthermore, it resulted in an MCI score of 60 units, indicative of 'poor' water quality, and equal to the lowest recorded at this site of the eight surveys conducted there. This represents a significant deterioration from the previous survey, and a lesser deterioration from that recorded at site 5 upstream. It was also significantly less than the median for control sites in other lowland streams at a similar altitude. Although this MCI score was equal to that recorded in the 2015 survey, which coincided with the discovery of a number of dead eels near to this site, the SQMCI_s score at this site was significantly higher than that recorded in 2015, and was also the highest recorded at this site to date. This supports the conclusion that the lower than average MCI score is related to the low flows and high algal biomass observed at the time.

The surveys undertaken at this site sampled habitat that differed to the other Haehanga Stream sites, as it was a true riffle, with shallow flow tumbling over coarse and fine gravel, as opposed to deeper flow moving over macrophyte or submerged wood. This habitat difference can explain some of the differences in the taxa recorded and the increased abundance of worms. The current survey indicates that the water quality preceding this survey had been average to below average, with the main influence on the community being the low flows.

The lowest site (site 7) was sampled for the seventeenth time in this survey. There was an improvement in MCI score, and the SQMCI_s score was higher than that recorded at site 6. When compared with historical data, the community at site 7 was in average to above average health, and not indicative of a deterioration in water quality. The SQMCI_s score for this site (4.3) was equal to the highest recorded previously, but taxa richness (17) was lower than the long-term average. This also indicates that the community was in average to above average health.

During certain previous surveys, *Chironomus* bloodworms have been recorded as abundant at various sites. Abundance of this taxon is usually an indication of an organic discharge, although low dissolved oxygen in the stream can also allow this taxon to dominate the community, especially when this is associated with low flows. It may be then that the sporadic appearance of *Chironomus* in abundance is at least in part related to the dissolved oxygen concentrations. Dissolved oxygen concentrations in the Haehanga have been found to be depressed at times, and during the warmer months, when there is more aquatic weed growth, dissolved oxygen may be significantly depleted at night. This is a natural occurrence in some streams that are slow flowing and weedy. Any macroinvertebrate surveys undertaken when such conditions exist could potentially record a community with fewer sensitive species, and a more abundant population of *Chironomus*. During the current survey, *Chironomus* was recorded as rare at sites 2 and 6, common at sites 5 and 7 and abundant at site 1, the control site. This possibly suggests a slight increase in the organic enrichment of the stream, but the abundance at the control site indicates that it is more likely a reflection of the very low flows, and as a consequence, low dissolved oxygen concentrations. It is understood that the issue of high chlorides at site 6 has been identified and is being addressed, and so water quality will hopefully improve with time. This would be further contributed to through any on-going works to the leachate and stormwater treatment system, and improved management of the riparian margin. Any works that improve water quality are also likely to lead to an improvement in freshwater macroinvertebrate communities below the discharges, and should continue to be encouraged.

This was the only macroinvertebrate programme scheduled for the 2017-18 period. It is recommended that this level of monitoring continue, but that a provisional macroinvertebrate survey be retained in the programme, to be implemented should water quality monitoring indicate an issue.

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To Nathan Crook, Job Manager
From Bart Jansma, Environmental Scientist
Report No BJ309
Document 2066234
Date 7 June 2018

Fish Survey of the Haehanga Stream in relation to discharges from the Remediation (NZ) Limited composting site at Uruti, January 2018

Introduction

Remediation (NZ) Ltd operates a composting facility in the Haehanga Valley, Uruti (previously owned by Perry Environmental Ltd who was preceded by Global Vermiculture Ltd). Raw materials are trucked to the site for composting, on a purpose built composting pad for a period of 35-40 days. Synthetic hydrocarbon contaminated drilling muds and cuttings are also received on site. They are piled up and the liquids are allowed to drain, then blended with green waste and other organic matter. Composted material is transported off site by trucks to Remediation (NZ) Ltd's worm farming operations at Waitara Road and Pennington Road.

This survey is the fifth fish survey undertaken in the Haehanga Stream, in relation to this site. It was included for the first time in the 13-14 monitoring period as a replacement for the late summer macroinvertebrate programme, as flow rates have been slowly reducing over time, inhibiting macroinvertebrate sample collection. On this occasion, the fish survey was undertaken concurrent with the spring/early summer macroinvertebrate survey. Results from previous surveys are detailed in the references.

Fish surveys are useful long-term indicators of ecosystem health, as most fish live longer than a year, and as such may reflect chronic impacts from the composting site, should there be any. The first few surveys will provide results, which can be compared to those from subsequent surveys. This will allow the fish community to be assessed at that point in time, and over time, it will also allow an assessment of any change in community health. Fish communities can be influenced by operations at the composting site, principally related to the discharge of wastewater from the site (and the quality thereof), but also by changes in instream habitat. The banks of the Haehanga Stream are highly unstable and support little in the way of riparian vegetation (with the exception of rank grass). As a result, there is significant bank slumping in areas. Should the stream be fenced and planted in a way that adequately protects the banks and stream channel, it is likely that the fish community would improve.

Methods

In this survey, three sites were surveyed in the Haehanga Stream. Site 1 was located upstream of all composting and waste disposal activities, site 2 was located immediately downstream of the lower irrigation area, while site 3 was located just upstream of State Highway 3. Details of the sites surveyed are given in Table 1 and the locations of the sites surveyed in relation to the site are shown in Figure 1.

The fish populations were sampled using fyke nets (Photo 1) and gee minnow traps. At each site, five gee minnow traps were set, and baited with Marmite. They were set overnight, among macrophytes or alongside woody debris. Two fyke nets were also set at each site, a standard mesh (25mm) net and a fine mesh (13mm). The standard mesh net was set downstream, in attempt to intercept any large eels moving up from downstream. Both fyke nets were baited with fish food pellets. These nets were also set overnight. All fish caught were identified, counted and measured, and any eels longer than 300mm were weighed, using electronic scales that measured to the nearest 20 grams. All nets and traps were deployed on the afternoon of 16 January 2018, and retrieved midmorning the following day.

In addition to the nets and traps set in the Haehanga Stream, gee minnow traps were also set in the unnamed tributary. Two traps were set both upstream and downstream of the wetland discharge. This is the second time this tributary was surveyed, and was done to gain some understanding of what may inhabit this area of the catchment.

Table 1 Sampling sites surveyed in the Haehanga Stream in relation to the Remediation NZ composting operations

Site	Site code	Stream Name	Location
1	HHG000093	Haehanga Stream	Upstream of all composting and waste water irrigation areas
2	HHG000150	Haehanga Stream	30 meters downstream of Remediation NZ irrigation area
3	HHG000190	Haehanga Stream	50 metres upstream of State Highway 3 bridge
T1	HHG000098	Unnamed Tributary	5 meters upstream of wetland discharge
T2	HHG000103	Unnamed Tributary	40 meters downstream of wetland discharge



Figure 1 Location of the three Haehanga Stream and two unnamed tributary sampling sites in relation to composting and wastewater irrigation areas.



Photo 1 A fyke net and gee minnow trap, set at site 1, Haehanga Stream. 16 January 2018

Results and Discussion

The fish-monitoring component of the compliance monitoring programme is usually scheduled for December, to target the higher flows typically present in early summer. However, due to a very dry spring and early summer, the current survey was delayed in the hope that rains would return and flows would recover. A rain event occurred ten days prior to this survey, but was not sufficient to restore groundwater levels to the point where there was improved flow in the Haehanga Stream. As a result, the current survey was undertaken in very low flows, with no discernible flow at site 1, and very little flow present at sites 2 and 3.

All sites contained moderate fish habitat, with deep pools, and macrophyte beds both on the bed and on the edge. The substrate of the surveyed pools comprised primarily of thick silt, with some large logs present at site 3. All sites had at least some undercut banks, but there was no overhanging vegetation at any site, other than long grass. The water appearance of the Haehanga Stream was clear and yellow at site 1 and brown and cloudy at sites 2 and 3.

The unnamed tributary also had very little to no flow, with the pools containing clear and uncoloured water.

Water temperatures recorded during the macroinvertebrate survey, conducted on the same day, ranged from 23.1 to 28.2 °C, which is particularly warm, well above the thermal preference, and near to the maximum thermal tolerance of a number of native fish species (Richardson, Boubée and West, 1994)).

A previous (December 2015) survey observed seven dead eels at, and downstream of site 2. In addition, a macroinvertebrate sample collected upstream of site 2 on the same day smelt of hydrocarbons, and there was a hydrocarbon sheen noted on the surface. This follows on from the observations made during the December 2014 survey, when hydrocarbons were released from the sediment at site 3. No such observations were made during the current survey.

It is worth noting that the macroinvertebrate survey undertaken on the first day of the fish survey found that macroinvertebrate communities of five mainstem sites were in average to below average health. This was attributed primarily to the low flow causing habitat limitation, coupled with a change in sampling method at some sites.

The full results of the fish survey are shown in Table 2 and Table 3.

Table 2 Results of the current fish survey and a summary of previous surveys undertaken in the Haehanga Stream in relation to Remediation NZ's composting operations.

Site:		Site 1			Site 2			Site 3		
Net/Trap type:		Previous results (4 surveys)	Fyke net	Gee minnow trap	Previous results (4 surveys)	Fyke net	Gee minnow trap	Previous results (4 surveys)	Fyke net	Gee minnow trap
Sampling effort (minutes):			2790	6900		2410	6025		2670	6675
Longfin eel (<i>Anguilla dieffenbachii</i>)	Number	3-7	1	-	1-17	2	-	1-8	3	-
	Length range (mm)	478-1045	413	-	365-1050	484-570	-	431-930	738- 825	-
	Weight range (kg)	0.24-3.31	0.16	-	0.10-3.425	0.29- 0.46	-	0.18-2.61	1.17- 1.44	-
Shortfin eel (<i>Anguilla australis</i>)	Number	0-1	1	-	4-17	10	1	2-3	6	-
	Length range (mm)	195-600	683	-	196-850	257-789	239	510-790	449- 822	-
	Weight range (kg)	0.44	0.61	-	0.02-0.98	0.13- 1.01	-	0.26-1.57	0.18- 1.23	-
Inanga (<i>Galaxias maculatus</i>)	Number	-	-	-	1-11	-	-	0-6	-	-
	Length range (mm)	-	-	-	86-123	-	-	-	-	-
Redfin bully (<i>Gobiomorphus huttoni</i>)	Number	-	-	-	-	-	-	0-1	-	-
	Length range (mm)	-	-	-	-	-	-	70	-	-
Total number of species		2	2		3	2		4	2	
Total number of fish		-	2		-	13		-	9	

Table 3 Results of the current fish survey and a summary of previous surveys undertaken in the unnamed tributary of the Haehanga Stream in relation to Remediation NZ's composting operations

Site:		T1		T2	
Net/Trap type:		Previous results (1 survey)	Gee minnow trap	Previous results (0 surveys)	Gee minnow trap
Sampling effort (minutes):			2700		2700
Banded Kokopu (<i>Galaxias fasciatus</i>)	Number	1	-	-	-
	Length range (mm)	130	-	-	-
Total number of species		1	0	-	0
Total number of fish		-	0	-	0

Site 1

This site recorded just two species, being longfin and shortfin eel. This is consistent with that recorded in previous surveys. It is likely that this is related in part to the reduced flow that can occur at this site, resulting in reduced habitat. As in some previous surveys, there was little to know flow at this site. Fish passage may also be influencing the number of species present at this site, as the barriers to fish passage observed downstream may have prevented fish migrating upstream to this site. This has serious implications for inanga, as this species is a short-lived species, and migrates downstream annually to spawn, with juveniles migrating upstream during the whitebait season.

Overall, two fish were recorded at this site, which is a reduction from that recorded previously. This is likely a reflection of the extended period of lower flows preceding this survey, which may have prompted fish to emigrate from this reach. In addition, the lack of flow will have reduced the extent that the bait odour travelled downstream, reducing the attraction of fish to the nets.

This site is intended as a control site with which to compare the downstream results. Due to the lack of fish passage, it cannot be considered a true control site. In addition, if a culvert does not provide for the passage of fish, it is non-compliant and must be remediated. Some remedial works have been undertaken since the previous survey was completed. However, further remedial work is required, so it is once again recommended that the site operator is made aware of these barriers to fish passage, and required to take steps to remediate them. The barriers are discussed in more detail below.

Site 2

This site, located immediately downstream of the lowest irrigation area, contained an equivalent species richness (2) but the highest abundance (13) of the three sites surveyed. No inanga were recorded at this site during this survey, although this species has been recorded at this site in three of the four previous surveys completed. Natural variation will occur in inanga populations from year to year, as they recruit annually, and are therefore subject to numerous other factors. That no inanga were recorded (compared with a maximum of eleven in 2014) is not necessarily cause for concern, as it is likely that the low flows resulted in lower numbers, either through emigration, predation or low dissolved oxygen levels. There may have also been predation within the nets, especially with the number of large eels caught also.

Thirteen eels were captured, of which two were longfin eels, none of which were particularly large, with the largest being 570mm and 0.46kg. This is a reduction from the number of eels recorded in the previous survey, which recorded eighteen eels. Unlike in the more recent surveys, there was little difference in size class distribution, similar to that recorded in the 2013-2014 survey, which was also undertaken in low flows (Figure 2). There were more smaller eels recorded at this site than in the previous survey, which is likely

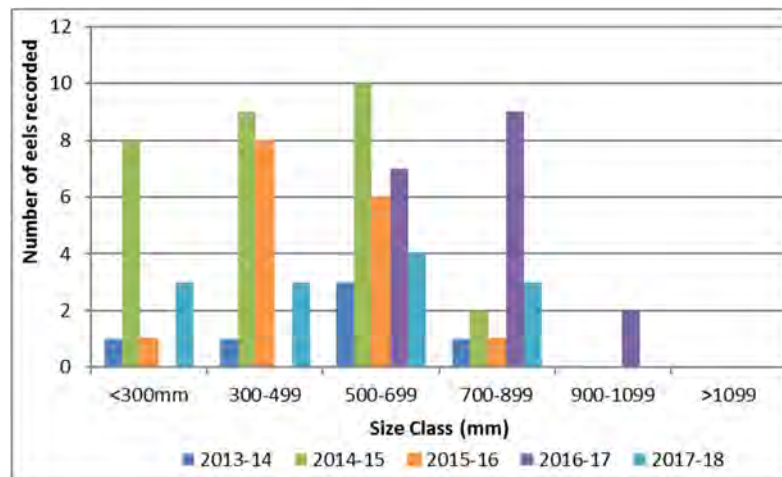


Figure 2 Size class distribution of all eels recorded at site 2 over the four surveys completed to date

related to the smaller number of large eels, and a consequent reduction in predation within the nets.

It is apparent that site 2 still had a much higher abundance than that recorded upstream at site 1. This suggests that the access culvert immediately upstream of this site may still be posing a barrier to fish passage (Photo 2). Some remedial works had been undertaken in the past, with gravel being used to build up the bed level at the outlet of the first pool downstream of the culvert prior to the 2016-2017

survey. While this was an appropriate approach, as it lifted the water level and resolved the perched nature of the culverts, the material used was too fine and had already begun scouring away. During the current survey, it was apparent that the material had indeed washed away, and the culverts were again perched. Remedial works are therefore once again required.



Photo 2 The access culvert immediately upstream of site 2, December 2015 (left), December 2016 (middle) and January 2018 (right).

Site 3

Located just upstream of State Highway 3, this site provides some perspective, providing an indication as to the extent of influence from the upstream composting activities. This site contained some of the best habitat, with large logs, deep water and undercut banks. These three habitat features are frequently used by nocturnal fish as daytime cover.

Nine fish were recorded at this site, similar to that recorded in the previous survey. Inanga and redfin bully were absent despite being recorded in one or more previous surveys. Three longfin eels and six shortfin eels were recorded, although there was a lack of small individuals, which seems typical for this site (Table 2). This site recorded the same species richness (two) as site 1, with a similar ratio of longfin to shortfin eels. It is possible that predation within the nets contributed to the low species richness lack of small eels, as suggested in previous reports. Overall, these results reflected the low flows present at the time of this survey, and represented little change from that recorded in the previous survey.

Unnamed tributary

This tributary was surveyed for the second time in this survey, with the current survey being the first occasion when both sites T1 and T2 were trapped. It should be noted that previous macroinvertebrate surveys have incidentally recorded fish, including banded kokopu and longfin eel, with larger unidentified eels observed below the wetland discharge. Unfortunately, no fish were recorded at either site in the current survey, which is a reflection of the relatively low intensity trapping, but also the low flows present at the time. In the previous (2016-2017) survey, one banded kokopu was captured (Photo 3), being an individual 130mm in length, likely to be between two and three years old (Hopkins, 1979). Banded kokopu are considered a regionally distinctive species in Taranaki, and as such, their presence in this unnamed tributary shows the significant values such small streams can have.



Photo 3 Banded kokopu (*Galaxias fasciatus*) captured in the unnamed tributary upstream of the wetland discharge, December 2016.

Size class distribution

Assessing the size class distribution of fish populations can provide a useful perspective on fish recruitment, and the long-term health of the community. For example, if recruitment were restricted, then there would be a lack of young fish. However, it can be influenced by other activities such as people feeding eels, or commercial eeling operations. It is therefore recommended that no such activities take place on the consent holder's property. It should also be noted that good numbers of fish are needed to support strong conclusions, and therefore only the size class distribution of eels (as opposed to other species) is discussed.

Figure 3 Figure 4 shows that a lower number of eels were recorded in the current survey than in the 2015-2016 survey, but similar to that recorded in the 2015-16 survey. The size class distribution was quite different however, with no size category clearly dominating the community. This differs to the previous surveys, which have recorded the most eels in the 500 to 700 mm size class. The most abundant size category in the current survey (albeit by only two eels) was the 700-899 mm size category.

This difference in the number of eels and the size class distribution can be attributed to the reduced flow conditions during the current survey. This lower flow meant that the bait scent was not carried as far downstream, with fish attracted from a smaller area than during higher flows. This will have contributed to the reduced number of large eels in the nets, reducing the likelihood of predation in the nets. This allowed for an increased survival of smaller eels.

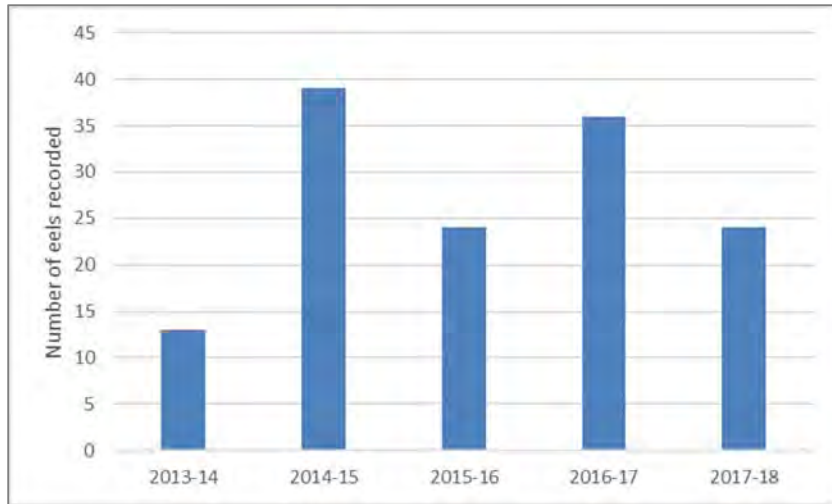


Figure 3 The total number of eels recorded per survey

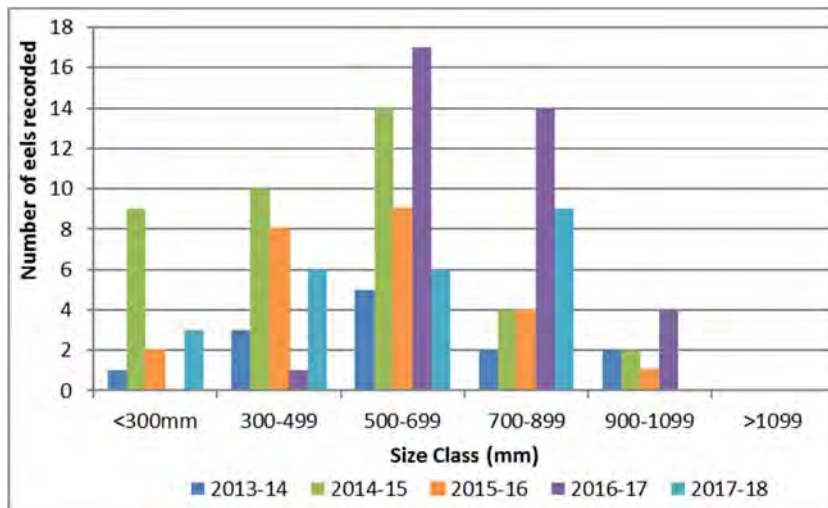


Figure 4 The size class distribution of all eels captured at all sites over the three surveys undertaken to date.

The presence of large eels (coupled with the higher numbers recorded in the previous survey) is a positive result, as it suggests some recovery from the impacts of commercial eeling, which is understood to have occurred just prior to the 2013-14 survey. However, this recovery will not yet be complete. The community will take some time to recover from the impacts of commercial eeling, as commercial eeling methods (fyke netting) are so efficient that 75% of the eels in a fished area can be caught in a single night. As a result, it can take a decade or more for the eel's population at such a site to recover (PCE, 2013). It should be noted that the sampling methodology is less likely to record eels smaller than 150mm, compared with larger eels.

Fish condition

The composting activities undertaken alongside the Haehanga Stream have the potential to release a range of substances to the stream, including some that have toxic effects on the fauna of the stream. The degree of toxicity can range from acute, resulting in quick death, to chronic, where repeated exposure over time may result in the fauna becoming unwell, and/or leaving the area. Eels captured in this survey were measured and weighed. This data is used to gauge the physical condition of the fish, which can be a useful indication of fish health. If fish at one site were in poorer condition than others in the same stream, then it would be expected that the sick fish of the same length would be lighter.

Figure 5 shows that all of the longfin eels recorded in the current survey were in better condition than would be expected. Shortfin eel showed a similar result, although one eel was found to be underweight by 26%. The four eels captured at site 3 were all well in excess of the expected weight, a result consistent with that recorded in the previous two surveys. This indicates that the longfin eel communities were in better physical condition than would be expected, while the shortfin eel communities were in average physical condition. This is despite the low flows and likely stressful conditions that preceded this survey, reflecting their relatively robust nature. This overall average condition is similar to that that recorded in the 2013-14 and 2014-15 surveys, but not as high as recorded in the previous two surveys, when most fish were heavier than that predicted by Jellyman *et al* (2013). The trend lines in Figure 5 used the equation from table 1 for longfin eel and table 3 for shortfin eel found in Jellyman *et al* (2013).

Overall, these fish condition results suggest that fish condition is better in early summer than late summer, including at site 2. This is consistent with the higher and cooler early summer flow conditions providing for improved habitat and food supply. The results from site 2 suggest that the eel community was in poorer health than the previous survey, although the eels were still of average condition i.e. not underweight. This suggests that the activities at the composting facility had not affected this community.

In addition to length and weight measurements, each fish was inspected for obvious physical damage or abnormalities. No such features were noted.

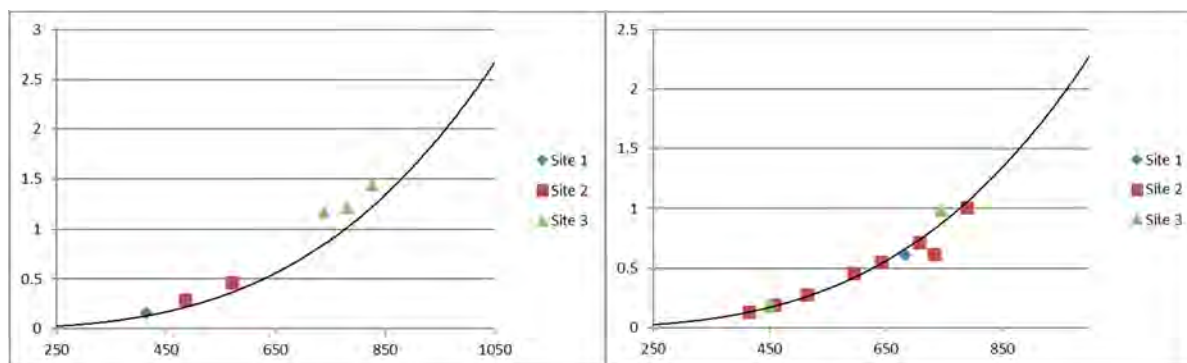


Figure 5 Longfin eel condition (left) and shortfin eel condition (right) in the Haehanga Stream, 14/15 December 2016. Weight (Kg) is on the y-axis, length (mm) on the x-axis. The trend line is the predicted weight, using equations from Jellyman *et al* 2013.

Fish Passage

During this and previous surveys, three access culverts were inspected, and assessed for fish passage. The locations of these culverts are summarised in Table 4. It was noted that each of the three culverts impeded fish passage in some way.

Culvert 1, on the Haehanga Stream near the composting pads, had a very shallow flow (Photo 4), which would inhibit most swimmers including inanga. The outlet of this culvert is usually too steep and water speeds too swift, and only suitable for climbing species. The low flows during the current survey reduced passage by reducing depth. Furthermore, the large rocks added to the streambed had moved, further reducing water depth. This culvert is in need of remediation.

Culvert 2 has two pipes, one that takes low flow, and a higher one that only flows during higher flows. Both culverts were perched, although the lower culvert only by a matter of approximately 20 mm. However, the lower culvert appeared subject to blockage (Photo 4). Although kokopu and eels have been recorded upstream of this culvert, these species are good climbing species and highly adept at negotiating barriers that swimming species cannot pass. This culvert will still reduce the passage of climbing species, while completely preventing the passage of swimming species.

Culvert 3, a double culvert under the main access track, was again perched (Photo 2), due to the remedial works completed prior to the 2016-2017 survey having washed away. This was predicted in the previous report (Jansma, 2017), and as a result, remedial works are once again required.

It is important that the site operator is made aware that these culverts generally need ongoing maintenance, and that the provision of fish passage is a requirement that must be met at all times.

Table 4 Culverts assessed for fish passage during the current fish survey

Culvert number	Location	NZTM GPS reference
1	Haehanga Stream, near composting pads	1732285-5685087
2	Unnamed tributary, immediately upstream of Haehanga Stream	1732291-5685098
3	Haehanga Stream, at downstream extent of irrigation area	1731707-5685778

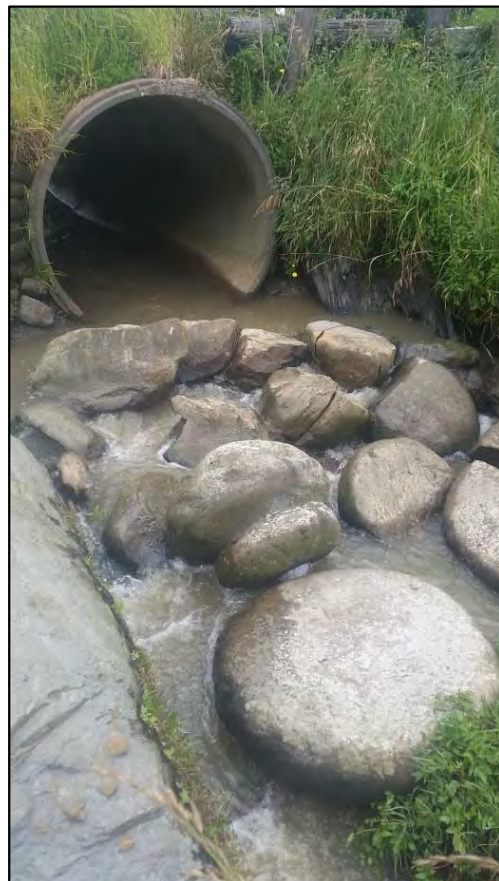


Photo 4 Culvert 1
 Top left: December 2015
 Top right: December 2016
 Bottom left: January 2018

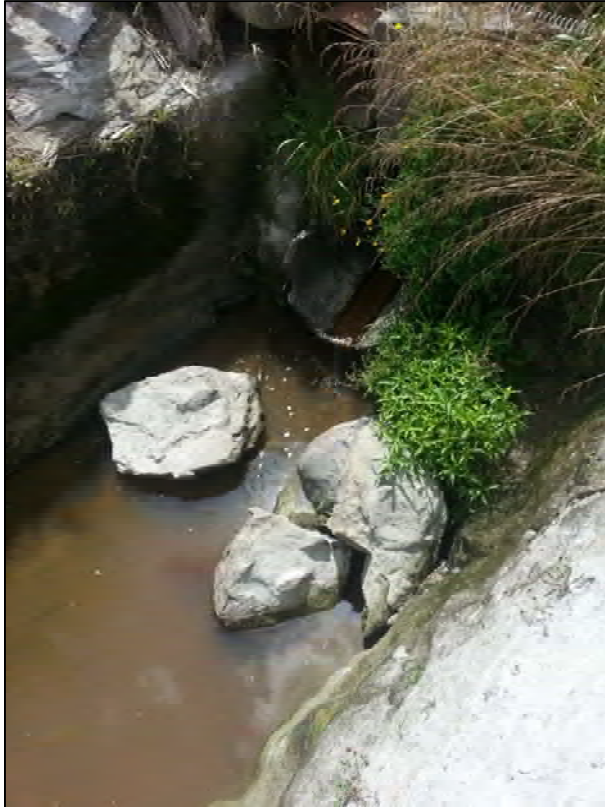
Photo 5 Culvert 2

Top left: December 2015

Top right: December 2016

Bottom left: January 2018

Bottom right: Interior, January 2018



Summary and conclusions

On 16 and 17 January 2018, three sites were surveyed for freshwater fish in the Haehanga Stream in relation to the composting activities undertaken by Remediation NZ Ltd. Site 1 was located upstream of the site, site 2 located immediately downstream of the lowest extent of the irrigation area, and site 3 was located just upstream of State Highway 3. The survey method involved deploying baited fine and coarse mesh fyke nets and gee minnow traps at each site overnight. This survey also including trapping of the unnamed tributary that receives the wetland discharge, with two gee minnow traps set both upstream and downstream of the discharge. All nets and traps were recovered the following morning, with all fish identified, counted and measured, with eels greater than 300mm weighed.

This survey is usually scheduled for December, to target the higher flows typically present in early summer. However, due to a very dry spring and early summer, the current survey was delayed in the hope that rains would return and flows would recover. A rain event occurred ten days prior to this survey, but was not sufficient to restore groundwater levels to the point where there was improved flow in the Haehanga Stream. As a result, the current survey was undertaken in very low flows, with no discernible flow at site 1, and very little flow present at sites 2 and 3.

All sites contained moderate fish habitat, with deep pools, and good cover. It should be noted that water temperatures in this stream may occasionally exceed the thermal preference, and maximum thermal tolerance of a number of native fish species, with a water temperature of 28.2°C recorded during the current survey. Due to the reduced flow conditions, which resulted in less flow past the nets and traps and reduced distribution of bait odour downstream, fish abundance and number of species recorded was lower than that recorded in the previous survey. Over all sites, twenty-four fish were recorded across two species. Unfortunately no fish were recorded in the unnamed tributary, where a banded kokopu was recorded in the previous survey.

Unlike in the 2015-2016 survey, when seven dead eels were observed at and downstream of site 2, there were no observations made that posed any concern. There was some discolouration noted at sites 2 and 3, but no obvious hydrocarbon contamination of the Haehanga Stream like that recorded in the 2014-2015 and 2015-2016 surveys. The degree of discolouration at sites 2 and 3 was minor, and likely a reflection of a lack of flushing due to the low flows. Upstream, the water was coloured yellow by dissolved tannins.

It is worth noting that the macroinvertebrate survey undertaken on the first day of the fish survey found that macroinvertebrate communities of five mainstem sites were in average to below average health. This was attributed primarily to the low flow causing habitat limitation, coupled with a change in sampling method at some sites.

The site that would be expected to experience the greatest impacts should there be any is site 2. At this site, two species were recorded, as was the highest abundance (13 fish) of the survey. Inanga were not present, despite being present in the previous survey. Natural variation will occur in inanga populations from year to year, as they recruit annually, and are therefore subject to numerous other factors. It should also be noted that there may be predation within the nets, as noted in the previous survey, when larger eels had clearly ingested smaller eels. It is very possible that smaller fish such as inanga has also been predated upon, although this was not obvious when handling the eels.

Site 3, further downstream also recorded two species, which is equal to that recorded in the previous survey. Inanga were absent, but have been recorded at this site previously.

Eels were recorded at all three sites, with the largest longfin eel being recorded at site 3. This individual was 825 mm long, and weighed 1.44 kg. The size class distribution of the eels was quite different to that recorded in the previous surveys, with no size class clearly dominating the community. This is probably a

reflection of the reduced flow conditions during the current survey. This lower flow meant that the bait scent was not carried as far downstream, with fish attracted from a smaller area than during higher flows. This will have contributed to the reduced number of large eels in the nets, reducing the likelihood of predation in the nets. This allowed for an increased survival of smaller eels. It is likely that the community is still impacted by the commercial eeling that is understood to have occurred just prior to the 2013-14 survey. It is expected it will take over decade for the community to recover from this. The physical condition of the eels showed that most of the eels captured at all three sites were in average condition, although the condition of the longfin eels was better than would be expected. This is despite the low flows and likely stressful conditions that preceded this survey, reflecting their relatively robust nature. Overall, these fish condition results suggest that fish condition is better in early summer than late summer, including at site 2. This is consistent with the higher and cooler early summer flow conditions providing for improved habitat and food supply. The results from site 2 suggest that the eel community was in poorer health than the previous survey, although the eels were still of average condition i.e. not underweight. This suggests that the activities at the composting facility had not affected this community. No observed fish exhibited any obvious physical damage or abnormalities during the current survey.

Three access culverts were assessed for fish passage during this survey, and all were found to present a barrier to fish passage at most if not all flows. Even in higher flows, it is likely that these culverts severely restrict the passage of swimming species such as inanga. The culvert located immediately above site 2 was perched, as the remedial works completed prior to the previous survey had scoured away. Remedial works are required on this culvert, and on the remaining two culverts, which have been identified as a barrier for a number of years.

In summary, the results of the current survey do not indicate that the composting activities and wastewater irrigation undertaken by Remediation NZ Ltd, alongside the Haehanga Stream, have had a deleterious impact on the fish communities of this stream. This is consistent with the findings of the macroinvertebrate survey, completed on the same day. However, the impact on fish passage caused by the three access culverts is likely to have contributed to the reduced species richness at site 1. It is important that the site operator is made aware that these culverts generally need ongoing maintenance, and that the provision of fish passage is a requirement that must be met at all times.

Although originally planned for early summer, this survey was delayed until mid-summer in the hope that flows would recover from the extended period of dry weather that occurred in late 2017. It is recommended that this survey continues to be scheduled for early summer, and that surveys continue on an annual basis. In addition, it is recommended consideration be given to installing continuous water temperature monitoring equipment over the summer months, to improve the understanding of how water temperature changes in the Haehanga Stream. It is also recommended that the company be reminded of their responsibilities regarding the provision for fish passage.

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