

New Plymouth District Council  
Inglewood, Okato,  
and Marfell Park Landfills  
Monitoring Programme  
Annual Report  
2017-2018

Technical Report 2018-38

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## Executive summary

The New Plymouth District Council (NPDC) maintains two reinstated landfills, one at Inglewood and one at Okato. Both of these sites are now used as transfer stations and are held in reserve to accept refuse, if required, as a contingency. The Inglewood landfill is an active cleanfill site; located on King Road at Inglewood, in the Waiongana catchment. The Okato landfill is an active cleanfill and green waste disposal site; located on Hampton Road at Okato, in the Kaihihi catchment.

NPDC also maintains a closed landfill, Marfell Park (Marfell) landfill in the Huatoki catchment. This landfill does not accept any waste for disposal and has been fully reinstated.

This report for the period July 2017 to June 2018 describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess NPDC'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 NPDC's activities.

NPDC holds seven resource consents in relation to these landfills, which include a total of 59 conditions setting out the requirements that they must satisfy. NPDC holds three consents to discharge leachate and stormwater into various streams, two consents to discharge contaminants onto and into land, and two consents to discharge emissions into the air.

### **During the monitoring period, NPDC demonstrated an overall high level of environmental performance.**

The Council's monitoring programme for the year under review included six inspections, one discharge sample, 14 receiving water samples, two biomonitoring surveys of receiving waters, and one ambient air quality analysis. The biennial monitoring scheduled for the Marfell landfill site will next be implemented during the 2018-2019 year.

During the monitoring year there were no incidents logged by Council associated with NPDC's landfills covered in this report.

Overall during the year, NPDC demonstrated a good level of environmental performance and a high level of administrative performance in relation to the Inglewood landfill consents as defined in Section 1.1.5. Although no significant environmental effects were found due to the operation of the site, the recent trend of increasing concentrations of nitrogen compounds prior to the remediation of the cap and the increasing trend in acid soluble manganese indicate that there may be the potential for environmental effects to emerge in the future.

During the year, NPDC demonstrated a high level of environmental performance and a high level of administrative performance in relation to the Okato landfill resource consents as defined in Section 1.1.5.

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 remains at a good or high level in the year under review.

This report includes recommendations for the 2018-2019 year, including a recommendation relating to an optional review of consents 3860-3, 4528-3 and 4529-3.



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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 New Plymouth District Council (NPDC) for closed landfills in the district.

NPDC holds a consent to discharge leachate and contaminated stormwater from its closed landfill, Marfell Park (Marfell) landfill in the Huatoki catchment. This landfill does not accept waste for disposal to land and has been fully reinstated.

NPDC also hold consents to discharge solids to land, emissions to air, and leachate and contaminated stormwater to land and water, at two contingency landfills that currently operate as transfer stations and green waste and/or cleanfill disposal sites. These are Inglewood landfill (cleanfill) in the Waiongana catchment, and Okato landfill (cleanfill and green waste) in the Kaihihi catchment. The landfills are not routinely accepting refuse and these former activities have been fully reinstated. They do, however, retain all necessary consents to act as contingency sites if the regional landfill at Colson Road has to cease accepting waste, or there are transportation issues in the event of an emergency.

The Colson Road regional landfill remains operational. The monitoring of this facility has been reported separately since the annual report covering the 1999-2000 monitoring period.

The report includes the results and findings of the monitoring programme implemented by the Council in respect of the consents held by NPDC that relate to the discharges of leachate and stormwater within these catchments and discharges of contaminants onto and into land and emissions to air for the Inglewood and Okato sites.

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 NPDC's use of water, land and air, and is the 28<sup>th</sup> combined annual report by the Council for the consent holder.

### 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 NPDC for landfills/cleanfills in the Huatoki, Waiongana, and Kaihihi catchments;
- the nature of the monitoring programme in place for the period under review; and
- a summary of the status of these three landfill sites.

Each of the sites is then discussed in a separate section (Sections 2 to 4).

**Sub-section 1** (for example Section 2.1) presents:

- a general description of the former landfill, current activities and discharges;

- an aerial photograph or map showing the location of the former landfill; and
- an outline of the matters covered by NPDC's permit(s) for the site

**Sub-section 2** presents the results of monitoring of the NPDC's activities at each of the sites during the period under review, including scientific and technical data.

**Sub-section 3** discusses the results, their interpretation, and their significance for the environment.

**Sub-section 4** presents recommendations to be implemented in the 2018-2019 monitoring year.

**Section 5** contains a summary of recommendations for the 2018-2019 period.

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 NPDC, 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 NPDC'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 Summary of resource consents

NPDC holds a total of seven consents in relation to its closed and contingency landfills. The consents held for each of the closed and contingency landfills are summarised in Table 1, and are further explained in each sub-section 1.

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

There are consents held by NPDC for each of the sites to allow for the discharge of leachate and stormwater.

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.

There are consents held by NPDC for the Inglewood and Okato contingency landfills to allow for the discharge of contaminants to air that cover both potential discharges from historical landfilling activities, and discharges to air that may occur should the landfills be used in the event of an emergency.

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 contingency discharge to land consent held for the Inglewood landfill also permits the discharge of cleanfill to land at the site and this aspect of the consent is routinely exercised. The consent held for Okato also permits the discharge of cleanfill and green waste and this aspect of the consent is routinely exercised.

The summary of consent conditions included in each sub-section 1 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 (Appendix I).

**Table 1 Summary of consents held by NPDC**

Site	Consent No.	Purpose	Review opportunities	Expires
Inglewood	3954-2	To discharge up to a total of 4,752 m <sup>3</sup> /day (55 litres/second) of leachate and stormwater from the Inglewood municipal landfill into an unnamed tributary of the Awai Stream, a tributary of the Mangaoraka Stream in the Waiongana catchment	-	1 June 2020
	4526-3	To discharge contaminants, being landfill gas, and odours associated with a landfill, into the air from the Inglewood municipal landfill	June 2020	1 June 2026
	4527-3	To discharge cleanfill and inert materials onto and into land at the Inglewood municipal landfill, and to discharge municipal refuse onto and into land at the Inglewood municipal landfill when, and only when, it cannot be discharged at the Colson Road municipal landfill	June 2020	1 June 2026

Site	Consent No.	Purpose	Review opportunities	Expires
Okato	3860-3	To discharge stormwater and leachate from the Okato municipal landfill into an unnamed tributary of the Kaihihi Stream	June 2019 June 2025	1 June 2031
	4528-3	To discharge emissions into the air from the contingency discharge of solid contaminants at the Okato municipal landfill	June 2019 June 2025	1 June 2031
	4529-3	To discharge cleanfill and green waste to land and to discharge general refuse on a contingency basis to land	June 2019 June 2025	1 June 2031
Marfell	4902-2	To discharge leachate from the Marfell former landfill site via groundwater into the Mangaotuku Stream	June 2020 June 2026	1 June 2032

## 1.3 Monitoring programme

### 1.3.1 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 programmes for the NPDC landfill sites consisted of four primary components as outlined below. The Inglewood and Okato landfills, where cleanfill and/or green waste is still being discharged are monitored annually. The closed Marfell site is monitored biennially and will next be monitored as scheduled during the 2018-2019 year.

### 1.3.2 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.

### 1.3.3 Site inspections

A total of six inspections were carried out at the Inglewood and Okato sites. With regard to consents for the discharge to water, inspections focused on site processes with potential or actual discharges to receiving watercourses, including contaminated stormwater. The potential for emissions to air is also considered at the time of inspection.

### 1.3.4 Chemical sampling

The Council took one discharge and 14 receiving water samples for physicochemical analysis during the monitoring year across all of the NPDC landfill sites covered in this report.

Ambient air quality monitoring was also carried out at the Inglewood landfill during inspection on two occasions.

### 1.3.5 Biomonitoring surveys

A biological survey was performed on two occasions at the Inglewood landfill in two unnamed tributaries of the Awai Stream.

**Table 2** Summary of monitoring activities carried out at the NPDC landfills during the monitoring period

Landfill	Number of discharge samples	Number of receiving water samples	Number of inspections	Biomonitoring surveys	Ambient air surveys
Inglewood	1	10	4	2	2
Marfell*	0	0	0	0	0
Okato	0	4	2	0	0
<b>TOTAL</b>	<b>1</b>	<b>14</b>	<b>6</b>	<b>2</b>	<b>2</b>

\* monitoring is undertaken biennially at the Marfell closed landfill and this is next scheduled during 2018-2019

## 2 Inglewood landfill

### 2.1 Introduction

#### 2.1.1 Site description

The Inglewood landfill opened in 1978 and operated as a municipal landfill for about 24 years.

The site had been constructed in the head of a gully in the Awai Stream catchment. As the gully was filled with refuse, cover material was progressively excavated from the side walls ahead of the fill. The underlying soil, cover and capping material at the site is clay (Taranaki Ash).

Solid waste from the Inglewood kerbside collection was disposed of at Colson Road from about 1999 and the Inglewood landfill was closed to general waste acceptance on 1 September 2006. During the period January 2005 to March 2006 solid waste from the Stratford District kerbside collection was disposed of at this site, and for three months from July 2005 to October 2005 solid waste normally disposed of at Colson Road, was disposed of here whilst remedial work was undertaken at Colson Road.

The site has continued to be used as a waste transfer station. Refuse is placed in bins for removal and disposal at the Colson Road landfill. The disposal of cleanfill is still permitted at the site, and the site has been identified as a contingency landfill in the event that refuse cannot be disposed of at Colson Road.

Approximately 1.78 ha of the site has been used for landfilling. As required by the conditions of the consent, NPDC maintains a Landfill Closure Management Plan for the site that addresses monitoring and management of the site. NPDC staff also undertake regular inspections at the site, and the plan states that if any issues are identified they will be remediated appropriately.

The Inglewood Landfill Closure Plan states that it is suspected that when this landfill was originally developed there were no standard specifications for the siting and operation of landfills. As a result the site is not lined, nor does it have landfill gas or leachate collection systems in place.

Figure 1 shows the approximate extent of the fill and the general layout of the Inglewood landfill site. The discharge and receiving water monitoring site locations are shown in Figure 2.





Figure 1 Site layout at Inglewood contingency landfill



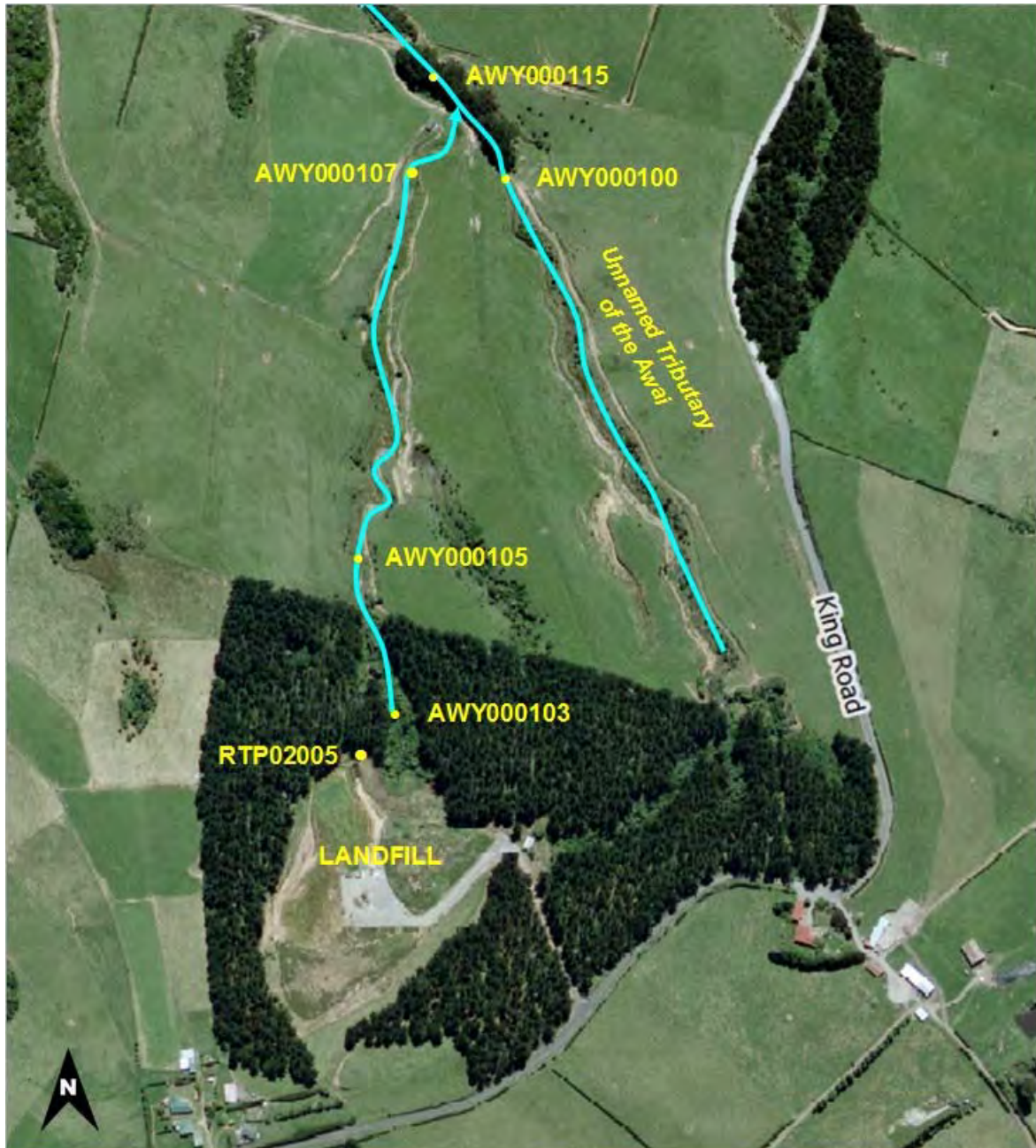


Figure 2 Inglewood landfill and receiving water sampling sites

## 2.1.2 Resource consents

### 2.1.2.1 Water abstraction permit

NPDC holds water discharge permit **3954-2** to cover the discharge of up to a total of 4,752 m<sup>3</sup>/day or 55 L/s of leachate and stormwater from the Inglewood municipal landfill to an unnamed tributary of the Awai Stream, a tributary of the Mangaoraka Stream, in the Waiongana catchment. This permit was issued by the Council on 18 February 2002 under Section 87(e) of the RMA. It is due to expire on 1 June 2020.

It has eight conditions:

Condition 1 requires that a site contingency plan be prepared, maintained and adhered to.

Condition 2 requires the consent holder to prepare a landfill operations and management plan.

Condition 3 states that the consent holder shall prepare a landfill closure management plan by 1 June 2007 or three months prior to the closure of the landfill.

Condition 4 allows for changes to management plans relating to the landfill.

Conditions 5, 6 and 7 relate to monitoring of water associated with the site, leachate and stormwater collection and discharge, and discharge effects on aquatic life or receiving water quality respectively.

Condition 8 allows for the review, amendment, deletion or addition to the conditions of the resource consent.

A copy of this consent is included in Appendix I of this report.

### 2.1.2.2 Air discharge permit

The NPDC holds air discharge consent **4526-3** to discharge emissions into the air from the Inglewood municipal landfill site. This permit was issued by the Council on 20 March 2007 under Section 87(e) of the RMA. It is due to expire on 1 June 2026. It has four conditions:

Conditions 1 and 2 require the submission of a contingency plan and management plan.

Condition 3 requires that NPDC notifies the Council of any changes to its operations at the site.

Condition 4 is a review condition.

A copy of this consent is included in Appendix I of this report.

### 2.1.2.3 Discharge of wastes to land

NPDC holds water discharge permit **4527-3** to discharge cleanfill and inert materials onto and into land at the Inglewood municipal landfill and to discharge municipal refuse onto and into land when, and only when, it cannot be discharged at the Colson Road municipal landfill. The consent expires on 1 June 2026. It has 12 conditions:

Condition 1 requires that the consent holder adopts the best practicable option.

Conditions 2, 3, 4 and 5 stipulate the requirements regarding the adherence to the information supplied in the consent applications and the landfill management plan and the maintenance of the management plan.

Condition 6 stipulates the maximum water content of sludges to be disposed.

Conditions 7 and 8 define the term "cleanfill".

Condition 9 stipulates that discharge to land shall not result in any contaminants entering surface water.

Conditions 10 and 11 require that stormwater and leachate systems are maintained.

Condition 12 is a lapse condition.

A copy of this consent is included in Appendix I of this report.

## 2.2 Results

### 2.2.1 Site inspections

22 September 2017

The site was inspected during fine weather with calm wind conditions. The cap was well vegetated with no ponding, erosion or slumping observed. It was noted that the cap was wet underfoot but this was thought to be caused by recent wet weather. The cap was not being grazed at the time of the inspection, with no sign of stock or rabbit damage. The batters were well vegetated and showed no signs of erosion, slumping or cracking. The stormwater drains were clear and free flowing. Gorse was observed to be growing in the

western drain, and it was recommended that this be sprayed. The drains showed signs of recent flow and showed minor ponding. No exposed refuse was observed.

The northern leachate drains and the leachate pond were discharging, with the drains discharging at around 0.2 L/s and the ponds at 0.5 L/s. The site had appropriate signage and security in place. The fencing was permanent and in good condition. The transfer station was unoccupied and the site was tidy.

#### 21 November 2017

The site was inspected in fine weather with gusty south-easterly wind. It was noted that the cap was intact and well vegetated. No obvious erosion, slumping or cracking was observed at the time of inspection. The drains showed no sign of recent flow and were in good condition, it was noted gorse and blackberry was starting to emerge in some of the drains.

The water level in the leachate pond was very low with only 20-30cm of tan milky brown fluid observed. The pond was not discharging at the time of the inspection. The site was securely fenced with the correct signage in place. No unauthorised material was found in the cleanfill disposal area.

#### 13 February 2018

The site was inspected in overcast conditions with intermittent drizzle. The cap was well vegetated with no obvious signs of erosion or slumping. It was noted that blackberry and gorse were starting to establish on the cap. There was no evidence of recent grazing. A very slight earthy odour was detected on the cap near the old cracks, the inspecting officer was unable to locate the exact source of the smell. It was recommended that the consent holder assess the integrity of the cap. It was observed that gorse and blackberry was starting to grow in the drains, however at the time of the inspection the drains appeared to be effective, with no sign of ponding or recent flow.

The leachate ponds were dry and not discharging. The green waste storage area was tidy.

#### 26 March 2018

The site was inspected during fine weather conditions. The cap was well vegetated and there were no obvious signs of erosion, slumping or cracking observed. Some small trees had fallen on the cap from the bank but these did not appear to be compromising the integrity of the cap. There were no signs of recent grazing. The perimeter drains were dry with no signs of recent flow. As in the previous inspections, it was noted that vegetation was growing in the drains and it is possible that this may inhibit flow pathways.

The leachate pond was near full but was not discharging, the pond was dark brown and no odour was detected. The site was securely fenced with the correct signage in place and visible. It was noted that a small amount of green waste was present in the transfer station, and no unauthorised material was identified in the cleanfill area.

### 2.2.2 Results of stormwater/leachate monitoring

One sample was collected from the stormwater/leachate pond during the monitoring period. The results are presented in Table 3 together with a summary of the historical data.

It has previously been found that the pond only discharges directly into the landfill tributary after heavy rain, as accumulated water in the pond tends to be lost to evaporation and seepage. This means that there is usually a significant amount of freeboard present at any given time.

During the year under review the pond was found to be discharging only at the time of the inspection on 22 September 2017. It was not discharging during any of the scheduled surface water sampling surveys. A leachate/stormwater sample was taken from the pond immediately upstream of the pond outlet on 21 November 2017. The second scheduled sample was not collected, as the pond was dry at the time of the February 2018 survey.

Table 3 Chemical analysis of samples taken from the Inglewood landfill leachate/stormwater pond (site RTP002005)

Parameter	Unit	21 Nov 17 <sup>a</sup>	13 Feb 18 <sup>b</sup>	Minimum	Maximum	Median	Number
Ammoniacal nitrogen	g/m <sup>3</sup> N	6.66	-	0.01	73.3	5.36	26
Biochemical oxygen	g/m <sup>3</sup>	7.0	-	0.6	850	2.6	25
Conductivity @ 20°C	mS/m@20C	25.5	-	13.3	208	38.8	26
Nitrate/nitrite nitrogen	g/m <sup>3</sup> N	<0.01	-	0.88	1.89	-	2
pH	pH	7.3	-	6.7	8.5	7.3	26
Temperature	Deg.C	16.5	-	4.8	18.3	13.0	25
Total nitrogen	g/m <sup>3</sup> N	8.26	-	11.3	12.1	-	2
Turbidity	NTU	69	-	1.5	58	3.5	10
Un-ionised ammonia	g/m <sup>3</sup>	0.04877	-	0.00005	0.04525	0.00163	15
Zinc Dissolved	g/m <sup>3</sup>	0.054	-	<0.005	0.63	0.008	26

**Key :** a sampled from the pond as no discharge was occurring

b pond dry

The autumn samples were collected after heavy rainfall in the 2013-2014, 2014-2015 and 2015-2016 years resulting in the ammoniacal nitrogen concentrations of the samples collected being elevated when compared the 2009-2012 years. During the year under review, ammoniacal nitrogen concentration continued to be elevated, (Figure 3), but to a slightly lesser extent due to the lower rainfall in the month preceding this survey.

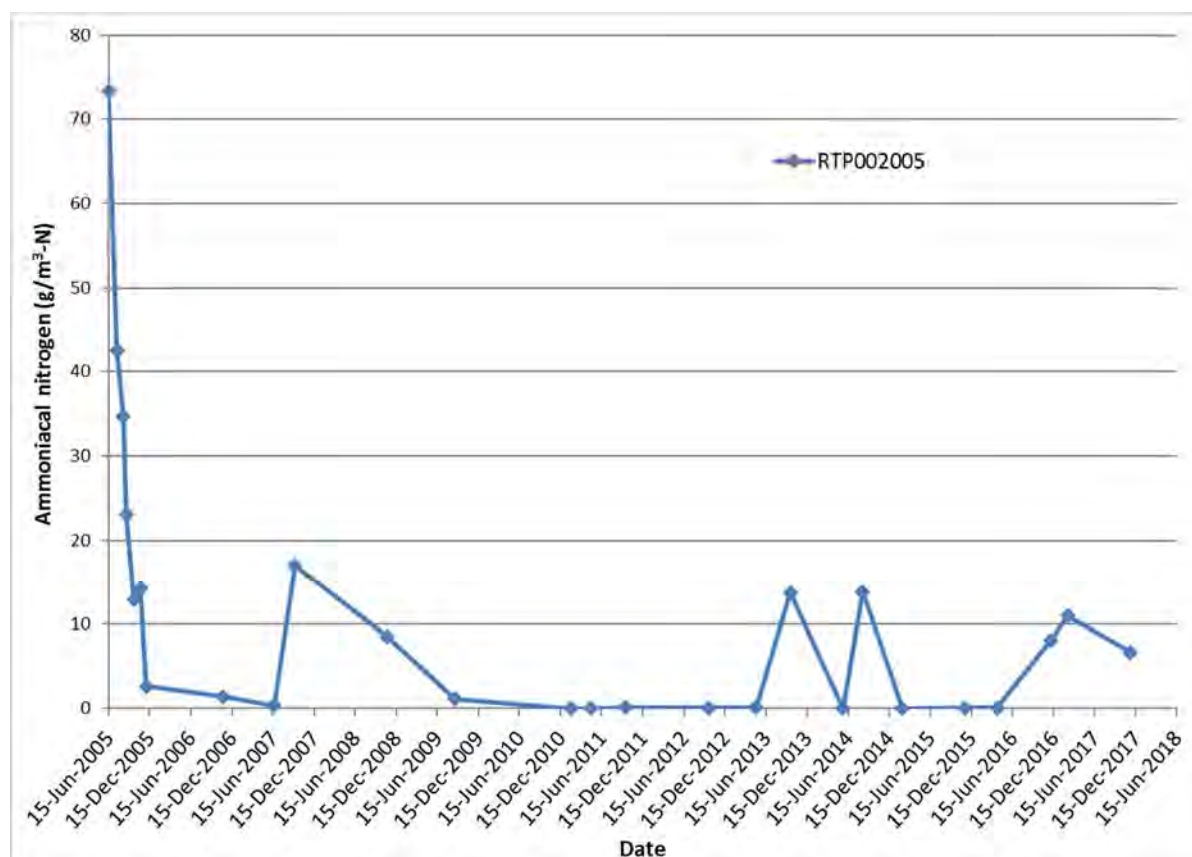


Figure 3 Ammoniacal nitrogen concentration of the Inglewood landfill stormwater/leachate (RTP002005) for monitoring to date

The higher values obtained may have been the result of one or more of a number of factors including: the surrounding area, recent grazing, and/or additional stormwater infiltration causing increased leachate generation. Increased leachate generation is considered to be an unlikely cause as the cap was remediated during the 2014-2015 year, and was found to be intact and well vegetated during the year under review.

The receiving water results are discussed in Section 2.2.3 and indicate that, due to the stormwater/leachate pond not discharging during either sampling occasion, it is unlikely to be responsible for the elevated ammoniacal nitrogen concentrations found in the landfill tributary immediately below the culvert outlet (site AWT000103).

At this stage there are no significant adverse effects being found in the receiving waters, however nitrate/nitrite nitrogen and total nitrogen analyses have been added to the suite of parameters determined. This has been done to aid with the interpretation of results and identifying any trends that may emerge.

## 2.2.3 Results surface water sampling

### 2.2.3.1 Chemical analysis

Receiving water sampling was undertaken at sites AWY00103, AWY100105, AWY000100, AWY000107 and AWY000115 on two occasions (21 November 2017 and 13 February 2018). The locations of these monitoring sites are shown in Figure 2 and the results of the chemical analysis of the samples are presented in Table 4 and Table 5.

Table 4 Chemical analysis of the Awai Stream tributaries sites on 21 November 2017

Parameter	Unit	AWY000103	AWY000105	AWY000107	AWY000100	AWY000115
		30 m d/s of landfill (culvert discharge)	130 m d/s of landfill	400 m d/s landfill face	u/s of confluence of landfill trib	d/s of confluence of landfill trib
Alkalinity	g/m <sup>3</sup> CaCO <sub>3</sub>	331	76	62	21	44
BOD	g/m <sup>3</sup>	1.4	2.7	1.3	<0.5	1.7
Conductivity @ 20°C	mS/m	68.7	25.1	20.4	8.2	15.4
Dissolved oxygen	g/m <sup>3</sup>	4.53	5.52	7.51	9.43	8.43
Dissolved reactive phosphorus	g/m <sup>3</sup> -P	<0.003	<0.003	0.003	<0.003	<0.003
Acid soluble iron	g/m <sup>3</sup>	18.6	0.23	0.22	0.17	0.58
Acid soluble manganese	g/m <sup>3</sup>	8.23	1.21	0.09	0.03	0.09
Unionised ammonia	g/m <sup>3</sup>	0.10359	0.00055	0.00010	0.00009	0.00009
Ammoniacal nitrogen	g/m <sup>3</sup> -N	32.4	0.097	0.016	0.024	0.018
Nitrate/nitrite nitrogen	g/m <sup>3</sup> -N	0.11	5.82	3.56	0.36	2.27
pH	pH	7.0	7.2	7.2	7.1	7.2
Temperature	Deg C	14.6	16.2	17.0	13.6	14.0
Total nitrogen	g/m <sup>3</sup> -N	32.9	6.00	3.66	0.40	2.44
Turbidity	NTU	350	7.1	3.7	0.91	17
Dissolved zinc	g/m <sup>3</sup>	0.088	0.076	0.038	0.072	0.036



Table 5 Chemical analysis of the Awai Stream tributaries sites on 13 February 2018

Parameter	Unit	AWY000103	AWY000105	AWY000107	AWY000100	AWY000115
		30 m d/s of landfill (culvert discharge)	130 m d/s of landfill	400 m d/s landfill face	u/s of confluence of landfill trib	d/s of confluence of landfill trib
Alkalinity	g/m <sup>3</sup> CaCO <sub>3</sub>	335	65	56	24	42
BOD	g/m <sup>3</sup>	2.7	0.5	<0.5	<0.5	<0.5
Conductivity @ 20°C	mS/m	68.6	19.3	17.0	9.4	13.5
Dissolved oxygen	g/m <sup>3</sup>	2.37	6.56	6.62	0.46	6.38
Dissolved reactive phosphorus	g/m <sup>3</sup> -P	<0.003	<0.003	<0.003	<0.003	<0.003
Acid soluble iron	g/m <sup>3</sup>	20.2	0.66	0.93	0.22	0.28
Acid soluble manganese	g/m <sup>3</sup>	5.94	0.30	0.43	0.07	0.55
Unionised ammonia	g/m <sup>3</sup>	0.12005	0.00017	0.00009	0.00006	0.00009
Ammoniacal nitrogen	g/m <sup>3</sup> -N	30.5	0.014	0.014	0.019	0.021
Nitrate/nitrite nitrogen	g/m <sup>3</sup> -N	0.10	0.92	0.39	0.21	0.31
pH	pH	6.9	7.4	7.1	6.9	7.0
Temperature	Deg C	20.5	20.6	20.6	18.1	19.0
Total nitrogen	g/m <sup>3</sup> -N	32.8	1.08	0.44	0.28	0.39
Turbidity	NTU	400	5.4	8.8	1.3	1.4
Dissolved zinc	g/m <sup>3</sup>	<0.005	<0.005	<0.005	<0.005	<0.005

As with previous results, the discharge from the culvert below the landfill exhibits leachate contamination as indicated by the high levels of conductivity, alkalinity, iron, manganese, ammoniacal nitrogen and ammonia.

An unusually low dissolved oxygen concentration was recorded in the main tributary, upstream of the landfill tributary during the February survey. It was noted at the time of sampling that there was a significant amount of decomposing leaves present at the sampling site, which would have accounted for this finding. The dissolved oxygen concentration at this survey were all lower than median at all sites due to the very low flow conditions prevailing.

The dissolved zinc at all surface water sites was elevated at the time of the November survey, and a new maximum was obtained at all sites. Site AWY000100, which is upstream of any influences from the landfill exhibited a similar concentration to AWY000103 and AWY000105, indicating that the cause was not related to the discharges from the landfill.

With the exception of nitrate/nitrite nitrogen (and BOD on 21 November 2017), the levels of contaminants found 130 m downstream of the discharge (at site AWY000105) are far lower, indicating that the intervening wetland is being effective at reducing contaminant levels. The higher nitrate/nitrite nitrogen at site AMY000105 when compared to AMY000103 is due to the oxidation of the ammoniacal nitrogen in the landfill tributary. However, it is noted that although the nitrate/nitrite nitrogen concentration had increased, the total nitrogen in the waterbody had decreased significantly compared to the upstream value at the time of both surveys during the year under review.

Figure 4 shows the ammoniacal nitrogen results for the stormwater/leachate pond (RTP002005) and the landfill tributary below the culvert outlet (AWY000103). During the year under review there was no discharge occurring at the time of either survey, but it is noted that the concentration was much lower in the pond than in the tributary. This has been a consistent finding since September 2005, and continues to indicate that ammoniacal nitrogen is entering the landfill tributary via another route, potentially via shallow groundwater.

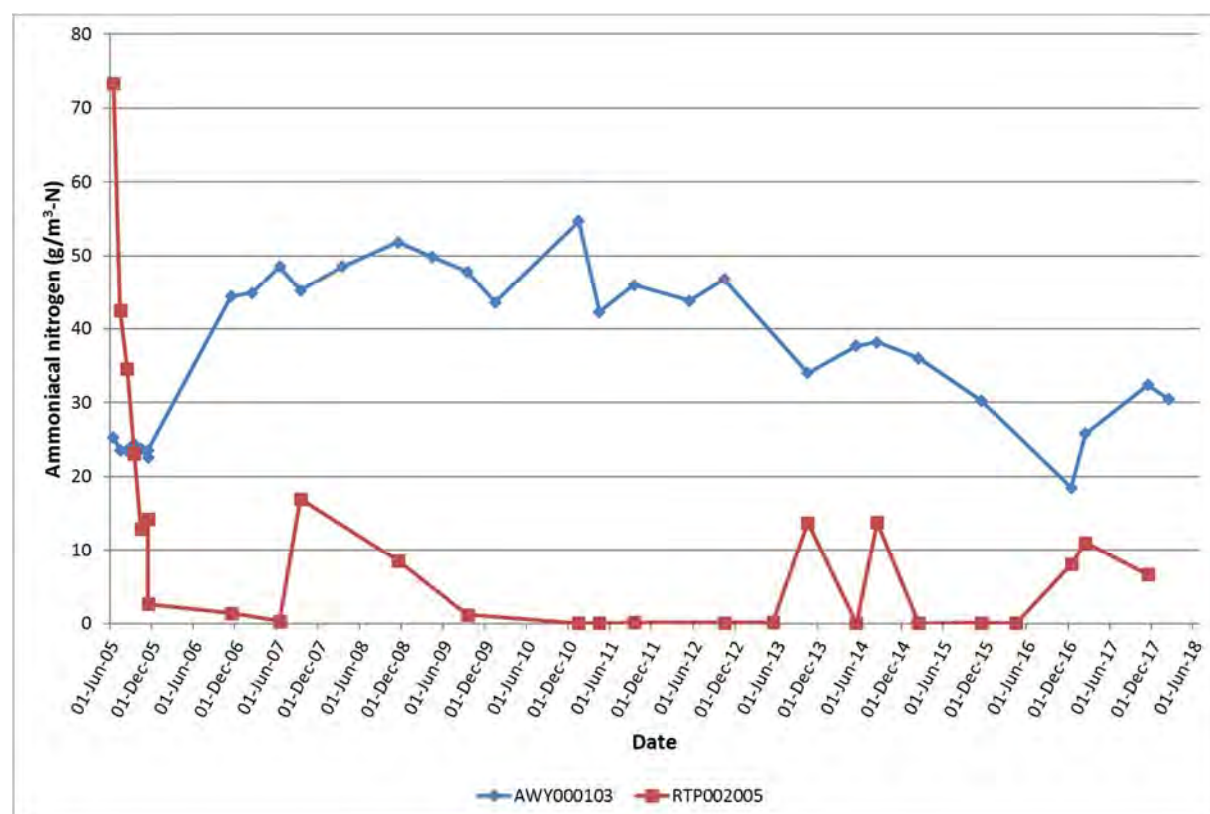


Figure 4 Ammoniacal nitrogen concentration between the Inglewood landfill stormwater/leachate (RTP002005) and the tributary below the culvert outlet (AWY000103)

It is also noted that at the culvert outlet the unionised ammoniacal nitrogen concentration has been consistently above the 0.025 g/m³ guideline adopted by the Council to protect aquatic organisms from chronic effects. From a review of the historical results, it appears that there has been an emerging trend of increasing levels of this contaminant at this site. It is however noted that, for the most part, this is generally assimilated in the wetland area, and the concentrations found at the lower end of the landfill tributary (site AWY000105) are normally well below this guideline value (Figure 5).

The concentration range above which acute toxic effects may be seen for New Zealand native fish, for example a fish kill, is 0.75 to 2.35 g/m³, and the levels of unionised ammonia found at all monitoring sites during the year under review were well below this concentration range. Although the unionised ammonia concentration was found to be above the 0.025 g/m³ guideline at the lower end of the tributary on occasion, this has not happened in recent years.

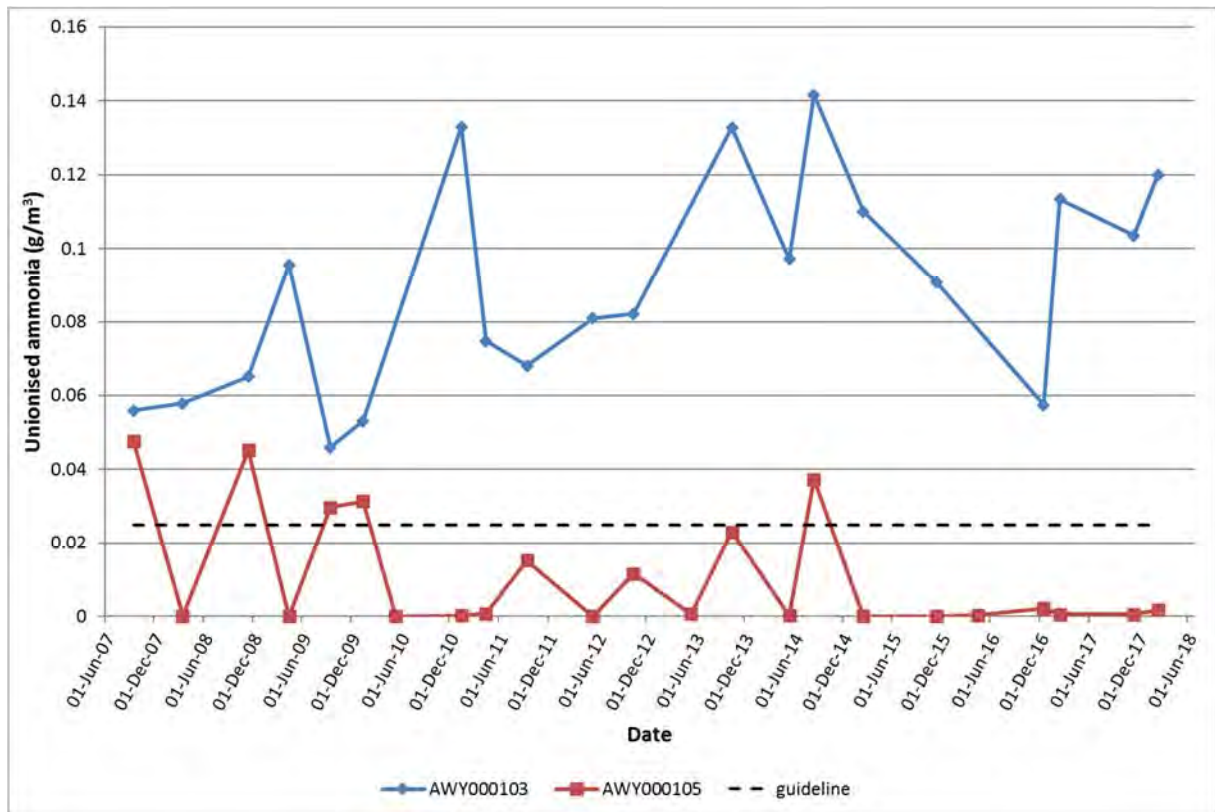


Figure 5 Unionised ammonia concentration in the landfill tributary below Inglewood landfill

Figure 6 shows that there has generally been little, if any, effect found on the unionised ammonia concentration of the larger (main) tributary (site AWY000115). Any changes that have been found have not been of environmental significance.

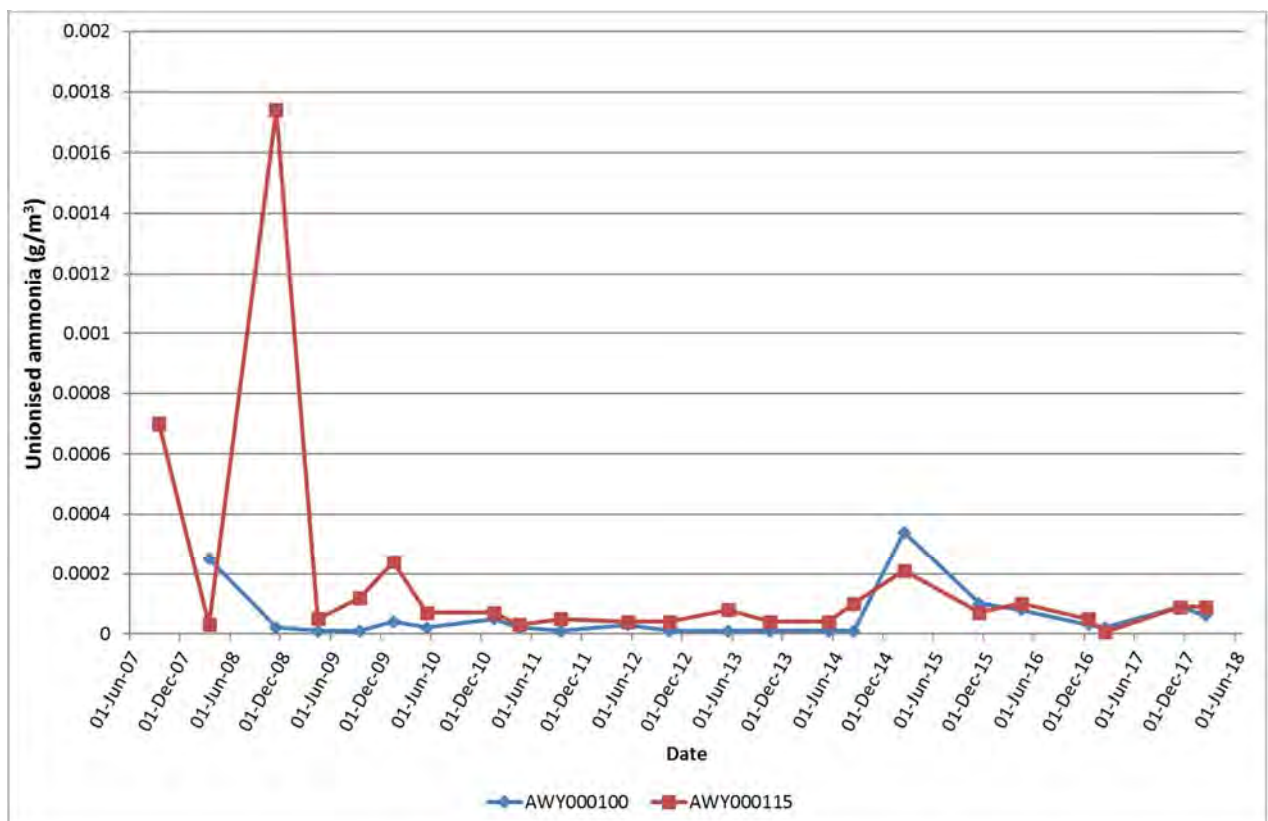


Figure 6 Unionised ammonia concentration in the main tributary below Inglewood landfill



The main unnamed tributary that receives the discharge from the landfill tributary displays slight elevations in conductivity, pH, alkalinity and ammoniacal nitrogen and nitrite/nitrate nitrogen at AWY000115 when compared to the upstream site (AWY000100). These minor increases have been noted in previous monitoring years and have been considered most likely a result of the presence of the landfill and from inputs from stock grazing in the area immediately downstream of the landfill site.

A review of the historical data also shows that the difference in the nitrate/nitrite nitrogen concentrations between sites AWY000100 and AWY000115 appears to be increasing. However, in the case of the February 2018 survey, the landfill tributary had little, if any, effect on the water quality of the main tributary.

Due to the changes observed in recent years in the ammoniacal nitrogen and nitrate/nitrite concentrations at the various sites, total nitrogen has recently been included in the suite of analyses performed. The results obtained since this analysis was initiated in the 2016-2017 year are depicted in Figure 7, and show that:

- the nitrogen contained in the leachate/stormwater pond is significantly lower than at site AWY000103;
- the wetland below the culvert is effective at decreasing the total nitrogen loading in the landfill tributary, and that this continues to decrease prior to the confluence with the main tributary; and
- with the exception of the February 2018 survey, there is a notable increase in the total nitrogen concentration of the main tributary that mirrors the increases observed in the nitrate/nitrogen at these sites (Figure 8).

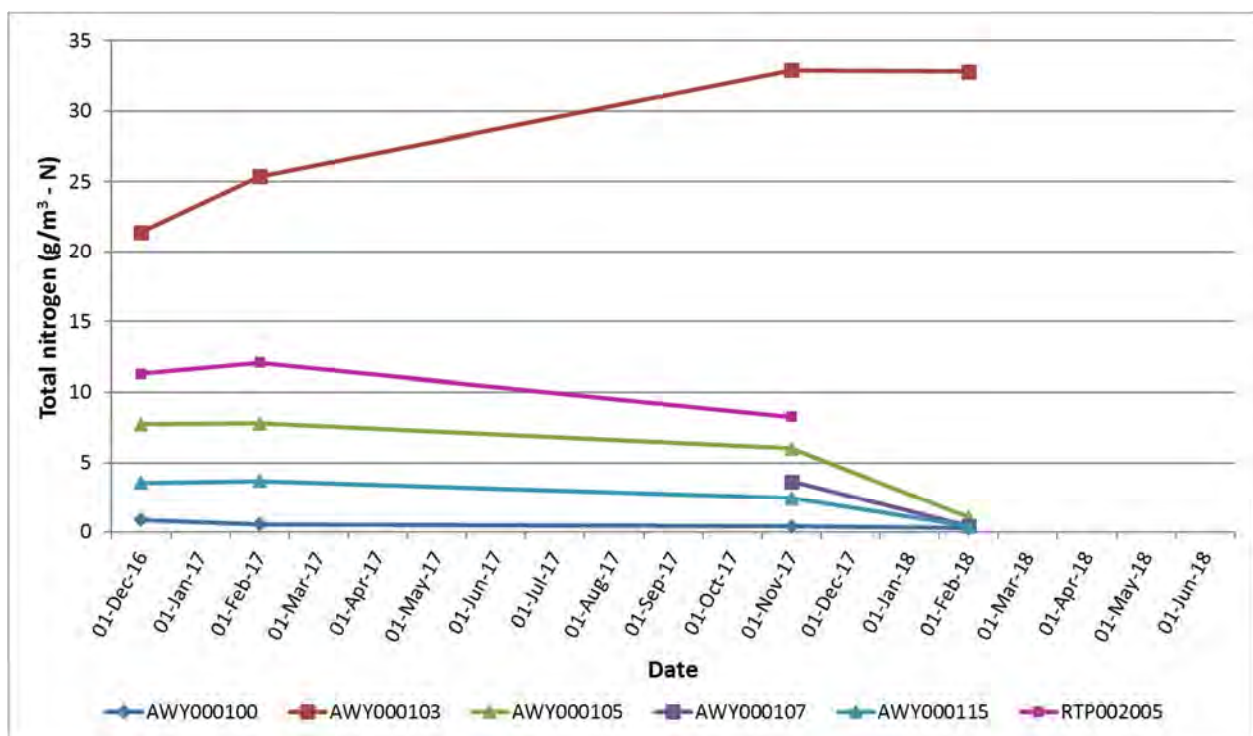


Figure 7 Total nitrogen concentration in the surface waters below the landfill

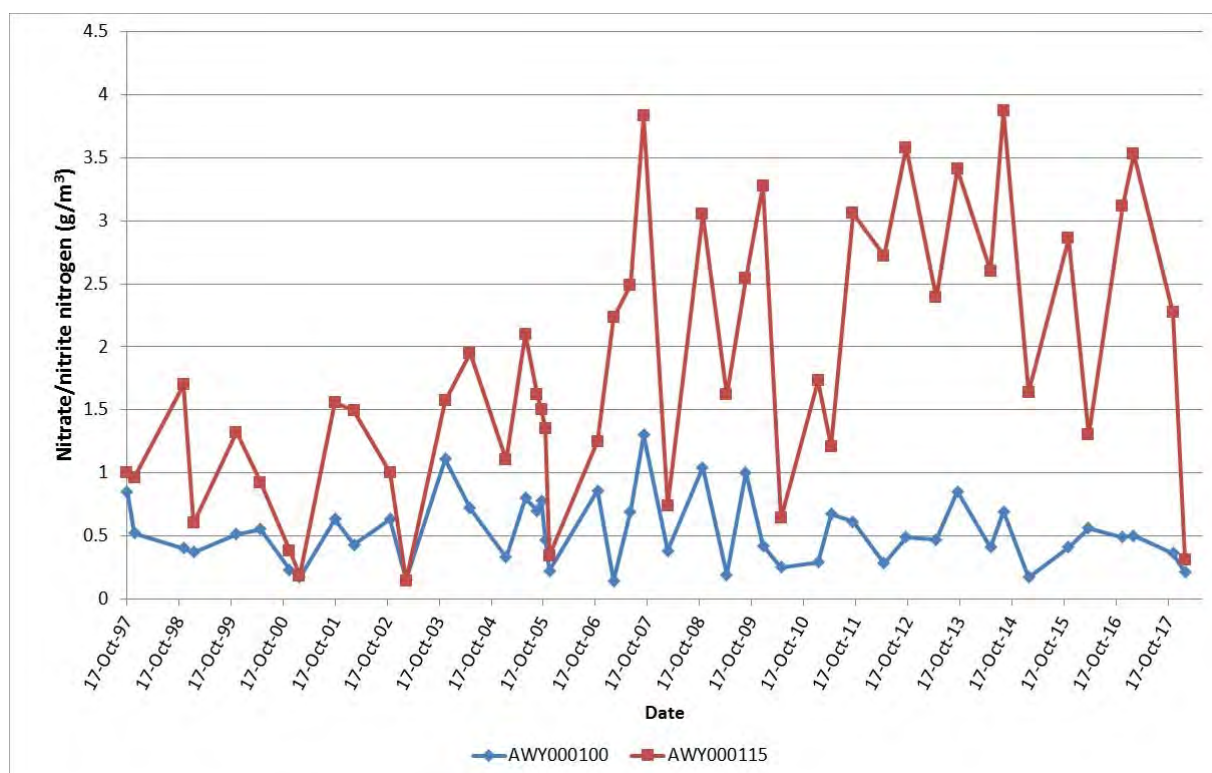


Figure 8 Nitrate/nitrite nitrogen results in the main tributary upstream and downstream of the Inglewood landfill tributary discharge

The current levels of contaminants found in the main tributary are not uncommon within agricultural areas and would therefore be considered a minor effect, at most, on the aquatic environment.

### 2.2.3.2 Biomonitoring

Macroinvertebrate sampling was undertaken on 26 October 2017 and 1 March 2018, at four sites in two tributaries of the Awai Stream (Table 6 and Figure 9) using a combination of the 'vegetation-sweep' and 'kick' sampling techniques, both standard sampling techniques used by the Council. This was undertaken to assess whether leachate discharges from Inglewood landfill had had any adverse effects on the macroinvertebrate communities of this stream. Samples were processed to provide number of taxa (richness), MCI and SQMCI<sub>s</sub> scores for each site.

Table 6 Biomonitoring sites in tributaries of the Awai Stream

Site number	Site code	Location
1a	AWY000105	Smaller tributary, 100 metres below tip face
1b	AWY000107	Smaller tributary, 400 metres below tip face
2	AWY000100	Larger tributary, above confluence with small tributary
3	AWY000115	Larger tributary, 80 metres below confluence with small tributary

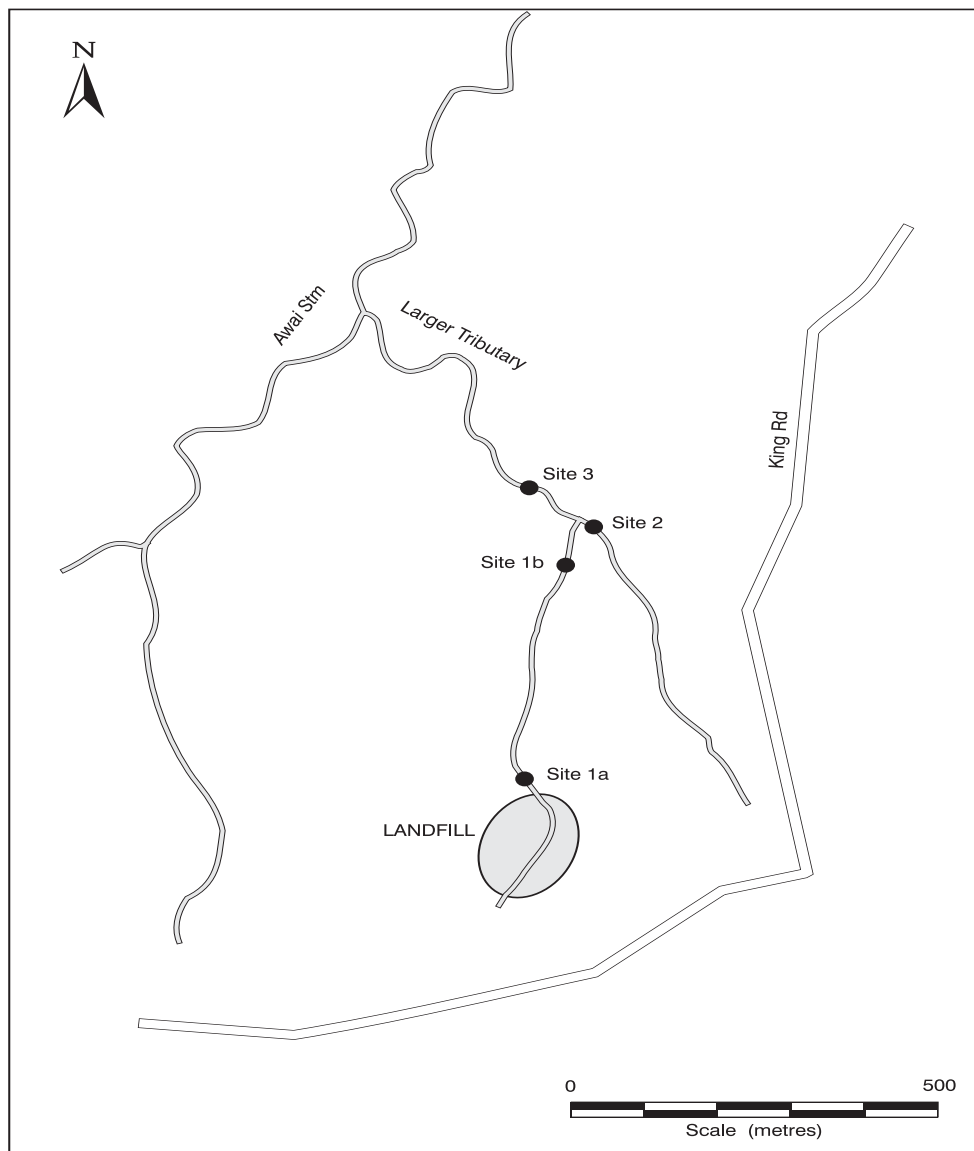


Figure 9 Biomonitoring sites in tributaries of the Awa Stream relative to the Inglewood landfill

Taxa richness is the most robust index when determining whether a macroinvertebrate community has been exposed to toxic discharges. Macroinvertebrates when exposed to toxic discharges may die and be swept downstream or may deliberately drift downstream as an avoidance mechanism (catastrophic drift). The MCI is a measure of the overall sensitivity of the macroinvertebrate community to organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The SQMCI<sub>5</sub> takes into account relative abundances of taxa as well as sensitivity to pollution. Significant differences in taxa richness, MCI or SQMCI<sub>5</sub> between sites may indicate the degree of adverse effects (if any) of the discharge being monitored.

#### October 2017

The spring survey recorded low taxa richnesses at all four sites. These were lower than the historical medians and the richness recorded in the preceding survey in all cases, which may be a result of the low flow conditions encountered in the survey. MCI scores were similar at sites 1a, 2 and 3, while site 1b recorded a significantly lower score. The scores were similar to the preceding result and to historical medians for all sites except site 1b, which was significantly lower. SQMCI<sub>5</sub> scores were similar at sites 1a, 1b and 2, while site 3 recorded a significantly lower score. This reflects the numerical dominance of low scoring oligochaete worms and ostracod seed shrimps at this site (MCI tolerance value of 1 for both taxa).

Previous surveys typically recorded a poorer community at site 1a than at site 1b. In contrast, the current survey recorded very similar taxa richnesses and SQMCI<sub>s</sub> scores at the two sites, while the MCI score decreased significantly between the two sites.

Overall, the results of the survey indicated that the leachate discharge from the Inglewood landfill was not causing adverse impacts on the macroinvertebrate communities of these two unnamed tributaries of the Awai Stream. Observed differences between sites and previous surveys are likely to be a result of differences in habitat and low flow conditions at the time of sampling.

#### 1 March 2018

The late summer/early autumn survey recorded similarly low taxa richnesses at all four sites. These were substantially lower than the historical medians and lower than the richness recorded in the preceding survey in all cases, which is likely to be a result of the very low flow conditions encountered in this survey. These scores were the lowest recorded to date for sites 1b, 2 and 3, while site 1a was three taxa more than the lowest recorded score for the site.

MCI scores were similar at sites 1a, 1b and 2, while site 3 recorded a significantly lower score. The scores at sites 1a and 1b in the smaller tributary were similar to historical medians, while sites 2 and 3 in the larger tributary recorded scores significantly lower than historical medians. When compared to the preceding survey, sites 1b and 2 had similar scores and sites 1a and 3 showed a significant decrease. SQMCI<sub>s</sub> scores varied between sites, with site 1b recording a result significantly higher than any other site, while sites 2 and 3 (in the larger tributary) had similar results and were significantly lower than both sites 1a and 1b. Scores at sites 1a and 1b were similar to historical medians, while at sites 2 and 3 score were significantly lower than these medians. Compared to the preceding survey, site 2 showed a significant decrease while all other sites remained similar. These MCI and SQMCI<sub>s</sub> scores at sites 2 and 3 were the lowest recorded to date for the respective sites.

Site 3 showed very poor results for all invertebrate metrics, and in particular the MCI, which had decreased by 42 units since the preceding survey. This is likely a result of very low flow conditions and almost still water velocity at the time of sampling. The low SQMCI<sub>s</sub> score reflects the numerical dominance of the very low scoring taxa, oligochaete worms and ostracod seed shrimps, both of which have an MCI tolerance value of 1. These taxa, and in fact all five taxa recorded at this site, are often associated with slow or still water velocities. The low MCI score also reflects the very low proportion of 'sensitive' taxa (20%, or one taxon) in the community. In contrast, site 2 recorded a similarly low SQMCI<sub>s</sub> score, because it was also numerically dominated by very low scoring taxa, but a much higher MCI score reflecting the higher proportion of 'sensitive' taxa (57%, or 4 taxa) in the community. All of the sensitive taxa at both sites were 'rare' which means only one to four individuals of each taxon were recorded. This therefore reflects the disproportionate influence that 'rare' taxa may have on the MCI score, especially when taxa richness is low. Because of this, the SQMCI<sub>s</sub> is the more robust metric in this instance.

Previous surveys typically recorded a poorer community at site 1a than at site 1b. In contrast to this, the survey recorded very similar taxa richnesses and identical MCI scores at the two sites, while the SQMCI<sub>s</sub> score reflected this typical pattern.

Overall, the results indicated that the leachate discharge from the Inglewood landfill is not causing adverse impacts on the macroinvertebrate communities of these two unnamed tributaries of the Awai Stream. The smaller tributary, which would be expected to be more strongly affected by any leachate discharge from the Inglewood landfill, was in similar to median health. Differences between sites and compared with previous surveys are likely to result from differences in habitat, which are most likely caused by the very low flow conditions at the time of sampling.

The full biomonitoring reports are attached in Appendix II.

## 2.2.4 Air quality

Methane and hydrogen sulphide readings were taken at the landfill entrance gate, and at the culvert at the toe of the landfill, during two of the routine site inspections.

No methane was detected at either monitoring location during the period under review. No objectionable odours were noted on the site or beyond the site boundary during any of the inspections.

## 2.2.5 Investigations, interventions, and incidents

In the 2017-2018 period, it was not necessary for the Council to undertake significant additional investigations and interventions, or record incidents, in association with NPDC's conditions in resource consents or provisions in Regional Plans in relation to the consent holder's activities at the Inglewood landfill.

## 2.3 Discussion

### 2.3.1 Discussion of site performance

The landfill at Inglewood continues to act as a contingency landfill for NPDC, and is currently actively used for the disposal of cleanfill.

There were no environmental issues raised with regard to site management during the period under review. No unauthorised materials were found in the cleanfill area, the cap and batters were found to be stable and secure, and grazing on the site was well managed.

Air monitoring did not detect any methane or hydrogen sulphide emissions at the site, and no dust or odour issues were found.

There were no complaints received by Council in regard to the landfill during the period under review.

### 2.3.2 Environmental effects of exercise of consents

Water sampling undertaken during the year shows that the tributary immediately below the landfill continues to experience contamination from the landfill, however the levels of these contaminants (with the exception of nitrate/nitrite nitrogen) are, on the whole, significantly attenuated in the landfill tributary 130 m downstream of the landfill.

Chemical monitoring shows that the larger tributary of the Awai Stream (downstream of the landfill tributary) appears to be impacted to only a minor degree, with the levels of contaminants being at an acceptable level in this tributary.

When viewing the long term data, alkalinity, ammoniacal nitrogen and nitrate/nitrite nitrogen concentrations in the discharge from the culvert (AWY000103) all appear to be declining from the peak that was reached following the use of this site for the three months of contingency filling in 2005 and closure of the site to general waste on 1 September 2006 (Figure 10, Figure 11 and Figure 12).

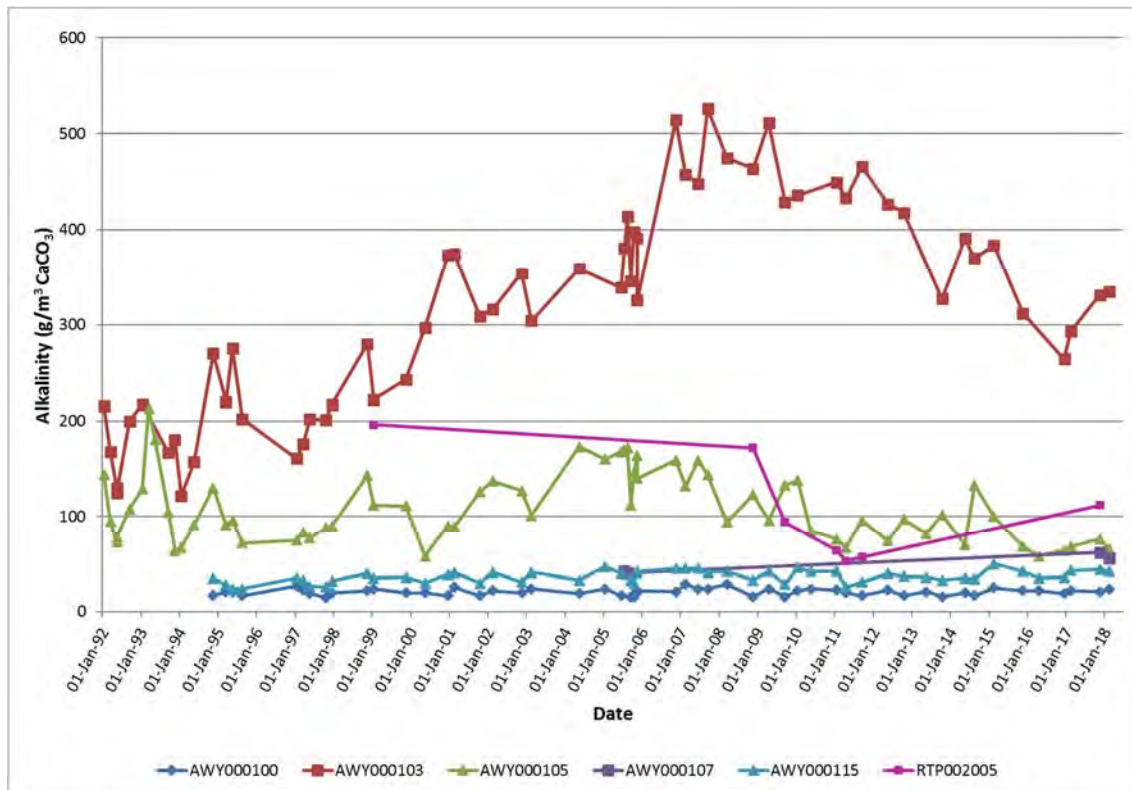


Figure 10 Alkalinity in the surface waters below the Inglewood landfill (1992 to date)

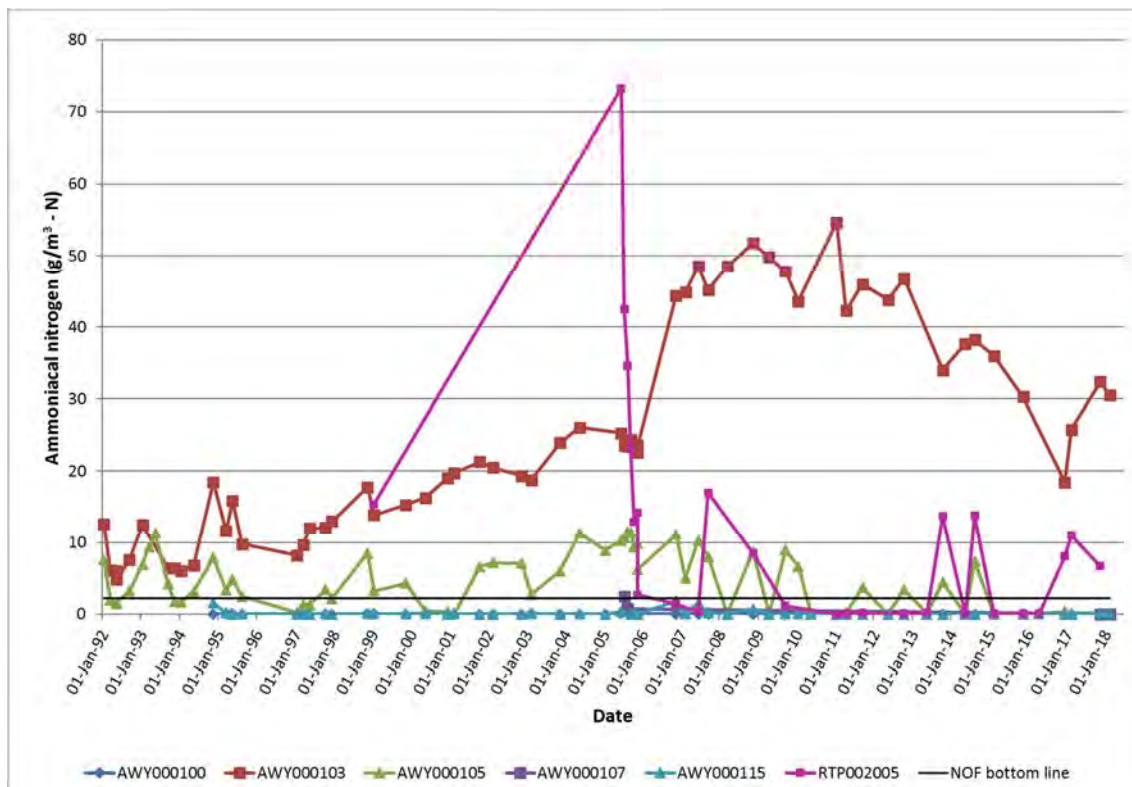


Figure 11 Ammoniacal nitrogen in the surface waters below the Inglewood landfill (1992 to date)



Although the ammoniacal nitrogen concentration is consistently above the National Objectives Framework (NOF) bottom line of 2.2 g/ m<sup>3</sup> (annual 95 percentile)<sup>1</sup> at the culvert outlet (AWY000103), the concentration at the wetland is decreasing, and the concentrations found in the main tributary are well below this level.

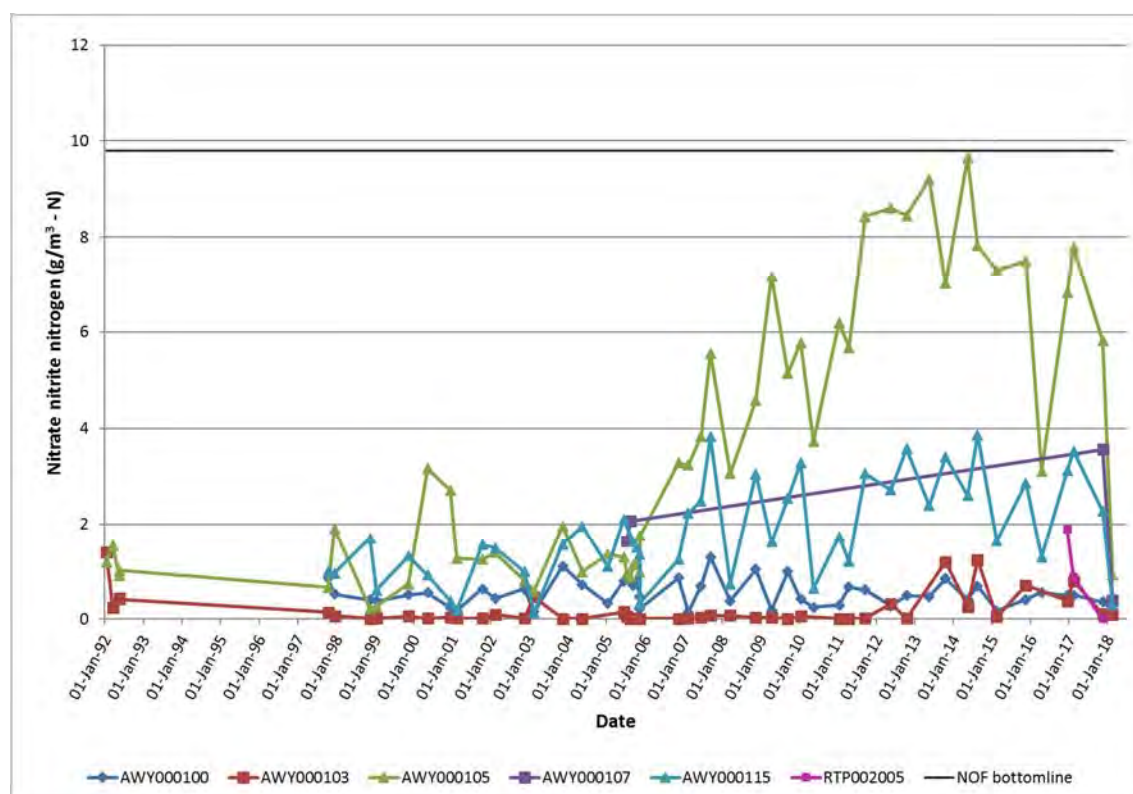


Figure 12 Nitrate/nitrite nitrogen in the surface waters below the Inglewood landfill (1992 to date)

The nitrate/nitrite nitrogen concentration is well below the National Objectives Framework (NOF) bottom line of 9.8 g/ m<sup>3</sup> (annual 95 percentile) at all sites. At the end of the 2014-2015 year, it was noted that the ammoniacal nitrogen and unionised ammonia concentrations in the landfill tributary at the culvert appeared to be increasing and the difference in the nitrate/nitrogen concentrations between the upstream and downstream sites in the main tributary also appeared to be increasing. It was thought possible that the condition of the cap as found in the 2014-2015 year, with its increased permeability, may have contributed to the increasing trends seen in the nitrogen containing species in recent years. Although the long term trend now appears to be decreasing and this may have resolved with the remediation work undertaken on the cap during the 2014-2015 year, the limited total nitrogen data available (four surveys) still potentially indicated increasing concentrations of nitrogen containing species at the culvert outlet (Figure 7).

Council will continue to monitor the situation under the routine compliance monitoring programme, but may require further investigations if necessary. In time, addition of total nitrogen analysis of the samples to the programme may help with the interpretation of the receiving water results.

Historical data is also indicating a trend of increasing acid soluble manganese in the discharges from the site. However currently, with a few exceptions at site AWY000105, the tributaries beyond the wetland treatment system are below the ANZECC guideline for the protection of 80 % of species (3.6 g/m<sup>3</sup>), with the landfill tributary well below the guideline for the protection of 99 % of species (1.2 g/m<sup>3</sup>).

<sup>1</sup> Appendix 2 of the National Policy Statement for Freshwater Management (Ministry for the Environment 2014)

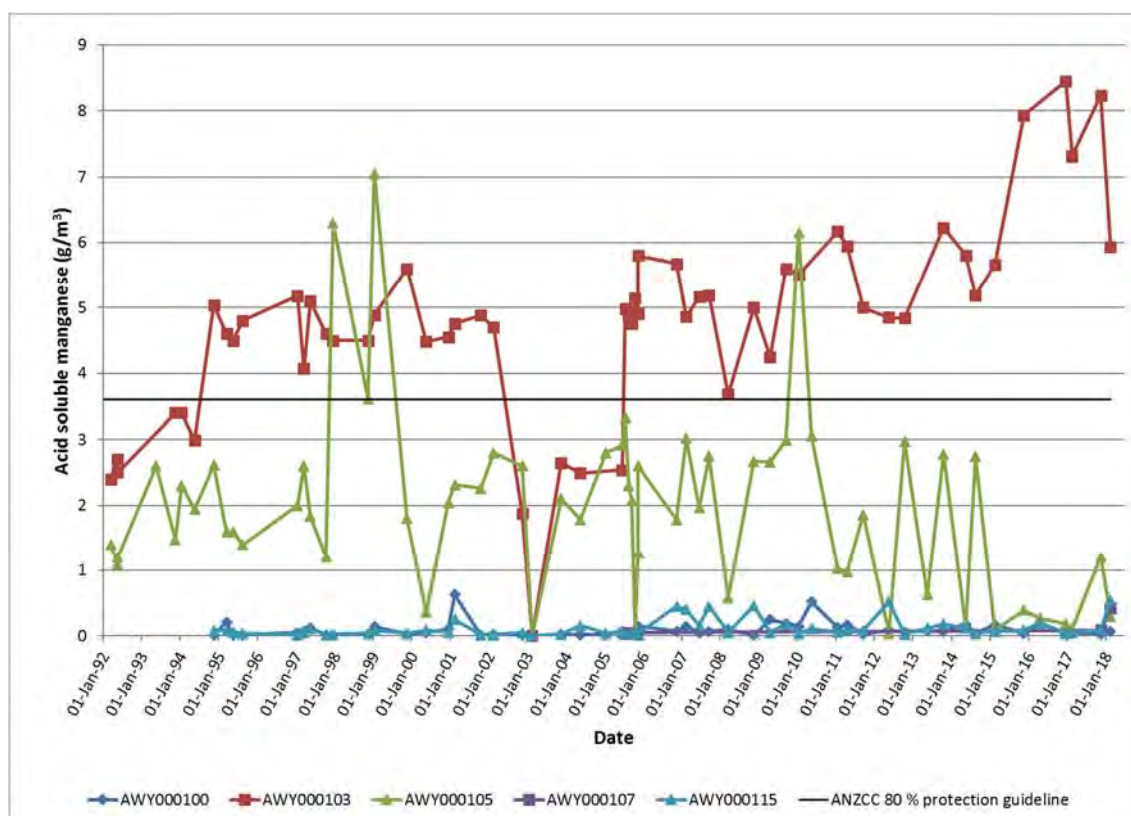


Figure 13 Acid soluble manganese in the surface waters below the Inglewood landfill (1992 to date)

Biomonitoring surveys undertaken during the 2017-2018 year indicated that there were no significant effects to aquatic life in either of the unnamed tributaries of the Awai Stream downstream of the landfill as a result of the discharges from the site.

Based on the results of this monitoring period the presence of the landfill has not been found to have had significant adverse effects on the water quality downstream of the site during the period under review.

The results from inspections and air quality monitoring show that the presence of the landfill is unlikely to have any significant effects in terms of emissions to air.

### 2.3.3 Evaluation of performance

A tabular summary of NPDC's compliance record for the year under review is set out in Table 7, Table 8 and Table 9.

Table 7 Summary of performance for Inglewood contingency landfill leachate consent 3954-2

Purpose: To discharge up to a total of 4,752 m <sup>3</sup> /day (55 L/s) of leachate and stormwater from the Inglewood municipal landfill into an unnamed tributary of the Awai Stream, a tributary of the Mangaoraka Stream in the Waiongana catchment		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Prepare and maintain a site contingency plan	Review of documentation on file in relation to inspection finding. Latest plan dated August 2017	Yes
2. Prepare and maintain a landfill operations and management plan	Plan provided. Latest plan dated August 2017	Yes
3. Provide a landfill closure management plan by 1 June 2007	Plan previously provided	Yes



**Purpose: To discharge up to a total of 4,752 m<sup>3</sup>/day (55 L/s) of leachate and stormwater from the Inglewood municipal landfill into an unnamed tributary of the Awai Stream, a tributary of the Mangaoraka Stream in the Waiongana catchment**

Condition requirement	Means of monitoring during period under review	Compliance achieved?
4. One months' notice required by Council/ NPDC requesting/advising of changes to the operation and management or closure plans	Site inspection and review of plans on file. Latest plan dated August 2017 No changes had been requested by Council	Yes
5. Monitoring of ground and surface water on and near the site to Council's satisfaction	Surface water monitoring undertaken by the Council at inspection	Yes
6. Maintain all parts of all stormwater and leachate systems	Site inspection	Yes
7. No actual or likely adverse impact on aquatic life or receiving water quality	Biomonitoring and surface water sampling	Some contaminants increasing in landfill tributary and main tributary. However, no unacceptable changes found during the year under review
8. Optional review provision re environmental effects	No further opportunities for review	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		<b>Good</b>
Overall assessment of administrative performance in respect of this consent		<b>High</b>

N/A = not applicable

**Table 8 Summary of performance for Inglewood contingency landfill air discharge consent 4526-3**

<b>Purpose: To discharge contaminants, being landfill gas, and odours associated with a landfill, into the air from the Inglewood municipal landfill</b>		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adopt the best practicable option to prevent or minimise effects	Inspection and off site observations	Yes
2. Consent to be exercised in accordance with application documentation	Inspection and liaison with consent holder	Yes
3. One months' notice required by Council/ NPDC requesting/advising of changes to the operation and management or closure plans	Site inspection and review of plans on file. Latest plan dated August 2017 No changes had been requested by Council	Yes
4. Maintain and adhere to the landfill operations and management plan	Plan provided. Latest plan dated August 2017	Yes

<b>Purpose: To discharge contaminants, being landfill gas, and odours associated with a landfill, into the air from the Inglewood municipal landfill</b>		
<b>Condition requirement</b>	<b>Means of monitoring during period under review</b>	<b>Compliance achieved?</b>
5. The conditions of the consent prevail over any potential contradictions with the management plan	N/A	N/A
6. Offensive, objectionable, dangerous and noxious odours, dust or ambient levels of any other contaminant prohibited	Inspection and off site observations. Ambient air quality monitoring for methane and hydrogen sulphide	Yes
7. Burning prohibited	Site inspection	Yes
8. Significant adverse effects on any ecosystem is prohibited	Site inspection and off site observations	Yes
9. Specifies records to be kept by consent holder in the event of a complaint	Site inspection and liaison with consent holder. No complaints received by NPDC or the Council	Yes
10. Optional review provision re environmental effects	Next opportunity for review June 2020	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		<b>High</b>
Overall assessment of administrative performance in respect of this consent		<b>High</b>

N/A = not applicable

**Table 9 Summary of performance for Inglewood cleanfill and contingency landfill discharge to land consent 4527-3**

<b>Purpose: To discharge cleanfill and inert materials onto and into land at the Inglewood municipal landfill, and to discharge municipal refuse onto and into land at the Inglewood municipal landfill when, and only when, it cannot be discharged at the Colson Road municipal landfill</b>		
<b>Condition requirement</b>	<b>Means of monitoring during period under review</b>	<b>Compliance achieved?</b>
1. Prepare and maintain a site contingency plan	Review of documentation on file in relation to inspection finding. Latest plan dated August 2017	Yes
2. The activity shall be undertaken in accordance with the application documents	Site inspection	Yes
3. Notification of changes to landfill management plan	Inspection and review of plans on file. Updated contingency disposal plan received	Yes

**Purpose: To discharge cleanfill and inert materials onto and into land at the Inglewood municipal landfill, and to discharge municipal refuse onto and into land at the Inglewood municipal landfill when, and only when, it cannot be discharged at the Colson Road municipal landfill**

Condition requirement	Means of monitoring during period under review	Compliance achieved?
4. Maintain and adhere to management plan	Plan provided. Latest plan dated August 2017	Agreed that improvements in leachate management practices resulting from contingency disposal to be incorporated prior to any contingency filling occurring
5. Consent conditions to prevail over management plan	Review of inspection findings in relation to documentation on file	Yes
6. Liquid waste shall not be accepted at the landfill	Site inspection – transfer station and cleanfilling activities only during the year under review	Yes
7. Acceptable cleanfill criteria	Site inspection	Yes
8. Unacceptable cleanfill criteria	Site inspection	Yes
9. Discharge shall not result in contaminants directly entering water	Site inspection and sampling	Yes
10. Install leachate retention structures	Site inspection	Yes
11. Install stormwater systems	Site inspection	Yes
12. Optional review provision re environmental effects	Next opportunity for review June 2020	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		<b>Good</b>
Overall assessment of administrative performance in respect of this consent		<b>High</b>

N/A = not applicable

Overall during the year, NPDC demonstrated a good level of environmental performance and a high level of administrative performance in relation to the Inglewood landfill consents as defined in Section 1.1.5.

Although no significant environmental effects were found due to the operation of the site, the recent trend of increasing concentrations of nitrogen compounds prior to the remediation of the cap and the increasing trend in acid soluble manganese indicate that there may be the potential for environmental effects to emerge in the future.

### 2.3.4 Recommendation from the 2016-2017 Annual Report

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

1. THAT monitoring of consented activities at the Inglewood landfill in the 2017-2018 year be amended from that undertaken in 2016-2017 by the addition of site AWY000107 to the physicochemical receiving water sampling surveys.

This recommendation was implemented.

### 2.3.5 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 of the Inglewood landfill remains unchanged from that of 2017-2018.

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.

## 2.4 Recommendations

1. THAT monitoring of consented activities at the Inglewood landfill in the 2018-2019 year remain unchanged from that undertaken in 2017-2018.
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 Marfell Park landfill

### 3.1 Introduction

#### 3.1.1 Site description

The landfill at Marfell closed in 1982. Due to effects caused by leachate discharging into the Mangaotuku Stream, NPDC applied for consent to discharge leachate in 1996. In 1998 NPDC captured the main leachate flow and directed it to the trade waste system. Various investigations have taken place at the site during previous monitoring periods, some undertaken by Council and others by consultants. The findings of these investigations are in earlier Council Annual Reports and other documents listed in the bibliography.

The discharge from the site now is predominantly stormwater. Presently the site is a park with sports field, playground and a BMX track.



Figure 14 An aerial view showing the former landfill at Marfell Park and associated sampling sites



### 3.1.2 Water discharge permit

NPDC holds resource consent **4902-2** to cover the discharge leachate from the Marfell former landfill site via groundwater into the Mangaotuku Stream. This permit was originally issued by the Council on 26 January 1996 under Section 87(e) of the RMA and was renewed on 21 October 2014. It is due to expire on 1 June 2032.

It has six conditions:

Condition 1 requires the adoption of the best practicable option to prevent or minimise any adverse effect on the environment associated with the discharge of leachate from the site.

Condition 2 requires that the cap and stormwater structures be maintained to prevent ponding, to minimise stormwater infiltration, ensure effective stormwater diversion and drainage, and prevent iron oxide deposits at the outfall structure from entering the stream.

Condition 3 requires the provision of a management plan within three months of the granting of the consent (by 21 January 2015) that is to be certified by the Council. This is to cover general site management practices to ensure consent compliance and specifically addresses the way in which compliance with the matters contained in condition 2 will be achieved.

Condition 4 places limits on the concentration of ammoniacal nitrogen ( $0.9 \text{ g/m}^3$ ), unionised ammonia ( $0.025 \text{ g/m}^3$ ), pH range (6-9) and dissolved zinc ( $0.05 \text{ g/m}^3$ ) in the stream downstream of the discharge.

Condition 5 prohibits a range of specific effects in the stream downstream of the discharge.

Condition 6 provides for a review of the conditions of the consent in June 2020 and/or in June 2026.

## 3.2 Results

The closed landfill at Marfell is monitored on a biennial basis. Monitoring is next scheduled during the 2018-2019 year. No inspections or discharge or receiving water sampling were undertaken during the year under review.

### 3.2.1 Investigations, interventions, and incidents

In the 2017-2018 period, it was not necessary for the Council to undertake significant additional investigations and interventions, or record incidents, in association with NPDC's conditions in resource consents or provisions in Regional Plans in relation to the consent holder's activities at the Marfell landfill.

## 3.3 Discussion

### 3.3.1 Evaluation of performance

A tabular summary of NPDC's compliance record for the year under review is set out in Table 10.

Table 10 Summary of performance for Marfell Park closed landfill leachate consent 4902-2

Purpose: To discharge up to 2 L/s of leachate from the Marfell Park former landfill site via groundwater into the Mangaotuku Stream in the Huatoki Catchment		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adopt best practice to prevent or minimise any adverse effects on the environment	Not monitored during period under review	N/A

<b>Purpose: To discharge up to 2 L/s of leachate from the Marfell Park former landfill site via groundwater into the Mangaotuku Stream in the Huatoki Catchment</b>		
<b>Condition requirement</b>	<b>Means of monitoring during period under review</b>	<b>Compliance achieved?</b>
2. Maintain cap and drains on site to minimise ponding, stormwater infiltration, ensure stormwater diversion and drainage, and prevent iron oxide on outlet structure entering the stream	Not monitored during period under review	N/A
3. Site to be operated in accordance with management plan that details how the site will be managed to ensure consent compliance. Plan required by 21 January 2014	Not monitored during period under review	N/A
4. The discharge shall not cause specified parameter concentrations to be outside prescribed limits in the Mangaotuku Stream	Not monitored during period under review	N/A
5. Prohibits certain effects in the stream beyond reasonable mixing	Not monitored during period under review	N/A
6. Provision of review of consent conditions	Not monitored during period under review	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		<b>N/A</b>
Overall assessment of administrative performance in respect of this consent		<b>N/A</b>

N/A = not applicable

During the year, the environmental performance and administrative performance of NPDC was not assessed in relation to their Marfell landfill resource consent.

### 3.3.2 Recommendation from the 2016-2017 Annual Report

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

1. THAT the biennial monitoring of discharges at the Marfell landfill continues unchanged and that the programme next be implemented in the 2018-2019 period.

This recommendation was implemented.

### 3.3.3 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 the biennial monitoring of discharges at the Marfell landfill continues unchanged with the programme next being implemented in 2018-2019.

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.

### 3.4 Recommendation

1. THAT the biennial monitoring of discharges at the Marfell landfill continues unchanged and that the programme next be implemented in the 2018-2019 period.
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.



## 4 Okato landfill

### 4.1 Introduction

#### 4.1.1 Site description

The Okato landfill stopped accepting general waste for discharge to land in 2005. The landfill was capped and the site became a transfer station. The NPDC also continued to exercise consent 4529-3 (discharge of contaminants to land) for the purpose of accepting and discharging green waste and cleanfill. All other refuse accepted at the site is transferred to New Plymouth for disposal or recycling. The site is also designated as a contingency landfill in the event that Colson Road landfill and/or Inglewood landfill became unusable or inaccessible.



Figure 15 Okato landfill and sampling sites

#### 4.1.2 Resource consents

##### 4.1.2.1 Water discharge permit

NPDC holds resource consent **3860-3** to discharge stormwater and leachate from the Okato municipal landfill into an unnamed tributary of the Kaihihi Stream. This permit was issued by the Council on 13 September 2013 under Section 87(e) of the RMA. It expires on 1 June 2031.

It has seven conditions:

Condition 1 requires the consent holder to adopt the best practicable option.

Condition 2 requires the consent holder to adhere to the landfill management plan as supplied with the application.

Conditions 3 and 4 deal with the management of stormwater and leachate from the closed filling areas.

Condition 5 requires that leachate from any contingency filling be directed to a lined holding pond for removal from the site.

Condition 6 is a lapse condition.

Condition 7 is a review condition.

A copy of this consent is included in Appendix I of this report.

#### 4.1.2.2 Air discharge permit

The NPDC holds air discharge permit **4528-3** to discharge emissions into the air from the contingency discharge of solid contaminants at the Okato municipal landfill. This permit was issued by the Council on 13 September 2013 under Section 87(e) of the RMA. It is due to expire on 1 June 2031. It has six conditions:

Condition 1 specifies that discharge of refuse only occur on a contingency basis as set out in the management plan supplied with the application.

Condition 2 requires the consent holder to adopt the best practicable option.

Condition 3 prohibits objectionable and offensive odours beyond the boundary.

Condition 4 sets out limits for PM<sub>10</sub> and dust deposition.

Condition 5 is a lapse condition.

Condition 6 contains provisions for review of the conditions of the consent.

A copy of this consent is included in Appendix I.

#### 4.1.2.3 Discharge of wastes to land

NPDC holds discharge permit **4529-3** to discharge cleanfill and green waste to land and to discharge general refuse on a contingency basis to land at the Okato landfill. This permit was issued by the Council on 9 September 2013 under Section 87(e) of the RMA. It will expire on 1 June 2031.

It has 15 conditions:

Condition 1 specifies that contaminants may only be discharged within the footprint of the existing landfill.

Condition 2 requires the consent holder adopt the best practicable option.

Condition 3 requires the consent holder to maintain stormwater and diversion drains.

Condition 4 requires that the existing landfill cap not be disturbed.

Condition 5 requires any areas used for the discharge of cleanfill and green waste be re-vegetated and reinstated prior to expiry or surrender of the consent.

Condition 6 requires that cleanfill be discharged as set out in the landfill management plan as supplied with the application.

Conditions 7, 8 and 9 deal with what materials are acceptable as cleanfill.

Condition 10 requires that green waste be discharged as set out in the landfill management plan as supplied with the application.

Condition 11 states that general refuse shall only be discharged as set out in the landfill management plan as supplied with the application.

Condition 12 deals with notification requirements.

Condition 13 deals with site reinstatement.

Condition 14 is a lapse condition.

Condition 15 is a review condition.

A copy of this consent is included in Appendix I.

## 4.2 Results

### 4.2.1 Inspections

#### 23 August 2017

An inspection was conducted in fine weather with a light north-westerly wind. The cap was intact and well-vegetated, with no ponding present. Neither the cap nor batters showed any sign of slumping, cracking or exposed refuse. The stormwater drains were free-flowing with a low surface water flow occurring following the recent wet weather. The drains were clear of obstructions, and there were signs of recent weed spraying and maintenance. The fencing and site security was intact and permanent while signage was tidy and visible.

The transfer station was tidy and unoccupied at the time of inspection. No unauthorised material was found in either the cleanfill or greenwaste areas. Superficial ponding was noted in the surrounding farmland, which was attributed to the extraordinary volume of rain over the previous month.

#### 23 March 2018

An inspection was conducted during fine weather with light northerly winds. The cap was intact and well-vegetated, with no evidence of ponding. No slumping, erosion, cracking or exposed refuse was noted on the cap or batters. The stormwater drains were clear and contained minor amounts of water following heavy rain the previous day. They were discharging at a trickle flow to the wetland. The site was secure and fencing was intact.

The transfer station was well maintained, and no unauthorised material was noted onsite or in the cleanfill areas.

### 4.2.2 Results of surface water sampling

Samples were collected from the tributary of the Kaihihi Stream below the landfill on two occasions, 23 August 2017 and 23 March 2018.

Table 11 Chemical analysis of a tributary of the Kaihihi Stream, sampled on 23 August 2017

Parameter	Unit	KHH000650	KHH000655
		30 m d/s of landfill	200 m d/s of landfill
Alkalinity	g/m <sup>3</sup> CaCO <sub>3</sub>	85	72
Conductivity @ 20°C	mS/m	32.0	28.6
Dissolved reactive phosphorus	g/m <sup>3</sup> -P	<0.003	0.020
Acid soluble iron	g/m <sup>3</sup>	0.98	2.73
Unionised ammonia	g/m <sup>3</sup>	0.00056	<0.00001

Parameter	Unit	KHH000650	KHH000655
		30 m d/s of landfill	200 m d/s of landfill
Ammoniacal nitrogen	g/m <sup>3</sup> -N	0.245	<0.003
Nitrate/nitrite nitrogen	g/m <sup>3</sup> -N	3.21	2.78
pH	pH	6.9	7.4
Temperature	Deg C	13.2	13.8
Dissolved zinc	g/m <sup>3</sup>	0.048	0.007

Table 12 Chemical analysis of a tributary of the Kaihihi Stream, sampled on 23 March 2018

Parameter	Unit	KHH000650	KHH000655
		30 m d/s of landfill	200 m d/s of landfill
Alkalinity	g/m <sup>3</sup> CaCO <sub>3</sub>	134	104
Conductivity @ 20°C	mS/m	36.3	30.7
Dissolved reactive phosphorus	g/m <sup>3</sup> -P	0.010	<0.003
Acid soluble iron	g/m <sup>3</sup>	5.32	1.28
Unionised ammonia	g/m <sup>3</sup>	0.00093	0.00002
Ammoniacal nitrogen	g/m <sup>3</sup> -N	0.250	0.007
Nitrate/nitrite nitrogen	g/m <sup>3</sup> -N	0.14	0.01
pH	pH	7.0	7.0
Temperature	Deg C	16.6	15.3
Dissolved zinc	g/m <sup>3</sup>	0.006	0.011

As with previous monitoring results there is no indication that the presence of the landfill is having any significant adverse effects on the environment. The levels of ammonia and other indicator contaminants immediately below the landfilled area are low, indicating only low levels of leachate contamination.

### 4.2.3 Air quality

Objectionable odour and dust nuisance were checked for during each inspection undertaken in the 2017-2018 monitoring year. There were no problems in regard to dust or odour during any of the inspections for the period under review.

### 4.2.4 Investigations, interventions, and incidents

In the 2017-2018 period, it was not necessary for the Council to undertake significant additional investigations and interventions, or record incidents, in association with NPDC's conditions in resource consents or provisions in Regional Plans in relation to the consent holder's activities at the Okato landfill.

## 4.3 Discussion

### 4.3.1 Discussion of site performance

Overall, the site was well managed during the 2017-2018 period. There were no issues in regards to cap condition, stormwater or leachate control. It was considered that there was good control over the site and its operation during the monitoring period.

### 4.3.2 Environmental effects of exercise of consents

The landfill will carry on generating leachate, some of which will continue to enter the stream below the site via ground and spring water.

Physicochemical analysis of the unnamed tributary indicates that the landfill is having no significant adverse effect on water quality at this site.

There were no issues of concern during the 2017-2018 monitoring period. No odour or dust problems were observed at or beyond the boundary of the site.

### 4.3.3 Evaluation of performance

A tabular summary of NPDC's compliance record for the year under review is set out in Table 13, Table 14, and Table 15.

**Table 13 Summary of performance for Okato contingency landfill leachate consent 3860-3**

<b>Purpose: To discharge stormwater and leachate from the Okato municipal landfill into an unnamed tributary of the Kaihihi Stream</b>		
<b>Condition requirement</b>	<b>Means of monitoring during period under review</b>	<b>Compliance achieved?</b>
1. Best practicable option	Site inspection	Yes
2. Discharges in accordance with management plan	Site inspection	Yes
3. Install and maintain stormwater diversion drains	Site inspection	Yes
4. Surface runoff and leachate directed to leachate stormwater/collection drain	Site inspection	Yes
5. All leachate generated from a contingency discharge to be directed to a lined pit and removed from site	No contingency discharge during monitoring period	N/A
6. Consent lapse September 2018 if not exercised	N/A	N/A
7. Optional review provision re environmental effects	Next review opportunity June 2019, recommendation attached in 4.3.6	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		<b>High</b>
Overall assessment of administrative performance in respect of this consent		<b>High</b>

N/A = not applicable

Table 14 Summary of performance for Okato contingency landfill air discharge consent 4528-3

<b>Purpose: To discharge emissions into the air from the contingency discharge of solid contaminants at the Okato municipal landfill</b>		
<b>Condition requirement</b>	<b>Means of monitoring during period under review</b>	<b>Compliance achieved?</b>
1. Discharge to occur on contingency basis only	Consent not exercised	N/A
2. Optional review provision re environmental effects	Consent not exercised	N/A
3. Discharge not to result in offensive or objectionable odours at or beyond the boundary	Consent not exercised	N/A
4. Limits on deposited and suspended dust	Consent not exercised	N/A
5. Lapse of consent	N/A	N/A
6. Optional review provision re environmental effects	Next review opportunity June 2019, recommendation attached in 4.3.6	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		<b>N/A</b>
Overall assessment of administrative performance in respect of this consent		<b>N/A</b>

N/A = not applicable

Table 15 Summary of performance for Okato contingency landfill discharge to land consent 4529-3

<b>Purpose: To discharge cleanfill and green waste to land and to discharge general refuse on a contingency basis to land</b>		
<b>Condition requirement</b>	<b>Means of monitoring during period under review</b>	<b>Compliance achieved?</b>
1. Discharges to occur within existing landfill footprint	Site inspection and review of records	Yes
2. Best practicable option to prevent or minimise environmental effects	Site inspection	Yes
3. Consent holder to install stormwater diversion drains	Site inspection	Yes
4. Existing landfill cap to remain undisturbed	Site inspection	Yes
5. Areas used for discharge of cleanfill and green waste to be stabilised and revegetated prior to surrender or expiry	Consent still being exercised	N/A
6. Cleanfill may be discharged at any time in accordance with Management Plan	Site inspection and review of records	Yes
7. Allowable cleanfill materials	Site inspection	Yes

<b>Purpose: To discharge cleanfill and green waste to land and to discharge general refuse on a contingency basis to land</b>		
<b>Condition requirement</b>	<b>Means of monitoring during period under review</b>	<b>Compliance achieved?</b>
8. Materials not to be discharged	Site inspection	Yes
9. Written approval required where uncertainty of acceptability of waste	Site inspection	Yes
10. Green waste may be discharged at any time in accordance with Management Plan	Site inspection	Yes
11. Discharge of general refuse on a contingency basis only	No discharge to landfill during the monitoring period	N/A
12. Notification of contingency discharge	No discharge to landfill during the monitoring period	N/A
13. Contingency discharge to be capped and revegetated	No discharge to landfill during the monitoring period	N/A
14. Consent lapse September 2018	N/A	N/A
15. Optional review of consent	Next review opportunity June 2019, recommendation attached in 4.3.6	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		<b>High</b>
Overall assessment of administrative performance in respect of this consent		<b>High</b>

N/A = not applicable

During the year, NPDC demonstrated a high level of environmental performance and a high level of administrative performance in relation to the Okato landfill resource consents as defined in Section 1.1.5.

#### 4.3.4 Recommendation from the 2016-2017 Annual Report

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

1. THAT monitoring of consented activities at Okato landfill in the 2017-2018 year continue at the same level as in 2016-2017.

This recommendation was implemented.

#### 4.3.5 Alterations to monitoring programmes for 2018-2019

In designing and implementing the monitoring programmes for air and 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 emitting to the atmosphere/discharging to the environment.

It is proposed that for 2018-2019 the monitoring of discharges at the Okato landfill continue unchanged.

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

#### 4.3.6 Exercise of optional review of consent

Resource consents 3860-3, 4528-3 and 4529-3 provide for an optional review of the consent in June 2019. Conditions 7, 6, and 15, respectively, allow the Council to review the consent, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of the consents.

Based on the results of monitoring in the year under review, and in previous years as set out in earlier annual compliance monitoring reports, it is considered that there are no grounds that require a review to be pursued.

### 4.4 Recommendation

1. THAT monitoring of consented activities at Okato landfill in the 2018-2019 year continue at the same level as in 2017-2018.
2. THAT should there be issues with environmental or administrative performance in 2017-2018, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.
3. THAT the option for a review of resource consents 3860-3, 4528-3 and 4529-3 in June 2019, as set out in conditions of the consents, not be exercised, on the grounds that the current conditions are adequate to deal with any adverse effects on the environment arising from the exercise of the consents.

## 5 Summary of recommendations

The following is a summary of the recommendations for each landfill as presented in the individual sections of this report.

1. THAT monitoring of consented activities at the Inglewood landfill in the 2018-2019 year remain unchanged from that undertaken in 2017-2018.
2. THAT the biennial monitoring of discharges at the Marfell landfill continues unchanged and that the programme next be implemented in the 2018-2019 period.
3. THAT monitoring of consented activities at the Okato landfill in the 2018-2019 year continue at the same level as in 2017-2018.
4. THAT the option for a review of resource consents 3860-3, 4528-3 and 4529-3 in June 2019, as set out in conditions of the consents, not be exercised, on the grounds that the current conditions are adequate to deal with any adverse effects on the environment arising from the exercise of the consents.
5. THAT should there be issues with environmental or administrative performance in 2018-2019, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.

## Glossary of common terms and abbreviations

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

Biomonitoring	Assessing the health of the environment using aquatic organisms.
BOD	Biochemical oxygen demand. A measure of the presence of degradable organic matter, taking into account the biological conversion of ammonia to nitrate.
BODF	Biochemical oxygen demand of a filtered sample.
Bund	A wall around a tank to contain its contents in the case of a leak.
Conductivity	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 20°C and expressed in mS/m.
DO	Dissolved oxygen.
DRP	Dissolved reactive phosphorus.
g/m <sup>3</sup>	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 <sup>2</sup>	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 <sub>4</sub>	Ammonium, normally expressed in terms of the mass of nitrogen (N).
NH <sub>3</sub>	Unionised ammonia, normally expressed in terms of the mass of nitrogen (N).
NNN	Nitrate and nitrite nitrogen, normally expressed in terms of the mass of nitrogen (N).
TN	Total nitrogen, 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).

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.
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 NPDC

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



Inglewood



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

Name of  
Consent Holder:           New Plymouth District Council  
Private Bag 2025  
NEW PLYMOUTH

Consent Granted           18 February 2002  
Date:

**Conditions of Consent**

Consent Granted:       To discharge up to a total of 4,752 cubic metres/day (55 litres/second) of leachate and stormwater from the Inglewood Municipal Landfill into an unnamed tributary of the Awai Stream, a tributary of the Mangaoraka Stream in the Waiongana Catchment at or about GR: Q19:124-296

Expiry Date:           1 June 2020

Review Date(s):       June 2008, June 2014

Site Location:           Inglewood Municipal Landfill, 277 King Road, Inglewood

Legal Description:      Lot 1 DP 16116 Blk XI Paritutu SD

Catchment:            Waiongana

Tributary:             Mangaoraka  
Awai

**General conditions**

- a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) That 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) That 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. Within three months of granting of this consent the consent holder shall prepare and maintain a site contingency plan to the satisfaction of the Chief Executive, Taranaki Regional Council, outlining measures and procedures undertaken to prevent spillage or accidental discharge of contaminants and procedures carried out should such a spillage or discharge occur. This shall be reviewed by the Council on an annual basis.
- 2. Within three months of granting of this consent the consent holder shall prepare and maintain a landfill operations and management plan to the satisfaction of the Chief Executive, Taranaki Regional Council, and shall adhere to such a plan in so far as they concern the exercise of this consent at all times.
- 3. The consent holder shall provide a landfill closure management plan to the satisfaction of the Chief Executive, Taranaki Regional Council, by 1 June 2007 or 3 months prior to the closure of the landfill should this occur before 1 June 2007; such plan to address site security, litter control, vegetation cover, stormwater diversion, leachate control, site contouring, and cover placement and compaction, in addition to any other matters relevant to the exercise of this consent.
- 4. The consent holder shall advise the Taranaki Regional Council one month prior to any changes being made to the operation and management plan or landfill closure management plan. Should the Taranaki Regional Council wish to review either of these plans, one month's notice shall be provided to the consent holder.
- 5. The monitoring of the site and adjacent surface and groundwaters shall be to the satisfaction of the Chief Executive, Taranaki Regional Council
- 6. The leachate and stormwater diversion, collection, treatment and discharge systems shall be maintained to the satisfaction of the Chief Executive, Taranaki Regional Council
- 7. Any discharge shall not, in the opinion of the Chief Executive, Taranaki Regional Council, cause nor be likely to cause any significant adverse effects on aquatic life or receiving water quality.

## Consent 3954-2

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 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.

Signed at Stratford on 18 February 2002

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:           New Plymouth District Council  
Private Bag 2025  
NEW PLYMOUTH 4600

Consent Granted           20 March 2007  
Date:

**Conditions of Consent**

Consent Granted:           To discharge contaminants, being landfill gas, and odours  
associated with a landfill, into the air from the Inglewood  
Municipal Landfill at or about GR: Q19:120-295

Expiry Date:               1 June 2026

Review Date(s):           June 2014, June 2020

Site Location:             Inglewood Municipal Landfill, 277 King Road, Inglewood

Legal Description:         Lot 1 DP 16116 Blk XI Paritutu SD

### **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 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 exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of applications 4475, 1611 and 94/118. In the case of any contradiction between the documentation submitted in support of applications 4475, 1611 and 94/118 and the conditions of this consent, the conditions of this consent shall prevail.
- 3. The consent holder shall advise the Taranaki Regional Council one month prior to any changes being made to the landfill management plan, and/or landfill closure management plan. Should the Taranaki Regional Council wish to review any of these plans, one month's notice shall be provided to the consent holder.
- 4. The consent holder shall maintain the landfill management plan to the satisfaction of the Chief Executive, Taranaki Regional Council, and shall adhere to such a plan in so far as it concerns the exercise of this consent at all times.
- 5. In case of any contradiction between the landfill management plan and the conditions of this consent, the conditions of this consent shall prevail.
- 6. The discharge of contaminants into the air from the landfill operation shall not result in any of the following - offensive or objectionable odours; offensive or objectionable dust; or dangerous or noxious ambient concentrations of any airborne contaminant - as determined by at least one enforcement officer of the Taranaki Regional Council, at or beyond the boundary of the site.
- 7. No material is to be burnt at the landfill site.

## Consent 4526-3

8. The discharges authorised by this consent shall not give rise to any significant adverse ecological effects on any ecosystem, including but not limited to, habitats, plants, animals, microflora and microfauna.
9. The consent holder shall keep a record of any complaints received relating to discharges to air with respect to the landfill activity. The complaints record shall include the following where possible:
  - a) name and address of complainant;
  - b) nature of complaint;
  - c) date and time of the complaint and alleged event;
  - d) weather conditions at the time of the event; and
  - e) any action taken in response to the complaint.
10. 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 2014 and/or June 2020, 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 20 March 2007

For and on behalf of  
Taranaki Regional Council

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**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:           New Plymouth District Council  
Private Bag 2025  
NEW PLYMOUTH 4600

Consent Granted  
Date:                       20 March 2007

**Conditions of Consent**

Consent Granted:       To discharge cleanfill and inert materials onto and into land  
at the Inglewood Municipal Landfill at or about  
GR: Q19:120-295, and to discharge municipal refuse onto  
and into land at the Inglewood Municipal Landfill when, and  
only when, it cannot be discharged at the Colson Road  
Municipal Landfill

Expiry Date:             1 June 2026

Review Date(s):        June 2014, June 2020

Site Location:           Inglewood Municipal Landfill, 277 King Road, Inglewood

Legal Description:      Lot 1 DP 16116 Blk XI Paritutu SD

Catchment:             Waiongana

Tributary:              Awai  
Mangaoraka

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

### **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 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 exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of applications 4476, 1613 and 94/119. In the case of any contradiction between the documentation submitted in support of applications 4476, 1613 and 94/119 and the conditions of this consent, the conditions of this consent shall prevail.
- 3. The consent holder shall advise the Taranaki Regional Council one month prior to any changes being made to the landfill management plan, and/or landfill closure management plan. Should the Taranaki Regional Council wish to review any of these plans, one month's notice shall be provided to the consent holder.
- 4. The consent holder shall maintain the landfill management plan to the satisfaction of the Chief Executive, Taranaki Regional Council, and shall adhere to such a plan in so far as it concerns the exercise of this consent at all times.
- 5. In case of any contradiction between the landfill management plan and the conditions of this consent, the conditions of this consent shall prevail.
- 6. Waste, including liquid and sludges, with a solids content of 20% or less, shall not be accepted at the landfill.
- 7. For the purposes of this consent, "clean fill and inert materials" are defined as materials consisting of any solid concrete, cement or cement wastes, bricks, mortar, tiles (clay, ceramic or concrete), non-tanalised timber, porcelain, glass, gravels, boulders, shingles, fibreglass, plastics, sand, soils and clays, and/or tree stumps and roots, whether singly or in combination or mixture, or any other material that when placed onto and into land will not render that land or any vegetation grown on that land toxic to vegetation or animals consuming vegetation.



## Consent 4527-3

8. For the purposes of this consent, “clean fill and inert materials” excludes: food wastes, paper and cardboard, grass clippings, vegetative wastes other than tree stumps and roots, textiles, steel, galvanised metals, construction materials containing paint or fillers or sealers or their containers, oils or greases or any liquids or sludges or their containers, any industrial process by-products other than as permitted under condition 7, any poisons or solvents or their containers, batteries, general domestic refuse not otherwise described, or any wastes with the potential to render land or any vegetation grown on the land toxic to vegetation or to animals consuming such vegetation.
9. The discharge to land shall not result in any contaminant entering surface water.
10. Silt and leachate retention structures shall be installed and maintained to the satisfaction of the Chief Executive, Taranaki Regional Council.
11. The consent holder shall install and maintain stormwater diversion drains to minimise stormwater movement across, or ponding on the site, to the satisfaction of the Chief Executive, Taranaki Regional Council.
12. 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 2014 and/or June 2020, 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 20 March 2007

For and on behalf of  
Taranaki Regional Council

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**Director-Resource Management**



## Marfell Park



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

Name of  
Consent Holder:                      New Plymouth District Council  
Private Bag 2025  
New Plymouth 4342

Decision Date:                      21 October 2014

Commencement Date:              21 October 2014

**Conditions of Consent**

Consent Granted:                      To discharge leachate from the Marfell Park former landfill  
site via groundwater into the Mangaotuku Stream

Expiry Date:                          01 June 2032

Review Date(s):                      June 2020, June 2026

Site Location:                          Marfell Park, Grenville Street, New Plymouth

Legal Description:                      Lot 4 DP 9485 (Discharge point)  
Lot 1 DP 9295 Lot 1 DP 15742 (Discharge source)

Grid Reference (NZTM)              1690275E-5674646N

Catchment:                              Huatoki

Tributary:                                Mangaotuku

*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.
2. The landfill cap and associated stormwater structures shall be maintained in a manner that;
  - a) Minimises ponding to prevent stormwater infiltration into the filled area;
  - b) Ensures stormwater is adequately diverted and/or drained away from the land fill cap; and
  - c) Ensures iron oxide deposits on the outfall structure do not directly enter the Mangaotuku Stream.
3. The site shall be operated in accordance with a 'Management Plan' prepared by the consent holder within 3 months of granting of this consent, and approved by the Chief Executive, Taranaki Regional Council, acting in a certification capacity. The plan shall detail how the site will be managed to achieve compliance with the conditions of this consent and shall include but not be limited to:
  - a) maintenance of the landfill cap to minimise ponding and stormwater infiltration;
  - b) maintenance and management of the stormwater drains on and around the landfill to ensure stormwater is adequately diverted and/or drained away from the land fill cap; and
  - c) monitoring and management of iron oxide deposits on the outfall structure to ensure iron oxide deposits do not enter the water way.
4. After reasonable mixing the receiving waters downstream of the discharge shall meet the following standards;
  - a) unionised ammonia concentration less than 0.025 g/m<sup>3</sup>;
  - b) ammoniacal nitrogen level concentration less than 0.9 g/m<sup>3</sup>;
  - c) pH within the range of 6.0 and 9.0; and
  - d) dissolved zinc concentration less than or equal to 0.05 g/m<sup>3</sup>.
5. The discharge shall not cause the following effects in the receiving waters after reasonable mixing;
  - 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.

## Consent 4902-2.0

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 2020 and/or June 2026 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 21 October 2014

For and on behalf of  
Taranaki Regional Council

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B G Chamberlain  
**Chief Executive**





Okato



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

Name of  
Consent Holder:                      New Plymouth District Council  
Private Bag 2025  
NEW PLYMOUTH 4342

Decision Date:                      13 September 2013

Commencement Date:              13 September 2013

**Conditions of Consent**

Consent Granted:                      To discharge stormwater and leachate from the Okato  
Municipal Landfill into an unnamed tributary of the Kaihihi  
Stream

Expiry Date:                          1 June 2031

Review Date(s):                      June 2019, June 2025

Site Location:                          Okato Municipal Landfill, Hampton Road, Okato

Legal Description:                      Lot 1 DP 13150 Blk I Cape SD (Discharge site)

Grid Reference (NZTM)              1674817E-5663981N

Catchment:                              Kaihihi

*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 [the Council] all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act.

**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.
2. All discharges permitted under this consent shall be undertaken in accordance with the "Okato Landfill Contingency Disposal Management Plan" as supplied with the application (5831).
3. The consent holder shall install and maintain all stormwater diversion drains to minimise stormwater entering or flowing across the discharge area.
4. During routine operations all surface runoff and leachate from the previously filled area of the landfill shall be directed to the leachate stormwater/ collection drain.
5. During and after any contingency discharge of general refuse (as permitted under consent 4529-2), all leachate generated from the new fill shall be directed to a lined pond and removed from the site.
6. This consent shall lapse on 30 September 2018, 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.
7. 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 2019 and/ or June 2025 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 13 September 2013

For and on behalf of  
Taranaki Regional Council

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**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:                      New Plymouth District Council  
Private Bag 2025  
NEW PLYMOUTH 4342

Decision Date:                      13 September 2013

Commencement Date:              13 September 2013

**Conditions of Consent**

Consent Granted:                      To discharge emissions into the air from the contingency  
discharge of solid contaminants at the Okato Municipal  
Landfill

Expiry Date:                          1 June 2031

Review Date(s):                      June 2019, June 2025

Site Location:                          Okato Municipal Landfill, Hampton Road, Okato

Legal Description:                      Lot 1 DP 13150 Blk I Wairau SD (Discharge source & site)

Grid Reference (NZTM)              1674817E-5663981N

*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 [the Council] all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act.

**Special conditions**

1. The discharge of general refuse at the site shall only occur on a contingency basis and in accordance with the Okato Landfill Contingency Disposal Management Plan as submitted with application 5832.
2. The consent holder shall at all times adopt the best practicable option or options [as defined in section 2 of the Resource Management Act 1991] to prevent or minimise any actual or potential effect on the environment arising from any discharge at the site.
3. That the discharge of contaminants into the air shall not result in offensive or objectionable odours or dangerous or noxious ambient concentrations of any airborne contaminant that, in the opinion of at least one enforcement officer of the Taranaki Regional Council, is offensive or objectionable at or beyond the boundary of the site.
4. The discharges authorised by this consent shall not give rise to suspended or deposited dust at or beyond the boundary of the site that is offensive or objectionable. For the purpose of this condition, discharges in excess of the following limits are deemed to be offensive or objectionable:
  - a) dust deposition rate 0.13 g/m<sup>2</sup>/day; and/or
  - b) suspended dust level 3 mg/m<sup>3</sup>.
5. That this consent shall lapse on 1 June 2031, 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.
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 2019 and or June 2025, 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 13 September 2013

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: New Plymouth District Council  
Private Bag 2025  
NEW PLYMOUTH 4342

Decision Date: 13 September 2013

Commencement Date: 13 September 2013

**Conditions of Consent**

Consent Granted: To discharge cleanfill and greenwaste to land and to  
discharge general refuse on a contingency basis to land

Expiry Date: 1 June 2031

Review Date(s): June 2019, June 2025

Site Location: Okato Municipal Landfill, Hampton Road, Okato

Legal Description: Lot 1 DP 13150 Blk I Wairau SD (Discharge source & site)

Grid Reference (NZTM) 1674817E-5663981N

Catchment: Kaihihi

*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 [the Council] all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act.

### **Special conditions**

1. All discharges permitted by this consent shall occur within the existing landfill footprint as shown by the red dotted line on the attached plan (appendix 1).
2. The consent holder shall at all times adopt the best practicable option or options [as defined in section 2 of the Resource Management Act 1991] to prevent or minimise any actual or potential effect on the environment arising from any discharge at the site.
3. The consent holder shall install and maintain stormwater diversion drains to minimise stormwater entering or flowing across the discharge area.
4. The existing landfill cap shall at all times be maintained in its existing condition and shall not be disturbed during any activities permitted by this consent.
5. Prior to the expiry or surrender of this consent all areas used to discharge greenwaste and/or cleanfill shall be stabilised and re-vegetated to minimise erosion, sedimentation and stormwater infiltration.

### **Cleanfill**

6. Cleanfill as defined by special conditions seven and eight may be discharged at any time and shall be undertaken in accordance with the Okato Landfill Contingency Disposal Management Plan as submitted with application 5833.
7. The contaminants to be discharged shall be limited to cleanfill and/or inert materials. For the purposes of this condition, “clean fill and inert materials” are defined as materials consisting of any concrete, cement or cement wastes, bricks, mortar, tiles [clay, ceramic or concrete], non-tanalised timber, porcelain, glass, gravels, boulders, shingles, fibreglass, plastics, sand, soils and clays, and/or tree stumps and roots, whether singly or in combination or mixture, or any other material [subject to condition 8] that when placed onto and into land will not render that land or any vegetation grown on that land toxic to vegetation or animals consuming vegetation.
8. The discharge of the following contaminants shall not occur: food wastes, paper and cardboard, grass clippings, garden wastes including but not limited to wastes containing foliage or other vegetation [other than tree stumps and roots as permitted under condition 7], textiles, steel, galvanised metals, construction materials containing paint or fillers or sealers or their containers, oils or greases or any liquids or sludges or their containers, any industrial process by-products other than as permitted under condition 7, any poisons or solvents or their containers, batteries, general domestic refuse not otherwise described, or any wastes with the potential to render land or any vegetation grown on the land toxic to vegetation or to animals consuming such vegetation.



9. If the consent holder is uncertain as to the acceptability or not of a certain material the consent holder shall obtain written approval from the Consents Manager, Taranaki Regional Council, prior to its discharge.

### **Greenwaste**

10. Green waste may be discharged at any time and shall be undertaken in accordance with the Okato Landfill Contingency Disposal Management Plan as submitted with application 5833.

### **Contingency Landfilling**

11. The discharge of general refuse at the site shall only occur on a contingency basis and in accordance with the Okato Landfill Contingency Disposal Management Plan as submitted with application 5833.
12. In the event that contingency filling is required, the consent holder shall notify Council within 48 hours via email at [worksnotification@trc.govt.nz](mailto:worksnotification@trc.govt.nz). The notification shall include, reasons for using the site, likely volume of material to be discharged and likely duration of the contingency discharge.
13. Upon completion of any contingency discharge, the discharged refuse shall be capped and re-vegetated to the specifications set out in section 4.10.3 of the Okato Landfill Contingency Disposal Management plan as submitted with application 5833.
14. This consent shall lapse on 30 September 2018, 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
15. 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 2019 and or June 2025, 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 13 September 2013

For and on behalf of  
Taranaki Regional Council

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**Director-Resource Management**

Appendix 1

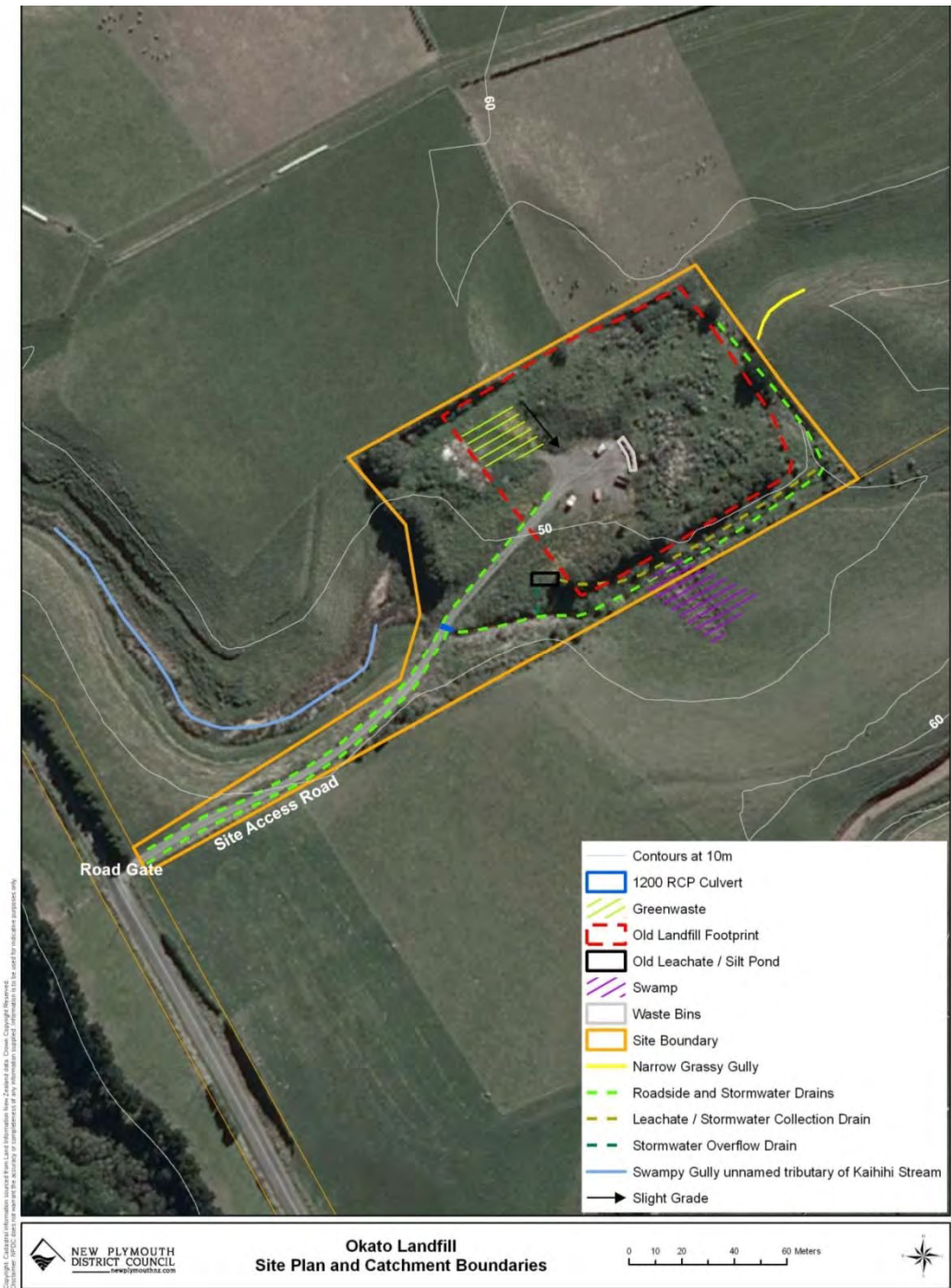


Figure 1 Aerial plan of Okato landfill site

## Appendix II

### Biomonitoring reports



**To** Job Manager, Lorraine Smith  
**From** Environmental Scientist, Katie Blakemore  
**Document** 2027504  
**Report No** KB035  
**Date** 22 March 2018

## Biomonitoring of two unnamed tributaries of the Awai Stream, below the Inglewood Landfill, October 2017

### Introduction

This was the first biological survey undertaken of the two surveys scheduled for the 2017-2018 monitoring year in two tributaries of the Awai Stream in relation to the Inglewood landfill. Leachate from the landfill discharges to a small tributary, which then joins a larger tributary approximately 450m below the face of the landfill. Results of biological surveys performed in the tributaries since the 2001-2002 monitoring year are discussed in the series of reports referenced at the end of this report.

### Methods

This survey was undertaken on 26 October 2017 at four sites in two tributaries of the Awai Stream; sites 1(a) and 1 (b) were located in the smaller tributary and sites 2 and 3 in the larger tributary (Table 1 and Figure 1).

Two different sampling techniques were used to collect streambed macroinvertebrates in this survey. The Council's standard '400ml kick-sampling' technique was used at site 2 and the 'vegetation sweep' technique was used at site 1a. A combination of these two techniques was used at sites 1b and 3. The 'kick-sampling' 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).

**Table 1** Biomonitoring sites in tributaries of the Awai Stream

Site number	Site code	Location
1a	AWY000105	Smaller tributary, 100 metres below tip face
1b	AWY000107	Smaller tributary, 400 metres below tip face
2	AWY000100	Larger tributary, above confluence with small tributary
3	AWY000115	Larger tributary, 80 metres below confluence with small tributary

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

Table 2 Macroinvertebrate abundance categories

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

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams. Highly 'sensitive' taxa were assigned the highest scores of 9 or 10, while the most 'tolerant' forms scored 1. Sensitivity scores for certain taxa have been modified in accordance with Taranaki experience. Averaging the scores from a list of taxa taken from one site and multiplying by a scaling factor of 20 produces a Macroinvertebrate Community Index (MCI) value. A difference of 11 units or more in MCI values is considered significantly different (Stark 1998). A gradation of biological water quality conditions based upon MCI ranges which has been adapted for Taranaki streams and rivers (TRC, 2013) from Stark's classification (Stark, 1985; Boothroyd and Stark, 2000) (Table 3).

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

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

A semi-quantitative MCI value (SQMCI<sub>s</sub>) 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<sub>s</sub> is not multiplied by a scaling factor of 20, therefore SQMCI<sub>s</sub> values range from 1 to 10, while MCI values range from 20 to 200.

Where necessary, sub-samples of algal and detrital material taken from the macroinvertebrate samples were scanned under 40-400 x 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 these organisms is an indicator of organic enrichment within a stream.

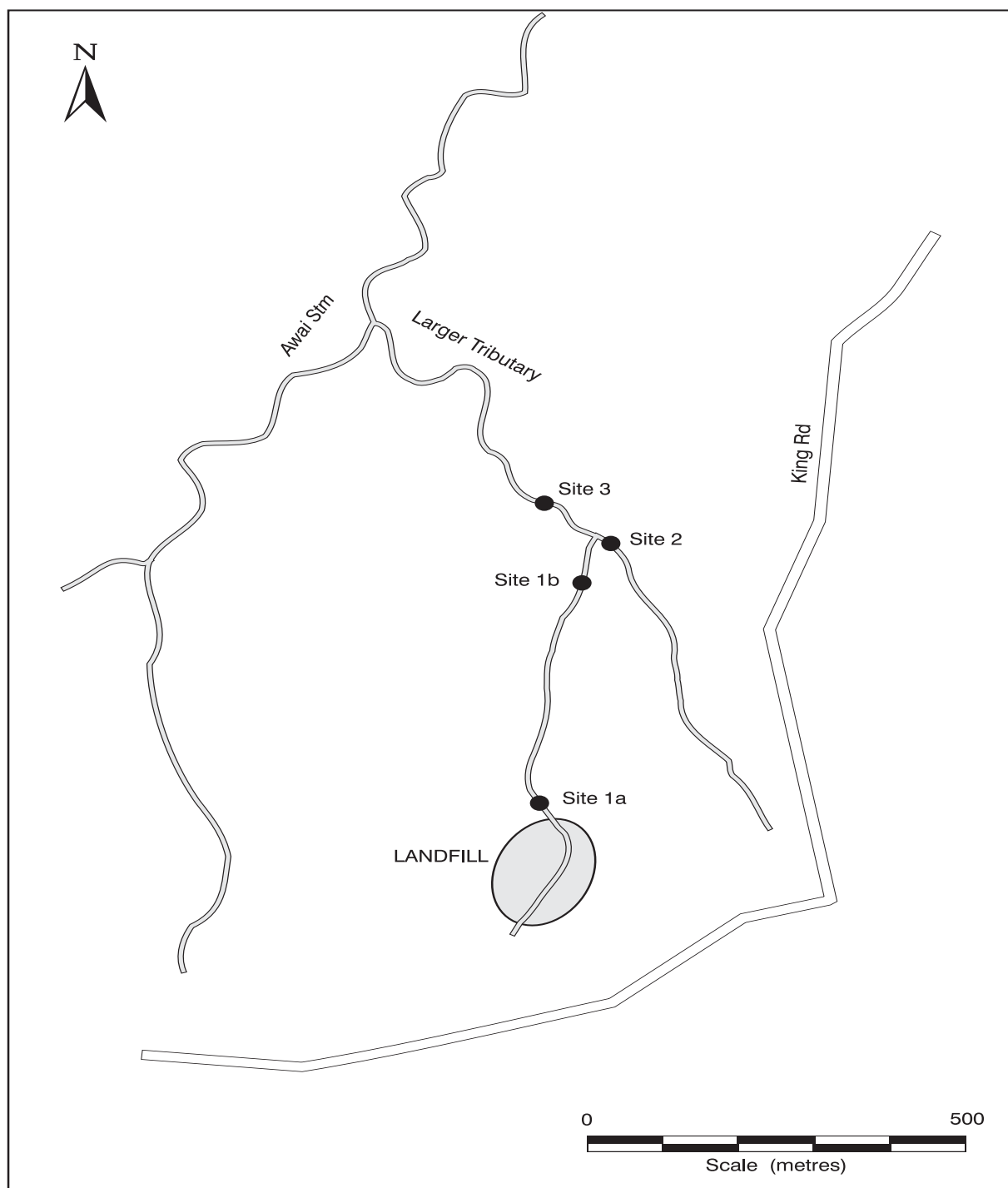


Figure 1 Biomonitoring sites in tributaries of the Awai Stream related to the Inglewood landfill

## Results

This spring survey was carried out under moderate to low flow conditions. The water was dirty brown at site 1a, cloudy brown at site 1b and clear and uncoloured at sites 2 and 3 (in the larger tributary). Flows were slow to very slow at the four sites. The survey followed a period of 13 days since a fresh in excess of both 3x and 7x median flow. Water temperatures at the time of the survey ranged between 15.0 – 18.0°C at the four sites.

The substrate comprised predominantly silt at site 1a, hard clay at site 1b, silt, wood/root and gravel at sites 2 and 3. There was a higher proportion of fine substrate (silt and sand) recorded at site 3 compared with site 2. Macrophytes were recorded on the streambed at site 1a and the stream margins at site 1b, but were not recorded at sites 2 and 3. Leaves were patchy on the streambed at sites 1a and 2, absent at site 1b, and widespread at site 3. There was overhanging vegetation at all four sites, providing partial shading at sites 1a and 2, and complete shading at sites 1b and 3.

No sites supported any undesirable biological growths.

## Macroinvertebrate communities

A summary of results from previous surveys performed in the tributaries of the Awai Stream in relation to the Inglewood landfill are presented together with current results in Table 4. The full results of the current survey are provided in Table 5.

**Table 4** Numbers of taxa and MCI values recorded in previous surveys related to the Inglewood landfill, together with current results

Site No	No. Taxa				MCI values				SQMCI <sub>s</sub> values			
	No. samples	Range	Median	Current result	No. Samples	Range	Median	Current result	No. samples	Range	Median	Current result
1a	46	4-23	15	13	46	60-92	72	82	36	1.2-3.6	2.6	3.3
1b	49	11-29	19	14	49	69-88	77	66	36	2.1-4.5	3.4	3.3
2	50	8-29	18	12	50	79-108	90	87	36	1.4-6.1	4.1	4.1
3	50	9-27	19	10	50	69-111	90	86	36	1.3-5.8	3.3	1.7



Table 5 Macroinvertebrate fauna of two unnamed tributaries of the Awai Stream sampled in relation to the Inglewood Landfill on 26 October 2017

Taxa List	Site Number	MCI score	1a	1b	2	3
	Site Code		AWY000105	AWY000107	AWY000100	AWY000115
	Sample Number		FWB17344	FWB17345	FWB17343	FWB17346
ANNELIDA (WORMS)	Oligochaeta	1	A	R	C	VA
	Lumbricidae	5	R	-	-	-
MOLLUSCA	<i>Gyraulus</i>	3	-	R	-	-
	<i>Potamopyrgus</i>	4	C	A	R	-
	Sphaeriidae	3	R	-	-	-
CRUSTACEA	Ostracoda	1	A	C	R	VA
	<i>Paracalliope</i>	5	-	-	-	R
	Paraleptamphopidae	5	A	R	A	R
EPEHEMEROPTERA (MAYFLIES)	<i>Zephlebia group</i>	7	R	-	C	C
PLECOPTERA (STONEFLIES)	<i>Zelandobius</i>	5	-	R	-	-
HEMIPTERA (BUGS)	<i>Microvelia</i>	3	-	R	-	-
TRICHOPTERA (CADDISFLIES)	<i>Hydrobiosis</i>	5	-	R	-	-
	<i>Polypsectropus</i>	6	C	-	R	R
	Oeconesidae	5	-	-	R	-
	<i>Triplectides</i>	5	-	R	R	C
DIPTERA (TRUE FLIES)	Hexatomini	5	-	-	R	-
	<i>Paralimnophila</i>	6	R	-	-	-
	<i>Chironomus</i>	1	-	R	-	-
	Orthoclaadiinae	2	-	C	-	-
	<i>Polypedilum</i>	3	A	R	A	A
	Tanypodinae	5	A	-	R	R
	Ceratopogonidae	3	C	-	-	-
	<i>Paradixa</i>	4	R	-	-	-
	<i>Austrosimulium</i>	3	-	R	-	-
ACARINA (MITES)	Acarina	5	-	R	C	A
No of taxa			13	14	12	10
MCI			82	66	87	86
SQMCIs			3.3	3.3	4.1	1.7
EPT (taxa)			2	3	4	3
%EPT (taxa)			15	21	33	30
'Tolerant' taxa		'Moderately sensitive' taxa	'Highly sensitive' taxa			
R = Rare	C = Common	A = Abundant	VA = Very Abundant	XA = Extremely Abundant		

## Site 1a

A low taxa richness of 13 taxa was recorded. This is a substantial eight taxa fewer than recorded in the preceding survey, but only two taxa less than the median richness for this site (Table 4, Figure 2). The macroinvertebrate community was characterised by two 'moderately sensitive' taxa [amphipod (*Paraleptamphopidae*) and midge larvae (*Tanypodinae*)] and three 'tolerant' taxa [oligochaete worms, seed shrimps (*Ostracoda*) and midge larvae (*Polypedilum*)].

A MCI score of 87 was recorded, categorising the site as having 'fair' macroinvertebrate community health. This score is a non-significant (Stark 1998) ten units higher than the median score for this site and equal to the score recorded in the preceding survey (Figure 2). A SQMCI<sub>5</sub> score of 3.3 units was recorded, not significantly (Stark 1998) higher than the median score for this site (median SQMCI<sub>5</sub> score 2.6 units; Table 4) and significantly higher (Stark 1998) the score of 1.6 units recorded in the preceding survey.

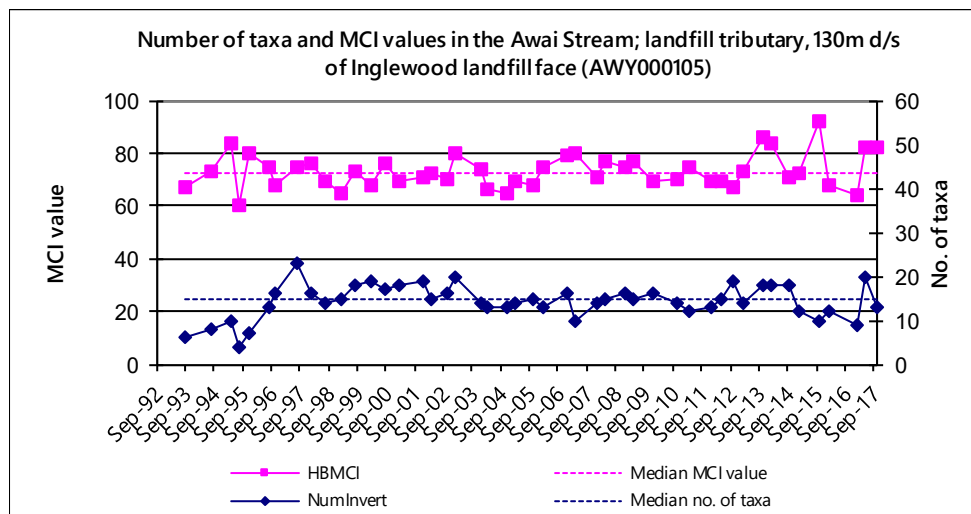


Figure 2 Number of taxa and MCI values at site 1a in a tributary of the Awai Stream

## Site 1b

A low taxa richness of 14 taxa was recorded, five taxa less than both the median score for this site and the score recorded in the preceding survey (Table 4, Figure 3). The macroinvertebrate community was characterised by only one taxon, the 'tolerant' mud snail (*Potamopyrgus*).

A MCI score of 66 units was recorded, categorising the site as having 'poor' macroinvertebrate community health. This score is significantly lower (Stark 1998) than both the median score for this site and the score recorded in the preceding survey (Table 4, Figure 3). A SQMCI<sub>5</sub> score of 3.3 units was recorded, which is not significantly different to the score of 3.9 units recorded in the preceding survey or to the median score for this site (median SQMCI<sub>5</sub> score 3.4 units; Table 4).

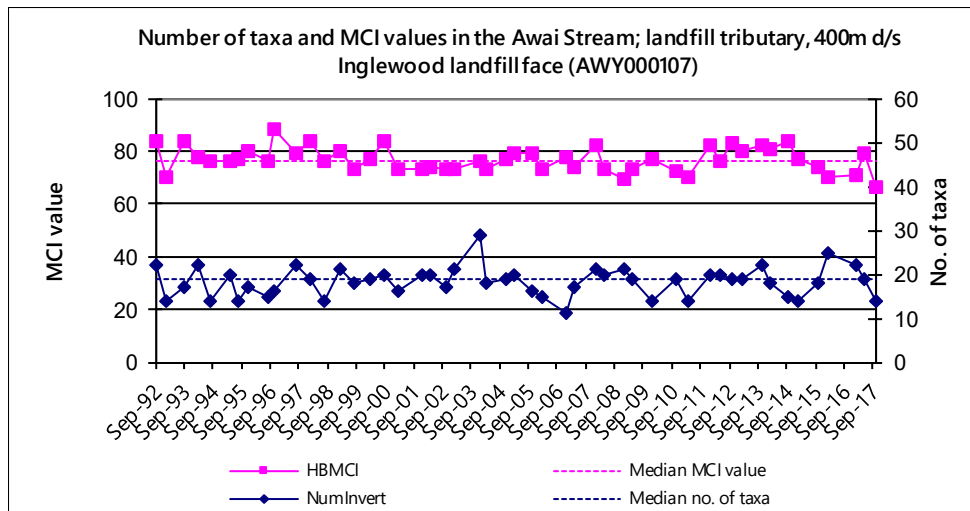


Figure 3 Number of taxa and MCI values at site 1b in a tributary of the Awai Stream

## Site 2

A low taxa richness of 12 taxa was recorded in the current survey, a substantial six taxa less than both the median richness for this site and the result recorded in the preceding survey (Table 4, Figure 4). The macroinvertebrate community was characterised by one 'moderately sensitive' taxon [amphipod (Paraleptamphopidae)] and one 'tolerant' taxon [midge larvae (*Polypedium*)].

A MCI score of 87 units was recorded at this site, categorising the site as having 'fair' macroinvertebrate community health. This score is not significantly lower (Stark 1998) than either the median score for this site (median MCI score 90 units; Table 4) or the score recorded in the preceding survey (Figure 4). A SQMCI<sub>s</sub> score of 4.1 units was recorded, significantly lower (Stark 1998) than the score of 5.5 units recorded in the preceding survey but equal to the median score for this site (Table 4).

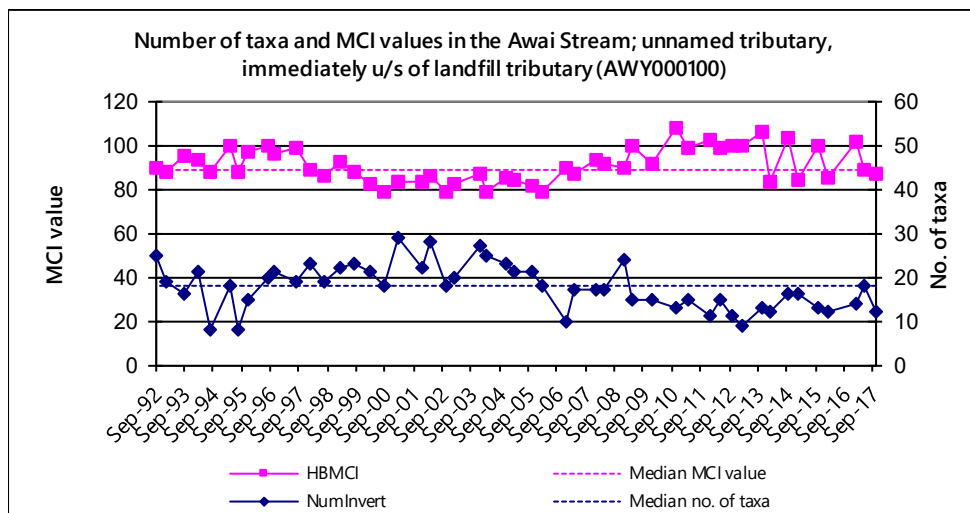


Figure 4 Number of taxa and MCI values at site 2 in a tributary of the Awai Stream

## Site 3

A low taxa richness of 10 taxa was recorded, a substantial nine taxa fewer than the median richness for this site and eight taxa less than the richness recorded in the preceding survey (Table 4, Figure 5). The macroinvertebrate community was characterised by one 'moderately sensitive' taxon [mite (Acarina)] and three 'tolerant' taxa [oligochaete worms, seed shrimp (Ostracoda) and midge larvae (*Polypedium*)].

A MCI score of 86 units was recorded, categorising the site as having 'fair' macroinvertebrate community health. This score is not significantly different from either the median score for this site (median MCI score 90 units; Table 4, Figure 5) or the score recorded in the preceding survey (Figure 5). A SQMCI<sub>s</sub> score of 1.7 units was recorded, significantly lower (Stark 1998) than the median score for this site (median SQMCI<sub>s</sub> score 3.3 units; Table 4) but similar to the score of 1.9 units recorded in the preceding survey.

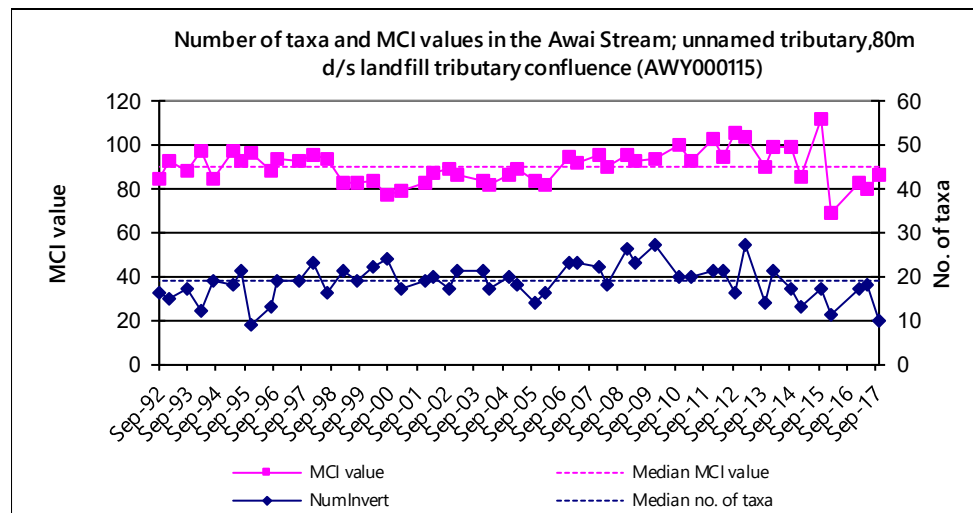


Figure 5 Number of taxa and MCI values at site 3 in a tributary of the Awai Stream

## Discussion and conclusions

The Council's 'kick-sampling' and 'vegetation sweep' techniques were used at four sites to collect benthic macroinvertebrates from two unnamed tributaries of the Awai Stream in relation to leachate discharges from the Inglewood Landfill. This has provided data to assess any potential impacts the consented discharges have had on the macroinvertebrate communities of the stream. Samples were processed to provide number of taxa (taxa richness), MCI and SQMCI<sub>s</sub> scores for each site.

Taxa richness is the most robust index when determining whether a macroinvertebrate community has been exposed to toxic discharges. Macroinvertebrates when exposed to toxic discharges may die and be swept downstream or may deliberately drift downstream as an avoidance mechanism (catastrophic drift). The MCI is a measure of the overall sensitivity of the macroinvertebrate community to organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The SQMCI<sub>s</sub> takes into account relative abundances of taxa as well as sensitivity to pollution. Significant differences in taxa richness, MCI or SQMCI<sub>s</sub> between sites may indicate the degree of adverse effects (if any) of the discharge being monitored.

The current survey recorded low taxa richnesses at all four sites. These were lower than the historical medians and the richness recorded in the preceding survey in all cases, which may be a result of the low flow conditions encountered in this survey. MCI scores were similar at sites 1a, 2 and 3, while site 1b recorded a significantly lower score. The scores were similar to the preceding result and to historical medians for all sites except site 1b, which was significantly lower. SQMCI<sub>s</sub> scores were similar at sites 1a, 1b and 2, while site 3 recorded a significantly lower score. This reflects the numerical dominance of low scoring oligochaete worms and ostracod seed shrimps at this site (MCI tolerance value of 1 for both taxa).

Previous surveys typically recorded a poorer community at site 1a than at site 1b. In contrast, the current survey recorded very similar taxa richnesses and SQMCI<sub>s</sub> scores at the two sites, while the MCI score decreased significantly between the two sites.

Overall, the results of this survey indicate that the leachate discharge from the Inglewood Landfill is not causing adverse impacts on the macroinvertebrate communities of these two unnamed tributaries of the

Awai Stream. Observed differences between sites and previous surveys are likely to be a result of differences in habitat and low flow conditions at the time of sampling.

## Summary

Macroinvertebrate sampling was undertaken on 26 October 2017, at four sites in two tributaries of the Awai Stream, using a combination of the 'sweep-net' and 'kick-sampling' techniques, both standard sampling techniques used by the Council. This was undertaken to assess whether leachate discharges from Inglewood landfill had had any adverse effects on the macroinvertebrate communities of this stream. Samples were processed to provide number of taxa (richness), MCI and SQMCI<sub>s</sub> scores for each site.

Taxonomic richnesses were low and were similar at all four sites, while MCI scores were similar at all sites except site 1b, which had a significantly lower score. SQMCI<sub>s</sub> scores were similar at all sites except site 3, which had a significantly lower score. The MCI score at site 1b and the SQMCI<sub>s</sub> score at site 3 were significantly lower than historical medians, while all other MCI and SQMCI<sub>s</sub> scores were similar to historical medians. Habitat differences and low flow conditions were thought to be the cause of observed differences in macroinvertebrate communities.

No sites supported any undesirable biological growths.

The results of this survey provide no indication that the discharge of leachate into the unnamed tributary of the Awai Stream was having a significant adverse effect on the macroinvertebrate communities in the two tributaries monitored.

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**To** Job Manager, Lorraine Smith  
**From** Environmental Scientist, Katie Blakemore  
**Document** 2064234  
**Report No** KB056  
**Date** 1 June 2018

## Biomonitoring of two unnamed tributaries of the Awai Stream, below the Inglewood Landfill, March 2018

### Introduction

This was the second biological survey undertaken of the two surveys scheduled for the 2017-2018 monitoring year in two tributaries of the Awai Stream in relation to the Inglewood landfill. Leachate from the landfill discharges to a small tributary, which then joins a larger tributary approximately 450m below the face of the landfill. Results of biological surveys performed in the tributaries since the 2001-2002 monitoring year are discussed in the series of reports referenced at the end of this report.

### Methods

This survey was undertaken on 1 March 2018 at four sites in two tributaries of the Awai Stream; sites 1a and 1b were located in the smaller tributary and sites 2 and 3 in the larger tributary (Table 1 and Figure 1).

Two different sampling techniques were used to collect streambed macroinvertebrates in this survey. The Council's standard '400ml kick-sampling' technique was used at sites 2 and 3, and a combination of the 'kick-sampling' and 'vegetation sweep' techniques was used at sites 1a and 1b. The 'kick-sampling' 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).

**Table 1** Biomonitoring sites in tributaries of the Awai Stream

Site number	Site code	Location
1a	AWY000105	Smaller tributary, 100 metres below tip face
1b	AWY000107	Smaller tributary, 400 metres below tip face
2	AWY000100	Larger tributary, above confluence with small tributary
3	AWY000115	Larger tributary, 80 metres below confluence with small tributary

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

Table 2 Macroinvertebrate abundance categories

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

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams. Highly 'sensitive' taxa were assigned the highest scores of 9 or 10, while the most 'tolerant' forms scored 1. Sensitivity scores for certain taxa have been modified in accordance with Taranaki experience. Averaging the scores from a list of taxa taken from one site and multiplying by a scaling factor of 20 produces a Macroinvertebrate Community Index (MCI) value. A difference of 11 units or more in MCI values is considered significantly different (Stark 1998). A gradation of biological water quality conditions based upon MCI ranges which has been adapted for Taranaki streams and rivers (TRC, 2013) from Stark's classification (Stark, 1985; Boothroyd and Stark, 2000) (Table 3).

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

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

A semi-quantitative MCI value (SQMCI<sub>s</sub>) 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<sub>s</sub> is not multiplied by a scaling factor of 20, therefore SQMCI<sub>s</sub> values range from 1 to 10, while MCI values range from 20 to 200.

Where necessary, 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 these organisms is an indicator of organic enrichment within a stream.

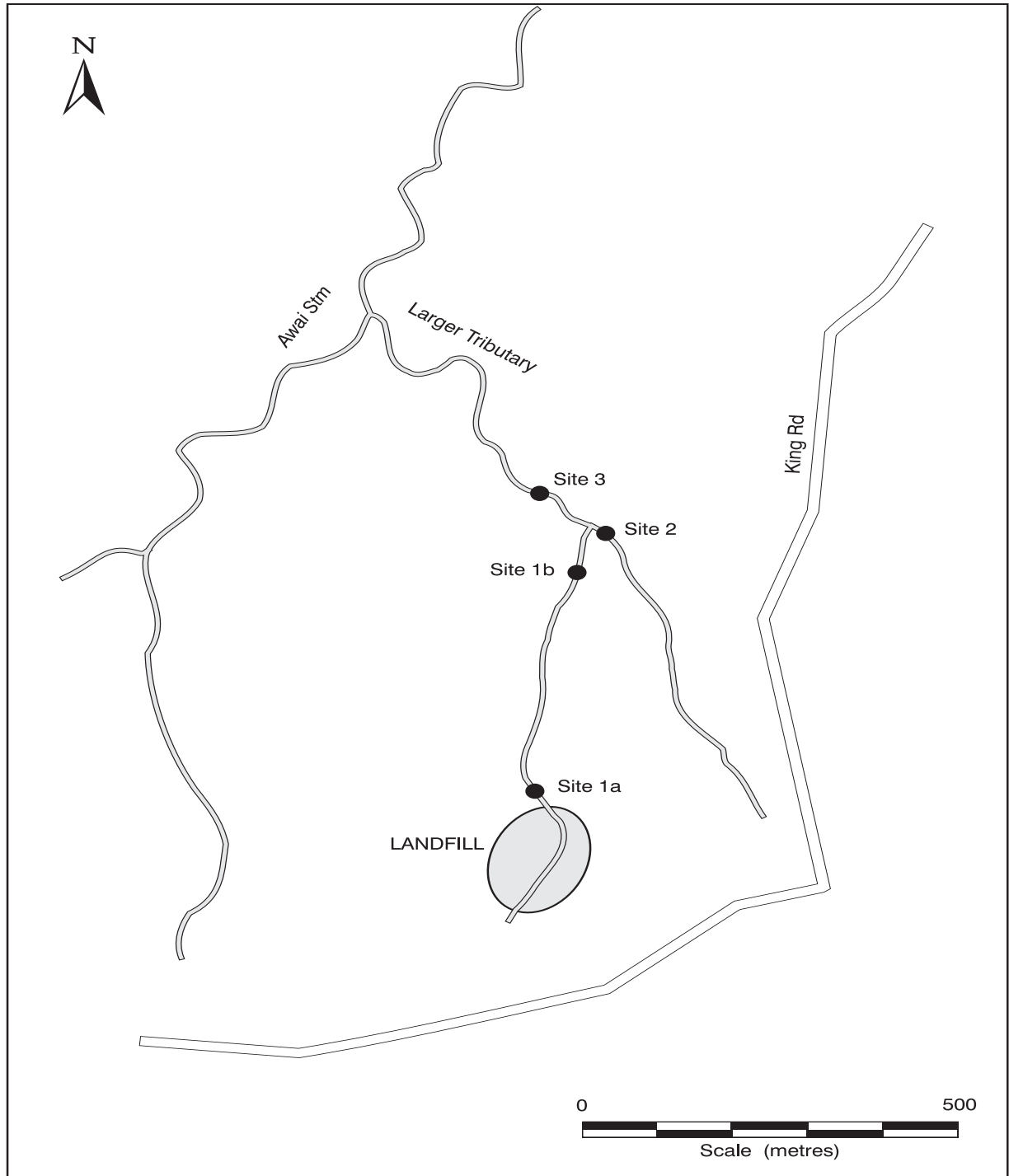


Figure 1 Biomonitoring sites in tributaries of the Awai Stream related to the Inglewood landfill

## Results

This summer survey was carried out under low to very low flow conditions. The water was clear and uncoloured at all four sites. Flows were slow at sites 1a, 1b and 2, and very slow at site 3. The survey followed a period of 8 days since a fresh in excess of 3x median flow and 28 days since a fresh in excess of 7x median flow. Water temperatures at the time of the survey ranged from 17.1 °C - 17.2 °C in the larger tributary and 18.9 °C – 19.9 °C in the smaller tributary.

The substrate comprised predominantly silt at site 1a, silt and hard clay at site 1b, silt, sand and wood/root at sites 2 and 3. Some hard clay was also present at site 2. Periphyton was absent at all four sites. Macrophytes were recorded at on the streambed at site 1a, but were not recorded at sites 1b, 2 and 3. Leaves were patchy on the streambed at sites 1a and 1b, and widespread at site 2 and 3. There was overhanging vegetation at all four sites, providing partial shading at sites 1a, 1b and 3, and complete shading at site 2.

No sites supported any undesirable biological growths.

## Macroinvertebrate communities

A summary of results from previous surveys performed in the tributaries of the Awai Stream in relation to the Inglewood landfill are presented together with current results in Table 4. The full results of the current survey are provided in Table 5.

**Table 4** Numbers of taxa and MCI values recorded in previous surveys related to the Inglewood landfill, together with current results

Site No	No. Taxa				MCI values				SQMCI <sub>s</sub> values			
	No. samples	Range	Median	Current result	No. Samples	Range	Median	Current result	No. samples	Range	Median	Current result
1a	47	4-23	15	7	47	60-92	72	69	37	1.2-3.6	2.6	2.5
1b	50	11-29	19	9	50	66-88	77	69	37	2.1-4.5	3.3	3.5
2	51	8-29	18	7	51	79-108	89	77	37	1.4-6.1	4.1	1.2
3	51	9-27	19	5	51	69-111	90	44	37	1.3-5.8	3.3	1.0

Table 5 Macroinvertebrate fauna of two unnamed tributaries of the Awai Stream sampled in relation to the Inglewood Landfill on 1 March 2018

Taxa List	Site Number	MCI score	1a	1b	2	3
	Site Code		AWY000105	AWY000107	AWY000100	AWY000115
	Sample Number		FWB18110	FWB18111	FWB18109	FWB18112
COELENTERATA	Coelenterata	3	C	-	-	-
ANNELIDA (WORMS)	Oligochaeta	1	A	C	XA	VA
MOLLUSCA	<i>Gyraulus</i>	3	-	R	-	-
	<i>Potamopyrgus</i>	4	VA	A	-	-
CRUSTACEA	Copepoda	5	-	-	R	-
	Ostracoda	1	VA	C	R	A
	Paraleptamphopidae	5	-	-	-	R
	<i>Paranephrops</i>	5	-	-	R	-
EPHEMEROPTERA (MAYFLIES)	<i>Austroclima</i>	7	-	-	R	-
TRICHOPTERA (CADDISFLIES)	<i>Polypectropus</i>	6	-	-	R	-
	Oeconesidae	5	R	C	-	-
	<i>Triplectides</i>	5	R	R	-	-
DIPTERA (TRUE FLIES)	<i>Chironomus</i>	1	-	-	-	C
	Orthocladiinae	2	-	R	VA	-
	<i>Polypedilum</i>	3	-	-	-	R
	Tanypodinae	5	-	C	-	-
ACARINA (MITES)	Acarina	5	C	R	-	-
No of taxa			7	9	7	5
MCI			69	69	77	44
SQMCIs			2.5	3.5	1.2	1.0
EPT (taxa)			2	2	2	0
%EPT (taxa)			29	22	29	0
'Tolerant' taxa	'Moderately sensitive' taxa		'Highly sensitive' taxa			

R = Rare

C = Common

A = Abundant

VA = Very Abundant

XA = Extremely Abundant

## Site 1a

A low taxa richness of seven taxa was recorded. This is a substantial six taxa fewer than recorded in the preceding survey, and eight taxa less than the median richness for this site (Table 4, Figure 2). The macroinvertebrate community was characterised by three 'tolerant' taxa [oligochaete worms, mud snail (*Potamopyrgus*) and seed shrimp (*Ostracoda*)].

A MCI score of 69 was recorded, categorising the site as having 'poor' macroinvertebrate community health. This score is a non-significant (Stark 1998) three units lower than the median score for this site and a significant 18 units lower than recorded in the preceding survey (Figure 2). A SQMCI<sub>s</sub> score of 2.5 units was recorded, not significantly (Stark 1998) lower than the median score for this site (median SQMCI<sub>s</sub> score 2.6 units; Table 4) or the score of 3.3 units recorded in the preceding survey.

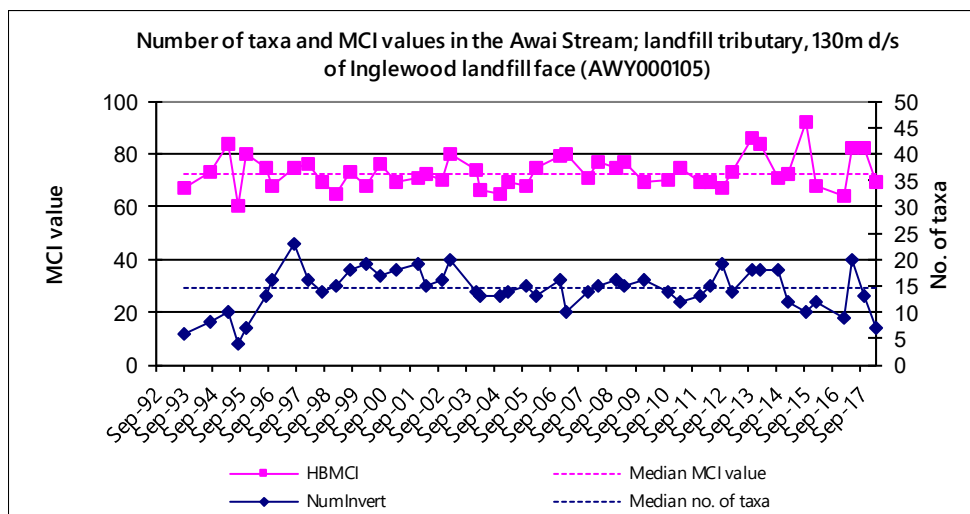


Figure 2 Number of taxa and MCI values at site 1a in a tributary of the Awai Stream

## Site 1b

A low taxa richness of nine taxa was recorded, ten taxa less than the median score for this site and five taxa less than the score recorded in the preceding survey (Table 4, Figure 3). This is also the lowest richness recorded at this site to date, by two taxa (Table 4, Figure 3). The macroinvertebrate community was characterised by only one 'tolerant' taxon, the mud snail (*Potamopyrgus*).

A MCI score of 69 units was recorded, categorising the site as having 'poor' macroinvertebrate community health. This score is non-significantly lower (Stark 1998) than the median score for this site but is a non-significant (Stark 1998) three units higher than that recorded in the preceding survey (Table 4, Figure 3). A SQMCI<sub>s</sub> score of 3.5 units was recorded, which is not significantly different to the score of 3.4 units recorded in the preceding survey or to the median score for this site (median SQMCI<sub>s</sub> score 3.3 units; Table 4).

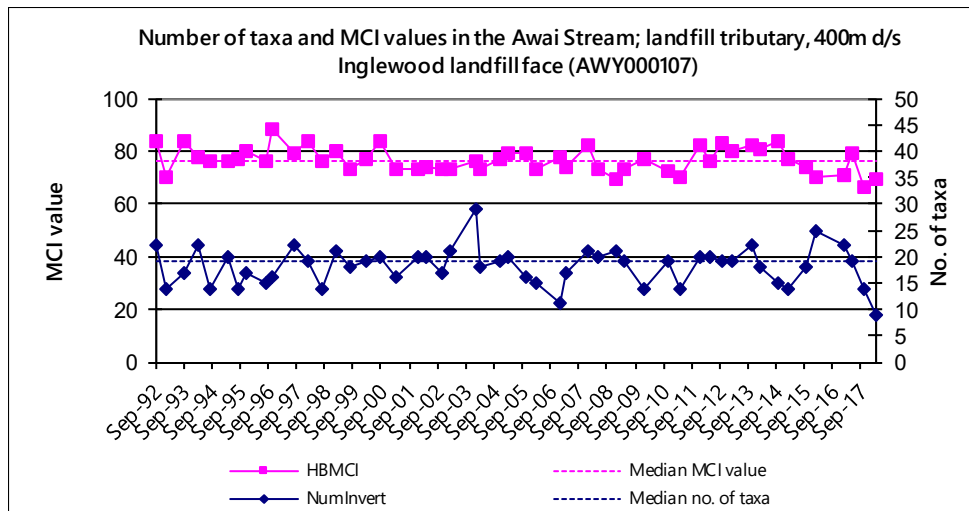


Figure 3 Number of taxa and MCI values at site 1b in a tributary of the Awai Stream

## Site 2

A low taxa richness of seven taxa was recorded in the current survey, a substantial 11 taxa less than the median richness for this site and five taxa less than the result recorded in the preceding survey (Table 4, Figure 4). This result is also the lowest richness recorded at this site to date, by one taxon (Table 4, Figure 4). The macroinvertebrate community was characterised by two 'tolerant' taxa [oligochaete worms and midge larvae (Orthocladiinae)].

A MCI score of 77 units was recorded at this site, categorising the site as having 'poor' macroinvertebrate community health. This score is significantly lower (Stark 1998) than the median score for this site (median MCI score 89 units; Table 4) but is not significantly lower than the score recorded in the preceding survey (Figure 4). This MCI score is the lowest score recorded at this site to date, by 2 units (Table 4, Figure 4). A SQMCI<sub>s</sub> score of 1.2 units was recorded, significantly lower (Stark 1998) than the score of 4.1 units recorded in the preceding survey and the median score for this site (Table 4). This is also the lowest SQMCI<sub>s</sub> score recorded at this site to date, by 0.2 unit (Table 4).

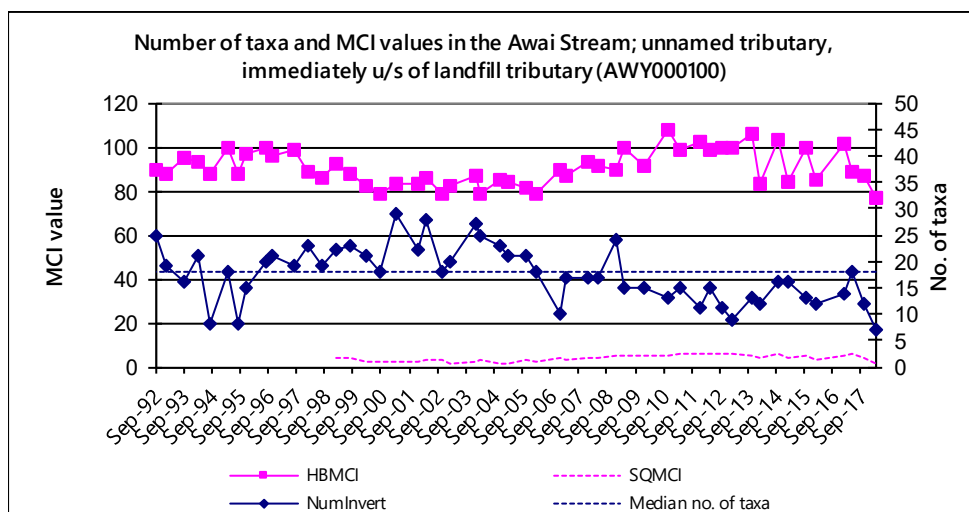


Figure 4 Number of taxa and MCI values at site 2 in a tributary of the Awai Stream

## Site 3

A low taxa richness of five taxa was recorded, a substantial 14 taxa fewer than the median richness for this site and five taxa less than the richness recorded in the preceding survey (Table 4, Figure 5). This is also the lowest richness recorded at this site to date, by four units (Table 4, Figure 5). The macroinvertebrate community was characterised by two 'tolerant' taxa [oligochaete worms and seed shrimp (Ostracoda)].

A MCI score of 44 units was recorded, categorising the site as having 'very poor' macroinvertebrate community health. This score is a significant (Stark 1998) 46 units lower than the median score for this site (median MCI score 90 units; Table 4, Figure 5) and 42 units lower than the score recorded in the preceding survey (Figure 5). A SQMCI<sub>s</sub> score of 1.0 units was recorded, significantly lower (Stark 1998) than the median score for this site (median SQMCI<sub>s</sub> score 3.3 units; Table 4) and non-significantly lower than the score of 1.7 units recorded in the preceding survey. The MCI and SQMCI<sub>s</sub> scores are the lowest recorded at this site to date, by 25 units and 0.3 unit respectively (Table 4, Figure 5).

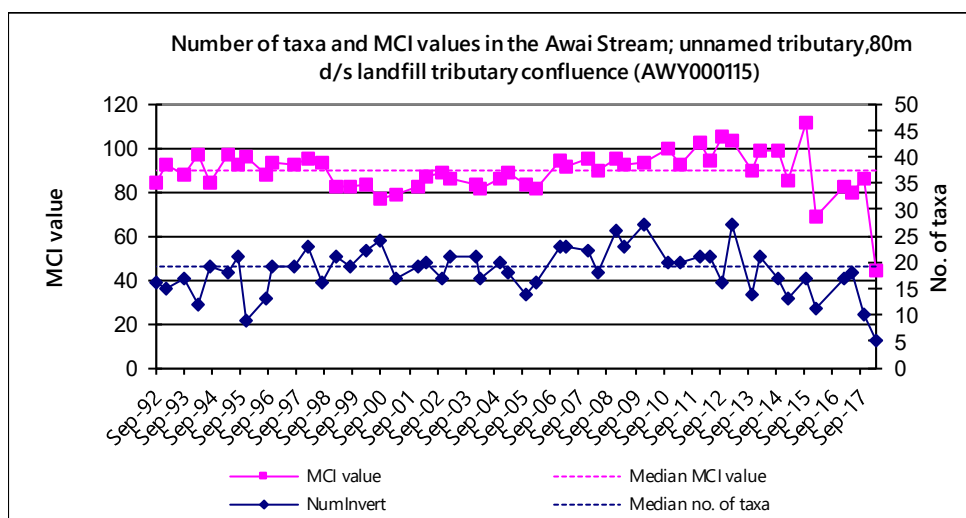


Figure 5 Number of taxa and MCI values at site 3 in a tributary of the Awai Stream

## Discussion and conclusions

The Council's 'kick-sampling' and a combination of 'kick-sampling' 'vegetation sweep' techniques were used at four sites to collect benthic macroinvertebrates from two unnamed tributaries of the Awai Stream in relation to leachate discharges from the Inglewood Landfill. This has provided data to assess any potential impacts the consented discharges have had on the macroinvertebrate communities of the stream. Samples were processed to provide number of taxa (taxa richness), MCI and SQMCI<sub>s</sub> scores for each site.

Taxa richness is the most robust index when determining whether a macroinvertebrate community has been exposed to toxic discharges. Macroinvertebrates when exposed to toxic discharges may die and be swept downstream or may deliberately drift downstream as an avoidance mechanism (catastrophic drift). The MCI is a measure of the overall sensitivity of the macroinvertebrate community to organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The SQMCI<sub>s</sub> takes into account relative abundances of taxa as well as sensitivity to pollution. Significant differences in taxa richness, MCI or SQMCI<sub>s</sub> between sites may indicate the degree of adverse effects (if any) of the discharge being monitored.

The current survey recorded similarly low taxa richnesses at all four sites. These were substantially lower than the historical medians and lower than the richness recorded in the preceding survey in all cases, which is likely to be a result of the very low flow conditions encountered in this survey. These richnesses were the



lowest recorded to date for sites 1b, 2 and 3, while site 1a was three taxa more than the lowest recorded score for the site.

MCI scores were similar at sites 1a, 1b and 2, while site 3 recorded a significantly lower score. The scores at sites 1a and 1b in the smaller tributary were similar to historical medians, while sites 2 and 3 in the larger tributary recorded scores significantly lower than historical medians. When compared to the preceding survey, sites 1b and 2 had similar scores and sites 1a and 3 showed a significant decrease. SQMCI<sub>s</sub> scores varied between sites, with site 1b recording a result significantly higher than any other site, while sites 2 and 3 (in the larger tributary) had similar results and were significantly lower than both sites 1a and 1b. Scores at sites 1a and 1b were similar to historical medians, while at sites 2 and 3 score were significantly lower than these medians. Compared to the preceding survey, site 2 showed a significant decrease while all other sites remained similar. These MCI and SQMCI<sub>s</sub> scores at sites 2 and 3 were the lowest recorded to date at these sites.

Site 3 in the current survey showed very poor results for all invertebrate metrics, and in particular the MCI, which had decreased by 42 units since the preceding survey. This is likely a result of very low flow conditions and almost still water velocity at the time of sampling. The low SQMCI<sub>s</sub> score reflects the numerical dominance of the very low scoring taxa, oligochaete worms and ostracod seed shrimps, both of which have an MCI tolerance value of 1. These taxa, and in fact all five taxa recorded at this site, are often associated with slow or still water velocities. The low MCI score also reflects the very low proportion of 'sensitive' taxa (20%, or one taxon) in the community. In contrast, site 2 recorded a similarly low SQMCI<sub>s</sub> score, because it was also numerically dominated by very low scoring taxa, but a much higher MCI score reflecting the higher proportion of 'sensitive' taxa (57%, or 4 taxa) in the community. All of the sensitive taxa at both sites were 'rare' which means only 1-4 individuals of each taxon were recorded. This therefore reflects the disproportionate influence that 'rare' taxa may have on the MCI score, especially when taxa richness is low. Because of this, the SQMCI<sub>s</sub> is the more robust metric in this instance.

Previous surveys typically recorded a poorer community at site 1a than at site 1b. In contrast to this, the current survey recorded very similar taxa richnesses and identical MCI scores at the two sites, while the SQMCI<sub>s</sub> score reflected this typical pattern.

Overall, the results of this survey indicate that the leachate discharge from the Inglewood Landfill is not causing adverse impacts on the macroinvertebrate communities of these two unnamed tributaries of the Awai Stream. The smaller tributary, which would be expected to be more strongly affected by any leachate discharge from the Inglewood landfill, was in similar to median health. Differences between sites and from previous surveys are likely to result from differences in habitat, principally caused by the very low flow conditions at the time of sampling.

## Summary

Macroinvertebrate sampling was undertaken on 1 March 2018, at four sites in two tributaries of the Awai Stream, using the 'kick-sampling' and a combination of the 'sweep-net' and 'kick-sampling' techniques, both standard sampling techniques used by the Council. This was undertaken to assess whether leachate discharges from Inglewood landfill had had any adverse effects on the macroinvertebrate communities of this stream. Samples were processed to provide number of taxa (richness), MCI and SQMCI<sub>s</sub> scores for each site.

Taxonomic richnesses were low and were similar at all four sites, while MCI scores were similar at all sites except site 3, which had a significantly lower score. SQMCI<sub>s</sub> scores were lower at sites 2 and 3 than sites 1a and 1b. All metrics at site 3 were the lowest recorded at this site to date. When compared to historical medians, taxa richnesses were lower, and MCI and SQMCI<sub>s</sub> scores were lower at sites 2 and 3 but were similar at sites 1a and 1b. Habitat differences, primarily due to low flow conditions were thought to be the cause of observed differences in macroinvertebrate communities.

No sites supported any undesirable biological growths.

The results of this survey provide no indication that the discharge of leachate into the unnamed tributary of the Awai Stream was having a significant adverse effect on the macroinvertebrate communities in the two tributaries monitored.

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