

New Plymouth District Council  
Inglewood, Okato, Okoki,  
and Marfell Park Landfills  
Monitoring Programme  
Annual Report 2014-2015

Technical Report 2015-106

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## Executive summary

The New Plymouth District Council (NPDC) maintains two reinstated landfills, one at Inglewood and one at Okato. Both landfills have been used in the past, and are now used as transfer stations, and are held in reserve to accept refuse, if required, as a contingency. The Inglewood landfill is located on King Road at Inglewood, in the Waiongana catchment, and the Okato landfill is located on Hampton Road at Okato, in the Kaihihi catchment.

NPDC also maintains two closed landfills; Okoki landfill in the Urenui catchment, and Marfell Park (Marfell) landfill in the Huatoki catchment. Neither of these landfills accept waste for disposal and have been fully reinstated.

This report for the period July 2014 to June 2015 describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess NPDC's environmental performance during the period under review, and the results and environmental effects of NPDC's activities in regard to these closed landfills.

**Overall, during the monitoring period NPDC demonstrated a high level of environmental performance.**

NPDC holds eight resource consents, which include a total of 65 conditions setting out the requirements that they must satisfy. NPDC holds four 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.

The Council's monitoring programme for the year under review included eight inspections, three discharge samples, 18 receiving water samples; two biomonitoring surveys of receiving waters, and two ambient air quality analyses. Monitoring was scheduled and carried out at both the Marfell and Okoki landfill sites during the year under review.

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 of this report. Although no significant environmental effects were found due to the operation of the site, the trend of increasing nitrogen containing species in the landfill tributary and the main tributary indicate that there may be the potential for environmental effects to emerge in the future, if the cap remediation undertaken during the period under review does not arrest this trend.

During the year, NPDC demonstrated a high level of environmental performance and a high level of administrative performance with the Marfell landfill resource consent as defined in Section 1.1.5.

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.

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

For reference, in the 2014-2015 year, 75% of consent holders in Taranaki monitored through tailored compliance monitoring programmes achieved a high level of environmental performance and compliance with their consents, while another 22% demonstrated a good level of environmental performance and compliance with their consents.

This report includes recommendations for the 2015-2016 period.

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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 the Annual Report for the period July 2014 to June 2015 by the Taranaki Regional Council (the Council) on the monitoring programme associated with resource consents held by New Plymouth District Council (NPDC).

NPDC hold consents to discharge leachate and contaminated stormwater from its closed landfills. These are the Okoki landfill in the Urenui catchment, and Marfell Park (Marfell) landfill in the Huatoki catchment. These landfills do not accept waste for disposal to land and have all 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. These are Inglewood landfill in the Waiongana catchment, and Okato landfill in the Kaihihi catchment. These landfills are non-operational and are 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.

This report covers 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 NPDC's use of water, land, and air, and is the 25<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 compliance monitoring under the RMA and the Council's obligations and general approach to monitoring sites through annual programmes, a summary of the resource consents held by NPDC for landfills in the Urenui, Huatoki, Waiongana, and Kaihihi catchments, the nature of the monitoring programmes in place for the period under review, and a summary of the status of these four landfill sites.

Each of the closed/contingency landfills is then discussed in a separate section (Sections 2 to 5).

In each subsection 1 (e.g. Section 2.1) there is a general description of the landfilled site and its 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.

Subsection 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.

Subsection 3 discusses the results, their interpretation, and their significance for the environment in the immediate vicinity of the site under discussion.

Subsection 4 presents recommendations to be implemented in the 2015-2016 monitoring year.

Section 6 contains a summary of the recommendations for the 2015-2016 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 a discharger, and may include cultural and socio-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);
- (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 Investigations, interventions, and incidents**

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

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

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

Any investigations, interventions, and incidents for each site are discussed in each subsection 2.

### 1.1.5 Evaluation of environmental performance

Besides discussing the various details of the performance and extent of compliance by the consent holder during the period under review, this report also assigns a rating as to their environmental and administrative performance.

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

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

The categories used by the Council for this monitoring period, and their interpretations, 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 compliance**

- **High:** The administrative requirements of the resource consents were met, or any failures 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 2014-2015 year, 75% of consent holders in Taranaki monitored through tailored compliance monitoring programmes achieved a high level of environmental performance and compliance with their consents, while another 22% demonstrated a good level of environmental performance and compliance with their consents.

## 1.2 Process description

NPDC holds consents to discharge leachate and contaminated stormwater from two closed landfills: the Okoki landfill in the Urenui catchment, and Marfell landfill in the Huatoki catchment. These landfills do not accept waste for disposal and have been fully closed and reinstated.

NPDC holds consents to discharge solids to land, leachate and emissions to air at the Inglewood landfill in the Waiongana catchment and the Okato landfill in the Kaihihi catchment. These landfills do not currently accept general waste for on site disposal but could be re-commissioned if needed.

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.

## 1.3 Summary of resource consents

NPDC holds a total of eight consents in relation to its closed and contingency landfills. The consents held for each of the closed and contingency landfills are summarised in the following paragraphs and in Table 1, with further detail on the consents held for each landfill site provided in each subsection 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.

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.

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. The 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.

**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
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	4902-1	Discharge leachate and stormwater	-	1 June 2014
	4902-2	To discharge leachate from the Marfell former landfill site via groundwater into the Mangaotuku Stream [Granted 21 October 2014]	June 2020 June 2026	1 June 2032
Okoki	3955-2	Discharge leachate and stormwater *[Renewal application received 27 February 2015]	-	1 June 2015*

## 1.4 Monitoring programmes

### 1.4.1 Introduction

Section 35 of the RMA sets out an obligation for the Council to gather information, monitor and conduct research on the exercise of resource consents, and the resultant effects arising within the Taranaki region.

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 Okoki and Marfell sites are monitored either triennially (Okoki) or biennially (Marfell).

### 1.4.2 Programme liaison and management

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

- ongoing liaison with resource consent holders over consent conditions and their interpretation and application;

- in discussion over monitoring requirements;
- preparation for any reviews;
- renewals;
- new consents;
- advice on the Council's environmental management strategies and content of regional plans; and
- consultation on associated matters.

### 1.4.3 Site inspections

A total of eight inspections were carried out across all the 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.

### 1.4.4 Chemical sampling

The Council took 18 receiving water and three discharge 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 one occasion.

### 1.4.5 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	2	8	4	2	2
Marfell	1	4	2	0	0
Okato	0	4	1	0	0
Okoki	1 (NPDC)	2	1	0	0
<b>TOTAL</b>	<b>3 (TRC only)</b>	<b>11</b>	<b>8</b>	<b>2</b>	<b>2</b>

## **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. The gully was filled and the cover material was progressively excavated from the side walls of the gully and refuse was put in its place. 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 can not be disposed of at Colson Road.

In total 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.

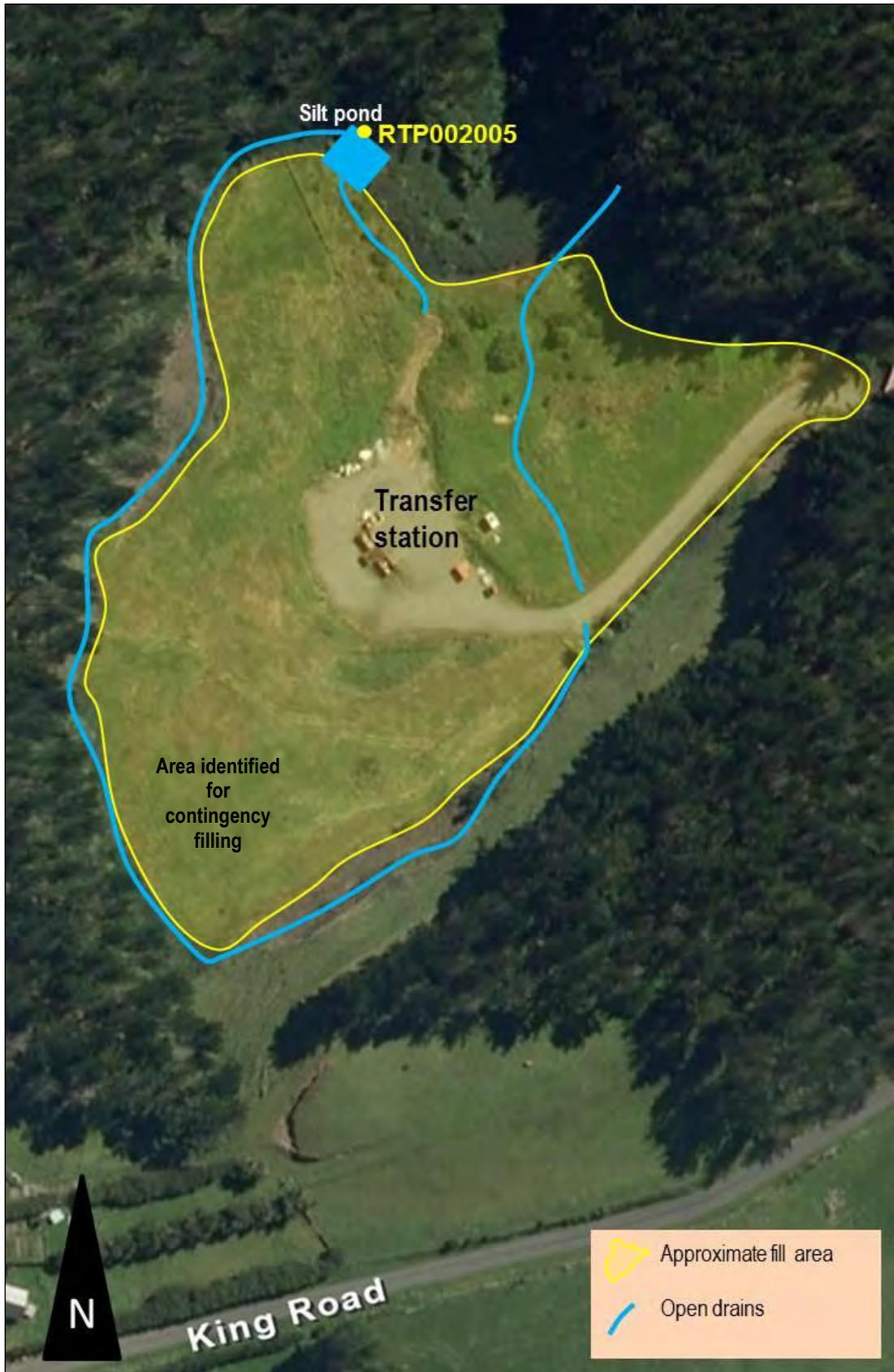


Figure 1 Site layout at Inglewood contingency landfill

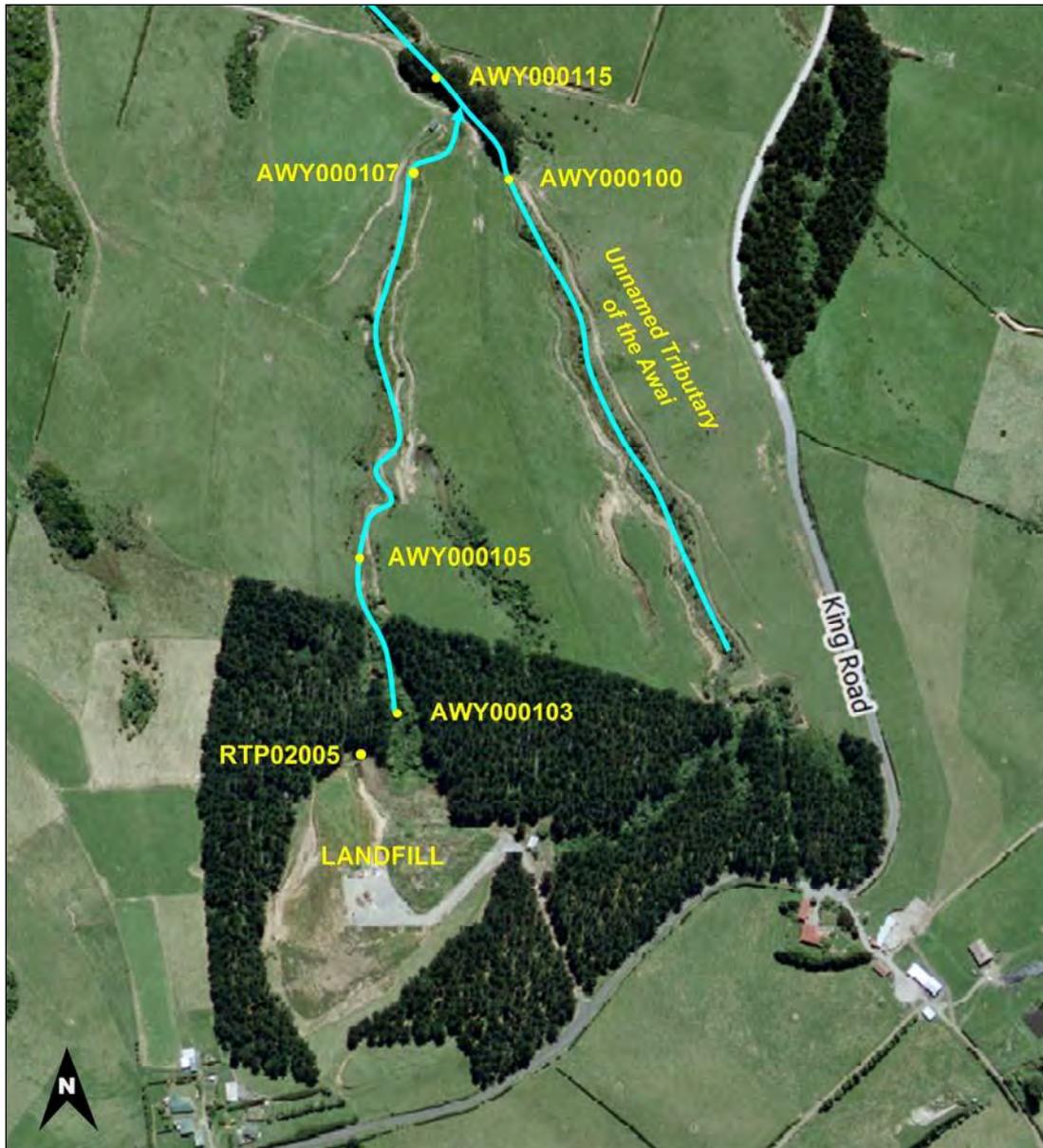


Figure 2 Inglewood landfill and receiving water sampling sites

## 2.1.2 Resource consents

### 2.1.2.1 Water discharge 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 3 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 activity. 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 the NPDC to notify 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 requires 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**

#### **19 August 2014**

The site was inspected in overcast weather with very light wind conditions. The cap and perimeter of the site were walked, with the MultiRea gas detector in operation. No methane or hydrogen sulphide were detected either on or off site. The grass cover on the cap was short and it appeared to have been grazed recently by sheep. One small crack was noted in the cap near the entrance gate on the southern side of the filled area. It was observed that there was quite a lot of vegetation in the stormwater drains, but it appeared that some of this may have been sprayed recently. A sample was taken from the stormwater/leachate pond. The pond was full and there was a very low flow, slightly turbid discharge from the pond. It was observed that there was an inflow to the pond from the south-west that appeared to contain a lot of iron oxide. A rabbit hole was noted between the pond and the cleanfill area. NPDC were advised that this would need to be monitored to ensure that the rabbit population does not impact on the integrity of the cap. It was found that there was some green waste and a small amount of particle board in the cleanfill area that needed to be removed. There were pockets of exposed refuse protruding through the cap above the cleanfill. This cap in this area did not feel very stable, and NPDC was advised that this area may need to be rolled before recapping. The transfer station area was tidy and appeared to be well managed. Photographs were taken and sampling of the discharge and receiving waters was undertaken.

The following action was to be taken:

- Remove any material that is not authorised cleanfill from the cleanfill area,
- Address areas of exposed refuse, and
- Improve stability of the cap where required.

#### **22 October 2014**

The site was inspected in fine weather with very light wind conditions. The grass cover on the cap was short and it appeared to have been grazed recently by sheep. It appeared that some remediation work had taken place on the cap on the south western side of the filled area. One small crack was noted running in an approximately east-west direction approximately 15-20 meters from the southern boundary. It was thought that this may have been an older crack that had re-opened slightly, and NPDC was advised that this needed to be monitored. It was observed that there was quite a lot of vegetation in the stormwater drains, and although at the time of inspection it was considered that there was not enough vegetation present to impede stormwater flow to any great degree, NPDC was advised that this needed to be monitored. There was again evidence of rabbit activity, and NPDC was asked to continue to monitor this to ensure that it does not impact on the integrity of the cap.

It was found that a significant amount of work had been undertaken in the cleanfill area, and on the area where exposed refuse was observed at the previous inspection

(Photo 1). The area had new cover applied and some early grass growth was noted. There was no exposed refuse, the area felt stable underfoot, and no unauthorised cleanfill material was found to be present.



**Photo 1** Remediated central cap at the Inglewood landfill 24 October 2014

The transfer station area was tidy and appeared to be well managed, and no odour or dust issues were found at inspection.

The following action was to be taken:

- Continue to monitor the integrity of the cap in respect of the minor cracking in the southern area and the rabbit activity at the site.
- Monitor the amount of vegetation in the stormwater drains, and action if required.

#### **10 February 2015**

The site was inspected in fine, windy weather conditions. The cap and perimeter of the site were walked.

The capped areas were generally well vegetated and the grass in most places was long. There was some minor cracking observed in the area remediated prior to the last inspection that would need to be monitored and addressed if necessary. It was noted that vegetation had yet to establish fully in this area.

The cracks noted in the southern paddock on the two previous inspections appeared to have widened. Photographs were taken (Photo 2). NPDC was advised that these needed to be investigated further and addressed if they were more than shallow surface cracks.

The drains to the leachate pond were clear. There was some dead vegetation present in the stormwater drains, but it was considered that the amount present was not sufficient to impede expected stormwater flows at present.



**Photo 2** Section of the crack in the in southern area of Inglewood landfill cap 10 February 2015

The cleanfill area appeared to be well managed and no unauthorised materials were found in this area. The transfer station was in a tidy condition.

No dust or odour issues were found at inspection.

Site security was good, with the entrance gate padlocked. Fencing and signage were in good condition.

The following action was to be taken:

- Investigate the extent of the cracking in the southern paddock, and remediate if these are anything more than shallow surface cracks.
- Monitor the cracking in the recently covered area, and address if necessary.
- Monitor the amount of vegetation in the stormwater drains, and action if required.

#### **16 February 2015**

An on-site meeting was held with the NPDC Senior Engineering Officer Solid Wastes to investigate and discuss remediation options for the crack in the cap (southern paddock).

It was found that the crack was approximately 400 mm deep, and at the time of inspection there was a light intermittent refuse odour in the immediate vicinity of the crack.

The consent holder proposed ploughing, re-contouring, re-compacting and reseeded the affected area, and stated that he would notify Council (by email) of the timeframes for doing this work, after talking to his supervisor.

The following action was to be taken:

Confirm remedial works to be undertaken and the timeframes involved.

### 17 June 2015

The site was inspected in fine and sunny conditions. The cap was well-vegetated and grass was establishing on areas where the crack remediation had taken place on the southern cap (Photo 3). No erosion, slumping, cracking or ponding was evident. No rabbit holes were observed. Grass was still establishing on the area remediated prior to the inspection on 22 October 2014. The stormwater system had some vegetation in the drains which appeared to be sprayed and dead. There was not enough vegetation to impede stormwater flow, and no ponding was observed. The leachate pond was full but not discharging at the time of inspection. The fencing on site was in a good condition and signage and security were satisfactory, with padlocked gates and visible signage.



**Photo 3** Remediated southern cap crack at Inglewood landfill 17 June 2015

The tributary below the landfill had a clear, low flow over a heavy iron oxide bed. There were no visible effects from the landfill at the time of inspection. The cleanfill area did not have any unacceptable wastes, and the transfer station area was tidy. No dust or odour issues were noted onsite.

## 2.2.2 Results of stormwater monitoring

Two samples were taken from the stormwater/leachate pond during the monitoring period. The results are presented in Table 3.

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

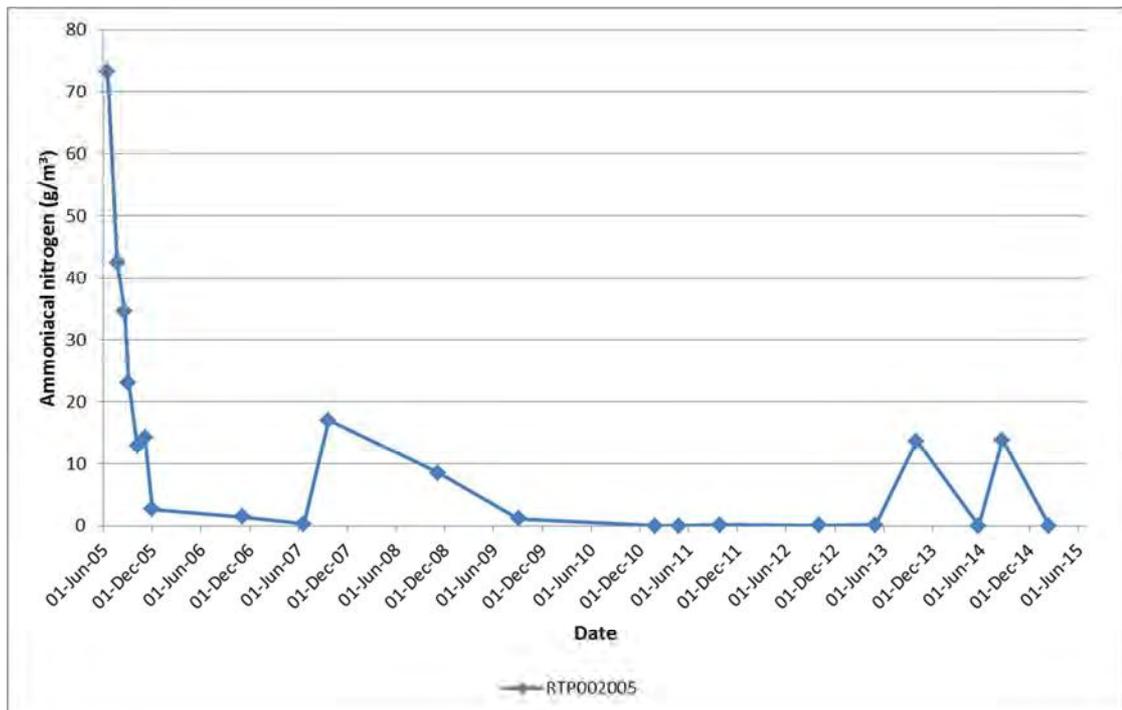
Parameter	Unit	19 Aug 2014	10 Feb 2015	Median	Minimum	Maximum	Number
Biochemical oxygen demand	g/m <sup>3</sup>	2.0	3.5	3.0	0.6	850	22
Conductivity @ 20 °C	mS/m	49.9	18.5	38.2	13.3	208	23
Unionised ammonia	g/m <sup>3</sup> N	0.01376	0.00163	0.00135	0.00005	0.03404	12
Ammoniacal Nitrogen	g/m <sup>3</sup> N	13.8	0.018	2.65	0.01	73.3	23
pH	pH	6.7	8.4	7.4	6.7	8.5	23

Parameter	Unit	19 Aug 2014	10 Feb 2015	Median	Minimum	Maximum	Number
Temperature	°C	8.2	17.2	12.3	4.8	18.1	22
Turbidity	NTU	17	1.8	3.1	1.5	58	7
Dissolved zinc	g/m <sup>3</sup>	0.018	<0.005	0.008	0.005	0.63	23

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 on 19 August 2014 at a very low flow rate (<1 L/min). Therefore the sample was again collected from the pond immediately upstream of the pond outlet.

As with the autumn sample collected after heavy rainfall in the 2013-2014 year, the ammoniacal nitrogen concentration of the August 2014 sample was inconsistently high when compared to more recent historical results (Figure 3)



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

This may have been the result of one or more of a number of factors including; the surrounding area and the drain being cleared of vegetation, the dying sprayed vegetation in the stormwater drains, the recent grazing, seasonal variation and/or additional stormwater infiltration causing increased leachate generation due to the condition of the cap on the central area of the landfill as noted at the August 2014 inspection.

The receiving water results discussed in Section 2.2.3 indicate that this low flow discharge is unlikely to be responsible for the elevated (and increasing) ammoniacal

nitrogen concentrations found at site AWT000103, in the landfill tributary immediately below the culvert outlet.

## 2.2.3 Results surface water sampling

### 2.2.3.1 Chemical analysis

Receiving water sampling was undertaken at sites AWY00100, AWY100115, AWY000103 and AWY000115 on two occasions (19 August 2014 and 10 February 2015). 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 19 August 2014

Parameter	Unit	AWY000103	AWY000105	AWY000100	AWY000115
		30 m d/s of landfill(culvert discharge)	130m d/s of landfill	u/s of confluence of landfill trib.	d/s of confluence of landfill trib
Alkalinity	g/m <sup>3</sup> CaCO <sub>3</sub>	370	133	34	17
BOD	g/m <sup>3</sup>	2.6	10	1.0	<0.5
Conductivity	mS/m	77.7	39.3	14.6	8.2
Dissolved oxygen	g/m <sup>3</sup>	7.96	1.53	9.5	9.41
Dissolved reactive phosphorus	g/m <sup>3</sup> -P	<0.003	<0.003	0.004	0.006
Acid soluble iron	g/m <sup>3</sup>	23.8	0.18	0.25	0.47
Total mercury	g/m <sup>3</sup>	-	<0.0002	-	-
Acid soluble manganese	g/m <sup>3</sup>	5.19	2.74	0.04	0.04
Unionised ammonia	g/m <sup>3</sup> -N	0.14161	0.03733	0.0001	0.00001
Ammoniacal nitrogen	g/m <sup>3</sup> -N	38.2	7.38	0.016	0.005
Nitrate/nitrite nitrogen	g/m <sup>3</sup> -N	1.24	7.82	3.87	0.69
% Oxygen Saturation	%	78.5	14.4	91.6	90.2
pH	pH	7.1	7.3	7.4	7.0
Temperature	Deg C	13.5	11.5	11.6	12.0
Turbidity	NTU	240	0.78	1.2	3.6
Dissolved zinc	g/m <sup>3</sup>	<0.005	<0.005	<0.005	<0.005

**Table 5** Chemical analysis of the Awai Stream tributaries sites on 22 May 2015

Parameter	Unit	AWY000103	AWY000105	AWY000100	AWY000115
		30 m d/s of landfill(culvert discharge)	130m d/s of landfill	u/s of confluence of landfill trib.	d/s of confluence of landfill trib
Alkalinity	g/m <sup>3</sup> CaCO <sub>3</sub>	384	100	50	25
BOD	g/m <sup>3</sup>	1.1	2.1	<0.5	0.6
Conductivity	mS/m	77.8	32.2	15.6	8.5
Dissolved oxygen	g/m <sup>3</sup>	4.84	4.92	8.61	9.22
Dissolved reactive phosphorus	g/m <sup>3</sup> -P	0.007	0.006	0.006	0.008
Acid soluble iron	g/m <sup>3</sup>	9.53	0.10	0.22	1.86
Total mercury	g/m <sup>3</sup>	-	<0.0002	-	-
Acid soluble manganese	g/m <sup>3</sup>	5.66	0.09	0.07	0.17

Parameter	Unit	AWY000103	AWY000105	AWY000100	AWY000115
		30 m d/s of landfill(culvert discharge)	130m d/s of landfill	u/s of confluence of landfill trib.	d/s of confluence of landfill trib
Unionised ammonia	g/m <sup>3</sup> -N	0.11009	0.00003	0.00021	0.00034
Ammoniacal nitrogen	g/m <sup>3</sup> -N	36.0	0.006	0.034	0.086
Nitrate/nitrite nitrogen	g/m <sup>3</sup> -N	0.05	7.30	1.64	0.17
pH	pH	7.0	7.2	7.3	7.1
Temperature	Deg C	14.0	15.9	14.5	14.4
Turbidity	NTU	54	0.91	1.1	9.9
Dissolved zinc	g/m <sup>3</sup>	<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.

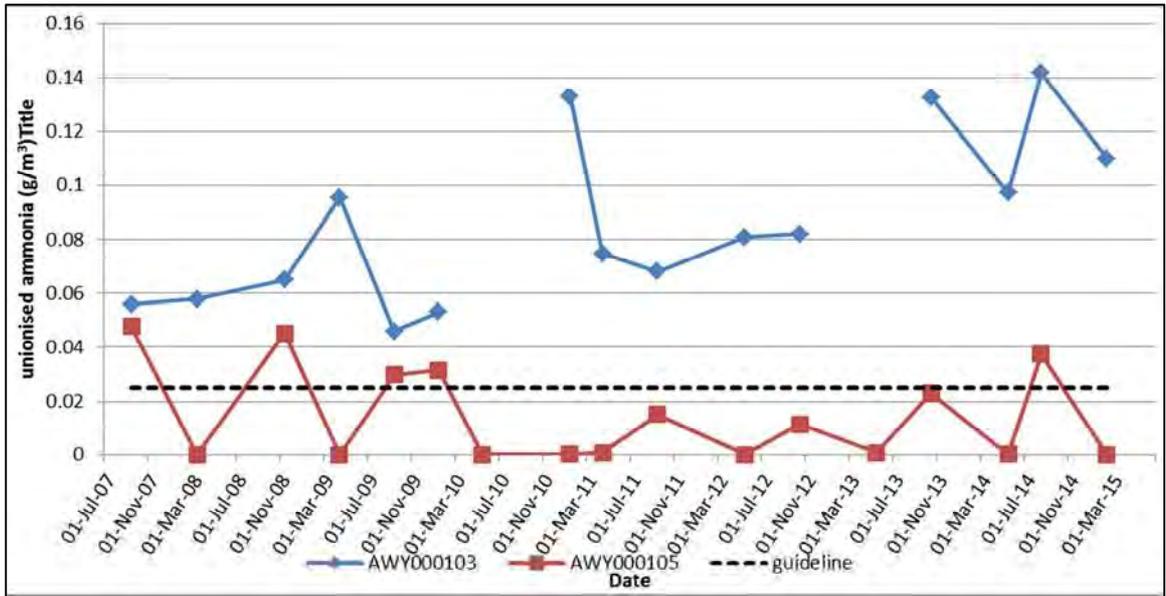
With the exception of nitrate/nitrite nitrogen, the levels of contaminants found 130 m downstream of the discharge (at site AWY000105) are far lower, indicating that the intervening wetland is being effective at reducing contaminant levels. The higher nitrate/nitrite nitrogen at site AMY000105 when compared to AMY000103 is due to the oxidation of the ammoniacal nitrogen in the landfill tributary.

Biochemical oxygen demand was another parameter that, on one occasion during the year under review, showed an increase at AMY000105 when compared to the upstream site. This has occurred from time to time in previous years, and is thought to be a result of water flowing off the adjacent cattle race into the landfill tributary, or due to dieback of vegetation in this swampy tributary.

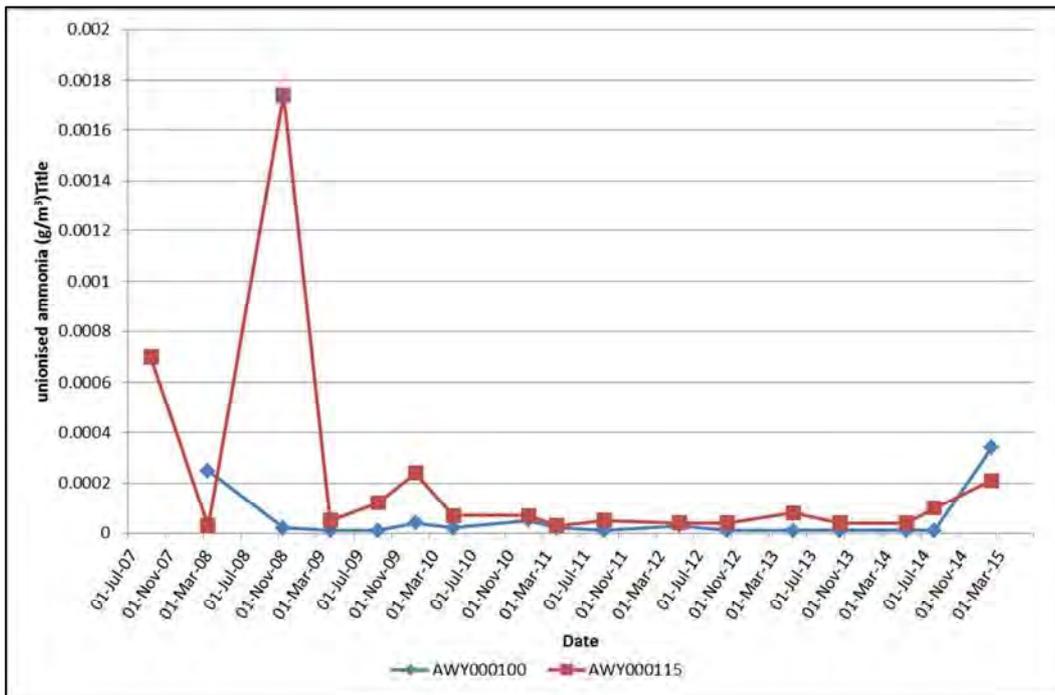
As noted in section 2.1.1.3 the level of ammoniacal nitrogen in the leachate/stormwater pond was much higher than usual. However, the concentration in the pond was much lower than was found in the landfill tributary below the culvert outlet. This indicates that ammoniacal nitrogen is entering the landfill tributary via another route, potentially via shallow groundwater.

It is also noted that the unionised ammoniacal nitrogen concentration has been consistently above the 0.025 g/m<sup>3</sup> guideline adopted by the Council to protect aquatic organisms from chronic effects at the culvert outlet. From a review of the historical results, it appears that there is 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 are normally well below this guideline value(Figure 4).

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/m<sup>3</sup>, and the levels of unionised ammonia found at all monitoring sites during the year under review were well below this concentration range. It can be seen from Figure 5 that, although the unionised ammonia concentration was found to be above the 0.025 g/m<sup>3</sup> guideline at the lower end of the tributary on 19 August 2014, there was little, if any, effect found on the unionised ammonia concentration of the larger (main) tributary (site AWY000115).

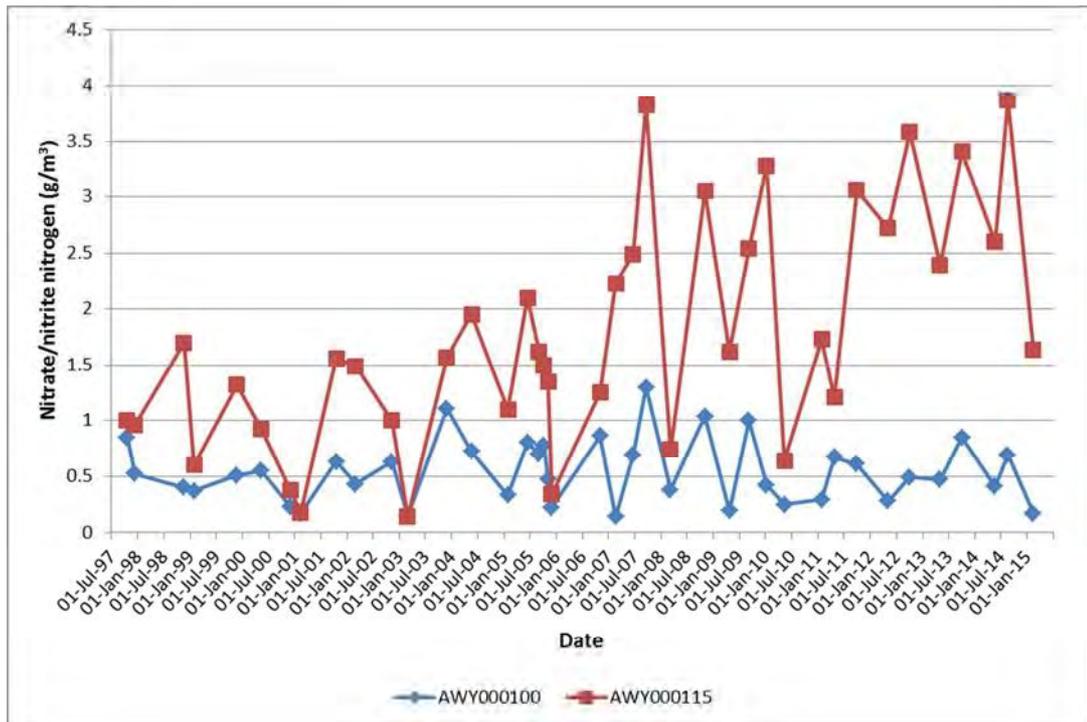


**Figure 4** Unionised ammonia concentration in the landfill tributary below Inglewood landfill



**Figure 5** 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.



**Figure 6** Nitrate/nitrite nitrogen results in the main tributary upstream and downstream of the Inglewood landfill tributary discharge

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 (Figure 6). However, the current levels of contaminants found were within acceptable ranges in the main tributary and would therefore be considered a minor effect, at most, on the aquatic environment.

### 2.2.3.2 Biomonitoring

Macroinvertebrate sampling was undertaken on 9 October 2014 and 10 February 2015, 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 on the larger tributary (Figure 7).

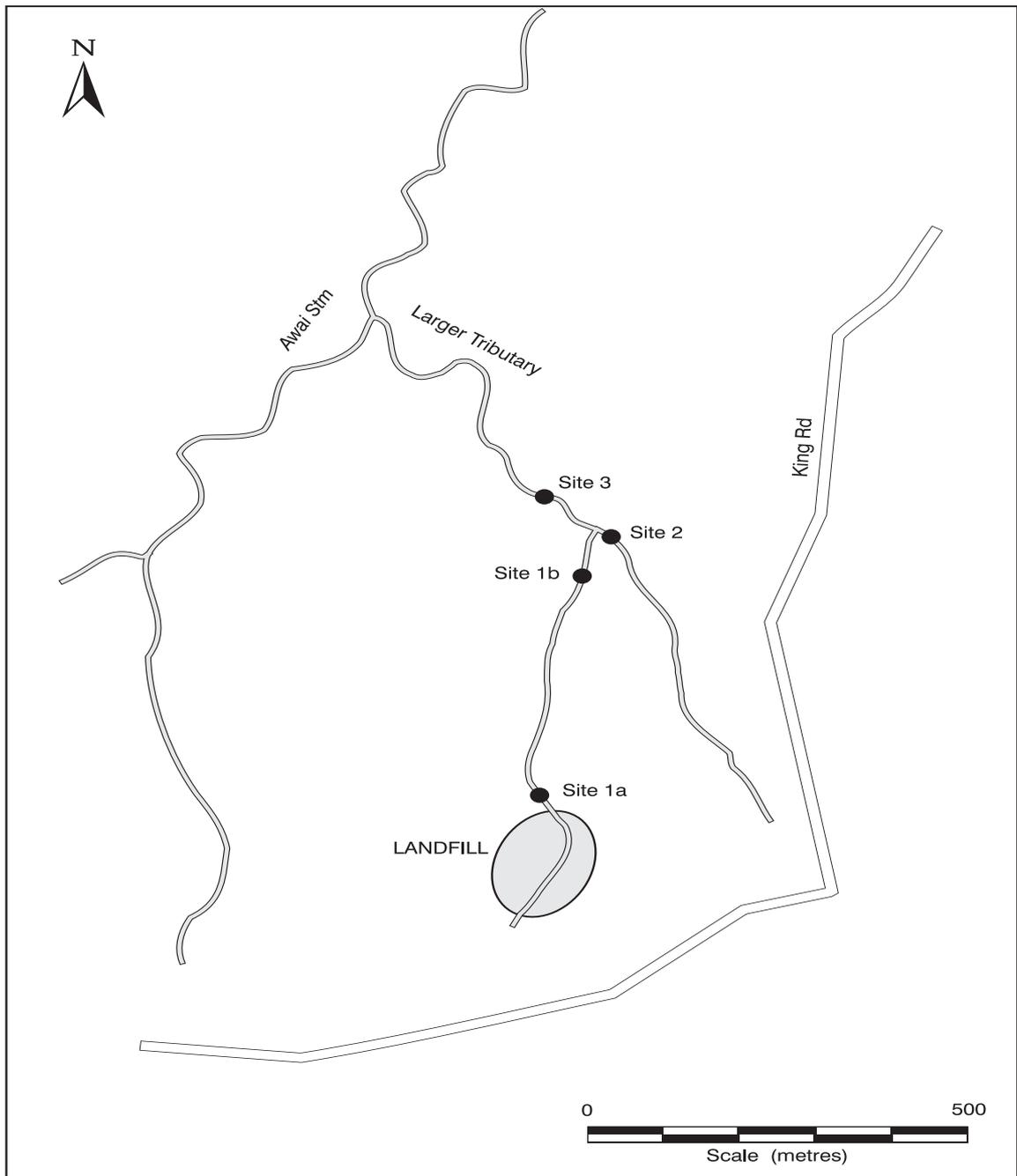
A combination of the standard 400 ml 'kick-sampling' and 'sweep-net' sampling techniques were used to collect streambed macroinvertebrates from sites 1a and 1b. The 400 ml 'kick-sampling' technique was used at site 2 and the 'sweep-net' sampling technique was used at site 3. The 'kick-sampling' technique is very similar to Protocol C1 (hard-bottomed, semi-quantitative) protocol for macroinvertebrate samples in wadeable streams (Stark *et al*, 2001). The 'sweep-net' sampling technique was very similar to Protocol C2 (soft-bottomed, semi-quantitative) protocol of the New Zealand Macroinvertebrate Working Group (NZMWG).

**Table 6** Biomonitoring sites in tributaries of the Awai Stream

Site	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

The survey was undertaken to assess whether leachate discharges from Inglewood landfill had had any adverse effects on the macroinvertebrate communities of this waterbody. Samples were processed to provide number of taxa (richness), MCI and SQMCI<sub>s</sub> scores for each site.

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The SQMCI<sub>s</sub> takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities, particularly if non-organic impacts are occurring. Significant differences in the MCI or the SQMCI<sub>s</sub> between sites indicate the degree of adverse effects (if any) of the discharges monitored.



**Figure 7** Biomonitoring sites in tributaries of the Awai Stream related to the Inglewood landfill

### 9 October 2014

At the time of this survey it was found that no marked differences in taxa richnesses existed among the sites sampled and therefore there is no evidence for leachate causing toxic effects in the macroinvertebrate communities downstream of the Inglewood landfill.

There were significant differences (Stark, 1998) among sites for both MCI and SQMCI<sub>s</sub> scores. The 'primary impacted' site had a significantly lower scores than the 'secondary impacted' site which in turn had a significantly lower scores than the 'tertiary impacted' site. There were insignificant differences in MCI and SQMCI<sub>s</sub> scores between the 'tertiary impacted' site and the 'control' site. This result would usually indicate that there was organic pollution impacting on the unnamed tributary and the extent of the pollution was reduced the further downstream the sample was collected either because the nutrients were being utilised by instream plants or algae and/ or diluted by higher quality water than the other tributary.

However, significant habitat differences existed between the four sites. In particular, site 1a was a seepage fed stream that resembled a wetland rather than a stream and also had an iron oxide coating. Site 1b was a very small stream that was dominated by terrestrial grasses both on the stream bank and growing in the streambed. Sites 2 and 3 were more typical of a stream with overhanging vegetation and larger substrate types. Based on those habitat characteristics the macroinvertebrate fauna in the wetland stream (site 1a) would have the lowest MCI score, followed by the open small grassy stream (site 1b) with the highest scores expected at the gravel/cobble substrate vegetated bank sites 2 and 3. Analysis of previous results show this pattern with the median values for site 1a for both MCI and SQMCI<sub>s</sub> score being the lowest of the four sites surveyed, followed by site 1b, followed by site 3 and then site 2. Previous reports (e.g. Thomas, 2014b) have suggested that the observed results could be explained by habitat variation rather than leachate from the landfill. Unfortunately as stated above this pattern would also mimic what might be expected with nutrients leaching from the landfill. Therefore, interpretation of differences in MCI and SQMCI<sub>s</sub> scores among the four sites has to be done with caution. However, sites 1a and 1b still have some value in their ability to detected changes in taxa richness which is useful in detecting toxic discharges. As this landfill is also the primary contingency landfill for the region, current monitoring at these sites also provides useful baseline data for comparison, should circumstances arise that require this currently closed landfill to be used.

A comparison with previous survey results show that site 2, the 'control' site, had an improvement in macroinvertebrate community health since the summer survey in early 2014. There were only minor, insignificant differences in macroinvertebrate community health at sites 1b and 3 while site 1a had a significant decline in macroinvertebrate health as both MCI and SQMCI<sub>s</sub> scores were significantly lower than the previous summer survey. However, when compared with median values there were only two MCI units and 0.2 SQMCI<sub>s</sub> units difference between median values calculated for the site and the current survey results. The result is therefore more of a reflection of the exceptional good result of the previous survey rather than a decrease in macroinvertebrate health from what is typically found at the site. Thomas (2014b) states in regards to site 1a during the 2014 summer survey that "The MCI score was only just below the highest MCI score recorded to date and the SQMCI<sub>s</sub> score was the highest score ever recorded at this site".

Overall, the results suggest that differences in the macroinvertebrate communities between the four sites relate to differences in habitat rather than the effects of any discharge from the landfill site.

#### **4 February 2015**

Landfills may have a variety of contaminants leaching (e.g. nutrients and metals). A decrease in taxa richness is usually associated with toxic impacts. Taxa richnesses were marginally lower for the current survey compared with the median value calculated from previous surveys but this result also included the 'control' site and appears to be due to seasonal variation. There were insignificant differences in taxa richnesses among the sites sampled and therefore there is no evidence for leachate causing toxic effects in the macroinvertebrate communities downstream of the Inglewood landfill.

The 'control' site had a significantly higher (Stark, 1998) MCI score than the 'primary impacted' and 'secondary impacted' sites. The 'control' site also had a markedly higher SQMCI<sub>s</sub> score than the 'primary impacted' site. This result would usually indicate that there was organic pollution impacting on the unnamed tributary and the extent of the pollution was reduced the further downstream the sample was collected either because the nutrients were being utilised by instream plants or algae and/ or diluted higher quality water from the other tributary.

However, significant habitat differences existed between the four sites. In particular, site 1a was a seepage feed stream that resembled a wetland rather than a stream and also had an iron oxide coating. Site 1b was a very small stream that was dominated by terrestrial grasses both on the stream bank and growing in the streambed. Sites 2 and 3 were more typical streams with overhanging vegetation. Based on those habitat characteristics the macroinvertebrate fauna in the wetland stream (site 1a) would have the lowest MCI score, followed by the open small grassy stream (site 1b) with the highest scores expected at sites 2 and 3 with significant riparian vegetation. Analysis of previous results show this pattern with the median values for site 1a for both MCI and SQMCI<sub>s</sub> scores being the lowest out of the four sites surveyed, followed by site 1b, followed by site 3 and then site 2. Previous reports (e.g. Sutherland and Thomas, 2014 and Thomas, 2014b) have suggested that the observed results could be explained by habitat variation rather than leachate from the landfill. Unfortunately as stated above this pattern would also mimic what might be expected with organic nutrients leaching from the landfill. Therefore, interpretation of differences in MCI and SQMCI<sub>s</sub> scores among the four sites has to be done with caution, but sites 1a and 1b still have some value in their ability to detect changes in taxa richness which is useful in detecting toxic discharges. As this landfill is also the primary contingency landfill for the region, current monitoring at these sites also provides useful baseline data for comparison, should circumstances arise that require this currently closed landfill to be used.

A comparison with previous survey results show that sites 2 and 3 had significant decreases in macroinvertebrate community health since the spring survey in October 2014. This was probably due to a change in substrate type with a large increase in silt at both sites. Generally 'sensitive' taxa prefer gravel, cobble and boulder substrates and 'tolerant' taxa are often found at sites with silt substrates. There were only minor, insignificant differences in macroinvertebrate community health at sites 1a and 1b which had little change in habitat from the previous survey. Both sites had silt substrates during both the current and previous surveys and were dominated by 'tolerant' taxa and therefore less susceptible to further impacts.

Overall, the results suggest that differences in the macroinvertebrate communities between the four sites relate to differences in habitat rather than the effects of any discharge from the landfill site.

#### **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 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 2014-2015 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 during the monitoring period.

### **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.

Issues raised during the 2014-2015 year related to unauthorised material in the cleanfill area, exposed refuse and an unstable or insufficiently compacted area of fill and/or capping in the central area of the landfill, and cracking in the cap in the southern area. These non-compliances were attended to positively and co-operatively, within an acceptable timeframe.

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 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 monitored being at an acceptable level in this tributary. However, it is noted that the ammoniacal nitrogen and unionised ammonia concentrations in the landfill tributary at the culvert appear to be increasing. Additionally the difference in the nitrate/nitrogen concentrations between the upstream and downstream sites in the main tributary appears to be increasing. It is possible that the condition of the cap, with

its increased permeability, may have contributed to the increasing trends seen in the nitrogen containing species in recent years. This may resolve with the remediation work undertaken on the cap during the period under review, and Council will continue to monitor the situation, and will require further investigations if necessary.

Biomonitoring surveys undertaken during the 2014-2015 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.

Based on the results of this monitoring period the presence of the landfill has not been found to have 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

<b>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</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 findings. Latest plan dated September 2014	Yes
2. Prepare and maintain a landfill operations and management plan	Review of documentation on file in relation to inspection finding. Latest plan dated September 2014	Yes
3. Provide a landfill closure management plan by 1 June 2007	Plan provided, and updated September 2014	Yes
4. Advise of any changes being made to the operation and management plan or closure management plan	Updated plan reviewed and accepted	Yes
5. Monitor ground and surface water on and near the site	Surface water monitoring undertaken by the Council	Yes
6. Maintain all stormwater and collection systems	Inspection	Yes
7. No 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	Yes
8. Optional review provision re environmental effects	No further opportunity for review	N/A
Overall assessment of environmental performance in respect of this consent		<b>High</b>
Overall assessment 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 4526-2

<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>
1. Prepare and maintain a site contingency plan	Review of documentation on file in relation to inspection findings. Latest plan dated September 2014	Yes
2. Prepare and maintain a landfill operations and management plan	Review of documentation on file in relation to inspection finding. Latest plan dated September 2014	Yes
3. Advise of any changes being made to the operation and management plan	Updated plan reviewed and accepted	Yes
4. Optional review provision re environmental effects	Next optional review scheduled in June 2020	N/A
Overall assessment of environmental performance in respect of this consent		<b>High</b>
Overall assessment 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. The consent holder shall adopt the best practicable option	Site inspection and sampling	Yes
2. The activity shall be undertaken in accordance with the application documents	Site inspection	<b>Cap remediation required and carried out as requested</b>
3. Notification of changes to landfill management plan	Updated plan reviewed and accepted	Yes
4. Maintain and adhere to management plan	Review of inspection findings in relation to documentation on file	<b>Cap remediation required and carried out as requested</b>
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	Inspection – transfer station and cleanfilling activities only	Yes
7. Acceptable cleanfill criteria	Inspection	<b>Some unacceptable wastes removed at Council's request</b>

<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>
8. Unacceptable cleanfill criteria	Inspection	<b>Some unacceptable wastes removed at Council's request</b>
9. Discharge shall not result in contaminants directly entering water	Inspection and sampling	Yes
10. Install leachate retention structures	Inspection	Yes
11. Install stormwater systems	Inspection	Yes
12. Optional review provision re environmental effects	Next optional review scheduled in June 2020	N/A
Overall assessment of environmental performance in respect of this consent		<b>Good</b>
Overall assessment 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 trend of increasing nitrogen containing species in the landfill tributary and the main tributary indicate that there may be the potential for environmental effects to emerge in the future, if the cap remediation undertaken during the period under review does not arrest this trend.

### **2.3.4 Recommendation from the 2013-2014 Annual Report**

In the 2013-2014 Annual Report, it was recommended:

THAT monitoring of discharges from Inglewood landfill in the 2014-2015 year continues at the same level as in 2013-2014.

This recommendation was implemented.

### **2.3.5 Alterations to monitoring programmes for 2015-2016**

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 made available by previous authorities, its relevance under the RMA, the obligations of the Act in terms of monitoring emissions, discharges and their effects, and subsequently reporting to the regional community. 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 and discharging to the environment.

It is proposed that for 2015-2016, monitoring of the Inglewood landfill continue at the same level as in 2014-2015.

## **2.4 Recommendation**

THAT monitoring of discharges from Inglewood landfill in the 2015-2016 year continues at the same level as in 2014-2015.

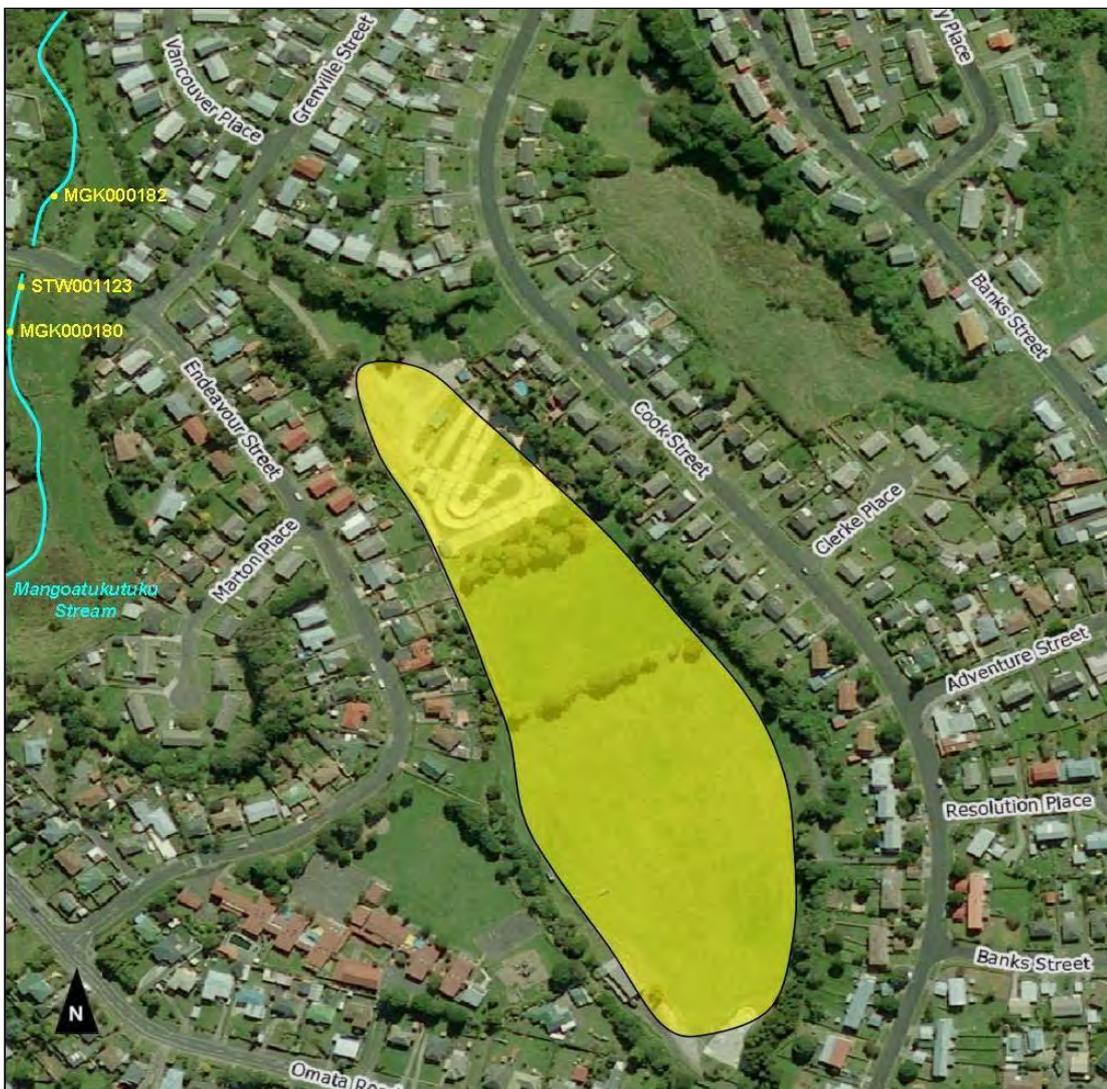
### 3. Marfell Park landfill

#### 3.1 Introduction

##### 3.1.1 Site description

The landfill at Marfell closed in 1982. Due to effects cause 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. The site is now a park with sports field, playground and a BMX track.



**Figure 8** An aerial view showing former landfill at Marfell Park and sampling sites

### 3.1.2 Water discharge permit

NPDC held resource consent **4902-1** to cover the discharge of up to 2 L/s of leachate from the Marfell former landfill site via groundwater into the Mangaotuku Stream in the Huatoki catchment. This permit was issued by the Council on 26 January 1996 under Section 87(e) of the RMA. It expired on 1 June 2014, however as a renewal application had been submitted to Council early, NPDC continued to operate the site under the conditions of the expired consent as provided for in Section 124 of the RMA. A new consent was granted on 21 October 2014.

Resource consent **4902-1**, which was in effect until 20 October 2014, had seven conditions;

Condition 1 required the installation and maintenance of stormwater drains and ground contours to minimise stormwater movement across or ponding on the site.

Condition 2 required maintenance of vegetation cover on the site.

Condition 3 required adoption of best practicable option to prevent or minimise any adverse effect on the environment associated with the discharge of leachate from the site.

Condition 4 stipulated that the exercise of the consent shall not cause the level of unionised ammonia in the receiving water to exceed 0.025 g/m<sup>3</sup>.

Condition 5 stipulated that the discharge shall not give rise to any significant adverse effects on aquatic life or receiving water quality.

Conditions 6 and 7 were review conditions.

The NPDC now 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 issued by the Council on 21 October 2014 under Section 87(e) of the RMA. It is due to expire on 1 June 2032.

Resource consent 4902-2 contains 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 and covers 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. One inspection and one set of discharge and receiving water samples were programmed for the 2014-2015 year.

### 3.2.1 Inspection

#### 23 July 2014

The site was inspected in fine weather and calm wind conditions. The perimeter of the site was walked. It was found that there was some leaf litter and grass clippings in the stormwater drain on the eastern side of the cap, but this was not considered to be an amount likely to significantly impede stormwater flow. On the whole the cap looked to be well maintained and well vegetated, although there were a few small areas on the western side (on the level above the BMX track) where slumping and maybe some ponding had been occurring. There were also small areas of exposed fresh clay on this level, indicating recent maintenance of the cap. Photos were taken. There was no flow in the stormwater drains on either side of the landfill area, and there was no exposed rubbish. Sampling of the discharge and receiving waters was undertaken.

The following action was to be taken:

Continue with maintenance of the cap to prevent stormwater ponding.

### 3.2.2 Receiving water and discharge sampling

Samples were taken on one occasion during the monitoring year. The results are presented below in Table 10.

**Table 10** Results of sampling undertaken a Marfell Park landfill 23 July 2014

Parameter	Units	Mangaotuku Stream ~ 100 m u/s of STW001123	Piped discharge to Mangaotuku Stream (TLB) ~ 50 m u/s STW001123	MGK000176 10m u/s discharge	STW001123 discharge	MGK000178 20 m d/s discharge
Alkalinity	$\text{g/m}^3 \text{ CaCO}_3$	30	54	30	236	34
Conductivity	mS/m	13.3	18.8	13.3	47.2	14.2
Acid soluble iron	$\text{g/m}^3$	0.66	3.84	0.68	27.4	1.56
Unionised ammonia	$\text{g/m}^3\text{-N}$	0.00009	0.00059	0.00012	0.0242	0.0012
Ammoniacal nitrogen	$\text{g/m}^3\text{-N}$	0.025	0.088	0.026	10.8	0.32
pH	pH	7.2	7.4	7.3	6.8	7.2
Temperature	$^{\circ}\text{C}$	9.8	12.1	10.2	16	10.6
Dissolved zinc	$\text{g/m}^3$	0.012	0.009	0.014	0.016	0.009

TLB True left bank

The discharge is a mixture of stormwater and spring water that drains from the area surrounding the landfill. The bulk of the leachate from the filled area is captured and piped to trade waste. The results of the discharge monitoring indicate that low level contamination from the landfill is occurring. With the exception of ammoniacal nitrogen, the receiving water shows very little change in water quality between the upstream and downstream sites. As with previous years, although the ammoniacal nitrogen of the stream was found to have increased by more than a factor of ten, the ammoniacal concentration of the stream remained at an acceptable level, and the unionised ammonia concentration in the stream remained relatively low.

Based on these results and those gathered in previous monitoring periods the discharges from the closed Marfell landfill are having only a minor effect on the receiving water.

### **3.2.3 Investigations, interventions, and incidents**

In the 2014-2015 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 holders activities at the Marfell landfill during the monitoring period.

## **3.3 Discussion**

### **3.3.1 Discussion of site performance**

At inspection it was found that recent cap maintenance had taken place, indicating that NPDC has an adequate monitoring and maintenance programme in place for the site.

A reminder was sent to NPDC regarding the new consent requirement for the provision of a management plan by 21 January 2015. The plan was received on 11 March 2015.

### **3.3.2 Environmental effects of exercise of consents**

The site was found to be well maintained and well vegetated, and no odour issues were noted. There were no issues found at inspection that required attention.

Sampling found that although there was an increase in the ammoniacal nitrogen concentration in the stream, this constituted only a minor effect at most.

### **3.3.3 Evaluation of performance**

A tabular summary of NPDC's compliance record for the year under review is set out in Table 11 and Table 12.

**Table 11** Summary of performance for Marfell Park closed landfill leachate consent 4902 -1 (to 20 October 2014)

<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>
1. Maintain drains, and contours on site to minimise unwanted water movement and ponding on site	Site inspection	Yes
2. Maintain an adequate vegetative cover	Site inspection	Yes
3. Adopt best practice to prevent or minimise any adverse effects on the environment	Site inspection	Yes
4. The discharge shall not cause free ammonia levels to exceed 0.025 g/m <sup>3</sup> in the Mangaotuku Stream	Sampling	Yes
5. The discharge is not to give rise to certain effects in the Mangaotuku Stream	Sampling	Yes
6. Provision of review of consent conditions if significant effects are found during sampling	Review not required	N/A
7. Provision of review of consent conditions	No further review opportunities	N/A
Overall assessment of environmental performance in respect of this consent		<b>High</b>
Overall assessment administrative performance in respect of this consent		<b>High</b>

N/A = not applicable

**Table 12** Summary of performance for Marfell Park closed landfill leachate consent 4902 -2 (from 21 October 2014 to date)

<b>Purpose: To discharge leachate from the Marfell Park former landfill site via groundwater into the Mangaotuku Stream</b>		
<b>Condition requirement</b>	<b>Means of monitoring during period under review</b>	<b>Compliance achieved?</b>
1. Adopt best practice to prevent or minimise any adverse effects on the environment	Not monitored during period this consent was in effect	N/A
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 this consent was in effect	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	Review of Council records. Plan received 11 March 2015	<b>Plan provided 7 weeks late</b>
4. The discharge shall not cause given parameter concentrations in the Mangaotuku Stream to be outside prescribed limits	Not monitored during period this consent was in effect	N/A
5. Prohibits certain effects in the stream beyond reasonable mixing	Not monitored during period this consent was in effect	N/A

Purpose: <i>To discharge leachate from the Marfell Park former landfill site via groundwater into the Mangaotuku Stream</i>		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
6. Provision of review of consent conditions	Next opportunity of review June 2020	N/A
Overall assessment of environmental performance in respect of this consent		N/A
Overall assessment administrative performance in respect of this consent		Good

N/A = not applicable

During the year, NPDC demonstrated an overall high level of environmental performance and a high level of administrative performance with their Marfell landfill resource consent as defined in Section 1.1.5.

### 3.3.4 Recommendation from the 2013-2014 Annual Report

In the 2013-2014 Annual Report, it was recommended:

THAT the biennial monitoring of discharges at the Marfell landfill continue unchanged and that the programme next be implemented in the 2014-2015 period.

This recommendation was implemented.

### 3.3.5 Alterations to monitoring programmes for 2015-2016

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 made available by previous authorities, its relevance under the RMA, the obligations of the Act in terms of monitoring emissions and discharges and their effects, and report 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 and discharging to the environment.

It is proposed that the biennial monitoring of discharges at the Marfell landfill continue unchanged with the programme next being implemented in 2016-2017.

## 3.4 Recommendation

THAT the biennial monitoring of discharges at the Marfell landfill continue unchanged and that the programme next be implemented in the 2016-2017 period.

## 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 greenwaste 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.

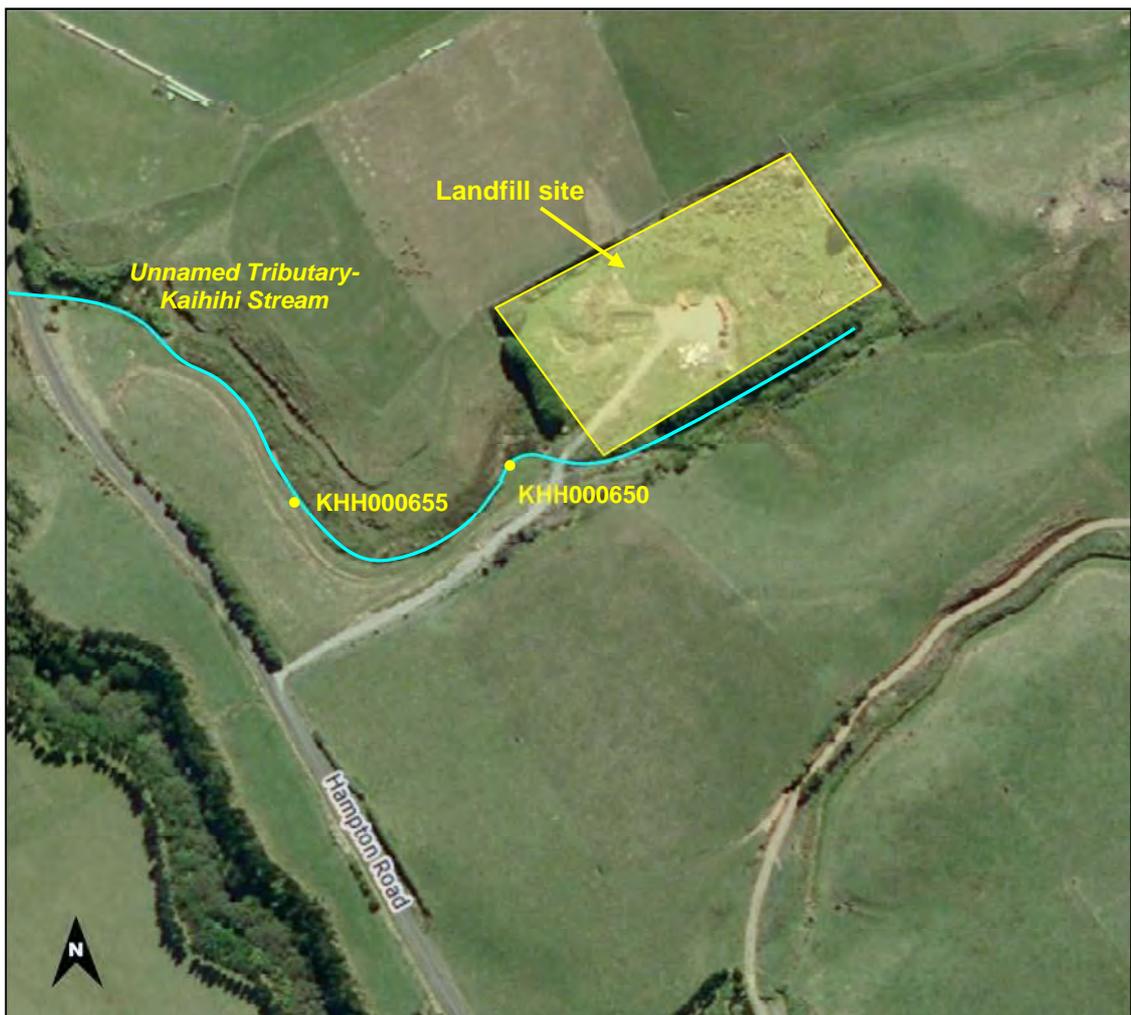


Figure 9 Okato landfill and sampling sites

## **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 or 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 greenwaste 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 greenwaste 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**

#### **10 September 2014**

The site was inspected in fine overcast weather with very light wind conditions. The cap was walked, and the stormwater drains were checked. It was found that the stormwater drain above the cleanfill and green waste areas was partially obstructed by a slip and/or green waste, which the consent holder was advised would need to be removed. It was reported that, on the whole, the cleanfill area looked good, however there were a few treated fence posts amongst the material present that needed to be removed. The cap appeared to be stable and was well vegetated or metallised, with no

evidence of erosion, slumping, ponding or cracking found. The transfer station was in a tidy condition. Sampling of the tributary below the landfill was undertaken and it was noted that there were iron oxide films present in the tributary running alongside the landfill.

The following action was to be taken:

- Remove the material from the stormwater drain on the upslope side of the cleanfill/green waste area and ensure that the stormwater drains around the perimeter of the landfill are unobstructed.
- Remove the treated timber fence posts from the cleanfill area, and continue to monitor to ensure that unauthorised wastes are removed from stockpiles prior to discharge.

#### **22 April 2015**

The weather conditions at the time of this inspection were rain with a light wind.

It appeared that trees at the site had been cleared and some residual branches and logs were stacked up along and in the southern drain. NPDC was advised that this would have to be removed to ensure free drainage of the area. It was also noted that the clearing of vegetation had revealed some refuse in the area and NPDC was advised that this should be placed back in the transfer station area.

The cleanfill area was inspected and it was found to be compliant with consent conditions. Stacks of woodchip were present in the green waste disposal area. NPDC was informed that the chip had been stacked up right along side the perimeter drain and was advised that there was a risk of the chip entering the drain itself.

The cap appeared to be stable and was well vegetated or metalled, with no evidence of erosion, slumping, ponding or cracking found. The transfer station was in a tidy condition. It was again noted that there were iron oxide films present in the tributary running alongside the landfill. Sampling of the tributary below the landfill was undertaken.

The consent holder was contacted to discuss the wood chip, old refuse and tree remains.

The following action was to be taken:

- Remove the tree clearing material and exposed refuse.
- Keep woodchip away from the perimeter drain.

This work was completed as requested

### **4.2.2 Results of surface water sampling**

Samples were collected from the tributary of the Kaihihi Stream below the landfill on two occasions, 10 September 2014 and 22 April 2015.

Figure 9 shows the Okato sampling sites and Table 13 and Table 14 present the water quality results.

**Table 13** Chemical analysis of a tributary of the Kaihihi Stream, sampled on 10 September 2014

Parameter	Units	KHH000650	KHH000655
		30 m d/s of landfill	200 m d/s of landfill
Alkalinity	g/m <sup>3</sup> CaCO <sub>3</sub>	102	72
Conductivity	mS/m	33.9	26.4
Dissolved reactive phosphorus	g/m <sup>3</sup> -P	0.003	<0.003
Acid soluble iron	g/m <sup>3</sup>	1.07	24.8
Unionised ammonia	g/m <sup>3</sup> -N	0.00131	0.0001
Ammoniacal nitrogen	g/m <sup>3</sup> -N	0.369	0.019
Nitrate/nitrite nitrogen	g/m <sup>3</sup> -N	2.72	0.76
pH	pH	7.1	7.3
Temperature	Deg C	12.9	12.4
Dissolved zinc	g/m <sup>3</sup>	0.008	<0.005

**Table 14** Chemical analysis of a tributary of the Kaihihi Stream, sampled on 22 April 2015

Parameter	Units	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	84
Conductivity	mS/m	33.1	29.4
Dissolved reactive phosphorus	g/m <sup>3</sup> -P	0.018	<0.003
Acid soluble iron	g/m <sup>3</sup>	16.6	2.18
Unionised ammonia	g/m <sup>3</sup> -N	0.00044	0.00005
Ammoniacal nitrogen	g/m <sup>3</sup> -N	0.254	0.016
Nitrate/nitrite nitrogen	g/m <sup>3</sup> -N	1.74	0.71
pH	pH	6.7	7.0
Temperature	°C	15.7	15.2
Dissolved zinc	g/m <sup>3</sup>	<0.005	<0.005

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 land-filled area are low, indicating only low levels of leachate contamination. An elevated level of iron was found at the downstream site on 10 September 2014 and at the upstream site on 22 April 2015, however these sites are very swampy and samples are easily contaminated with sediments, which may contribute to these higher levels.

Based on the results of the period under review, and from previous monitoring periods, the presence of the closed landfill is not likely to have a significant adverse effect on the receiving environment.

#### 4.2.3 Air quality

Objectionable odour and dust nuisance were checked for during each inspection during the monitoring period. 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 2014-2015 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 holders activities at the Okato landfill during the monitoring period.

## 4.3 Discussion

### 4.3.1 Discussion of site performance

Overall, the site was well managed during the 2014-2015 period. There were no issues in regards to cap condition. It was considered that there was generally good control over the site and its operation during the monitoring period, with minor issues noted at inspection resolved positively, co-operatively and within a reasonable timeframe.

### 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 2014-2015 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 Tables 15-17.

**Table 15** 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	N/A	N/A
7. Optional review provision re environmental effects	Next review opportunity June 2019	N/A
Overall assessment of environmental performance in respect of this consent		<b>High</b>
Overall assessment administrative performance in respect of this consent		<b>High</b>

N/A = not applicable

**Table 16** 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 optional review scheduled in June 2019	N/A
Overall assessment of environmental performance in respect of this consent		<b>N/A</b>
Overall assessment administrative performance in respect of this consent		<b>N/A</b>

N/A = not applicable

**Table 17** Summary of performance for Okato contingency landfill discharge to land consent 4529-3

<b>Purpose: To discharge cleanfill and greenwaste 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	Yes
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	<b>Treated timber posts removed promptly</b>

<b>Purpose: To discharge cleanfill and greenwaste 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	Treated timber posts removed promptly
9. Written approval required where uncertainty of acceptability of waste	Site inspection	Yes
10. Greenwaste 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 optional review scheduled in June 2019	N/A
Overall assessment of environmental performance in respect of this consent		<b>High</b>
Overall assessment 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 Recommendations from the 2013-2014 Annual Report**

In the 2013-2014 Annual Report, it was recommended:

THAT monitoring of discharges from the Okato landfill in the 2014-2015 year continues at the same level as in 2013-2014.

This recommendation was implemented.

#### **4.3.5 Alterations to monitoring programmes for 2015-2016**

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 made available by previous authorities, its relevance under the RMA, the obligations of the Act in terms of monitoring emissions and discharges and their effects, and report 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 and discharging to the environment.

It is proposed that for 2015-2016, the programme remained unchanged.

#### **4.4 Recommendation**

THAT monitoring of discharges from the Okato landfill in the 2015-2016 year continues at the same level as in 2014-2015.

## 5. Okoki Road landfill

### 5.1 Introduction

#### 5.1.1 Site description

The Okoki Road landfill operated as an uncontrolled landfill from around 1984. In 1991 NPDC obtained consent to discharge leachate and stormwater to the Urenui River and undertook to take control of the site with a view to closing it within three years. The site was closed and reinstated by September 1994.

Post closure management and monitoring of the site has continued with one inspection undertaken by the Council and a leachate sample taken by NPDC, both on a triennial basis. During the period under review upstream and downstream samples were also collected to compare with the requirements of Rule 28 of the Regional Freshwater Plan (RFP), as the consent was due to expire and Rule 28 permits discharges from closed landfills if certain specific standards, terms and conditions are met.

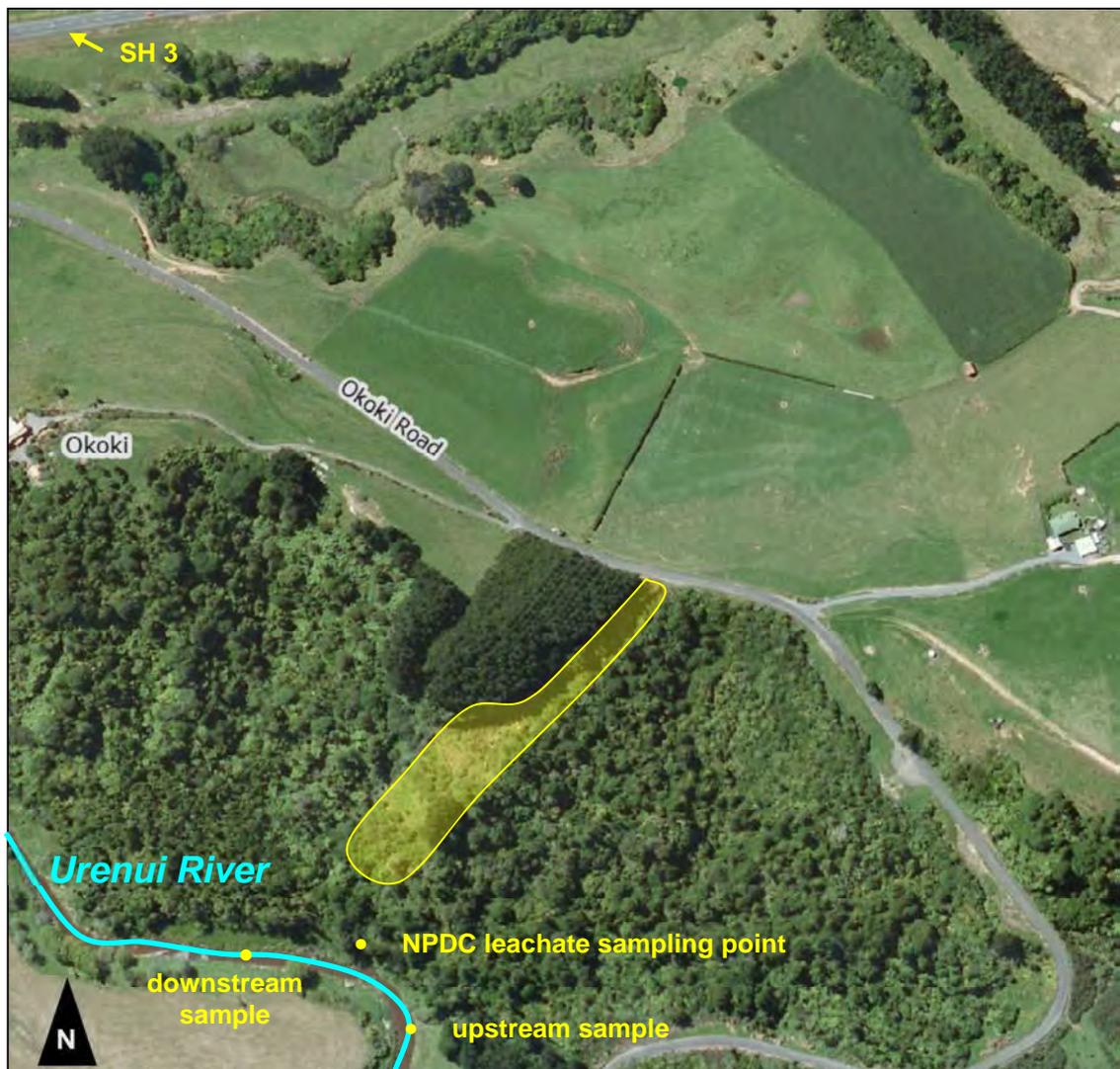


Figure 10 Aerial view of the former landfill at Okoki

### 5.1.2 Water discharge permit

The NPDC held resource consent **3955-2** to cover the discharge of up to 864 m<sup>3</sup>/day (10 L/s) of stormwater and leachate from a former landfill site into the Urenui River. This permit was issued by the Council on 26 November 1996 under Section 87(e) of the RMA. It expired on 1 June 2015.

An application to renew this consent was received on 27 February 2015. As the application was received more than three months prior to the expiry of the existing consent, Council exercised its discretion and advised NPDC that they could continue to operate under the conditions of the expiring consent until a decision was made on the renewal.

In March 2015, receiving water sampling was undertaken to compare with the RFP rule that permits the discharge of leachate from closed landfills. It was found that the site complied with the permitted activity rule (discussed in Section 5.2), however at end of the 2014-2015 year, the application had not yet been withdrawn as NPDC were having discussions about the site with Te Runanga O Ngati Mutunga. The consent application was withdrawn on 9 March 2016.

Consent 3955-2 had six conditions;

Condition 1 requires that stormwater drains and ground contours be installed and maintained to minimise stormwater movement across or ponding on the site. It also requires that one consent holder shall maintain soil cover on the site.

Condition 2 states that adequate vegetation cover shall be maintained to prevent dust emission or stormwater erosion of the site.

Condition 3 stipulates that the best practicable option be adopted to prevent or minimise any adverse effect on the environment associated with the discharge of leachate.

Condition 4 stipulates that the discharge shall not give rise to any significant adverse effects on aquatic life or receiving water quality in the Urenui River.

Conditions 5 and 6 provided opportunities for review of the conditions on the consent.

A copy of this permit is included in Appendix I.

## 5.2 Results

The closed landfill at Okoki is monitored on a triennial basis, with one inspection and one sampling survey undertaken during the year under review.

### 5.2.1 Inspection

#### 25 February 2015

The site was inspected in fine weather and calm wind conditions. The site was found to be secure, with good fencing and the gate was padlocked. The south eastern boundary and the river bank below the site were walked. It was found that the cap looked to be stable and well vegetated. It appeared that the majority of stormwater at

the site would flow around the cap, and that the grade and vegetation cover would prevent the cap from being prone to ponding, slips or erosion. No cracks or slumping were observed. There was a small amount of partially exposed inert material present (a couple of tyres, a concrete pillar, iron water trough and a sheet of galvanized iron). This material was well anchored into the bank and was at least 50 metres above the river. Access to the area in which these items were located was very difficult, and it was considered that adding new cover would be impractical. It was considered that this material was unlikely to present any environmental risk. Photographs were taken. NPDC undertook sampling of very low flow seepage from the bank below the filled area. Samples were also taken from the Urenui River upstream and downstream of the site to assess the site against Rule 28 of the RFP in order to make an assessment on whether the consent could be surrendered and/or the renewal application withdrawn.

NPDC were asked to provide a copy of the discharge results when they became available.

## 5.2.2 Discharge sampling

NPDC took one sample of the spring water/leachate mix that seeps out of the Urenui River bank down gradient of the landfill. The results are given in Table 18.

**Table 18** Analysis results for the bank seepage below the Okoki landfill

Parameter	Units	Results
Alkalinity	g/m <sup>3</sup> CaCO <sub>3</sub>	111
Conductivity	mS/m	32.8
pH	pH	7.2
Carbonaceous BOD	g/m <sup>3</sup>	<1
COD	g/m <sup>3</sup>	23
Ammoniacal nitrogen	g/m <sup>3</sup> -N	<0.1
Dissolved cadmium	g/m <sup>3</sup>	<0.002
Dissolved copper	g/m <sup>3</sup>	<0.02
Dissolved lead	g/m <sup>3</sup>	<0.03
Dissolved iron	g/m <sup>3</sup>	2.7
Dissolved zinc	g/m <sup>3</sup>	<0.04

The results indicate that this spring-water/leachate mix is not highly contaminated. Landfill indicator species such as ammoniacal nitrogen, zinc, BOD and iron are all low and the volume of the discharge is small. Therefore there is a high dilution rate in the river after mixing.

## 5.2.3 Receiving water monitoring

Receiving water monitoring is not usually scheduled in this programme, however as the landfill has been closed for a number of years and the consent was due to expire on 1 June 2014, it was agreed that receiving water sampling would be carried out to compare with the standards given in the permitted activity rule for closed landfills in the RFWP for Taranaki.

Samples were collected from the Urenui River approximately 100 m upstream of the landfill and approximately 60 m downstream of the landfill. The results are given in Table 19.

**Table 19** Receiving water monitoring results for the Urenui River in the vicinity of the Okoki landfill

Parameter	Units	Urenui River approx 100 m u/s Okoki landfill bank seepage	Urenui River approx 60 m d/s Okoki landfill bank seepage	Permitted activity standard
Filtered carbonaceous BOD	g/m <sup>3</sup>	1.6	2.0	<b>2.0</b>
Conductivity	mS/m	10.0	10.2	-
Unionised ammonia	g/m <sup>3</sup> -N	0.00011	0.00008	<b>0.02</b>
Ammoniacal nitrogen	g/m <sup>3</sup> -N	0.015	0.012	-
pH	pH	7.2	7.2	-
Temperature	°C	19.9	19.1	-
Turbidity		80	82	-
Dissolved zinc	g/m <sup>3</sup>	<0.005	<0.005	<b>0.05*</b>

\* Total zinc limit

The results show that the discharge is not causing any effects on the receiving water that fall outside the standards required by Rule 28 of the RFWP, and therefore NPDC was advised that the application to renew the consent could be withdrawn.

#### 5.2.4 Investigations, interventions, and incidents

In the 2014-2015 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 holders activities at the Okoki landfill during the monitoring period.

### 5.3 Discussion

#### 5.3.1 Discussion of site performance

The site was found to be stable, secure and well vegetated, with no dust or odour issues noted. Council also received no complaints about the site during the 2014-2015 year.

#### 5.3.2 Environmental effects of exercise of consents

Based on the results gathered during this and previous monitoring periods, the presence of the Okoki landfill is having little, if any, effect on the Urenui River.

#### 5.3.3 Evaluation of performance

A tabular summary of NPDC's compliance record at the Okoki landfill for the year under review is set out in Table 20.

**Table 20** Summary of performance for Okoki closed landfill leachate consent 3955-2

<b>Purpose: To discharge up to 864 m<sup>3</sup>/day [10 L/s] of stormwater and leachate from a former landfill site into the Urenui River</b>		
<b>Condition requirement</b>	<b>Means of monitoring during period under review</b>	<b>Compliance achieved?</b>
1. Maintain drains, and contours on site to minimise unwanted water movement and ponding on site	Site inspection	Yes
2. Maintain an adequate vegetative cover	Site inspection	Yes
3. Adopt best practice to prevent or minimise any adverse effects on the environment	Site inspection and receiving water sampling	Yes
4. The discharge is not to give rise to certain effects in the Urenui River	Inspection and receiving water sampling	Yes
5. Optional review provision re contamination in discharge	No review this period	N/A
6. Optional review provision re environmental effects	No review this period	N/A
Overall assessment of environmental performance in respect of this consent		<b>High</b>
Overall assessment 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 Okoki landfill resource consent as defined in Section 1.1.5.

### 5.3.4 Recommendation from the 2013-2014 Annual Report

The 2013-2014 Annual Report recommended;

THAT the triennial monitoring of discharges at the Okoki landfill continue unchanged and next be implemented in the 2014-2015 period.

This recommendation was implemented.

### 5.3.5 Alterations to monitoring programmes for 2015-2016

In designing and implementing the monitoring programmes for air and water 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 made available by previous authorities, its relevance under the RMA, the obligations of the Act in terms of monitoring emissions and discharges and their effects, and report 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 and discharging to the environment.

It is now proposed that the triennial monitoring of discharges at the Okoki landfill cease. Monitoring during the year under review showed that the discharges from the

site meet the requirements of the permitted activity rule for closed landfills, and therefor the application to renew the consent has been withdrawn as discharges from the site no longer require consent from the Council.

#### **5.4 Recommendation**

THAT the triennial monitoring of discharges at the Okoki landfill cease as the site no longer requires a resource consent, and the application to renew the consent has been withdrawn.

## **6. 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 discharges from Inglewood landfill in the 2015-2016 year continues at the same level as in 2014-2015.
2. THAT the biennial monitoring of discharges at the Marfell landfill continue unchanged and that the programme next be implemented in the 2016-2017 period.
3. THAT monitoring of discharges from the Okato landfill in the 2015-2016 year continues at the same level as in 2014-2015.
4. THAT the triennial monitoring of discharges at the Okoki landfill cease as the site no longer requires a resource consent, and the application to renew the consent has been withdrawn.

## Glossary of common terms and abbreviations

The following abbreviations and terms that may have been 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.
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.
IR	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.
MCI	Macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the sensitivity of the taxa present to organic pollution in stony habitats.
mS/m	Millisiemens per metre.
Mixing zone	The zone below a discharge point where the discharge is not fully mixed with the receiving environment. For a stream, conventionally taken as a length equivalent to seven times the width of the stream at the discharge point.
NH <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).
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.
PM <sub>10</sub>	Relatively fine airborne particles (less than 10 micrometre diameter).
Resource consent	Refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15).
RMA	Resource Management Act 1991 and including all subsequent amendments.
SS	Suspended solids.
SQMCI	Semi quantitative macroinvertebrate community index.
Temp	Temperature, measured in °C (degrees Celsius).
Turbidity	Turbidity, expressed in NTU.
UI	Unauthorised Incident.
Zn*	Zinc.

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

For further information on analytical methods, contact the Council's laboratory.

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## **Appendix I**

### **Resource consents held by NPDC**

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

## Consent 3954-2

### 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

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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 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

### **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



TRK964902

## DISCHARGE PERMIT

**Pursuant to the RESOURCE MANAGEMENT ACT 1991  
a resource consent is hereby granted by the  
Taranaki Regional Council**

Name of: NEW PLYMOUTH DISTRICT COUNCIL  
Consent Holder: PRIVATE BAG 2025 NEW PLYMOUTH

Consent  
Granted Date: 26 January 1996

## CONDITIONS OF CONSENT

Consent Granted: TO DISCHARGE UP TO 2 LITRES/SECOND OF LEACHATE FROM  
THE MARFELL PARK FORMER LANDFILL SITE VIA  
GROUNDWATER INTO THE MANGAOTUKU STREAM IN THE  
HUATOKI CATCHMENT AT OR ABOUT GR: P19:006-365

Expiry Date: 1 June 2014

Review Date[s]: June 2002 and June 2008

Site Location: MARFELL PARK, GRENVILLE STREET, NEW PLYMOUTH

Legal Description: LOT 1 DP9295 BLK IV PARITUTU SD

Catchment: HUATOKI 389.000

Tributary: MANGAOTUKU 389.030

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

TRK964902

### GENERAL CONDITIONS

- (a) That on receipt of a requirement from the General Manager, Taranaki Regional Council (hereinafter the General Manager), 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;
  - (ii) charges for the carrying out of the Council's functions under section 35 in relation to this consent; and
  - (iii) charges authorised by regulations.

### SPECIAL CONDITIONS

- 1) THAT the consent holder shall install and maintain stormwater drains and ground contours at the site, to the satisfaction of the General Manager, Taranaki Regional Council, in order to minimise stormwater movement across, or ponding on the site.
- 2) THAT the consent holder shall maintain an adequate vegetative cover on the site to the satisfaction of the General Manager, Taranaki Regional Council.
- 3) THAT the consent holder shall at all times adopt the best practicable option to prevent or minimise any or likely adverse effect on the environment associated with the discharges of leachate from the site.
- 4) THAT the discharge shall not be shown to raise the concentration of un-ionised ammonia in the receiving water above  $0.025 \text{ gm}^{-3}$  at any point.
- 5) THAT after allowing for reasonable mixing within a mixing zone extending 15 metres downstream of the discharge point, the discharge shall not give rise to any of the following effects in the receiving waters of the Mangaotuku Stream:
  - (a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended material;
  - (b) any conspicuous change in 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
- 6) THAT the Taranaki Regional Council may review any or all of the conditions of this consent should further chemical sampling of the Mangaotuku Stream reveal levels of contamination resulting in significant adverse environmental effects.

TRK964902

7) THAT the Taranaki Regional Council may review any or all of the conditions of this consent, by giving notice of review during June 1999 and/or June 2005, 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 consent.

Signed at Stratford on 26 January 1996

For and on behalf of  
TARANAKI REGIONAL COUNCIL

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OPERATIONS MANAGER



**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

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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 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.

## Consent 4529-3

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

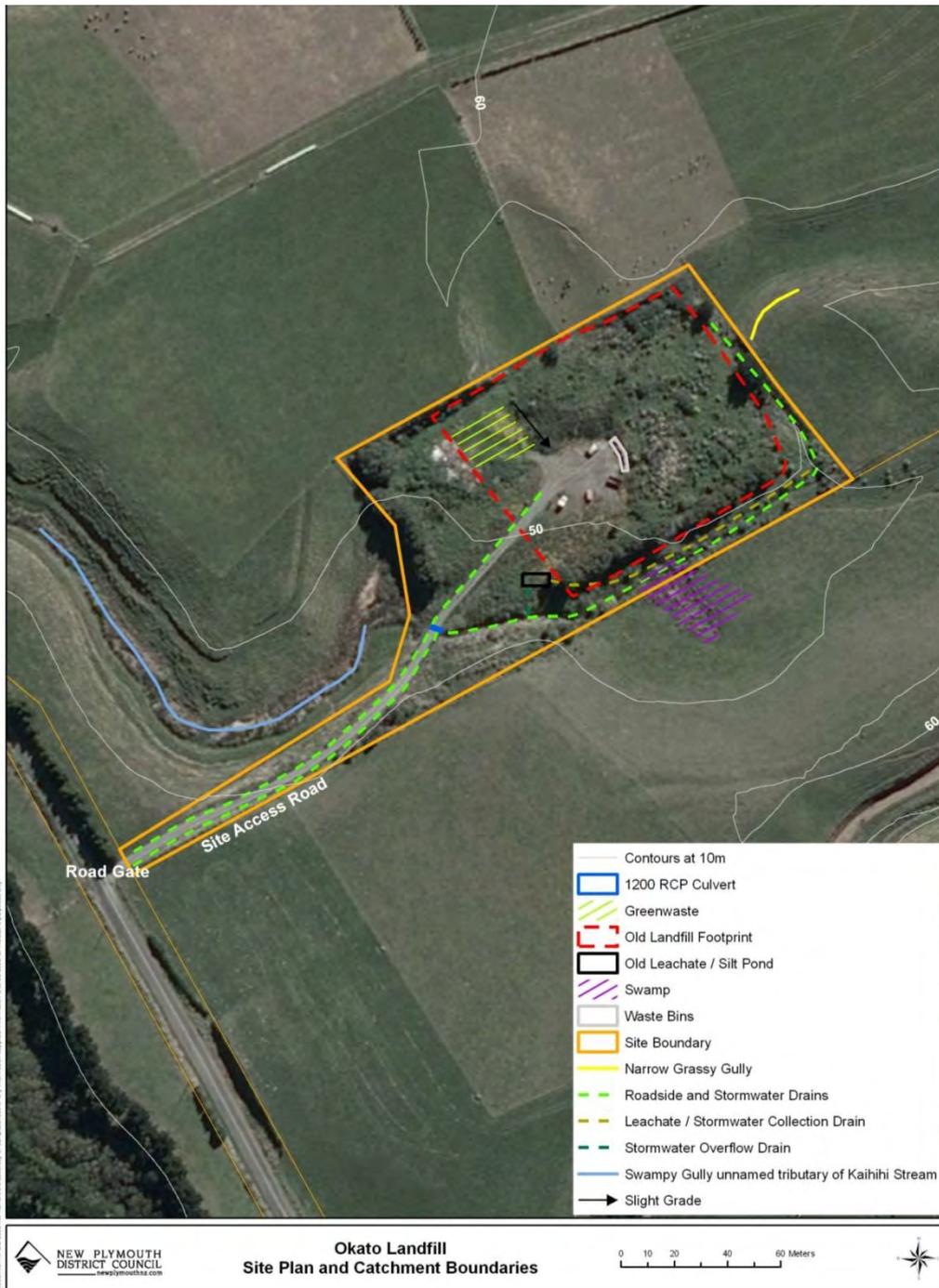


Figure 1 Aerial plan of Okato landfill site

Okoki



TRK963955

## DISCHARGE PERMIT

**Pursuant to the RESOURCE MANAGEMENT ACT 1991  
a resource consent is hereby granted by the  
Taranaki Regional Council**

Name of: NEW PLYMOUTH DISTRICT COUNCIL  
Consent Holder: PRIVATE BAG 2025 NEW PLYMOUTH

Consent  
Granted Date: 26 November 1996

## CONDITIONS OF CONSENT

Consent Granted: TO DISCHARGE UP TO 864 CUBIC METRES/DAY [10 LITRES/SECOND] OF STORMWATER AND LEACHATE FROM A FORMER LANDFILL SITE INTO THE URENUI RIVER AT OR ABOUT GR: Q19:347-455

Expiry Date: 1 June 2015

Review Date[s]: June 2003 and June 2009

Site Location: FORMER URENUI MUNICIPAL LANDFILL, OKOKI ROAD, URENUI

Legal Description: PT URENUI 7B PT SUBSEC 24 SO9850 BLK IV WAITARA SD

Catchment: URENUI 399.000

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

TRK963955

### GENERAL CONDITIONS

- (a) That on receipt of a requirement from the General Manager, Taranaki Regional Council (hereinafter the General Manager), 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;
  - (ii) charges for the carrying out of the Council's functions under section 35 in relation to this consent; and
  - (iii) charges authorised by regulations.

### SPECIAL CONDITIONS

- 1. THAT the consent holder shall install and maintain stormwater drains and ground contours at the site, to the satisfaction of the General Manager, Taranaki Regional Council, in order to minimise stormwater movement across, or ponding on, the site; and shall maintain soil cover on the site.
- 2. THAT the consent holder shall maintain an adequate vegetative cover on the site, to the satisfaction of the General Manager, Taranaki Regional Council, to prevent dust emission or stormwater erosion of the site.
- 3. THAT the consent holder shall at all times adopt the best practicable option to prevent or minimise any adverse effect or any likely adverse effect on the environment associated with the discharges of leachate from the site. Without restriction or limitation, the best practicable option shall include the measures specified in conditions 1 and 2 above.
- 4. THAT the discharge shall not give rise to any of the following effects in the receiving waters of the Urenui River:
  - 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.
- 5. THAT the Taranaki Regional Council may review any or all of the conditions of this

TRK963955

consent, should further chemical sampling of the discharge at the base of the landfill biomass reveal levels of contamination resulting in, or likely to result in, significant adverse environmental effects.

6.THAT the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2003 and/or June 2009, 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 consent, which were not foreseen at the time the application was considered and which it was not appropriate to deal with at the time.

Signed at Stratford on 26 November 1996

For and on behalf of  
TARANAKI REGIONAL COUNCIL

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OPERATIONS MANAGER



**Appendix II**  
**Biomonitoring reports**



To Job Manager, Lorraine Smith  
From Scientific Officers, Darin Sutherland and Brooke Thomas  
Report No DS026  
Document No 1550905  
Date August 2015

## **Biomonitoring of two unnamed tributaries of the Awai Stream, below the Inglewood landfill, October 2014**

### **Introduction**

This was the first biological survey undertaken of the two surveys scheduled for the 2014-2015 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 9 October 2014 at four sites on the two tributaries of the Awai Stream; sites 1(a) and 1(b) were located in the smaller tributary and sites 2 and 3 on the larger tributary (Figure 1).

The standard 400 ml 'sweep-net' sampling technique was used to collect streambed macroinvertebrates from sites 1a and 1b. The 'sweep-net' sampling technique is very similar to Protocol C2 (soft-bottomed, semi-quantitative). The standard '400 ml kick-sampling' technique was used to collect streambed macroinvertebrates from sites 2 and 3. The 'kick-sampling' technique is very similar to Protocol C1 (hard-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.

<b>Site</b>	<b>Site code</b>	<b>Location</b>
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 using protocol P1 of NZMWG protocols for sampling macroinvertebrates in wadeable streams (Stark *et al.* 2001). Macroinvertebrate taxa found in each sample were recorded as:

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

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams (MCI). Highly 'sensitive' taxa were assigned the highest scores of 9 or 10, while the most 'tolerant' forms scored 1 and 0.1 in hard bottomed and soft bottomed streams respectively. The sensitivity scores for certain taxa found in hard bottomed streams have been modified in accordance with Taranaki experience. After extensive use of the MCI, categories were assigned to the sensitivity scores, to clarify their 'relative' sensitivity e.g. taxa that scored between 1 and 4 inclusive are considered tolerant (see Table 3).

By averaging the scores obtained from a list of taxa taken from one site and multiplying by a scaling factor of 20, a Macroinvertebrate Community Index (MCI) value was obtained. The MCI is a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. More 'sensitive' communities inhabit less polluted waterways.

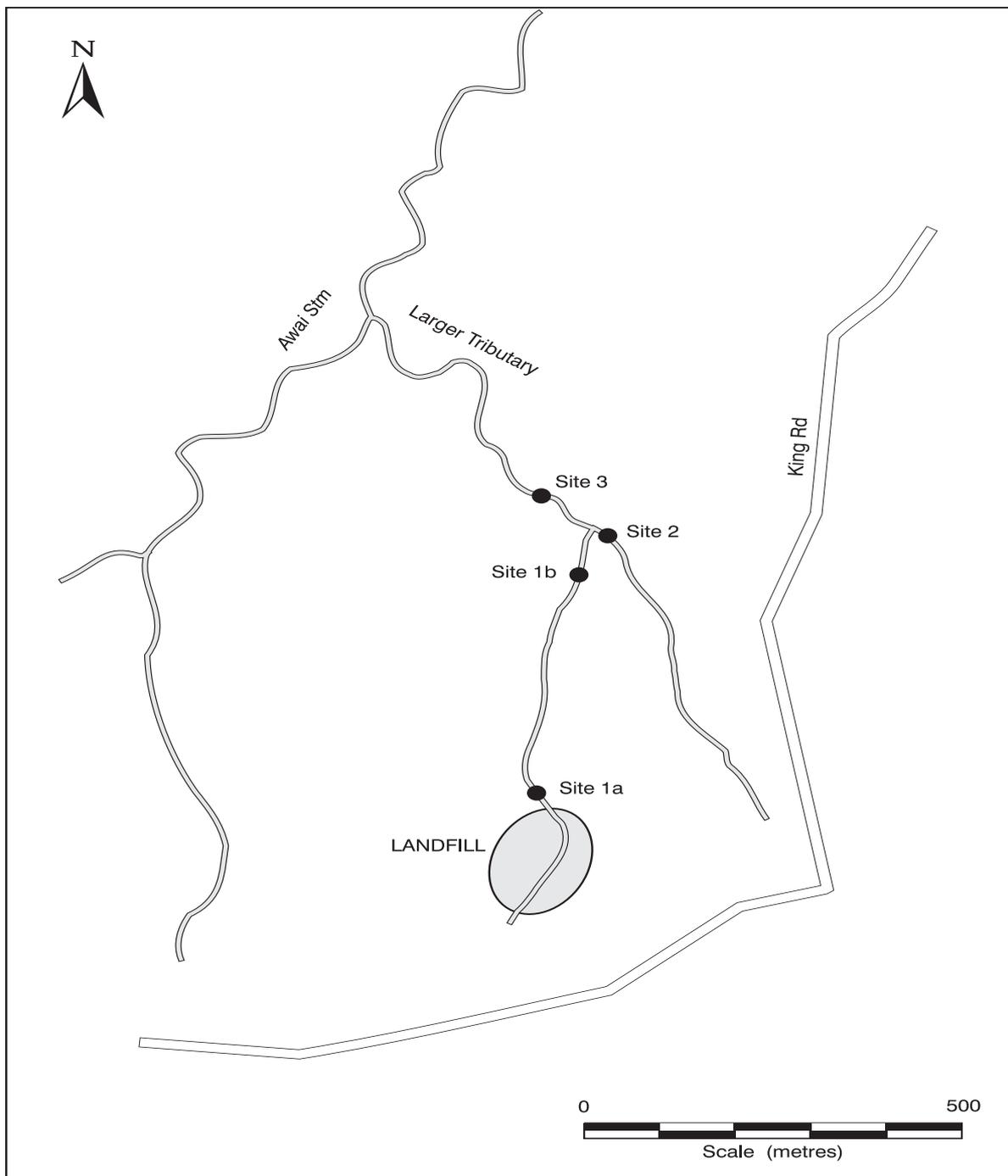
A gradation of biological water quality conditions based upon MCI ranges has been adapted by TRC for Taranaki streams and rivers (TRC, 2015) from Stark's classification (Stark, 1985). This is as follows:

Grading	HBMCI	Code
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, so that its corresponding range of values is 20x lower. A difference of 11 units or more in MCI values is considered significantly different (Stark 1998).

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

### Site habitat characteristics and hydrology

This October 2014 survey followed a period of 11 days since a fresh in excess of three times median flow, and 67 days since a fresh in excess of seven times median flow. In the month prior to this survey there had been eight fresh events, two of which exceeded three times median flow.

Water temperatures were cool (11.5-12.5°C). Water levels were moderate and flows steady at sites 1b, 2 and 3 while site 1a had a very low flow and very slow water speed. Water was clear and uncoloured. Site 1a had a substrate comprised entirely of silt, site 1b had a predominately silt substrate with some sand and fine gravel, site 2 had predominately fine gravel substrate with some silt and wood/roots, and site 3 had a predominately cobble substrate with some silt, fine gravel, coarse gravel and wood/roots.

None of the sites had filamentous algae. Sites 1a and 1b also did not have any periphyton mats while sites 2 and 3 had slippery periphyton mats. Sites 1a and 1b had no moss, leaves and wood and macrophytes on the streambed. Sites 2 and 3 had patchy moss, widespread leaves and no macrophytes on the streambed. Site 2 had widespread wood while site 3 only had patchy wood. Site 1a had no shading, site 1b had partial shading from overhanging grasses, and sites 2 and 3 both had complete shading from overhanging vegetation.

### 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 2. The full results of the present survey are provided in Table 3.

**Table 2** 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	40	4-23	15	18	40	60-86	73	71	30	1.2-3.6	2.6	2.4
1b	43	11-29	19	15	43	69-88	77	84	30	2.1-4.5	3.2	3.8
2	44	8-29	19	16	44	79-108	90	103	30	1.4-6.1	3.9	5.5
3	44	9-27	19	17	44	74-105	91	99	30	1.3-5.8	3.3	5.2

**Table 3** Macroinvertebrate fauna of unnamed tributaries of the Awai Stream sampled in relation to the Inglewood landfill on 9 October 2014.

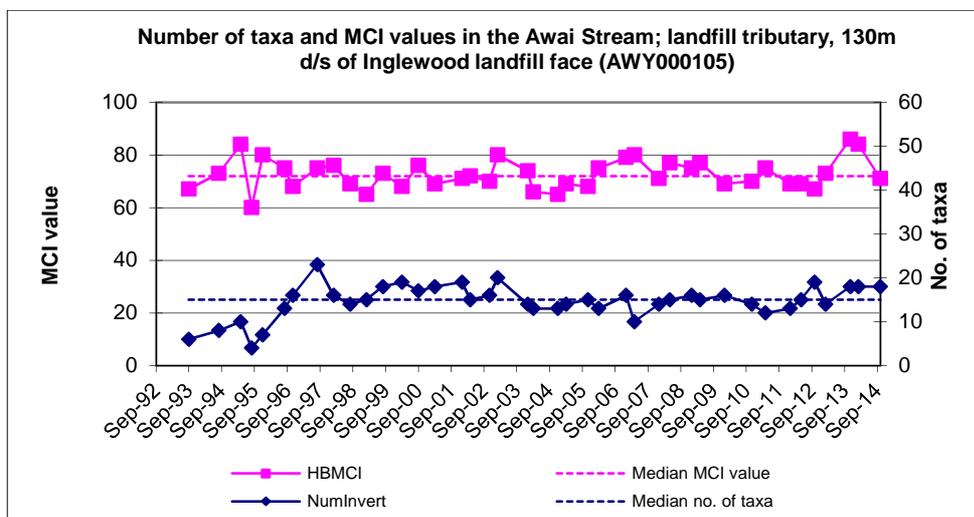
Taxa List	Site Number	MCI score	1a	1b	2	3
	Site Code		AWY000105	AWY000107	AWY000100	AWY000115
	Sample Number		FWB14246	FWB14247	FWB14248	FWB14249
PLATYHELMINTHES (FLATWORMS)	<i>Cura</i>	3	-	C	-	-
ANNELIDA (WORMS)	Oligochaeta	1	R	C	A	C
	Lumbricidae	5	R	-	-	-
MOLLUSCA	<i>Gyraulus</i>	3	-	-	-	R
	Lymnaeidae	3	R	-	-	-
	<i>Potamopyrgus</i>	4	-	XA	-	C
CRUSTACEA	Ostracoda	1	VA	C	R	-
	Isopoda	5	R	-	-	-
	Paraleptamphopidae	5	-	R	VA	C
EPHEMEROPTERA (MAYFLIES)	<i>Coloburiscus</i>	7	-	-	-	C
	<i>Zephlebia group</i>	7	-	-	VA	R
PLECOPTERA (STONEFLIES)	<i>Acroperla</i>	5	-	C	R	R
	<i>Zelandobius</i>	5	-	R	-	-
ODONATA (DRAGONFLIES)	<i>Xanthocnemis</i>	4	A	-	-	-
	<i>Antipodochlora</i>	5	-	-	-	R
HEMIPTERA (BUGS)	<i>Microvelia</i>	3	R	-	-	-
COLEOPTERA (BEETLES)	Dytiscidae	5	R	-	-	-
	Hydrophilidae	5	R	-	-	-
	Ptilodactylidae	8	-	-	R	C
TRICHOPTERA (CADDISFLIES)	<i>Hydropsyche (Orthopsyche)</i>	9	-	R	R	C
	<i>Polypectropus</i>	6	C	R	R	-
	<i>Psilochorema</i>	6	-	R	R	R
	Oeconesidae	5	-	R	R	-
	<i>Oxyethira</i>	2	R	-	-	-
DIPTERA (TRUE FLIES)	<i>Triplectides</i>	5	-	-	R	R
	Hexatomini	5	-	-	R	R
	<i>Zelandotipula</i>	6	-	-	-	R
	<i>Chironomus</i>	1	R	-	-	-
	<i>Corynoneura</i>	3	R	-	-	-
	<i>Harrisius</i>	6	-	-	R	-
	Orthoclaadiinae	2	R	A	-	R
	<i>Polypedilum</i>	3	A	R	C	C
	Tanypodinae	5	C	C	R	-
	<i>Austrosimulium</i>	3	-	VA	-	R
Stratiomyidae	5	C	-	-	-	
ACARINA (MITES)	Acarina	5	A	-	R	-
No of taxa			18	15	16	17
MCI			71	84	103	99
SQMCIs			2.4	3.8	5.5	5.2
EPT (taxa)			1	6	7	6
%EPT (taxa)			6	40	44	35
'Tolerant' taxa		'Moderately sensitive' taxa		'Highly sensitive' taxa		

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

## Site 1a

A moderate macroinvertebrate community richness of 18 taxa was found at site 1a ('primary impacted' site) at the time of the survey which was three more than the median number recorded for the site (median taxa richness 15; Table 2) and the same number as the previous sample (taxa richness 18; Figure 2).

The MCI score of 71 units indicated a community of 'poor' biological health which was not significantly different (Stark, 1998) to the median value calculated from previous surveys at the same site (median MCI score 73 units; Table 2) but was significantly lower (Stark, 1998) than the previous survey score (MCI score 84 units; Figure 2). The SQMCI<sub>s</sub> score of 2.4 units was similar to the median value calculated from previous surveys at the same site (median SQMCI<sub>s</sub> score 2.6 units; Table 2) and was lower than the previous survey score (SQMCI<sub>s</sub> score 3.6 units).



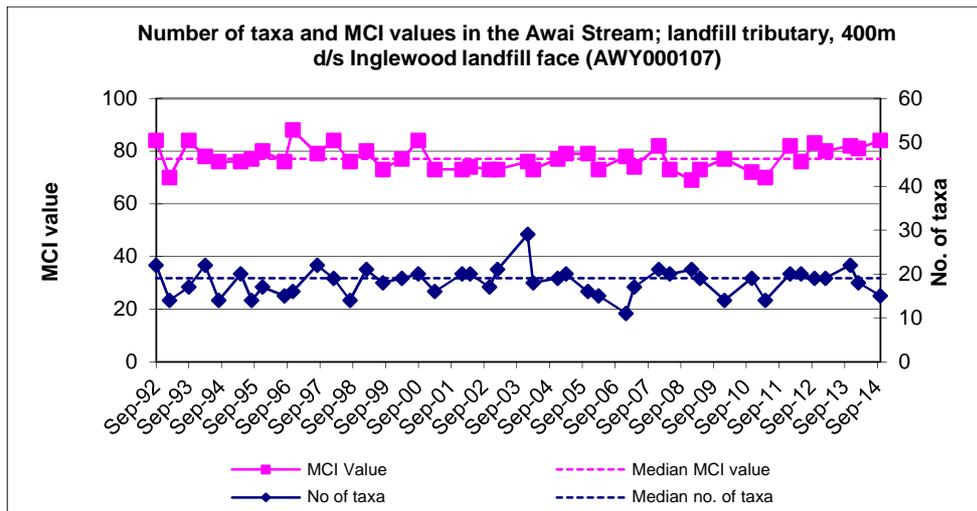
**Figure 2** Number of taxa and MCI values at site 1a in a tributary of the Awai Stream.

The community was characterised by three 'tolerant' taxa [ostracod seed shrimp, damselfly (*Xanthocnemis*) and midge (*Polypedilum*)] and one 'moderately sensitive' taxon [mites (Acarina)] (Table 3).

## Site 1b

A moderate macroinvertebrate community richness of 15 taxa was found at site 1b ('secondary impacted' site) at the time of the survey which was four less than the median number recorded for the site (median taxa richness 19; Table 2) and three less than the previous sample (taxa richness 18; Figure 3).

The MCI score of 84 units indicated a community of 'fair' biological health which was not significantly different (Stark, 1998) to the median value calculated from previous surveys at the same site (median MCI score 77 units; Table 2) or to that of previous survey score (MCI score 84 units; Figure 3). The SQMCI<sub>s</sub> score of 3.8 units was similar to the median value calculated from previous surveys at the same site (median SQMCI<sub>s</sub> score 3.2 units; Table 2) and was lower than the previous survey score (SQMCI<sub>s</sub> score 3.6 units).



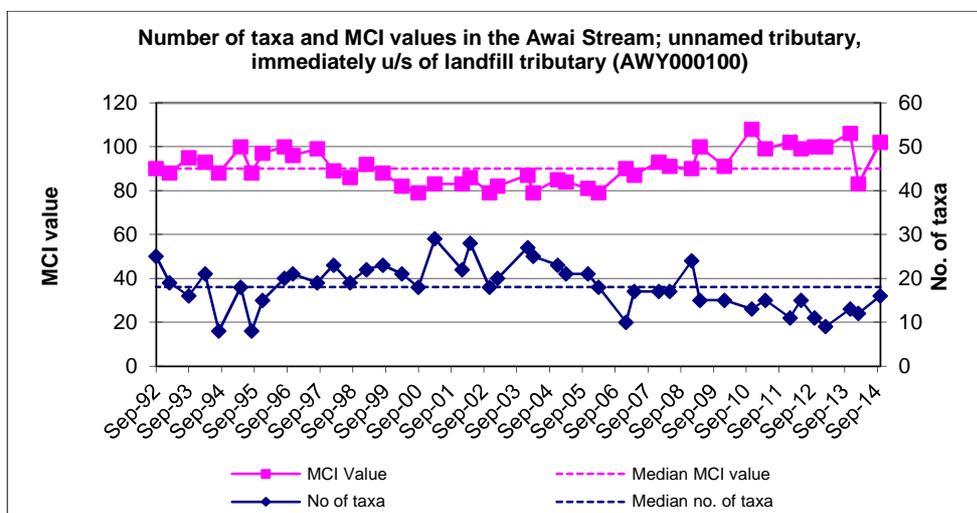
**Figure 3** Number of taxa and MCI values at site 1b in a tributary of the Awai Stream.

The community was characterised by three ‘tolerant’ taxa [snail (*Potamopyrgus*), orthoclad midges and sandfly (*Austrosimulium*) (Table 3).

## Site 2

A moderate macroinvertebrate community richness of 16 taxa was found at site 2 (‘control’ site) at the time of the survey which was three less than the median number recorded for the site (median taxa richness 19; Table 2) and four more than the previous sample (taxa richness 12; Figure 4).

The MCI score of 103 units indicated a community of ‘good’ biological health which was significantly higher (Stark, 1998) than the median value calculated from previous surveys at the same site (median MCI score 90 units; Table 2) and to that of previous survey score (MCI score 83 units; Figure 4). The SQMCI<sub>s</sub> score of 5.5 units was markedly higher than the median value calculated from previous surveys at the same site (median SQMCI<sub>s</sub> score 3.9 units; Table 2) and to that of the previous survey score (SQMCI<sub>s</sub> score 4.3 units).



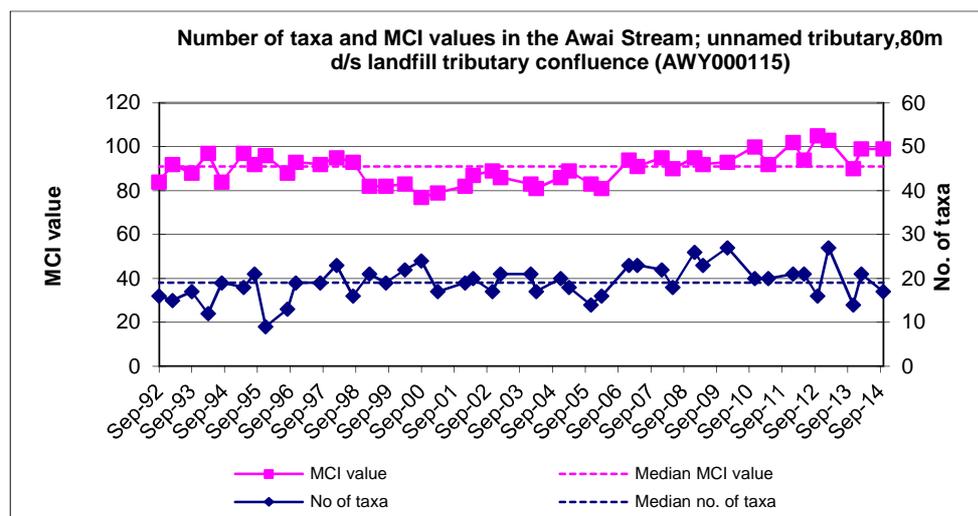
**Figure 4** Number of taxa and MCI values at site 2 in a tributary of the Awai Stream.

The community was characterised by one ‘tolerant’ taxon [oligochaete worms] and two ‘moderately sensitive’ taxon [amphipod (*Paraleptamphopidae*) and mayfly (*Zephlebia* group)] (Table 3).

### Site 3

A moderate macroinvertebrate community richness of 17 taxa was found at site 3 (‘tertiary impacted’ site) at the time of the survey which was two more than the median number recorded for the site (median taxa richness 19; Table 2) and four less than the previous sample (taxa richness 21; Figure 4).

The MCI score of 99 units indicated a community of ‘fair’ biological health which was not significantly different (Stark, 1998) to the median value calculated from previous surveys at the same site (median MCI score 91 units; Table 2) and was the same score as the previous survey score (MCI score 99 units; Figure 4). The SQMCI<sub>s</sub> score of 5.2 units was markedly higher than the median value calculated from previous surveys at the same site (median SQMCI<sub>s</sub> score 3.3 units; Table 2) and similar to the previous survey score (SQMCI<sub>s</sub> score 5.0 units).



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

The macroinvertebrate community at the site was very sparse with only ‘rare’ and ‘common’ taxa recorded. No taxa had an abundances class of ‘abundant’ or greater.

## Discussion and conclusions

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

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The SQMCI<sub>s</sub> takes into account taxa abundances as well as sensitivity to pollution. Significant differences in either the taxa richness, MCI or the SQMCI<sub>s</sub> between sites may indicate the degree of adverse effects (if any) caused by leachate.

Landfills may have a variety of contaminants leaching from them (e.g. nutrients and metals). A decrease in taxa richness is usually associated with toxic impacts. No marked differences in taxa richnesses existed among the sites sampled and therefore there is no evidence for leachate causing toxic effects in the macroinvertebrate communities downstream of the Inglewood landfill.

There were significant differences (Stark, 1998) among sites for both MCI and SQMCI<sub>s</sub> scores. The 'primary impacted' site had a significantly lower scores than the 'secondary impacted' site which in turn had a significantly lower scores than the 'tertiary impacted' site. There were insignificant differences in MCI and SQMCI<sub>s</sub> scores between the 'tertiary impacted' site and the 'control' site. This result would usually indicate that there was organic pollution impacting on the unnamed tributary and the extent of the pollution was reduced the further downstream the sample was collected either because the nutrients were being utilised by instream plants or algae and/ or diluted by higher quality water than the other tributary.

However, significant habitat differences existed between the four sites. In particular, site 1a was a seepage fed stream that resembled a wetland rather than a stream and also had an iron oxide coating. Site 1b was a very small stream that was dominated by terrestrial grasses both on the stream bank and growing in the streambed. Sites 2 and 3 were more typical of a stream with overhanging vegetation and larger substrate types. Based on those habitat characteristics the macroinvertebrate fauna in the wetland stream (site 1a) would have the lowest MCI score, followed by the open small grassy stream (site 1b) with the highest scores expected at the gravel/cobble substrate vegetated bank sites 2 and 3. Analysis of previous results show this pattern with the median values for site 1a for both MCI and SQMCI<sub>s</sub> score being the lowest of the four sites surveyed, followed by site 1b, followed by site 3 and then site 2. Previous reports (e.g. Thomas, 2014b) have suggested that the observed results could be explained by habitat variation rather than leachate from the landfill. Unfortunately as stated above this pattern would also mimic what might be expected with nutrients leaching from the landfill. Therefore, interpretation of differences in MCI and SQMCI<sub>s</sub> scores among the four sites has to be done with caution but sites 1a and 1b still have some value in their ability to detected changes in taxa richness which is useful in detecting toxic discharges. As this landfill is also the primary contingency landfill for the region, current monitoring at

these sites also provides useful baseline data for comparison, should circumstances arise that require this currently closed landfill to be used.

A comparison with previous survey results show that site 2, the 'control' site, had an improvement in macroinvertebrate community health since the summer survey in early 2014. There were only minor, insignificant differences in macroinvertebrate community health at sites 1b and 3 while site 1a had a significant decline in macroinvertebrate health as both MCI and SQMCI<sub>s</sub> scores were significantly lower than the previous summer survey. However, when compared with median values there were only two MCI units and 0.2 SQMCI<sub>s</sub> units difference between median values calculated for the site and the current survey results. The result is therefore more of a reflection of the exceptional good result of the previous survey rather than a decrease in macroinvertebrate health from what is typically found at the site. Thomas (2014b) states in regards to site 1a during the 2014 summer survey that "The MCI score was only just below the highest MCI score recorded to date and the SQMCI<sub>s</sub> score was the highest score ever recorded at this site".

Overall, the results suggest that differences in the macroinvertebrate communities between the four sites relate to differences in habitat rather than the effects of any discharge from the landfill site.

## Summary

- A spring macroinvertebrate survey was performed at four sites in two unnamed tributaries of the Awai Stream in relation to the Inglewood landfill.
- Taxa richnesses were moderate at the four sites and similar to median values calculated from previous surveys.
- There were significant differences in MCI and SQMCI<sub>s</sub> scores among sites with macroinvertebrate communities improving in health the further away from the landfill they were located. However, this is a typical result for this survey and was a reflection of the significant differences in habitat among sites.
- Overall, there was no evidence that leachate from the Inglewood landfill had significantly affected the freshwater macroinvertebrate communities in the two unnamed tributaries of the Awai Stream.

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To Job Manager, Lorraine Smith  
From Scientific Officer, Darin Sutherland  
Report No DS027  
Document No 1552131  
Date August 2015

## **Biomonitoring of two unnamed tributaries of the Awai Stream, below the Inglewood landfill, February 2015**

### **Introduction**

This was the second biological survey undertaken of the two surveys scheduled for the 2014-2015 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 10 February 2015 at four sites on the two tributaries of the Awai Stream; sites 1(a) and 1(b) were located in the smaller tributary and sites 2 and 3 on the larger tributary (Figure 1).

A combination of the standard 400 ml 'kick-sampling' and 'sweep-net' sampling techniques were used to collect streambed macroinvertebrates from sites 1a and 1b. The 400 ml 'kick-sampling' technique was used at site 2 and the 'sweep-net' sampling technique was used at site 3. The 'kick-sampling' technique is very similar to Protocol C1 (hard-bottomed, semi-quantitative) protocol for macroinvertebrate samples in wadeable streams (Stark *et al*, 2001). The 'sweep-net' sampling technique was very similar to Protocol C2 (soft-bottomed, semi-quantitative) protocol of the New Zealand Macroinvertebrate Working Group (NZMWG).

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

Site	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 using protocol P1 of NZMWG protocols for sampling macroinvertebrates in wadeable streams (Stark *et al.* 2001). Macroinvertebrate taxa found in each sample were recorded as:

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

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams (MCI). Highly 'sensitive' taxa were assigned the highest scores of 9 or 10, while the most 'tolerant' forms scored 1 and 0.1 in hard bottomed and soft bottomed streams respectively. The sensitivity scores for certain taxa found in hard bottomed streams have been modified in accordance with Taranaki experience. After extensive use of the MCI, categories were assigned to the sensitivity scores, to clarify their 'relative' sensitivity e.g. taxa that scored between 1 and 4 inclusive are considered tolerant (see Table 3).

By averaging the scores obtained from a list of taxa taken from one site and multiplying by a scaling factor of 20, a Macroinvertebrate Community Index (MCI) value was obtained. The MCI is a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. More 'sensitive' communities inhabit less polluted waterways.

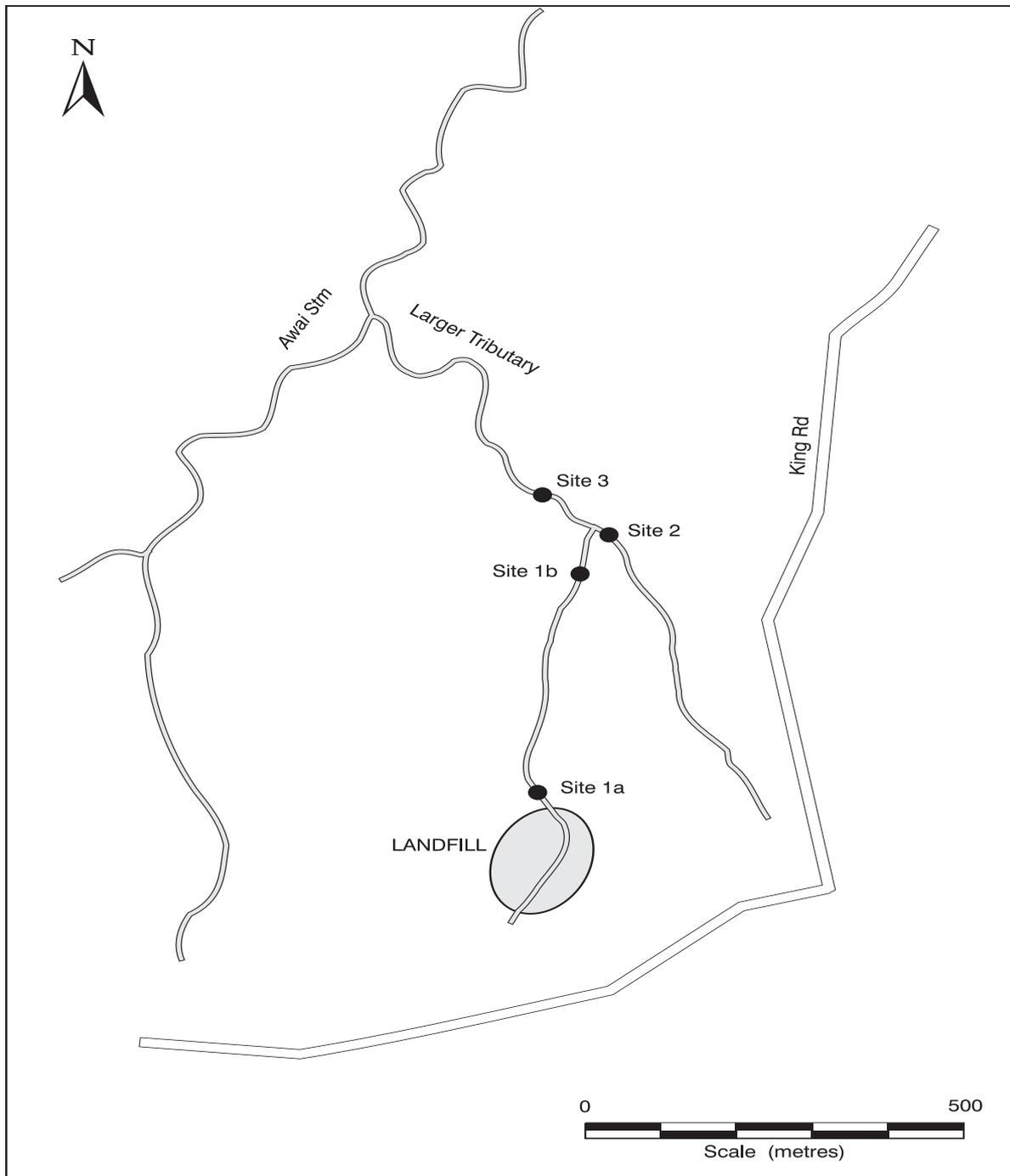
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Grading	HBMCI	Code
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A semi-quantitative MCI value (SQMCI<sub>s</sub>) has also been calculated for the taxa present at each site by multiplying each taxon score by a loading factor (related to its 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, so that its corresponding range of values is 20x lower. A difference of 11 units or more in MCI values is considered significantly different (Stark 1998).

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

### Site habitat characteristics and hydrology

This February 2015 survey followed a period of eight days since a fresh in excess of three times median flow, and 62 days since a fresh in excess of seven times median flow. In the month prior to this survey only the one fresh event was recorded.

Water temperatures were warm (14.8-18.7°C). Water levels at the four sites were very low and flows very slow. Water was uncoloured and cloudy for site 1a and uncoloured and clear for sites 1b, 2 and 3. All sites had a silt substrate with only site 2, the 'control' site, also having a very minor amount of wood/root substrate recorded at the site.

None of the sites had periphyton mats and only site 1a had filamentous algae present which was patchy at the time of the survey. Sites 1a had no moss, leaves and wood and macrophytes on the streambed. Sites 1b had no moss or wood, patchy leaves and macrophytes on the streambed. Site 2 had no moss and macrophytes and patchy leaves and wood. Site 3 had no moss, wood and macrophytes and patchy leaves. Site 1a had no shading, site 1b had partial shading from overhanging grasses, and sites 2 and 3 both had complete shading from overhanging vegetation.

### 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 2. The full results of the present survey are provided in Table 3.

**Table 2** 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	41	4-23	15	12	41	60-86	72	72	31	1.2-3.6	2.6	2.2
1b	44	11-29	19	14	44	69-88	77	77	31	2.1-4.5	3.2	3.9
2	45	8-29	18	16	45	79-108	90	84	31	1.4-6.1	3.9	3.8
3	45	9-27	19	13	45	74-105	91	85	31	1.3-5.8	3.3	2.9

**Table 3** Macroinvertebrate fauna of unnamed tributaries of the Awai Stream sampled in relation to the Inglewood landfill on 10 February 2015.

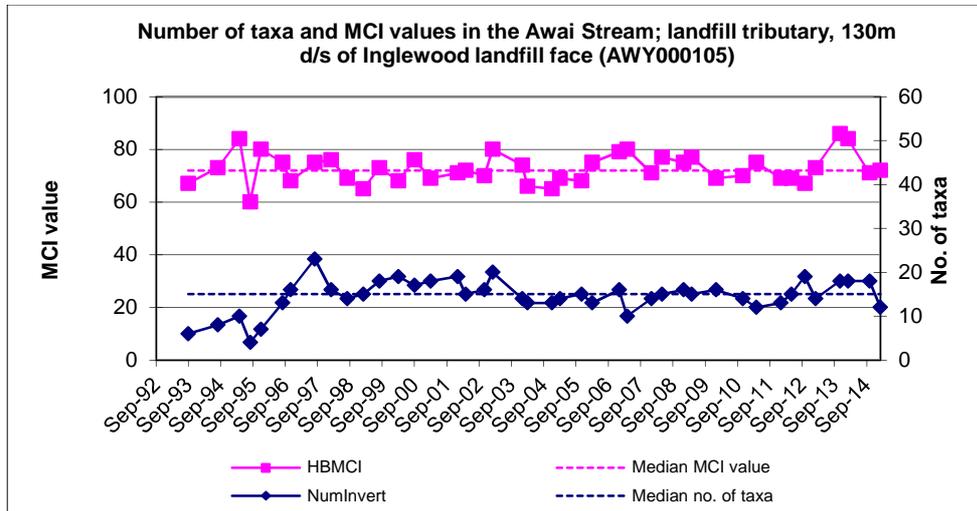
Taxa List	Site Number	MCI score	1a	1b	2	3
	Site Code		AWY000105	AWY000107	AWY000100	AWY000115
	Sample Number		FWB15074	FWB15075	FWB15076	FWB15077
PLATYHELMINTHES (FLATWORMS)	<i>Cura</i>	3	-	R	-	-
NEMERTEA	Nemertea	3	-	-	-	R
NEMATODA	Nematoda	3	-	-	R	-
ANNELIDA (WORMS)	Oligochaeta	1	-	C	VA	A
	Lumbricidae	5	-	-	R	-
MOLLUSCA	<i>Gyraulus</i>	3	-	R	R	R
	<i>Potamopyrgus</i>	4	-	VA	-	R
CRUSTACEA	Copepoda	5	-	-	R	-
	Ostracoda	1	VA	C	R	-
	Paraleptamphopidae	5	-	-	A	C
	<i>Paranephrops</i>	5	-	-	C	R
EPHEMEROPTERA (MAYFLIES)	<i>Zephlebia group</i>	7	-	-	VA	R
ODONATA (DRAGONFLIES)	<i>Xanthocnemis</i>	4	R	-	-	-
HEMIPTERA (BUGS)	<i>Microvelia</i>	3	R	R	-	R
TRICHOPTERA (CADDISFLIES)	<i>Hydropsyche (Orthopsyche)</i>	9	-	R	-	-
	<i>Polypsectropus</i>	6	C	R	-	R
	Oeconesidae	5	-	C	R	-
	<i>Oxyethira</i>	2	R	-	-	-
	<i>Triplectides</i>	5	-	-	R	C
DIPTERA (TRUE FLIES)	Hexatomini	5	-	-	R	-
	<i>Zelandotipula</i>	6	R	-	-	-
	Orthocladiinae	2	R	-	-	-
	<i>Polypedilum</i>	3	VA	-	VA	A
	Tanypodinae	5	R	C	R	-
	<i>Paradixa</i>	4	-	-	R	-
	Empididae	3	R	R	-	-
	Muscidae	3	-	R	-	-
<i>Austrosimulium</i>	3	R	C	-	-	
	Stratiomyidae	5	-	-	-	R
ACARINA (MITES)	Acarina	5	C	C	R	R
No of taxa			12	14	16	13
MCI			72	77	84	85
SQMCIs			2.2	3.9	3.8	2.9
EPT (taxa)			1	3	3	3
%EPT (taxa)			8	21	19	23
'Tolerant' taxa		'Moderately sensitive' taxa		'Highly sensitive' taxa		

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

### Site 1a

A moderately low macroinvertebrate community richness of 12 taxa was found at site 1a ('primary impacted' site) at the time of the survey which was three less than the median number recorded for the site (median taxa richness 15; Table 2) and six less as the previous sample (taxa richness 18; Figure 2).

The MCI score of 72 units indicated a community of ‘poor’ biological health which was the same number as the median value calculated from previous surveys at the same site (median MCI score 72 units; Table 2) but was not significantly different (Stark, 1998) to the previous the survey score (MCI score 73 units; Figure 2). The SQMCI<sub>s</sub> score of 2.2 units was similar to the median value calculated from previous surveys at the same site (median SQMCI<sub>s</sub> score 2.6 units; Table 2) and to the previous survey score (SQMCI<sub>s</sub> score 2.4 units).



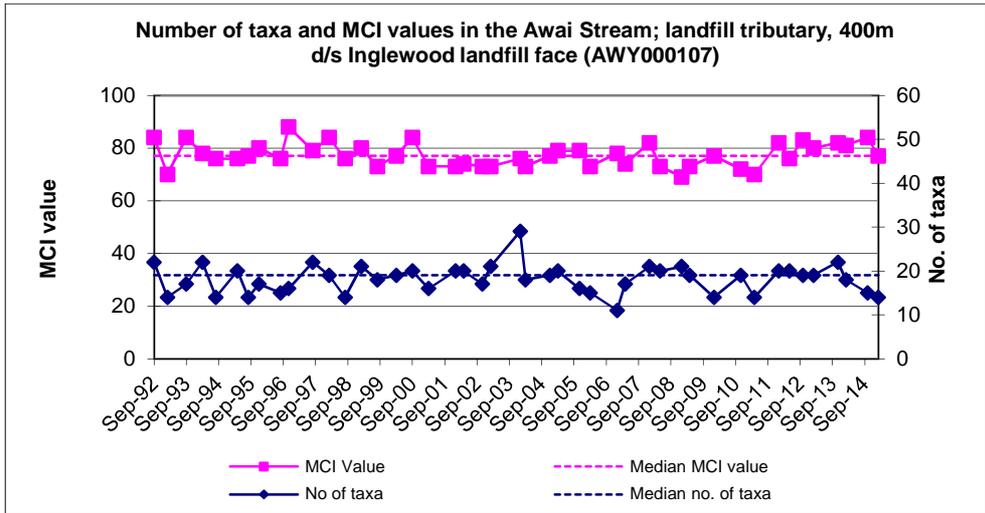
**Figure 2** Number of taxa and MCI values at site 1a in a tributary of the Awai Stream.

The community was characterised by two ‘tolerant’ taxa [ostracod seed shrimp and midge (*Polypedilum*)] (Table 3).

### Site 1b

A moderate macroinvertebrate community richness of 14 taxa was found at site 1b (‘secondary impacted’ site) at the time of the survey which was one less than the median number recorded for the site (median taxa richness 15; Table 2) and previous sample (taxa richness 15; Figure 3).

The MCI score of 77 units indicated a community of ‘poor’ biological health which was the same as the median value calculated from previous surveys at the same site (median MCI score 77 units; Table 2) and not significantly different (Stark, 1998) to that of previous survey score (MCI score 84 units; Figure 3). The SQMCI<sub>s</sub> score of 3.9 units was similar to the median value calculated from previous surveys at the same site (median SQMCI<sub>s</sub> score 3.2 units; Table 2) and to the previous survey score (SQMCI<sub>s</sub> score 3.8 units).



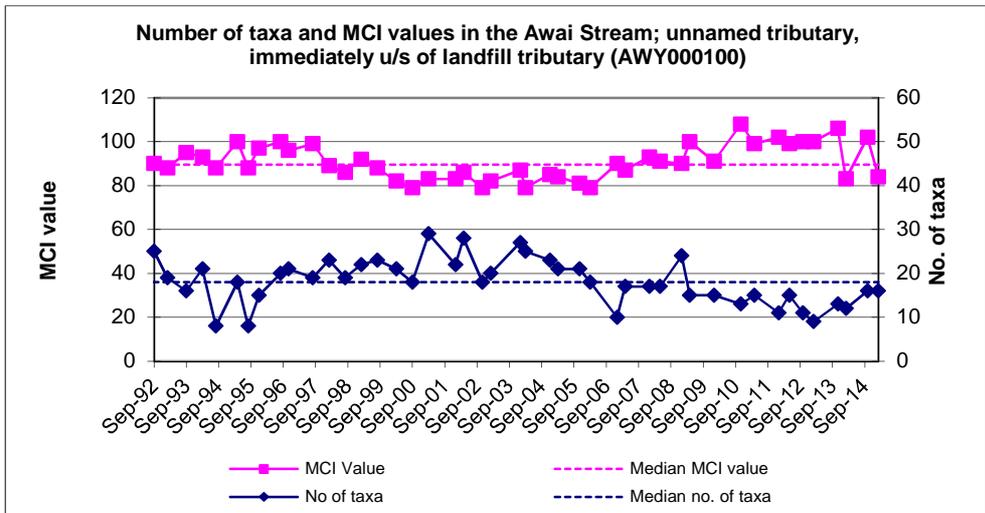
**Figure 3** Number of taxa and MCI values at site 1b in a tributary of the Awai Stream.

The community was characterised by one ‘tolerant’ taxon [snail (*Potamopyrgus*)] (Table 3).

**Site 2**

A moderate macroinvertebrate community richness of 16 taxa was found at site 2 (‘control’ site) at the time of the survey which was two less than the median number recorded for the site (median taxa richness 18; Table 2) and the same as the previous sample (taxa richness 16; Figure 4).

The MCI score of 90 units indicated a community of ‘fair’ biological health which was the same as the median value calculated from previous surveys at the same site (median MCI score 90 units; Table 2) and significantly lower (Stark, 1998) than the survey score (MCI score 102 units; Figure 4). The SQMCI<sub>s</sub> score of 3.8 units was similar to the median value calculated from previous surveys at the same site (median SQMCI<sub>s</sub> score 3.9 units; Table 2) and markedly lower than the previous survey score (SQMCI<sub>s</sub> score 5.5 units).



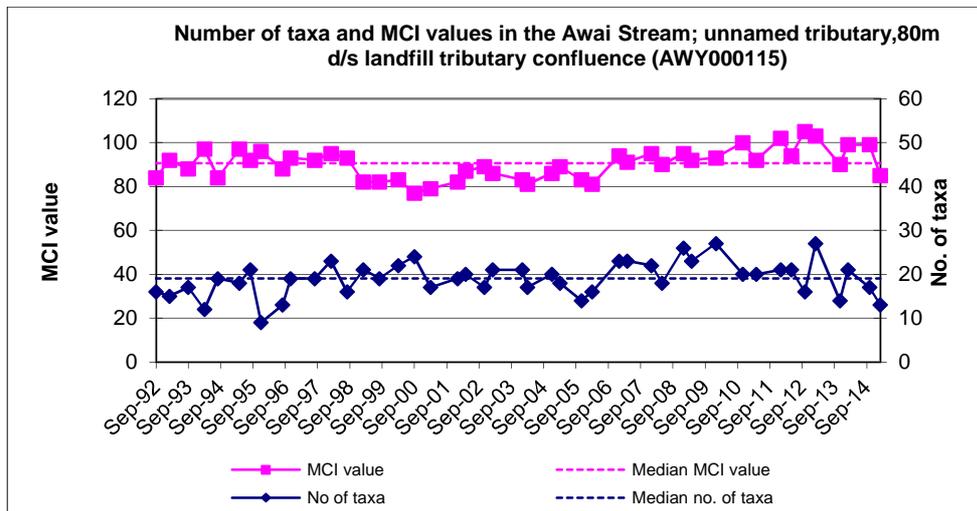
**Figure 4** Number of taxa and MCI values at site 2 in a tributary of the Awai Stream.

The community was characterised by two 'tolerant' taxa [oligochaete worms and midge (*Polypedilum*)] and two 'moderately sensitive' taxa [amphipod (*Paraleptamphopidae*) and mayfly (*Zephlebia* group)] (Table 3).

### Site 3

A moderately low macroinvertebrate community richness of 13 taxa was found at site 3 ('tertiary impacted' site) at the time of the survey which was six less than the median number recorded for the site (median taxa richness 19; Table 2) and four less than the previous sample (taxa richness 17; Figure 4).

The MCI score of 85 units indicated a community of 'fair' biological health which was not significantly different (Stark, 1998) to the median value calculated from previous surveys at the same site (median MCI score 91 units; Table 2) and was significantly lower (Stark, 1998) than the previous survey score (MCI score 99 units; Figure 4). The SQMCI<sub>s</sub> score of 2.9 units was similar to the median value calculated from previous surveys at the same site (median SQMCI<sub>s</sub> score 3.3 units; Table 2) and markedly lower than the previous survey score (SQMCI<sub>s</sub> score 5.2 units).



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

The community was characterised by two 'tolerant' taxa [oligochaete worms and midge (*Polypedilum*)] (Table 3).

## Discussion and conclusions

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

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The SQMCI<sub>s</sub> takes into account taxa abundances as well as sensitivity to pollution. Significant differences in either the taxa richness, MCI or the SQMCI<sub>s</sub> between sites may indicate the degree of adverse effects (if any) caused by leachate.

Landfills may have a variety of contaminants leaching (e.g. nutrients and metals). A decrease in taxa richness is usually associated with toxic impacts. Taxa richnesses were marginally lower for the current survey compared with the median value calculated from previous surveys but this result also included the 'control' site and appears to be due to seasonal variation. There were insignificant differences in taxa richnesses among the sites sampled and therefore there is no evidence for leachate causing toxic effects in the macroinvertebrate communities downstream of the Inglewood landfill.

The 'control' site had a significantly higher (Stark, 1998) MCI score than the 'primary impacted' and 'secondary impacted' sites. The 'control' site also had a markedly higher SQMCI<sub>s</sub> score than the 'primary impacted' site. This result would usually indicate that there was organic pollution impacting on the unnamed tributary and the extent of the pollution was reduced the further downstream the sample was collected either because the nutrients were being utilised by instream plants or algae and/ or diluted higher quality water from the other tributary.

However, significant habitat differences existed between the four sites. In particular, site 1a was a seepage feed stream that resembled a wetland rather than a stream and also had an iron oxide coating. Site 1b was a very small stream that was dominated by terrestrial grasses both on the stream bank and growing in the streambed. Sites 2 and 3 were more typical streams with overhanging vegetation. Based on those habitat characteristics the macroinvertebrate fauna in the wetland stream (site 1a) would have the lowest MCI score, followed by the open small grassy stream (site 1b) with the highest scores expected at sites 2 and 3 with significant riparian vegetation. Analysis of previous results show this pattern with the median values for site 1a for both MCI and SQMCI<sub>s</sub> scores being the lowest out of the four sites surveyed, followed by site 1b, followed by site 3 and then site 2. Previous reports (e.g. Sutherland and Thomas, 2014 and Thomas, 2014b) have suggested that the observed results could be explained by habitat variation rather than leachate from the landfill. Unfortunately as stated above this pattern would also mimic what might be expected with organic nutrients leaching from the landfill. Therefore, interpretation of differences in MCI and SQMCI<sub>s</sub> scores among the four sites has to be done with caution but sites 1a and 1b still have some value in their ability to detect changes in taxa richness which is useful in detecting toxic discharges. As this landfill is also the primary contingency

landfill for the region, current monitoring at these sites also provides useful baseline data for comparison, should circumstances arise that require this currently closed landfill to be used.

A comparison with previous survey results show that sites 2 and 3 had significant decreases in macroinvertebrate community health since the spring survey in October 2014. This was probably due to a change in substrate type with a large increase in silt at both sites. Generally 'sensitive' taxa prefer gravel, cobble and boulder substrates and 'tolerant' taxa are often found at sites with silt substrates. There were only minor, insignificant differences in macroinvertebrate community health at sites 1a and 1b which had little change in habitat from the previous survey. Both sites had silt substrates during both the current and previous surveys and were dominated by 'tolerant' taxa and therefore less susceptible to further impacts.

Overall, the results suggest that differences in the macroinvertebrate communities between the four sites relate to differences in habitat rather than the effects of any discharge from the landfill site.

## Summary

- A summer macroinvertebrate survey was performed at four sites in two unnamed tributaries of the Awai Stream in relation to the Inglewood landfill.
- Taxa richnesses were moderate to moderately low at the four sites and slightly lower to median values calculated from previous surveys.
- There were significant differences in MCI scores between the 'control' site and the 'primary impacted' and 'secondary impacted' sites with macroinvertebrate communities improving in health the further away from the landfill they were located. However, this is a typical result for this survey and was a reflection of the significant differences in habitat among sites.
- Overall, there was no evidence that leachate from the Inglewood landfill had significantly affected the freshwater macroinvertebrate communities in the two unnamed tributaries of the Awai Stream.

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