South Taranaki District Council
Waverley, Kaponga, Manaia and Patea
Municipal Wastewater Treatment Plant Systems
Monitoring Programmes
Annual Report
2014-2015

Technical Report 2015-09

ISSN: 1178-1467 (Online)
Document: 1541036 (Word)
Document: 1547289 (Pdf)

Taranaki Regional Council
Private Bag 713
STRATFORD

September 2015

Executive summary

The South Taranaki District Council (STDC) operates seven municipal oxidation pond systems within the district of South Taranaki. This report addresses performances of four of these oxidation ponds' systems, located in the Waverley, Kaponga, Manaia and Patea townships[1].

This report for the period July 2014-June 2015 describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess the STDC's environmental performance during the period under review, and the results and effects of the STDC's activities at these four oxidation ponds' systems.

During the monitoring period, STDC demonstrated an overall high level of environmental performance.

The STDC holds a total of six resource consents for the Waverley, Kaponga, Manaia and Patea oxidation ponds, which include a total of seventy-six conditions setting out the requirements that the STDC must satisfy. The consents for the Patea system were renewed six years previously while consents for the Manaia and Kaponga systems were renewed toward the end of the 2006-2007 monitoring period. The requisite upgrade to the Patea wastewater treatment system was completed by mid 2008, the Kaponga system by June 2008, the Waverley system by early 2009, and the Manaia system by early 2010.

Monitoring was performed to ensure continued maintenance and efficient operation of all treatment systems plus compliance with discharge permits' conditions.

No significant impacts of the Waverley, Manaia, Kaponga, or Patea treatment systems on adjacent receiving waters were recorded in late summer-autumn under low flow conditions during the monitoring period (at which time the Waverley system had been desludged with bio-bugs, the Manaia system had been upgraded with the addition of two wetlands, the Kaponga pond subsurface discharge rate was very low and receiving water dilution very high) in early winter under higher flow conditions (when the Patea upgraded ponds system discharged continuously), or on other occasions when monitoring of impacts was required by specific consent conditions. This monitoring continued the increased frequency of bacteriological receiving water surveys in the lower Patea River in relation to the upgraded oxidation pond system effluent and emergency sewage outfall discharges. Localised impacts of the Manaia pond's discharge have reduced markedly following the incorporation of wetlands into the treatment system as a component of the upgrade. However, the receiving stream may still require investigations associated with upstream water quality and receiving waters' and bacterial marker source tracking is proposed.

Liaison with the Council is used as a method for evaluating, and thus managing and controlling the introduction of industrial wastes into each of the oxidation pond treatment systems. No significant additional wastes connections were made to any of the systems during the year, and the Waverley system no longer received stock truck wastes from the nearby SH3 roadside facility as these had been directed to an on-site ponds treatment system. The Waverley ponds system, which had been reconfigured in the 2009-2010 period, had bacterial desludging operating over several months finishing in late 2014 during the current period.

[1] The Eltham, Hawera, and Opunake Wastewater Treatment Systems are the subject of separate reports by the Taranaki Regional Council.

There were two brief and one longer wet weather-related overflows of emergency pump station raw sewage from the Patea reticulation into the Patea River reported by the consent holder during the monitoring period under review when all aspects of consent conditions were complied with. Recent upgrades to this pump station, including measures taken to reduce the frequency and duration of overflows, have been very successful in reducing overflows, during or subsequent to, wet weather events in recent monitoring years.

Additional biomonitoring of pond performance utilising regular semi-quantitative assessments of ponds' microflora has provided long-term performance information for each system. Generally, diverse algal populations have indicated relatively healthy pond systems with the dominant algal taxa varying both with the location of the pond and the loading on the system. With the establishment of a lengthy historical pond microfloral record for each treatment system, this monitoring was replaced for the 2013-2014 and subsequent periods with chlorophyll-a measurements as a component of inspectorial visits. These measurements indicated good microfloral populations in all pond systems coincidental with positive dissolved oxygen saturation levels with seasonal variability often influenced by stormwater infiltration flushing and/or cooler temperatures. Highest chlorophyll-a levels were more apparent in the underloaded Kaponga, Waverley, and Patea systems and were often coincidental with high dissolved oxygen saturation levels.

Overall, high levels of environmental performance and compliance with resource consents were achieved by the STDC at each of the four municipal oxidation pond systems during the monitoring period, with continued improvement in respect of environmental compliance matters at the recently upgraded Manaia treatment system. No impacts of the re-configured, upgraded Patea system discharge on the bacteriological quality of the lower Patea River and at the more popular Mana Bay adjacent to the river mouth were detected in terms of compliance with contact recreational standards which were achieved throughout the summer-autumn period. Poorer bacteriological water quality under higher river flow conditions following wet weather periods were not further impacted by the discharges from the Patea system during spring and early winter.

This report also addresses monitoring of the use of the STDC stock truck wastewater disposal system near Waverley where the consent (with five conditions) allows for on-site land discharge of anaerobic-aerobic ponds' treated stock truck effluent. No re-occurrences of past dumping of human wastes into the system were recorded in 2014-2015 although some improvement in management of the pre-treatment waste reception area (roadside) needs to be addressed. The presence of appropriate signage and surveillance by the consent holder have been effective in maintaining compliance at the facility. No discharges to land or nearby natural water occurred at this site where the three pond system was de-sludged and ponds levels lowered in the previous 2013-2014 period. Increased monitoring of this facility was instigated by the Council eight years previously and will continue in conjunction with the programme for the Waverley municipal oxidation ponds system (where the stock truck wastes were disposed of originally).

Table of contents

List of tables

List of figures

List of photos

1. Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

The South Taranaki District Council (STDC) operates eight municipal wastewater treatment systems within its district. This report is the Annual Report for the period July 2014-June 2015 by the Taranaki Regional Council (the Council) on the monitoring programme associated with resource consents held by the STDC for the municipal oxidation ponds systems located at Waverley, Kaponga, Manaia and Patea. The programme also included the consent held for the discharge of treated stock truck effluent from the SH3 system to land (in a Waitotara catchment) near Waverley. The municipal systems located at Wai-inu Beach, Eltham, Hawera and Opunake are reported on separately by the Council.

This report covers the results and findings of the monitoring programme implemented by the Council in respect of the consents held by the STDC that relate to discharges of wastewater in the Wairoa (Waverley) and Waiau (Waitotara), Kaupokonui (Kaponga), Waiokura/Motumate (Manaia) and Patea (Patea) catchments.

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

1.1.2 Resource consents

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.

Each of the permits held by the STDC in relation to the Waverley, Kaponga, Manaia and Patea oxidation pond systems was issued by the Council as a resource consent under Section 87(e) of the RMA.

1.1.2.1 Waverley oxidation pond discharge consent and stock truck effluent discharge consent

The STDC holds discharge consent **0072** (granted on 13 August 1986 and renewal granted on 20 January 1998) to discharge up to 450 cubic metres per day of treated wastewater from the Waverley municipal oxidation ponds system into an unnamed tributary of the Wairoa Stream. It is due to expire on 1 June 2016. The special conditions described within the permit relate to a requirement to maintain the oxidation ponds system in an aerobic condition, a requirement to notify Council in the event that trade wastes are to be disposed of through the system, a requirement to minimise impacts on receiving waters, and two review periods (June 2004 and June

2010) for the purpose of ensuring that the conditions adequately deal with the environmental effects arising from the exercise of the consent. The options for the reviews in June 2004 and June 2010 were not exercised as the consent conditions adequately dealt with the environmental effects arising from the consented discharge.

STDC also holds discharge consent **6621** (granted on 19 September 2005) to discharge treated stock truck effluent onto and into land in the vicinity of the Waiau Stream. It has an expiry date of 1 June 2022 and two review dates of June 2010 and June 2016. The special conditions described within the permit relate to requirements to minimise impacts on a nearby watercourse, maintenance of the system and provision for two reviews. The option for the review in June 2010 also was not exercised as the consent conditions adequately dealt with the environmental effects arising from the consented discharge.

Copies of the consents are included in Appendix 1.

1.1.2.2 Kaponga oxidation pond discharge consent

The STDC holds discharge consent **0861** (first granted on 12 August 1981) to discharge up to 500 cubic metres per day of treated wastewater from the Kaponga municipal oxidation ponds sewage treatment system into the Kaupokonui Stream. The consent holder was granted a change to consent conditions on 4 March 1997. It expired on 1 June 2005 and was renewed on 6 June 2007. The special conditions described within the current permit relate to requirements for upgrading the system, monitoring, maintenance of the oxidation ponds system in an aerobic condition, notification to Council in the event that trade wastes are to be disposed of through the system, minimisation of impacts on receiving waters; and provided three review dates (June 2011, June 2017 and June 2023) for the purpose of ensuring that the conditions adequately deal with the environmental effects arising from the exercise of the consent, with an expiry date of June 2029. The option for review in June 2011 was not exercised as the consent conditions had dealt adequately with the environmental effect arising from the consented discharge.

A copy of the renewed consent is included in Appendix 1.

1.1.2.3 Manaia oxidation pond discharge consent

The STDC holds discharge consent **1204** (first granted on 14 December 1983) to discharge up to 600 cubic metres per day of treated sewage effluent from the Manaia municipal oxidation pond into an unnamed coastal stream between the Waiokura Stream and the Motumate Stream. The consent has subsequently been granted renewals on 16 June 1993, 21 July 1999 and 6 June 2007. The special conditions described within the permit relate to requirements for monitoring, upgrading of the system, maintenance of the oxidation ponds system in an aerobic condition and provision of a management plan, notification to Council in the event that trade wastes are to be disposed of through the system, minimisation of impacts on coastal receiving waters, and implementation of a stormwater and groundwater infiltration reduction programme. The consent provides for three review periods (June 2011, June 2017 and/or June 2023) for the purpose of ensuring that the conditions adequately deal with the environmental effects arising from the exercise of the consent. Reporting has proceeded according to timeframes and the appropriate upgrade to the system was

completed in late 2009. The option for review in June 2011 was not exercised as the consent conditions had dealt adequately with the environmental effects arising from the consented discharge.

A copy of the renewed consent is included in Appendix 1.

1.1.2.4 Patea oxidation pond discharge consent

The STDC holds discharge consent **0067** (first issued on 11 February 1987) for the discharge of up to 455 cubic metres per day of treated municipal sewage from the Patea oxidation pond systems into the Patea River. The consent was subsequently granted a renewal on 29 July 1992. It expired on 1 June 2004 and was renewed as a coastal permit on 7 February 2006 by the Minister of Conservation. The special conditions described within the permit relate to requirements for monitoring, to maintain the oxidation ponds system in an aerobic condition, to notify the Council in the event that trade wastes are to be disposed of through the system, and to minimise any impacts on the receiving waters. They also required that the system be upgraded within two years of the renewal date, with progress reports in June 2006 and June 2007. A variation was granted in February 2006 to allow for a short-term delay to the upgrade which subsequently has been completed.

The STDC also holds discharge consent **0145** (first issued on 13 November 1985) for the discharge of untreated municipal sewage only in emergencies into the Patea River. The original consent expired on 1 June 2005 and was renewed as a coastal permit in conjunction with consent **0067**. The special conditions described within the permit relate to the prescription of what constitutes an emergency (i.e. under what circumstances the consent may be exercised), notification, alarm requirements, duration of exercise, review, monitoring, contingency planning and inspection and record keeping by the applicant and an upgrade of the outfall.

A consent (**4576**) is also held for both the oxidation pond outfall and emergency outfall structures with conditions relating to upgrades, maintenance and review provisions. This consent is for a duration of 23 years and was granted in November 2005.

Copies of the consents are included in Appendix 1.

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 social-economic effects;
(b) physical effects on the locality, including landscape, amenity and visual effects;
(c) ecosystems, including effects on plants, animals, or habitats, whether aquatic or terrestrial;
(d) natural and physical resources having special significance (e.g., 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 discharge source. Monitoring programmes are not only based on exiting 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 performance of resource users against regional plans and consents. Compliance monitoring, (covering both activity and impact) monitoring, also enables the Council to continuously assess its own performance in resource management as well as that of resource users particularly consent holders. It further enables the Council to continually re-evaluate its approach and that of consent holders to resource management, and, ultimately, through the refinement of methods, and considered responsible resource utilisation to move closer to achieving sustainable development of the region's resources.

1.1.4 Evaluation of environmental and administrative performance

Besides discussing the various details of the performance and extent of compliance by the consent holder/s during the period under review, this report also assigns a rating as to each Company's 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 interpretation, are as follows:

Environmental Performance

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

- **Good:** Likely or actual adverse effects of activities on the receiving environment were negligible or minor at most. There were some such issues noted during monitoring, from self reports, or in response to unauthorised incident reports, but these items were not critical, and follow-up inspections showed they have been dealt with. These minor issues were resolved positively, co-operatively, and quickly. The Council was not obliged to issue any abatement notices or

infringement notices in relation to the minor non-compliant effects; however abatement notices may have been issued to mitigate an identified potential for an environmental effect to occur.

For example:

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

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

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

Administrative performance

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

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

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

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

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

demonstrated a good level of environmental performance and compliance with their consents.

1.2 Monitoring programme: water

1.2.1 Introduction

Section 35 of the RMA sets out obligations upon the Council to gather information, monitor, and conduct research on the exercise of resource consents, and the effects arising, within the Taranaki region and report upon these obligations.

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.

1.2.2 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, or new consents, advice on the Council's environmental management strategies and the content of regional plans, and consultation on associated matters.

1.2.3 Waverley oxidation pond and stock truck wastes treatment system

The monitoring programme for the Waverley oxidation pond consisted of three main components: site inspections, biological monitoring of the oxidation ponds, and a physicochemical survey of the effluent and receiving waters. The stock truck wastes treatment system was also inspected within this programme. Where appropriate, sources of data or information being collected by the consent holder were also identified and accessed, so that performance in respect of operation, internal monitoring, and supervision could be reviewed by the Council. Results and observations are discussed within section 2 of this report.

Site inspections

The Waverley oxidation ponds system was scheduled for three inspections during the monitoring period. These inspections were conducted during mid-morning and focused on the maintenance, operation and refurbishment of the oxidation ponds system and the condition of the receiving waters. The stock truck wastewater treatment system was inspected on the same three occasions during the period.

Physicochemical sampling

The Council undertook a physicochemical sampling survey of the receiving water quality upstream and downstream of the oxidation ponds, and of the effluent from the oxidation ponds during early autumn under very low flow conditions. The sampling sites are shown in Figure 1 (Section 2), of this report. The samples were analysed for temperature, pH, conductivity, chloride, dissolved oxygen, total and filtered uninhibited biochemical oxygen demand, turbidity, suspended solids, dissolved reactive phosphorus, ammonia and faecal coliform bacteria by the Council laboratory.

In addition samples were taken from the second section of the oxidation ponds (i.e. adjacent to the pond outlet) during the three site inspections and analysed for temperature and dissolved oxygen.

Biological monitoring

The Council collected samples of effluent from the surface of the second section of the ponds system (adjacent to the outlet) on all three inspection occasions for the purpose of monitoring the oxidation ponds performance by way of evaluation of the microfloral chlorophyll-a concentrations.

1.2.4 Kaponga oxidation pond

The monitoring programme for the Kaponga oxidation ponds system consisted of four main components: three site inspections and biological monitoring of the oxidation pond system, a physicochemical effluent survey, three receiving water physicochemical surveys, and a biological survey of the receiving waters. Where appropriate, sources of data or information being collected by the consent holder were also identified and accessed, so that performance in respect of operation, internal monitoring, and supervision could be reviewed by the Council. Results and observations are discussed separately within section 3 of this report.

Site inspections

The Kaponga oxidation ponds system was scheduled for three inspections during the monitoring period. These inspections were conducted during early to mid-morning and focused on the maintenance and operating condition of the oxidation pond system.

Physicochemical sampling

The Council undertook a physicochemical sampling survey of the receiving water quality upstream and downstream of the oxidation ponds, and of the effluent from the oxidation ponds during late summer under very low river flow conditions. The sampling sites are shown in Figure 3 (Section 3) of this report. The samples were analysed for temperature, pH, conductivity, chloride, dissolved oxygen, total and filtered uninhibited biochemical oxygen demand, turbidity, suspended solids, dissolved reactive phosphorus, ammonia and faecal coliform bacteria by the Council laboratory. Further receiving water physicochemical sampling, required by the renewed consent conditions, was undertaken at two sites at the time of the other two inspections.

In addition, samples were also taken from the second section of the oxidation ponds system (i.e. adjacent to the pond outlet) during the three site inspections and analysed for temperature and dissolved oxygen.

Biological sampling

One late summer biomonitoring survey was conducted in the Kaupokonui River at three sites to assess the impact of the oxidation ponds system discharge on the receiving water.

Biological surveys are used to assist in the determination of what effects discharges may be having on the environment over a period of time, as distinct from physicochemical surveys which give detailed information upon the constituents of the discharge and receiving waters at the time of sampling but cannot give information upon previous discharge characteristics or effects.

Biological surveys also directly indicate whether any significant adverse effects of discharges upon in-stream flora and fauna have occurred, so that cause-effect relationships do not have to be established as is the case with critical levels of individual physicochemical parameters.

In addition, the Council collected samples of effluent from the ponds system's surface (adjacent to the outlet) on the three inspection occasions for the purpose of monitoring the oxidation ponds performance by way of evaluation of the microfloral chlorophyll-a concentrations.

1.2.5 Manaia oxidation pond

The monitoring programme for the Manaia oxidation pond consisted of five main components: site inspections, physicochemical effluent monitoring, biological monitoring of the oxidation pond, bacteriological monitoring of the receiving waters (stream and coastal), and low tide ecological inspections of the beach. Where appropriate, sources of data or information being collected by the consent holder were also identified and accessed, so that performance in respect of operation, internal monitoring, and supervision could be reviewed by the Council. The neighbourhood was also surveyed for environmental effects. Results and observations are discussed separately within section 4 of this report.

Site inspections

The Manaia oxidation pond system was scheduled for three inspections during the monitoring period. These inspections were conducted during mid-morning and focused on the maintenance and operating condition of the oxidation pond and wetlands and specific areas of the reticulation.

Physicochemical sampling

The Council undertook the programmed comparative physicochemical sampling of the effluents from the oxidation pond and wetlands during late autumn under moderately low flow conditions and delayed from summer when the very dry conditions resulted in minimal flow into the wetlands and no discharge to the stream. These samples were analysed for temperature, pH, conductivity, chloride, dissolved oxygen, total and filtered uninhibited biochemical oxygen demand, turbidity, suspended solids, dissolved reactive phosphorus, ammonia and faecal coliform bacteria. A sample was taken from the wetlands outlet on one other site inspection occasion during the period. This was analysed for temperature, dissolved oxygen, conductivity and faecal coliform bacteria.

In addition, on two inspection occasions, samples were collected upstream and downstream of the effluent discharge to the Manaia Creek and also at two sites in the nearby coastal waters of the Tasman Sea (Figure 5, Section 4). All samples were analysed for conductivity and faecal coliform bacteria by the Council laboratory.

Biological monitoring

Both low tide beach ecological inspections in the programme were performed to assess the impact of the discharge from the oxidation pond and the additional wetlands, on the marine environment. These occurred in mid summer 2014 and early winter 2015.

Biological surveys are used to assist in the determination of what effects discharges may be having on the environment over a period of time, as distinct from physicochemical surveys which give detailed information upon the constituents of the discharge and receiving waters at the time of sampling but cannot give information upon previous discharge characteristics or effects. Biological surveys also directly indicate whether any significant adverse effects of discharges upon in-stream flora and fauna have occurred, so that cause-effect relationships do not have to be established as is the case with critical levels of individual physicochemical parameters.

In addition, the Council collected samples of effluent from the pond's surface (adjacent to the outlet) on the three inspection occasions for the purpose of monitoring the oxidation ponds performance by way of evaluation of the microfloral chlorophyll-a concentrations.

1.2.6 Patea oxidation pond

The monitoring programme for the Patea oxidation pond consisted of four main components: site inspections, physicochemical surveys, biological monitoring of the final cell of the oxidation pond and bacteriological monitoring of the receiving waters upstream and downstream of the emergency discharge and pond effluent discharge. Where appropriate, sources of data or information being collected by the consent holder were also identified and accessed, so that performance in respect of operation, internal monitoring, and supervision could be reviewed by the Council. The neighbourhood was surveyed for environmental effects. Results and observations are discussed separately within Section 5 of this report.

1.2.7 Site inspections

The Patea oxidation pond system was scheduled for three inspections during the monitoring period. These inspections were conducted during mid-morning and focused on the maintenance and operating condition of the oxidation pond and its upgrade and the usage and maintenance of the emergency outfall system.

Physicochemical sampling

The Council undertook a physicochemical sampling survey of the effluent from the oxidation pond system during autumn. These samples were analysed for temperature, pH, conductivity, chloride, dissolved oxygen, turbidity, suspended solids, and enterococci and faecal coliform bacteria by the Council laboratory. (No receiving water sampling was performed at this time as the river was in fresh).

In addition, on each inspection occasion, samples were taken from the final cell of the pond near the outlet during the site inspections and analysed for temperature and dissolved oxygen.

Bacteriological surveys were conducted on two inspection occasions at four river monitoring sites during low tide conditions to assess the impact of the oxidation pond discharge on the receiving water, and also with respect to possible intermittent usage of the emergency outfall. Samples were analysed for temperature, conductivity and faecal coliform and enterococci bacteria.

No additional river receiving water bacteriological surveys were required in association with usage of the emergency overflow outfall as although one overflow occurred during the period, this was for a very short period (approximately half an hour) during the season when additional recreational bacteriological water quality monitoring was undertaken on twenty occasions at one lower river and one coastal site (Mana Bay), during the 2014-2015 bathing season.

Biological sampling

In addition, the Council collected samples of effluent from the final cell of the pond's surface (adjacent to the outlet) on each inspection occasion for the purpose of monitoring the oxidation ponds' performance by way of evaluation of the microfloral chlorophyll-a concentrations.

2. Waverley oxidation pond

The Waverley oxidation pond is a single pond system that is divided into two sections by a wooden/asbestos wall which has been operative since 1973. It receives mainly domestic wastes (population 900 in 2013) with a small industrial waste (sawmill) component. It previously received wastes from the stock truck facility on SH3 sited approximately 2 km south of the township. However, the stock truck wastes disposal was changed to an anaerobic-aerobic pond system, with on-site discharge to adjacent land during the 2006-2007 period. The municipal oxidation pond system was reconfigured during the 2008-2009 period with the existing outfall abandoned, the secondary pond converted to a primary pond with a new inlet design, repairs made to the dividing wall, and the primary pond converted to a secondary pond with a repositioned outlet connected into the original outfall to the Wairoa Stream. The pond system was lowered incrementally during winter 2008 and levels returned to normal by late summer 2009. However, the desludging of the pond system was delayed until a suitable disposal site was established by STDC (see TRC, 2009a) but was re-scheduled for bacterial desludging in the latter part of 2013 (STDC, 2013). 'Sludge-bugs' were introduced into the system for the purpose of microbial sludge digestion in September 2013 and this was completed by December 2014 with more than 5000 cubic metres of sludge removed (STDC, 2015). Inlet flow monitoring was added in 2010. Mechanical screening of the incoming wastes was installed at the inlet during the latter half of the 2012-2013 period. This has associated telemetry alarming and was operative during the 2014-2015 period.

2.1 Inspections

2.1.1 Oxidation pond

In accordance with the monitoring programme, three inspections were performed, on 22 July 2014, 15 December 2014 and 3 March 2015. The physical features of the pond system were recorded and the dissolved oxygen concentration of the second section of the pond was measured from the pond's surface adjacent to the effluent outlet. The results are presented in Table 1. In addition, a sample was collected during each inspection for chlorophyll-a analysis as an assessment of microfloral 'health'. These results are discussed in section 2.3.

Table 1 Dissolved oxygen measurements from the surface of the second section of the Waverley oxidation pond adjacent to the outfall

Date	Time	Temperature	Dissolved Oxygen	
			Concentration	Saturation
	NZST	C	g/m^3	%
22 July 2014	0940	8.2	12.9	110
15 December 2014	0825	19.2	13.3	144
3 March 2015	0820	22.9	2.6	30

As dissolved oxygen can vary seasonally and on a daily basis (with minimum concentrations generally recorded in early daylight hours), sampling times were standardised toward early to mid-morning for comparative purposes.

Aerobic conditions were recorded on all monitored occasions with dissolved oxygen levels within the typical range expected for this type of biological treatment system. Two instances of supersaturation were recorded in mid winter (110%) and mid summer (144% saturation) and there were no instances of very low saturation. Minimal wave action on the ponds (i.e. flat to slight rippling) was noted coincident with light wind to calm conditions at the times of these inspections.

The ponds' system varied from turbid grey-green to pale green to dark green/brown in appearance on inspection occasions, with effluent appearance varying from turbid, pale green to pale lemon at the discharge outfall where the estimated discharge rate ranged from < 0.001 L/s (autumn) to 4 L/s (winter). The ponds' surrounds generally were maintained in a tidy condition (mown) and the ponds' surfaces were clear of debris.

The wavebands were generally in good condition. There was no indication that the sludge layer was close to either pond's surface as determined by the 'rock' test and bio-bugs dosing of both ponds continued through the July 2014 to December 2015 period. No obvious odours were recorded adjacent to either pond and only slight odours near the primary pond stepscreen on two of the three inspection occasions. No foaming in the receiving waters of the tributary stream was observed near the outfall to the stream and/or within the mixing zone permitted by the consent, with no 'sewage fungus' growths apparent in the receiving waters on any of the three inspection occasions.

Moderate number of wildlife were recorded on the ponds, (mainly mallard ducks) with black swan, scaup ducks, and pied stilt each on one occasion.

2.1.2 Stock truck wastes treatment system

Prior to the 2006-07 monitoring period, stock truck wastewater discharged into the facility adjacent to SH3, 2 km south of Waverley, was held on site in storage tanks prior to tanker disposal to the Waverley oxidation ponds system (TRC, 2006). However, a decision was made to treat the wastewater on site in an anaerobic pond followed by two lined aerobic ponds prior to discharge on to land at the head of a steep gully in the vicinity of the Waiau Stream. This decision was related to the costs of transport and the amount of inert solids introduced to the Waverley ponds for disposal, despite the Waverley municipal oxidation pond system being underloaded and capable of assimilating this wastewater.

Inspections of the new on-site disposal system initially found it to be operating adequately, until September 2006 when the consent holder advised that illegal dumping of human domestic wastes had occurred. The source of this disposal was uncertain.

Subsequent inspections in October and November 2006 found extensive evidence of human sewage and debris which had recently been dumped. No debris of this nature had carried over into the two aerobic ponds and no discharge to land was obvious. Because of the apparent large volume dumped, it was assumed to have originated from a contract tanker rather than campervans/motor homes. An abatement notice was issued to the consent holder who organised a tanker to empty the anaerobic pond and dispose of the wastes at an authorised facility. The consent holder also installed a surveillance camera on-site and appropriate signage. Subsequent inspections in

January and May 2007 found that all human wastes had been removed, the pond system was operating normally, and no discharge was occurring.
Similarly, over the 2007-2008 period, the pond system operated normally with no discharge from the final pond. On one occasion (November, 2007) there was further evidence of some human wastes and rubbish in the first pond. The consent holder removed the material which was transported to the Hawera WWTP industrial tanker discharge facility, but despite video surveillance at the Waverley site, the unlawful discharge was unable to be sourced. No problems were found with the system over the 2008-2009, 2009-2010, 2010-2011, 2011-2012, 2012-2013, or 2013-2014 periods and no overflows to land were recorded or apparent. Desludging of the anaerobic pond was performed during the 2013-2014 season.

Four inspections of the system, performed between mid July 2014 and early March 2015 found the system well managed with the first two ponds full and the third pond just below the outlet level on the first two inspection occasions. There were no significant odours recorded downwind of the system on any occasions. No human wastes were present in the system and no debris was noted on the surface of two of the ponds. However, at the time of the December 2014 inspection it was noted that some rubbish (from an overflowing waste bin) had blown into the anaerobic pond. At the time of the March, 2015 inspection very low levels were recorded in all three ponds. Maintenance of the receptor area has been generally acceptable as there was minimal evidence of localised spillage onto the reception area. However, there was evidence in March 2015 that not all users had been washing down the reception concrete pad area after unloading wastes to the system and no hosing facility was available. No overflows to land from the ponds system were apparent on any inspection occasion. The signage remained in place throughout the period.

2.2 Physical, chemical and bacteriological sampling

An early autumn assessment of the impact of the oxidation ponds' effluent discharge on the receiving waters of an unnamed tributary of the Wairoa Stream was performed on 3 March 2015 during fine, calm weather, and very low flow conditions after a very dry mid to late summer period. The sampling sites' locations are shown in Figures 1 and 2 and listed in Table 2.

Table 2 Sampling site locations for the Waverley oxidation ponds system

No.	Site	Location	GPS reference	Site code
2	Unnamed tributary of the Wairoa Stream	Upstream of confluence with the oxidation ponds discharge receiving waters	1739148 E 5596620 N	WRO 000069
OP	Oxidation pond effluent	At outfall to stream	1739140 E 5596588 N	OXP 002005
4	Unnamed tributary of the Wairoa Stream	Approximately 400 m downstream of the oxidation ponds discharge (Waverley Beach Road)	1739367 E 5596322 N	WRO 000077
5	Wairoa Stream	Outlet of Ihupuku Swamp approximately 3 km d/s of discharge (Beach Road)	1739402 E 5593780 N	WRO 000150

Site 2 is located upstream and site 4 downstream of the oxidation pond discharge.

Site 5 has been established to provide an indication of the overall impact of the discharge on the Wairoa Stream in its mid reaches after seepage through the extensive wetlands (i.e. the 9 hectare Ihupuku Swamp) which characterises this drainage system.

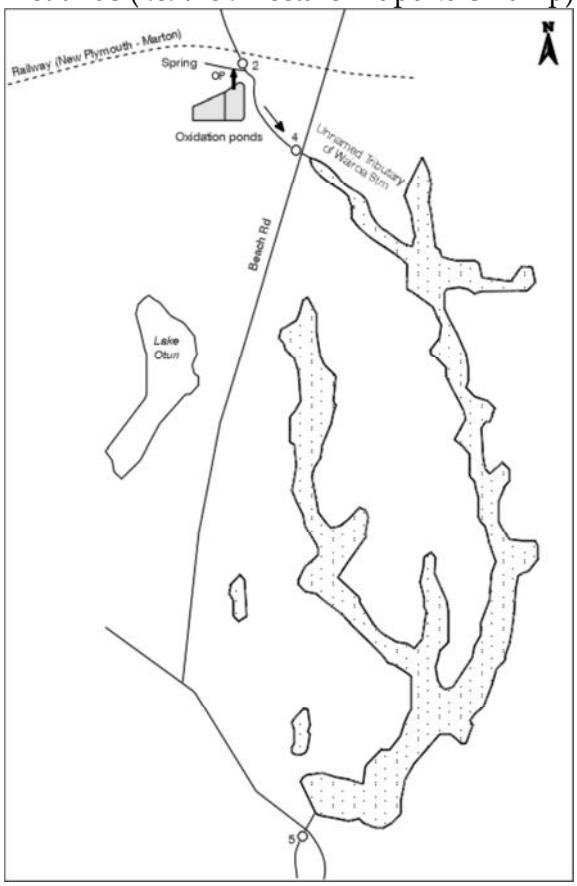

Figure 1 Sampling sites in an unnamed tributary of the Wairoa Stream in relation to Waverley oxidation ponds

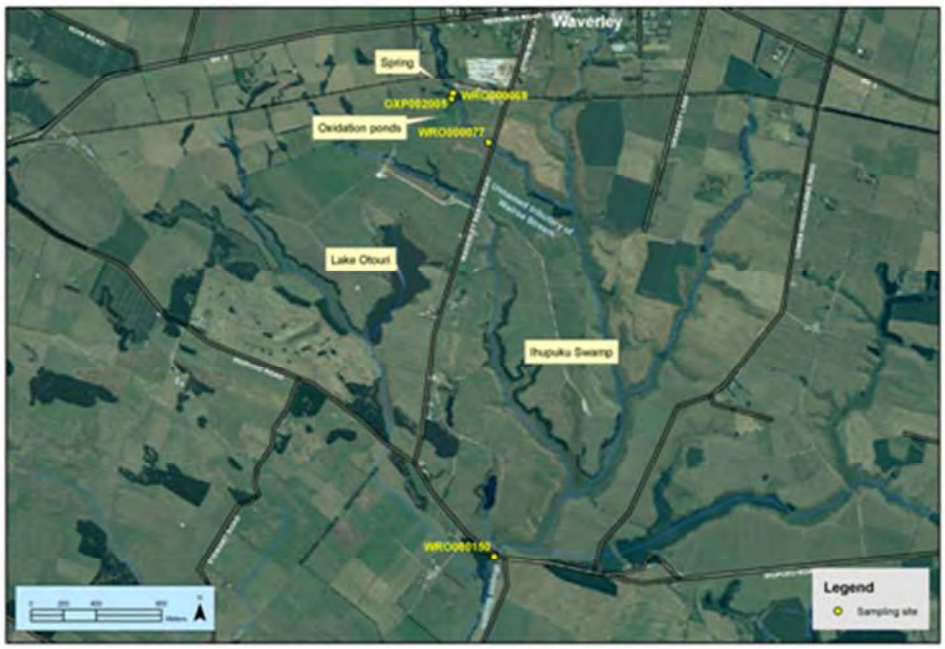

Figure 2 Aerial location map of sites in relation to Waverley oxidation ponds

The results of the survey are summarised in Table 3. All analyses were performed in the Council's IANZ-registered laboratory using standard methods.

Table 3 Results of the sampling survey of 3 March 2015

Site		2	OP	4	5
Location		Upstream	Discharge	Downstream	
Parameter	Unit				
Time	NZST	0835	0855	0915	0925
Flow	l/s	8	<0.001	22	-
Temperature	°C	16.6	22.9	15.7	17.3
Dissolved oxygen	g/m^3	9.0	2.6	8.2	3.8
DO saturation	%	93	30*	83	40
BOD_5	g/m^3	2.5	21	2.6	1.2
BOD_5 (filtered carbonaceous)	g/m^3	0.8	12	0.5	0.6
pH	pH	7.7	7.9	7.6	7.2
Conductivity @ 20°C	mS/m	28.8	65.3	31.6	29.7
Chloride	g/m^3	33.6	75.6	37.0	39.5
Dissolved reactive phosphorus	g/m^3 P	0.010	4.06	0.054	0.037
Ammonia-N	g/m^3 N	0.069	0.251	0.033	0.014
Un-ionized ammonia	g/m^3 N	0.0013	0.0114	0.0005	0.0001
Suspended solids	g/m^3	19	11	26	11
Turbidity	NTU	8.9	9.4	16	7.7
Black disc	m	0.47	-	0.64	0.75
Faecal coliform bacteria	nos/100 ml	800	100	780	200
Appearance		rel. clear, uncoloured (some fines)	rel. clear, pale-lemon	rel. clear, uncoloured	rel. clear, uncoloured

[Note: * DO saturation @ 22.9˚C in final pond at 0820 NZST]

The flow in the small tributary receiving the oxidation pond's effluent was uncoloured and relatively clear (although some fines were noted in the water column as the softbed of the stream is easily disturbed) upstream of the oxidation pond discharge with a flow rate gauged at 8 L/s.

2.2.1 Effluent quality

The results of the effluent quality analytical survey performed in early March 2015 are summarised and compared with historical data from past surveys in Table 4.

Table 4 Results from the survey in the 2014-2015 period and data from Waverley oxidation pond (second section) effluent analyses recorded for the period 1987 to 30 June 2014

Parameter	Unit	2014-2015 Survey	Past data		
		3 Mar 2015	No of samples	Range	Median
Dissolved oxygen	g/m^3	2.6	83	0.9-21.0	6.8
DO saturation	%	30	77	10-227	68
BOD5 (total)	g/m^3	21	25	11-66	30
BOD5 (filtered)	g/m^3	12	22	2.2-11	4.9
pH	pH	7.9	26	7.7-9.5	8.3
Conductivity @ 20^{o}C	mS/m	65.3	27	43.3-68.7	58.7
Ammonia-N	g/m^3 N	0.25	27	0.10-26.2	4.69
Dissolved reactive phosphorus	g/m^3 P	4.06	26	1.52-7.98	6.02
Suspended solids	g/m^3	11	25	27-220	68
Turbidity	NTU	9.4	22	5-210	32
Faecal coliform bacteria	nos/100 ml	100	27	100-91,000	7,200

Note: With the exception of DO results, historical data were recorded mainly from summer surveys.

The effluent quality (Table 4) from the reconfigured pond system was relatively typical of the range expected from municipal oxidation pond wastes. On this occasion quality was very similar to or slightly better than median DRP level, pH, conductivity, and total BOD_5. The quality, after a very dry period, was much better than median levels for turbidity and ammonia-N and far better for faecal coliform bacteria number and suspended solids level. This was coincident with a moderate microfloral population density in early autumn in the pond. The quality was typical to better than typical of the effluent from a biological treatment system receiving essentially domestic wastes, as emphasised by the relatively low filtered BOD_5 concentration, and in the absence of the disposal of stock truck or any other significant industrial wastes to the system.

This early autumn effluent quality was within the range of past quality for all parameters, with the exception of the suspended solids concentration which was 59% lower than the previous minimum, and the faecal coliform bacteria number which was equal with the minimum, recorded over a 27-year period of annual surveys.

2.2.2 Impacts on receiving waters

An extremely low discharge rate of 0.0008 L/s (2.8 L/hr) was measured at the time of the survey following a very dry late summer period. The receiving water flow measured upstream of the discharge in the adjacent contributing watercourse was low at 8 L/s. Flow measurements at the time of the survey indicated an instantaneous effluent dilution ratio in excess of 5000:1 in the receiving waters.

Upstream water quality (at site 2) was generally relatively good, with a dissolved oxygen saturation of 93%, moderate level of dissolved reactive phosphorus and ammonia-N nutrients and a low dissolved BOD_5, although there were elevated turbidity and suspended solids, and low black disc clarity as a result of easily disturbed fine sediment amongst the vegetation on the stream bed. However, there was an elevated faecal coliform bacteria count, indicative of possible stock and/or wildlife access upstream.

Due to the high dilution ratio (higher than usual for this site), impacts of the discharge on the stream (downstream of the effluent discharge at site 4) were less pronounced

and included mainly small increases in dissolved reactive phosphorus, turbidity, and suspended solids, but not in dissolved or total biochemical oxygen demand and ammonia concentrations, or in faecal coliform bacteria. There was also a small decrease (of 10%) in dissolved oxygen saturation. The relatively small increase in turbidity and suspended solids levels and reduction in ammonia nitrogen were a consequence of a high dilution ratio, and settlement and filtration by the dense weed growth and slower flow present through the reach of the stream between the outfall and site 4. There were no visible impacts on stream appearance at this site.

The water quality measured at the furthest downstream site (site 5), after approximately 3 km of the Ihupuku Swamp wetlands, continued to record a relatively low dissolved oxygen concentration and small decrease in pH, similar trends to those found by all previous years' surveys. However, relatively low dissolved oxygen levels are typical of outflows from extensive wetland areas, in which more stagnant, less aerated reducing conditions and lower pH are typical. Water quality of the stream improved, in comparison with upstream conditions (at site 4), in terms of marked decreases in suspended solids and nutrient concentrations (particularly ammoniacal nitrogen) and faecal coliform bacteria levels following filtration and nutrient uptake by wetland vegetation. The faecal coliform bacteria number at site 5 was markedly lower (by 75%) in comparison with the number at the upstream 'control' site 2. The dissolved BOD_5 concentration and turbidity were reduced to slightly lower levels than those recorded at the upstream 'control' site while ammonia concentration was nearly 80% lower. Black disc visibility was slightly better than the equivalent value at the upstream 'control' site and some improvement on aesthetic conditions recorded at site 4.

2.3 Biological monitoring

2.3.1 Microflora of the pond system

Pond microflora are very important for the stability of the symbiotic relation with aerobic bacteria within the facultative pond. These phytoplankton may be used as a bio-indicator of pond conditions (e.g. cyanobacteria are often present in under-loaded conditions and chlorophyceae are present in overloaded conditions). To maintain facultative conditions in a pond system there must be an algal community present in the surface layer.

The principal function of algae is the production of oxygen which maintains aerobic conditions while the main nutrients are reduced by biomass consumption. Elevated pH (due to algal photosynthetic activity) and solar radiation combine to reduce faecal bacteria numbers significantly.

Samples of the secondary pond effluent had been collected at the time of most inspections of the Waverley oxidation ponds system for semi-quantitative microfloral assessment prior to curtailment of this component of the programme during the 2012-2013 period. The microflora present in the secondary oxidation pond have been summarised and discussed in recent annual reports and historical data have been provided in a previous annual report (TRC, 2009).

Samples of the secondary pond effluent were collected on all three inspection occasions for chlorophyll-a analyses. Chlorophyll-a concentration can be used as a useful indicator of the algal population present in the system. (Note: Pearson (1996) suggested

that a minimum in-pond chlorophyll-a concentration of 300 mg/m^3 was necessary to maintain stable facultative conditions). However, seasonal changes in algal populations and also dilution by stormwater infiltration might be expected to occur in any wastewater treatment system which together with fluctuations in waste loading would result in chlorophyll-a variability.

The results of secondary pond effluent chlorophyll-a analyses and historical data are provided in Table 5 together with field observations of pond appearance.

Table 5 Chlorophyll-a measurements from the surface of the Waverley secondary oxidation pond at the perimeter adjacent to the outlet

Date	Time NZST	Appearance	Chlorophyll-a (mg/m^3)	Chlorophyll-a (mg/m^3) data for period 2013-mid 2014		
22 July 2014	0940	pale green	1,100	N	Range	Median
15 December 2014	0825	dark green	694	3	144-200	159
3 March 2015	0820	dark green-brown	270			

High concentrations were recorded in July and December 2014 coincident with dissolved oxygen supersaturation of 110% and 144%, whereas the moderate chlorophyll-a concentration in early autumn coincided with much lower saturation (30%) in the secondary pond at the time of sampling (0820 hrs). All concentrations were higher than recorded over the previous one year period.

2.4 Investigations, interventions, and incidents

The monitoring programme for the year was based on what was considered to be an appropriate level of monitoring, review of data, and liaison with 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).

In the 2014-2015 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with the Company's conditions in resource consents or provisions in Regional Plans.

2.5 Discussion

2.5.1 Discussion of performance

The Waverley oxidation pond sewerage treatment system was well maintained and operated, and performed satisfactorily throughout the monitoring period following the relatively recent reconfiguration of the divided pond to the extent that the performance of the system was considered to be typical of a biological treatment system receiving essentially domestic wastes with some improvements compared to historical treated wastewater quality. There were no instances of large areas of scum development recorded or reported as had occasionally been the case in the past. The consent holder had previously advised that desludging of the system would be necessary and would involve the pumping of sludge to a small partitioned area in the main pond, specifically designed for containment and drying of the sludge. This was not undertaken as it was decided to wait until a new STDC sludge disposal site is consented for usage. Originally the intention was to transport de-watered sludge to the Patea landfill for disposal but local concerns with disposal at this site resulted in the need for an alternative disposal option. However, during September 2013 'sludge bio-bugs' were introduced to the ponds system for desludging purposes and the ponds were dosed with these bugs for several months, ending in the late 2014.

The annual (early autumn) physicochemical survey, performed under a period of low receiving water flow conditions and an extremely low rate of wastewater discharge, recorded a good effluent quality with low nutrients and BOD_5 concentrations, and very low faecal coliform bacteria number and suspended solids concentration discharged to the receiving waters of the Wairoa Stream.

This was coincident with a moderate algal population density observed in the reconfigured ponds system at this time. All waste parameters were within the ranges typically observed for municipal oxidation ponds systems for the time of year when sampling was performed and for this system which receives essentially domestic wastes, especially as the system no longer is used for the disposal of stock truck wastewater. An above median conductivity level was probably correlated with the lengthy very dry period preceding the survey whereas most other parameters were better than historical medians, particularly faecal coliform bacteria and suspended solids which were equal with or lower than previous minima.

Chlorophyll-a concentrations were indicative of moderate to high microfloral richnesses attributable to relatively low pond loadings and zooplankton grazing from time-to-time within the system and positively correlated with dissolved oxygen saturation levels.

2.5.2 Environmental effects of exercise of water permit

There were no 'sewage fungal' growths observed by inspections performed under varying flow conditions in the short section of the receiving tributary immediately downstream of the effluent outfall, and there was no localised foaming within the mixing zone of the receiving waters.

Under very low receiving water flow conditions, dilution of the extremely low discharge rate was more than adequate at the time of the early autumn receiving water survey. This survey recorded minor impacts of the discharge on the water quality of

the Wairoa Stream tributary, with small increases in turbidity, suspended solids, and dissolved reactive phosphorus levels. However, these and other effects were readily assimilated, first by the aquatic weed growth in the tributary, and then in the extensive Ihupuku wetland area located downstream of Beach Road. No other significant impacts were recorded within the receiving waters with only a small reduction in percentage dissolved oxygen saturation and no increase in bacterial number immediately below the discharge outfall. Lowered pH, nutrient, and dissolved oxygen levels and bacterial numbers further downstream below the wetland were consistent with past monitoring results and typical of wetland drainage streams.

2.6 Evaluation of performance

A tabular summary of STDC's compliance record for the year under review is set out in Table 6 for the oxidation pond system and Table 7 for the stock truck effluent disposal system.

Table 6 Summary of performance for Consent 0072-2 -

Purpose: Discharge of treated municipal wastewater to water		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Operational and maintenance requirements	Inspections and sampling of system	Yes
2. Trade wastes connections	Liaison with consent holder	Yes
3. Limits on receiving water effects	Inspections and physicochemical sampling	Yes
4. Optional review provision re environmental effects	No further review scheduled before expiry in June 2016	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

During the year, STDC demonstrated a high level of environmental performance and compliance with the resource consent for the municipal wastewater treatment system.

Table 7 Summary of performance for Consent 6621-1

Purpose: Discharge of treated stock truck wastewater to land		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Best practicable option	Inspections	Yes
2. Limits on receiving water quality	Inspections and physicochemical sampling	N/A (no discharge)
3. Limits on receiving water effects	Inspections and physicochemical sampling	N/A (no discharge)
4. Design and maintenance	Inspections	Yes
5. Optional review provision	Not scheduled for consideration until June 2016	N/A

Overall assessment of consent compliance and environmental performance in respect of this consent	High
Overall assessment of administrative performance in respect of this consent	High

N/A = not applicable

Compliance with the resource consent for the stocktruck wastewater disposal was high by the consent holder during the year although certain aspects of pre-treatment maintenance require attention.

2.7 Recommendations from the 2013-2014 Annual Report

The recommendation from the 2013-2014 Annual Report for the Waverley oxidation pond and stock truck wastewater treatment disposal systems monitoring programme was:

1. THAT monitoring of the Waverley oxidation pond and stock truck wastewater treatment disposal systems be continued for the 2014-2015 period by formulation of an appropriate monitoring programme similar in format to the programme undertaken during the 2013-2014 period.

This recommendation was subsequently adopted and all aspects of the 2014-2015 programme were performed as formulated for both consents.

2.8 Alterations to the monitoring programme for 2015-2016

In designing and implementing the monitoring programmes for air/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, its obligations to monitor emissions/discharges and effects under the RMA, 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/discharging to the environment.

In the case of the STDC and the monitoring programme for the Waverley oxidation ponds and stock truck wastewater treatment disposal system, it is proposed that for the 2015-2016 period that the monitoring programme continue at the same level as that in the 2014-2015 period.

A recommendation to this effect is attached to this report.

2.9 Exercise of optional review of consents

Resource Consent 0072 does not provide for any further review prior to its expiry in June 2016 whereas consent 6621 provides for an optional review next in June 2016.

2.10 Recommendation

1. That monitoring of the Waverley oxidation pond and stock truck wastewater treatment disposal systems be performed for the 2015-2016 period by

continuation of an appropriate monitoring programme similar in format to the programme undertaken during the 2014-2015 period.

3. Kaponga oxidation pond

The Kaponga oxidation pond is a single pond system (constructed in 1971) that has been separated into two sections by a wooden dividing barrier. The pond is gravity fed mainly domestic wastes from a population of about 370 people although it was designed for a population of 650. A sludge survey performed by consultants for the consent holder (MWH, 2005) found that there had been a slow rate of sludge accumulation and at such a rate, it was estimated that the system would not require desludging for another 17 years. Sludge surveys will be repeated at five-yearly intervals (STDC, 2015). Issues of stormwater infiltration, improved mixing within the ponds' system, and reduction of the microfloral component of the treated wastewater discharge, were identified in consideration of upgrading the treatment system during the consent renewal process in the 2007-2008 period (CH2M Beca Ltd, 2006). Infiltration remedial work has a lesser priority for the Kaponga system than elsewhere in South Taranaki although 121m of pipeline was re-lined during the 2014-2015 period (STDC, 2015).

The upgrading of the system was completed by late May 2008 and comprised a shortening of the inlet pipe (to reduce short circuiting within the primary section of the pond), inclusion of four (rock) stub baffles (to improve mixing within the system), and installation of a sub-surface baffle outlet (to reduce the algal component of final effluent). Riparian planting of the river margin adjacent to the ponds system was also undertaken. Local stock damage to these plantings necessitated replanting during the 2009-2010 period. Re-fencing with cattle proof materials was undertaken prior to late July, 2010 and again after tree removal in 2012. The installation of a mechanical step-screen at the inlet was undertaken during the latter months of the 2012-2013 monitoring period although this did not operate until the 2014-2015 period. This screen system has telemetry alarming.

3.1 Inspections

In accordance with the monitoring programme for the Kaponga oxidation pond system, three inspections were performed on 11 September 2014, 25 February 2015, and 19 June 2015. The physical features of the system were recorded and the surface dissolved oxygen concentration in the second section of the pond was measured adjacent to the effluent outlet grid. The results are presented in Table 8. Chlorophyll-a samples were also collected from the same site on each inspection visit for on-going assessments of system performance. These results are discussed in section 3.3.2.

Table 8 Dissolved oxygen measurements from the surface of the second section of the Kaponga oxidation pond adjacent to the outfall

Date	Time	Temperature	Dissolved Oxygen	
			Concentration	Saturation
	NZST	C	g/m^3	%
11 September 2014	0855	12.3	1.9	18
25 February 2015	0825	18.7	7.6	84
19 June 2015	0845	10.7	10.2	93

As dissolved oxygen can vary seasonally, but also on a daily basis (with minimum concentrations recorded in early daylight hours), sampling times have been standardised toward early to mid-morning for comparative purposes. Marked variability in dissolved oxygen levels is typical of biological treatment pond systems.

Aerobic conditions were recorded on all sampling occasions. High, often supersaturated dissolved oxygen levels, have been a feature of this pond system in the past reflecting the photosynthetic contribution of the system's (often extensive) algal populations (Note: the cyanobacteria algal taxon, *Microcystis* has been very abundant in the pond system in the past during these periods).This was emphasised by moderate to high saturation recorded on the three inspection occasions (although supersaturation was not recorded) despite the relatively early time of the day. The appearance of the ponds varied from relatively clear pale green, to pale brown-green, to turbid dark green, the latter in late summer

No more than occasional slight odours were recorded adjacent to the ponds during the monitoring period. All inspections were conducted during very light to light wind conditions, with both ponds' surfaces flat or only slightly disturbed (rippling) by the wind. 'Rock tests' indicated that the sludge layer was well beneath the ponds' surfaces at all times. Moderate numbers of wildlife (ducks [paradise and mallard]) were recorded on the first pond at the time of the summer inspection visit, whereas no wildlife were recorded on either pond on all other occasions.

The surrounds were maintained in a tidy condition (by grazing sheep) and the wavebands were always tidy. The effluent grill outlet was clear of debris on all monitoring inspections and effective at preventing surface algal bloom accumulations being discharged in the effluent. The estimated effluent discharge rate to the Kaupokonui River varied from 0.3 L/s (in late spring) to 12 L/s, with the effluent varying from pale green to slightly turbid pale brown in appearance with no visual impact on the receiving waters of the river on any occasion.

The refurbished wavebands, dividing wall, and outlet grid have functioned successfully since the 1998-1999 monitoring period with a new outlet grid installed during the 2002-2003 monitoring period and well maintained since. The upgrading of the ponds system, required as a condition of the renewed consent, was completed by June 2008. Some maintenance of the stub groynes and stream riparian plantings subsequently have been necessary. Re-fencing with cattle proof materials had been performed prior to winter 2010. Removal of old pine trees was undertaken late in 2011 with new riparian fencing in place by the time of the January 2012 inspection (see photos in TRC, 2012). Replanting has still to be undertaken in full (STDC, 2015), although additional new fencing was noted in June 2014.

3.2 Physical, chemical and bacteriological monitoring

3.2.1 Summer receiving water quality survey

A late summer low flow assessment of the impact of the oxidation pond's effluent discharge on the receiving waters of the Kaupokonui River was performed on 25 February 2015, during a lengthy, very low flow period, and nearly two months since a moderate river fresh. There was a very low rate of discharge from the ponds system (estimated at approximately 0.5 L/s) at the time of the survey. The river flow was gauged at 346 L/s upstream of the discharge. The flow of 700 L/s recorded in the lower reaches of the river (TRC Glenn Road recorder) was well below the average February mean monthly flow (1,565 L/s) and only slightly above the minimum February mean monthly flow (683 L/s) for the period 1978 to 2014. This sampled flow was toward the

lowest of the range of the flows recorded at the times of the previous twenty years' low flow surveys. The sampling sites' locations are listed in Table 9 and shown in Figures 3 and 4.

Table 9 Sampling site locations for Kaponga oxidation ponds system

No.	Location	Location	GPS Reference	Site Code
U	Kaupokonui River	Approximately 250 m upstream of the oxidation pond discharge	1698609 E 5634423 N	KPK 000500
OP	Effluent	Adjacent to outlet of second section of the oxidation pond	1698629 E 5634266 N	OXP 002004
D1	Kaupokonui River	50 m downstream of the oxidation pond discharge	1698548 E 5634263 N	KPK 000520
D2	Kaupokonui River	Approximately 1 km downstream of the oxidation pond discharge	1698497 E 5633456 N	KPK 000550

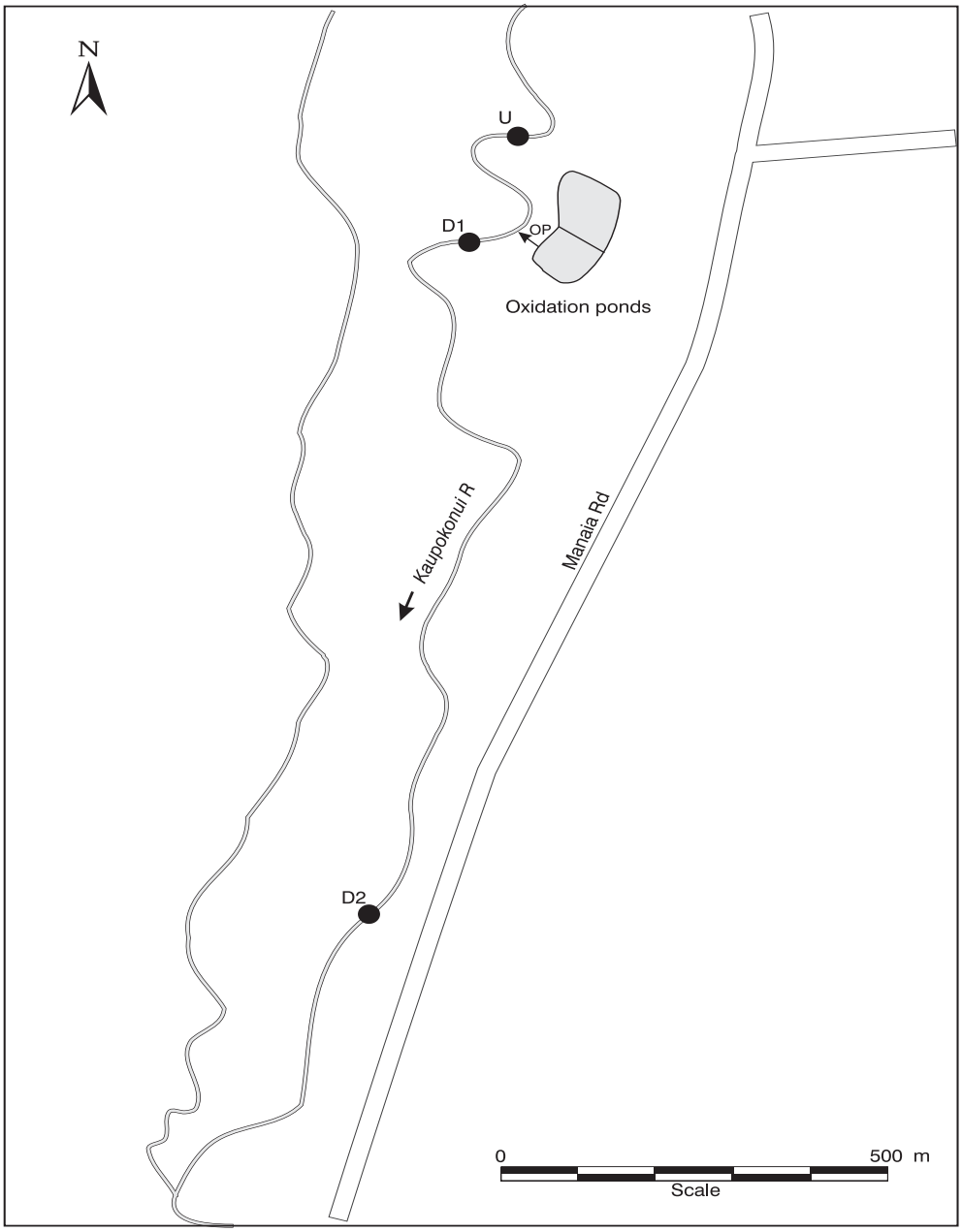

Figure 3 Sampling sites for Kaponga Oxidation ponds survey

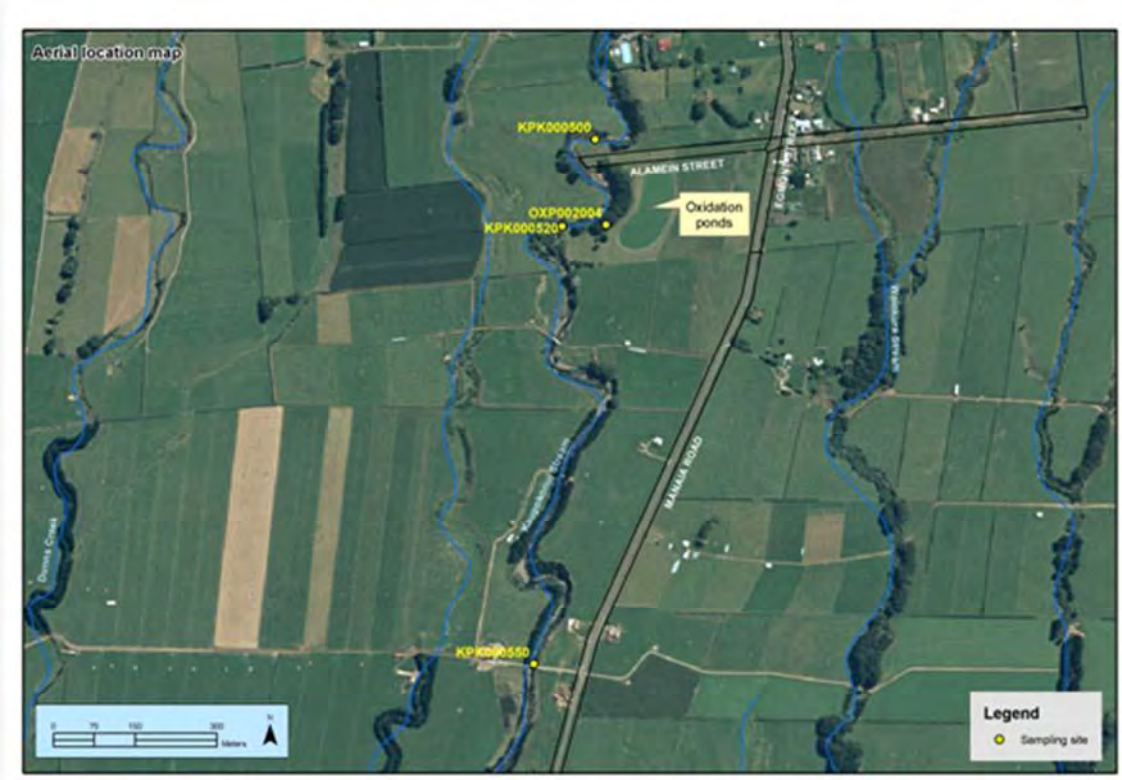

Figure 4 Aerial location map of sites in relation to Kaponga oxidation ponds

The results of the low flow survey are summarised in Table 10. All analyses were performed in the Council's IANZ-registered laboratory using standard methods.

Table 10 Results of the Kaupokonui River receiving water sampling survey 25 February 2015

Site		U	OP	D1	D2
Location		Upstream	Discharge	Downstream	
Parameter	Unit				
Time	NZST	0810	0825	0840	0910
Flow	l/s	346	0.5*	-	-
Temperature	^oC	14.0	18.7	14.4	15.0
Dissolved oxygen	g/m^3	9.9	7.6	10.1	10.1
DO saturation	%	100	84	102	103
BOD_5	g/m^3	0.6	13	0.6	0.6
BOD_5 (filtered)	g/m^3	<0.5	2.4	0.5	<0.5
pH	pH	7.7	9.5	8.0	8.0
Conductivity @ 20^{o}C	mS/m	9.0	17.7	9.0	9.1
Chloride	g/m^3	7.0	11.9	7.0	7.2
Dissolved reactive phosphorus	g/m^3 P	0.022	1.76	0.030	0.022
Ammonia-N	g/m^3 N	0.011	0.023	0.009	0.009
Un-ionised ammonia	g/m^3N	0.0002	0.015	0.0003	0.0003
Nitrate-N	g/m^3N	0.11	<0.01	0.10	0.10
Turbidity	NTU	0.7	36	0.7	0.8
Suspended solids	g/m^3	<2	43	<2	<2
Black disc	m	3.51	-	2.91	2.64
Faecal coliform bacteria	nos/100 ml	230	1,100	210	71
Appearance		clear, pale green	slightly turbid, dark green	slightly turbid, pale green	slightly turbid, pale green

Note: * = flow estimate

3.2.1.1 Effluent quality

The effluent quality (Table 10) was relatively typical of a well-performing municipal oxidation pond system for this time of the year and receiving minimal industrial waste loadings with low BOD_5 and nutrient levels coincident with a moderate microfloral population density in the pond typical of late summer conditions. This contributed to the colour and moderate turbidity and suspended solids concentration, with elevated pH due to algal photosynthetic activity as evidenced by the relatively high dissolved oxygen level which was 84% saturated. Suspended solids, turbidity, and pH levels were lower than those recorded at the time of the previous survey (which was performed at a similar time but under supersaturation conditions), but nutrient levels were lower than typical of a treatment system of this nature. There was a low dissolved BOD_5 level in the treated wastewater and the faecal coliform bacterial number was relatively low coincident with the moderate algal population in the pond.

Table 11 Ranges of selected results of Kaponga oxidation pond (second section) effluent analyses recorded for the period 1987 to 30 June 2014

Parameter	Unit	No of samples	Range	Median
Flow	L/s	37	<1-50	1.5
Dissolved oxygen	g/m^3	82	1.4-19.2	10.5
DO saturation	%	79	17-228	106
BOD_5	g/m^3	26	12-140	24
BOD_5 (filtered)	g/m^3	22	<1-5.8	1.8
pH	pH	27	7.4-10.6	9.6
Conductivity @ 20°C	mS/m	30	15.5-30.3	20.4
Ammonia-N	g/m^3 N	26	0.005-2.09	0.024
Dissolved reactive phosphorus	g/m^3 P	26	<0.003-2.81	1.09
Suspended solids	g/m^3	26	38-680	130
Turbidity	NTU	23	24-860	100
Faecal coliform bacteria	nos/100 ml	31	21-44000	5800

Note: With the exception of DO results, data were recorded principally from summer surveys.

In comparison with past survey results (Table 11) this late summer effluent quality for most parameters was within past ranges with most of the parameters better than historical median values. There were slightly elevated pH, turbidity, and dissolved oxygen levels, due to the moderate algal population with relatively low suspended solids, and low BOD_5, ammoniacal nitrogen, and faecal coliform bacteria numbers were also coincident with this moderate algal density. The effluent quality was considered typical of municipal oxidation pond treated wastes under late summer conditions.

3.2.1.2 Impacts on receiving waters

A very low effluent discharge rate was recorded at the discharge point into the Kaupokonui River, which was in low flow at the time of the survey. A river flow of 346 L/s gauged upstream of the outfall (with an estimated discharge of 0. 5 L/s) would have provided an estimated dilution ratio of at least 700:1 at the time of sampling.

As a result of the large dilution afforded to the discharge, there was only a small decrease in clarity of the stream downstream of the discharge point as emphasised by the 17% decrease in black disc clarity and no change in turbidity between sites U and D1. No significant impacts on the river were recorded for all other parameters measured (Table 10) with minimal or no increases in measured levels of conductivity,

suspended solids, bacteria, BOD_5, and nutrients (including un-ionised ammonia) although there was an elevation in river pH of 0.3 unit. These results were indicative of compliance with Special Conditions 9, 11, and 12 of the consent as the reduced algal component of the wastewater caused only minor discolouration and minimal change in turbidity beyond the mixing zone in the river.

The river appearance was clean and clear to slightly turbid along the reach surveyed (Table 10), with high aesthetic water quality in the reaches near Kaponga township and 1 km downstream of the oxidation pond discharge. Dissolved oxygen concentrations were close to 100% saturation at all sites upstream and downstream of the discharge.

3.2.2 Receiving water compliance surveys

Special conditions 11 and 12 of the consent require receiving water physicochemical monitoring of compliance with specified limits set on the Kaupokonui River at the boundary of the (50 m) mixing zone. This aspect of receiving water sampling was performed on two additional inspection occasions to that of the low flow survey.

3.2.2.1 Survey of 11 September 2014

Sampling was performed under steady recession river flow conditions (1.64 m^3/s at Glenn Road recorder: minimum September monthly mean flow – 1.68 m^3/s) five days after the most recent river fresh. Results of this survey are presented in Table 12.

Table 12 Results of the Kaupokonui River receiving water compliance survey of 11 September 2014

Site		U	D1
Location		Upstream	Downstream
Parameter	Unit		
Time	NZST	0840	0915
Temperature	˚C	8.8	9.0
BOD_5 (carbonaceous filtered)	g/m^3	<0.5	<0.5
pH	pH	7.8	7.8
Ammonia-N	g/m^3N	N/A	N/A
Unionised ammonia	g/m^3 N	N/A	N/A
Turbidity	NTU	0.9	0.7
Appearance		clear, no colour	clear, no colour

[Note: N/A = not analysed]

The discharge of relatively clear, pale, green effluent, estimated at 0. 3 L/s, was observed to have no visual impact on the Kaupokonui River at the boundary of the permitted mixing zone in compliance with Special Condition 9. Carbonaceous filtered BOD_5 concentration was well within the limits imposed by Special Condition 11, while there was no increase in turbidity, in compliance with Special Condition 12 at the downstream site. Dilution of the discharge was estimated to have been at least 1000:1 in the receiving waters at the time of the survey.

3.2.2.2 Survey of 19 June 2015

Sampling was performed under moderate river flow conditions (3.06 m^3/s at Glenn Road recorder: minimum June monthly mean flow – 1.62 m^3/s), six days after the most recent river fresh. The results are presented in Table 13.

Table 13 Results of the Kaupokonui River receiving water compliance survey of 19 June 2014

Site		U	D1
Location		Upstream	Downstream
Parameter	Unit		
Time	NZST	0800	0815
Temperature	˚C	10.0	9.6
BOD_5 (carbonaceous filtered)	g/m³pH	0.6	0.8
pH	mS/m	7.3	7.4
Ammonia-N	g/m³ N	<0.003	<0.003
Unionised ammonia	NTU	<0.00001	<0.00001
Turbidity		1.0	1.1
Appearance		clear, no colour	clear, no colour

The discharge of pale brown, slightly turbid effluent, estimated at 12 L/s, was observed to have no visual impact on the Kaupokonui River at the boundary of the permitted mixing zone in compliance with Special Condition 9. Carbonaceous filtered BOD_5 and un-ionised ammonia concentrations were well within the limits imposed by Special Condition 11, while there was minimal increase in turbidity, in compliance with Special Condition 12 at the downstream site. Dilution of the discharges was estimated to have been in excess of 150:1 in the receiving waters at the time of the survey.

3.3 Biological monitoring

3.3.1 Biomonitoring survey

The biomonitoring survey associated with the receiving waters of the Kaupokonui River was undertaken under very low, steady recession flow conditions on 19 February 2015, at identical sites to the physicochemical survey (Figures 3 and 4). Flow was well below the mean average monthly mean flow and only slightly above the minimum February mean monthly flow for the river at this time. Results of the biomonitoring survey are summarised in Table 14 and the report is presented in Appendix II.

Table 14 Biomonitoring results from the survey of 19 February 2015

Site	Macroinvertebrate fauna	
	Taxa numbers	MCI value
U	26	110
D1	24	113
D2	26	112

Moderate, but typical, macroinvertebrate community richnesses were found in the Kaupokonui River upstream and downstream of the oxidation pond system's effluent discharge, and very similar to those recorded by the previous summer's survey. This was coincident with patchy substrate periphyton mats and filamentous algal cover, at these sites during a period of very low flow conditions, in late summer. MCI scores similar to those predicted for the mid-reaches of a developed catchment, were recorded at all three sites. The very narrow range of these scores, with no downstream decreases in scores, combined with the similarity in macroinvertebrate communities' compositions were indicative of no recent impacts of the Kaponga oxidation ponds system's discharge on the macroinvertebrate fauna of the surveyed reach of the

Kaupokonui River. The absence of heterotrophic growths on the river's substrate was further confirmation of no impacts of the discharge on the biological communities of the river.

The range of MCI scores categorised this reach of the stream as having 'good' generic biological health consistent with good physical habitat and preceding physicochemical water quality. These scores were also similar to, or slightly higher than, predicted scores for ringplain sites at equivalent altitudes and distances downstream of the National Park and were indicative of 'better than expected' predictive stream health (TRC, 2015a).

3.3.2 Microflora of the ponds' system

Pond microflora are very important for the stability of the symbiotic relation with aerobic bacteria within the facultative pond. These phytoplankton may be used as a bio-indicator of pond conditions (e.g. cyanobacteria are often present in under-loaded conditions and chlorophyceae are present in overloaded conditions). To maintain factitive conditions in a pond system there must be an algal community present in the surface layer.

The principal function of algae is the production of oxygen which maintains aerobic conditions while the main nutrients are reduced by biomass consumption. Elevated pH (due to algal photosynthetic activity) and solar radiation combine to reduce faecal bacteria numbers significantly.

Samples of the secondary pond final effluent had been collected at the time of most inspections of the Kaponga oxidation ponds system for semi-quantitative microfloral assessment prior to curtailment of this component of the programme during the 2012-2013 period. The microflora present in the secondary oxidation pond have been summarised and discussed in recent annual reports and historical data have been provided in a previous annual report (TRC, 2009).

Samples of the secondary pond effluent were collected on all three inspection occasions over the 2014-2015 period for chlorophyll-a analyses. Chlorophyll-a concentration can be used as a useful indicator of the algal population present in the system. (Note: Pearson (1996) suggested that a minimum in-pond chlorophyll-a concentration of 300 mg/m^3 was necessary to maintain stable facultative conditions). However, seasonal changes in algal populations and also dilution by stormwater infiltration might be expected to occur in any wastewater treatment system which together with fluctuations in waste loading would result in chlorophyll-a variability.

The results of secondary pond effluent chlorophyll-a analyses and historical data are provided in Table 15 together with field observations of pond appearance.

Table 15 Chlorophyll-a measurements from the surface of the Kaponga secondary oxidation pond at the perimeter adjacent to the outlet

Date	Time NZST	Appearance	Chlorophyll-a (mg/m^3)	Chlorophyll-a (mg/m^3) data for period 2013-mid 2014		
				N	Range	Median
11 September 2014	0855	pale green	11	3	223-648	394
25 February 2015	0825	pale green	400			
19 June 2015	0930	turbid, green-brown	330			

Good microfloral populations were indicated by high chlorophyll-a concentrations in mid winter and late summer (coincident with dissolved oxygen levels of 84% and 93%)but a very low concentration was found in spring following a wet weather period coincident with a relatively low dissolved oxygen saturation level of 18%.

3.4 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).

In the 2013-2014 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with the Company's conditions in resource consents or provisions in Regional Plans.

3.5 Discussion

3.5.1 Discussion of plant performance

The upgraded Kaponga oxidation ponds sewerage treatment system was well maintained and operated and performed satisfactorily throughout the monitoring period. The refurbished wavebands, dividing wall, and replacement outlet grid have functioned successfully since the 1998-1999 monitoring period and continued to do so throughout the current period. The constructed (upgrade) scrub groynes have required weeding maintenance from time to time and refurbishment of stock-impacted riparian fencing has also been necessary together with replacement riparian fencing and planting was required after pine tree removal.

The effluent quality data was indicative of a well treated wastewater with parameters typical or better than those of a municipal oxidation pond system receiving minimal industrial waste loadings, with the measured parameters within the ranges and mostly better than the median values monitored to date for this system. Moderate turbidity and suspended solids levels were coincidental with a seasonal increase in abundance of microfloral taxa within the pond (as indicated by chlorophyll-a level). Monitoring of the microfloral component of the second pond by means of chlorophyll-a measurements indicated effective pond performance with good microfloral populations, coincident with high dissolved oxygen saturation levels on two occasions, but a very low microfloral population (and reduction in dissolved oxygen saturation) in spring following cooler, wetter weather conditions.

3.5.2 Environmental effects of exercise of water permit

No significant impacts on the Kaupokonui River were recorded from the physicochemical parameters analysed during the late autumn survey conducted in February 2015, when a very low discharge rate of well-treated wastewater characterised this system. There were no significant changes in the measured concentrations of almost all parameters downstream under low receiving water flow conditions, mainly due to the very high effluent dilution occurring at the time. Both this survey and two other receiving water surveys found compliance with all limits set by special conditions at all times.

The Kaupokonui River continued to have high aesthetic water quality in the reaches near the Kaponga township and for 1 km downstream of the oxidation pond discharge under autumn low flow conditions.

Moderate, but typical macroinvertebrate community richnesses were found in the Kaupokonui River upstream and downstream of the oxidation pond effluent discharge during a late summer, low flow period. MCI scores were similar to scores typical of those recorded for mid-reaches of developed ringplain catchments and rivers, indicative of 'good' generic biological health. No significant impacts of the effluent discharge were indicated by MCI scores through the reach of the river surveyed. The absence of heterotrophic growths on the river bed was consistent with these findings.

3.6 Evaluation of performance

A tabular summary of the STDC's compliance record for the year under review is set out in Table 16.

Table 16 Summary of performance for Consent 0861-3

Purpose: To discharge treated wastewater to water		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
Upgrade to plant within 1 year	Reporting by consent holder; upgrade completed	Yes
Exercise in accordance with documentation	Liaison with consent holder and inspections	Yes
Minimisation of effects	Inspections and sampling	Yes

Purpose: To discharge treated wastewater to water		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
Limits on volume	Reporting by consent holder and inspections	Yes
Implementation of a management plan	Provision by consent holder	Yes
Provision of operator	Liaison with consent holder	Yes
Maintenance of aerobic ponds conditions	Inspections and sampling	Yes
Trade wastes connections	Liaison with consent holder	N/A
Limits on receiving water effects	Inspections and physicochemical sampling and biomonitoring	Yes
Monitoring provisions	Performance of tailored programme	Yes
Limits on receiving water effects for ammonia and filtered BOD_5	Performance of tailored programme	Yes
Limits on aesthetic water effects	Performance of tailored programme	Yes
Provision for lapse of consent	Consent holder liaison	N/A
Optional review provision re environment effects	Next due for consideration in June, 2017	Yes
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

During the year, the STDC demonstrated a high level of environmental performance and compliance with the resource consent conditions.

3.7 Recommendation from the 2013-2014 Annual Report

The recommendation from the 2013-2014 Annual Report for the Kaponga oxidation pond monitoring programme was:

1. THAT monitoring of the Kaponga oxidation pond system be continued for the 2014-2015 period by formulation of a monitoring programme similar in format to the programme undertaken during the 2013-2014 period.

This recommendation was subsequently adopted and all aspects of the 2014-2015 programme were performed as required.

3.8 Alterations to the monitoring programme for 2014-2015

In designing and implementing the monitoring programmes for air/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, its obligations to monitor emissions/discharges and effects under the RMA, 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/discharging to the environment.

A review of the programme was necessary for the 2008-2009 period following the renewal of the consent and the inclusion of additional receiving water conditions. Subsequently, this programme has been maintained in a similar format with a minor alteration to the microfloral monitoring component in the 2013-2014 period which remained unchanged in 2014-2015.

In the case of the STDC and the monitoring programme for the Kaponga oxidation ponds it is proposed that for the 2015-2016 period that monitoring continue at a similar level to that in the programme for the 2014-2015 period.

A recommendation to this effect is attached to this report.

3.9 Exercise of optional review of consent

The recently renewed resource consent 0861 provided for an optional review of the consent in June 2011. It was considered at that time that there were no grounds to exercise this review based upon results of monitoring over the past years since the renewal of this consent. The next optional review is provided in June 2017.

3.10 Recommendation

1. THAT monitoring of the Kaponga oxidation pond system be continued for the 2015-2016 period by formulation of a monitoring programme similar in format to the programme undertaken during the 2014-2015 period.

4. Manaia oxidation pond

The Manaia oxidation pond system is a single treatment pond (constructed in 1984), followed by twin wetlands (in parallel) receiving mainly domestic sewage together with trade wastes from the bakery industry. These trade wastes are currently un-regulated but with the proposed introduction of a planned trade waste by-law, restrictions and standards were intended to be imposed by STDC with investigations planned for late 2013 (STDC, 2013).

4.1 Background to historical performance and most recent consent renewal

Issues relating to the historical operation and performance of the reticulation and treatment system have been presented in previous annual reports (see TRC, 2004 and TRC, 2007 in particular).

Consent renewal (1999) issues relating to the upgrade of the treatment plant are also summarised in previous reports and the final design of the required upgrade was addressed by the consent renewal in 2007. An assessment of the wastes loadings to the pond system was also included in this process. The upgrade now provides additional screening of the influent and wetlands polishing of the final effluent principally to improve the bacteriological quality of the treated wastewater prior to discharge. Desludging of the oxidation pond was also a component of the upgrade. This commenced in the latter part of the 2006-2007 monitoring period with de-watered sludge transferred to the Patea landfill. Local issues with the use of this landfill subsequently halted desludging until an alternative disposal site was determined. The remaining desludging was completed in November 2007 with the de-watered sludge used onsite as a base for the constructed wetlands. Some remaining sludge in the pond was re-distributed around the pond to remove any areas of build-up. The wetlands construction initially was delayed, awaiting a ruling from the Historic Places Trust following an archaeological survey performed in November, 2007.

It was intended to install the required mechanical screening, and construct the wetland over summer 2008-2009 to comply with the completion of the upgrade by June 2009 (required by Special Condition 1 of the consent). However, although the installation of the screening was completed, the earthworks were delayed until late winter 2009 and the wetlands were completed by early summer 2009 with the planting of 24,000 reeds followed by filling with water. The northern wetland was lined with water treatment plant sludge to prevent seepage. Hedging was planted along the northern and eastern boundary of the WWTP during 2008. The southern wetland was not used during the first few months of 2010 while the northern wetland wastewater level was maintained at operating level.

Both wetlands have been in use since the 2010-2011 period. The consent holder constructed an emergency high level overflow pipe between the oxidation pond and the northern wetland in August 2010 (see TRC, 2011) to prevent overtopping of the pond onto neighbouring farmland. This pipe has been used only occasionally following heavy rainfall periods (e.g. September, 2010 and August, 2011) with a gate-valve installed to provide greater pond storage before use.

The consent holder had advised that no stormwater infiltration/inflow work was performed on the Manaia sewerage reticulation in the 2007-2014 period (mainly due to the greater priorities at Hawera and also because there had been no issues with manholes surcharging in recent years), but 230m of pipeline had been re-lined during the 2014-2015 period (STDC, pers.comm.)

This work had been prioritised throughout the District with the Manaia component to be performed and completed by 2012. However, since the necessity for the emergency overflow pipe installation, the consent holder recognised that there was a requirement to undertake a house to house survey for stormwater faults and/or illegal cross connections into the sewerage reticulation in Manaia. This was completed and the consent holder found about a dozen properties where remedial gully trap work will be required (STDC pers. comm., August, 2012). The property owners have been requested to remedy defects and STDC has yet to complete the follow-up inspections. No surcharging from reticulation manholes has occurred in recent years (STDC, 2013).

An upgrade to the coastal track was undertaken in July-August 2011 to provide safer access to the coastal receiving waters but regular checks and maintenance continue to be necessary.

The consent holder's consultant undertook a cliff erosion topographical survey in November, 2014 and concluded that there had been no significant erosion adjacent to the WWTP site since the previous survey in 2006 (see Appendix III).

4.2 Inspections

In accordance with the monitoring programme, three regular inspections of the Manaia oxidation pond were performed on 12 December 2014, 5 March 2015, and 29 May 2015. Inspections also included monitoring of the potential overflow sites in and near Manaia township.

During each regular inspection, the physical features of the pond system were recorded and the dissolved oxygen concentration was measured from the pond's surface adjacent to the effluent outlet. The results are presented in Table 17. A sample was collected during each regular inspection for chlorophyll-a analysis as an assessment of microfloral 'health'. The results are discussed separately in section 4.4.1.

Table 17 Dissolved oxygen measurements from the surface of the Manaia oxidation pond adjacent to the outfall

Date	Time NZST	Temperature °C	Dissolved Oxygen	
			Concentration g/m^3	Saturation %
12 December 2014	0800	16.3	1.0	11
5 March 2015	0825	21.1	0.6	6
29 May 2015	0915	10.5	1.6	14

As dissolved oxygen can vary seasonally, but also on a daily basis (with minimum concentrations recorded in early daylight hours), sampling times were standardised toward early to mid-morning (prior to 0920 hrs) for comparative purposes. The step screen on the influent line was operative on all inspection occasions. Although aerobic conditions were recorded in the pond on all sampling occasions, all surveys found

relatively low saturation (< 15%), and a relatively narrow range in dissolved oxygen levels despite a wide range of pond microfloral populations (as indicated by chlorophyll-a concentrations (Section 4.4.1)). Variations in dissolved oxygen concentrations are typical of biological treatment systems in which levels may vary on both a daily and seasonal basis.

Low concentrations were found on inspection occasions with no supersaturation (normally indicative of a significant algal photosynthetic contribution), recorded on any inspection occasion during 2014-2015, relatively dissimilar to the situation in many previous monitoring years. Only very slight, localised, odours were apparent at the time of the inspections, and there were no occasions of scum accumulation on the pond surface.

Light wind to calm conditions coincided with the time of inspections, and flat surface conditions were recorded on the pond at these times. A 'rock test' indicated no sediment disturbances, although monitoring over the four years prior to mid 2007 had found that the sludge layer was building up in certain areas of the pond below the surface, particularly toward the outlet end. (Note: sludge removal from the pond had been completed by November, 2007). The pond desludging exercise which commenced in March 2007 involved the on-site de-watering of sludge dredged by a barge from the oxidation pond and trucking of the sludge to the Patea landfill for disposal. Some de-watering problems occurred during the flocculation and centrifuging process in the early stages of the contract due to the nature of the sludge, but the work was postponed due to problems with the acceptability of the landfill disposal site. The procedure operated with no apparent problems or odours, with all centrifuged filtrate drained back to the pond inlet. The work recommenced with sludge stored onsite at the plant for future use as the base for constructed wetland. The work was completed by mid-November 2007 with a total of 310 tonnes of dry solids (1,550 m^3 of sludge) removed from the pond.

The appearance of the pond varied from turbid dark green-brown, to relatively pale grey-green in colour. Moderate wildlife numbers were present at the time of the inspections ranging from up to 20 gulls, 2 to 7 black swan, a few paradise ducks, and up to 40 mallard ducks. The pond wave bands were tidy during the monitoring period and the pond surrounds generally were maintained in a tidy condition by mowing or sheep grazing. There was evidence of small pockets of scum on one occasion on the surface of the pond. The pond's effluent grid was clear of debris on all occasions and the grid was cleared on a regular basis during the period.

The wetlands component was tidy with both sections achieving an equal balance in wastewater levels through most of the monitoring period and levels decreased in both wetlands in dry late summer conditions with both wetlands dried out by early autumn similar to conditions in autumn, 2013 (TRC, 2013). No use of the additional pond overflow into the wetland was recorded on any inspection occasion. Effluent appearance was relatively clear pale green with an estimated discharge rate ranging from nil (autumn) to 15 L/sec (early summer and winter) on the inspection occasions. A few of pukeko were present on one occasion and two ducks on the other occasion.

At the time of the monitoring inspections when the wetlands effluent was discharging, minimal discolouration in the small receiving stream was recorded.

Photo 1 The small discharge channel from the wetland's prior to the 'Manaia Creek'

No sewage fungal growths were noted in the discharge channel which had additional rock rip-rap added by the consent holder as further filtration (Photo 1) and single electric-wired fencing of this channel had occurred by late May 2015. Observations noted an improvement in stream aesthetic appearance compared with most previous monitoring conducted in the receiving waters. No 'sewage fungus' was recorded on the streambed or amongst stream vegetation through the short distance of the stream within the mixing zone below the oxidation pond-wetland system outfall prior to discharging over the cliff to the coastal waters of the Tasman Sea.

No overflows from the town's sewerage reticulation were recorded at the times of the inspections. A new sewerage main had been installed between the town and the pond system (along Sutherland Road) during the 2004-2005 monitoring period and no overflows from this section of the reticulation occurred during the period.

4.3 Physical, chemical and bacteriological sampling

4.3.1 Effluent quality

A full analysis of the oxidation pond effluent was performed on 29 May 2015; partial analyses of the wetlands effluent was performed on 12 December 2014; and a full analysis of the wetlands effluent on 29 May 2015. No wetlands analyses were performed at the time of the inspection of 5 March 2015 as the final ponds were both dry following a lengthy very dry period. These results are summarised in Table 18. All analyses were performed in the Council IANZ-registered laboratory using standard methods.

Table 18 Results of the sampling survey of the Manaia oxidation pond and wetland effluents during the 2014-2015 period

Date		12 Dec 2014	5 March 2015	29 May 2015	
Site		Wetlands effluent	Wetlands effluent	Oxidation pond effluent	Wetlands effluent
Parameter	Unit				
Time	NZST	0825	0840	0915	0955
Temperature	°C	15.4	-	10.5	8.4
Dissolved oxygen	g/m^3	-	-	1.6	2.0
DO saturation	%	-	-	14	16
BOD_5	g/m^3	-	-	14	4.4
BOD_5 (filtered)	g/m^3	-	-	6.6	3.1
pH	pH	-	-	7.2	7.3
Conductivity @ 20°C	mS/m	30.0	-	29.8	30.8
Chloride	g/m^3	43.2	-	44.2	44.2
Ammonia –N	g/m^3 N	-	-	3.84	5.00
Dissolved reactive phosphorus	g/m^3 P	-	-	0.45	0.59
Suspended solids	g/m^3	-	-	8	3
Turbidity	NTU	17	-	8.8	2.4
Faecal coliform bacteria	nos/100 ml	9,500	-	28000	70
Appearance		sl. turbid, pale green	(final ponds dry; no discharge)	rel. clear, pale green-grey	rel clear, pale lime green

The oxidation pond effluent quality was typical of a municipal single oxidation pond system receiving a relatively low industrial waste component coincidental with variable pond microfloral populations and a relatively typical bacterial level. Low suspended solids and BOD_5 (total and dissolved) levels and close to neutral pH, together with 14% dissolved oxygen saturation, were indicative of low algal density in the pond in late autumn.

In comparison with past data (Table 19), late autumn oxidation pond effluent quality was much better than previous median parameters' values in terms of BOD_5 (total and filtered), suspended solids, and both nutrient species , but similar to the median value for faecal coliform bacteria. Variability in the pond's microfloral population has contributed to differences in effluent quality over the period since monitoring commenced.

Table 19 Ranges of results of Manaia wastewater treatment system effluent analyses recorded for the period 1987 to June 2014[2]

Parameter	Unit	Oxidation pond			Wetlands		
		No of samples	Range	Median	No of samples	Range	Median
Flow	L/s	34	2-50	5	12	0.3-13	5
Dissolved oxygen	g/m^3	97	<0.1-23	5.7	3	0.7-1.6	0.8
BOD_5	g/m^3	26	11-90	42	6	8-34	15
BOD_5 (filtered)	g/m^3	24	1.4-23	11	3	3.4-13	4
pH	pH	29	7.2-9.0	7.5	3	6.9-7.6	7.4
Conductivity @ 20°C	mS/m	51	25.9-56.8	32.8	12	27.5-42.6	30.9
Chloride	g/m^3	43	27.0-66.4	45.8	12	37.0-53.5	44.4
Suspended solids	g/m^3	30	9-420	86	3	7-20	12
Turbidity	NTU	44	4.3-540	20	12	2-81	8
Faecal coliform bacteria	nos/100ml	52	1200-500000	21000	12	7-2500	140
Ammonia N	g/m^3N	25	1.8-17.8	9.8	3	3.3-10.0	6.77
Dissolved reactive phosphorus	g/m^3P	26	0.68-4.89	3.25	3	0.87-2.28	1.20

At present the high wetland effluent quality has been emphasised by marked improvement in terms of total BOD_5, suspended solids, and faecal coliform bacteria levels in comparison with the oxidation pond effluent. Most parameters were lower than or toward the median of the limited ranges measured to date with the exception of ammonia-N which was nearer the median value previously found. The combined system will require more time before valid comparative assessments with historical oxidation pond performance can be provided.

4.3.2 Impacts on receiving waters

Assessments of the impact of the oxidation pond-wetlands effluent discharges on the bacteriological quality of the receiving waters of the small Manaia Creek and the nearby coastal waters of the Tasman Sea under mid to low tide conditions, were performed on one of the inspection visits. The sampling sites are listed in Table 20.

[2] It should be noted that the database includes a limited amount of oxidation pond effluent quality data recorded during a period (1991-1992) when problems occurred with the disposal of drilling mud wastes into the system. Seasonal and climatic conditions also account for variability in effluent quality.

Table 20 Sampling site locations for the Manaia oxidation pond system

No	Site	Location	GPS Reference	Site code
U	Manaia Creek	5 m upstream of the oxidation pond discharge	1696373 E 5618563 N	MNA000090
OP	Effluent	WWTP oxidation pond effluent at outfall	1696197 E 5618609 N	OXP003001
WET	Outlet	WWTP wetland at outfall	1696368 E 5618551 N	OXP006005
D1	Manaia Creek	10 m downstream of the oxidation pond discharge	1696369 E 5618539 N	MNA000093
SE	Tasman Sea	200 m east of mouth of Manaia Creek	1696641 E 5618404 N	SEA905086
SW	Tasman Sea	200 m west of mouth of Manaia Creek	1696255 E 5618419 N	SEA905080

Sampling site locations in relation to the pond system are illustrated in Figures 5 and 6.

Figure 5 Location of Manaia oxidation pond-wetlands system and sampling sites

Figure 6 Aerial location map of sites in relation to Manaia wastewater treatment system

Sampling was performed under moderate to low stream flow conditions. Coastal sampling was timed around mid tide conditions on all of the three inspection occasions. Results are presented and discussed as follows for each of the receiving water surveys.

12 December 2014

An effluent flow of 12 L/s from the Manaia oxidation pond-wetlands system was estimated at the time of this mid tide survey under fine weather conditions following recent wet weather. Relatively clear, uncoloured conditions were observed in the moderate flow of the receiving waters above the discharge outfall prior to the slightly turbid, pale green flow below the outfall dispersing across the rocky shore and entering the slightly cloudy, green coastal seawater. No 'sewage fungus' was observed on the stream bed over the short distance below the outfall prior to the cliffs under moderate flow conditions.

Table 21 Results of the receiving waters survey of 12 December 2014 (low tide: 0710 NZST)

Site		U	Wetlands	D1	SE	SW
		Upstream	Discharge	Downstream	Coastal	
Parameter	Unit					
Time	NZST	0820	0825	0830	0930	0950
Temperature	^{o}C	14.2	15.4	14.4	15.7	N/R
Conductivity @ 20^{0} C	mS/m	41.2	30.0	39.1	4,430	4,670
Chloride	g/m^{3}	58.6	43.2	58.4	-	-
Turbidity	NTU	6.1	17	8.2	-	-
Faecal coliform bacteria	nos/100ml	1,100	9,500	3400	240	23
Appearance		rel. clear, uncoloured	slightly turbid, pale green	slightly turbid , uncoloured	sl. turbid, grey	sl. turbid, grey

Wetland effluent quality, in terms of the parameters analysed, had moderate bacteriological quality when compared to the median and the range of oxidation pond effluent quality previously measured (Table 19) and slightly clearer in terms of median turbidity as might be expected of a wetlands polished wastewater. A dilution ratio of approximately seventy-five parts stream flow to one part effluent flow was calculated from the physicochemical data. Although there was good dilution available in the Manaia Creek on this occasion, there was a relatively large increase in bacteria number found 10 m downstream of the outfall as a result of the moderate effluent bacterial quality. The slightly turbid effluent caused no significant deterioration in the turbidity of the relatively clear stream downstream of the discharge.

An impact on seawater faecal coliform bacterial quality was found at the site to the south east of the mouth of the stream where there was some indication of freshwater encroachment at this site as indicated by the conductivity level. Neither of the two sites' bacterial numbers were in compliance with the median guideline for recreational shellfish-gathering (median of 14 per 100 ml) and only the south west site met the 90% guideline (90% of samples <43 per 100 ml) (MfE/MoH, 2003) at the time of this survey as the survey followed recent wet weather and a stream fresh the previous day.

5 March 2015

No assessment of the impact of the wetlands effluent discharge on the receiving waters was able to be performed on 5 March 2015, under very low stream recession flows eight weeks after a significant fresh, during drought conditions, due to very low wetlands levels and therefore no discharge to the Manaia Creek (see earlier).

29 May 2015

A further assessment of the impact of the wetlands effluent discharge (estimated at 15 L/s) on the receiving waters was performed on 29 May 2015, during recent relatively dry weather and stream recession flow two weeks after a fresh, but above median flow conditions. Minimal discolouration of the relatively clear receiving water's moderate flow was noted below the discharge prior to the stream dispersing across the rocky shore and into the clear, pale grey coastal seawater near mid-tide. No 'sewage fungus' was observed on the stream bed over the short distance below the outfall. Results from this survey are presented in Table 22.

Table 22 Results of the receiving waters survey of 29 May 2015 (high tide: 0624 NZST)

Site		U	Wetlands	D1	SE	SW
		Upstream	Discharge	Downstream	Coastal	
Parameter	Unit					
Time	NZST	0950	0955	1,000	1,025	1,040
Temperature	^{o}C	11.2	8.8	10.4	12.5	12.6
Conductivity @ 20^{0} C	mS/m	39.7	30.8	37.8	4,440	4,740
Chloride	g/m^{3}	63.6	44.2	60.4	-	-
Turbidity	NTU	2.7	2.4	2.6	-	-
Faecal coliform bacteria	nos/100ml	160	70	140	2	<2
Appearance		rel. clear, uncoloured	rel. clear, pale green	rel. clear, very pale green	clear, pale grey	clear, pale grey

Wetland effluent quality, in terms of the parameters analysed, was extremely good (particularly in relation to bacteriological quality) when compared to the median and the range of oxidation pond effluent quality previously measured (Table 19) and much clearer in terms of median turbidity as might be expected of a wetland polished wastewater. A dilution ratio of approximately five parts stream flow to one part effluent flow was calculated from the physicochemical data. Although there was a relatively low dilution available in the Manaia Creek on this occasion, there was a small decrease in bacteria number found 10 metres downstream of the outfall as a result of the extremely good effluent bacterial quality. The relatively clear effluent caused no deterioration; instead there was minimal difference in the turbidity of the stream downstream of the discharge.

No impact on seawater faecal coliform bacterial quality was found at the two sites either side of the mouth of the stream although there was minor freshwater encroachment apparent at the site to the east of the mouth (SE) as indicated by the lower conductivity. Both sites' bacterial numbers were well within the guidelines for recreational shellfish-gathering (median of 14 per 100 ml and 90% of samples < 43 per 100 ml (MfE/MoH, 2003)) at the time of this survey.

Summary of impact monitoring on receiving waters

There was minimal effect of the wetlands' discharges on the receiving waters of the Manaia Creek and the coastal waters of the Tasman Sea on the latter of the two occasions in the monitoring period when a discharge was monitored, with no 'sewage fungus' recorded on the streambed on either occasion. There were very low bacterial counts measured in the coastal waters on the latter of the two occasions surveyed and moderate counts on the early summer occasion coincident with high faecal bacteria counts in the Manaia Creek following wet weather prior to the time of this sampling occasion.

The Ministry for the Environment and Ministry of Health (MfE/MoH, 1998) 'Bacteriological Water Quality Guidelines for Marine and Fresh Water' (subsequently reviewed in 2003) are consistent with international practice and are based on the application of 'maximum acceptable' levels of bacteria for bathing in marine and fresh water and for recreational shellfish-gathering. Special condition 7 of consent 1204 has adopted the guideline levels for recreational shellfish as a standard for measuring whether compliance of the consent has occurred. The guidelines use 'faecal coliform' indicator bacteria numbers to denote the potential presence of pathogenic bacteria, viruses and protozoa. The prescribed values for recreational shellfish-gathering waters establish a median faecal coliform not in excess of 14 per 100 ml or not more than 10% of samples in exceedance of 43 per 100 ml. The guideline levels themselves do not guarantee that shellfish living in waters of this microbiological quality will be 'safe', rather they are intended as a management tool to measure any changes from those conditions prevailing at the time of assessment. They provide an assessment of the level of risk associated with timing of shellfish-gathering from waters being surveyed.

At the times of the two coastal receiving water surveys performed in the monitoring period there was one instance when the seawater faecal coliform bacterial levels exceeded the recommended 10% exceedance guideline value at one site and one occasion when the median guideline for shellfish gathering was exceeded at both of the sites either side of the stream mouth. Whilst results of bacterial monitoring conducted at the two coastal sites either side of the mouth of the Manaia Creek to date have indicated that this particular element of compliance has not always been achieved, care needs to be exercised in drawing too many inferences from the data gathered to date. It should be noted that natural run-off from freshwater catchments may also impact upon coastal seawater bacteriological quality from time-to-time. A summary of the seawater bacteriological water quality monitoring data gathered during the period prior to the upgrade of the Manaia WWTP is provided in Table 23. Data collected since the addition of the wetlands component of the system are also summarised in this table.

Table 23 Summary of faecal coliform bacteria data for the two Tasman Sea sites for the period June 1999 to June 2015 in relation to the discharge of Manaia oxidation pond and wetlands treated wastewater

Period	Site	No of samples	Range (nos/100 ml)	Median (nos/100 ml)	% of samples > 43/100 mls
Pre-upgrade (to July 2009)	SEA905086 (SE)	32	<2-400	19	34
	SEA905080 (SW)	32	<2-1,300	8	28
Post upgrade (since January 2010)	SEA905086 (SE)	14	<2-240	8	7
	SEA905080 (SW)	14	<2-23	2	0
All data	SEA905086 (SE)	46	<2-400	11	24
	SEA905080 (SW)	46	<2-1,300	6	20

The sampling frequency has been relatively limited to date and does not consider other relevant information such as the frequency of usage of these sites for food gathering purposes and natural background seawater bacteriological water quality in the vicinity. Both sites' bacteriological quality for the 16 year period are within the median guideline. However, more than 10% of samples (20 to 24%) have exceeded the upper limit to date although some of these results could be expected to have resulted from the impacts of preceding wet-weather run off from nearby catchments (including the Waiokura Stream) entering coastal waters and others due to poor Manaia Creek

bacteriological water quality in general. Longer term compliance with the relevant guidelines will continue to be addressed by the receiving water bacteriological component of the monitoring programme. The upgrade of the system (addition of wetlands) has also focused on issues required for a marked improvement in the bacteriological quality of the treated wastewater discharge and subsequent coastal receiving water monitoring will continue to asses this performance. To date, only one exceedance of the upper limit and much reduced exceedances of the median limit at both sites have occurred since the wetlands tertiary waste treatment component has been operative.

4.4 Biological monitoring

4.4.1 Microflora of the pond system

Pond microflora are very important for the stability of the symbiotic relation with aerobic bacteria within the facultative pond. These phytoplankton may be used as a bio-indicator of pond conditions e.g. cyanobacteria are often present in under-loaded conditions and chlorophyceae are present in overloaded conditions. To maintain facultative conditions in a pond system there must be an algal community present in the surface layer.

The principal function of algae is the production of oxygen which maintains aerobic conditions while the main nutrients are reduced by biomass consumption. Elevated pH (due to algal photosynthetic activity) and solar radiation combine to reduce faecal bacteria numbers significantly.

Samples of the pond effluent had been collected at the time of most inspections of the oxidation pond system for semi-quantitative microfloral assessment prior to curtailment of this component of the programme during the 2012-2013 period. The microflora present in the final cell of the secondary oxidation pond have been summarised and discussed in recent annual reports and historical data have been provided in a previous annual report (TRC, 2009).

Samples of the primary pond effluent were collected on all three inspection occasions in the 2014-2015 period for chlorophyll-a analyses. Chlorophyll-a concentration can be used as a useful indicator of the algal population present in the system. (Note: Pearson (1996) suggested that a minimum in-pond chlorophyll-a concentration of 300 mg/m^3 was necessary to maintain stable facultative conditions). However, seasonal changes in algal populations and also dilution by stormwater infiltration might be expected to occur in any wastewater treatment system which together with fluctuations in waste loading would result in chlorophyll-a variability.

The results of primary pond effluent chlorophyll-a analyses and historical data are provided in Table 24 together with field observations of pond appearance.

Table 24 Chlorophyll-a measurements from the surface of Manaia oxidation pond at the perimeter adjacent to the outlet

Date	Time NZST	Appearance	Chlorophyll-a (mg/m^3)	Chlorophyll-a (mg/m^3) data for period 2013-mid 2014		
				N	Range	Median
12 December 2014	0800	turbid, dark green-brown	297	3	300-682	422
5 March 2015	0825	turbid, dark green-brown	1,460			
19 May 2015	0915	rel. clear, pale green-grey	46			

The presence of good microfloral pond population was indicated by relatively high chlorophyll-a concentrations on two occasions (ranging from 297 to 1,460 mg/m^3) while the early winter, 2015 level was very low following colder, wet weather conditions coincidental with lowest dissolved oxygen saturation (14%) recorded in the stormwater-diluted pond when the appearance was relatively clear, pale green-grey.

4.4.2 Beach ecological inspections

The monitoring programme for the 2014-2015 period required two beach ecological inspections to be performed. These surveys were performed in December, 2014 and June 2015. The inspections were conducted to provide qualitative assessments of the intertidal area for species present and also to assess the general 'ecological health' of the area. The results of these inspections are discussed below.

12 December 2014 survey

A marine ecological inspection of the foreshore in the vicinity of the discharge from the Manaia oxidation pond-wetland system was performed on 12 December 2014 commencing at 0830 NZST. Low tide on this day was at 0710 NZST at a height of 0.8 m above chart datum.

At the time of the inspection the effluent from the oxidation pond-wetland system was discharging at a moderate rate. The discharge was brown-green and had a detectable sewage odour. No sewage fungus was present after the Manaia Creek stream confluence. The discharge channel below the pipe outfall had not yet been fenced. Rocks had been placed in the channel. The Manaia Creek was in medium flow at the time of the inspection.

The intertidal inspection consisted of a qualitative assessment of the species present. The inspection covered the area where the stream flowed across the reef and an area up to approximately 50 m northwest of the stream, and included high, middle and low shore. The stream was approximately 10 m wide at the coast and the freshwater input was likely to have had a significant impact on the surrounding intertidal communities, particularly on the higher sections of the shore.

Photo 2 *Enteromorpha intestinalis* and *Ulva lactuca* present in pools at the top of the shore

Dense cover of the green macroalgal species *Enteromorpha intestinalis* and *Ulva lactuca* stretched along the high tide mark ~40 m either side of the stream (Photos 2 and 3). These algal species are typical of freshwater influence and thrive under nutrient rich conditions. At the top of the intertidal region within the vicinity of the stream, the gastropods *Austrolittorina*

Photo 3 Green algae evident along the high water mark

Photo 4 Dense cover of *Enteromorpha intestinalis* in the 'Manaia Creek' at mid shore

Photo 5 Green lipped mussel *Perna canaliculus* abundant on the lower shore

cincta and *Diloma* spp. were abundant. Other species became more abundant further away from the stream, including the limpet *Cellana radians*, the gastropods *Haustrum scobina* and *Melagraphia aeithiops*, and the barnacle *Austrominius modestus*.

A greater diversity of algal and animal species occurred at the mid and low tidal regions, as typical of intertidal marine communities, and expected with the diminishing influence of the stream. At the mid and low shore elevations, 15 animal and algal species occurred within the vicinity of the stream. *Enteromorpha intestinalis* dominated within the direct influence of the stream, forming a dense cover (Photo 4). The algal species *Corallina officinalis,* encrusting *Corallina* spp. and *Geledium caulacantheum* were present on boulders within the stream, becoming more abundant lower down the shore. The little black mussel, *Xenostrobus pulex* was abundant on rocks within the influence of the stream.

Twenty seven species were found more than 50 m to the north west of the stream in the mid and low shore regions, with an obvious change in the appearance of the reef and the diversity of species. Species only found away from the influence of the stream included: the seaweed *Laurencia thryisfera* and the anemone *Actinia tenebrosa*. The green lipped mussel *Perna canaliculus* was abundant at low shore both within and away from the influence of the stream (Photo 5).

In summary, the stream appeared to have a significant effect on nearby intertidal organisms, most likely a result of freshwater influence. *Enteromorpha intestinalis* was evident along the length of the stream, forming particularly dense cover from high to mid shore. Prolific growth of this species is typical of nutrient enrichment. The diversity and abundance of intertidal communities away from the influence of the stream was typical of that found at other reef sites around Taranaki.

9 June 2015 survey

A marine ecological inspection of the foreshore in the vicinity of the discharge from the Manaia oxidation pond wetland system was performed on 9 June 2015 commencing at 0915 NZST. Low tide on this day was at 0847 NZST at a height of 0.7 m above chart datum. This inspection was later in the year than usual, following a long dry period during summer and autumn when there was no discharge from the wetlands to the stream.

At the time of the inspection the effluent from the oxidation pond-wetland system was discharging at a high rate. The discharge had a brown tinge, a distinctive sewage odour

and was foaming in the channel (Photo 6). No sewage fungus was present on the bed of the Manaia Creek receiving waters. The area surrounding the discharge channel had been fenced since the previous inspection (Photo 7). Rocks had been placed in the channel previously in order to reduce the risk of sewage fungus growth. The Manaia Creek was in high to medium flow during the inspection.

Photo 6 The small discharge channel from the oxidation ponds prior to the Manaia Creek

The intertidal inspection consisted of a qualitative assessment of the species present. The inspection covered the area where the stream flowed across the reef (Photo 8) and an area up to approximately 50 m northwest of the stream, and included high, middle and low shore. The stream was approximately 10 m wide at the coast. Over the high to mid shore, the stream had a slight brown coloration and faint sewage odour, with surface foam present (Photo 9). Freshwater input was likely to have had a significant impact on the surrounding intertidal communities, particularly on the higher sections of the shore.

Photo 10 Fencing around the discharge channel from the oxidation ponds

Photo 10 Manaia Creek flowing over the intertidal reef at Manaia

Green macroalgal species *Enteromorpha intestinalis* and *Ulva lactuca* stretched along the high tide mark ~20 m either side of the stream, however, the cover was sparse relative to the December 2014 inspection. These algal species are typical of freshwater influence and thrive under nutrient rich conditions. At the top of the intertidal region within the vicinity of the stream, the gastropods *Austrolittorina cincta* and *Diloma* spp. were abundant. Other species became more abundant further away from the stream, including the limpet *Cellana radians*, the gastropods *Haustrum scobina* and *Melagraphia aeithiops* (Photo 10), and the barnacle *Austrominius modestus*.

Photo 10 Foam from Manaia Creek flowing over the intertidal reef at Manaia

A greater diversity of algal and animal species occurred at the mid and low tidal regions, as typical of intertidal marine communities, and expected with the diminishing influence of the stream. At the mid and low shore elevations, 24 animal and algal species occurred within the vicinity of the stream.

Photo 10 Snails – *Haustrum haustorium* consuming *Melagraphia aeithiops*, midshore

Photo 11 Macroalgal species at low shore, abundant away from the influence of the stream

Photo 12 Kina *Evechinus chloroticus* present on the low shore away from the influence of the stream

Photo 13 Green lipped mussel Perna canaliculus abundant on the lower shore

Enteromorpha intestinalis was present within the direct influence of the stream. The algal species *Corallina officinalis,* encrusting *Corallina* spp., *Geledium caulacantheum Ralfsia* sp. and *Hormosira banksii* were present on boulders within the stream, becoming more abundant lower down the shore (Photo 11).

Twenty eight species were found more than 50 m to the north west of the stream in the mid and low shore regions, with an obvious change in the appearance of the reef and the diversity of species. Species only found away from the influence of the stream included: the seaweed *Echinothamnion* sp. and kina *Evechinus chloroticus* (Photo 12). The green lipped mussel *Perna canaliculus* was abundant at low shore both within and away from the influence of the stream (Photo 13).

In summary, the stream appeared to have a significant effect on nearby intertidal organisms, most likely a result of freshwater influence. *Enteromorpha intestinalis* was evident along the length of the stream, although the cover was notably less dense than observed during the previous survey. Prolific growth of this species is typical of nutrient enrichment, however, this species was not abundant beyond the 50 m mixing zone extending either side of the stream. The diversity and abundance of intertidal communities away from the influence of the stream was typical of that found at other reef sites around Taranaki.

4.5 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).

In the 2013-2014 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with the Company's conditions in resource consents or provisions in Regional Plans.

4.6 Discussion

4.6.1 Discussion of performance

The Manaia oxidation pond and wetlands sewage treatment system was well maintained and operated throughout the monitoring period. In recent years the installation of the new screen and baffle system to the pond outlet appeared to have rectified past instances of debris discharging via the outfall to the receiving waters. No occurrences of sewerage reticulation overflow in or near Manaia township were recorded during the period. Desludging of the pond which, had been completed in the 2007-2008 period, had been used to line the wetlands, which were constructed after an archaeological survey of the area had been completed, and planted in the latter part of the 2009-2010 period.

The performance of the oxidation pond showed typical seasonal variability, with aerobic conditions occurring throughout the monitoring period although dissolved oxygen levels were lower than usual.

Wetlands effluent surveys which have been conducted since completion of the upgrade, have shown wastewater parameter concentrations far lower than historical median oxidation pond values. In terms of the extensive previous monitoring data, it can be concluded that the pond continues to perform adequately and that the addition of the wetlands has markedly improved wastewater quality in the interim in terms of bacteriological numbers, BOD_5, suspended solids, and turbidity levels. Semi-quantitative biomonitoring of the microflora component of the oxidation pond prior to current period has found communities typical of other well-performing pond systems elsewhere in the region. Chlorophyll-a measurements and inspectorial observations

during the current season have indicated good microfloral health in the aerobic oxidation pond on all but one occasion (following a wet weather period) after stormwater dilution and a cooler weather period. The overall performance of the wastewater system was considered typical of a single pond system (with a relatively low industrial loading component) followed by wetland tertiary treatment.

4.6.2 Environmental effects of exercise of water permit

Minimal impacts of the wetlands discharge were recorded on aspects of the water quality of the Manaia Creek into which the effluent discharged earlier in the monitoring period. More recent receiving water monitoring, after incorporation of the wetlands into the system, had identified marked improvements in the aesthetic water quality of the Manaia Creek. However, the poor water quality often recorded upstream of the discharge warrants some investigation as this may have contributed to past 'sewage fungus' outbreaks and the potential for elevated coastal water bacteria levels on occasions. (Note: Background investigations of the upstream water quality of Manaia Creek have been delayed by drought conditions over the 2012-2013 and 2014-2015 summer-autumn periods). Notwithstanding this factor, monitoring over the 2014-2015 period continued to illustrate that there was minimal impact on the bacterial levels measured in the nearby coastal receiving waters of the Tasman Sea adjacent to the inflowing stream, although elevated numbers were found following a wet late spring period.

The 1998 MfE/MoH Bacteriological Water Quality Guidelines for Marine and Fresh Water guidelines (subsequently updated in 2003) are used as the basis for determining compliance with special condition 7(iii) of consent 1204 for recreational shellfish-gathering purposes. Results of bacteriological monitoring conducted at the two coastal sites showed standards were met on one of two occasions in terms of bacteriological water quality for shellfish gathering with the median value exceeded on this one occasion at both sites and the 10% occurrence level exceeded at one site on this occasion. However, care needs to be exercised in drawing too many inferences from the data gathered to date, because there is currently limited information available on which to analyse the significance of variations in numbers observed in terms of wastewater impacts and/or in relation to natural background coastal seawater bacteriological levels.

The two ecological beach surveys (conducted in December 2014 and June 2015) found that whilst there were localised, significant effects on marine species within the vicinity of the stream, the ecological diversity and species abundance were similar to those found during previous inspections at both reef sites and typical of other Taranaki reef sites.

4.7 Evaluation of performance

A tabular summary of the STDC's compliance record for the year under review is set out in Table 25 for the recently renewed consent.

Table 25 Summary of performance for Consent 1204-4

Purpose: To discharge treated wastewater to water		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Upgrade to plant within two years	Reporting by consent holder; upgrade commenced and completed	Yes
2. Provision of annual progress reports	Reporting by consent holder on upgrade	Yes (completed)
3. Exercise in accordance with documentation	Liaison with consent holder and inspections	Yes
4. Minimisation of effects	Inspections and sampling	Yes
5. Limits on volume	Reporting by consent holder and inspections	Yes
6. Implementation of a management plan	Provision by consent holder	Yes
7. Provision of operator	Liaison with consent holder	Yes
8. Maintenance of aerobic ponds conditions	Inspections and sampling	Yes
9. Trade wastes connections	Liaison with consent holder	Yes
10. Limits on receiving water effects	Inspections and physicochemical sampling and biomonitoring (when discharging)	Majority of times
11. Monitoring provisions	Performance of tailored programme	Yes
12. Implementation of infiltration programme	Reporting by consent holder	Progress reported
13. Provision for lapse of consent	Consent holder liaison	N/A
14. Optional review provision re environmental effects	Not scheduled for consideration until June 2017	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		High High

[Note: N/A = not applicable]

During the year, STDC demonstrated a high standard of compliance with consent conditions relating to the wastewater treatment system. There was a continuation of the marked improvement in the level of environmental performance (high) in terms of localised impacts on the receiving waters of the Manaia Creek and the coastal waters of the Tasman Sea. In particular bacteriological issues have been addressed by way of conditions of the renewed consent and the requisite upgrade of the wastewater treatment plant, although some investigations into the water quality of the Manaia Creek may be warranted upstream of the wetlands discharge in relation to other possible issues.

4.8 Recommendations from the 2013-2014 Annual Report

The recommendations from the 2013-2014 Annual Report for the Manaia wastewater treatment system monitoring programme were:

1. THAT monitoring of the Manaia wastewater treatment system be continued for the 2014-2015 period by formulation of an appropriate monitoring programme similar in format to the programme undertaken during the 2013-2014 period with a minor change to the microfloral component of the inspectorial requirements.

2. THAT the consent holder liaise with the Council with respect to any proposed industrial waste discharges to the system in order that potential impacts may be assessed and if necessary, additional monitoring requirements formulated.

3. THAT the consent holder liaise with the Council should overloading of the sewerage reticulation occur in such a manner that there may be a likelihood of an unauthorised discharge to natural water.

4. THAT the reporting required by Special Condition 12 of consent 1204 shall be supplied to the Council by 30 June 2015.

5. THAT the Council investigates aspects of the water quality of Manaia Creek upstream of the WWTP and the source of bacteria in both the stream and coastal waters, during the 2015-2016 period.

Recommendation 1 was subsequently adopted and most aspects of the programme were performed. Recommendations 2 to 4 were satisfied and the investigations in Recommendation 5 were deferred for further consideration of usage of DNA marker investigations to the 2015-2016 period.

4.9 Alterations to the monitoring programme for 2015-2016

In designing and implementing the monitoring programmes for air/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, its obligations to monitor emissions/discharges and effects under the RMA, 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/discharging to the environment.

It is noted that the programme was reviewed following the system upgrade required by the renewed consent over the 2009-2011 period.

In the case of the STDC and the Manaia oxidation pond system, it is proposed that for the 2015-2016 period that monitoring continue consistent with that reviewed and adopted for the 2014-2015 period [(incorporating the additional survey to assess the performance of the wetland component of the WWTP (surveyed in conjunction with the summer inspection and receiving water sampling)) and also the minor change to the microfloral monitoring of the oxidation pond where chlorophyll-a analyses replaced the requirement for the more detailed phytoplankton evaluation at the time of each inspection]. A recommendation to this effect is attached to this report. Although

not a component of the monitoring programme, it is noted that some investigation into the upstream water quality of Manaia Creek may also be undertaken in order to better ascertain the implications for aspects of stream and coastal water quality downstream of the WWTP discharge.

4.10 Exercise of optional review of consent

Resource consent 1204 was renewed in June 2007 and there was provision for review in June 2011. At that stage, with the upgrade only recently completed, it was not considered appropriate to exercise the review. The next optional review is due in June 2017.

4.11 Recommendations

1. THAT monitoring of the Manaia wastewater treatment system be continued for the 2015-2016 period by formulation of an appropriate monitoring programme similar in format to the programme undertaken during the 2014-2015 period.

2. THAT the consent holder liaise with the Council with respect to any proposed industrial waste discharges to the system in order that potential impacts may be assessed and if necessary, additional monitoring requirements formulated.

3. THAT the consent holder liaise with the Council should overloading of the sewerage reticulation occur in such a manner that there may be a likelihood of an unauthorised discharge to natural water.

4. THAT the reporting required by Special Condition 12 of consent 1204 shall be supplied to the Council by 30 June 2016.

5. THAT the Council investigates aspects of the water quality of Manaia Creek upstream of the WWTP in terms of the source of bacteria in both the stream and coastal waters, during the 2015-2016 period.

5. Patea oxidation pond system

The Patea wastewater treatment system (constructed in 1973 for a population of 2,400) originally was comprised of a single large oxidation pond which was upgraded to a three cell system in 2008. There are currently no significant industrial wastes being discharged into this pond. The population serviced by the system was 1,143 in 2006. The nearby York Street pumping station has provision for river overflow via a separate outfall in the event of emergencies.

5.1 Background

Historical information relating to the operation of the treatment pond system, particularly the consented York Street pumping station overflow, is presented in several earlier annual reports (see TRC, 2004). Upgrades to the pump station and reticulation have significantly reduced raw sewage overflows to the river in recent years to the extent that relatively few (seven), mainly short duration (less than 2 hours), overflows occurred during the six year period from mid 2004 to mid 2010.

Upgrades to the reticulation and treatment system were addressed by the consent holder and consultant in the recent consents' renewal process associated with the oxidation pond system and pump station. These consents were renewed in February 2006 (see section 1.1.2.4), with a minor variation granted in July 2007 to extend the date for completion of the upgrade modifications.

The consent holder advised that the upgrade of the treatment plant was planned for early 2007 involving partitioning of the pond and partial desludging prior to lining the pond. The upgrade was expected to take about four weeks. Some upgrading of the pump station facility was also planned. Various delays occurred but the upgrading of all facilities was complete by June 2008 (see TRC, 2008).

Inspections of the oxidation pond system by the Council have also incorporated inspections of the pump station and emergency outfall area in the annual monitoring programmes since 1996 and the frequency of bacteriological receiving water quality surveys of the Patea River has increased since the 1997-1998 year and more recently since the renewal of consents in 2006. Recreational bacteriological water quality of two sites (lower river and Mana Bay) is now also monitored as a requirement of the renewed consents and is also monitored at nearby Patea beach at three-yearly intervals as a component of the coastal state of the environment programme. The latter will be monitored next in the 2015-2016 period.

5.1.1 Upgrade of the system

The wastewater treatment system upgrade (required by Special Condition 1 of the renewed consent) comprised the division of the single pond into three partitions, (one of which required lining), repair of the pond wavebands, desludging of the main pond, upgrading of both the pond and emergency outfalls with rock diffusers, and provision of a new step screen on the main influent line to the pump station.

The upgrade commenced in early 2007 with lowering of the pond wastewater level by removal of the outlet weir. The proposed configuration of the pond was altered as a consequence of geotechnical investigations into the integrity of the principal section of

the pond. This also required the relocation of the (pumped) inlet to the system, and a delay in the completion date, necessitating a variation to the consent which subsequently was granted toward the end of the 2006-2007 period.

During 2006-2007 various issues caused delays with the upgrade which had been anticipated to take eight weeks for completion. However, by June 2007 the pond had been partitioned, the inlet relocated and the pond diffuser outlet upgraded but the normal pond level had not been reinstated. Desludging of the pond was also delayed by the issue of community concerns with the location of the disposal site. Desludging was subsequently performed in the 2007-2008 period, with the sludge pumped to a lined bunded area within the first section of the pond and covered with polythene. Consent for removal of this sludge to a suitable land disposal site was granted late in the 2012-2013 period, with sludge disposal planned for later in 2013 (STDC, 2013). By the end of April 2008 the pond system upgrade was complete with the exception of the lining of the first pond which remained empty. A geotextile liner was used in this pond as not all the sludge was dried out on the base of the pond as intended by the time the liner was installed (July 2008). Flow metering at the outlet weir was installed in July 2007.

All other upgrade work (York Street screening facility, wave band repairs, flow meter on the outlet weir, pond outlet diffuser and rock rip-rap, and new emergency outlet and rock rip-rap) was completed by May 2008 at which time the final pond was filling to operational level.

In July 2008, contractors secured the geosynthetic liner in the first pond to the dividing rock wall but it was noted that there were difficulties with securing the liner to the pond floor, as the liner had floated to the surface at several points (see TRC, 2010) This remained the situation throughout the 2009-2010 period despite further attempts to sink the liner (with sandbags).

The consent holder's consultant had addressed the situation in July 2009 but work undertaken later in that year did not alleviate the problem. The liner remained floating at several points throughout the 2009 to 2013 monitoring periods.

A brush-layer wall, 40 m in length, was constructed in August 2008 at the river bank adjacent to the ponds after slippage(s) occurred. This work did not require consenting and complied with Rules 25 and 26 of the Regional Freshwater Plan. A small slip on the nearby river bank late in the 2009-2010 period (after prolonged wet weather) was contract planted with brush willows (V. Kuyl, STDC; pers.comm). Willow planting was undertaken on some minor slips on the river bank in June 2015 (STDC, 2015).

No infiltration/inflow pipe rehabilitation work was undertaken on the reticulation during the 2011-2012 year but some lining was performed in 2012-2013 (STDC, 2013). Further reticulation investigations were performed in 2013-2014 and the resultant faults have been incorporated into repair worked programmed over the next three years with 372m of pipeline re-lined during the 2014-2015 period (STDC; pers.comm)

No alteration has been made to the capacity of the rising main from the York Street pump station to the WWTP but there is provision for a new or duplicate main should emergency overflows exceed consent conditions (STDC, 2013).

5.1.2 Stakeholders' meeting

Special condition 15 of consent 0145 requires a meeting to be held with interested submitters to the consent at least every three years. The consent holder organised such a meeting in Patea township on 3 April 2009 with thirteen persons (nine submitters (iwi and Area Health Board)) present. The consent holder updated the meeting on matters relating to the upgrade to all components of the system. TRC addressed all aspects of the monitoring programme including state of the environment contact recreational monitoring of the lower Patea River and Patea beach sites. No particular concerns were raised by the submitters who were appreciative of these updates and information provided. No meeting was required during the 2010-2011 or 2011-2012 periods. The meeting scheduled for the 2012-2013 period was cancelled as none of the submitters required such a meeting. The next meeting is scheduled for the 2015-2016 period.

5.2 Inspections

5.2.1 Pond system

In accordance with the monitoring programme for the Patea oxidation pond, three inspections were performed on 13 November 2014, 15 April 2015, and 11 June 2015. The physical features of the three pond cells were recorded and the dissolved oxygen concentration was measured from the final cell's surface adjacent to the effluent outlet. The results are presented in Table 26. In addition, a sample was collected from the final cell during each inspection for chlorophyll-a analyses with these results discussed in section 5.4.

Table 26 Dissolved oxygen measurements from the surface of the Patea oxidation pond tertiary cell adjacent to the outlet

Date	Time NZST	Temperature °C	Dissolved Oxygen	
			Concentration g/m³	Saturation %
13 November 2014	0855	14.7	7.7	78
15 April 2015	0930	11.7	11.6	103
11 June 2015	0955	11.8	9.7	89

As dissolved oxygen can vary seasonally, but also on a daily basis (with minimum concentrations recorded in early daylight hours), sampling times have been standardised toward early to mid-morning for comparative purposes.

Photo 144 General view of three cell system November 2014

Aerobic conditions were recorded on all occasions with dissolved oxygen levels within the range expected for this type of biological treatment system. During the current monitoring period much less variability than usual (78 to 103% saturation) was recorded for dissolved oxygen. This variation in saturation was far narrower than ranges recorded in most previous monitoring years when supersaturation has often been coincident with a high algal component in the pond. No incidents of super-saturated concentrations were recorded although fully saturated conditions were found in autumn. The pond cells operated at normal levels during the year after completion of the upgrade of the wastewater treatment system some six years earlier (Photo 14).

5.2.1.1 First cell

Surface conditions in this, the largest of the three recently re-configured cells, were flat to rippling due to light to moderate wind conditions at inspection times. The cell wastewater appearance varied from turbid green (summer and autumn) to slightly turbid green (winter). There were only slight odours recorded on any occasion adjacent to or downwind of this cell. The surrounds were maintained in tidy condition by mowing and weeds were sprayed. The cell's surface was free of debris/floatables with no floating scum around the perimeter. Wildlife comprised moderate to high numbers of mallard or paradise ducks on each occasion and several black swan in winter.

5.2.1.2 Second cell

Surface conditions on this, the second of the three re-configured cells, were also flat to rippling under light to moderate wind conditions on inspection occasions. The cell wastewater appearance varied from turbid green (spring) to turbid dark green (autumn), to paler green (winter). There were no odours recorded on all occasions. The surrounds and wavebands were maintained in tidy condition by mowing and spraying. The cell's surface was free of debris/floatables with no floating scum around the perimeter. Wildlife was confined to few to moderate numbers of mallard ducks on two inspection occasions and three royal spoonbills in autumn. No wildfowl were present on this cell at the time of the winter survey

5.2.1.3 Final (tertiary) cell

Surface conditions on this, the final of the three re-configured cells, ranged from flat to light rippling under light to moderate wind conditions on inspection occasions. The cell wastewater appearance varied from turbid, pale green (spring), to turbid dark green (autumn), to relatively clear, pale green (winter). There were no odours recorded on any occasion adjacent to this cell. The surrounds and wavebands were maintained in tidy conditions. The cell's surface was free of debris/floatables with no floating scum around the perimeter. No wildlife were present on this cell on two inspection occasions, a feature of this cell to date, with five black swans present in winter.

The estimated discharge rate from this final cell via the rock riprap outfall to the river varied from 10 to 20 L/sec (winter and spring) to 60 L/sec (in autumn). There was minimal visual impact of the discharge on the receiving waters of the Patea River in the immediate vicinity of the outfall with no plumes visible at the right bank downstream on either of two occasions and a short, green plume visible within the mixing zone in autumn.

5.2.2 Pumping station system and overflows

Additional pre-screening of the raw wastewater (prior to the pump station) and improvements to the physical outfall structure (rock riprap placement) were components of the upgrade to the wastewater treatment system required by the renewed consents with construction of these components completed in the 2007-2008 period. Some localised works to improve ground-water drainage adjacent to the pump station were performed early in the period.

Inspections in the area of the flume shed, pump station, and outfall to the Patea River were made by the Council in conjunction with each inspection occasion. No evidence

of discharges to the river was found and the visual alarm system appeared to have remained in working order. STDC advised that regular checking of the system was performed. The area was maintained in tidy condition throughout the period.

The consent holder's upgrading of the pump station and associated alarms, completed during the 2003-2004 monitoring period, was very effective in that no overflows were recorded during, or subsequent to any extreme wet weather periods during the following two monitoring years (2004 to 2006). However, for various reasons, seven overflow events (all but one of very short duration) occurred in the 2006-2009 monitoring periods. No overflows were recorded during the 2009-2010 period although a fault in the ultrasonic level control at the pump station recorded in late September 2009 led to an erroneous report of one overflow. This was repaired immediately and no overflow occurred.

A high level pump station alarm was triggered over a weekend in late June 2010. Although no overflow occurred, the consent holder's contractor displayed signage (as a cautionary measure) but did not remove the signage or advise the STDC of these actions. This resulted in public comment and inquiries to the Council and subsequently required that the consent holder improve contractual procedural methods.

In September, 2009 a significant amount of gravel was removed from the lower reaches of the main trunk sewerage line. A number of displaced joints in the pipework were found during the CCTV investigation and are to be integrated into a repair programme over the next five years (STDC, pers.comm). Re-lining of sewer pipes (395 m) was performed in areas of Patea township during the 2010-2011 period.

One overflow event occurred on 6 September 2010 following heavy rainfall and continued for approximately five hours. All parties were notified and the requisite signage displayed, then removed at the appropriate time. No additional receiving water quality sampling was warranted due to the short duration of the event and the flood flow condition of the lower Patea River at the time. In early March 2011 a high level alarm was activated (after recent heavy rainfall conditions) but no overflow eventuated. No overflow events occurred during the 2011-2012 period.

One very brief (15 min) emergency overflow occurred in mid July 2012 when contractors clearing fallen trees damaged a section of the influent line. Repairs were effected soon after this incident and signage was erected in accordance with the contingency plan and Special Condition 13 of the consent.

The inlet channel to the York Road screening facility was also raised to further contain high inflows (STDC, 2013).

A brief overflow event (two hours) occurred on 28 November, 2013 following heavy rainfall and another (half an hour) on 10 December, 2014 following heavy rainfall. All parties were notified and the requisite signage erected for appropriate periods. No additional receiving water quality monitoring was necessary as the lower Patea River was in high flow at both times and the duration of the overflow was short. The contact recreational bacteriological monitoring programme was also operative over these periods. Overflows followed heavy rainfall in mid May 2015 and again from 19 to 22 June 2015. All parties were advised and warning signage displayed as required.

5.3 Physical, chemical and bacteriological sampling

Effluent analyses and Patea River receiving water quality surveys were performed on two of the three inspection occasions. No overflow event surveys were required in the lower river due to the absence of any significant events (see above). Recreational bacteriological monitoring of two sites (lower river and Mana Bay) was performed as required by consent conditions. The site at Patea Beach, a component of the Council's state of the environment programme, is monitored on a three-yearly cycle and was performed previously in the 2012-2013 period (TRC, 2013b).

5.3.1 Effluent quality

One full analyses of the effluent from the oxidation ponds final tertiary cell was performed on 15 April 2015. There was no receiving water survey at this time as the river was in fresh following a flood flow event a week earlier. At the time of this restricted sampling survey the effluent was turbid green in appearance and discharging at an estimated rate of 60 L/s. The results are presented in Table 27. All analyses were performed in the Council's IANZ-registered laboratory using standard methods.

Table 27 Results of the sampling survey of the Patea oxidation pond final (tertiary) cell effluent on 15 April 2015

Site Date	Unit	Third cell discharge 15 April 2015
Parameter		
Time	NZST	0915
Temperature	^{o}C	11.7
Dissolved oxygen	g/m^3	11.6
DO saturation	%	103
BOD_5	g/m^3	26
BOD_5 (filtered)	g/m^3	15
pH	pH	8.5
Conductivity @ 20^{o}C	mS/m	51.7
Dissolved reactive phosphorus	g/m^3 P	0.005
Ammonia-N	g/m^3 N	1.44
Suspended solids	g/m^3	74
Turbidity	NTU	48
E.coli bacteria	nos/1-- ml	5800
Faecal coliform bacteria	nos/100 ml	10,000
Enterococci bacteria	nos/100 ml	1,100
		turbid, green, 60 litres/sec (est)

Effluent quality results indicated a relatively high effluent quality, typical of a municipal pond treatment system receiving mainly domestic wastes for the time of the year sampled. The fully saturated (103% dissolved oxygen), slightly elevated pH (particularly for midmorning conditions), suspended solids and turbidity levels, together with the appearance of the effluent, were indicative of significant pond microfloral contributions. The faecal coliform bacteria number was lower than typical of the effluent quality from the previous single pond treatment system. This was probably related to improved retention and circulation in the upgraded, modified system and coincidental with the significant microfloral population.

The historical wastewater quality data for the Patea single oxidation pond system (prior to the 2008 upgrade to a three-cell system) and post upgrade are presented in Table 28 for comparative purposes.

Table 28 Ranges of selected results of Patea oxidation pond effluent analyses recorded for the period 1987 to 30 June 2008 (ie prior to upgrade) and tertiary cell effluent analyses (post upgrade to 30 June 2014)

		Pre upgrade			Post upgrade		
Parameter	Unit	No of samples	Range	Median	No of samples	Range	Median
Dissolved oxygen	g/m^3	66	0.3-25	8.1	18	1.1-14.8	7.8
BOD_5	g/m^3	20	15-66	29	7-	13-31	24
BOD_5 (filtered)	g/m^3	17	1.8-21	4.7	7	1.11	1.5
pH		21	8.1-9.6	8.6	7	8.6-10.1	10.0
Conductivity @ 20°C	mS/m	36	57-154	79	12	48.5-73.2	66.6
Chloride	g/m^3	18	57.0-276	71.6	5	65.8-77.8	75.7
Ammonia-N	g/m^3 N	21	0.027-9.2	2.62	7	0.025-1.10	0.038
Dissolved reactive phosphorus	g/m^3 P	21	1.48-6.87	3.77	7	0.011-1.91	1.12
Suspended solids	g/m^3	22	27-140	74	7	35-150	110
Turbidity	NTU	25	7.8-113	27	12	7-240	93
Faecal coliform bacteria	nos/100 ml	38	360-190,000	26,500	12	10-420	43
Enterococci bacteria	nos/100 ml	26	300-20,000	2,700	11	8-1,200	60

[Note: With the exception of DO results, the majority of the data was recorded from summer-autumn surveys.]

The survey of effluent quality indicated that the upgraded ponds three cell system's effluent was very good in comparison with the results from past surveys (Table 28) of the original single pond effluent and within or better than historical ranges for the majority of parameters. Several parameters' results were better than past median values, and the faecal coliform bacterial level was well below the median previously recorded. Depending upon the time of the year, changes in pond microfloral populations also contribute to variability in effluent quality which must be taken into account for comparative purposes. This was apparent from the survey with 103% dissolved oxygen saturation, elevated pH, suspended solids, and turbidity (above or near previous pond medians) which, together with the moderately low faecal coliform bacteria number (slightly below the previous minimum), were indicative of a relatively significant microfloral contribution. The upgraded system should now have reached a stable state following pond cells re-filling six years previously, after the significant re-configuration of the original single pond. Wastewater quality appears to have improved in terms of median and/or ranges of BOD_5, nutrients, and particularly bacteria levels, but not in terms of suspended solids (and turbidity) as this component often is comprised principally of algae. However, as more survey data are recorded, comparisons of the upgraded system with the historical data will become more valid.

5.3.2 Impacts on receiving waters

Assessments of the impact of the pond's effluent discharge on the bacteriological quality of the receiving waters of the lower tidal reaches of the Patea River were undertaken on two of the three inspection occasions toward low tide conditions. The sampling sites for these surveys are listed in Table 30 and sampling sites' locations in relation to the pond system are illustrated in Figure 7. Sampling sites associated with the bacteriological recreational monitoring programme (SEA 907022 and SEA 907020) are also listed in Table 29.

Table 29 Sampling site locations for the Patea oxidation ponds system

No.	Site	Location	GPS reference	Site code
1	Patea River	At SH3 bridge approximately 1 km upstream of the oxidation pond discharge (right bank)	1727126 E 5598189 N	PAT 000970
2	Patea River	Approximately 500 m downstream of SH3 bridge; downstream of emergency discharge	1727127 E 5597688 N	PAT 000975
OP	Effluent	From the outlet of the Patea oxidation pond final cell	1727268 E 5597296 N	OXP 008001
3	Patea River	Approximately 200 m downstream of the oxidation pond discharge (right bank)	1727433 E 5597119 N	PAT 000985
4	Patea River	At Motor Camp boat ramp (approximately 0.6 km downstream of the oxidation pond discharge; right bank)	1727517 E 5596784 N	PAT 000995
SMB	Tasman Sea	Mana Bay	1727532 E 5596415 N	SEA 907022
SPB	Tasman Sea	Patea Beach	1727220 E 5596442 N	SEA 907020

Figure 7 Aerial location map of sampling sites in relation to the Patea upgraded three cell oxidation pond system

Site 2 was added to the programme as a consequence of raw sewage overflow discharges during the 1995-96 monitoring period (see section 5.1) and has been retained as a necessary component of receiving water surveys in relation to the renewed consents.

Additional monitoring of the river at site 4, and Mana Bay are required by a specific condition (Special Condition 11) included on the renewed discharge consent, while Patea Beach is monitored every third year by the Council's state of the environment recreational bacteriological programme. (Note: the beach site was last monitored in the 2012-2013 period (TRC, 2013b) and therefore was not monitored in the 2013-2014 or current 2014-2015 periods).

5.3.2.1 Lower river impacts

Sampling was undertaken under moderate to lowish river flow conditions (above median (late spring) and well below median (autumn) flows at McColl's bridge recorder site), and timed toward low tide on the two survey occasions. Results are presented and discussed as follows for each of these receiving water surveys.

13 November 2014

The effluent discharge from the tertiary cell of the re-configured Patea oxidation ponds system was estimated at 20 L/s at the time of this late spring sampling occasion. (Note: No discharge from the pumping station had occurred since a very minor wet weather event in late November 2013). The survey was performed soon after low tide under turbid, brown, moderate river flow conditions during fine weather but following recent wet-weather conditions. The river was flowing slowly in a downstream direction at all sites. Results are presented in Table 30.

Table 30 Results of the sampling survey of 13 November 2014 (low tide: 0742 NZST)

Site		1	2	OP	3	4
Location		Upstream		Discharge	Downstream	
Parameter	Unit					
Time	NZST	0820	0835	0855	0925	0950
Temperature	^{o}C	14.6	14.9	14.7	16.3	16.1
Conductivity @ 20^{o}C	mS/m	18.4	21.2	58.6	39.7	27.6
Turbidity	NTU	36	22	7.8	40	34
E. coli bacteria	nos/100 ml	1,200	1,200	350	1,000	990
Faecal coliform bacteria	nos/100 ml	1,200	1,200	360	1,100	990
Enterococci bacteria	nos/100 ml	200	250	50	180	220
Appearance		turbid, brown; slow, d/s flow	turbid, brown; slow, d/s flow	sl. turbid, pale green	turbid, brown; slow, surging flow	turbid, brown; slow, surging flow

Low conductivity levels indicated minimal saline penetration of the lower river which remained relatively uniform in this reach under fresh river flow conditions. The bacterial numbers were typical of these higher river flow conditions in the absence of any coastal water intrusion. A narrow range of faecal coliform, *E.coli,* and enterococci bacteria numbers were recorded at all four sites (Table 30) consistent with no impacts from a high standard of bacterial effluent quality discharged from the re-configured oxidation ponds system outfall. There was minimal change in turbidity downstream of the discharge which was consistent with the high quality of wastewater discharge (Table 30). In general, bacteria numbers were typical of ranges in the lower reaches of a large river draining a developed catchment under elevated fresh flow conditions.

11 June 2015

The discharge from the final cell of the Patea oxidation ponds system was estimated at 10 L/s at the time of this winter sampling survey which was performed under moderately high flow conditions, in overcast, fine weather, following wet weather and one week since a significant fresh. While a very brief wet weather overflow from the pumping station had occurred in mid December 2014, no further overflows preceeded this survey. The sampling survey was performed just before low tide when a slow downstream river flow was recorded at the sites. Results from the survey are presented in Table 31.

Table 31 Results of the sampling survey of 11 June 2015 (low tide: 1051 NZST)

Site		1	2	OP	3	4
Location		Upstream		Discharge	Downstream	
Parameter	Unit					
Time	NZST	0930	0945	0955	1000	1030
Temperature	°C	11.7	11.8	11.6	11.9	11.9
Conductivity @ 20°C	mS/m	15.1	16.3	47.1	28.2	18.8
Turbidity	NTU	120	76	17	90	75
E.coli	nos/100 ml	N/A	N/A	N/A	N/A	N/A
Faecal coliform bacteria	nos/100 ml	770	730	2000	780	680
Enterococci bacteria	nos/100 ml	240	270	210	350	330
Appearance		turbid, grey-brown; slow d/s flow	turbid, grey-brown; slow d/s flow	sl. turbid, pale green-brown	turbid, grey-brown; slow d/s flow	turbid, grey-brown; steady d/s flow

(Note: N/A = not analysed)

These results indicated no saltwater penetration under moderately high flow and low tide conditions. Faecal coliform and enterococci bacteriological water quality was poor but typical of the lower reaches of a developed farmland catchment after a wet weather period under turbid, higher flow conditions. It was indicative of no impacts of the upgraded oxidation ponds' system discharge which had a typical faecal coliform bacteriological effluent quality under winter conditions. Minimal visible impacts of the slightly turbid, wastewater discharge were indicated at the site (3) at the downstream boundary of the consented mixing zone.

5.3.3 Impacts of overflow events on receiving waters

No additional monitoring of the lower reaches of the Patea River was required as there was only one very brief insignificant overflow event during the contact recreational period between November 2014 and April 2015 (see Section 5.2.2).

5.3.4 Summary of impact monitoring of the receiving waters of the river

There were no significant impacts of the moderate to good bacteriological quality discharge from the upgraded oxidation ponds' system recorded by two monitoring surveys of bacteria numbers in the Patea River. Bacterial water quality measured through the tidal lower reaches of the river in late spring and winter was typical of the lower reaches of a developed farmland catchment following periods of wet-weather and was relatively uniform throughout the reach upstream and downstream of the emergency overflow and wastewater treatment system outfalls. Poorer bacteriological water quality was correlated with the absence of saltwater penetration in this reach of the river under low tide and higher flow conditions.

The 1998 MfE/MoH Guidelines for Bacteriological Water Quality for Marine and Fresh Waters (revised in 2003), recommend enterococci as the indicator bacteria for marine beach sites whilst for freshwater the recommended indicator is *E. coli*. It is noted that on both occasions the bacterial numbers at the downstream site (4) near the river mouth (assuming that all faecal coliform bacteria were *E. coli* which is generally the case in ringplain surface waters) were well above the single sample 'Alert' limit (260 *E. coli* per 100 ml), and above the 'Action' limit (550 *E. coli* per 100 ml) for contact

recreational waters (MfE, 2003), which are typical of bacteriological water quality conditions following wet weather periods.

Areas nearby are commonly used for contact recreational purposes (eg, lower river boat ramp, Mana Bay (adjacent to the river mouth), and Patea Beach) and more intensive contact recreational monitoring at two of these sites was programmed in relation to conditions on the renewed consents (see section 5.3). This was also integrated with the Council's state of the environment contact recreational bacteriological monitoring programme (which specifically includes Patea Beach on a three-yearly rotation frequency), the results of which are presented in Section 5.3.5.

5.3.5 Contact recreational bacteriological water quality monitoring

Two sites were included in the consent monitoring programme (see Table 30 and Figure 7), one in the lower river at the Motor Camp boat ramp (PAT000995) and the other in the nearby coastal waters at Mana Bay (SEA907022). Another site at Patea Beach (SEA 907020) is included at three-yearly intervals in the Council's recreational monitoring programme and was last surveyed over the 2012-2013 period (TRC, 2013b). Sampling at these sites during the Council's defined recreational monitoring period occurred between mid November 2014 and late March 2015 (TRC, 2015), and although concentrated on high tide conditions (13 samples), also included low tidal conditions at these sites on 8 other occasions at the site in the lower river and 7 occasions at Mana Bay. The results are summarised in Tables 32, and 33 and illustrated in Figures 8 and 9.

5.3.5.1 Lower Patea River at the boat ramp

This site was sampled on 21 occasions (13 high tide and eight low tide), none of which were immediately related to consented usage of the emergency outfall (as minimal significant use was made of this outfall). These results are summarised in Table 32 and illustrated in Figure 8.

Table 32 Statistical results summary for the lower Patea River at the boat ramp (PAT000995) from November 2014 to March, 2015

Parameter	Unit	Number of samples	Minimum	Maximum	Median	Medians	
						HT	LT
Conductivity @ 20°C	mS/m	21	27.6	4,790	4,500	4,680	1,745
E.coli	nos/100ml	21	<1	990	12	5	47
Enterococci	nos/100ml	21	<1	220	7	4	25
Faecal coliforms	nos/100ml	21	1	990	12	5	48
Temperature	°C	21	16.1	23.5	20.0	20.3	19.7
Turbidity	NTU	21	3.5	87	15	17	11

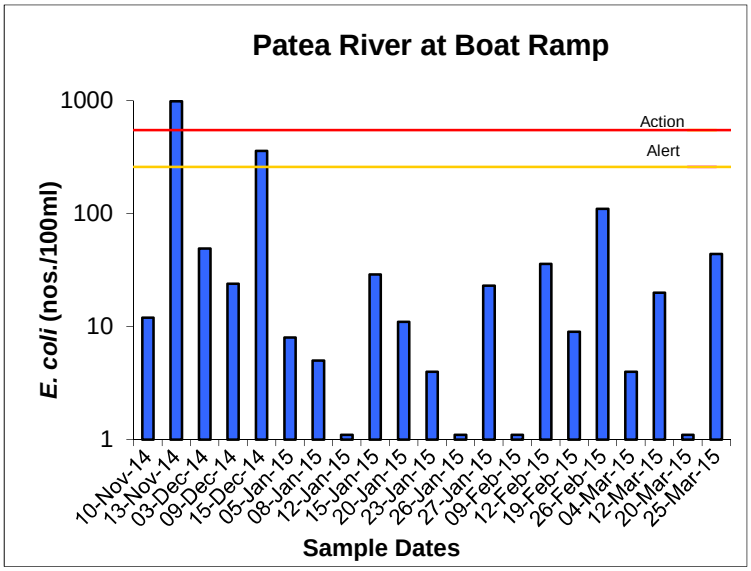

Figure 8 *E.coli* numbers for the lower Patea River at the boat ramp during the survey period

Bacteriological water quality was typical of the lower reaches of a large ringplain-eastern hill country catchment with moderate numbers under river (freshwater) dominated conditions but improved bacteriological quality when influenced by saline penetration of the coastal seawater. One exceedance of the 'Action' limit and one of the 'Alert' mode were recorded under low tide conditions; but the 'Alert' limit was not approached under high tide conditions. These data were indicative of good bacteriological water quality conditions coincident with an improved effluent quality discharged upstream from the upgraded wastewater treatment system. Some bathing activity was noted during the 2014-2015 period at this site which was used mainly for boating access and occasionally for fishing, kayaking, jet skiing, and walking. [Note: The Council had undertaken microbial source tracking (MST) using DNA marker techniques over the 2011-2012 period at this site and at the upstream site at SH3 bridge on two occasions (high and low tides) (see TRC, 2012). Faecal coliform bacteria were found to have been sourced predominantly from cattle on both occasions at the two sites while gulls contributed to populations at the boat ramp site under both tidal conditions. A faint trace of human source derivation was found (downstream of the Patea WWTP treated discharge) at the boatramp site only under low tidal flow conditions].

5.3.5.2 Mana Bay

Sampling was performed 13 times under high tide conditions and 7 times under low tide conditions at this relatively sheltered coastal site, inside the western mole adjacent to the river mouth. Results are summarised in Table 33 and illustrated in Figure 9.

Table 33 Statistical results summary for Mana Bay, Patea (SEA 907022) from November 2014 to March 2015

Parameter	Unit	Number of samples	Minimum	Maximum	Median	Medians	
						HT	LT
Conductivity @ 20°C	mS/m	20	1,400	4,800	65	4,720	2,120
E.coli	nos/100ml	20	<1	149	10	4	43
Enterococci	nos/100ml	20	<1	82	4	2	15
Faecal coliforms	nos/100ml	20	<1	149	10	4	43
Temperature	°C	19	16.4	23.6	19.9	19.9	20.3
Turbidity	NTU	20	4.3	56	19	23	9.1

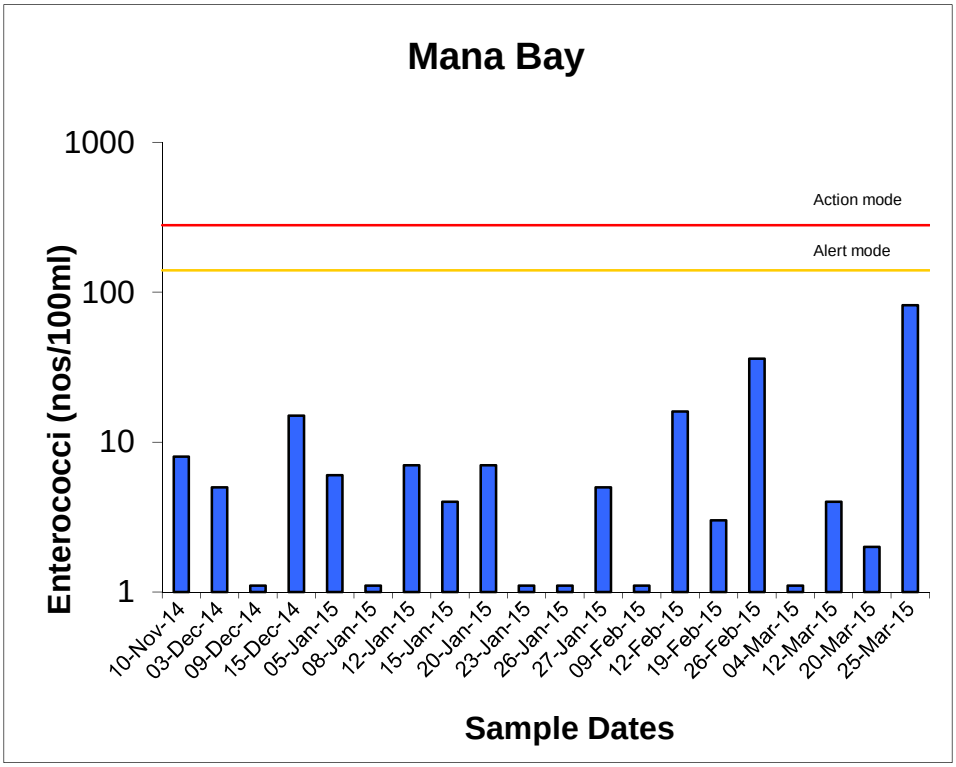

Figure 9 Enterococci numbers for Mana Bay during the survey period

Bacterial water quality at this well patronised site (particularly by children) was very good considering the proximity and influence of the river. Better bacterial quality (median: 4 *E coli*/100 ml and 2 enterococci/100 ml) was recorded under high tide conditions when coastal seawater had greater influence at this site. No two consecutive enterococci results entered the 'Action' mode and no counts exceeded the 'Alert' limit (Figure 9). Higher counts (median: 15 enterococci/100 ml and 43 *E.coli*/100 ml) were recorded close to low tide times. Even under these low tide conditions, the *E. coli* 'Alert' limit (for freshwater) was not exceeded on any sampling occasion during the period.

5.3.5.3 Patea Beach

No sampling was performed at this exposed beach site approximately 300 m to the west of the Patea River mouth and moles during the 2014-2015 period. This site is

schedule for monitoring (as a component of the state of the environment coastal recreational bacteriological programme) next in the 2015-2016 period, and was last monitored in the 2012-2013 period (TRC, 2013b).

5.3.5.4 Summary of impact monitoring of recreational monitoring receiving water sites

No impacts of the upgraded oxidation pond's effluent discharge were recorded at the lower river boat ramp site during a period when coincidentally, only one, very brief overflow occurred from the emergency outfall under flood flow conditions. No impacts on coastal water quality at the Mana Bay site were attributable to these discharges. No incursions into the 'Alert' mode nor into the 'Action' mode of the MfE guidelines (2003) occurred during the contact recreational period at the Mana Bay site, whereas one incursion into each mode occurred at the lower river site, coincident with recent wet weather and high river flow conditions.

5.4 Biological monitoring

5.4.1 Microflora of the pond system

Pond microflora are very important for the stability of the symbiotic relation with aerobic bacteria within the facultative pond. These phytoplankton may be used as a bio-indicator of pond conditions e.g. cyanobacteria are often present in under-loaded conditions and chlorophyceae are present in overloaded conditions. To maintain facultative conditions in a pond system there must be an algal community present in the surface layer.

The principal function of algae is the production of oxygen which maintains aerobic conditions while the main nutrients are reduced by biomass consumption. Elevated pH (due to algal photosynthetic activity) and solar radiation combine to reduce faecal bacteria numbers significantly.

Samples of the original pond and the final (tertiary) pond effluent had been collected at the time of most inspections of the oxidation pond system for semi-quantitative microfloral assessment prior to curtailment of this component of the programme during the 2012-2013 period. The microflora present have been summarised and discussed in recent annual reports and historical data have been provided in a previous annual report (TRC, 2009).

Samples of the final tertiary pond effluent were collected on all three inspection occasions for chlorophyll-a analyses. Chlorophyll-a concentration can be used as a useful indicator of the algal population present in the system. (Note: Pearson (1996) suggested that a minimum in-pond chlorophyll-a concentration of 300 mg/m^3 was necessary to maintain stable facultative conditions). However, seasonal changes in algal populations and also dilution by stormwater infiltration might be expected to occur in any wastewater treatment system which together with fluctuations in waste loading would result in chlorophyll-a variability.

The results of final pond effluent chlorophyll-a analyses and historical data are provided in Table 34 together with field observations of pond appearance.

Table 34 Chlorophyll-a measurements from the surface of the tertiary pond of the upgraded Patea oxidation pond system at the perimeter adjacent to the outlet

Date	Time (NZST)	Appearance	Chlorophyll-a (mg/m^3)	Chlorophyll-a (mg/m^3) data for period 2013 to mid 2014		
13 November 2014	0855	rel. clear, pale green	88	N	Range	Median
15 April 2015	0930	turbid, dark green	570	3	305-628	353
11 June 2015	0930	sl. turbid, pale green-brown	478			

Moderate (spring) to relatively high (autumn and winter) chlorophyll-a concentrations were indicative of good microfloral populations in the final pond, consistent with visual observations, and coincident with the well-saturated dissolved oxygen levels (Table 26) recorded on all three inspection occasions in this under-loaded system.

5.5 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).

In the 2013-2014 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with the Company's conditions in resource consents or provisions in Regional Plans.

5.6 Discussion

5.6.1 Discussion of performance

The re-configured Patea oxidation pond sewage treatment system was well maintained and operated and performed satisfactorily throughout the monitoring period. The upgrade to the system and the pumping station required by specific conditions placed upon the recently renewed consents, which commenced in the latter half of the 2006-2007 period, was completed by mid 2007. The final pond of the three stage pond upgrade filled and discharged during the 2008-2009 period, and the effluent quality in terms of most parameters, has subsequently showed marked improvement over the quality typical of the previous single pond treatment system receiving minimal industrial waste loadings.

Prior to the 2014-2015 period, semi-quantitative microfloral biomonitoring had confirmed satisfactory long-term pond performance before being curtailed for replacement with an alternative monitoring (chlorophyll-a measurement) component . The pond had typically supported good algal communities, which was reflected in relatively high average microflora community index pond scores.

Moderate to relatively high chlorophyll-a concentrations with typical seasonal variability confirmed good microfloral communities during the 2014-2015 monitoring year.

The consent holder recorded two brief, and one three-day, overflow discharges of sewage during the monitoring period following heavy rain as provided for by the appropriate consent. The relatively recent upgrades to the pump station alarm system in conjunction with increased storage facilities has reduced the frequency and duration of overflow events, with no overflows recorded during or following wet weather conditions during six of the eleven monitoring periods (mid 2004 to 2015) and the remainder mainly of very short duration since these upgrades.

5.6.2 Environmental effects of exercise of water permits

No significant impacts associated with the discharges were measured on the bacteriological quality of the lower reaches of the Patea River under low tide and higher, turbid river flow following wet weather conditions during the discharge of the upgraded oxidation ponds' system effluent. The effect of the oxidation pond's effluent discharge generally has been limited to occasional small rises in bacteria numbers the right bank Patea River site immediately upstream or downstream of the discharge (dependant on tide conditions) with bacterial water quality measured a further 600 m downstream usually similar to that measured upstream of the discharge at SH3 bridge. Minimal impacts were measured during the 2014-2015 monitoring period, continuing the good performance shown during the previous period.

More intensive monitoring of the lower river and one adjacent coastal water sites during the summer contact recreational period found that bacterial numbers exceeded the single sample 'Alert' guideline and/or the 'Action' mode for *E. coli* (in fresh water) or enterococci (in seawater) in the MfE/MoH's 2003 Recreational Water Quality Guidelines under one instance of high river flow and low tide conditions following a wet weather period.

In the absence of any significant usage of the pump station emergency outfall during the recreational period, no impacts of the upgraded oxidation ponds' system' discharges were discernible on these contact recreation water standards at the estuary or the coastal sites between November 2014 and late March 2015.

5.7 Evaluation of performance

A tabular summary of the STDC's compliance record for the year under review is presented in Tables 35, 36, 38 and 38.

Table 35 Summary of performance for Consent 0067-3

Purpose: Discharge of treated wastewater to water		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Provision for upgrade	Reporting by consent holder; upgrade completed	Yes
2. Exercise in accordance with documentation	Liaison with consent holder	Yes
3. Progress reports of upgrade	Reporting by consent holder; upgrade completed	N/A
4. Minimisation of effects	Inspections and sampling	Yes
5. Limits on volume	Reporting by consent holder (after plant upgraded)	N/R
6. Implementation of management plan	Provision by consent holder after plant upgraded (updated)	Yes
7. Provision of operator	Liaison with consent holder	Yes
8. Maintenance of aerobic pond condition	Inspections, sampling and reporting	Yes
9. Trade wastes connections	Liaison with consent holder	Yes
10. Limits on receiving water effects	Inspections and physicochemical/bacteriological assessments	Yes
11. Monitoring provisions	Performance of tailored monitoring programme	Yes
12. Contact recreational monitoring provisions	Performance of tailored monitoring programme	Yes
13. Provision for lapse of consent	Liaison with consent holder (within 5 years of issue)	Yes
14. Optional review provisions	Not scheduled until June 2016	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		High High

Table 36 Summary of performance for Consent 0145-2

Purpose: Emergency discharge of untreated wastewater to water		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Minimisation of adverse effects	Inspections and liaison with consent holder	Yes
2. Exercise in accordance with documentation	Liaison with consent holder	Yes
3. Provision of contingency plan	Reporting by consent holder	Yes
4. Outfall upgrade within 2 years	Reporting by consent holder; upgrade completed	Yes
5. Restriction on frequency of overflows	Records supplied by consent holder	Yes
6. Limitations on causes of overflows	Reporting by consent holder	Yes
7. Restriction on overflows	Reporting by consent holder	Yes

Purpose: Emergency discharge of untreated wastewater to water		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
8. Limit on duration	Records supplied by consent holder	Yes
9. Provision of alarm system	Liaison with consent holder	Yes
10. Maintenance of alarm system	Liaison with consent holder and reporting	Yes
11. Notification and recording of overflows	Reporting by consent holder	Yes
12. Provision of records	Liaison and reporting by consent holder	Yes
13. Provision of signage	Reporting by consent holder and inspection	Yes
14. Notification to Taranaki Healthcare	Reporting by consent holder	Yes
15. Meetings with submitters	Liaison with consent holder (3-yearly);next required in 2015-2016	Yes
16. Monitoring provisions	Performance of monitoring programme tailored to overflow events	Yes
17. Provision for lapse of consent	Liaison with consent holder (within 5 years of issue)	N/A
18. Optional review provisions	Not scheduled until June 2016	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 37 Summary of performance for Consent 4576-2

Purpose: Erect, place and maintain oxidation pond and emergency overflow discharges structures		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Notification of construction	Reporting by consent holder; upgrade completed	N/A
2. Exercise and maintenance in accordance with documentation	Liaison with consent holder and inspections; upgrade completed	Yes
3. Timing and exercise of upgrade to oxidation pond outfall	Reporting by consent holder completed	N/A
4. Minimisation of effects	Inspections; upgrade completed	N/A
5. Minimisation of riverbed disturbance, and reinstatement	Inspections; upgrade completed	N/A
6. Public access provision	Inspections; upgrade completed	Yes
7. Restriction on timing of riverbed disturbances	Inspections; upgrade completed	N/A
8. Provision for fish passage	Liaison with consent holder and inspections	Yes
9. Provision of signage	Inspections, reporting by consent holder during construction	N/A

Purpose: Erect, place and maintain oxidation pond and emergency overflow discharges structures		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
10. Provision for removal and reinstatement	Liaison with consent holder	N/A
11. Provision for lapse of consent	Liaison with consent holder (within 5 years of issue)	N/A
12. Optional review provisions	Not scheduled until June 2016	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		High High

During the year, the STDC demonstrated a high level of environmental performance and compliance with the resource consents. Some aspects of conditions of the recently granted consents do not apply now that the upgrade of the system has been completed.

5.8 Recommendations from the 2013-2014 Annual Report

The recommendations from the 2013-2014 Annual Report for the Patea oxidation pond monitoring programme were:

1. THAT monitoring of the reconfigured Patea oxidation pond system be continued for the 2014-2015 period by formulation of a programme similar in format to the programme undertaken during the 2013-2014 period.

This recommendation was adopted and the appropriate monitoring programme was performed.

5.9 Exercise of optional review of consents

Resource consents 0067, 0145 and 4576 do not provide for optional review of the consents until June 2016.

5.10 Alterations to the monitoring programme for 2015-2016

In designing and implementing the monitoring programmes for air/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, its obligations to monitor emissions/discharges and effects under the RMA, 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/discharging to the environment.

A review of the programme was required following the renewal of the various consents during the 2005-2006 period and the extended programme was implemented during the 2006-2007 monitoring year and continued through to the 2014-2015 year with a minor change to the microfloral pond monitoring component in the 2013-2014 period.

No changes are proposed to the monitoring programme for the 2015-2016 period which will continue at the same level as that in the 2014-2015 period.

5.11 Recommendation

As a result of the 2014-2015 monitoring programme the following recommendation is made:

1. THAT monitoring of the reconfigured Patea oxidation pond system be continued for the 2015-2016 period by formulation of a programme similar in format to the programme undertaken during the 2014-2015 period.

6. Summary of recommendations

The following is a summary of the recommendations for each oxidation pond treatment system as presented in the individual sections of this report.

Waverley oxidation pond system

1. THAT monitoring of the Waverley oxidation pond and stock truck wastewater treatment disposal systems be continued for the 2015-2016 period by formulation of an appropriate monitoring programme similar in format to the programme undertaken during the 2014-2015 period.

Kaponga oxidation pond system

1. THAT monitoring of the Kaponga oxidation pond system be continued for the 2015-2016 period by formulation of a monitoring programme similar in format to the programme undertaken during the 2014-2015 period.

Manaia oxidation pond system

1. THAT monitoring of the Manaia wastewater treatment system be continued for the 2015-2016 period by formulation of an appropriate monitoring programme similar in format to the programme undertaken during the 2014-2015 period.

2. THAT the consent holder liaise with the Council with respect to any proposed industrial waste discharges to the system in order that potential impacts may be assessed and if necessary, additional monitoring requirements formulated.

3. THAT the consent holder liaise with the Council should overloading of the sewerage reticulation occur in such a manner that there may be a likelihood of an unauthorised discharge to natural water.

4. THAT the reporting required by Special Condition 12 of consent 1204 shall be supplied to the Council by 30 June 2016.

5. THAT the Council investigates aspects of the water quality of Manaia Creek upstream of the WWTP in terms of the source of bacteria in both the stream and coastal waters, during the 2015-2016 period.

Patea oxidation pond system

1. THAT monitoring of the reconfigured Patea oxidation pond system be continued for the 2015-2016 period by formulation of a programme similar in format to the programme undertaken during the 2014-2015 period.

7. Acknowledgements

The Job Manager for the programmes was Chris Fowles (Scientific Officer) who was the author of this Annual Report and also performed the Kaponga macroinvertebrate survey. Field inspections and sampling surveys were undertaken by Ray Harris and Rae West (Technical Officers) and hydrological staff with physicochemical water and wastewater analyses performed by the Council ISO-9000 accredited laboratory. Emily Roberts (Scientific Officer) performed the Manaia marine ecological surveys.

Glossary of common terms and abbreviations

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

Biomonitoring	Assessing the health of the environment using aquatic organisms.
BOD	Biochemical oxygen demand. A measure of the presence of degradable organic matter, taking into account the biological conversion of ammonia to nitrate.
BODF	Biochemical oxygen demand of a filtered sample.
Bund	A wall around a tank to contain its contents in the case of a leak.
condy	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 20°C and expressed in mS/m.
Cumec	Volumetric flow measure - 1 cubic metre per second ($m^3 s^{-1}$).
DO	Dissolved oxygen.
DRP	Dissolved reactive phosphorus.
E.coli	*Escherichia coli,* an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as the number of colonies per 100 ml.
Ent	Enterococci, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as the number of colonies per 100 ml.
FC	Faecal coliforms, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as the number of colonies per 100 ml.
Fresh	Elevated flow in a stream, such as after heavy rainfall.
g/m^3	Grammes per cubic metre, and equivalent to milligrammes 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	The Incident Register contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan.
L/s	Litres per second.
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.
MfCI	Microflora community index; a numerical indication of the state of treatment pond biological life which takes into account the sensitivity of floral taxa to wastewater quality.
MOW 'rock' test	Observations of the plume associated with a solid object lobbed in to the pond.

mS/m	Millisiemens per metre.
Mixing zone	The zone below a discharge point where the discharge is not fully mixed with the receiving environment. For a stream, conventionally taken as a length equivalent to 7 times the width of the stream at the discharge point.
NH_4	Ammoniacal nitrogen, normally expressed in terms of the mass of nitrogen (N).
NH_3	Unionised ammonia nitrogen, normally expressed in terms of the mass of nitrogen (N).
NO_3	Nitrate, normally expressed in terms of the mass of nitrogen (N).
NTU	Nephelometric Turbidity Unit, a measure of the turbidity of water.
O&G	Oil and grease, defined as anything that will dissolve into a particular organic solvent (e.g. hexane). May include both animal material (fats) and mineral matter (hydrocarbons).
pH	A numerical system for measuring acidity in solutions, with 7 as neutral. Numbers lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength. For example, a pH of 4 is ten times more acidic than a pH of 5.
Physicochemical	Measurement of both physical properties (e.g. temperature, clarity, density) and chemical determinants (e.g. metals and nutrients) to characterise the state of an environment.
Resource consent	Refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15).
RMA	Resource Management Act 1991 and subsequent amendments.
$SQMCI_s$	Semi quantitative macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the numerical abundances and sensitivities of the taxa present to organic pollution in stony habitats.
SS	Suspended solids.
Temp	Temperature, measured in °C.
Turb	Turbidity, expressed in NTU.
UI	Unauthorised Incident.

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Appendix I

Resource consents held by the STDC for discharges from Waverley, Kaponga, Manaia and Patea municipal oxidation ponds systems and the Waitotara stock truck wastewater system

TRK980072

TARANAKI REGIONAL COUNCIL

PRIVATE BAG 713
47 CLOTON ROAD
STRATFORD
NEW ZEALAND
PHONE 0-6-765 7127
FAX 0-6-765 5097

DISCHARGE PERMIT

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

Name of Consent Holder:	SOUTH TARANAKI DISTRICT COUNCIL PRIVATE BAG 902 HAWERA
Renewal Granted Date:	20 January 1998

CONDITIONS OF CONSENT

Consent Granted:	TO DISCHARGE UP TO 450 CUBIC METRES/DAY OF TREATED WASTEWATER FROM THE WAVERLEY MUNICIPAL OXIDATION PONDS SYSTEM INTO AN UNNAMED TRIBUTARY OF THE WAIROA STREAM AT OR ABOUT GR: Q22:492-581
Expiry Date:	1 June 2016
Review Date[s]:	June 2004 and June 2010
Site Location:	MAIN ROAD WAVERLEY [PROPERTY OWNER: R J BREMNER]
Legal Description:	PT SEC 336 BLK VII WAIROA SD
Catchment:	WAIROA 340.000
Tributary:	UNNAMED TRIBUTARY

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

TRK980072

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; and
ii) charges authorised by regulations.

Special conditions

1. THAT the consent holder shall properly and efficiently maintain and operate the oxidation ponds system which shall be regularly maintained in an aerobic condition.

2. THAT the consent holder shall undertake to advise and consult with the Taranaki Regional Council if trade wastes are accepted from any trade premises into the consent holder's wastewater system, for which it may be appropriate or necessary to place limits on the concentrations in the final discharge of any toxic or hazardous compounds which may be contained in that trade waste. If such limits are considered necessary, the General Manager, Taranaki Regional Council, shall require a review of the consent conditions in accordance with section 128 of the Resource Management Act 1991.

3. THAT after allowing for a mixing zone of 200 metres downstream of the discharge, these wastes shall not give rise to any of the following effects in the tributary of the Wairoa Stream:

   i) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
   ii) any conspicuous change in the colour or visual clarity;
   iii) any emission of objectionable odour;
   iv) the rendering of fresh water unsuitable for consumption by farm animals; and
   v) any significant adverse effects on aquatic life.

4. THAT the Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during the month of June 2004 and/or June 2010, for the purpose of ensuring that the conditions adequately deal with the environmental effects 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 that time.

Signed at Stratford on 20 January 1998

For and on behalf of
TARANAKI REGIONAL COUNCIL

DIRECTOR—RESOURCE MANAGEMENT

Discharge Permit

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

Name of Consent Holder:	South Taranaki District Council Private Bag 902 HAWERA
Consent Granted Date:	19 September 2005

Conditions of Consent

Consent Granted:	To discharge treated stock truck effluent from an oxidation pond treatment system onto and into land in the vicinity of the Waiau [2] Stream in the Waitotara catchment at or about GR: R22:525-580
Expiry Date:	1 June 2022
Review Date(s):	June 2010, June 2016
Site Location:	State Highway 3, RP352-5.070, 150 m south of State Highway 3/Waiau Road intersection, Road Reserve, Waverley
Legal Description:	Lot 2 DP 7820 Pt Lot 2 DP 84280 Blk VIII Wairoa SD
Catchment:	Waitotara
Tributary:	Waiau [2]

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

General conditions

a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in Section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects of the discharge.

2. After allowing for reasonable mixing, within a mixing zone extending 50 metres below the discharge point, the discharge shall not cause the concentration of the following constituents to be exceeded in the receiving water:

Constituent	**Concentration**
Unionised ammonia	0.025 gm^{-3}
Filtered carbonaceous BOD_5	2.0 gm^{-3}

3. After allowing for reasonable mixing, within a mixing zone extending 50 metres below the discharge point, the discharge shall not give rise to any of the following effects in the receiving waters of the Waiau [2] Stream in the Waitotara catchment:

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.

4. The treatment and discharge system shall be designed, managed, operated and regularly maintained to ensure that the conditions of this consent are met.

5. 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 2010 and/or June 2016, 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 19 September 2005

For and on behalf of
Taranaki Regional Council

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Director-Resource Management

COASTAL PERMIT

TRC – Applications: 2752
2753

Pursuant to the provisions of section 119 of the Resource Management Act 1991, I Chris Carter, Minister of Conservation, hereby grant South Taranaki District Council a coastal permit (No. SAR-05-49-04-03) to (i) discharge up to 455 cubic metres per day of treated wastewater; and (ii) discharge untreated wastewater only in emergency situations, to the Patea River, within the coastal marine area, generally in accordance with the application and subject to the attached conditions of consent.

Dated at Wellington this 7th day of February 2006

Hon Chris Carter

Minister of Conservation

63-01-011/01

139518

Office of Hon Chris Carter
MP for Te Atatu
Minister of Conservation
Minister of Housing
Minister for Ethnic Affairs

- 7 FEB 2006

Peter Canvin
Consents Manager
Taranaki Regional Council
Private Bag 713
Stratford

Dear Mr Canvin

Attached for your information is a copy of the coastal permit that I have recently granted to South Taranaki District Council to discharge treated and untreated wastewater to the Patea River.

I have made the permit subject to the conditions recommended to me by the Hearing Committee.

My reasons for the decision are that:

- the upgrades are an improvement on the existing treatment system, resulting in a higher quality of effluent, and
- it meets the requirements of the: New Zealand Coastal Policy Statement; Regional Coastal Plan for Taranaki; Regional Policy Statement for Taranaki; relevant provisions of the RMA, including section 104 and Part 2.

Please note that I have advised the applicant and my appointee on the Hearing Committee, Mr Richard Heerdegen, of my decision. I understand you will be notifying other interested parties of my decision in line with the provisions of section 119A(b) and section 114 of the Resource Management Act 1991.

Yours sincerely

Hon Chris Carter MP
Minister of Conservation

Encl.

Parliament Buildings, Wellington, New Zealand Telephone: 64 4 470 6568, Facsimile: 64 4 472 8034
Email: ccarter@ministers.govt.nz Website: www.beehive.govt.nz

Marine Area, in respect of the matters considered under section 104 of the Resource Management Act 1991 as follows:

- *Application 2752 [to renew and change consent 0067]: To discharge treated municipal wastewater from the Patea Wastewater Treatment Plant into the coastal marine area of the Patea River;*
- *Application 2753 [to renew and change consent 0145]: To discharge untreated municipal sewage in emergencies only into the coastal marine area of the Patea River.*

10. The Hearing Committee resolved to recommend to the Minister of Conservation that the consents be granted and all members of the Committee supported the recommendations.

11. Pursuant to section 118 of the Resource Management Act 1991, the Committee's reasons for its recommendations are that:

    a) It accepts the assessment of the application given in the Taranaki Regional Council's officer's report; and

    b) Monitoring will continue to be undertaken by the Taranaki Regional Council to ensure that there are no significant adverse effects on the environment as a result of the exercise of this consent, should it be granted.

Recommendation of the Hearing Committee

13. The Hearing Committee recommends that the Minister of Conservation approves application 2752, to discharge treated municipal wastewater from the Patea Wastewater Treatment Plant into the coastal marine area of the Patea River, be submitted to the Minister of Conservation for approval for a period to 1 June 2028, with provision for review in June 2010 and/or June 2016 and/or June 2022, subject to the policies and conditions of the Taranaki Regional Council, including the following general conditions and special conditions:

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 wastewater treatment systems shall be upgraded, substantially in accordance with recommended Option 3 contained in the document supporting the application entitled *'Assessment of Environmental Effects for the Upgraded Wastewater Treatment Plant'* [CH2M Beca], May 2004. Implementation of this upgrade shall be completed two years from the date of grant of this consent.

2. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of application 2752. In the case of any contradiction between the documentation submitted in support of application 2752 and the conditions of this consent, the conditions of this consent shall prevail.

3. The consent holder shall supply progress reports on implementation of the upgrade referred to under special condition 1, by June 2006 and June 2007 to the Chief Executive, Taranaki Regional Council.

4. Notwithstanding any conditions within this consent, 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 the exercise of this consent.

5. The volume of treated wastewater discharge shall not exceed 455 cubic metres per day, unless there has been rain on any of the previous three days [as measured at the Taranaki Regional Council rain gauge on Durham Street, Patea], in which case the instantaneous treated wastewater discharge flow rate shall not exceed 20 litres per second.

6. The consent holder shall implement and maintain a management plan which shall include operating procedures to avoid , remedy or mitigate against potential adverse effects arising from:

    i) operation of the wastewater treatment plant; and
    ii) plant failure.

7. The consent holder shall use a suitably trained operator to ensure proper and efficient operation and maintenance of the wastewater treatment system to the satisfaction of the Chief Executive, Taranaki Regional Council.

8. The oxidation pond shall be maintained in an aerobic condition at all times during daylight hours.

9. The consent holder shall undertake to advise and consult with the Taranaki Regional Council prior to accepting new trade wastes, which may contain toxic or hazardous wastes, into the consent holder's wastewater system.

10. After allowing for reasonable mixing, being a mixing zone extending 200 metres downstream and 200 metres upstream of the discharge point, the discharge shall not give rise to any of the following effects in any surface water body:

    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) any significant adverse effects on aquatic life.

11. The consent holder shall, in conjunction with the Taranaki Regional Council, undertake additional chemical, bacteriological and ecological monitoring of the oxidation pond and Patea River as deemed necessary by the Chief Executive, Taranaki Regional Council subject to Section 35 (2)(d) and Section 36 of the Resource Management Act 1991.

12. As a component of the monitoring required by Special Condition 11, the consent holder shall undertake bacteriological monitoring of the receiving waters of the Patea River and at 'Mana Bay' for contact recreational purposes. The monitoring programme shall be consistent with the provisions of the 'Microbiological Water Quality Guidelines for Marine and Freshwater recreational area' [Ministry for the Environment and Ministry of Health, 2003].

13. This consent shall lapse on the expiry of five years after the date of issue of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.

14. 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 2010 and/or June 2016 and/or June 2022, for the purpose of ensuring that the conditions are adequate to deal with an adverse effects on the environment arising from the exercise of this resource consent, which were not either foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

14. The Hearing Committee recommends that application 2753, to discharge untreated municipal sewage in emergencies only into the coastal marine area of the Patea River, be submitted to the Minister of Conservation for approval for a period to 1 June 2028, with provision for review in June 2010 and/or June 2016 and/or June 2022, subject to the policies and conditions of the Taranaki Regional Council, including the following general conditions and special conditions:

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 application 2753. In the case of any contradiction between the documentation submitted in support of application 2753 and the conditions of this consent, the conditions of this consent shall prevail.

3. The consent holder shall prepare and maintain a contingency plan, to the satisfaction of the Chief Executive, Taranaki Regional Council, detailing action to be taken in the event of accidental spillage or discharge of contaminants, the initial plan to be provided no later than three months prior to the exercise of this consent.

4. In addition to the existing outfall, rip rap shall be installed adjacent to the river bank which shall be adequately maintained and cleared following any discharge authorised under this permit. The outfall upgrade shall be completed no later than two years from the date of issue of this consent.

5. If the frequency of overflows exceeds one per year, the consent holder shall implement works for reducing the frequency and mitigate the effects of such overflows by way of:

   - increasing the capacity of the pipe leading from the pump[s] to the rising main;
   - duplication of the rising main between the pump station and the oxidation pond system; and/or
   - additional storage available for treated wastewater.

6. The intermittent discharge of wastewater into the Patea River shall only occur when:

   i. storm and groundwater inflows to the system is such that the capacity of the wastewater treated system pump station is exceeded; and/or
   ii. pump or power failure at the pump station occurs.

7. The intermittent discharge of wastewater into the Patea River shall not occur during routine maintenance of the pump station.

8. The consent holder shall ensure that, whenever practicable, the duration of the discharge authorised by this consent shall not exceed four hours.

9. The consent holder shall install and constantly monitor an alarm system to the satisfaction of the Chief Executive, Taranaki Regional Council. The alarm shall operate when the duty pump fails to cope with the inflow.

10. The consent holder shall inspect the installation regularly and at least once per week shall check that the alarm is operative and the electrical equipment is in good working order.

11. The consent holder shall immediately notify the Chief Executive, Taranaki Regional Council, following any discharge under this permit, including the time, reason[s], and duration of wastewater discharged and remedial measures implemented by the consent holder.

12. The consent holder shall forward a summary of records referred to in special condition 11 no later than 31 July of each year to the Chief Executive, Taranaki Regional Council.

13. The consent holder shall install and maintain suitable signage advising the public of the health risk on each and every occasion that a discharge occurs in terms of this consent. Signage shall be sited at appropriate positions upstream and downstream of the discharge point and at the river mouth, to warn the public of the presence of contaminants in the river.

14. The consent holder shall immediately notify Taranaki Healthcare following any discharge under this permit, in order to enable any measures necessary for the protection of public health to be undertaken.

15. The consent holder and staff of the Taranaki Regional Council shall meet as appropriate, and at least every three years with interested submitters to the consent to discuss any matter relating to the exercise of this consent.

16. The consent holder shall, in junction with the Taranaki Regional Council, undertake additional chemical, bacteriological and ecological monitoring of the Patea River as deemed necessary by the Chief Executive, Taranaki Regional Council subject to Section 35 (2)(d) and Section 36 of the Resource Management Act 1991.

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

18. 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 2010 and/or June 2016 and/or June 2022, for the purpose of ensuring that the conditions are adequate to deal with an adverse effects on the environment arising from the exercise of this resource consent,

which were not either foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Approved:
D L Lean
Chairperson
Taranaki Regional Council
Consents and Regulatory Committee and
Chairperson of the Hearing Committee

Date: 28/11/2005.

Discharge Permit

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

Name of Consent Holder:	South Taranaki District Council Private Bag 902 HAWERA 4640
Consent Granted Date:	6 June 2007

Conditions of Consent

Consent Granted:	To discharge treated municipal wastewater from the Kaponga Wastewater Treatment Plant into the Kaupokonui Stream at or about GR: P20:087-961
Expiry Date:	1 June 2029
Review Date(s):	June 2011, June 2017, June 2023
Site Location:	Egmont Street, Kaponga
Legal Description:	Pt Sec 69 Blk XI Kaupokonui SD
Catchment:	Kaupokonui

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

General conditions

a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. Within 1 year of the commencement of this consent, the wastewater treatment system shall be upgraded by:

a) the installation of stub baffles in accordance with drawing no. 6511929-CK02 provided in the *'Assessment of Environmental Effects for the Kaponga Wastewater Treatment Plant'* [CH2M Beca], March 2006.
b) Lower the discharge pipe so that all effluent if discharged at least 400mm below water level at all times.

2. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of application 3423. In the case of any contradiction between the documentation submitted in support of application 3423 and the conditions of this consent, the conditions of this consent shall prevail.

3. Notwithstanding any conditions within this consent, 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 the exercise of this consent.

4. The volume of treated wastewater discharge shall not exceed 500 cubic metres per day, unless there has been rain on any of the previous three days [as measured at Taungatara, Te Kiri], in which case the instantaneous treated wastewater discharge flow rate shall not exceed 15 litres per second.

5. The consent holder shall implement and maintain a management plan which shall include operating procedures to avoid, remedy or mitigate against potential adverse effects arising from:

i) the operation of the wastewater treatment plant;
ii) the build up of sludge in the pond system; and
iii) stormwater and groundwater infiltration into the sewerage system.

6. The consent holder shall use a suitably trained operator to ensure proper and efficient operation and maintenance of the wastewater treatment system.

7. The oxidation pond shall be maintained in an aerobic condition at all times during daylight hours.

8. The consent holder shall advise and consult with the Taranaki Regional Council prior to accepting new trade wastes, which may contain toxic or hazardous wastes, into the consent holder's wastewater system.

9. After allowing for reasonable mixing, being a mixing zone extending from the discharge point, to a point 50 metres downstream of the discharge point, the discharge shall not give rise to any of the following effects in any surface water body:

   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) any significant adverse effects on aquatic life.

10. The consent holder shall, in conjunction with the Taranaki Regional Council, undertake chemical, bacteriological and ecological monitoring of the oxidation pond and Kaupokonui Stream as deemed necessary by the Chief Executive, Taranaki Regional Council subject to Section 35 (2)(d) and Section 36 of the Resource Management Act 1991.

11. After allowing for reasonable mixing, being a mixing zone extending from the discharge point, to a point 50 meters downstream of the discharge point, the discharge shall not cause the receiving waters of the Kaupokonui Stream to exceed the following concentrations:

Contaminant	**Concentration**
Unionised ammonia	$0.025 gm^{-3}$
Filtered carbonaceous BOD_5	$2.0\ gm^{-3}$

12. After for allowing for reasonable mixing within a mixing zone extending 50 meters downstream of the discharge point, the discharge shall not give rise to an increase in turbidity of more than 50% [as determined using NTU (nephelometric turbidity units)] in the Kaupokonui Stream.

13. This consent shall lapse on the expiry of five years after the date of issue of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.

14. 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 2011 and/or June 2017, and/or June 2023 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 6 June 2007

For and on behalf of
Taranaki Regional Council

_____

Director-Resource Management

Discharge Permit

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

Name of Consent Holder:	South Taranaki District Council Private Bag 902 HAWERA 4640
Consent Granted Date:	6 June 2007

Conditions of Consent

Consent Granted:	To discharge treated municipal wastewater from the Manaia Wastewater Treatment Plant into the Unnamed Stream 27 at or about GR: P21:062-803
Expiry Date:	1 June 2029
Review Date(s):	June 2011, June 2017, June 2023
Site Location:	Sutherland Road, Manaia
Legal Description:	Lot 1 DP 20670 Blk VII Waimate SD
Catchment:	Unnamed Stream 27

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

General conditions

a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

i) the administration, monitoring and supervision of this consent; and
ii) charges authorised by regulations.

Special conditions

1. From 6 June 2009, the wastewater treatment plant shall comprise of:

(a) the existing 1ha oxidation pond with inlet screen; and
(b) two wetlands operating in parallel, each of 4800 m^2 ;

in accordance with recommended Option 3C and drawing no. 6513417/CK008 contained in the document supporting the application entitled *'Manaia Wastewater Treatment Plant Application for Discharge Permit and Assessment of Environmental Effects'* [CH2M Beca], Feb 2007.

2. The consent hold shall supply progress reports on implementation of the upgrade referred to under special condition 1, by 30 June 2008 and 30 June 2009, to the Chief Executive, Taranaki Regional Council.

3. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of application 4068. In the case of any contradiction between the documentation submitted in support of application 4068 and the conditions of this consent, the conditions of this consent shall prevail.

4. Notwithstanding any conditions within this consent, 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 the exercise of this consent.

5. The volume of treated wastewater discharge shall not exceed 600 cubic metres per day, unless there has been rain on any of the previous three days [as measured at the Kaupokonui, Glenn Road rain gauge station].

6. The consent holder shall implement and maintain a management plan which shall include operating procedures to avoid, remedy or mitigate against potential adverse effects arising from:

   i) the operation of the wastewater treatment plant;
   ii) the build up of sludge in the pond system; and
   iii) stormwater and groundwater infiltration into the sewerage system.

7. The consent holder shall use a suitably trained operator to ensure proper and efficient operation and maintenance of the wastewater treatment system.

8. The oxidation pond shall be maintained in an aerobic condition at all times during daylight hours.

9. The consent holder shall advise and consult with the Taranaki Regional Council prior to accepting new trade wastes, which may contain toxic waste or hazardous wastes or any significant additional organic loading, into the consent holder's wastewater system.

10. Allowing for a mixing zone of 50 metres extending either side of the mouth of the receiving stream the discharge shall not give rise to all or any of the following effects in the coastal waters of the Tasman Sea:

    i) any conspicuous change in the colour or visual clarity; and
    ii) any significant adverse effects on aquatic life, habitats, or marine ecology; and
    iii) exceedance of the guideline for shellfish gathering waters, as specified in the document 'Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas' [Ministry for the Environment, 2002].

11. The consent holder shall, in conjunction with the Taranaki Regional Council, undertake chemical, bacteriological and ecological monitoring of the wastewater treatment system, Manaia Creek and coastal receiving waters, as deemed necessary by the Chief Executive, Taranaki Regional Council, subject to Section 35 (2)(d) and Section 36 of the Resource Management Act 1991.

12. The consent holder shall implement a stormwater/groundwater infiltration reduction programme, and shall carry out all practicable actions to ensure that all unauthorised stormwater connections to the sewage reticulation system are removed and remain disconnected. The consent holder shall report on progress under this condition to the Chief Executive, Taranaki Regional Council, by 30 June 2008 and each subsequent year.

13. This consent shall lapse on the expiry of five years after the date of issue of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.

14. 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 2011 and/or June 2017, and/ or June 2023 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 6 June 2007

For and on behalf of
Taranaki Regional Council

_____

Director-Resource Management

Coastal Permit

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

Name of Consent Holder:	South Taranaki District Council Private Bag 902 HAWERA 4640
Change To Conditions Date:	9 July 2007 [Granted: 7 February 2006]

Conditions of Consent

Consent Granted:	To discharge treated municipal wastewater from the Patea Wastewater Treatment Plant into the Coastal Marine Area of the Patea River at or about 2637404E-6159017N
Expiry Date:	1 June 2028
Review Date(s):	June 2010, June 2016, June 2022
Site Location:	Beach Road, Patea
Legal Description:	Lot 1 DP 9100 Blk VII Carlyle SD
Catchment:	Patea

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

General conditions

a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

   i) the administration, monitoring and supervision of this consent; and
   ii) charges authorised by regulations.

Special conditions

Condition 1 – changed

1. The wastewater treatment system shall be upgraded in accordance with drawing number 77031, entitled *Patea Wastewater Treatment Plant: Pond General Arrangement and Bund Details* (dated 10.10.06) provided with application number 4617. Implementation of this upgrade shall be completed before 31 March 2008.

Conditions 2 to 14 – unchanged

2. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of application 2752. In the case of any contradiction between the documentation submitted in support of application 2752 and the conditions of this consent, the conditions of this consent shall prevail.

3. The consent holder shall supply progress reports on implementation of the upgrade referred to under special condition 1, by June 2006 and June 2007 to the Chief Executive, Taranaki Regional Council.

4. Notwithstanding any conditions within this consent, 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 the exercise of this consent.

5. The volume of treated wastewater discharge shall not exceed 455 cubic metres per day, unless there has been rain on any of the previous three days [as measured at the Taranaki Regional Council rain gauge on Durham Street, Patea], in which case the instantaneous treated wastewater discharge flow rate shall not exceed 20 litres per second.

6. The consent holder shall implement and maintain a management plan which shall include operating procedures to avoid , remedy or mitigate against potential adverse effects arising from:

   i) operation of the wastewater treatment plant; and
   ii) plant failure.

7. The consent holder shall use a suitably trained operator to ensure proper and efficient operation and maintenance of the wastewater treatment system to the satisfaction of the Chief Executive, Taranaki Regional Council.

8. The oxidation pond shall be maintained in an aerobic condition at all times during daylight hours.

9. The consent holder shall undertake to advise and consult with the Taranaki Regional Council prior to accepting new trade wastes, which may contain toxic or hazardous wastes, into the consent holder's wastewater system.

10. After allowing for reasonable mixing, being a mixing zone extending 200 metres downstream and 200 metres upstream of the discharge point, the discharge shall not give rise to any of the following effects in any surface water body:

    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) any significant adverse effects on aquatic life.

11. The consent holder shall, in conjunction with the Taranaki Regional Council, undertake additional chemical, bacteriological and ecological monitoring of the oxidation pond and Patea River as deemed necessary by the Chief Executive, Taranaki Regional Council subject to Section 35 (2)(d) and Section 36 of the Resource Management Act 1991.

12. As a component of the monitoring required by Special Condition 11, the consent holder shall undertake bacteriological monitoring of the receiving waters of the Patea River and at 'Mana Bay' for contact recreational purposes. The monitoring programme shall be consistent with the provisions of the 'Microbiological Water Quality Guidelines for Marine and Freshwater recreational area' [Ministry for the Environment and Ministry of Health, 2003].

13. This consent shall lapse on the expiry of five years after the date of issue of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.

14. 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 2010 and/or June 2016 and/or June 2022, for the purpose of ensuring that the conditions are adequate to deal with an adverse effects on the environment arising from the exercise of this resource consent, which were not either foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 9 July 2007

For and on behalf of
Taranaki Regional Council

_____

Director-Resource Management

Appendix II

Biomonitoring associated with the Kaponga oxidation ponds system

To Science Manager—Hydrology/Biology, R Phipps
From Scientific Officer, Chris R Fowles
Doc No 1486272
Report No CF642
Date March 2015

Biomonitoring of the Kaupokonui River in relation to the South Taranaki District Council's Kaponga oxidation ponds system discharge, February 2015

Introduction

This biomonitoring survey was the summer survey for the 2014-2015 monitoring period relating to the discharge from the Kaponga Municipal Wastewater Treatment System into the Kaupokonui River, downstream of the Kaponga township. Special Condition 9d of Consent 0861-3 requires that:

"after allowing for reasonable mixing over 50 metres downstream of the discharge point there shall be no significant adverse effects on aquatic life"

This survey also complemented the state of the environment biomonitoring programme within the Kaupokonui catchment (TRC, 2015a).

Method

The standard '400 ml kick sampling' technique was used to collect streambed (benthic) macroinvertebrates from three established sampling sites in the Kaupokonui River in the vicinity of the Kaponga oxidation ponds' system (illustrated in Figure 1), on 19 February 2015.

These sites were:

Site No.	Site code	GPS reference	Location
1	KPK000500	E1698609 N5634423	approximately 250 m upstream of oxidation ponds
2	KPK000520	E1698548 N5634263	50 m downstream of oxidation ponds
3a	KPK000550	E1698497 N5633456	approximately 1 km downstream of oxidation ponds

This '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).

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

R (rare) = less than 5 individuals;
C (common) = 5-19 individuals;
A (abundant) = 20-99 individuals;

VA (very abundant) = 100-499 individuals;
XA (extremely abundant) = 500 or more individuals.

Macroinvertebrate Community Index (MCI) values were calculated for taxa present at each site (Stark 1985) with certain taxa scores modified in accordance with Taranaki experience.

A semi-quantitative MCI value, $SQMCI_S$ (Stark, 1999) 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 scores, and dividing by the sum of the loading factors. 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).

Figure 1 Biomonitoring sites in the Kaupokonui River in relation to Kaponga oxidation ponds system

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

Results and discussion

This late summer survey was performed during a period of very low, recession river flow conditions, 60 days after a fresh in excess of three times median flow and 143 days after a fresh in excess of seven times median flow, with no flood flows during the previous two months. Flow at the Glenn Road recorder site was 703 L/sec, well below the average February mean monthly flow (1565 L/sec) and only slightly above the minimum February mean monthly flow (683 L/sec) for the period 1979 to 2014. River water temperatures ranged from 14.9°C to 15.4°C at the time of this early morning survey. Periphyton mats and filamentous algae were patchy at all three sites with patchy moss also present. Complete mixing of the oxidation pond system effluent discharge within the river was apparent upstream of site 2 where the dilution by the receiving waters was assessed at greater than 300:1 at the time of the survey. All sites were characterised by open, mainly gravel-cobble-boulder riffle habitats although there was some shade at sites 1 and 2 covering part of the reach between the outfall and site 2. Partial shade was provided at the rivers edge by extensive riparian planting of the left bank and the steeper right bank adjacent to site 3a.

Macroinvertebrate communities

Data have been collected from various past surveys of the Kaupokonui River immediately upstream of Kaponga township, and 1.3 km downstream of the oxidation ponds' discharge near the more recently established site 3a. These data are summarised in Table 1 for comparative purposes.

Table 1 Summary of macroinvertebrate taxa numbers and MCI values for previous Kaupokonui River surveys performed between February 1985 and December 1991

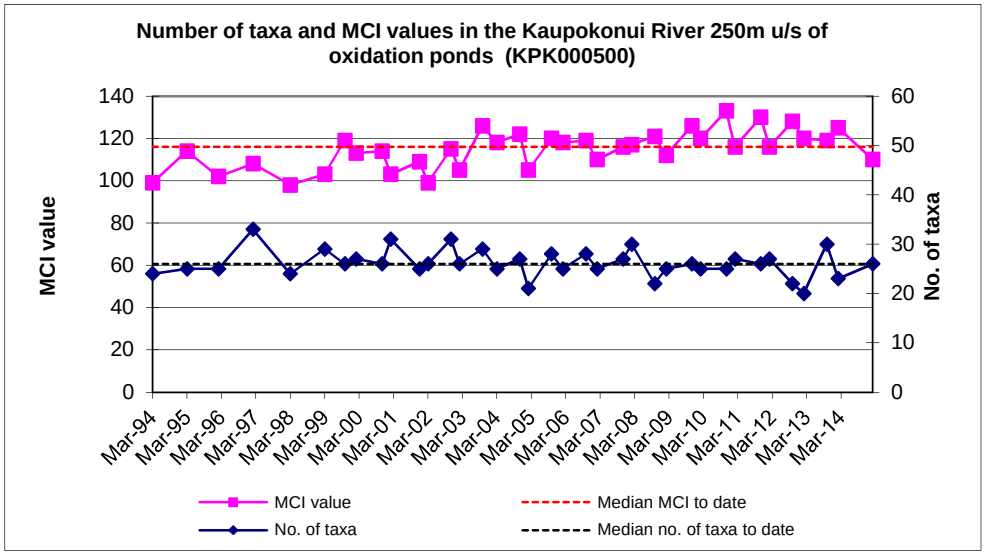
Site	No. of surveys	Taxa numbers		MCI values	
		Range	Median	Range	Median
Upstream of township	7	20-33	28	105-132	114
Near 3a	8	18-26	22	85-109	101

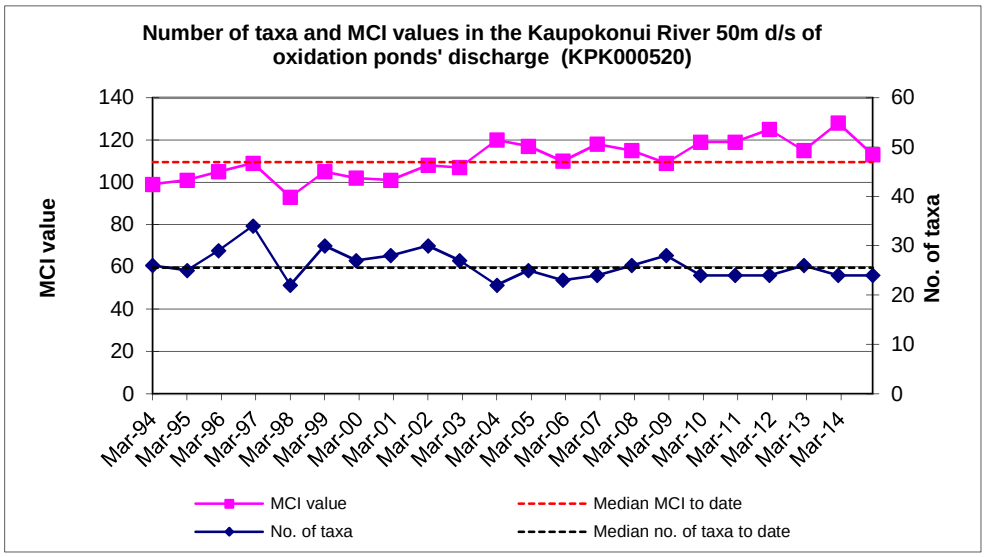
Data obtained from previous biomonitoring surveys are summarised in Table 2 and illustrated in Figure 2.

Table 2 Summary of macroinvertebrate taxa numbers and MCI values for previous surveys performed between March 1987 and February 2014

Site	No. of surveys	Taxa Numbers		MCI Values	
		Range	Median	Range	Median
1	38	18-33	26	98-133	116
2	21	22-34	26	93-128	109
3a	21	15-32	26	92-126	108

The results of the current survey are presented in Table 3 and illustrated in Figure 2.





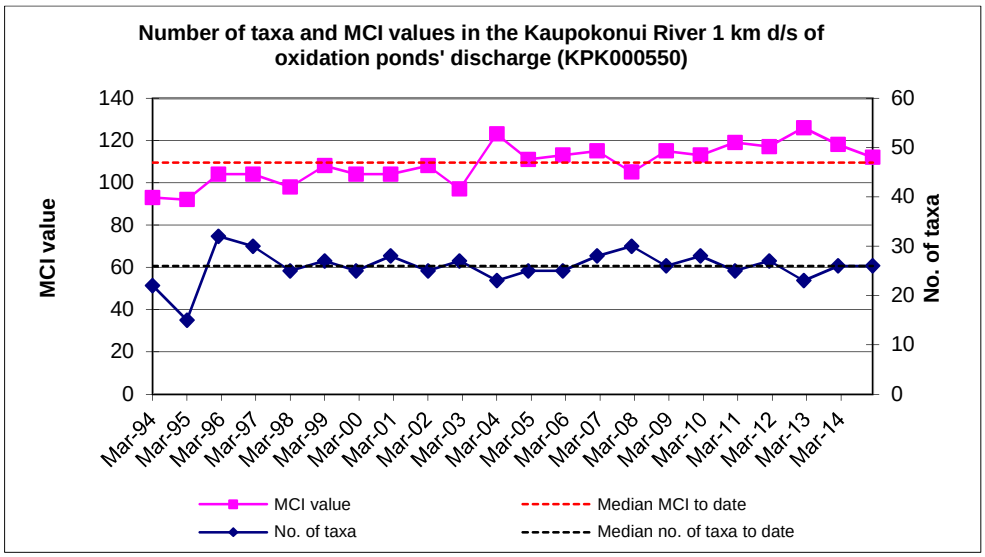


Figure 2 Taxa richness and MCI values at the three sampling sites to date

Table 3 Macroinvertebrate fauna of the Kaupokonui River in relaiton to the Kaponga oxidation ponds discharge sampled on 19 February 2015

Taxa List	Site Number	MCI score	1	2	3a
	Site Code		KPK000500	KPK000520	KPK000550
	Sample Number		FWB15147	FWB15148	FWB15149
NEMERTEA	Nemertea	3	-	-	C
ANNELIDA (WORMS)	Oligochaeta	1	C	C	-
MOLLUSCA	*Potamopyrgus*	4	C	C	R
EPHEMEROPTERA (MAYFLIES)	*Austroclima*	7	VA	A	A
	Coloburiscus	7	VA	VA	VA
	Deleatidium	8	VA	XA	VA
	Nesameletus	9	R	C	C
PLECOPTERA (STONEFLIES)	*Megaleptoperla*	9	R	-	-
	Zelandoperla	8	-	R	R
COLEOPTERA (BEETLES)	Elmidae	6	A	VA	A
	Hydraenidae	8	C	C	R
	Ptilodactylidae	8	R	-	-
MEGALOPTERA (DOBSONFLIES)	*Archichauliodes*	7	A	A	A
TRICHOPTERA (CADDISFLIES)	*Hydropsyche (Aoteapsyche)*	4	XA	XA	XA
	Costachorema	7	C	A	A
	Hydrobiosis	5	VA	VA	A
	Neurochorema	6	C	R	R
	Beraeoptera	8	A	C	C
	Olinga	9	R	R	R
	Oxyethira	2	C	-	R
	Pycnocentria	7	-	-	R
	Pycnocentrodes	5	C	C	C
DIPTERA (TRUE FLIES)	*Aphrophila*	5	A	A	C
	Eriopterini	5	-	R	R
	Maoridiamesa	3	VA	VA	VA
	Orthocladiinae	2	A	A	A
	Tanypodinae	5	-	R	-
	Tanytarsini	3	A	A	VA
	Empididae	3	R	-	-
	Ephydridae	4	R	-	R
	Muscidae	3	A	A	C
		No of taxa	26	24	26
		MCI	110	113	112
		SQMCIs	5.0	5.7	4.7
		EPT (taxa)	12	12	13
		%EPT (taxa)	46	50	50

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

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

Taxa numbers (24 to 26) collected from the three river sites during this survey were indicative of good community richnesses typical of sites at an altitude range of 230 to 260 m asl in the mid-reaches of a river draining a developed catchment. Taxa richnesses recorded from 350 past surveys of Taranaki ringplain National Park-sourced streams and rivers at 'control' sites in the altitude range of 200 to 250 m asl have found a median richness of 23 taxa (TRC 2015). Taxa numbers recorded by the present survey tended to be very similar to those found at the time of the previous summer's survey (CF599) but lower (by two taxa) than the median found by previous surveys at one of the three sites (Table 2). However, the macroinvertebrate fauna of all three sites in the Kaupokonui River (Table 3) were relatively similar in terms of community composition and characterised by a combination of up to two 'highly sensitive' taxa [very to extremely abundant mayfly (*Deleatidium*); and caddisfly (*Beraeoptera*)]; up to seven 'moderately sensitive' taxa [mayflies (*Austroclima* and *Coloburiscus*), elmid beetles, dobsonfly (*Archichauliodes*), free-living caddisflies (*Hydrobiosis* and *Costachorema*), and cranefly (*Aphrophila*)]; and up to five 'tolerant' taxa [extremely abundant net-building caddisfly (*Aoteapsyche*); midges (orthoclads, tanytarsids, and *Maoridiamesa*), and muscid flies]. Most of these taxa typically have been characteristic of these sites over the previous twenty-one summer surveys and in most cases have been predominant (i.e. abundant on more than 50% of survey occasions). The current characteristic taxa were one fewer in number than the 'moderately sensitive' taxa and two additional fewer 'tolerant' taxa than those dominant at the time of the previous summer survey. The presence of seven 'highly sensitive' taxa at each site through this relatively short section of the Kaupokonui River was indicative of good habitat and recent physicochemical water quality conditions. The moderate range of $SQMCI_S$ values (4.7 to 5.7 units) mainly reflected a subtle change in extreme abundance of one 'highly sensitive' taxon between sites, but the fact that minimal significant differences in individual taxon abundances were recorded between sites, indicated very similar community compositions at all of the three sites over this reach of the river e.g., only six of the total of 31 taxa found in this reach were present at only one site, and all but one of these taxa were recorded only as rarities (less than five individuals).

The similarity in community compositions amongst the three sites surveyed (65% of the 31 taxa were found at all three sites) (Table 3), was reflected in the very narrow range of the MCI values (110 to 113) recorded in this 1.4km reach of the river by the present survey. Limited impacts of the patchy periphyton mats and filamentous algal substrate cover on the macroinvertebrate communities at each of the sites were reflected in the MCI values which were six units lower to four units above their respective sites' medians. These scores were within four units of predicted scores for sites at these altitudes (230 to 260 m asl) and 3 to 7 units higher than predicted for sites 9.2 to 10.6 km downstream from the National Park in ringplain streams (Stark & Fowles, 2009). These scores categorised these sites as having 'good' generic and 'expected' predictive stream health (TRC, 2015a) at the time of this summer survey. No significant decreases in MCI scores were recorded between adjacent sites, with an insignificant but atypical slight overall downstream increase (2 MCI units) along the reach surveyed. This represented no rate of decrease, atypical of the predicted rate of decrease (1.43 units/km) for this reach of the river.

Overall, the community richnesses, compositions, and MCI scores were indicative of no recent impacts of the oxidation ponds system's treated wastes discharge on the macroinvertebrate fauna of the surveyed reach of the Kaupokonui River.

Heterotrophic growths

There was no visual sign or microscopic evidence of any unusual heterotrophic growths present or forming on the substrate at any site, indicating that the Kaponga oxidation pond system discharge had had no recent impact on the riverbed microflora.

Conclusions

Moderate, but typical, macroinvertebrate community richnesses were found in the Kaupokonui River upstream and downstream of the oxidation pond system's effluent discharge, and very similar to those recorded by the previous summer's survey. This was coincident with patchy substrate periphyton mats and filamentous algal cover, at these sites during a lengthy period of very low flow conditions, in late summer. MCI scores similar to those predicted for the mid-reaches of a developed catchment, were recorded at all three sites. The very narrow range of these scores, with no downstream decreases in scores, combined with the similarity in macroinvertebrate communities' compositions were indicative of no recent impacts of the Kaponga oxidation ponds' system's discharge on the macroinvertebrate fauna of the surveyed reach of the Kaupokonui River. The absence of heterotrophic growths on the river's substrate was further confirmation of no impacts of the discharge on the biological communities of the river.

The range of MCI scores categorised this reach of the stream as having 'good' generic biological health consistent with good physical habitat and preceding physicochemical water quality. These scores were also similar to or slightly higher than predicted scores for ringplain sites at equivalent altitudes and distances downstream of the National Park and were indicative of 'expected' predictive stream health (TRC, 2015a).

Summary

The Council's standard 'kick-sampling' technique was used to collect streambed macroinvertebrates from the Kaupokonui River at three established sites. Each sample was processed to provide number of taxa (richness), MCI score, $SQMCI_S$ score, and %EPT taxa.

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects or organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The $SQMCI_S$ takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities. It may also provide more relevant information in relation to non-organic impacts. Differences in either the MCI or the $SQMCI_S$ between sites indicate the degree of adverse effects (if any) of the discharges being monitored.

This late summer macroinvertebrate survey indicated that the discharge of treated oxidation ponds wastes from the Kaponga wastewater treatment plant site had not had any detrimental effect on the macroinvertebrate communities of the Kaupokonui River. No significant differences in the macroinvertebrate communities' compositions were recorded between the upstream 'control' site and two sites downstream of the discharge.

The macroinvertebrate communities of the Kaupokonui River contained moderately high proportions of 'sensitive' taxa at all sites and the communities were also dominated by more 'sensitive' taxa than 'tolerant' taxa. Taxonomic richnesses (numbers of taxa) were similar in this summer survey compared to those of the previous summer survey during an extended

period of very low flow and coincident with patchy periphyton mats and filamentous algal substrate cover.

MCI scores indicated that the stream communities were of 'good' generic health, and 'expected' predictive conditions to those recorded in similar Taranaki ringplain streams at equivalent altitudes and distances from the National Park boundary.

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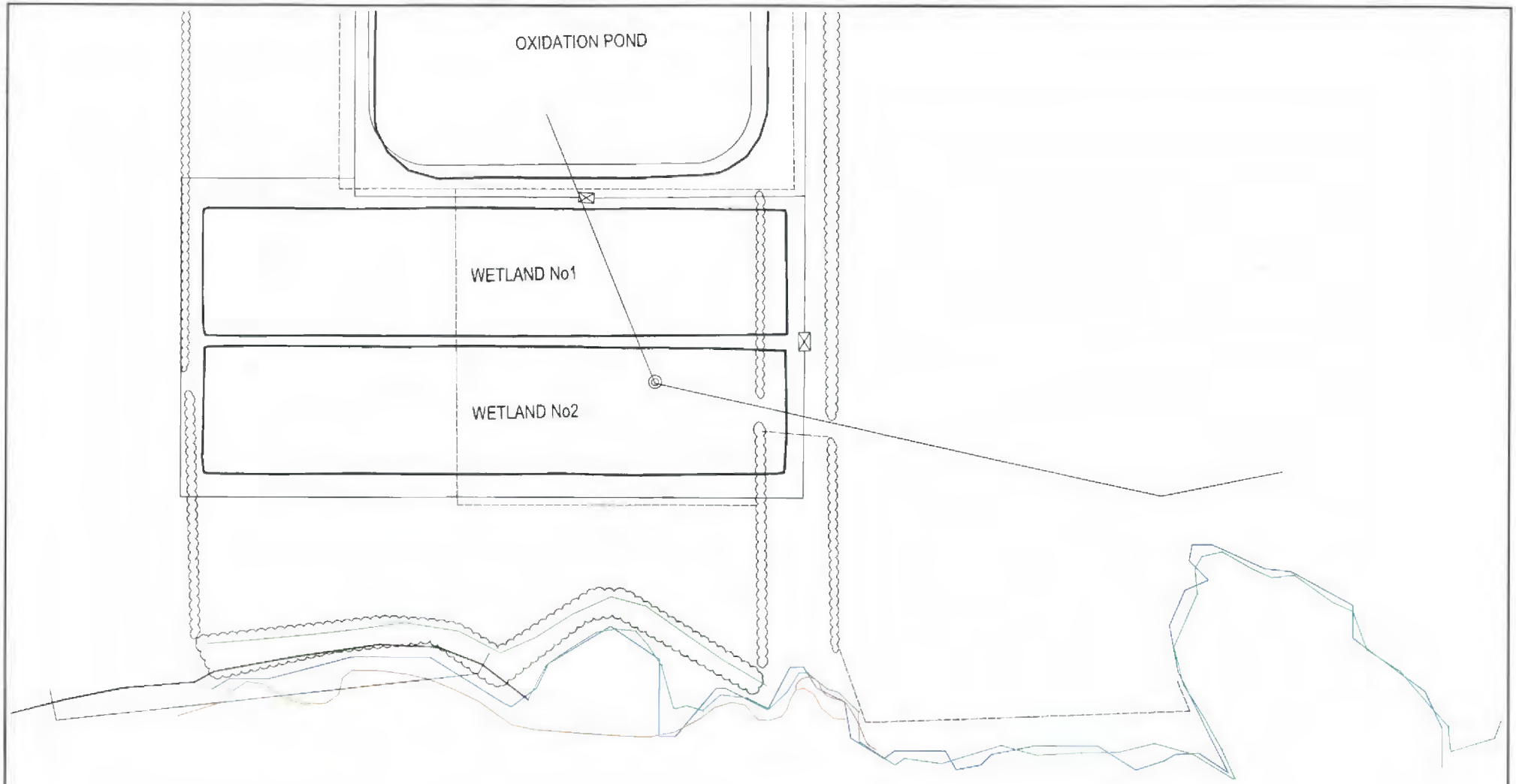
Appendix III

Topographical cliff erosion survey
November 2014



LEGEND

CLIFF SURVEY 1982

CLIFF SURVEY 2006

CLIFF SURVEY 2014

Scale 1:1000 A3

FOR INFORMATION
NOT FOR CONSTRUCTION

A	ISSUED FOR INFORMATION	HDB			28.11.14
No	Revision	By	Chk	Appd	Date

Drawing Originator: Beca

Original Scale (A1): NTS
Reduced Scale (A3): NTS

Design	HDB	28.11.14	Approved For Construction
Drawn	DR	28.11.14	
Dsg Verified			
Dwg Check			Date

* Refer to Revision Tier Original Signature

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TEL: 0800 111 323
FAX: (06)278-8757
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Client: MANAIA AND OPUNAKE WATER TREATMENT PLANT CLIFF SURVEYS

Title: MANAIA WWTP CLIFF SURVEY

Discipline:

Drawing No: 3852890-CE-002

Rev: A

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