South Taranaki District Council
Waverley, Kaponga, Manaia and Patea
Municipal Wastewater Treatment Plant Systems
Monitoring Programmes
Annual Report
2012-2013

Technical Report 2013 -16

ISSN: 0144-8184 (Print)
ISSN: 1178-1467 (Online)
Document: 1231054 (Word)
Document: 1245964 (Pdf)

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November 2013

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 2012-June 2013 describes the monitoring programme implemented by the Taranaki Regional 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.

The STDC holds a total of 6 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 five 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, 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 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, and 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 and adjacent coastal recreational waters in relation to the upgraded oxidation pond system effluent and emergency sewage outfall discharges. Localised impacts of the Manaia pond's discharge, particularly turbidity and bacteriological issues that had been previously measured in the overloaded receiving waters of the 'Manaia Creek' which provided minimal dilution of the wastes prior to the coast, have reduced markedly following the incorporation of wetlands into the treatment system as a component of the upgrade, although minimal receiving water monitoring was required under the very low flow, drought conditions during which the treatment system ceased to discharge for a period of several weeks. However, the receiving stream will still require investigations associated with upstream water quality. The upgrade had been completed in 2009-2010, with the pond de-sludging component performed during the 2007-2008 period. Sludge disposal from the Patea ponds system is now proposed (and consented) on coastal farmland near the township.

Liaison with Taranaki Regional 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

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

system. The Waverley ponds system, which had been reconfigured in the 2009-2010 period, is programmed for bacterial de-sluding later in 2013.

No usage of the emergency pump station raw sewage overflow from the Patea reticulation into the Patea River was reported by the consent holder during the monitoring period under review although one very minor accidental overflow was reported and rectified within an acceptable timeframe. Recent upgrades to the 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 indicated relatively healthy pond systems with the dominant algal taxa varying both with the location of the pond and the loading on the system. The reduced microfloral monitoring conducted on each of the oxidation pond systems showed no indication of poor ponds' performances at any of the wastewater treatment systems. With the establishment of a lengthy historical pond microfloral record for each treatment system, this monitoring will be replaced with chlorophyll-a measurements as a component of inspectorial visits in future.

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, at the more popular 'Mana' Bay adjacent to the river mouth, or at the coastal Patea beach were detected in terms of compliance with contact recreational standards which were achieved throughout the summer-autumn period.

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 dumping of human wastes into the system were recorded in 2012-2013. 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. Increased monitoring of this facility was instigated by the Taranaki Regional Council six 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).

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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 2012-June 2013 by the Taranaki Regional 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 Taranaki Regional 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) 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 Taranaki Regional 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 Taranaki Regional Council for the STDC.

1.1.2 Resource consents

Section 15(1)(a) of the Resource Management Act 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 Taranaki Regional Council as a resource consent under Section 87(e) of the Resource Management Act.

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 option for the reviews in June 2004 and June 2010 was 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 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 Resource Management Act 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 (eg, 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 Taranaki Regional 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 Resource Management Act to assess the effects of the exercise of consents. In accordance with section 35 of the Resource Management Act 1991, 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 performance

Besides discussing the various details of the performance and extent of compliance by the Company/companies in the catchment during the period under review, this report also assigns an overall rating. The categories used by the Council, and their interpretation, are as follows:

- a **high** level of environmental performance and compliance indicates that essentially there were no adverse environmental effects to be concerned about, and no, or inconsequential (such as data supplied after a deadline) non-compliance with conditions.

- a **good** level of environmental performance and compliance indicates that adverse environmental effects of activities during the monitoring period were negligible or minor at most, or, 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, or, there were perhaps some items noted on inspection notices for attention but these items were not urgent nor critical, and follow-up inspections showed they have been dealt with, and inconsequential non compliances with conditions were resolved positively, co-operatively, and quickly.

- **improvement desirable** indicates that the Council may have been obliged to record a verified unauthorised incident involving measureable environmental impacts, or, there were measureable environmental effects arising from activities and intervention by Council staff was required, and there were matters that required urgent intervention, took some time to resolve, or remained unresolved at end of the period under review, and/or abatement notices may have been issued.

- **poor performance** indicates that the Council may have been obliged to record a verified unauthorised incident involving significant environmental impacts, or, there were adverse environmental effects arising from activities and there were grounds for prosecution or an infringement notice.

1.2 Monitoring programme: water

1.2.1 Introduction

Section 35 of the Resource Management Act sets out obligations upon the Taranaki Regional 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 Taranaki Regional 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 Taranaki Regional 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 (i.e. 0830-0920 hours) 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 Taranaki Regional 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 autumn, following 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 Taranaki Regional Council laboratory.

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

Biological monitoring

The Taranaki Regional 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 microflora communities present.

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 (i.e. 0830-0945 hours) and focused on the maintenance and operating condition of the oxidation pond system.

Physicochemical sampling

The Taranaki Regional 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 autumn under relatively low river flow conditions. This survey was delayed due to no discharge from the system under very dry late summer-autumn conditions. The sampling sites are shown in Figure 2 (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 Taranaki Regional 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 Taranaki Regional 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 documentation and evaluation of the microflora communities present.

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 (i.e. 0830-0910 hours) and focused on the maintenance and operating condition of the oxidation pond and wetlands and specific areas of the reticulation.

Physicochemical sampling

The Taranaki Regional Council did not undertake the programmed comparative physicochemical sampling of the effluents from the oxidation pond and wetlands during late summer or autumn due to a lack of discharge from the system under very dry conditions. (These samples are normally 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 site inspection occasion during the period. This was analysed for temperature, dissolved oxygen, conductivity and faecal coliform bacteria.

In addition, on one inspection occasion, samples were collected upstream and downstream of the effluent discharge to the 'Manaia Creek' and on two occasions at two sites in the nearby coastal waters of the Tasman Sea (Figure 7, Section 4). All samples were analysed for conductivity and faecal coliform bacteria by the Taranaki Regional Council laboratory.

Biological monitoring

One of the two low tide beach ecological inspections in the programme was performed to assess the impact of the discharge from the oxidation pond and the additional wetlands, on the marine environment. This was delayed until early winter 2013 following the absence of discharges during the late summer-autumn period.

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 Taranaki Regional 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 microflora communities present.

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 (i.e. 0820-0930 hours) 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 Taranaki Regional Council undertook a physicochemical sampling survey of the effluent from the oxidation pond system during late summer. These samples were analysed for temperature, pH, conductivity, chloride, dissolved oxygen, turbidity, suspended solids, and enterococci and faecal coliform bacteria by the Taranaki Regional Council laboratory.

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 river receiving water bacteriological surveys were required in association with usage of the emergency overflow outfall as only one very minor overflow occurred during the period. Additional recreational bacteriological water quality monitoring was undertaken on twenty occasions at one lower river, one coastal site ('Mana' Bay), and the adjacent coastal Patea beach site during the 2012-2013 bathing season.

Biological sampling

In addition, the Taranaki Regional 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 microflora communities present.

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 has been re-scheduled for bacterial desludging in the latter part of 2013 (STDC, 2013). 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 and this has telemetry alarming associated with its operation.

2.1 Inspections

2.1.1 Oxidation pond

In accordance with the monitoring programme, a total of three inspections was performed, on 17 July 2012, 12 November 2012, and 4 April 2013. 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 microflora sample was collected during each inspection for semi-quantitative assessment. 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/m³	%
17 July 2012	0920	11.7	5.7	53
12 November 2012	0830	15.7	12.3	124
4 April 2013	0900	18.5	7.9	86

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. One instance of supersaturation was recorded in late spring (124% saturation) and there were no instances of low saturation. Minimal wave action on the ponds (i.e. flat to

rippling) was noted coincident with light wind conditions at the times of these inspections.

The ponds' system varied from lime green to green-brown to dark green/brown in appearance on inspection occasions, with effluent appearance varying from relatively pale green to lime green to turbid, darker green at the discharge outfall where the estimated discharge rate ranged from < 0.1 (autumn) to 5 litres per second. The ponds' surrounds generally were maintained in a tidy condition (sprayed or 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 performed after reconfiguration of the system. No obvious odours were recorded adjacent to the secondary pond and only slight odours near the primary pond on any of the three inspection occasions. Minimal 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, with these mainly mallard ducks and several black swan (and cygnets), and teal and paradise ducks. No wildlife were recorded on either pond at the time of the July 2012 inspection occasion.

The March 2012 inspection which had followed stormy, very windy conditions (five days earlier), found considerable damage in the pine plantation surrounding the WWTP although the structural integrity of the WWTP was not affected. Several trees had fallen across the entrance track to the ponds system and one tree had fallen into the primary pond. Various trees had been uprooted or fallen adjacent to the WWTP outfall and had damaged sections of the boundary fence (see photos in TRC, 2012). The majority of this debris was removed from the WWTP and surrounds by late 2012 but access to the outfall required upgrading (by advice to the consent holder following the April 2013 inspection).

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, 2km 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, or 2010-2011, or 2011-2012 periods and no overflows to land were recorded or apparent.

Three inspections of the system, performed between mid July 2012 and early April 2013, found the system well managed with the first two ponds full and the third pond below the outlet level. There were slight odours recorded downwind of the system on two occasions. No human wastes were present in the system but some debris was noted on the surface of two of the ponds. Maintenance of the receptor area has been generally acceptable as there was no evidence of localised spillage onto the reception area. However, there was evidence in November 2012 that not all users had been washing down the reception concrete pad area after unloading wastes to the system. No overflows to land 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 4 April 2013 during fine weather, a light northerly wind, and low flow conditions after a very dry late summer. 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 metres 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 5593780N	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.

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

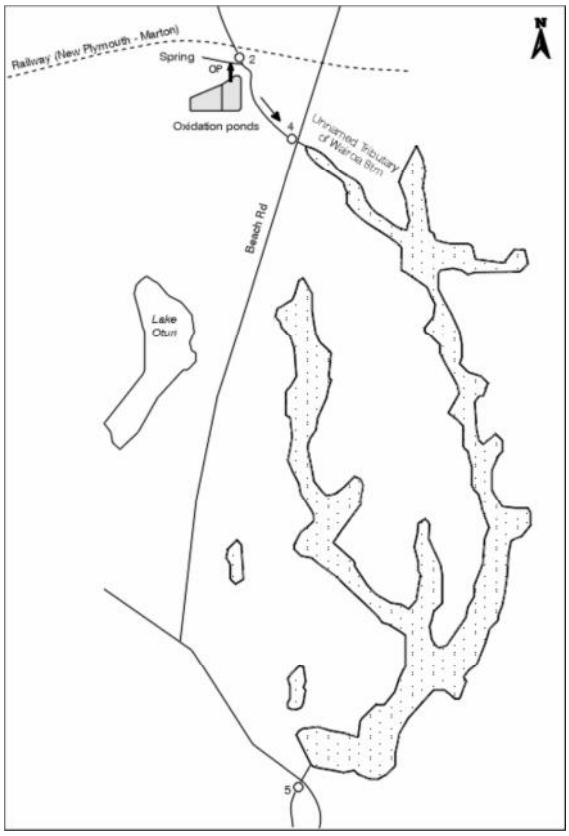

Figure 1 Sampling sites in an unnamed tributary of the Wairoa Stream in relation to Waverley oxidation ponds

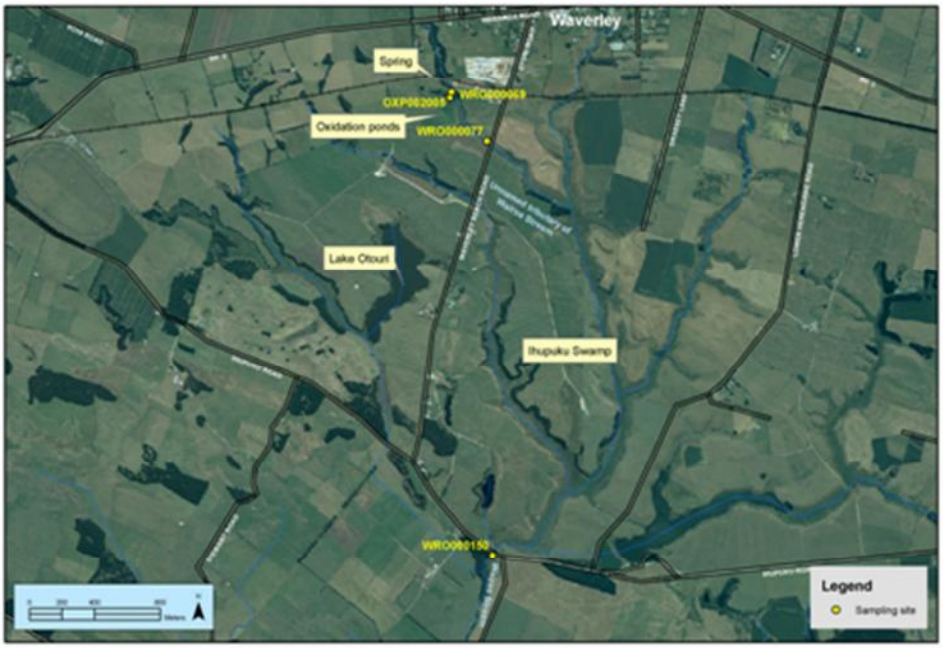

Figure 2 Aerial location map of sites in relation to Waverley oxidation ponds

Table 3 Results of the sampling survey of 4 April 2013

Site		2	OP	4	5
Location		Upstream	Discharge	Downstream	
Parameter	Unit				
Time	NZST	0910	0920	1000	1025
Flow	l/s	10	0.08	12	-
Temperature	°C	16.0	17.6	15.4	16.6
Dissolved oxygen	g/m³	9.2	7.9	8.5	4.3
DO saturation	%	94	86*	85	44
BOD_5	g/m³	0.9	30	1.3	0.6
BOD_5 (filtered)	g/m³	0.7	4.3	<0.5	<0.5
pH	pH	7.8	8.2	7.7	7.3
Conductivity @ 20°C	mS/m	28.1	68.4	31.1	30.4
Chloride	g/m³	31.8	74.8	34.4	40.3
Dissolved reactive phosphorus	g/m³ P	0.012	5.28	0.075	0.044
Ammonia-N	g/m³ N	0.020	5.18	0.019	0.009
Un-ionized ammonia	g/m³ N	0.0004	0.3355	0.0003	<0.0001
Suspended solids	g/m³	5	52	11	9
Turbidity	NTU	3.2	35	9.7	5.6
Black disc	m	1.66	-	N/R	1.22
Faecal coliform bacteria	nos/100 ml	1500	6500	1000	390
Appearance		rel. clear, uncoloured	turbid, lime green	rel. clear, uncoloured	slightly turbid, green-brown

[Note: * DO saturation @ 18.5°C in final pond]

The flow in the small tributary receiving the oxidation pond's effluent was uncoloured and relatively clear upstream of the oxidation pond discharge with a flow rate gauged at 10 litres per second.

2.2.1 Effluent quality

The results of the effluent quality analytical survey performed in early April 2013 are summarised and compared with historical data from past surveys in Table 4.

Table 4 Results from the survey in the 2012-2013 period and data from Waverley oxidation pond (second section) effluent analyses recorded for the period 1987 to 30 June 2012

Parameter	Unit	2012-2013 Survey	Past data		
		4 Apr 2013	No of samples	Range	Median
Dissolved oxygen	g/m³	7.9	77	0.9-21.0	7.0
DO saturation	%	86	71	10-227	68
BOD5 (total)	g/m³	30	23	11-66	28
BOD5 (filtered)	g/m³	4.3	19	2.2-11	5.0
pH	pH	8.2	24	7.7-9.5	8.3
Conductivity @ 20°C	mS/m	68.4	25	43.3-68.7	58.5
Ammonia-N	g/m³ N	5.18	25	0.10-26.2	4.69
Dissolved reactive phosphorus	g/m³ P	5.28	24	1.52-7.98	6.04
Suspended solids	g/m³	52	23	27-220	72
Faecal coliform bacteria	nos/100 ml	6500	25	210-91000	8600

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 typical of the range expected from municipal oxidation pond wastes. On this occasion quality was similar to median nutrient levels, pH, and BOD_5 and better than median levels for suspended solids and faecal coliform bacteria number and a relatively high conductivity level after a very dry period. This was coincident with a moderate microfloral population density in autumn in the pond. The quality was typical of the effluent from a biological treatment system receiving essentially domestic wastes, as emphasised by the 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 autumn effluent quality was within the range of past quality for all parameters, near the median quality for both nutrient levels, total BOD_5, and pH, and better than median levels for faecal coliform bacteria number and suspended solids concentration.

2.2.2 Impacts on receiving waters

A very low discharge rate of 0.08 litres per second was measured at the time of the survey following a very dry late summer-early autumn period. The receiving water flow measured upstream of the discharge in the adjacent contributing watercourse was low at 10 litres per second. An effluent dilution ratio of about 15:1 was estimated from physicochemical data downstream of the confluence of the two small streams (approximately 20 metres below the discharge point) and about 400 m downstream of the discharge at the time of the survey. However flow measurements at the time of the survey indicated an instantaneous effluent dilution in excess of 75:1.

Upstream water quality (at site 2) was generally relatively good, with a dissolved oxygen saturation of 94%, moderate levels of nutrients, a low BOD_5, slightly elevated turbidity and suspended solids, and a moderate black disc clarity. However, there was a high faecal coliform bacteria count, indicative of stock and/or wildlife access upstream.

Due to the moderate 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 increases in dissolved reactive phosphorus, suspended solids, and biochemical oxygen demand concentrations, but not in ammonia concentration or faecal coliform bacteria numbers. There was also a small decrease (of 9%) in dissolved oxygen saturation. The relatively small increase in turbidity and suspended solids levels were mitigated by 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 only minor 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 show 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 nutrient concentrations (particularly DRP), BOD_5, and faecal coliform bacteria levels following filtration and nutrient uptake by wetland vegetation. The faecal coliform bacteria number at site 5 was much lower in comparison with the

number at the upstream 'control' site 2. The BOD_5 concentration was reduced to a lower level than that recorded at the upstream 'control' site while ammonia concentration was also lower. Suspended solids, turbidity, and black disc visibility were slightly poorer than equivalent values at the upstream 'control' site, although an 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 (eg cyanobacteria are often present in under-loaded conditions and chlorophyceae are present in overloaded conditions).

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.

The identification and assessment of the abundance of pond microflora communities can also provide information relating to long term pond performance. Two samples of effluent were collected, in conjunction with regular inspections, from the pond's surface adjacent to the new outlet, during the first half of the 2012-2013 monitoring year before curtailment of this component of the monitoring.

These samples of effluent were analysed under a binocular microscope to identify phytoplankton present in the sample including algal and non-algal groups. The presence and estimated abundance (present (P), abundant (A) or very abundant (VA)) of these were recorded and the dominant taxa highlighted (in bold) in Table 5. Taxa richness (number of taxa) and the Microfloral Community Index (MfCI) were calculated.

The MfCI was designed by Taranaki Regional Council biologists as a measure of sewage pond performance using phytoplankton and some heterotrophic groups. This MfCI uses 'sensitivity' scores of 1 to 10 assigned to each taxon, depending on their occurrence in poorly-performing (overloaded) or well-performing ponds. The higher the MfCI value the better the performance of the pond.

The Waverley oxidation pond has supported one of the lowest algal richnesses (a median of 7 taxa) of all the treatment systems surveyed by the Taranaki Regional Council since July 1989. The numbers of taxa recorded in the upgraded Waverley pond in the first half of the 2012-2013 monitoring year varied widely (from 3 to 11 taxa), 4 taxa either side of this median for this system on the three sampling occasions (Table 5). However, the limited microflora of this pond historically may have been attributable to low nutrient levels as a result of under-loading. Under-loaded ponds may also provide more suitable conditions for a range of zooplankton, which can significantly reduce algal densities by grazing. High densities of cladocera (one such zooplankton group) have been observed in the past in this pond although not recently. For example in September 1998 *Daphnia* was abundant in the pond, resulting in lower diversity and microfloral community index (MfCI) scores during the monitoring year.

The motile green *Euglena*, the green algae *Chlorella*, the cyanobacteria *Oscillatoria* and bacteria have been found to dominate this pond in the past. The dominant algal groups are usually found only in moderate abundance, and only for short periods of time. In the first half of the current monitoring year the motile green, *Euglena* and the green alga, *Chlamydomonas* were abundant on individual occasions following reconfiguration of the ponds system and each was dominant on one of these occasions. No cyanobacteria were abundant on these occasions. Each of these microfloral taxa have been abundant on occasions in the past (TRC, 2009) prior to system configuration. Bacteria were not recorded in abundance on either sampling occasion prior to the end of 2012 (Table 5).

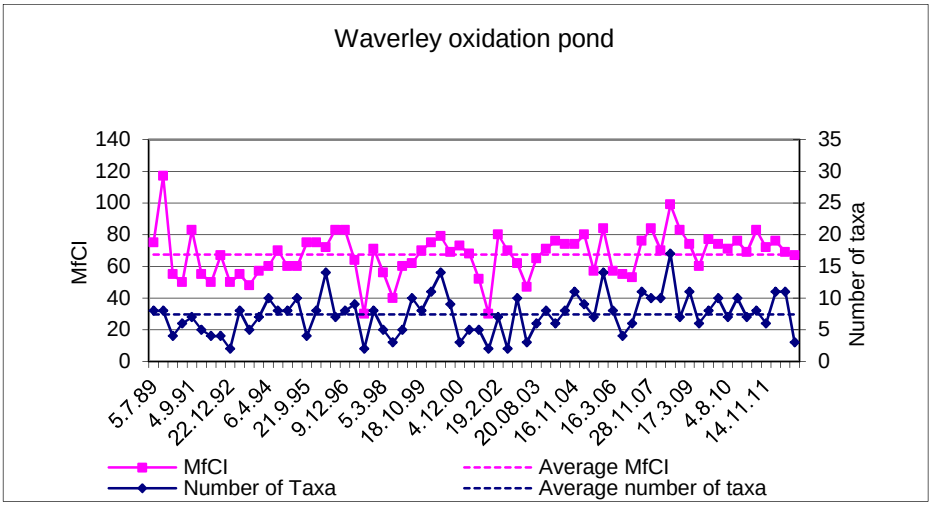

Figure 3 MfCI and number of taxa recorded in the Waverley oxidation pond since July 1989

Table 5 Planktonic microflora found in the Waverley upgraded secondary sewage treatment pond over the first half of the period 2012-2013

Algal Taxa	17 July 2012	12 November 2012
GREEN ALGAE		
Unidentified	P	P
Ankistrodesmus		
Chlamydomonas	**A**	
Chlorella		
Closterium/Closteriopsis	P	P
Oocystis	P	
Dictyosphaerium		
Golenkinia	P	
Scenedesmus	P	
CYANOBACTERIA		
Microcystis(Anacystis)		
Oscillatoria/Planktothrix	P	
DIATOMS		
Nitzschia		
EUGLENOIDS		
Euglena	P	**A**
Phacus		
CRYPTOPHYTES		
Cryptomonas	P	
NON-ALGAL GROUPS		
Non-pigmented bacteria	P	
Protozoa	P	
Rotifers		
Number of taxa	**11**	**3**
MfCI	**69**	**67**

Key: P= Present U= Uncertain ID A=Abundant VA= Very Abundant

To date, the median MfCI for the Waverley secondary pond (70) falls within the lower half of medians found in the Taranaki municipal treatment ponds systems. This low median partially reflects the predominantly low historical algal richnesses in this pond, rather than the community composition of algal species. The MfCI values for the first half of the 2012-2013 year were slightly below the median (70 units) in winter and early summer ranging from 67 to 69 units (Figure 3). Although the median number of taxa and median MfCI value have been low for this pond in relation to other ponds in Taranaki, the monitoring history suggests that there is no evidence of any problem with the performance of this pond, rather that the system is underloaded. Reconfiguration of the ponds should not affect the performance of the system in terms of its microfloral component.

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 eg provision of advice and information, or investigation of potential or actual causes of non-compliance or failure to maintain good practices. A pro-active approach that in the first instance avoids issues occurring is favoured.

The Taranaki Regional 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 Unauthorised Incident Register (UIR) 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 2012-2013 year, there were no incidents recorded by the Council that were associated with the consent holder at either the WWTP or the stock truck wastewater disposal sites.

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 recent reconfiguration of the divided pond. The performance of the system was considered to be typical of a biological treatment system receiving essentially domestic wastes. There were no instances of large areas of scum development recorded or reported. The consent holder had previously advised that de-sludging 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 the 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 which is currently being finalised.

The annual (early autumn) physicochemical survey, performed under a period of low receiving water flow conditions recorded a good effluent quality with moderate nutrient, BOD_5 and suspended solids concentrations, and lower than median faecal coliform bacteria number 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. A relatively high conductivity level was probably correlated with the lengthy very dry period preceding the survey.

Semi-quantitative biomonitoring of the microflora component indicated no pond performance problems during the first half of the monitoring period after reconfiguration of the system some four years previously.

Microfloral richness and MfCI values recorded prior to the end of 2012 were typical of this treatment system which historically has had low richnesses attributable to relatively low pond loadings and zooplankton grazing from time-to-time within the system.

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 discharge was adequate at the time of the autumn receiving water survey. This survey recorded some impacts of the discharge on the water quality of the Wairoa Stream tributary, with small increases in BOD_5, suspended solids, and more marked increases in nutrient 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 immediately below the discharge outfall. Lowered pH, nutrient, and dissolved oxygen levels and bacterial numbers in the stream 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 - 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**

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 - 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**

N/A = not applicable

Compliance with the resource consent for the stocktruck wastewater disposal was high by the consent holder during the year.

2.7 Recommendations from the 2011-2012 Annual Report

The recommendation from the 2011-2012 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 2012-2013 period by formulation of an appropriate monitoring programme similar in format to the programme undertaken during the 2011-2012 period.

This recommendation was subsequently adopted and all aspects of the 2012-2013 programme were performed as formulated for both consents.

2.8 Alterations to the monitoring programme for 2013-2014

In designing and implementing the monitoring programmes for water discharges in the region, the Taranaki Regional Council has taken into account the extent of information made available by previous authorities, its relevance under the Resource Management Act, the obligations of the Act in terms of monitoring discharges and effects, and subsequently reporting to the regional community, the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of municipal treatment processes within Taranaki 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 2013-2014 period that the monitoring programme continue at the same level as that in the 2012-2013 period, with a minor change to the microfloral monitoring of the pond system where chlorophyll-a analyses will replace the requirement for the detailed phytoplankton evaluation at the time of each inspection.

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 2013-2014 period by continuation of an appropriate monitoring programme similar in format to the programme undertaken during the 2012-2013 period with a minor change to the microfloral component of the inspectorial requirements (noted in 2.8 above).

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 receives 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. 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 (STDC, 2013).

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.

3.1 Inspections

In accordance with the monitoring programme for the Kaponga oxidation pond system, three inspections were performed on 14 August 2012, 29 January 2013, and 15 May 2013. 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. Microflora samples were also collected from the same site on each inspection visit for comparative assessments. 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/m³	%
14 August 2012	0905	10.5	8.8	83
29 January 2013	0830	21.4	9.9	119
15 May 2013	0945	12.2	7.9	75

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. 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. This was emphasised by high saturation recorded on all three inspection occasions and supersaturation in late January 2013 despite the relatively early time of the day. The appearance of the ponds varied from pale green to yellow-green, to slightly turbid darker green, the latter in late summer and autumn (Note: the cyanobacteria algal taxon, *Microcystis* has been very abundant in the pond system in the past during these periods).

No odours were recorded adjacent to the ponds during the monitoring period. All inspections were conducted during light to calm wind conditions, with both ponds' surfaces flat or only slightly disturbed (rippling) by the wind. The MOW 'rock test' indicated that the sludge layer was well beneath the ponds' surfaces at all times. Relatively low numbers of wildlife (ducks [paradise]) were recorded on the ponds at the time of the first two inspection visits, whereas paradise ducks were abundant mainly on the first pond during late autumn when there were also a few mallard ducks on both ponds.

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 adjacent surface algal bloom accumulations being discharged in the effluent. The estimated effluent discharge rate to the Kaupokonui River varied from 0.3 litre/sec (in late summer) to 5 litres/sec, with the effluent varying from pale green to slightly turbid dark green in appearance with minimal to no visual impact on the receiving waters of the river on each 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 had been scheduled for the 2012-2013 period but has still to be undertaken (STDC, 2013).

3.2 Physical, chemical and bacteriological monitoring

3.2.1 Summer receiving water quality survey

A late autumn low flow assessment of the impact of the oxidation pond's effluent discharge on the receiving waters of the Kaupokonui River was performed on 15 May 2013, nine days after a moderate river fresh. There was a moderate rate of discharge from the ponds system (of approximately 3 litres/sec) at the time of the survey. The river flow was gauged at 820 litres per second upstream of the discharge. The flow of 1294 litres per second recorded in the lower reaches of the river (TRC Glenn Road recorder) was well below the average May mean monthly flow (3052 litres per second) but above the minimum May mean monthly flow (976 litres per second) for the period 1978 to 2012. This sampled flow was in the upper range of the flows recorded at the times of the previous eighteen years' low flow surveys.

The sampling sites' locations are listed in Table 9 and shown in Figures 4 and 5.

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

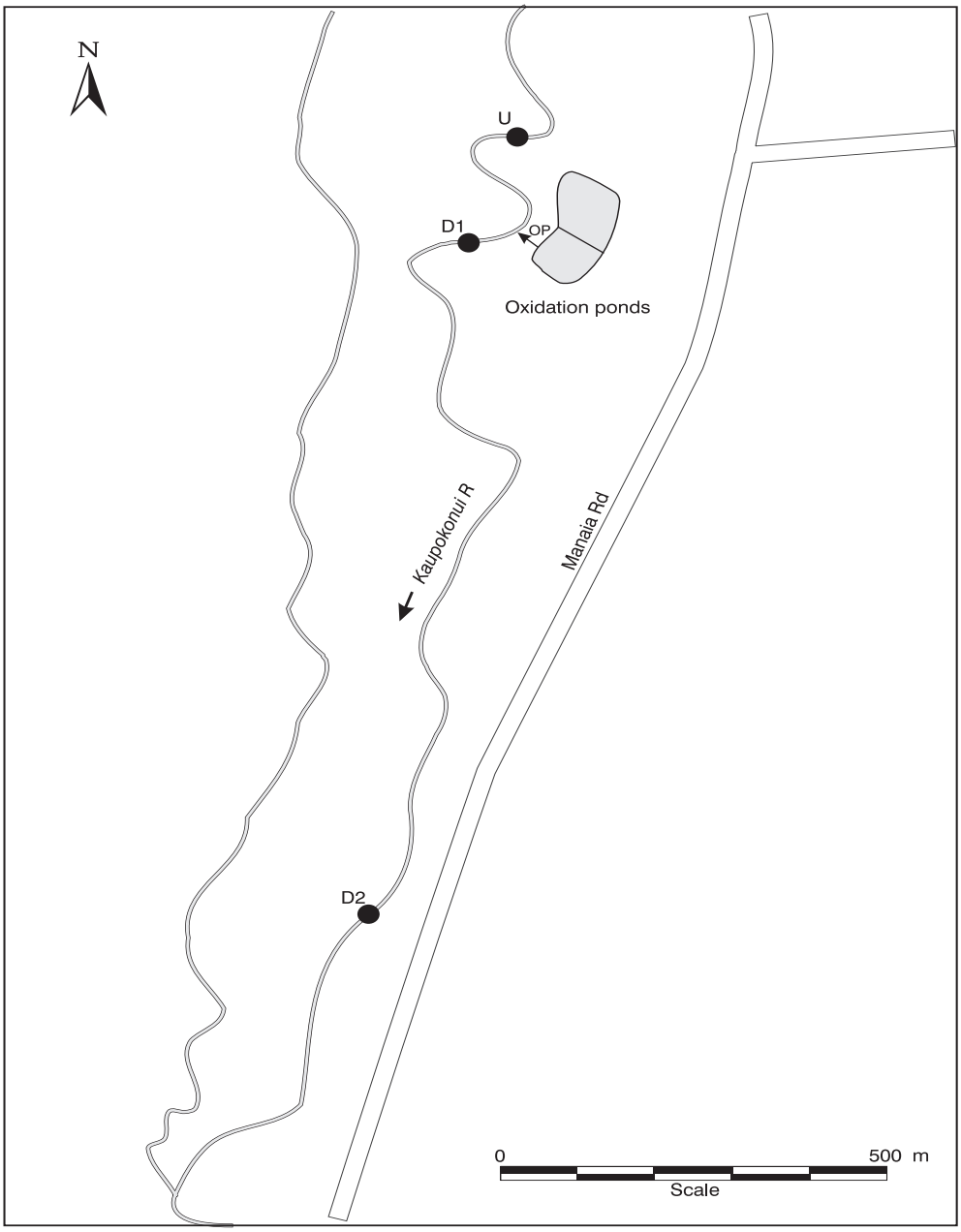

Figure 4 Sampling sites for Kaponga oxidation ponds survey

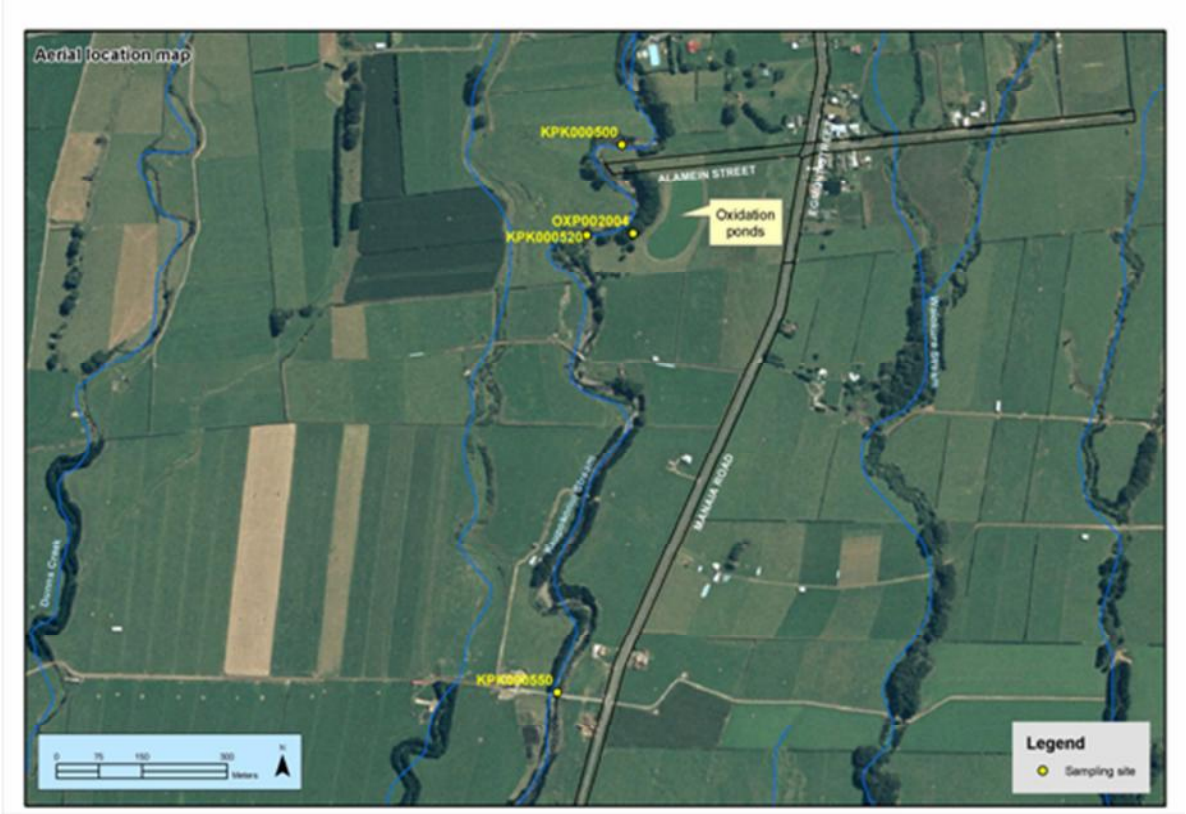

Figure 5 Aerial location map of sites in relation to Kaponga oxidation ponds

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

Table 10 Results of the Kaupokonui River receiving water sampling survey 15 May 2013

Site		U	OP	D1	D2
Location		**Upstream**	**Discharge**	**Downstream**	
Parameter	**Unit**				
Time	NZST	0925	0945	1005	1040
Flow	l/s	820	3	-	-
Temperature	°C	9.7	12.2	9.9	10.1
Dissolved oxygen	g/m³	11.1	7.9	11.2	11.1
DO saturation	%	100	75	102	102
BOD_5	g/m³	<0.5	19	<0.5	<0.5
BOD_5 (filtered)	g/m³	<0.5	1.4	<0.5	<0.5
pH	pH	7.6	7.4	7.6	7.6
Conductivity @ 20°C	mS/m	7.9	19.4	7.9	7.9
Chloride	g/m³	8.2	20.6	8.0	8.1
Dissolved reactive phosphorus	g/m³P	0.013	0.500	0.013	0.012
Ammonia-N	g/m³N	0.005	1.93	0.009	0.006
Un-ionised ammonia	g/m³N	0.00004	0.0129	0.00008	0.00005
Turbidity	NTU	0.7	50	0.8	0.7
Suspended solids	g/m³	<2	38	<2	<2
Black disc	m	4.12	-	3.59	4.81
Faecal coliform bacteria	nos/100 ml	230	10000	220	480
Appearance		clear, no colour	sl. turbid, pale green	rel.clear, uncoloured	clear, no colour

3.2.1.1 Effluent quality

The effluent quality (Table 10) was relatively typical of a well-preforming municipal oxidation pond system for this time of the year receiving minimal industrial waste loadings although with very low BOD_5 and nutrient levels coincident with a lower microfloral population density than usual in the pond probably as a result of the later (autumn) sampling date. This contributed to the relatively moderate turbidity and suspended solids concentration, with no elevation in pH due to limited algal photosynthetic activity as evidenced by the moderate dissolved oxygen level which atypically was not supersaturated. Suspended solids and pH levels were much lower than those recorded at the time of the previous survey (which was performed in mid March 2012). BOD_5 and nutrient levels were lower than typical of a treatment system of this nature with particularly low dissolved BOD_5 levels in the treated wastewater, but the faecal coliform bacterial number was elevated possibly as a result of the relatively later sampling date.

Table 11 Ranges of selected results of Kaponga oxidation pond (second section) effluent analyses recorded for the period 1987 to 30 June 2012

Parameter	Unit	No of samples	Range	Median
Flow	L/s	36	<1-50	2
Dissolved oxygen	g/m^3	76	1.4-19.2	10.7
DO saturation	%	73	17-228	106
BOD_5	g/m^3	24	12-140	25
BOD_5 (filtered)	g/m^3	20	1.1-5.8	1.9
pH	pH	25	8.0-10.6	9.6
Conductivity @ 20°C	mS/m	26	15.5-30.3	20.8
Ammonia-N	g/m^3 N	24	0.005-2.09	0.022
Dissolved reactive phosphorus	g/m^3 P	24	<0.003-2.81	1.17
Suspended solids	g/m^3	24	43-680	130
Turbidity	NTU	21	24-860	110
Faecal coliform bacteria	nos/100 ml	29	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 autumn effluent quality for most parameters was within past ranges with most of the parameters better than historical median values. There were low pH, turbidity, and suspended solids levels, due to the sparser suspended algal concentration. Low BOD_5, elevated ammoniacal nitrogen, and elevated faecal coliform bacteria numbers were also coincident with this lower than usual algal density. The effluent quality is considered typical of municipal oxidation pond treated wastes under late autumn conditions.

3.2.1.2 Impacts on receiving waters

A relatively low effluent discharge rate was recorded at the discharge point into the Kaupokonui River, which was in relatively low flow at the time of the survey. A river flow of 820 litres per second gauged upstream of the outfall (with an estimated discharge of 3 litres/sec) would have provided an estimated dilution ratio of at least 250:1 at the time of sampling.

Despite the large dilution afforded to the discharge, there was a small decrease in clarity of the stream downstream of the discharge point as emphasised by the 13% decrease in black disc values but only a minor increase in turbidity of 0.1 NTU

between sites U and D1. No significant impacts on the river were recorded for all other parameters measured (Table 10) with little or no change in measured levels of conductivity, suspended solids, bacteria, BOD_5, and nutrients (including un-ionised ammonia). 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 turbidity beyond the mixing zone in the river.

The river appearance was clean and clear 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 very 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 (50m) 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 14 August 2012

Sampling was performed under moderate, recession river flow conditions (3.25 m^3/s at Glen Road recorder: minimum August monthly mean flow – 2.02 m^3/s) two 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 14 August 2012

Site		U	D1
Location		Upstream	Downstream
Parameter	Unit		
Time	NZST	0850	0920
Temperature	˚C	8.0	8.2
BOD_5 (carbonaceous filtered)	g/m^3	<0.5	<0.5
pH	pH	7.6	7.6
Conductivity @ 20˚ C	mS/m	7.0	7.1
Chloride	g/m^3	7.8	7.9
Ammonia-N	g/m^3N	<0.003	0.004
Unionised ammonia	g/m^3 N	<0.00002	0.00003
Turbidity	NTU	0.9	0.9
Appearance		clear, no colour	clear, no colour

The discharge of relatively clear pale green effluent, estimated at 3 litres/sec, 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. Un-ionised ammonia and carbonaceous filtered BOD_5 concentrations were both 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 29 January 2013

Sampling was performed under low river flow conditions (0.77 m^3/s at Glen Road recorder: minimum monthly mean flow – 0.83 m^3/s), fourteen 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 29 January 2013

Site		U	D1
Location		**Upstream**	**Downstream**
Parameter	**Unit**		
Time	NZST	0810	0835
Temperature	˚C	16.4	17.1
BOD_5 (carbonaceous filtered)	g/m^3pH	<0.5	<0.5
pH	mS/m	7.8	7.9
Conductivity @ 20˚ C	g/m^3	-	-
Chloride	g/m^3N	-	-
Ammonia-N	g/m^3 N	0.009	0.009
Unionised ammonia	NTU	0.0002	0.0003
Turbidity		0.7	0.7
Appearance		clear, no colour	clear, no colour

The discharge of green effluent, estimated at 0.3 litres/sec, was observed to have minimal 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 no measurable 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 1000:1 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 low, steady recession flow conditions on 15 February 2013, at identical sites to the physicochemical survey (Figures 4 and 5). Flow was well below the mean average monthly mean flow but 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 15 February 2013

Site	Macroinvertebrate fauna	
	Taxa numbers	**MCI value**
U	20	120
D1	26	115
D2	23	126

Moderate, but typical, macroinvertebrate community richnesses were found in the Kaupokonui River upstream and downstream of the oxidation pond system's effluent discharge, and slightly lower than those recorded by the previous summer's survey.

This was coincident with thin to patchy substrate periphyton mats algal cover, at these sites following a period of relatively low flow conditions, in late summer. MCI scores slightly to significantly higher than those typical of the mid-reaches of a developed catchment, were recorded at all three sites. The moderate range of these scores, with no significant downstream decrease in scores, combined with the similarity in macroinvertebrate communities' compositions [as emphasised by the very narrow range (0.8 unit) in $SQMCI_s$ scores], 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' to 'very good' generic biological health consistent with good physical habitat and proceeding physicochemical water quality. These scores were also higher than predicted scores for ringplain sites at equivalent altitudes and distances downstream of the National Park and were indicative of 'better than expected' to 'well above expected' predictive stream health (TRC, 2013a).

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.

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.

The identification and assessment of the abundance of pond microflora communities can also provide information relating to long term pond performance. The Kaponga oxidation pond system was sampled on one occasion during the 2012-2013 monitoring year, in conjunction with a regular inspection prior to curtailment of this component. This sample was analysed under a binocular microscope to identify phytoplankton present in the sample including algal and non-algal groups. The presence and estimated abundance (present (P), abundant (A) or very abundant (VA)) of these were recorded and the dominant taxa highlighted (in bold) in Table 15. Taxa richness (number of taxa) and the Microfloral Community Index (MfCI) were both calculated. The MfCI was designed by Taranaki Regional Council biologists as a measure of sewage pond performance using the phytoplankton and some heterotrophic groups. This MfCI uses 'sensitivity' scores of 1 to 10 assigned to each taxon, depending on their occurrence in poorly-performing (overloaded) or well-performing ponds. The higher the MfCI value the better the performance of the pond.

With an historical median of 10 taxa, Kaponga has had one of the highest richnesses of all of the Taranaki treatment pond systems. During the 2012-2013 monitoring year, on the one occasion richness was very similar to the median (Table 15 and Figure 6).

Variations in microfloral richnesses in the past were probably due to stormwater dilution and/or seasonal phytoplankton cycles and were not likely to have indicated any problems with the pond system.

Table 15 Planktonic microflora found in the Kaponga WWTP, August 2012

Algal Taxa	14 August 2012
GREEN ALGAE	
Unidentified(nannoplankton)	**P**
Actinastrum	**A**
Ankistrodesmus	P
Chlamydomonus	
Chlorella	P
Closterium	
Coelastrum	P
Dictyosphaerium	A
Pediastrum	P
Scenedesmus	P
CYANOBACTERIA	
Microcystis (Anacystis)	
DIATOMS	
Nitzschia	
CRYPTOPHYTES	
Cryptomonas	P
NON-ALGAL GROUPS	
Protozoa	P
Number of taxa	**9**
MfCI	**80**

Key: P= Present U= Uncertain ID A=Abundant VA= Very Abundant

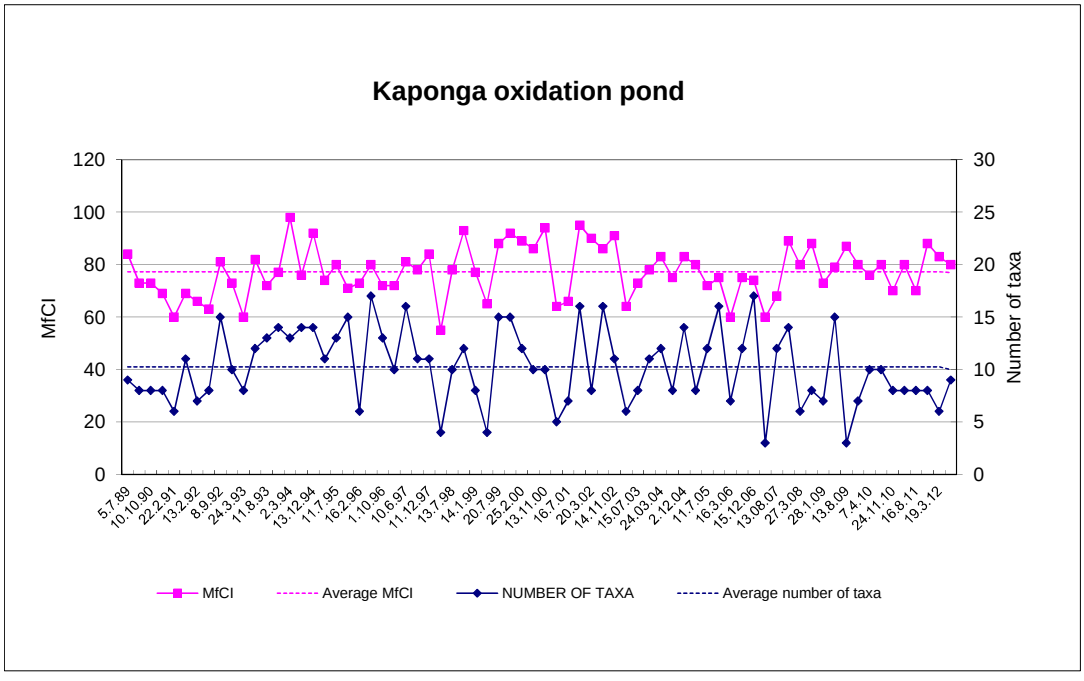

Figure 6 Number of taxa and MfCI values from microfloral communities in the Kaponga pond monitored since July 1986

In past years the green colonials *Scenedesmus* and *Pediastrum* , the cyanobacteria *Microcystis*, cryptophyte *Cryptomonas,* and the diatom *Cyclotella* have frequently dominated the microflora of the Kaponga oxidation pond (along with non-pigmented bacteria). However, in August, 2012 the green algae, *Actinastrum* and *Dictyosphaerium* were abundant and *Actinastrum* was the dominant organism in late winter (Table 15).

The occurrence of algae such as *Euglena* from time to time in the Kaponga pond system to date has contributed to the high pond microfloral community index (MfCI) average of 77 units and median of 77 units, amongst the highest averages and median of all of the Taranaki treatment pond systems. In August 2012 the MfCI score was 3 units lower than the median which was similar to the more recent trend of above median values (Figure 6), and coincident with moderate algal richnesses on all of these occasions.

The Kaponga pond has occasionally supported abundances of filamentous bacteria amongst the phytoplankton. Bacteria were abundant in July and November 2000 and dominated the community in November 2000. In the current 2011-2012 monitoring year, no bacteria were present on any occasions (Table 15). The abundance of bacteria in this pond appeared to have been more frequent during the 2000 to 2002 period. Combined with low richnesses and MfCI values in the latter part of the 2000-2001 monitoring period and early 2001-2002 period, these factors indicated that the pond condition at that time may have deteriorated. Since then the pond community appears to have recovered, indicating that this earlier low pond microfloral quality was an isolated event and not considered indicative of any operational problems.

Overall, the generally good number of taxa and the relatively high MfCI score (88 units) indicated that the upgraded Kaponga pond system has continued to perform well.

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 eg provision of advice and information, or investigation of potential or actual causes of non-compliance or failure to maintain good practices. A pro-active approach that in the first instance avoids issues occurring is favoured.

The Taranaki Regional 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 Unauthorised Incident Register (UIR) 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 2012-2013 year, there were no incidents recorded by the Council that were associated with the consent holder.

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 often better than the median values monitored to date for this system. Turbidity and suspended solids levels were lower than often found historically coincidental with an apparent seasonal decrease in abundance of microfloral taxa within the pond. Biomonitoring of the microfloral component indicated effective pond performance with no dominance of the microflora by bacteria and a moderate algal richness recorded on the single survey occasion monitored.

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 May 2013, when a 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. Macroinvertebrate community index (MCI) scores were slightly to significantly higher than scores typical of those recorded for mid-reaches of developed ringplain catchments and rivers, indicative of ‘good’ to ‘very 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 - Discharge of 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
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**

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 2011-2012 Annual Report

The recommendation from the 2011-2012 Annual Report for the Kaponga oxidation pond monitoring programme was:

1. That monitoring of the Kaponga oxidation pond system be continued for the 2012-2013 period by formulation of a monitoring programme similar in format to the programme undertaken during the 2011-2012 period.

This recommendation was subsequently adopted and all aspects of the 2012-2013 programme were performed as required.

3.8 Alterations to the monitoring programme for 2013-2014

In designing and implementing the monitoring programmes for water discharges in the region, the Taranaki Regional Council has taken into account the extent of information made available by previous authorities, its relevance under the Resource Management Act, the obligations of the Act in terms of monitoring discharges and effects, and subsequently reporting to the regional community, the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of municipal sewage treatment processes within Taranaki 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.

In the case of the STDC and the monitoring programme for the Kaponga oxidation ponds it is proposed that for the 2013-2014 period that monitoring continue at a similar level to that in the programme for the 2012-2013 period with a minor change to the microfloral monitoring of the pond system where chlorophyll-a analyses will replace the requirement for detailed phytoplankton evaluation at the time of each inspection.

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 2013-2014 period by formulation of a monitoring programme similar in format to the programme undertaken during the 2012-2013 period with a minor change to the microfloral component of the inspection requirements (noted above).

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 are 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 de-sludging 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 24000 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 2007-2013 period (mainly due to the greater priorities at Hawera).

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 will be necessary.

4.2 Inspections

In accordance with the monitoring programme, three regular inspections of the Manaia oxidation pond were performed on 6 August 2012, 30 January 2013, and 18 March 2013. 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 microflora sample was collected during each regular inspection for semi-quantitative assessment and for comparative purposes. 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/m³	Saturation %
6 August 2012	0910	12.1	0.6	6
30 January 2013	0830	22.4	4.3	44
18 March 2013	0830	21.4	0.8	9

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 0915 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, there were two surveys when saturation was low (< 10%), and a relatively narrow range in dissolved oxygen levels coincident with some fluctuations in pond microfloral populations. Variations in dissolved oxygen concentrations are typical of biological treatment systems in which levels may vary on both a daily and seasonal basis.

Low to moderate concentrations were found on inspection occasions with no supersaturation, (normally indicative of a significant algal photosynthetic contribution), recorded on any inspection occasion during 2012-2013, 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 was only one occasion when algal scum had accumulated in pockets on the pond surface.

Light wind to calm conditions coincided with the time of inspections, and flat to slight surface rippling conditions were recorded on the pond at these times. The MOW '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 de-sludging 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 (1550 m^3 of sludge) removed from the pond.

The appearance of the pond varied from turbid grey to pale green, to dark green in colour. Low wildlife numbers were present at the time of the inspections ranging from a few gulls, up to 10 black swan, and up to 15 paradise and/or 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 no evidence of sludge on any 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.

Photo 1 Low southern wetland pond levels March, 2013

The wetlands component was tidy with both sections achieving an equal balance in wastewater levels during the first half of the monitoring period but levels decreased in both wetlands in dry late summer conditions with the southern wetland almost dried out by autumn (Photo 1). No use of the additional pond overflow into the wetland was recorded on any inspection occasion. Effluent appearance was relatively clear, with the estimated discharge rate of 8 L/sec on the single overflow inspection occasion (in late winter). A number of pukeko were present on one occasion.

At the time of the one routine monitoring inspection when the wetlands effluent was discharging, minimal discolouration in the small receiving stream was recorded although sewage fungal growths were noted in the discharge channel (see below). Observations noted an improvement in stream aesthetic appearance compared with 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 outfall prior to discharging over the cliff to the coastal waters of the Tasman Sea. This was more typical of receiving water conditions prior to the establishment of the wetland component of the system.

Photo 2 'Sewage fungus' growths on bed of outlet channel, August 2012

Inspections noted the presence of 'sewage fungus' growths on the 5 metre long effluent open channel prior to discharge to the Manaia Creek (Photo 2). It was suggested to the consent holder that additional rock rip-rap be constructed as a filter in this reach which should also be fenced to prevent direct stock access. The consent holder advised that after discussions with the landowner, these works would be undertaken together with planting of the channel banks (STDC, pers comm., December 2012).

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

No full oxidation pond summer-autumn effluent analysis was undertaken during the current period due to the absence of discharges at this time. Partial effluent analysis of the wetlands effluent was performed only on 6 August 2012 for the same reason. These results are summarised in Table 18. All analyses were performed in the Taranaki Regional Council IANZ-registered laboratory using standard methods.

Table 18 Results of the sampling survey of the Manaia oxidation pond and wetland effluents during the 2012-2013 period

Date		6 Aug 2012
Site		Wetlands effluent
Parameter	**Unit**	
Time	NZST	0935
Temperature	°C	11.0
Dissolved oxygen	g/m^3	-
DO saturation	%	-
BOD_5	g/m^3	-
BOD_5 (filtered)	g/m^3	-
pH	pH	-
Conductivity @ 20°C	mS/m	30.5
Chloride	g/m^3	37.0
Ammonia –N	g/m^3 N	-
Dissolved reactive phosphorus	g/m^3 P	-
Suspended solids	g/m^3	-
Turbidity	NTU	4.7
Faecal coliform bacteria	nos/100 ml	140
Appearance		relatively clear

Historically the oxidation pond effluent quality has been typical of a municipal single oxidation pond system receiving a relatively low industrial waste component coincidental with variable microfloral populations in the pond (Table 19). Moderately low levels of suspended solids and BOD_5 (total and dissolved) and close to neutral pH have been indicative of a decrease in algal density in the pond particularly following wet weather periods.

The historical wetland effluent data indicated a marked improvement in terms of total BOD_5, suspended solids, and faecal coliform bacteria levels in comparison with the oxidation pond effluent. The combined system will require more time for full establishment before valid comparative assessments with historical oxidation pond performance can be provided

Table 19 Ranges of results of Manaia wastewater treatment system effluent analyses recorded for the period 1987 to June 2012[2]

Parameter	Unit	Oxidation pond			Wetlands		
		No of samples	Range	Median	No of samples	Range	Median
Flow	L/s	34	2-50	5	8	0.3-13	5
Dissolved oxygen	g/m^3	91	<0.1-23	6.6	2	0.8-1.6	1.2
BOD_5	g/m^3	25	11-90	44	5	8-34	17
BOD_5 (filtered)	g/m^3	23	1.4-23	12	2	3.4-13	8
pH	pH	28	7.2-9.0	7.5	2	6.9-7.6	7.2
Conductivity @ 20°C	mS/m	50	25.9-56.8	33.6	8	27.5-42.6	32.6
Chloride	g/m^3	42	27.0-66.4	46.1	8	38.7-53.5	45.5
Suspended solids	g/m^3	29	9-420	98	2	7-12	10
Turbidity	NTU	43	4.3-540	19	8	2-81	9
Faecal coliform bacteria	nos/100ml	51	1200-500000	22000	8	7-2500	220
Ammonia N	g/m^3N	24	1.7-17.8	9.8	2	6.8-10.0	8.38
Dissolved reactive phosphorus	g/m^3P	25	0.68-4.89	3.47	2	1.20-2.28	1.74

Minimal comparison with past data (Table 19) can be performed for the 2012-2013 period as no oxidation pond effluent quality was collected. The limited wetlands data indicated an effluent quality of better than median values in late winter, but will be further evaluated in the future as the system becomes established and the database increases. It will also be compared with historical oxidation pond effluent data.

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, in August, 2012; the only inspection occasion when a discharge was occurring. Baseline coastal water conditions were sampled in the absence of a discharge on one inspection occasion. 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'	5m 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'	10m downstream of the oxidation pond discharge	1696369 E 5618539 N	MNA000093
SE	Tasman Sea	200m east of mouth of 'Manaia Creek'	1696641 E 5618404 N	SEA905086
SW	Tasman Sea	200m west of mouth of 'Manaia Creek'	1696255 E 5618419 N	SEA905080

Sampling sites' locations in relation to the pond system are illustrated in Figures 7 and 8.

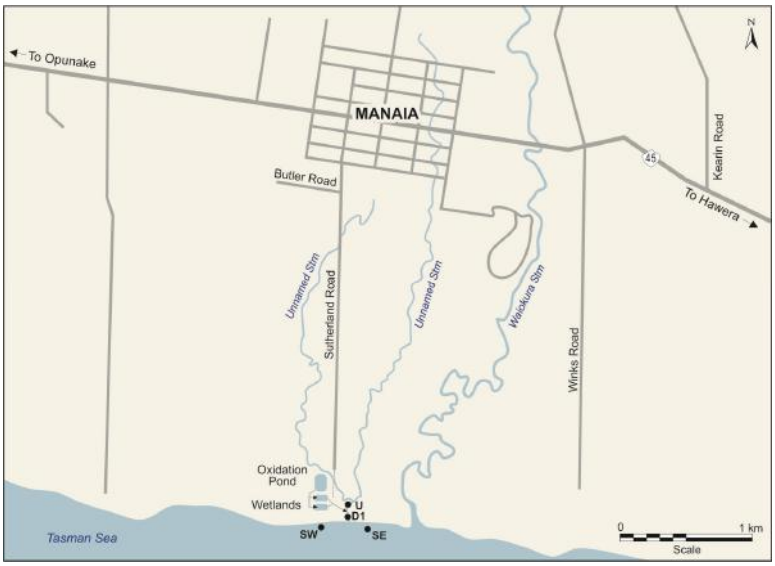

Figure 7 Location of Manaia oxidation pond-wetlands system and sampling sites

Figure 8 Aerial location map of sites in relation to Manaia wastewater treatment system

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

6 August 2012

An effluent flow of 8 litres per second from the Manaia oxidation pond-wetlands system was estimated at the time of this mid tide survey under fine conditions about two weeks after significant wet weather. Slightly turbid, pale green conditions were observed in the moderate flow of the receiving waters above and below the discharge outfall prior to the flow dispersing across the rocky shore and entering the cloudy,

brownish 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 although 'sewage fungus' was recorded in the effluent outlet channel (see earlier). Results from the survey are presented in Table 21.

Table 21 Results of the receiving waters survey of 6 August 2012 (low tide: 0620)

Site		U	WET	D1	SE	SW
		Upstream	Discharge	Downstream	Coastal	
Parameter	**Unit**					
Time	NZST	0930	0935	1940	0945	1000
Temperature	^{o}C	12.1	11.0	12.0	12.1	12.0
Conductivity @ 20^{0} C	mS/m	40.1	30.5	39.2	3810	4480
Chloride	g/m^3	61.7	37.0	58.0	-	-
Turbidity	NTU	4.8	4.7	5.8	-	-
Faecal coliform bacteria	nos/100ml	130	140	84	14	2
Appearance		slightly turbid, pale green	relatively clear, pale green	slightly turbid, pale green	cloudy, brown	cloudy, brown

Wetland effluent quality, in terms of the parameters analysed, was very good in terms of bacteriological quality when compared to the median and the range of oxidation pond effluent quality previously measured (Table 18) and much clearer in terms of median turbidity as might be expected of a wetlands polished wastewater. A dilution ratio of approximately six 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 no increase in bacteria number found 10 metres downstream of the outfall as a result of the good effluent bacterial quality. The relatively clear effluent caused no significant deterioration in the turbidity of the slightly turbid stream downstream of the discharge.

Minimal impact on seawater faecal coliform bacterial quality was found at the two sites either side of the mouth of the stream although there was some freshwater encroachment apparent at the site to the east of the mouth (SE) as indicated by the lower conductivity. The eastern site's bacterial number was equivalent with the median guideline 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. Although the survey followed recent wet weather and a stream fresh a week earlier, no impact was found at the site 200 m west of the stream mouth, where the bacterial quality was within both of the guidelines.

30 January 2013

There was no effluent flow from the wetlands component of the WWTP at the time of this inspection (performed under very low, recession flow conditions about four weeks after a period of wet weather). Coastal seawater sampling was performed under mid tidal conditions when the appearance was turbid grey to provide baseline bacteriological information in the absence of a wastewater discharge. Results of this survey are presented in Table 22.

Table 22 Results of the receiving waters survey of 30 January 2013 (low tide: 0533 NZST)

Site		U	WET	D1	SE	SW
		Upstream	Discharge	Downstream	Coastal	
Parameter	**Unit**					
Time	NZST	-	-	-	0900	0915
Temperature	^{o}C	-	-	-	21.3	21.3
Conductivity @ 20^{0} C	mS/m	-	-	-	3830	4590
Chloride	g/m^{3}	-	-	-	-	-
Turbidity	NTU	-	-	-	-	-
Faecal coliform bacteria	nos/100ml	-	-	-	2	13
Appearance		no discharge	no discharge	no discharge	slightly turbid, grey	slightly turbid, grey

In the absence of any wastewater discharge, minimal impacts of the stream on seawater faecal coliform bacterial quality were found at the two sites either side of the stream mouth although again there was evidence of some freshwater encroachment at the site to the east of the mouth. However, the eastern site's bacterial number did not exceed the median guideline for recreational shellfish-gathering (median of 14 per 100ml and 90% of samples <43 per 100ml (MfE/MoH, 2003)) and the bacterial quality at the site to the west of the stream mouth was within both guidelines.

18 March 2013

No further assessment of the impact of the wetlands effluent discharge on the receiving waters was able to be performed on 18 March 2013, under very low stream recession flows seven weeks after a fresh and during drought conditions, due to very low wetlands levels and therefore no discharge to the Manaia Creek (see earlier).

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 one occasion in the monitoring period when a discharge was monitored, with no 'sewage fungus' recorded on the streambed on this occasion. There were very low bacterial counts measured in the coastal waters on the two occasions surveyed. No significant effects were apparent in the coastal waters during the two surveys despite a moderate faecal bacteria count in the 'Manaia Creek' at the time of the late winter 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 time of the two coastal receiving water surveys performed in the monitoring period there were no occasions when the seawater faecal coliform bacterial levels exceeded the recommended guideline values for shellfish gathering at one or the other of the two 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 2013 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) SEA905080 (SW)	32 32	<2-400 <2-1300	19 8	34 28
Post upgrade (since January 2010)	SEA905086 (SE) SEA905080 (SW)	9 9	1-23 1-13	7 2	0 0
All data	SEA905086 (SE) SEA905080 (SW)	41 41	1-400 1-1300	11 5	24 22

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 14 year period are within the median guideline. However, more than 10% of samples (22 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 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, no exceedances of the upper limit have occurred since the wetlands tertiary wastes 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.

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.

The identification and assessment of the abundance of microflora communities present in the pond system can also provide information relating to long term pond performance. During the 2012-2013 monitoring period, one sample of oxidation pond effluent was collected in conjunction with the August 2012 inspection before this component of the programme was curtailed.

The sample of effluent from the outlet of the oxidation pond was analysed under a binocular microscope to identify phytoplankton present in the sample including algal and non-algal groups. The presence and estimated abundance[present (P), abundant (A) or very abundant (VA)] of these were recorded and the dominant taxa highlighted (in bold). Taxa richness (number of taxa) and the Microfloral Community Index (MfCI) were calculated. The MfCI was designed by Taranaki Regional Council biologist as a measure of sewage pond performance using the phytoplankton and some heterotrophic groups. The MfCI uses 'sensitivity' scores of 1 to 10 assigned to each taxon, depending on their occurrence in poorly-performing (overloaded) or well-performing ponds. Higher MfCI values indicate better pond performance.

To date the Manaia pond has supported a phytoplankton community with an average and median richnesses of 8 of 9 taxa respectively. On the one occasion during the 2012-2013 monitoring period, the number of taxa was slightly less than the average and median values in late winter 2013 (Table 24).

With the exception of bacteria, the colonial spined green alga, *Micractinium* has been the most commonly dominant taxon in the past; although, as with all treatment ponds, significant community composition changes may occur over short periods of time. Found with other algae common to bacteria-dominated ponds, *Micractinium* has been the dominant taxon on 17 occasions. On fourteen of these occasions it was present in early summer (November/December) but it was not present in late winter, 2012. *Euglena* has also commonly been a dominant organism (being abundant on ten occasions) but also was not present in late winter, 2012 (Table 24). Instead, there were low abundances of five green algae taxa found at this time.

Table 24 Planktonic microflora found in the Manaia treatment pond, 6 August, 2012

Algal Taxa	6 August 2012
GREEN ALGAE	
Unidentified	**P**
Ankistrodesmus	P
Closterium	
Chlorella	**P**
Oocystis	
Coelastrum	
Dictyosphaerium	
Actinastrum	**P**
Micractinium	
Golenkinia	
Scenedesmus	P
Pediastrum	**P**
CYANOBACTERIA	
Oscillatoria	
DIATOMS	
Cyclotella	
Nitzchia	
EUGLENOIDS	
Euglena	
NON-ALGAL GROUPS	
Protozoa	
Number of taxa	6
MfCI	64

Key: P= Present U= Uncertain ID A=Abundant VA= Very Abundant **=Dead cells only

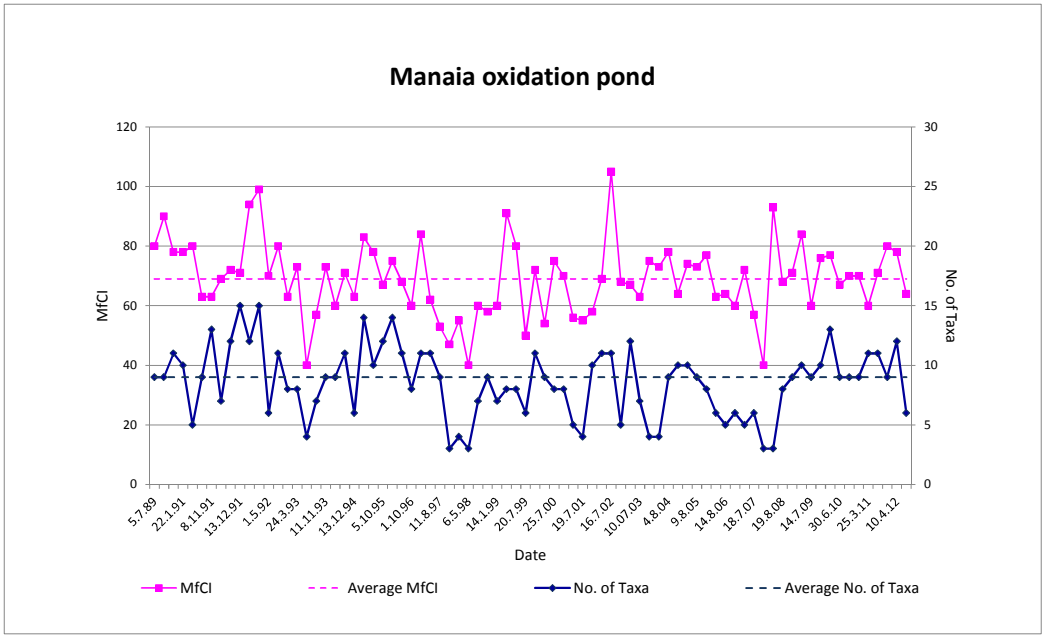

Figure 9 Numbers of taxa and MfCI values for the Manaia oxidation pond since monitoring began in 1989

The Manaia pond usually supports algae which rarely occur in overloaded ponds and this has contributed to relatively high average and median pond MfCI results (Figure 10). The average MfCI value (69) and median value (70) from the Manaia pond were similar to average and median MfCI values recorded from other well performing

ponds in Taranaki. In the 2012-2013 monitoring year the August score was lower than average and median scores.

A single baseline sampling of the phytoplanktonic taxa present in the wetland in autumn 2012 found 10 taxa of which only one taxon, the green alga, *Chlorella* was abundant. No further sampling of this wetland flora was performed during the 2012-2013 period.

4.4.2 Beach ecological inspections

The monitoring programme for the 2012-2013 period required two beach ecological inspections to be performed. Only one survey was performed and this was delayed until June 2013 following a lengthy period when no overflows to natural water occurred due to drought conditions. The inspection was 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 this inspection are discussed below.

24 June 2013

A marine ecological inspection of the foreshore in the vicinity of the discharge from the Manaia oxidation pond/wetland system was performed on 24 June 2013 commencing at 1530 NZST. Low tide on this day was at 1620 NZST at a height of 0.1 m above chart datum.

At the time of the inspection the effluent from the oxidation pond/wetland system was discharging at a relatively high rate. The discharge was slightly green in colour and had no noticeable odour. No 'sewage fungus' was present either before or after the stream confluence. The tributary receiving the discharge had yet to be fenced and have rocks added in order to reduce the risk of sewage fungus growth (Photo 3 and Section 4.2). The stream was in high flow during the inspection.

Photo 3 The discharge from the oxidation pond/wetlands prior to the stream

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.

At the top of the intertidal region, within the vicinity of the stream, the community was dominated by the gastropods *Austrolittorina cincta* and *Diloma* spp. and the little black mussel *Xenostrobus pulex*. The only algal species present were *Ralfsia* sp. and *Ulva* sp. These animal and algal species are typical of high shore environments and are tolerant of low salinity. Other species became more abundant further away from the stream, including the limpet *Cellana radians*, the gastropods *Haustrum scobina*, *Haustrum haustorium* and *Melagraphia aeithiops*, and the barnacle *Austrominius modestus*.

Photo 4 Abundant *Corallina* (pink paint colouration) covering boulders within the influence of the stream on the lower region of the intertidal zone

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, 21 animal and algal species occurred within the vicinity of the stream. Of these, the little black mussel *Xenostrobus pulex* was most dominant, occurring mainly on rocks within the influence the stream. The algal species *Corallina* (paint (Photo 4), *and* turf), *Geledium caulacantheum*, *Hormosira banksii,* and *Splachnidium rugosum* were all present on boulders within the stream, becoming more abundant lower down the shore. Although *Ulva* sp. has been recorded as abundant in previous surveys, this species was only observed on the higher shore during the present survey.

Photo 5 Sea urchin *Evechinus chloroticus* present on the lower shore away from the influence of the stream

A total of thirty seven species was 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 *Carpophyllum* sp., chitons *Acanthochitona zelandica* and *Chiton glaucus*, gastropods *Diloma bicanaliculata*, *Dicathis orbita,* and *Haustrum haustorium*, starfish *Patiriella regularis* and sea urchin *Evechinus chloroticus* (Photo 5).

In summary, the stream appeared to have a significant effect on nearby intertidal organisms, most likely a result of freshwater influence. The diversity and abundance of intertidal communities on the remaining reef 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 eg provision of advice and information, or investigation of potential or actual causes of non-compliance or failure to maintain good practices. A pro-active approach that in the first instance avoids issues occurring is favoured.

The Taranaki Regional 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 Unauthorised Incident Register (UIR) 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 2012-2013 year, there were no incidents recorded by the Council that were associated with the consent holder.

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 at times 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 is still performing 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 on one occasion recorded slightly lower than average taxa number in late winter but found that the community present was typical of other well-performing pond systems elsewhere in the region. 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. Very dry, drought-like, late summer-autumn conditions resulted in low wetland wastewater levels (due to evaporation and/or seepage within these components) and a lengthy period when no discharges occurred to the Manaia Creek. Prior 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 were delayed by drought conditions over the summer-autumn period). Notwithstanding this factor, monitoring over the 2012-2013 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.

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 both occasions in terms of bacteriological water quality for shellfish gathering. 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 one ecological beach survey conducted in June 2013 found that whilst there was a localised, significant effect 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 - Discharge of 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)	Yes (not always discharging)
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		**High**
Overall assessment of environmental performance		**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 water 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 recently renewed consent and the requisite upgrade of the wastewater treatment plant, although some investigations into the water quality of the 'Manaia Creek' continue to be warranted upstream of the wetlands discharge in relation to other possible issues.

4.8 Recommendations from the 2011-2012 Annual Report

The recommendations from the 2011-2012 Annual Report for the Manaia wastewater treatment system monitoring programme were:

1. That monitoring of the Manaia oxidation pond system be continued for the 2012-2013 period by formulation of an appropriate monitoring programme similar in format to the programme undertaken during the 2011-2012 period.

2. That the consent holder liaise with the Regional 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 Regional 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 Regional Council by 30 June 2013.

5. That the Regional Council investigates aspects of the water quality of the 'Manaia Creek' upstream of the WWTP and the source of bacteria in both the stream and coastal waters, during the 2012-2013 period.

Recommendation 1 was subsequently adopted and most aspects of the programme were performed (as dictated by weather conditions). Recommendations 2 to 4 were satisfied and the investigations in Recommendation 5 were deferred to the 2013-2014 period due to drought conditions in late summer-autumn.

4.9 Alterations to the monitoring programme for 2013-2014

In designing and implementing the monitoring programmes for water discharges in the region, the Taranaki Regional Council has taken into account the extent of information made available by previous authorities, its relevance under the Resource Management Act, the obligations of the Act in terms of monitoring discharges and effects, and subsequently reporting to the regional community, the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of municipal sewage treatment processes within Taranaki 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 2013-2014 period that monitoring continue consistent with that reviewed and adopted for the 2012-2013 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 a minor change to the microfloral monitoring of the oxidation pond where chlorophyll-a analyses will replace 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' will 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 2013-2014 period by formulation of an appropriate monitoring programme similar in format to the programme undertaken during the 2012-2013 period with a minor change to the microfloral component of the inspectorial requirements (noted above).

2. That the consent holder liaise with the Regional 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 Regional 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 Regional Council by 30 June 2014.

5. That the Regional 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 2013-2014 period.

6. That the charges (of $1474) associated with components of the programme which were unable to be performed or not undertaken during the 2012-2013 period, be refunded to the consent holder.

5. Patea oxidation pond system

The Patea wastewater treatment system (constructed in 1973 for a population of 2400) 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 1143 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 have 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 Regional 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.

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, de-sludging 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. De-sludging of the pond was also delayed by the issue of community concerns with the location of the disposal site. De-sludging 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 metres 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).

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).

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 2753 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 2009-2010, 2010-2011, or 2011-2012 periods. The next meeting was scheduled for the 2012-2013 period but has yet to be held.

5.2 Inspections

5.2.1 Pond system

In accordance with the monitoring programme for the Patea oxidation pond, three inspections were performed on 8 October 2012, 18 February 2013, and 7 May 2013. 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 microfloral sample was collected from the final cell during each inspection for semi-quantitative assessment. The results are 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/m^3	Saturation %
8 October 2012	0820	14.1	5.7	56
18 February 2013	0855	20.9	1.1	12
7 May 2013	0930	13.1	6.9	65

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.

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 less variability than usual (12 to 65% saturation) was recorded for dissolved oxygen. This variation in saturation was 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 and the lowest concentration was found in late summer. The pond cells operated at normal levels during the year after completion of the upgrade of the wastewater treatment system some four years earlier.

5.2.1.1 First cell

Surface conditions in this, the largest of the three recently re-configured cells, were flat to rippling to choppy due to light to strong wind conditions at inspection times. The cell wastewater appearance varied from grey to bright green (summer) to grey-brown (autumn). 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 numbers of mallard ducks in spring and higher numbers (75 to 150) of mallard ducks on the other two inspection occasions.

Storm damage from extremely strong winds during March 2012 resulted in widespread tree damage in the adjacent plantation and trees had fallen into the primary cell at the time of the autumn inspection. The access track to the WWTP was also blocked by fallen trees. These trees and the damaged pine plantation were removed early in the 2012-2013 (spring) period (STDC, 2013).

5.2.1.2 Second cell

Surface conditions on this, the second of the three re-configured cells, were also flat to rippling to choppy under light to strong wind conditions on inspection occasions. The cell wastewater appearance varied from green (in spring) to dark green-brown (summer and autumn). There were no odours recorded on any occasion adjacent to this cell. 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 moderate numbers of mallard ducks on two inspection occasions and ducklings in spring.

5.2.1.3 Final (tertiary) cell

Surface conditions on this, the final of the three re-configured cells, ranged from choppy to rippling to almost flat under strong to light wind conditions on inspection occasions. The cell wastewater appearance varied from dark green (spring), to dark green-brown (mid summer) to turbid brown (autumn). 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 any inspection occasion, a feature of this cell to date.

The estimated discharge rate from this final cell via the rock riprap outfall to the river varied from 0.3 litre/sec (summer) to 3 litres/sec (in spring and 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 any of the three occasions.

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 of the area of the flume shed, pump station, and outfall to the Patea River were made by the Taranaki Regional 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 TRC 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 (395m) 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).

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 and one site at Patea Beach as a component of the Regional Council's state of the environment programme. This monitoring of Patea Beach is undertaken on a three-yearly cycle.

5.3.1 Effluent quality

One full oxidation pond final tertiary cell effluent analyses was performed on 18 February 2013 at the time of a receiving water survey during a recession flow in the river, three days after a river fresh of near three times median flow. At the time of this sampling survey the effluent was turbid green-brown in appearance and discharging at an estimated rate of 0.3 litre per sec. The results are presented in Table 27. All analyses were performed in the Taranaki Regional Council IANZ-registered laboratory using standard methods.

Table 27 Results of the sampling survey of the Patea oxidation pond final (tertiary) cell effluent on 18 February 2013

Site Date	Unit	Third cell discharge 18 February 2013
Parameter		
Time	NZST	0900
Temperature	°C	20.9
Dissolved oxygen	g/m^3	1.1
DO saturation	%	12
BOD_5	g/m^3	27
BOD_5 (filtered)	g/m^3	8
pH	pH	8.6
Conductivity @ 20°C	mS/m	73.2
Chloride	g/m^3	-
Dissolved reactive phosphorus	g/m^3 P	1.74
Ammonia-N	g/m^3 N	0.103
Suspended solids	g/m^3	35
Turbidity	NTU	62
Faecal coliform bacteria	nos/100 ml	16
Enterococci bacteria	nos/100 ml	800
		turbid, dark green-brown, 0.3 litre/sec (est)

Effluent quality results indicated a relatively high effluent quality, better than typical of a municipal pond treatment system receiving mainly domestic wastes for the time of the year sampled. The slightly elevated pH (particularly for midmorning conditions) and turbidity level, together with the appearance of the effluent, were indicative of marked pond microfloral contributions. Faecal coliform bacteria number was very low and much lower than typical of the effluent from the previous single pond treatment system. This was probably related to improved retention and circulation in the upgraded, modified system and coincident 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 2012)

		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	12	1.9-14.8	8.0
BOD_5	g/m^3	20	15-66	29	5	13-31	21
BOD_5 (filtered)	g/m^3	17	1.8-21	4.7	5	1.0-2.1	1.5
pH		21	8.1-9.6	8.6	5	9.4-10.1	10.0
Conductivity @ 20°C	mS/m	36	57-154	79	8	48.5-69.2	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	5	0.025-1.1	0.036
Dissolved reactive phosphorus	g/m^3 P	21	1.48-6.87	3.77	5	0.011-1.91	1.12
Suspended solids	g/m^3	22	27-140	74	5	57-150	110
Turbidity	NTU	25	7.8-113	27	8	27-240	112
Faecal coliform bacteria	nos/100 ml	38	360-190000	26500	8	10-420	51
Enterococci bacteria	nos/100 ml	26	300-20000	2700	7	8-1200	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. Most parameters' results were better than past median values, and the faecal coliform bacterial level was lower than 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 an elevated pH and turbidity (equal with or above previous pond medians) which, together with the low faecal coliform bacteria number (below the minimum), were indicative of a relatively significant microfloral contribution. The upgraded system may now have reached a stable state following pond cells re-filling four years previously, after the significant re-configuration of the original single pond. Wastewater quality appears to have improved significantly in terms of median 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 29 and sampling sites' locations in relation to the pond system are illustrated in Figure 10. 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 10 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 Regional Council's state of the environment recreational bacteriological programme. (Note: the beach site was last monitored in the 2009-2010 period (TRC, 2010) and has been monitored in the current 2012-2013 period (TRC, 2013a)).

5.3.2.1 Lower river impacts

Sampling was undertaken under moderate to lowish river flow conditions (below mean (spring) and median (summer) 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.

8 October 2012

The effluent discharge from the tertiary cell of the re-configured Patea oxidation ponds system was estimated at 3 litres per second at the time of this spring sampling occasion. (Note: No discharge from the pumping station had occurred since a very minor accident in mid-July 2012). The survey was performed towards low tide under slightly turbid, pale brown, moderate river flow conditions during overcast but fine 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 8 October 2012 (low tide: 0839 NZST)

Site		1	2	OP	3	4
Location		**Upstream**		**Discharge**	**Downstream**	
Parameter	**Unit**					
Time	NZST	0750	0800	0820	0830	0915
Temperature	°C	13.6	13.8	14.1	14.3	14.0
Conductivity @ 20°C	mS/m	227	379	58.3	615	648
Turbidity	NTU	10	14	6.5	60	27
Faecal coliform bacteria	nos/100 ml	98	80	96	2600	84
Enterococci bacteria	nos/100 ml	12	17	22	13	20
Appearance		sl. turbid, pale brown; slow d/s flow	sl. turbid, pale brown; slow d/s flow	dark green	turbid, grey; slow d/s flow	sl. turbid, brown; slow d/s flow

Elevated conductivity levels indicated some saline penetration of the lower river which remained relatively uniform in this reach under relatively low river flow conditions. The bacterial numbers were typical of these river conditions in the presence of some coastal water intrusion. A narrow range of faecal coliform and enterococci bacteria numbers were recorded at three sites (Table 31) consistent with no recent impacts of an extremely high standard of bacterial effluent quality discharged from the re-configured oxidation ponds system outfall. There was an increase in turbidity downstream of the discharge coincident with a large increase in faecal coliform number which was inconsistent with the high quality of wastewater discharge (Table 31) and more indicative of a localised source of contamination (e.g. birds) with marked improvement after additional mixing at site 4. In general, bacteria numbers were toward the lower end of typical ranges in the lower reaches of a large river draining a developed catchment under low flow conditions.

18 February 2013

The discharge from the final cell of the Patea oxidation ponds system was estimated at 0.3 litre per second at the time of this late summer sampling survey which was performed under low flow conditions, in sunny, fine weather, two weeks after a river fresh. No recent overflows from the pumping station had occurred. The sampling survey was performed just prior to 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 18 February 2013 (low tide: 0930 NZST)

Site		1	2	OP	3	4
Location		**Upstream**		**Discharge**	**Downstream**	
Parameter	**Unit**					
Time	NZST	0830	0840	0900	0920	0935
Temperature	°C	20.7	20.8	20.9	20.8	20.7
Conductivity @ 20°C	mS/m	1230	1340	73.2	1440	1520
Turbidity	NTU	18	12	62	18	10
Faecal coliform bacteria	nos/100 ml	96	100	16	110	97
Enterococci bacteria	nos/100 ml	60	58	800	60	64
Appearance		turbid, brown; slow d/s flow	turbid, brown; slow d/s flow	turbid, dark green-brown	turbid, brown; slow d/s flow	turbid, brown; very slow d/s flow

These results indicated some saltwater penetration under low flow and low tide conditions, with a small increase in coastal seawater influence in a downstream direction. Faecal coliform and enterococci bacteriological water quality was relatively good but typical of the lower reaches of a developed farmland catchment and indicative of no impacts of the upgraded oxidation ponds' system discharge which had a very good faecal coliform bacteriological effluent quality. No visible impacts of the turbid, algal laden, wastewater discharge were indicated at the site (3) at the downstream boundary of the consented mixing zone prior to improved mixing at the boat ramp site (4).

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 were no overflow events during the contact recreational period between November 2012 and April 2013.

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

There were no significant impacts of the relatively high 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 mid summer and autumn was typical of, or better than, the lower reaches of a developed farmland catchment and was relatively uniform (with one unexplainable exception) throughout the reach upstream and downstream of the emergency overflow and wastewater treatment system outfalls. Moderate to good bacteriological water quality also continued to be correlated with the degree of saltwater penetration in this reach of the river under low tide 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 below the single sample 'Alert' limit (260 *E. coli* per 100 ml), and therefore the 'Action' limit (550 *E. coli* per 100 ml) for contact recreational waters (MfE, 2003).

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) and also at Patea Beach. This was also integrated with the Regional 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 29 and Figure 10), 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 also surveyed over the 2012-2013 period (TRC, 2013b). Sampling at these sites during the Council's defined recreational monitoring period occurred between early November 2012 and late March 2013 (TRC, 2013), 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, 33, and 34 and illustrated in Figures 11, 12, and 13.

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 related to consented usage of the emergency outfall (as no use was made of this outfall). These results are summarised in Table 32 and illustrated in Figure 11.

Table 32 Statistical results summary for the lower Patea River at the boat ramp (PAT000995) from November 2012 to March 2013

Parameter	Unit	Number of samples	Minimum	Maximum	Median
Conductivity @ 20°C	mS/m	21	121	4760	4680
E.coli	nos/100ml	20	<1	99	10
Enterococci	nos/100ml	21	<1	64	8
Faecal coliforms	nos/100ml	21	<1	99	12
Temperature	°C	21	14.9	23.6	20.2
Turbidity	NTU	21	3.1	37	10

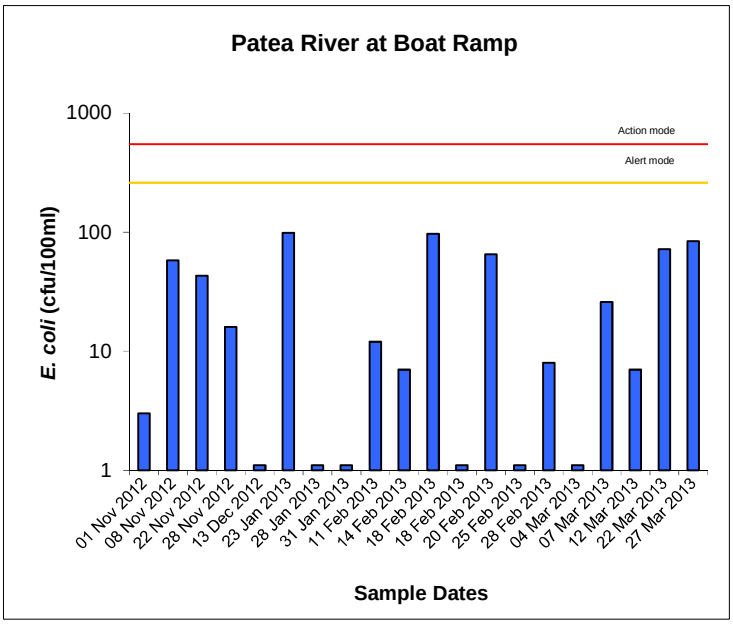

Figure 11 *E.coli* numbers for the lower Patea River at the boat ramp during the survey period

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. No exceedances of the 'Action' limit or the 'Alert' mode were recorded under low and high tide conditions; and the 'Alert' limit was not approached under low 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. Bathing activity was noted only once at this site which was used mainly for boating access and occasionally for fishing and walking. [Note: Taranaki Regional 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 summarized in Table 33 and illustrated in Figure 12.

Table 33 Statistical results summary for 'Mana' Bay, Patea (SEA 907022) from November 2012 to March 2013

Parameter	Unit	Number of samples	Minimum	Maximum	Median
Conductivity @ 20°C	mS/m	20	421	4740	4680
E.coli	nos/100ml	19	<1	81	3
Enterococci	nos/100ml	20	<1	64	4
Faecal coliforms	nos/100ml	20	<1	81	7
Temperature	°C	20	14.9	23.3	19.7

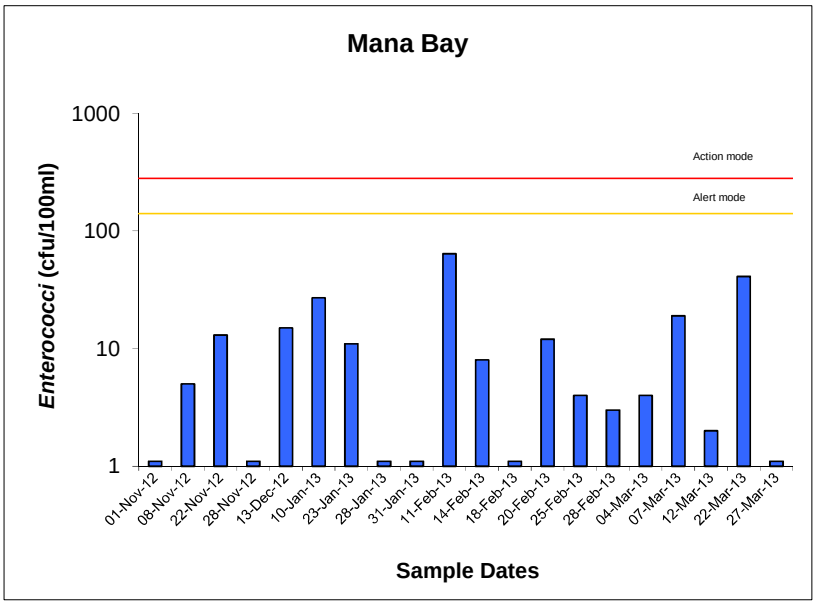

Figure 12 Enterococci numbers for 'Mana' Bay during the survey period

Bacterial water quality at this well patronized site (particularly by children) was very good considering the proximity of the river. Very similar bacterial quality (median: 4 *E coli*/100 ml and 4 enterococci/100 ml) was recorded under high tide conditions when the river had limited influence at this site. No two consecutive enterococci results entered the 'Action' mode and no counts exceeded the 'Alert' limit (Figure 13). Higher counts (median: 13 enterococci/100ml and 58 *E.coli*/100ml) 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

Sampling was performed on 13 occasions (all near high tide conditions) at this exposed beach site approximately 300 metres to the west of the Patea River mouth and moles. Very limited bathing usage of this site was noted during the bathing season. Results are summarised in Table 34 and illustrated in Figure 13.

Table 34 Statistical results summary for Patea Beach (SEA907020) from November 2012 to March 2013

Parameter	Unit	Number of samples	Minimum	Maximum	Median
Conductivity @ 20°C	mS/m	13	4680	4750	4710
E.coli	nos/100ml	13	<1	13	3
Enterococci	nos/100ml	13	<1	31	2
Faecal coliforms	nos/100ml	13	<1	15	3
Temperature	°C	13	16.8	22.6	19.7

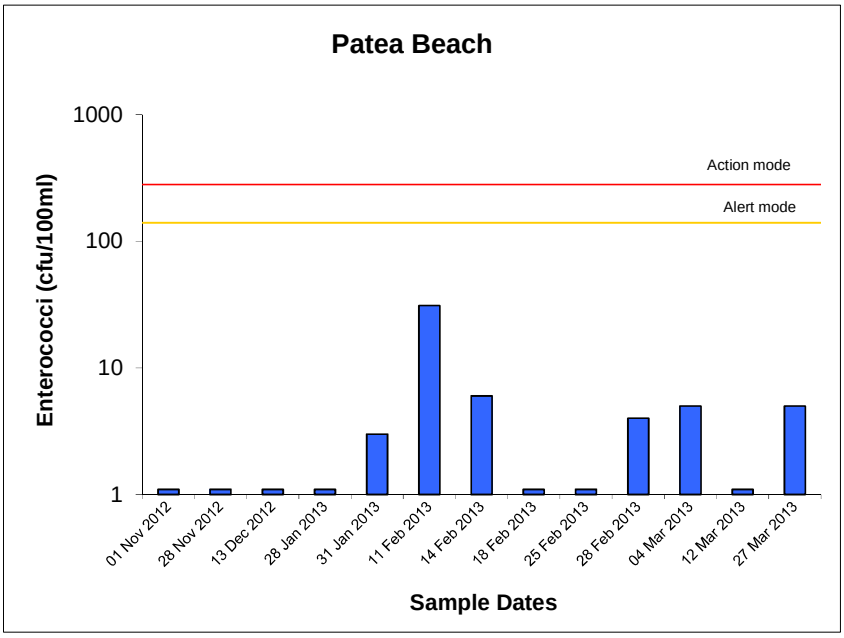

Figure 13 Enterococci numbers for Patea Beach during the survey period

The bacterial water quality of this coastal beach site was very good throughout the entire period under high tide conditions. No incursion into the 'Alert' mode occurred and no counts entered the 'Action' mode on any sampling occasion. Previous annual recreational monitoring surveys, performed at three-yearly intervals since 1997-1998, have recorded similarly very good bacteriological water quality (medians ranging from 3 to 8 enterococci/100ml) with minimal incursions into either 'Alert' or 'Action' modes of the MfE contact recreational guidelines (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, no overflows occurred from the emergency outfall. No impacts on coastal water quality at the Mana Bay or Patea Beach sites 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 any of the three sites.

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 eg cyanobacteria are often present in under-loaded conditions and chlorophyceae are present in overloaded conditions.

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.

The identification and assessment of the abundance of pond microflora communities can also provide information relating to long term pond performance. During the 2012-2013 monitoring year one sample was collected from the outlet of the third cell of the reconfigured oxidation pond system in conjunction with the routine inspection in October 2012 after which this component of the programme was curtailed. This was analysed under a binocular microscope to identify phytoplankton present in the sample including algal and non-algal groups. The presence and estimated abundance (present (P), abundant (A) or very abundant (VA)) of these were recorded and the dominant taxa highlighted (in bold). Taxa richness (number of taxa) and the Microfloral Community Index (MfCI) were calculated (Table 35).

The MfCI was designed by Taranaki Regional Council biologists as a measure of sewage pond performance using phytoplankton and some heterotrophic groups. The MfCI uses 'sensitivity' scores of 1 to 10 assigned to each taxon, depending on their occurrence in poorly-performing (overloaded) or well-performing ponds. Generally, the higher the MfCI value the better the pond performance.

Since monitoring began in 1989 and prior to reconfiguration, the Patea pond has supported a phytoplankton community with an average richness of 9 taxa (Figure 14) and median of 8 taxa. The richness on the one occasion during the current monitoring year (9 taxa) was very similar to historical median and mean richnesses.

In the past the Patea oxidation pond was dominated by the non-motile green algae *Chlorella* and *Closterium,* the motile greens *Euglena* and *Chlamydomonas*, the cyanobacteria *Oscillatoria* and *Microcyctis,* and non-pigmented bacteria.

On the one sampling occasion (spring) during the current monitoring year two of these taxa were present (*Closterium* and *Euglena*) but neither was dominant nor were any cyanobacteria taxa present.

Table 35 Planktonic microflora found in the Patea reconfigured third cell of the sewage treatment pond's system over the 2012-2013 period

Algal Taxa	8 October 2012
GREEN ALGAE	
Unidentified (colonial)	P
Unidentified (unicells)	P
Ankistrodesmus	P
Chlamydomonas	
Chlorella-like unicells	
Closterium/Closteriopsis	P
Actinastrum	
Oocystis	P
Dictyosphaerium	
Scenedesmus	P
CYANOBACTERIA	
Microsystis (Anacystis)	
Oscillatoria/Planktothrix	
DIATOMS	
Cyclotella	P
Nitzschia	
DIOFLAGELLATES	
Peridinium group	
EUGLENOIDS	
Euglena	P
CRYPTOPHYTES	
Cryptomonas	P
NON-ALGAL GROUPS	
Protozoa	
Rotifers	
Number of taxa	9
MfCI	75

Key : P = Present, A = Abundant, VA = Very Abundant, U= Uncertain ID

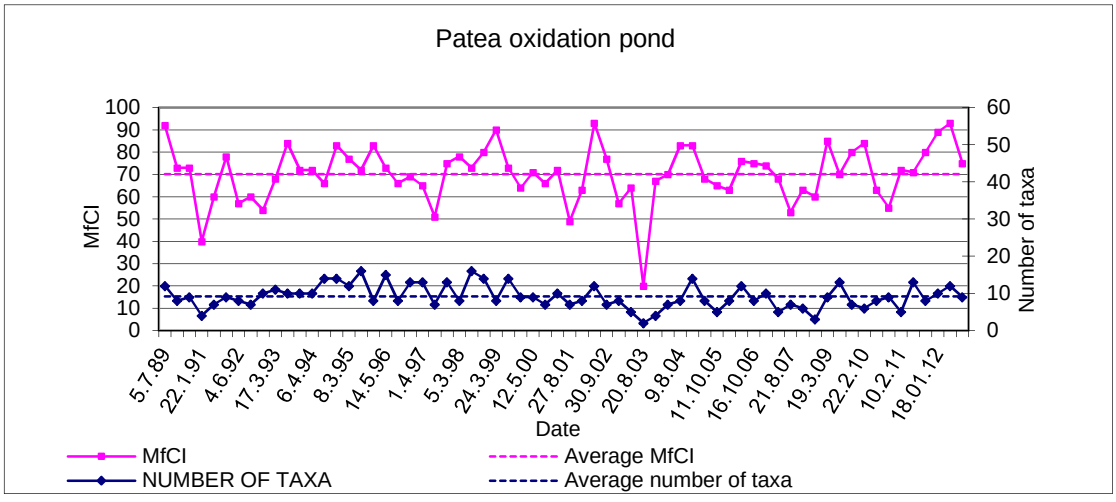

Figure 14 Number of taxa and MfCI values for the Patea oxidation ponds since monitoring began in 1989

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Patea pond has commonly supported algal communities characteristic of well-functioning ponds and in the past this has been reflected in the relatively high MfCI scores and average score found in the pond (TRC, 2009). In the current 2012-2013 monitoring year the MfCI for the reconfigured system was slightly above the historical average (70 units) on the one occasion sampled (Figure 14). This average and the

median (72 units) are amongst the highest values for treatment ponds in the Taranaki region. The MfCI value of 75 units in spring 2012, was typical for spring, reflecting the seasonal variability in phytoplankton communities in this re-configured pond system. There was no indication from the microfloral composition that there was any problem with pond performance on this occasion.

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 eg provision of advice and information, or investigation of potential or actual causes of non-compliance or failure to maintain good practices. A pro-active approach that in the first instance avoids issues occurring is favoured.

The Taranaki Regional 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 Unauthorised Incident Register (UIR) 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 2012-2013 year, there was one incident recorded by the Council that was associated with the consent holder. This related to the very brief discharge of untreated wastewater in July 2012 when the pumped main sewerage line was damaged by contractors working on storm-felled trees in the vicinity of the treatment pond system. This was rectified within an acceptable time frame.

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.

Semi-quantitative microfloral biomonitoring confirmed satisfactory long-term pond performance before being curtailed for replacement with an alternative component in future. The pond has typically supported good algal communities, this being reflected in relatively high average microflora community index pond scores. Average

microfloral richness and slightly above mean MfCI score was recorded in the spring of the 2012-2013 period with the community monitored indicative of a well performing re-configured pond system at this time.

The consent holder recorded one very brief accidental overflow discharges of sewage very early in the monitoring period. 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 five of the nine monitoring periods (mid 2004 to 2013) 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 varying river flow and preceding 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 near the right bank Patea River site immediately upstream or downstream of the discharge (dependant on tide conditions) with bacterial water quality measured a further 600m downstream usually similar to that measured upstream of the discharge at SH3 bridge. Minimal impacts were measured during the 2012-2013 monitoring period, continuing the good performance shown during the previous period.

More intensive monitoring of the lower river and two adjacent coastal water sites during the summer contact recreational period found that bacterial numbers never exceeded the single sample 'Alert' guideline 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 any flow or tide conditions.

In the absence of any usage of the pump station emergency outfall during the recreational period, impacts of the upgraded oxidation ponds' system' discharges were not discernible on these contact recreation water standards at the estuary or the two coastal sites between November 2012 and late March 2013.

5.7 Evaluation of performance

A tabular summary of the STDC's compliance record for the year under review is presented in Tables 36, 37, 38 and 39.

Table 36 Summary of performance for Consent 0067-3 - 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

Condition requirement	Means of monitoring during period under review	Compliance achieved?
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		**High**

Table 37 Summary of performance for Consent 0145-2 - 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; one minor overflow in period	Yes
6. Limitations on causes of overflows	Reporting by consent holder; one minor overflow in period	Yes
7. Restriction on overflows	Reporting by consent holder	Yes
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; one minor overflow in period	Yes
12. Provision of records	Liaison and reporting by consent holder; no overflows in period	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
13. Provision of signage	Reporting by consent holder and inspections; one accidental overflow in period	Yes
14. Notification to Taranaki Healthcare	Reporting by consent holder; one accidental overflow in period	Yes
15. Meetings with submitters	Liaison with consent holder (3-yearly); required in 2012-2013	overdue
16. Monitoring provisions	Performance of monitoring programme tailored to overflow events; no overflows in bathing period	N/A
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**

Table 38 Summary of performance for Consent 4576-2 - 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
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		**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 Recommendation from the 2011-2012 Annual Report

The recommendation from the 2011-2012 Annual Report for the Patea oxidation pond monitoring programme was:

1. That monitoring of the Patea oxidation pond system be continued for the 2012-2013 period by formulation of a programme similar in format to the programme undertaken during the 2011-2012 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 2013-2014

In designing and implementing the monitoring programmes for water discharges in the region, the Taranaki Regional Council has taken into account the extent of information made available by previous authorities, its relevance under the Resource Management Act, the obligations of the Act in terms of monitoring discharges and effects, and subsequently reporting to the regional community, the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of municipal sewage treatment processes within Taranaki 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 2012-2013 year.

A minor change is proposed to the microfloral component of the oxidation ponds programme where chlorophyll-a analyses will replace the requirement for the more detailed phytoplankton evaluation at the time of each inspection. Otherwise, monitoring for the 2013-2014 period will continue at the same level as that in the 2012-2013 period.

A recommendation to this effect is attached to this report.

5.11 Recommendations

1. That monitoring of the reconfigured Patea oxidation pond system be continued for the 2013-2014 period by formulation of a programme similar in format to the programme undertaken during the 2012-2013 period with a minor change to the microfloral component of the inspectorial requirement (noted above).

2. That the consent holder be charged costs of $5,180 in relation to the additional contact recreational bacteriological component of the programme as specifically required by Special Conditions 11 and 12 of coastal permit 0067 and performed during the 2012-2013 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 2013-2014 period by formulation of an appropriate monitoring programme similar in format to the programme undertaken during the 2012-2013 period.

Kaponga oxidation pond system

1. THAT monitoring of the Kaponga oxidation pond system be continued for the 2013-2014 period by formulation of a monitoring programme similar in format to the programme undertaken during the 2012-2013 period with a minor change to the microfloral component of the inspection requirements (noted above).

Manaia oxidation pond system

1. THAT monitoring of the Manaia wastewater treatment system be continued for the 2013-2014 period by formulation of an appropriate monitoring programme similar in format to the programme undertaken during the 2012-2013 period with a minor change to the microfloral component of the inspectorial requirements (noted above).

2. THAT the consent holder liaise with the Regional 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 Regional 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 Regional Council by 30 June 2014.

5. THAT the Regional 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 2013-2014 period.

6. THAT the charges (of $1474) associated with components of the programme which were unable to be performed or not undertaken during the 2012-2013 period, be refunded to the consent holder.

Patea oxidation pond system

1. THAT monitoring of the reconfigured Patea oxidation pond system be continued for the 2013-2014 period by formulation of a programme similar in format to the programme undertaken during the 2012-2013 period with a minor change to the microfloral component of the inspectorial requirement (noted above).

2. THAT the consent holder be charged costs of $5,180 in relation to the additional contact recreational bacteriological component of the programme as specifically required by Special Conditions 11 and 12 of coastal permit 0067 and performed during the 2012-2013 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 Amy Cameron (Technical Officers) with physicochemical water and wastewater analyses performed by the Taranaki Regional Council ISO-9000 accredited laboratory. Emily Roberts (Scientific Officer) performed the Manaia marine ecological survey.

Glossary of common terms and abbreviations

The following abbreviations and terms are 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
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
UIR	Unauthorised 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

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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

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.

Consent 0067-3

TARANAKI REGIONAL COUNCIL
CHIEF EXECUTIVE
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Please quote our file number on all correspondence

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
www.trc.govt.nz

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

TRK980072

TARANAKI REGIONAL COUNCIL

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47 CLOTON ROAD
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PHONE 0-6-765 7127
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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

Consent 0861-3

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Please quote our file number on all correspondence

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
www.trc.govt.nz

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

Consent 1204-4

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Please quote our file number on all correspondence

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
www.trc.govt.nz

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

Consent 4576-2

TARANAKI REGIONAL COUNCIL
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Please quote our file number on all correspondence

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 4800
Consent Granted Date:	16 November 2005

Conditions of Consent

Consent Granted:	To erect, place and maintain an oxidation pond discharge structure and an emergency overflow discharge structure as part of the Patea Wastewater Treatment System within the coastal marine area of the Patea River at or about GR: Q22:374-590
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 Beach Road Whenuakura Dist 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

1. The consent holder shall notify the Chief Executive, Taranaki Regional Council, at least 48 hours prior to the commencement and upon completion of the initial construction and again at least 48 hours prior to and upon completion of any subsequent maintenance works which would involve disturbance of or deposition to the riverbed or discharge to water.

2. The structures authorised by this consent shall be constructed and maintained generally in accordance with the documentation submitted in support of application 2754 and shall be maintained to ensure the conditions of this consent are met. In the case of any contradiction between documentation submitted in support of application 2754 and the conditions of this consent, the conditions of this consent shall prevail.

3. The consent holder shall upgrade the oxidation pond discharge structure, substantially in accordance with recommended Option C [rock diffuser] 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 no later than two years from the date of issue of the consent.

4. The consent holder shall at all times during construction and maintenance works, adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to avoid or minimise the discharge of silt or other contaminants into water or onto the riverbed and to avoid or minimise the disturbance of the coastal marine area and any adverse effects on water quality from the exercise of this consent.

5. The consent holder shall ensure that the area and volume of riverbed disturbance shall, so far as is practicable, be minimised and any areas which are disturbed shall, so far as is practicable, be reinstated.

6. The exercise of this consent shall not restrict public access to and along the coastal marine area.

7. Any disturbance of parts of the riverbed covered by water and/or works which may result in downstream discolouration of water shall be timed to coincide, as far as possible, with dry weather periods.

8. The structures which are the subject of this consent shall not obstruct fish passage.

9. The consent holder shall install and maintain suitable signage advising the public during construction of the structure[s] or any significant maintenance works.

10. The structure[s] authorised by this consent shall be removed and the area reinstated, if and when the structure[s] are no longer required. The consent holder shall notify the Taranaki Regional Council at least 48 hours prior to structure[s] removal and reinstatement.

11. 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.

12. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2010 and/or June 2016 and/or June 2022, 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 16 November 2005

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Consent 6621-1

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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

Director-Resource Management

Appendix II

Biomonitoring associated with the Kaponga oxidation ponds system

To Monitoring Manager—Environmental Quality, K Brodie
From Scientific Officer, Chris R Fowles
File 0861
Doc No 1197985
Report No CF570
Date March 2012

Biomonitoring of the Kaupokonui River in relation to the South Taranaki District Council's Kaponga oxidation ponds system discharge, February 2013

Introduction

This biomonitoring survey was the summer survey for the 2012-2013 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 state of the environment biomonitoring within the Kaupokonui catchment (TRC, 2013).

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 15 February 2013.

These sites were:

Site No.	Site code	Map reference	Location
1	KPK000500	P20: 087 962	approximately 250 m upstream of oxidation ponds
2	KPK000520	P20: 086 961	50 m downstream of oxidation ponds
3a	KPK000550	P20: 085 952	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 steady recession river flow conditions, nine days after a fresh in excess of three times median flow and 10 days after a fresh in excess of seven times median flow, but during a relatively dry mid to late summer period. Flow at the Glenn Road recorder site was 905 L/sec, well below the average February mean monthly flow (1580 L/sec) but above the minimum February mean monthly flow (683 L/sec) for the period 1979 to 2012. River water temperatures ranged from 13.9°C to 14.3°C at the time of this mid morning survey. Periphyton mats were thin (site 1) to patchy at the other two sites (sites 2 and 3a) with no filamentous algae 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 about 1000:1 at the time of the survey. All sites were characterised by open, mainly gravel-cobble-boulder riffle habitats although there was some shade covering part of the reach between the outfall and upstream of 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

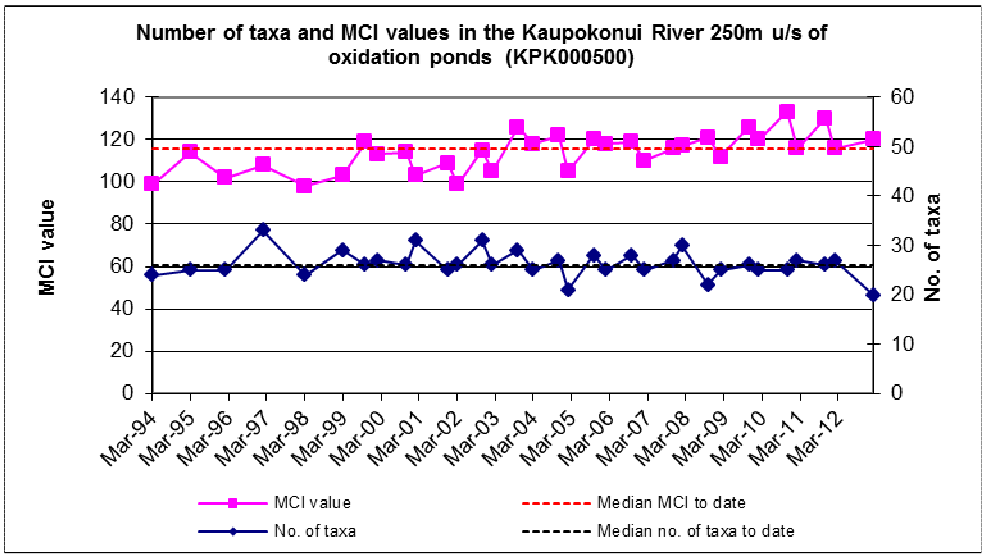
Site	No. of surveys	Taxa numbers		MCI values	
		Range	Median	Range	Median
Upstream of township	7	20-33	28	105-132	114
Near 3a	8	18-26	22	85-109	101

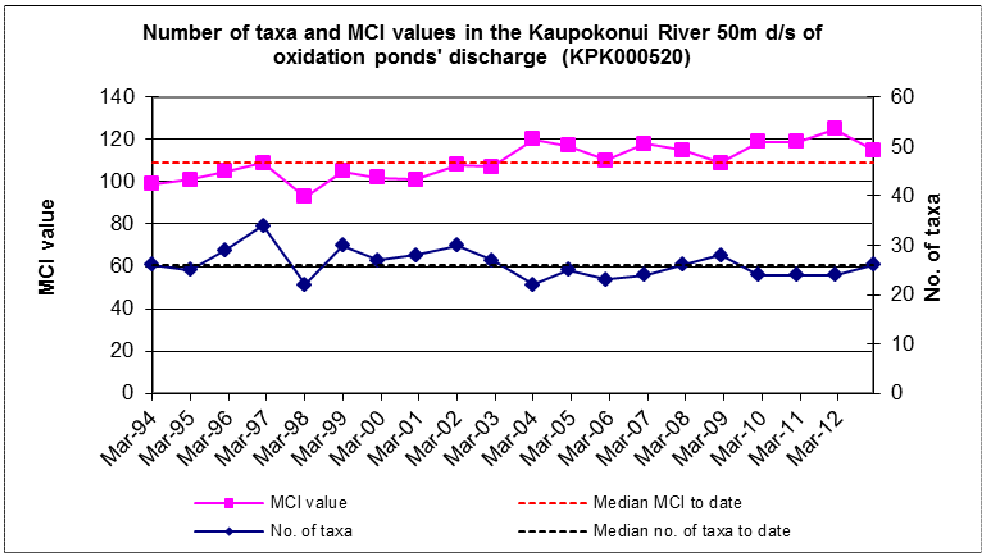
Data obtained from previous biomonitoring surveys are summarised in Table 2 and illustrated in Figure 2.

Table 2 Summary of macroinvertebrate taxa numbers and MCI values for previous surveys performed between March 1987 and February 2012

`Site	No. of Surveys	Taxa Numbers		MCI Values	
		Range	Median	Range	Median
1	34	18-33	26	98-133	115
2	19	22-34	26	93-125	109
3a	19	15-32	26	92-123	108

The results of the current survey are presented in Table 3.





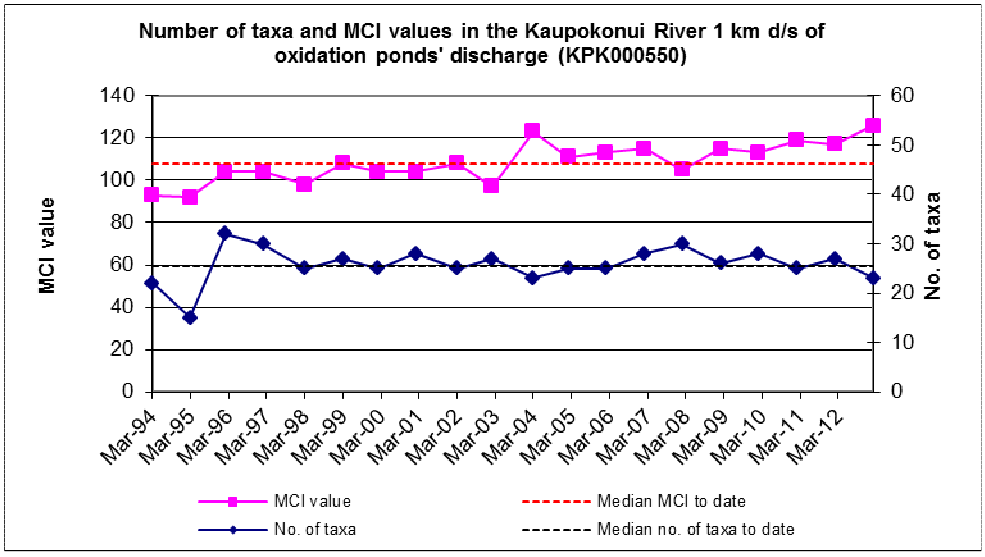


Figure 2 Taxa richness and MCI values at the three sampling sites to date

Table 3 Macroinvertebgrate fauna of the Kaupokonui River in relation to the Kaponga oxidation ponds discharge sampled on 15 February 2013

Taxa List	Site Number	MCI score	1	2	3a
	Site Code		KPK000500	KPK000520	KPK000550
	Sample Number		FWB13070	FWB13071	FWB13072
ANNELIDA (WORMS)	Oligochaeta	1	-	C	R
MOLLUSCA	*Potamopyrgus*	4	R	R	-
EPHEMEROPTERA (MAYFLIES)	*Austroclima*	7	C	C	C
	Coloburiscus	7	XA	VA	XA
	Deleatidium	8	XA	XA	XA
	Nesameletus	9	VA	VA	VA
PLECOPTERA (STONEFLIES)	*Austroperla*	9	-	-	R
	Megaleptoperla	9	R	R	C
	Stenoperla	10	-	-	R
	Zelandoperla	8	-	R	R
COLEOPTERA (BEETLES)	Elmidae	6	VA	VA	VA
	Hydraenidae	8	C	R	C
MEGALOPTERA (DOBSONFLIES)	*Archichauliodes*	7	A	A	C
TRICHOPTERA (CADDISFLIES)	*Aoteapsyche*	4	VA	XA	VA
	Costachorema	7	-	R	R
	Hydrobiosis	5	C	A	C
	Neurochorema	6	R	R	-
	Psilochorema	6	-	R	-
	Beraeoptera	8	A	A	R
	Olinga	9	C	C	C
	Pycnocentrodes	5	A	C	C
DIPTERA (TRUE FLIES)	*Aphrophila*	5	VA	VA	VA
	Eriopterini	5	R	C	R
	Hexatomini	5	-	R	-
	Maoridiamesa	3	R	R	A
	Orthocladiinae	2	C	R	VA
	Polypedilum	3	-	R	-
	Empididae	3	-	R	-
	Austrosimulium	3	R	-	R
		No of taxa	20	26	23
		MCI	120	115	126
		SQMCIs	7.0	6.2	6.7
		EPT (taxa)	11	14	14
		%EPT (taxa)	55	54	61

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

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

Taxa numbers (20 to 26) collected from the three river sites during this survey were indicative of moderate 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 331 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 shown a median richness of 23 taxa (TRC 1999 (updated, 2012)). Taxa numbers recorded by the present survey tended to be slightly lower than those found at the time of the previous summer's survey (CF543) and lower than medians found by previous surveys at two 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 three 'highly sensitive' taxa [very to extremely abundant mayflies (*Deleatidium* and *Nesameletus*); and flare-cased caddisfly (*Beraeoptera*)]; up to six 'moderately sensitive' taxa [mayfly (*Coloburiscus*), elmid beetles, dobsonfly (*Archichauliodes*), cased caddisfly (*Pycnocentrodes*), free-living caddisfly (*Hydrobiosis*), and cranefly (*Aphrophila*)]; and up to three 'tolerant' taxa [net-building caddisfly (*Aoteapsyche*) and midges (orthoclads and *Maoridiamesa*)]. All of these taxa typically have been characteristic of these sites over the previous nineteen summer surveys and in most cases have been predominant (ie abundant on more than 50% of survey occasions). The current characteristic taxa were one more in number of each of the 'moderately sensitive' and 'tolerant' taxa than those dominant at the time of the previous summer survey. The presence of six to nine 'highly sensitive' taxa at each site through this relatively short section of the Kaupokonui River was indicative of generally good recent physicochemical water quality conditions. The relatively narrow range of moderately high $SQMCI_S$ values (6.2 to 7.0 units) and the fact that only three significant differences in individual taxon abundances (increased midge numbers and decreased flare-cased caddisfly numbers at site 3) were recorded between sites, indicated very similar community compositions at all of the three sites over this reach of the river eg, only six of the total of 29 taxa found in this reach were present at only one site, and all of these taxa were recorded only as rarities (less than five individuals).

The similarity in community composition amongst the three sites surveyed (59% of the 29 taxa were found at all three sites) (Table 3), was reflected in the relatively narrow range of the MCI values (115 to 126) recorded in this 1.4km reach of the river by the present survey. Minimal impacts of the thin to patchy periphyton mats algal cover on the macroinvertebrate communities at each of the sites was reflected in the MCI values which were 5 to a significant 18 units above their respective sites' medians and in the case of site 3a, three units above the maximum previously recorded. These scores were 4 to 18 units above predicted scores for sites at these altitudes (230 to 260 m asl) and 8 to 21 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' to 'very good' generic and from 'better than' to 'well above expected' predictive stream health (TRC, 2013) at the time of this summer survey. No significant decreases in MCI scores were recorded between adjacent sites, with an insignificant and atypical overall downstream increase of 6 MCI units along the reach surveyed.

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 only slightly lower than those recorded by the previous summer's survey. This was coincident with thin to patchy substrate periphyton mats algal cover, at these sites during a period of relatively low flow conditions, in late summer. MCI scores slightly to significantly higher than those predicted for the mid-reaches of a developed catchment, were recorded at all three sites. The moderate range of these scores, with no significant downstream decreases in scores, combined with the similarity in macroinvertebrate communities' compositions as emphasised by the relatively narrow range (0.8 unit) in $SQMCI_s$ scores, 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' to 'very good' generic biological health consistent with good physical habitat and preceding physicochemical water quality. These scores were also higher than predicted scores for ringplain sites at equivalent altitudes and distances downstream of the National Park and were indicative of 'better than expected' to 'well above expected' predictive stream health (TRC, 2013).

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 far more by 'sensitive' taxa than 'tolerant' taxa. Taxonomic richnesses (numbers of taxa) were slightly

lower in this summer survey compared to the previous summer survey during a period of low flow and coincident with only thin to patchy periphyton substrate cover.

MCI and $SQMCI_S$ scores indicated that the stream communities were of 'good' to 'very good' generic health, and better than to well above the predicted conditions recorded in similar Taranaki ringplain streams at equivalent altitudes and distances from the National Park boundary.

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