South Taranaki District Council
Opunake Wastewater Treatment System Monitoring Programme Annual Report 2014-2015

Technical Report 2015-10

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Executive summary

The South Taranaki District Council (STDC) operates the Opunake Wastewater Treatment System located to the west of Opunake, in the Heimama catchment, and holds resource consents to allow it to discharge treated wastewater to land and natural water, and a coastal permit to discharge comminuted wastewater via an ocean outfall into the Tasman Sea. The consent to discharge treated wastewater to land allows for a limited discharge to natural water in recognition of improved reticulation to capture highly treated overland flow and discharge this in a controlled manner. The coastal permit was renewed in August 2004 for a period of 14 years. A consent is also held to place and maintain the outfall within the coastal marine area at Middleton Bay. This report for the period July 2014-June 2015 describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess the environmental performance during the period under review, and the results and effects of the consent holder's activities.

STDC holds three resource consents, which include a total of 32 special conditions setting out the requirements that they must satisfy in respect of the Opunake Wastewater Treatment Plant.

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

The Council's monitoring programme included four inspections, physicochemical and bacteriological sampling of wastewaters, bacteriological surveys of the coastal receiving waters, and recreational bacteriological surveys of the receiving waters of the Tasman Sea (at Opunake Beach and Middleton Bay).

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

The monitoring showed that no operational problems were associated with this wastewater treatment scheme during the monitoring period. No overland flow from the wetland area and limited surface water (wet weather) runoff from the trench disposal area occurred, with the upgraded reticulation from the trench system operating as designed. The trend of a reduction in the use of the ocean outfall continued following sewer system stormwater infiltration reduction and the late 2006 installation of a separation chamber prior to the pump station in the sewerage reticulation, with no overflows to the ocean outfall occurring over the monitoring period. There have been only two brief overflow events since 2006. The renewed coastal permit incorporates proposals for a much reduced frequency of usage and involves reticulation upgrades which were completed by late 2006. Therefore, no additional bacteriological coastal water monitoring was required in relation to ocean outfall overflows during the monitoring period although one incident of a localised sewage overflow (due to a pump failure) required additional bacteriological monitoring at Middleton Bay in late summer.

The treatment system was well maintained and operated during the monitoring period with a relatively high standard of treated wastewater discharged and minimal measurable impacts on coastal receiving waters which occasionally exceeded shellfish-gathering guidelines (mainly following wet weather conditions). Bacteriological contact recreational water quality at

Opunake Beach and Middleton Bay was very high during the summer continuing the trend of the last twenty-one summers at these popular recreational sites. (It may be noted that Opunake Beach is generally the region's 'cleanest' bathing beach in terms of bacteriological quality). The chlorophyll-a levels were indicative of a good microfloral component of the pond-wetland system, typical of a well-performing system, with the exceptions of late spring and late autumn when low levels followed wet weather conditions, mainly indicative of stormwater dilution through the system. Overall, the consent holder demonstrated a high level of environmental performance and compliance with the resource consent for the Waste Water Treatment Plant and a high level of compliance for the ocean outfall consent.

Appropriate monitoring programmes are proposed for both the discharge consent and the coastal permit. There is a requirement for increased bacteriological monitoring of ocean outfall discharges should usage of this outfall occur during the contact recreational season. However, in recognition of completion of the significant reticulation upgrade (to reduce the frequency of usage), and the successful operation of this upgrade, aspects of the programme were lessened in intensity in recent years but have been incorporated within the Council's state of the environment monitoring programme. No reviews of the coastal permit remain prior to expiry in 2018 while the most recent review of the discharge consent (optional in June 2014) was not considered necessary. A requirement for a meeting with interested submitters to the coastal permit has been scheduled for the 2015-2016 period although the previous meetings (in 2011-2012 and 2013-2014) were unnecessary as no parties had issues relating to the consent which required such meetings.

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1. Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report is the Annual Report for the period July 2014-June 2015 by the Taranaki Regional Council (the Council) describing the monitoring programme associated with resource consents held by South Taranaki District Council (STDC) for the Opunake wastewater treatment plant (WWTP) system.

This report covers the results and findings of the monitoring programme implemented by the Council in respect of the consents held by STDC that relate to discharges of wastes to land and surface water within the Heimama and Otahi catchments and into the Tasman Sea via an ocean outfall. This is the twenty-fifth annual report to be prepared by the Council to cover these discharges and their effects.

1.1.2 Structure of this report

Section 1 of this report is a background section. It sets out general information about compliance monitoring under the *Resource Management Act* 1991 (RMA) and the Council's obligations and general approach to monitoring sites through annual programmes, the resource consents held by STDC between the Heimama and Otahi catchments, the nature of the monitoring programme in place for the period under review, and a description of the activities and operations conducted in the Heimama and Otahi catchments.

Section 2 presents the results of monitoring during the period under review, including scientific and technical data.

Section 3 discusses the results, their interpretation, and their significance for the environment.

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

A glossary of common abbreviations and scientific terms, and a bibliography, are presented at the end of the report.

1.1.3 The Resource Management Act (1991) and monitoring

The RMA primarily addresses environmental `effects' which are defined as positive or adverse, temporary or permanent, past, present or future, or cumulative. Effects may arise in relation to:

(a) the neighbourhood or the wider community around a discharger, and may include cultural and socio-economic effects;
(b) physical effects on the locality, including landscape, amenity and visual effects;
(c) ecosystems, including effects on plants, animals, or habitats, whether aquatic or terrestrial;

(d) natural and physical resources having special significance (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 Council is recognising the comprehensive meaning of `effects' inasmuch as is appropriate for each discharge source. Monitoring programmes are not only based on existing permit conditions, but also on the obligations of the RMA to assess the effects of the exercise of consents. In accordance with section 35 of the RMA, the Council undertakes compliance monitoring for consents and rules in regional plans; and maintains an overview of 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 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 consent holder/s during the period under review, this report also assigns a rating as to each Company's environmental and administrative performance.

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

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

The categories used by the Council for this monitoring period, and their interpretation, are as follows:

Environmental Performance

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

- **Good:** Likely or actual adverse effects of activities on the receiving environment were negligible or minor at most. There were some such issues

noted during monitoring, from self reports, or in response to unauthorised incident reports, but these items were not critical, and follow-up inspections showed they have been dealt with. These minor issues were resolved positively, co-operatively, and quickly. The Council was not obliged to issue any abatement notices or infringement notices in relation to the minor non-compliant effects; however abatement notices may have been issued to mitigate an identified potential for an environmental effect to occur.

For example:

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

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

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

Administrative performance

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

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

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

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

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

1.2 Resource consents

1.2.1 Water discharge permits

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

STDC held water discharge permit **4248** to cover the discharge of treated municipal sewage to land. This permit was issued by the Council on 24 March 1993 as a resource consent under Section 87(e) of the RMA with an expiry date of 1 June 2002. A renewal was granted in June 2003 which provided for land and surface water discharges of treated wastewater, recognising that an improved method of land disposal and surface flow collection would be implemented by the consent holder. This consent now expires in June 2018.

Conditions require proper operation of the WWTP system, provision of a trained operator, maintenance of a management plan, and monitoring to be undertaken. Other conditions relate to limitation of effects in receiving waters and provision for review of conditions.

STDC also holds a coastal permit **0236**, renewed in 2004 by the Minister of Conservation, for the discharge of comminuted sewage into the Tasman Sea until 1 June 2018. This latter permit had been renewed (in July 1997 and in March 2001) in order to enable the consent holder to implement stormwater infiltration improvements and overcome other problems with the sewerage reticulation system. STDC holds a further coastal permit **4577**, which allows for placing and maintaining the outfall structure within the coastal marine area of Middleton Bay. This consent expired on 1 June 2006 and was renewed in December 2005 for a period to June 2018.

Copies of the consents are included as Appendix I. Special conditions attached to these consents require monitoring of impacts on receiving waters, record keeping, and establish reporting procedures in the event of ocean outfall usage and with respect to progressive implementation of the stormwater reduction scheme and upgrading of the pumping system to the WWTP.

1.3 Treatment plant system

1.3.1 Background

Prior to May 1994 untreated wastewater was discharged into the Tasman Sea via an ocean outfall at the base of the Opunake breakwater situated on the point between Middleton Bay and Opunake Beach. During the period from 1985 to 1990, a new wastewater treatment system was developed by a Wastewater Disposal Working Party (comprised of representatives of environmental groups, iwi liaison,

Department of Conservation and various local authorities) in conjunction with the STDC's consultants, with the new system constructed and operative by May 1994.

This Opunake Wastewater Treatment Scheme comprises two distinct components. The first is the interception of the town sewage by diverting the terminal sewer into a new pumping station.

This pumping station is located on Lookout Headland adjacent to the terminal sewer leading to the outfall and diverts the sewage to a land-based treatment system located on a headland bounded by State Highway 45 and the Heimama and Otahi Streams.

The second component is a land-based treatment system (Figures 1 and 2) and is comprised of an initial 1.25 hectare primary oxidation pond. Provision for aeration of this pond was made but aeration has not been required to date. After treatment in this pond the effluent initially passed equally to two combined secondary oxidation pond/wetland systems. These have operated in series since December 2004 when the configuration was altered. Final design disposal of the effluent is via a series of soakage trenches, which are backfilled with gravel and permit effluent flow along the trenches and through the side walls into a silty sand layer. This series of trenches has been designed to allow regular spelling of individual trenches. The trenches are located a minimum of 30 metres from the coastal cliff face. Consent TRK934248 was granted for this system with an expiry date of June 2002, and a subsequent renewal of the consent was granted with an expiry date of June 2018.

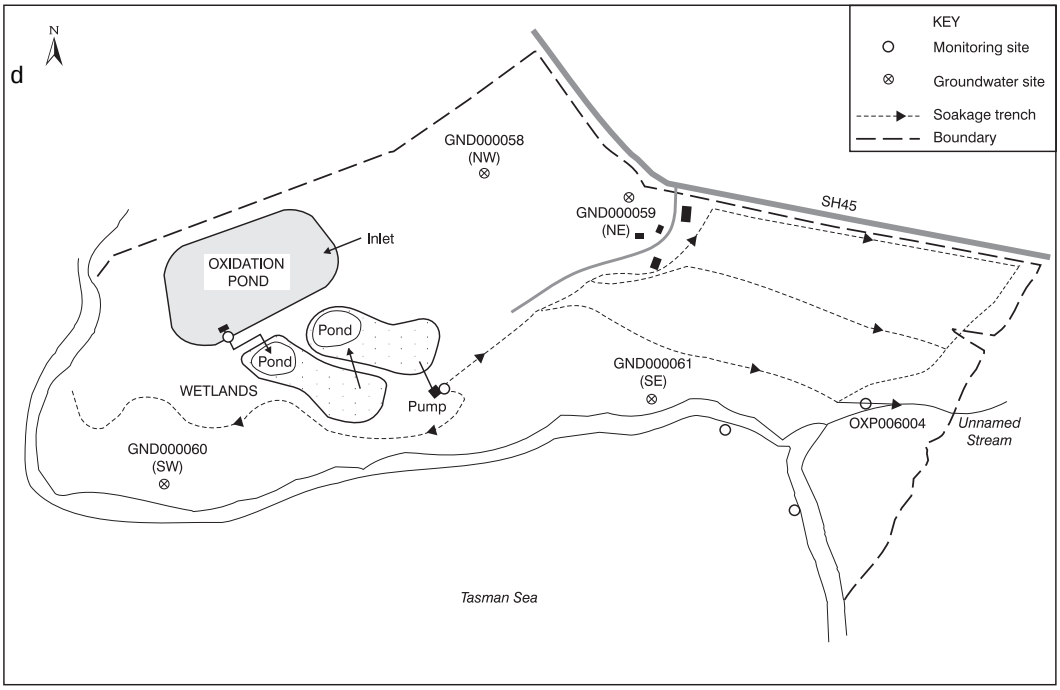

Figure 1 Location of sampling sites and design of Opunake waste treatment and disposal system as operated throughout the majority of the period

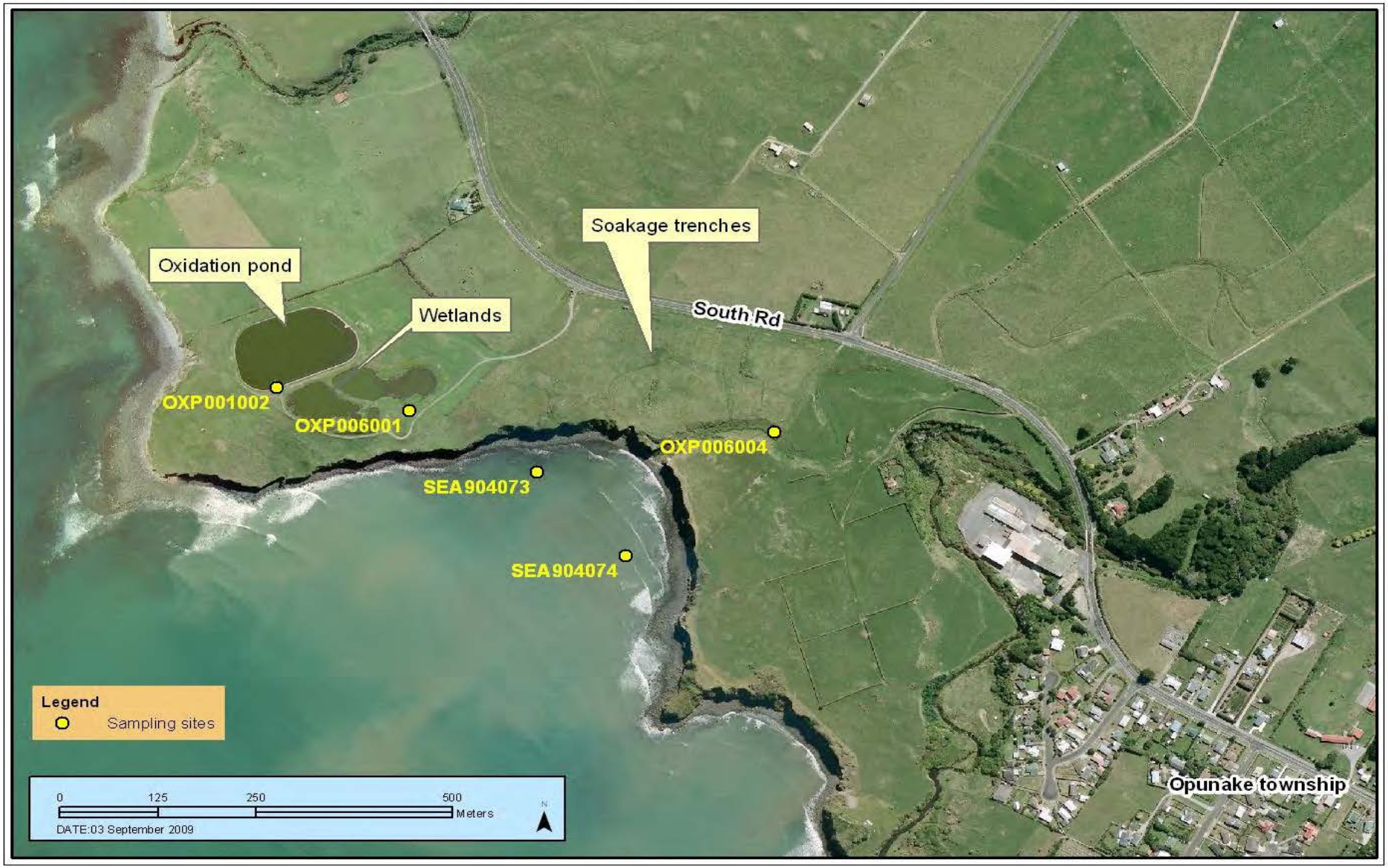

Figure 2 Aerial location map of the Opunake wastewater treatment system and sampling sites

The site is leased out for sheep farming in the sewage treatment area and two other areas of land in the treatment plant have been leased out for grazing of cattle (STDC, 2015). A public walkway through the area is maintained by the Council and riparian planting of the receiving stream (Figure 1) was performed in Autumn 2009).

The land-based treatment system was constructed during the 1993-94 period and has been operational during the nineteen subsequent monitoring years. The groundwater monitoring bores were constructed in September 1994 and located as shown in Figure 1.

The Council commissioned a video record of the establishment, operation and monitoring of all aspects of the WWTP and this video was completed in mid-1999. Copies are held by the Council and the consent holder.

In association with this land based sewage treatment scheme a consent (coastal permit) was granted by the Minister of Conservation in April 1993 to continue the discharge of untreated wastewater via the ocean outfall at Lookout Head. A consent was granted until December 1996 to enable the discharge of wastewater during the period prior to commissioning of the land based treatment scheme and, after commissioning of the plant, to allow for the use of the ocean outfall when storm and groundwater inflows exceed the capacity of the new pump station.

This consent was granted to allow the STDC time to implement improvements in the stormwater system in order to reduce storm and groundwater infiltration into the wastewater treatment system to a level within the design capacity of the new pumping station. Council initially indicated that this could be achieved within two or three years. However, delays resulted in a renewal application, which was granted with an expiry date of 30 June 1999. A further renewal application was processed by the Council and granted by the Minister of Conservation with an expiry date of 1 June 2003 to enable further investigations into the significant reduction in ocean outfall usage.

STDC noted that while the various reticulation works reduced the number of overflows (via the ocean outfall), and further work reduced these events, these works were not sufficient to achieve the overflow reduction to the frequency required by Special Condition 5(1) of the previous coastal permit. Consultants were engaged to address the necessary options to achieve this requirement. It was determined that improvements to the pumping and pipeline system would be implemented to increase the pumped flow to the wastewater treatment pond/wetland system. Installation of storage at the pump station has been provided in the event of power outages, faults or breakdowns in the pumping system. Duplication of the pipeline to the wastewater treatment system was also necessary. The consent holder applied for a subsidy from the Ministry of Health sanitary works subsidy scheme for the upgrade to the pumping system and improvements to the trench land disposal component of the wastewater treatment system. The renewed coastal permit (Appendix I) required this upgrading to be completed by June 2006 but for a number of valid reasons an extension was approved until 30 October 2006. This work was completed as scheduled.

Further historical information relating to the WWTP and ocean outfall is contained in the annual report of 2003-2004 (TRC, 2004).

1.3.2 Past operational problems

A number of problems were experienced with the operation of the treatment system after its establishment. Certain problems were sporadic e.g., sewage pumping station malfunctions, while others were ongoing e.g., overland effluent flow to the coast. These problems were immediately identified and discussed with the consent holder and corrective measures were investigated where possible, but most of the operational problems required longer term design remediation in conjunction with the consent holders' consultants. These problems are documented in the 2003-2004 Annual Report (TRC, 2004) and have been addressed by WWTP refurbishment and upgrading of the pump station and reticulation required by the renewed coastal consent.

1.3.3 WWTP refurbishment, 2004 to 2010

The consent holder reported further refurbishment of the WWTP, late in 2004, in compliance with the requirements of consent 4248 and to allow for the additional hydraulic loadings to be pumped to the system following the upgrades required by the renewed coastal permit (0236). This included:

- improvements to the disposal pipes in the trench system to prevent ponding in the vicinity of the actuator valves;
- installation of a control valve at the end of the trench disposal lines to regulate throughflow, together with connecting pipes from the disposal lines for use to carry excess effluent for consented discharge into the stream;
- manhole installation in the trench disposal lines for maintenance purposes;
- increased capacity pumps from the wetlands to the trench disposal system;
- changed configuration of the wetlands to allow them to operate in series rather than parallel; and
- raising and reinstatement of the bunds around the wetlands to provide for increased flows after completion of the rising main upgrade from the Hector Place (main) pump station (required by the renewed coastal permit).

More recently, manual valves have replaced the problematic actuated disposal line valves and isolation valves have been installed on the disposal lines for use should it be necessary to remove the disposal line valves for maintenance. An accessible sampling site has been constructed at the end of the disposal trenches.

STDC reported that a sludge survey of the oxidation pond (in January 2006) indicated that at the current rate of accumulation, sludge removal would not be required for another 11 years.

An updated Management Plan (July 2007) was supplied by the consent holder for the Wastewater Treatment Plant (see Appendix II; TRC 2007). This was updated further in May 2008 together with the Management Plan for the Hector Place pumping station. These continue to be reviewed and updated with the most recent received in June 2015.

The Hector Place pump station upgrade (required by consent 0236 conditions) was completed in early November 2006 and the pump station has operated adequately since commissioning of the upgrade in December 2006. One brief overflow (to the holding tank) occurred in early January 2007 due to a power supply outage, but no discharge to coastal water occurred on this occasion. No overflows have been recorded between this date and June 2009. Two overflow events occurred in the 2009-

2010 period; the first due to operational errors and the second due to very heavy rainfall. These events were of two to three days duration (see TRC, 2010). No overflows have occurred since these events.

1.4 Monitoring programme

1.4.1 Introduction

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

The Council may therefore make and record measurements of physical and chemical parameters, take samples for analysis, carry out surveys and inspections, conduct investigations, and seek information from consent holders.

An appropriate monitoring programme was established for the new wastewater treatment system in mid-1993 and covered a three-year period encompassing the construction, initial establishment, and operational phases of the system. Modified annual programmes have continued since mid-1996 and have also incorporated monitoring of the usage and possible impacts of the coastal outfall discharge.

The water quality monitoring programme for the Opunake wastewater disposal sites consisted of three primary components.

1.4.2 Programme liaison and management

There is generally a significant investment of time and resources by the Council in ongoing liaison with resource consent holders over consent conditions and their interpretation and application, in discussion over monitoring requirements, preparation for any reviews, renewals, or new consents, advice on the Council's environmental management strategies and the content of regional plans, and consultation on associated matters.

1.4.3 Site inspections

The Opunake WWTP site was visited four times during the monitoring period. The main points of interest were plant operation and performance, disposal trenches operation, and the discharges of treated wastewater. The Hector Place pump station was also included in these inspections. Inspections provided for the operation, internal monitoring, and supervision of the plant to be reviewed by the Council.

1.4.4 Wastewater and receiving water quality sampling

The Council undertook sampling of wastewater quality and receiving coastal water quality for plant performance and ocean outfall impact assessment purposes. Frequency of sampling and analytical parameters measured varied according to the purpose of monitoring.

Contact recreational bacteriological water quality at the principal Opunake Beach and at Middleton Bay was monitored by the Council on twenty and fourteen occasions respectively between early November 2014 and late March 2015.

2. Results

2.1 Inspections of treatment system operation

Four regular scheduled inspections were performed during the monitoring period. No operational problems were experienced during the period. During regular inspections, physical features of the components of the system were recorded, and dissolved oxygen concentrations were measured in the surface wastes adjacent to the oxidation pond outlet and at the combined wetlands' pump well (prior to pumping to the soakage trenches). Results of the dissolved oxygen measurements are summarised in Table 1. Chlorophyll-a samples were also collected from the oxidation pond on each scheduled inspection visit for microfloral comparative assessments of system performance.

Table 1 Dissolved oxygen measurements from the Opunake wastewater treatment system's oxidation pond and combined wetlands

Date	Oxidation Pond Outlet				Combined Wetlands' Effluent			
	Time (NZST)	Temp (°C)	Dissolved Oxygen		Time (NZST)	Temp (°C)	Dissolved Oxygen	
			Conc^{n} (g/m^3)	Saturation (%)			Conc^{n} (g/m^3)	Saturation (%)
29 September 2014	0825	10.8	10.8	94	0840	10.2	14.4	127
24 November 2014	0830	17.7	1.4	14	0850	17.1	-	-
20 February 2015	0820	21.3	4.9	57	0835	20.3	-	-
28 May 2015	0930	10.3	8.6	76	0950	9.8	-	-

Aerobic conditions were recorded on all sampling occasions in the oxidation pond and on the one occasion in the combined wetlands' effluent prior to soakage trench disposal, with a relatively wide range of saturation from 14% to 94% in the oxidation pond, but no instance of supersaturation found. Biological treatment systems' dissolved oxygen levels vary on both a daily and seasonal basis.

In mid March 2001 a continuous monitoring dissolved oxygen probe was installed at the pond outlet by the consent holder in order to monitor the dissolved oxygen levels for operational requirements. However, this was removed a few years later due to maintenance problems following many lightning strikes (STDC, pers.comm). [Note: temporary dissolved oxygen monitoring was re-instated in the pond in August 2013 following un-substantiated complaints (to STDC) from a neighbour of disposal trench odours. No complaints were received, nor noticed, by TRC on inspection visits during the 2013-2014 or 2014-2015 periods]. The consent holder has not considered it necessary to mechanically aerate the pond prior to, or during the current monitoring period, and the aerator has been removed from the oxidation pond. Consideration would need to be given to mechanical aeration only if problems associated with low dissolved oxygen levels arise.

The consent holder installed a step-screen on the influent line (see TRC, 2012) prior to the oxidation pond toward the end of the 2011-2012 monitoring period and that was operative on all inspection occasions.

Oxidation pond appearance varied, from relatively clear, pale green (in spring) to slightly turbid, green (autumn), to turbid, dark green (late winter and late summer) during the monitoring period. Minimal odours from the pond were recorded and the MOW 'rock' test indicated that any sludge layer was well beneath the pond's surface. The pond surface varied from flat to small ripples to choppy, as calm to light to strong wind conditions coincided with inspection visits. To date, it has been noticeable at times that the nearby cliffs appeared to deflect certain winds over the pond's surface. Wavebands, surrounds and the effluent outlet were maintained in tidy condition throughout the period with the surrounds grazed by sheep. High numbers of birdlife [mainly mallard and paradise ducks (up to four hundred of the latter in late summer), several Canadian geese, and a few black swans) were present on the pond on inspection occasions. No cattle were observed in the vicinity of the pond during the year. The consent holder had previously advised that while cattle grazing would not be permitted in the vicinity of the treatment system, the site was leased for sheep farming for pasture control purposes. All external boundaries were upgraded nine years earlier (STDC, pers comm).

The general wetland wastewater appearance ranged from relatively clear, pale green (in late spring and late autumn) to turbid, pale green (summer) to turbid, dark green (late winter) during the monitoring period. No odours were recorded in the vicinity of the wetlands. Relatively low birdlife numbers were noted amongst the wetlands during the recent monitoring period. These were only a few paradise and mallard ducks, pied stilt, and black swan on occasions, with no wildfowl present in late autumn (coincident with maintenance work at the pump site).

The breeding colony of black-backed gulls noted in the areas to the south-west between the treatment system and the cliffs in the past was not recorded in early summer for the eleventh year in succession, and none were recorded on the oxidation pond on any occasion. Fencing of this area had been necessary in the past to prevent stock access to the breeding colony. Sheep were noted grazing near the disposal trenches on one occasion (spring) during the period.

A sheep-proof fence had been erected during the 2007-2008 period at the southern wetland boundary near the stream gully and this stream margin was planted with riparian vegetation during the 2008-2009 period. The area was occasionally wet at the surfaces near the trenches after prior wet weather but was generally tidy and dry. Surface water run-off from the area to the coastal cliffs was noted on two occasions (late winter and late autumn). The area was mown in summer. A new platform had been erected by the consent holder during 2007-2008 at the outfall to the stream for sampling access. Estimated effluent discharge rates from the trench system to the stream ranged from 3 L/s (late summer) to 25 L/s (late autumn).

2.2 Operational problems

As referenced earlier in Section 1.3, and in past Annual Reports, operational problems were experienced during the establishment phase of the treatment system. Problems which have occurred are described as follows:

2.2.1 Sewage pumping station overflows

Records are required to be supplied by the consent holder documenting discharges which occurred during the monitoring period and telemetered by the STDC for duration, frequency and remedial purposes. Same day advice and summary records are supplied by the STDC in compliance with consent conditions.

Implementation of the stormwater infiltration reduction programme and improvements to the pumping system have reduced the frequency and duration of the usage of the ocean outfall since the installation of the separation chamber prior to the pump station, in September 1997. Generally since then there have been fewer occurrences of recorded discharges, which usually have been of shorter duration compared with previous monitoring years, with the exception of discharges following the intensive storms of July and October 1998, mid winter 1999 and during wet early winter 2000, October 2000, April 2001, late spring 2001, June 2002, mid-late summer 2004, October 2005, June 2006 and in July and October-November 2006. However discharges continued to occur following periods of wet weather and further elimination of illegal stormwater connections has been continued by the consent holder. The consent holder then implemented improvements to the alarm system and pump operational procedures were updated with contractors (STDC, pers comm). The renewed ocean outfall permit (0236) required that upgrades were performed to significantly reduce ocean outfall discharge events (see Special Conditions 3 and 5). This upgrade was completed in late 2006 and subsequently there were no overflows via the ocean outfall between then and June 2009, although one power supply outage resulted in usage of the storage system in 2006-2007. STDC reported sections of sewer pipeline were relined in the township during June 2010 and over the 2011-12 period. There were 266m of pipeline relined in the 2012-2013 period, 249m of pipeline re-lined in the 2013-14 period, and a further 362m of pipeline re-lined in the 2014-2015 period (STDC, pers. comm.). Pump stations at the Middleton Bay toilets and Opunake beach surf club now have overflow alarm systems installed (STDC, pers. comm., 2104).

Two overflow events were reported by the consent holder over the 2009-2010 monitoring period. The first of these was the result of several operational errors. Signage was placed at sites in accordance with the contingency plan. The consent holder subsequently undertook an internal audit of procedural matters and has put in place remedial measures to prevent a similar recurrence. In particular, monitoring and alarm system operation and response matters have been re-addressed (STDC, pers comm). The second overflow event occurred as a result of heavy rain. Signage was erected as necessary but no bacteriological sampling was required over that period. No overflow events occurred during the 2010-2011, 2011-2012, 2012-2013, 2013-2014, or current 2014-2015 periods.

Signage is required to be displayed following any ocean outfall discharges at Middleton Bay. A programme of low tide and the normal contact recreational beach bacteriological monitoring was performed as required by the Council between early November 2013 and early April 2014. As no ocean outfall discharges occurred during this period, no additional bacteriological monitoring to that normally performed for contact recreational monitoring purposes was required. However, one isolated overflow of localised wastewater occurred at Middleton Bay due to a pump failure

(see Section 2.6) necessitated one additional bacteriological survey in late February, 2015.

2.2.2 Surface overland flow of wetland treated effluent

Bunding of the effluent seepage area to the south of the wetlands, undertaken by the consent holder during earlier monitoring periods, was effective in containing the seepage with no overflows from this area noted at the time of inspections.

No overland flow was recorded from the western area on any inspection occasion as a result of earlier additional maintenance of the reticulation system, which prevented further direct discharges from the end of the piped disposal trench system. The western cut-off trench continued to intercept possible groundwater flow to a neighbouring property.

During the 2000-2001 period the consent holder had taken measures to reduce overland flow including bunding of an area adjacent to the small stream, capping the ends of some irrigation lines and removal of hedges to provide more wind flow drying of the area. The consent holder considered that further improvements would occur with minimisation measures to be taken to control and reduce stormwater infiltration into the sewerage reticulation. Incorporation of soakage holes within the trench disposal system was discounted in a consultant's report commissioned to assist with the operation of the existing trench disposal system. Further investigations were undertaken into improvement of the disposal methods as a component of the consent renewal process. The results of these investigations were incorporated into the plan for upgrading the soakage trenches reticulation as required by conditions attached to the consent renewed in June 2003 and were implemented in late 2004 as described in section 1.3.2

At the time of the August 2006 inspection some surface water flow from the vicinity of the eastern trench area was found to be discharging toward the cliffs. The consent holder reported that a number of factors involving valves on the disposal line had contributed to overflows in the past. Manhole grouting, as well as manual and isolation valve installation had been performed on the trench disposal system to attempt to overcome this problem. No further overflows occurred through the remainder of the 2006-2007 monitoring period, but wet boggy areas were noted on two of the other three inspection occasions in the vicinity of the eastern trench nearest SH45. Similarly, wet boggy areas were noted on two inspection occasions in the 2007-2008 period and on one occasion in September 2008. Problems with the trench line closest to SH45 were reported by the consent holder in October 2007. After clearance of an internal blockage in the line and ensuring that localised surface ponding was contained, the normal operation of the trench disposal system was re-instated.

Excessive inflow to the treatment system, caused by very wet weather in early August 2008, resulted in overflows from the wetlands to surrounding land and partly over the nearby cliff. The pumps were fully operative and all the trench disposal reticulation was open. The situation returned to normal operation within a few days of dry weather. No other overflows occurred from the trench disposal area during the remainder of the period, nor were there any significant overflows recorded during the 2009-2011 period. There were wet areas recorded in the vicinity of the trenches with some surface water overflow over the cliffs on one occasion in the 2011-2012 period. Some wet areas were noted (late winter and spring) in the 2013-2014 period

but these were minor in area and no surface flows over the cliff were apparent on any inspection occasion. Wet areas again were apparent (in late spring and late autumn) following wet weather periods during 2014-2015 with minor surface water flows through depressions toward the coastal cliffs.

2.3 Results of WWTP and receiving water monitoring

2.3.1 Plant performance

Samples of oxidation pond effluent and combined wetlands' effluent were analysed for comparative assessments of plant performance on each occasion during the monitoring year. These results are summarised in Table 2.

Table 2 Results of comparative sampling surveys of the Opunake wastewater treatment system during the 2014-2015 period

Wastes		Oxidation pond effluent					Wetlands' combined effluent					Reduction in wastes concentration (%)
Date		29.9.14	24.11.14	20.2.15	28.5.15	Range	29.9.14	24.11.14	20.2.15	28.5.15	Range	
Parameter	Unit											
Time	NZST	0825	0830	0820	0930	-	0840	0850	0835	0950		-
Temperature	C	10.8	17.7	21.3	10.3	10.3-21.3	10.2	17.1	20.3	9.8	9.8-20.3	-
Dissolved oxygen	g/m³	10.8	1.4	4.9	8.6	1.4-10.8	14.4	-	-	-	-	-
BOD_5	g/m³	-	18	82	30	18-82	-	11	33	8	8-33	39-73
BOD_5 (filtered)	g/m³	5.0	-	8.6	-	5.0-8.6	3.9	-	4.4	-	3.9-4.4	22-49
pH		-	7.3	7.5	7.5	7.3-7.5	-	7.5	7.4	7.1	7.1-7.5	-
Conductivity @ 20 C	mS/m	-	46.0	41.5	39.9	39.9-46.0	-	47.0	45.1	39.7	39.7-47.0	-
Suspended solids	g/m³	-	14	130	27	14-130	-	17	72	12	12-72	0-56
Faecal coliforms	nos/100ml	150,000	100,000	160,000	59,000	59,000-160,000	260,000	800	8,000	1,600	800-26,000	83-99
Enterococci	nos/100ml	200m	5,100	10,000	5,000	5,000-20,000	3100	440	2200	250	250-2,200	78-95

These results indicated typical ranges in effluent parameters for a single oxidation treatment pond receiving essentially domestic wastes. A decrease in faecal coliform bacterial numbers was apparent in late autumn following wet weather. Higher suspended solids and BOD_5 concentrations in late summer were coincident with a much higher microfloral density in the pond. The wide range recorded for suspended solids concentrations was coincident with fluctuations in microfloral populations in the pond. A moderate range in faecal coliform bacteria numbers (Table 2) for this single pond system was found in the period. Wetlands treatment provided an improved effluent in comparison with the corresponding pond effluent, particularly in terms of bacterial quality (usually by one to two orders of magnitude) and, to a lesser degree, BOD_5 and suspended solids concentrations, although no suspended solids reduction through the wetland was apparent on one occasion (in late spring). Moderate ranges for most parameters reflected seasonal variations. However, sampling was influenced by preceding wet weather periods and associated stormwater infiltration into the system, particularly on one occasion (late spring) during the 2014-2015 period when very low BOD_5 and suspended solids concentrations were recorded in both the pond and wetland effluents coincident with

a very poor pond microfloral component as indicated by a very low chlorophyll-a concentration (see Section 2.3.3).
Samples of oxidation pond effluent and the wetlands' effluent were further analysed for selected nutrient species on two occasions (late winter and late summer) to provide an assessment of plant performance in terms of nutrient removal. These results are summarised in Table 3.

Table 3 Results of effluent nutrient analyses from the Opunake wastewater treatment system during the 2014-2015 period

Date		29 September 2014		20 February 2015	
Effluent		Oxidation pond	Wetland	Oxidation pond	Wetland
Parameter	Unit				
Ammonia N	g/m^{3}N	10.1	4.07	0.055	1.74
Nitrate + nitrite N	g/m^{3}N	0.28	1.48	6.85	0.12
Dissolved reactive phosphorus	g/m^{3}P	1.42	0.98	3.28	4.54
Total phosphorus	g/m^{3}P	2.16	1.86	4.94	5.94

This nutrient survey indicated that the wetlands were having limited impacts upon nutrient species in late summer with a greater impact in late winter. The latter was coincident with about 39% reduction in BOD_5 and no reduction in suspended solids concentrations (Table 2) measured through these two components of the system whereas there was a much greater pond microfloral population present in late summer. The relatively small uptake of total phosphorus through the wetland (0 to 14%) continued the trend of more recent monitoring periods, which seems to be typical of the well-established wetland system, whereas increased ammonia nitrogen in the wetland in late summer appeared to be due in part to de-nitrification of the relatively high nitrate levels found in the oxidation pond.

A summary of effluents' qualities from previous monitoring surveys is presented in Table 4.

Table 4 Ranges for results of Opunake wastewater treatment system effluent analyses recorded for the period 1994 to June 2014

Site		Oxidation pond			Wetland			Reduction in median wastes concentrations (%)
		No of samples	Range	Median	No of samples	Range	Median	
Parameter	Unit							
Dissolved oxygen	g/m^3	82	<0.1-19.3	5.3	75	0.8-15.3	5.8	-
BOD_5	g/m^3	74	6-140	29	75	4-92	20	31
BOD_5 (filtered)	g/m^3	38	1.6-17	7.7	38	1.2-26	5.3	31
pH		75	6.7-9.6	7.4	75	6.6-9.8	7.3	-
Conductivity @ 20 C	mS/m	75	31.8-74.3	40.5	76	30.0-52.5	39.0	-
Suspended solids	g/m^3	73	3-290	55	74	5-100	32	42
Faecal coliform bacteria	nos/100ml	74	1,700-360,000	55,500	75	7-60,000	1,500	97
Enterococci bacteria	nos/100ml	73	430-68,000	11,000	73	8-45,000	500	95
Ammonia N	g/m^{3}N	35	0.07-21.7	10.6	36	0.05-18.8	6.35	40
Nitrate + nitrite N	g/m^{3}N	31	<0.01-14.1	0.22	32	<0.01-7.5	0.22	0
Dissolved reactive phosphorus	g/m^{3}P	34	1.25-7.79	4.08	34	1.23-7.75	4.00	2
Total phosphorus	g/m^{3}P	32	2.21-9.7	5.49	33	2.47-8.30	4.76	13

Note *$^+$ Period covers the initial establishment of the treatment system and change in wetlands configuration (2004)*

To date this system has shown very marked wetland polishing in terms of bacterial populations (95 to 97% reduction in median numbers), significant improvements in median BOD_5, suspended solids, and ammonia-N concentrations, and some improvement in median total phosphorus concentration.

Comparisons of the oxidation pond and wetlands effluents' quality (Tables 2 and 3) with previous monitoring data (Table 4) indicate that results for the 2014-2015 period fell within ranges previously recorded on all occasions for all parameters, although many parameters' results were similar to or slightly below past median levels through the period. The exceptions were higher than median bacteriological numbers in both systems and the oxidation pond late summer ammonia level which was slightly lower than the historical minimum, and wetland phosphorus species levels which were slightly below the historical minimum concentrations in late winter.

The oxidation pond bacterial quality was within the range of past results and typical of a primary treatment pond, with wetland effluent bacterial quality markedly better than the oxidation pond effluent. There was improvement in wetland BOD_5 concentrations on each of the three occasions illustrating the value of the wetlands as a tertiary treatment system. Improvements in wastes loadings in terms of BOD_5 were slightly higher than historical median improvement (Table 4) but bacteriological polishing continued to be very significant.

Bacterial counts in the combined wetlands effluent might be expected to be influenced from time-to-time by high bird numbers present in the wetlands. However, bird numbers generally were low at the time of each inspection during the 2014-2015 period, coincidental with relatively low faecal coliform bacterial numbers on three of the four sampling occasions and moderate numbers in late winter 2014.

2.3.2 Treated wastes disposal

No sampling of the overland wetlands effluent flow (Site: OXP006003) from the eastern soakage trenches was required as no significant run-off occurred during the period. However, the upgraded trench system which had been reticulated to discharge in a controlled manner to the unnamed stream (see section 2.2.2), was sampled for the purposes of coastal receiving bacteriological water quality assessments. These samples of the final wetlands/trench system treated effluent were collected from the discharge point (Site: OXP006004), immediately prior to the stream, on four occasions. A specific structure has been provided for sampling purposes by the consent holder. Results are presented in Table 5 and are compared with overland flow and controlled flow data from previous monitoring periods (presented in Table 6).

Table 5 Results of effluent analyses of wetland/trench final effluent from the Opunake wastewater treatment system during the 2014-2015 period

Site		Controlled final effluent				
Date		29 Sep 2014	24 Nov 2014	20 Feb 2015	28 May 2015	2014-2015 range
Parameter	Unit					
Time	NZST	0930	0915	0850	1010	-
Conductivity @ 20°C	mS/m	33.9	46.5	45.3	39.4	33.9-46.5
Faecal coliform bacteria	nos/100 ml	11000	240	2000	1900	240-11000

The controlled final effluent wastewater quality continued to be indicative of a well-treated waste flowing out of the soakage trenches to the stream, and similar to the quality of the wetlands polished effluent in terms of conductivity levels (Tables 2 and 4). Faecal coliform bacterial quality was better than the corresponding wetlands

effluent on three of the four occasions (58% to 75% reduction in numbers) and within 20% of wetland numbers in late autumn during the 2014-2015 period.

Table 6 Ranges of results of soakage trench overland flow and controlled wetland trench final effluent discharges recorded for the period 1994 to 2014

Site		Overland flow			Controlled final effluent		
Date		1994-2005			2004 - 2014		
Parameter	Unit	No	Range	Median	No	Range	Median
pH		19	6.9-7.6	7.3	5	7.3-7.6	7.4
Conductivity @ 20°C	mS/m	20	34.2-57.7	39.8	29	31.4-49.4	39.8
BOD_5	g/m^3	19	2.7-24	14	2	15-26	20
Suspended solids	g/m^3	20	4-140	30	3	28-44	35
Faecal coliform bacteria	nos/100 ml	22	28-9500	1030	29	14-6100	400
Enterococci bacteria	nos/100 ml	20	82-7300	440	15	2-5800	180

During the monitoring period, the controlled wetland/trenches final effluent (Table 5) was within the ranges of overland flow wastes parameters measured to date (Table 6) with one exception when the bacteriological quality, in terms of the faecal coliform count, was well above the median of previous results and higher than the maximum, but still better than the corresponding wetland effluent quality at that time (Table 3). Flow rates estimated at the outfall to the stream ranged from 3 to 25 L/sec prior to the rock rip-rap outfall through which the final effluent discharged into the stream. This effluent varied in appearance from relatively clear, pale green to turbid, dark green.

2.3.3 Microflora of the treatment system

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

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

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

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

The results of pond effluent chlorophyll-a analyses are provided in Table 7 together with field observations of pond appearance.

Table 7 Chlorophyll-a measurements from the surface of the Opunake oxidation pond at the perimeter adjacent to the outlet

Date	Time NZST	Appearance	Chlorophyll-a (mg/m^3)	Chlorophyll-a (mg/m^3) data for period 2013 to mid 2014		
				N	Range	Median
29 September 2014	0925	Turbid, dark green	807	4	4-1230	507
24 November 2014	0830	Rel. clear, pale-green	32			
20 February 2015	0820	Turbid, dark green	1,380			
28 May 2015	0930	Sl. turbid, pale green	122			

Relatively high chlorophyll-a concentrations (in late winter and late summer) were indicative of good pond microfloral populations (coincident with dissolved oxygen saturation levels of 94% and 57% respectively). A very low concentration was coincident with the lowest saturation (14%) following wet spring weather conditions.

2.4 Results of receiving environment monitoring

2.4.1 Introduction

Prior to the 2004-2005 period, monitoring of the impacts of the WWTP wastes disposal system on receiving waters had been confined to contact recreational bacteriological quality of the Tasman Sea at Middleton Bay and Opunake Beach. Before 2001, shallow groundwater quality had been monitored in the immediate vicinity of the WWTP but insufficient recharge, absence of shallow groundwater in some of the bores and no significant impacts illustrated by the remaining monitoring led to a decision in the 2000-2001 period to abandon this component of the receiving environment monitoring.

With the upgrade of the trench disposal system to incorporate a reticulated discharge to the small coastal stream (Figures 1 and 2), consent conditions required monitoring of the receiving waters of the Tasman Sea, beyond the designated mixing zone with the coastal stream (Figure 5; see consent special condition 10). This additional monitoring commenced in June 2005 following completion of the upgrade and has continued to date with monitoring performed on four occasions during the current period.

Coastal bacteriological water quality monitoring at Middleton Bay and Opunake Beach was continued during the summer recreational period with no additional

monitoring necessary in relation to usage of the ocean outfall over this period although one extra survey was required at Middleton Bay in relation to a localised sewage incident (see Section 2.6). Shellfish tissue bacteriological monitoring at two sites in the vicinity of the ocean outfall discharge to Middleton Bay (Figure 5) was curtailed during the 2004-2005 monitoring period due to damage to cages, loss of shellfish and difficulty with retrieval of samples, which severely limited the value of this form of monitoring. This action was also consistent with the anticipated very infrequent use of the ocean outfall following the consented requirements for reticulation upgrade which were completed in late 2006.

2.4.2 Tasman Sea mixing zone compliance water quality monitoring

2.4.2.1 2014-2015 programme

Four surveys of the receiving waters of the Tasman Sea were performed to assess compliance with the mixing zone condition of consent 4248 relating to the Tasman Sea in the vicinity of the mouth of the receiving waters of the unnamed tributary stream. An additional late autumn survey was performed at the time of the inspection, as a result of the very wet weather conditions causing some surface overland flow. The sampling sites are listed in Table 8 and located as illustrated in Figure 3. Sites were established slightly beyond the 50 metre mixing zone in consideration of the wide and meandering nature of the stream mouth.

Table 8 Sampling site locations in relation to the Opunake WWTP soakage trench system discharge

Site	Location	GPS reference	Site code
WWTP soakage trench discharge	at outfall to stream	1672357E 5633418N	OXP006004
Tasman Sea	150 m NW of stream mouth	1672055E 5633361N	SEA904073
Tasman Sea	100 m SE of stream mouth	1672167E 5633241N	SEA904074

Figure 3 Coastal monitoring sites in relation to Opunake WWTP

Three of the sampling surveys were performed at, or within, two hours of high tide and one within two hours of low tide conditions. Results are presented and discussed as follows for each of these receiving water surveys.

29 September 2014

A turbid, dark green treated effluent (estimated at 6 L/s), was discharging to the stream at the time of this survey two hours before high tide when sea conditions were moderately rough and slightly turbid, grey-green in appearance. Four significant stream freshes had occurred over the fifteen days prior to this survey and one fresh the previous day. The results of the survey are presented in Table 9.

Table 9 Results of the receiving waters survey of 29 September 2014 (high tide: 1232 NZST)

Site		OXP006004	SEA904073	SEA904074
		Discharge	Coastal	
Parameter	Unit			
Time	NZST	0930	1010	0950
Temperature	°C	10.6	12.9	12.6
Conductivity @ 20°C	mS/m	33.9	4,450	4,420
Faecal coliform bacteria	nos/100ml	11,000	140	920
Appearance		turbid, dark green (est 6 L/s)	grey-green	grey-green

A moderate bacteriological quality of treated wastewater with a significant phytoplankton component was being discharged to the small stream at the time of the survey. No visual impact but some effects on the bacteriological quality of the seawater were indicated at the sites either side of the stream mouth where faecal coliform bacteria numbers were well above the median shellfish-gathering guideline (14 per 100 ml) and also the 10% exceedance value (43 per 100 ml) at both sites. These counts reflected a significant influence of preceding wet weather catchment runoff events at both sites (as emphasised by lower than typical seawater conductivity levels) although the moderate bacterial number in the wastewater discharge should have been more than adequately diluted by the coastal waters.

24 November 2014

A relatively clear, pale green coloured effluent was being discharged to the stream at an estimated rate of about 15 L/s at the time of this survey about high tide when sea conditions were moderately rough and clean, turquoise-green in appearance. Four significant stream freshes had been recorded over the three weeks prior to the survey and one over the previous week. The results are presented in Table 10.

Table 10 Results of the receiving waters survey of 24 November 2014 (high tide: 1039 NZST)

Site		OXP006004	SEA904073	SEA904074
		Discharge	Coastal	
Parameter	Unit			
Time	NZST	0915	1015	1000
Temperature	°C	17.3	16.9	16.8
Conductivity @ 20°C	mS/m	46.5	4,790	4,790
Faecal coliform bacteria	nos/100ml	240	<1	28
Appearance		rel. clear, pale green (est 15 L/s)	clear, turquoise-green	clear, turquoise-green

A very well treated wastewater in terms of bacteriological quality and with a minor phytoplankton component (relatively clear, pale green) was being discharged to the small stream at an estimated rate of 15 L/s at the time of the survey following some wet weather. No visual impact or significant effects on the bacteriological quality of the seawater were indicated at the sites either side of the stream mouth where faecal coliform bacteria numbers were within the recreational shellfish-gathering guidelines in terms of the 10% guideline value (43 per 100 ml) at both sites but outside the median seasonal faecal coliform value (14 per 100 ml) at one site (SEA904074).

20 February 2015

A turbid, pale green effluent was being discharged to the stream at an estimated rate of 3 L/s at the time of this survey about high tide and moderately rough sea conditions. The stream was in very low flow at the time of the survey and there had been no freshes within two weeks of the survey and no other significant freshes since late December 2014. The results are presented in Table 11.

Table 11 Results of the receiving waters survey of 20 February 2015 (high tide: 1037 NZST)

Site		OXP006004	SEA904073	SEA904074
		Discharge	Coastal	
Parameter	Unit			
Time	NZST	0850	0940	0930
Temperature	°C	20.3	21.0	19.5
Conductivity @ 20°C	mS/m	45.3	4,750	4,720
Faecal coliform bacteria	nos/100ml	2,000	1	7
Appearance		turbid, pale green (est 3 L/s)	clear, turquoise green	clear, turquoise green

A well treated wastewater in terms of bacteriological quality but with a significant phytoplankton component was being discharged to the small stream at an estimated rate of 3 L/s at the time of the survey. A very localised visual impact at the mouth of the stream but no effects on the bacteriological quality of the seawater were indicated at the sites either side of the stream mouth. Faecal coliform bacteria numbers were well within the recreational shellfish-gathering guidelines in terms of the median seasonal faecal coliform value (14 per 100 ml) and the 10% guideline value (43 per 100 ml) at both sites coincident with a very dry late summer period.

28 May 2015

A slightly turbid, pale green effluent was being discharged to the stream at an estimated rate of 25 L/s at the time of this survey near low tide and under relatively calm sea conditions. The stream was in relatively high flow at the time of the survey and there had been four significant freshes over the three weeks before the survey and a very wet period since mid April 2015. The results are presented in Table 12.

Table 12 Results of the receiving waters survey of 28 May 2015 (high tide: 0531 NZST)

Site		OXP006004	SEA904073	SEA904074
		Discharge	Coastal	
Parameter	Unit			
Time	NZST	1010	1040	1030
Temperature	°C	9.3	13.5	13.4
Conductivity @ 20°C	mS/m	39.4	4,610	4,630
Faecal coliform bacteria	nos/100ml	1,900	<1	1
Appearance		sl. turbid, pale green (est 25 L/sec)	clear, uncoloured	clear, uncoloured

A well treated wastewater in terms of bacteriological quality with a moderate phytoplankton component was being discharged to the small stream at an estimated rate of 25 L/s at the time of the survey. No visual impact or effects on the bacteriological quality of the seawater were indicated at the sites either side of the stream mouth. Faecal coliform bacteria numbers were well within the recreational shellfish-gathering guidelines in terms of the median seasonal faecal coliform value (14 per 100mls) and the 10% guideline value (43 per 100 mls) at both sites despite a preceding lengthy period of wet weather.

2.4.2.2 Summary of impact monitoring on receiving waters

No significant effects of the WWTP trench disposal effluent discharge on the receiving waters of the coastal waters of the Tasman Sea were found through the monitoring period, with relatively low bacterial counts measured in the coastal waters on all three occasions, particularly in late summer and late autumn. Elevated counts were found after wet weather late winter conditions earlier in the 2014-2015 period.

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 recreational shellfish-gathering. Special condition 10 of consent 4248 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.

From the four receiving water surveys performed during the monitoring period there were two occasions when the seawater faecal coliform bacterial levels exceeded the recommended median guideline value for shellfish gathering at one or the other or both of the sites either side of the stream mouth and on one occasion when both site's levels exceeded the 10% value. Whilst these results of bacterial monitoring conducted at the two coastal sites either side of the mouth of the stream indicate that this

particular element of compliance generally has been achieved, care needs to be exercised in drawing too many inferences from the limited data record gathered to date.

A summary of the seawater bacteriological water quality monitoring data to date is provided in Table 13.

Table 13 Summary of faecal coliform bacteria data for the two Tasman Sea sites for the period June 2005 to June 2015

Site	No of samples	Range (nos/100 ml)	Median (nos/100 ml)	% of samples >43/100 ml
SEA904073	31	<1-140	1	6
SEA904074	31	<1-920	7	13

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. For the ten year period to date, both sites' bacteriological quality are within the median guideline. Fewer than 10% of samples have exceeded the upper limit of 43 per 100 ml at site SEA904073 and 13% have exceeded this limit at site SEA904074; the majority of which have followed periods of wet weather when run-off to nearby streams has impacted on coastal water bacteriological quality. Longer term compliance with the relevant guidelines will continue to be addressed by the receiving water bacteriological component of the monitoring programme.

2.4.3 Bacteriological recreational water quality monitoring

2.4.3.1 Background

Phase 1 of this programme was performed between December 1993 and February 1994, during the construction phase of the treatment system. This phase 1 survey concluded that seawater sites at Opunake Beach and adjacent to the new wastewater treatment system were well within the existing guideline water quality standards on all sampling occasions. The Middleton Bay site was generally within the existing median water quality standards but exceeded the single sample maximum for a designated bathing beach on three occasions. High bacterial numbers on these occasions were most probably influenced by the discharge of sewage from the ocean outfall with a possible additional impact from the Otahi Stream. Bacterial numbers at freshwater sites were generally higher than at the seawater sites due to the impact of agricultural run-off in these developed farmland catchments. The Otahi Stream site usually had markedly higher bacterial numbers than the Lake Opunake outlet stream and three seawater sites. The impact of the two freshwater streams on coastal bacterial water quality during this unseasonably low rainfall period was generally minimal.

Phase 2 of this programme, performed from December 1994 to February 1995, coincided with the first period of operation of the new land-based disposal system. This period was also notable for a second consecutive low summer rainfall, generally considered to have been equivalent to at least a 1 in 5 year occurrence. The results of this survey therefore provided data for comparison with phase 1 monitoring of bathing water quality performed during the construction of the new system, in the

previous year. Phase 2 coincided with a number of operational problems encountered with the land disposal system and, in particular, pump failures resulting in discharges of raw sewage through the old ocean outfall into the Tasman Sea near Middleton Bay. Therefore, the survey was not fully representative of the impacts of the designed operation of the new treatment system, but provided data for comparative assessment with the previous summer when the ocean outfall sewage discharge was operative.

The phase 2 survey concluded that the bacteriological water quality of the three seawater sites was of a high standard. All of the seawater sites were well within both the water quality bathing guidelines (DOH, 1992) and the old water quality standards (NWASCO, 1981) for median values over the bathing season. On one occasion, high bacteria numbers at Middleton Bay were almost certainly related to the discharge of sewage from the outfall which is situated to the south of this site, but with a possible small influence from the Otahi Stream. These sewage discharges occurred when the pumping system failed due to blockages.

Bacterial numbers continued to be generally higher for river samples than for the seawater samples. Lake Opunake outlet stream bacterial numbers were relatively low for a stream draining agricultural land, but some additional die-off could be expected to have occurred within the lake. Bacterial numbers were much higher for the Otahi Stream site than the three seawater sites. These numbers probably reflected a high level of agricultural run-off into this stream. During the phase 2 survey, the Otahi Stream median bacterial numbers were approximately half those of the previous summer. This was probably the result of very infrequent rainfall and therefore minimal surface run-off from agricultural land during the monitoring period.
The bacterial coastal water quality during the 1994-95 bathing season (the first operational period of the new Opunake Wastewater Treatment System) was improved in comparison to the previous bathing period. The water quality achieved both old (NWASCO, 1981) and revised (DOH, 1992) bathing water quality standards and guidelines. The implementation of the Opunake Wastewater Treatment System, despite its documented operational problems, resulted in an improvement of seawater quality in the Opunake area and in particular at Middleton Bay as surveyed by Phase 2 of the programme.

The final phase (Phase 3) of the programme was performed from December 1995 to February 1996. The sampling period coincided with a relatively low summer rainfall, but not as dry as the previous summer. It also coincided with operational problems, which continued at the land-based treatment system. However, in comparison with the previous summer, relatively few instances of raw sewage discharges were recorded via the old ocean outfall into the Tasman Sea near Middleton Bay. The overland flow of combined wetlands treated effluent continued throughout the summer. Although relatively low rates of flow were recorded (less than 5 L/s) this effluent discharged over the cliffs and to the foreshore beneath the treatment system site. Again, the survey was not fully representative of the impacts of the designed operation of the new treatment system, but has provided data for comparison with similar surveys which formed Phase 1 (summer 1993-94) and Phase 2 (summer 1994-95) of the programme.

In summary, the Phase 3 survey concluded that the bacteriological seawater quality was of a high standard at all three sites and well within the new water quality

guidelines and old water quality standards for contact recreation throughout the bathing season.

The water quality during the 1995-1996 bathing season was similar to that of the previous bathing period, while that of the 1996-1997 and 1997-1998 periods indicated that the implementation of the Opunake Wastewater Treatment System, despite some operational problems, resulted in the improvement of seawater quality in the Opunake area and in particular at Middleton Bay. This trend continued in the 1998-99 bathing season when very good bacteriological water quality was measured throughout the season with no exceptions. This coincided with minimal usage of the ocean outfall during this period.

The 1999-2000 bacteriological water quality programme concentrated on contact recreational water quality at the Opunake Beach site (SEA904090), a particularly popular recreational area of the western coast of Taranaki. The format of the programme was similar to that of past surveys, with the sampling period covering the months of November to March inclusive, and integrated within the TRC contact recreational water quality component of the region's state of the environment monitoring programme. Very good bacteriological water quality continued to be measured throughout the summer recreational period with few exceptions.

For the 2000-2001 period, the programme was extended to include the nearby Middleton Bay site (SEA904082) and additional low tide sampling was added through the bathing period from mid November 2000 to late March 2001. With few exceptions, coastal bacteriological water quality was consistently very good at both sites throughout the monitoring period. Water quality easily achieved the running median enterococci contact recreation standard at all times, despite four single short-term ocean outfall discharges of comminuted sewage during the period.

A similar programme in 2001-2002, from early November 2001 to early April 2002, found that with only a few exceptions, bacteriological water quality was consistently very good at both sites. It was well within the running median enterococci standard throughout the period, despite eleven single, short term ocean outfall discharge events during the recreational monitoring months.

The 2002-2003 programme found very high bacteriological water quality at both sites, well within the running median enterococci standard throughout the 5 month recreational period. No single samples at Opunake Beach exceeded the 'Action' limit whereas one sample exceeded this limit in late March 2003 at Middleton Bay following a brief ocean outfall discharge event.

Again, very high bacteriological water quality was found at both sites by the contact recreational SEM (high tide) and compliance monitoring (low tide) programmes during each of the twelve annual recreational periods extending from November 2003 to April 2014. Very few single samples have entered the 'Alert' mode at either of Opunake beach or Middleton Bay over the periods since 2003. Overall the seasonal enterococci medians of 1 to 3 per 100 ml at each of the two sites have emphasised the extremely high water quality generally present in these coastal waters over each of these recreational periods.

2.4.3.2 2014-2015 programme

This programme followed previous formats and was similar to those of the fourteen previous years which included thirteen high tide samples at Opunake Beach and at Middleton Bay, but also an additional seven low tide occasions at the Opunake Beach site. Monitoring extended from early November 2014 until late March 2015 and covered a wet spring-early summer and very dry late summer periods. The results for Opunake Beach are illustrated in Figure 4 in relation to the MfE, 2003 guidelines. There was no additional sampling required during the period as there was no usage of the ocean outfall discharge.

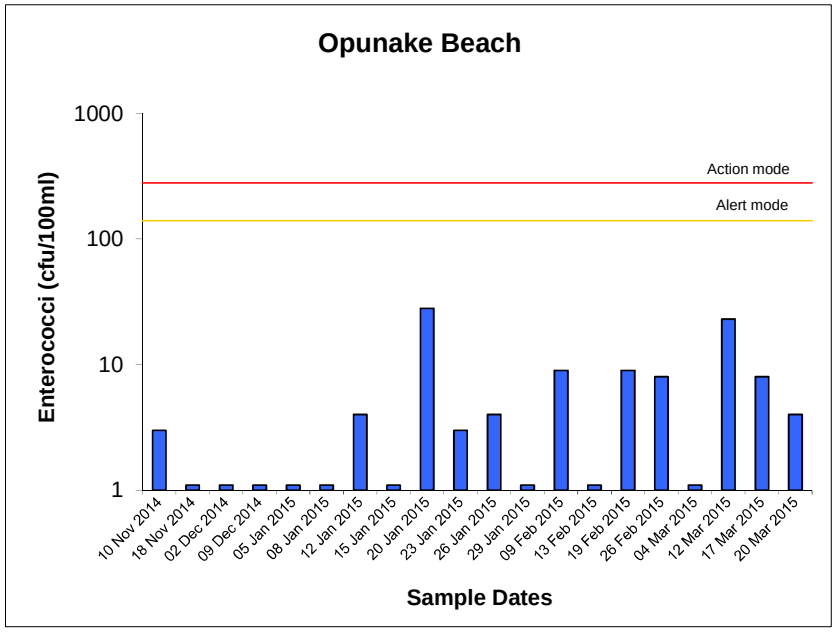

Figure 4 Bacteriological (enterococci) counts at the Opunake Beach site during summer 2014-2015

The coastal bacteriological water quality at Opunake Beach was extremely good throughout the monitoring period. There were two minor elevations in count in mid-January and March 2015 but no single sample exceeded the 'Action' limit for recreational activities during the period and no samples entered the 'Alert' mode. This very high water quality was emphasised by a maximum of 28 enterococci per 100 ml and the seasonal median counts of 4 enterococci (per 100 ml), 1 faecal coliform (per 100 ml), and 3 *E. coli* (per 100 ml) bacteria for the 20 samples survey period.

These results may be compared with past bacteriological survey data for Opunake Beach (Figure 5).

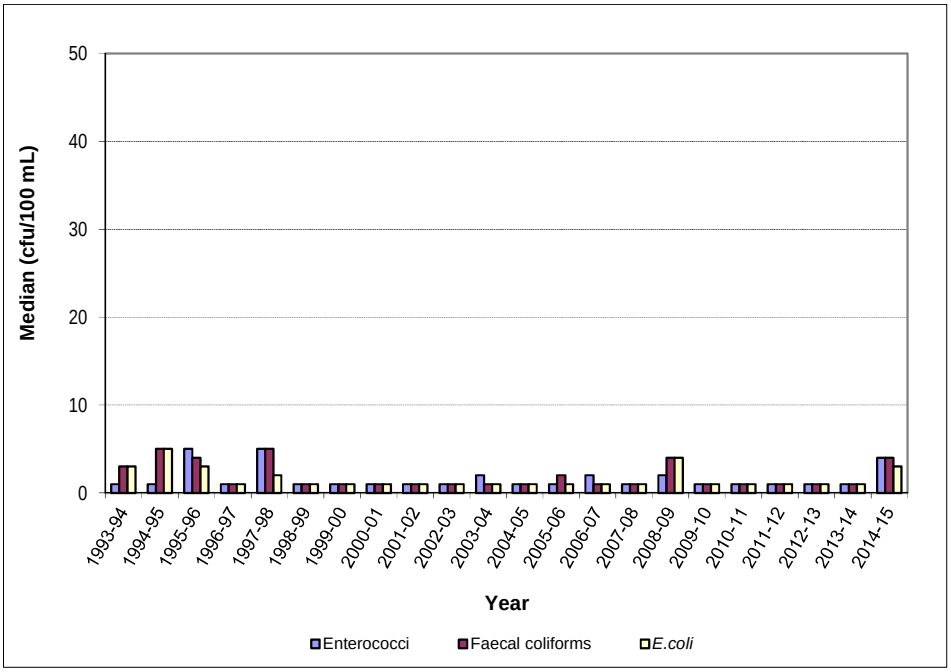

Figure 5 Bacteriological median counts at Opunake Beach for summer surveys since 1993-1994

These results indicate that in terms of median numbers the very high contact recreational bacteriological water quality at this beach site in 2014-2015 was typical of the very narrow range of the median water quality recorded by all 20 past summer survey programmes.

The results for the survey undertaken over the same summer 2014-2015 period at Middleton Bay are illustrated in Figure 6 in relation to the MfE, 2003 guidelines.

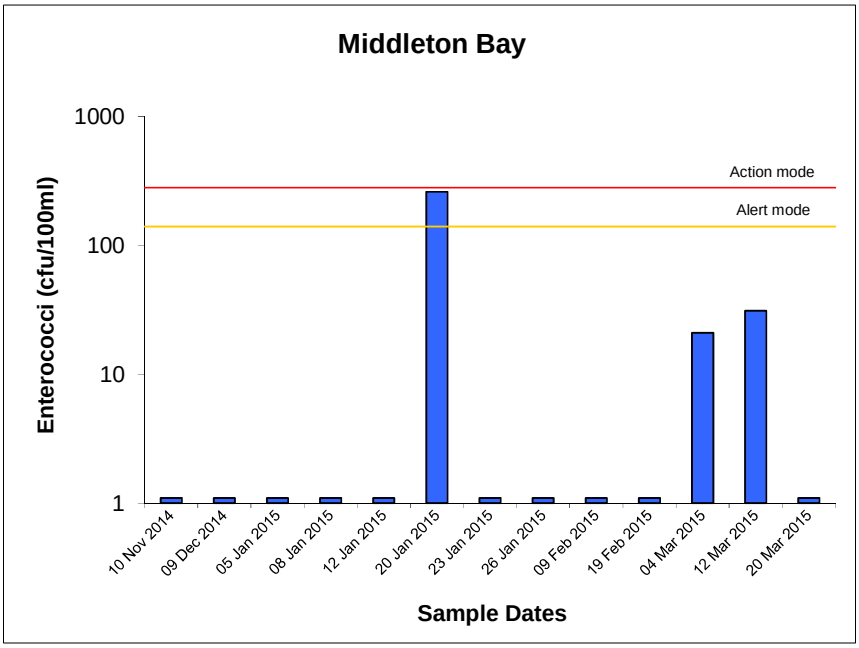

Figure 6 Bacteriological (enterococci) counts at the Middleton Bay site during summer 2014-2015

Although not an intensively used contact recreational area, this site was monitored due to the potential for occasional discharges of untreated domestic sewage (generally following high stormwater infiltration conditions) into the coastal waters from the nearby ocean outfall. However, an increase in local recreational usage was noted during the 2007-2008 period (TRC, 2008) and appears to have continued to date. No additional sampling to the programmed high tide surveys was required in relation to overflow discharges during the recreational monitoring season but one brief localised sewage overflow incident required a follow-up, more intensive survey in late February 2015. This survey at four sites along the length of the beach found no bacteriological counts in excess of 2 colonies per 100 ml for any of the three bacteria species. The very high bacteriological water quality was emphasised by only three counts recorded above 20 enterococci per 100 ml (one of which reached the 'Alert' mode) and by the seasonal median counts of 1 enterococci (per 100 ml), 2 faecal coliform (per 100 ml), and 2 *E.coli* (per 100 ml) bacteria for the 13 samples survey period, very similar to water quality recorded at the nearby Opunake Beach.

2.4.3.3 Guidelines for contact recreation

2.4.3.3.1 Background

Interim guidelines (MfE, 1998), to replace the provisional guidelines (DOH, 1992), were developed by MfE and MoH to assist water managers to implement the Resource Management Act (1991) and Health Act (1956) for the purposes of shellfish-gathering and contact recreation. The guidelines used a combination of seasonal median and single bacteriological samples to assess the safety of contact recreational waters. The framework for safety assessment was a three tier system; clean ('safe'), potentially unclean ('potentially unsafe'), and highly likely to be unclean ('highly likely to be unsafe').

For marine water the preferred indicator was enterococci. The framework in these guidelines used both medians and single sample maxima. Seasonal medians provided the basic means to assess safety. Single samples were used to help water managers determine whether it was likely that the seasonal median set out in the guidelines would be achieved. A running median was also used to assess whether the seasonal median (set out in the guidelines) would be achieved.

2.4.3.3.2 2003 Guidelines

More recently guidelines have been prepared by Ministry for the Environment in conjunction with the Ministry of Health (MfE, 2003). Components of these guidelines include sanitary surveys/inspections together with assessments of historical microbiological data which, when combined, provide an overall suitability for recreation grade, which describes the general condition of a site based on both risk and indicator bacteria counts. Minor changes to the marine enterococci recreational guideline values have been made for the purpose of regularly assessing single sample compliance with suitability for recreation and are now more reflective of New Zealand conditions. 'Alert' and 'Action' guideline levels are used for surveillance throughout the bathing season. They may be summarised as follows:

Mode	Enterococci (nos/100 ml)		
	Acceptable (green)	'Alert' (amber)	'Action' (red)
Marine	≤140	141-280	>280 (2 consecutive samples)

2.4.3.3.3 Suitability for recreation grading (SFRG) of sites

The 2003 Microbiological Water Quality Guidelines (MfE, 2003) provide for the grading of recreational water bodies utilising Microbiological Assessment Categories (using historical data) and Sanitary Inspection Categories which generate a measure of the susceptibility of water bodies to faecal contamination. This suitability for recreation grade (SFRG) therefore describes the general condition of a site based on both risk and indicator bacteria water quality. A grade is established on the basis of five years' data and recalculation of a grade may be performed annually although grades should be reassessed on a five-yearly basis.

SFRGs are very good, good, fair, poor, and very poor. Sites graded very good will almost always comply with the guideline values for recreation, and there are few sources of faecal contamination in the catchment. Consequently there is a low risk of illness from bathing. Sites graded very poor are in catchments with significant sources of faecal contamination, and they rarely pass the guidelines. The risk of illness from bathing at these sites is high, and swimming is not recommended. For the remaining beaches (good, fair and poor) it is recommended that weekly monitoring be carried out during the bathing season. The public are to be informed when guideline values are exceeded and swimming is not recommended (MfE, 2003).

All of the region's principal coastal recreation sites have been graded according to these criteria, using historical microbiological water quality data extending over the latest five year period (November 2009 to April 2014) preceding the current period (TRC, 2015). The relevant information for Opunake Beach is summarised in Table 14.

Table 14 Suitability for recreation grade for Opunake Beach for the period October 2009 to April 2014

Site	Sanitary Inspection Category	Microbiological assessment Enterococci (nos/100 ml)			SFR Grade	% of all samples in compliance (ie: <280 enterococci)
		95%ile	Number of samples	Category		
Opunake beach	Moderate	33	100	A	Good	100

2.4.3.3.4 Discussion of results

All 21 annual surveys at the Opunake Beach site have illustrated very high bacteriological water quality, well within existing guidelines for recreational beaches, including single sample criteria (MfE, 2003). Neither the single sample enterococci 'Alert' nor two sample 'Action' criteria was exceeded during the 2014-2015 bathing season. No exceedances of the two consecutive sample 'Action' mode but one isolated exceedance of the single sample 'Alert' mode were recorded during this period at nearby Middleton Bay. Coincidentally, there were no discharges of comminuted sewage from the ocean outfall over this period.

During the recreational survey period, Opunake Beach bacteriological water quality data was available (and progressively updated) for all users and interested parties via

the TRC web site www.trc.govt.nz for coastal recreational waters and the more recently established Taranaki District Health Board website www.tdnb.org.nz.

2.4.4 Biological receiving water monitoring

No shellfish tissue bacteriological monitoring was programmed for the summer of 2014-2015 in relation to the occasional usage of the ocean outfall at Middleton Bay for the reasons outlined in section 2.4.1. Prior to the 2005-2006 period this programme had comprised deployment of shellfish (mussels) at two sites adjacent to the outfall area (Figure 4) during the summer-autumn period. Live mussels had been placed in suitable cages located at two coastal inter-tidal reef sites (previously monitored) as listed in Table 15.

Table 15 Location of shellfish monitoring sites

Site	Location	GPS Reference	Code
Middleton Bay	west of bay	1672689E 5632566N	SEA904081
Lookout headland	between Opunake Beach and Middleton Bay	1672849E 5631944N	SEA904086

Shellfish tissue faecal coliform bacterial levels provide information relating to longer term bioaccumulation of indicator organisms which may originate from non-point source runoff (particularly into nearby rivers and streams) and/or point source discharges.

The following summary of historical mussel tissue bacteria results (Table 16) is provided for reference purposes.

Table 16 Summary of previous TRC summer shellfish tissue bacterial sampling performed during between November 1997 and April 2005

Parameter Unit	Faecal coliform bacteria (MPN nos/100 g)		
Site	No of samples	Range	Median
SEA904081	29	<20 – 2,400	220
SEA904086	22	<20 – 2,400	30

These faecal coliform bacterial numbers are considered to have been typical of mussel tissue numbers found along the southern Taranaki coastline where bacteriological water quality is frequently compromised by rainfall run-off to freshwater rivers' and streams' inflows along the coast. The recommended standard for human consumption of shellfish is 230MPN per 100g of tissue. Bacteriological monitoring of the coastal waters in Middleton Bay (site SEA904082), referenced in section 2.4.3.2, showed that faecal coliform bacteria numbers ranged from <1 to 31 nos/100 ml (median of 2 per 100 ml for 13 samples collected between November 2014 and March 2015). This was well in compliance with recommended guidelines for shellfish-gathering waters (MfE, 2003) and the 10% guideline as no samples were above 43 per 100 ml. Longer term (recreational) bacteriological monitoring at this site (November 2005 to March 2014) has found a median faecal coliform count of 1 nos/100 ml but only 9% of (171) samples above 43 per 100 ml; most of these exceedances following recent wet weather events.

2.5 Erosion surveys

Special Condition 3 of consent 4248 requires that cliff face stability monitoring be undertaken by the consent holder as appropriate. A report received during the 2000-2001 period from the consent holder's consultant, based upon historical data and surveys performed in 1997, 1998, 2000 and 2001, concluded that erosion of the cliffs in the vicinity of the Opunake WWTP and the associated pumping station sites was not significant.

Some very localised erosion was noted at the time of the June 2005 inspection coincident with the unauthorised overflow of soakage trench wastewater via a leaking manhole.

A further survey was undertaken in January 2006, by the consent holder's new consultant (see Appendix II of TRC, 2006). This survey concluded that there had only been one area of significant cliff movement between 1993 and 2006, toward the north-western boundary adjacent to the oxidation pond. There were also areas where WWTP treated effluent appeared to be discharging through the cliffs (eg adjacent to the wetlands) and while there were minor failures in the upper strata at these locations, these were having no impacts on long-term cliff stability.

An additional survey was undertaken by the consent holder's consultant in November 2014 which found no further significant cliff erosion adjacent to the WWTP since the previous (2006) survey (see Appendix II).

2.6 Investigations, interventions, and incidents

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

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

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

In the 2014-2015 year, there were no incidents recorded by the Council that were directly associated with the consent holder's exercise of consent 4248, and no incidents relating to the ocean outfall consent 0236. The consent holder advised one incident relating to the short term overflow of sewage from the toilets at Middleton Bay following a pump power outage in late February 2015. Sewage was tankered from the site while power was restored and overflow signage was erected at the toilet

and vehicle access areas (by STDC). Additional bacteriological monitoring along the length of the Middleton Bay shoreline found no elevation in any bacterial species' counts on the day following notification of the incident.

2.7 Stakeholders' meeting

Special condition 12 of consent 0236 requires a meeting to be held with interested submitters to the consent at least every two years. The consent holder contacted all parties in March 2012 and again during the 2013-2014 period to arrange meetings but no submitters had issues relating to the emergency use of the ocean outfall and therefore the meetings were not required. The next meeting is scheduled for the 2015-2016 year.

3. Discussion

3.1 Discussion of plant performance

This monitoring programme has documented the twenty-first annual period of the operation of the land-based treatment and disposal scheme since commissioning. The system experienced no operational problems during the period. Previously, problems had necessitated that the consent holder, in conjunction with its consultants, address long-term solutions in order that the otherwise well-designed treatment system and adequate disposal system could be operated as intended, and with minimal impacts on receiving waters. This had particular relevance in relation to the renewal of the coastal permit for discharge to the Tasman Sea granted by the Minister of Conservation and conditioned with requirements to implement reticulation upgrades capable of substantial reductions in future ocean outfall usage. These upgrades were completed in late 2006 and few further overflow events have occurred since then, with no overflows during the 2014-2015 period.

Maintenance of the wastewater treatment plant was very good during the period. Minimal overland flow from the soakage trenches was observed and the improved reticulation of the trench system with a common discharge point authorised by the renewed consent functioned properly throughout the period thereafter. Stock access and movement within the WWTP property area in general have been addressed by the consent holder in relation to appropriate good practice and documented in the consent holder's updated management plan of June 2007.

Compliance with consents' conditions was very good including operational procedures associated with the reticulation related to the ocean outfall.

3.2 Environmental effects of exercise of water permits

Monitoring of system performance indicated that a high standard of effluent quality was produced by the oxidation pond and series of two wetlands. Wastewater quality from the wetlands and the overland flow was very good, reflecting the good performance of the WWTP system. Upgrade of the reticulated soakage trench system and incorporation of a single discharge point into the unnamed coastal tributary had minimal measurable effects on the bacteriological quality of the coastal receiving waters of the Tasman Sea in the vicinity of the stream's mouth which generally have complied with shellfish-gathering bacteriological guidelines with occasional exceptions following wet weather periods. No impacts of wastewater disposal from the WWTP were measured on bacteriological contact recreational water quality surveyed throughout the summer period at the principal coastal recreational area on Opunake Beach and at the nearby Middleton Bay. No exceedances of contact recreational bacteriological 'Action' criterion occurred during the season at either of these two sites while one instance of an 'Alert' level exceedance was recorded at Middleton Bay. This continued the trend of very high bacteriological water quality measured at Opunake Beach over the previous 21 summers. Shellfish-gathering bacteriological water quality standards were exceeded on two of the four occasions in the coastal waters during the bacteriological monitoring period (adjacent to the WWTP) while the long term median standards have been met at both sites. The shellfish gathering single sample standard was very seldom exceeded at either of the recreational sites at Opunake Beach or Middleton Bay during the more intensively

monitored late spring-summer-early autumn recreational state of the environment monitoring period.

3.3 Evaluation of performance

A tabular summary of the South Taranaki District Council's compliance record for the year under review is set out in Tables 17 and 18.

Table 17 Summary of performance for consent 4248-2:

Purpose: To discharge of WWTP treated wastes to land and stream		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Design and operation of system requirements	Inspections of system and liaison with consent holder	Yes
2. Adoption of best practical options to prevent effects	Inspections and receiving water monitoring	Yes
3. Management plan to be implemented	Inspections and liaison with consent holder	Yes
4. Use of trained operator	Officer liaised with council	Yes
5. Maintenance of aerobic pond conditions	DO sampling surveys	Yes
6. Restriction on surface ponding	Inspections of treatment system	Yes
7. Prevention of unauthorised overland flow	Liaison and inspection	Yes
8. Monitoring provision	Council performed tailored programme; erosion survey reporting	Yes
9. Additional tradewastes provisions	Liaison with consent holder	N/A
10. Receiving water limits on effects	Inspections and sampling (physicochemical and bacteriological)	Yes
11. Reporting upgrade requirement	Report supplied in 2004	N/A
12. Optional review provision re environmental effects	No further reviews prior to expiry date	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 18 Summary of performance for coastal permit 0236-6:

Purpose: For intermittent discharge of wastewater to the Tasman Sea		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adoption of best practicable options to prevent effects	Inspections and receiving water bacteriological monitoring (not required; no overflows)	N/A

Purpose: For intermittent discharge of wastewater to the Tasman Sea		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
2. Provision for documented exercise execution	Inspections	Yes
3. Upgrade design and implementation	Liaison with consent holder	Yes
4. Upgrade reporting	Consent holder advised progress & completed upgrade	Yes
5. Limits upon reasons for discharge	Reporting by consent holder	N/A
6. Limits on solids discharged	Inspections and reporting by consent holder	N/A
7. Advice of exercise of consent	Consent holder reporting	N/A
8. Annual reporting	Consent holder report	N/A
9. Provision of contingency plan	Consent holder report	Yes
10. Maintenance of signage	Consent holder advice; inspections	N/A
11. Notification to Taranaki Healthcare	Consent holder reporting	N/A
12. Biennial meetings	Liaison with consent holder and submitters	Not required
13. Implementation of infiltration reduction programme	Consent holder report	Yes
14. Receiving water monitoring	Bacteriological sampling programme as required	N/A
15. Optional review of consent	No further review provision	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

During the year, STDC demonstrated a high level of environmental and high level of administrative performance with the resource consents as defined in Section 1.1.4, despite continuing stormwater ingress to the reticulation. There was no usage of the ocean outfall discharge facility by the consent holder, following completion of the required pumping reticulation and holding tank system upgrade in late 2006.

3.4 Recommendations from the 2013-2014 Annual Report

The previous Annual Report (TRC 2014-17) contained the following recommendations in relation to consents monitoring of the operation of the land treatment and disposal scheme and the ocean outfall system:

1. THAT monitoring of the WWTP discharge consent (4248) be continued by way of a similar programme to that performed during the 2013-2014 period and including a contact recreational water quality component integrated with State of the Environment (SEM) programme and coastal receiving water monitoring of the effects of the land-based treatment disposal system.

2. THAT monitoring of the renewed coastal permit (0236) be undertaken during the 2014-2015 period by way of an appropriate programme designed to focus on possible impacts upon the bacteriological water quality of Opunake Beach and Middleton Bay, only if ocean outfall usage occurs, particularly during the recreational SEM period.

3. THAT the consent holder maintain and supply appropriate records to the Council of each occasion upon which the ocean outfall is utilised for the disposal of wastes as required by Special Conditions 7 and 8 of Coastal Permit 0236. Such advice is required immediately should the ocean outfall discharge occur in the period between 1 November and 31 March.

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

Recommendations 1, 2, 3, and 4 were achieved during the monitoring period. As no usage of the ocean outfall occurred, no additional monitoring (Recommendation 2) was necessary. No connections of additional industrial wastes to the system were advised. All aspects of the monitoring programme were performed, including the additional monitoring of the more recently reticulated soakage trench outfall discharge system.

3.5 Alterations to the monitoring programme for 2015-2016

In designing and implementing the monitoring programmes for water discharges in the region, the Council has taken into account the extent of information made available by previous authorities, its relevance under the RMA, its obligations to monitor discharges and effects under the RMA, and report to the regional community. The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of municipal treatment processes within Taranaki discharging to the environment.

The variation to the consent to discharge treated wastes from the wetlands to land, to include discharge to an unnamed stream, required additional coastal water quality monitoring in the vicinity of the designated mixing zone. This was added to the 2005-2006 programme, has been continued to date, and will continue to form a component of future programmes. It is proposed for the 2015-2016 period that the monitoring continue at the same level as that in the 2014-2015 period.

3.6 Exercise of optional review of consents

Coastal permit 0236 provided for an optional review of the consent in June 2012 (which was not considered necessary) and there are no further review options. Consent 4248 provided for an optional review of the permit in June 2014 which was also not considered necessary, based on the results of previous years as set out in annual compliance monitoring reports, as it was considered that there were no grounds that required a review to be pursued. There are no further optional reviews scheduled prior to consents' expiries in June 2018.

4. Recommendations

A continuation of the comprehensive monitoring programme is proposed for the twenty-second year of the system's operation. This will also incorporate the summer bacteriological survey at the principal bathing beach site and adjacent Middleton Bay site in order to assess receiving water quality in conjunction with the fully operational land-based treatment and disposal system. Additional bacteriological coastal water monitoring of the renewed coastal permit associated with the occasional use of the ocean outfall will occur only if discharges of comminuted sewage are recorded. This programme will focus on bacteriological water quality at the sites in Middleton Bay and at Opunake Beach and will also incorporate coastal receiving water bacteriological monitoring of the effects of the land-based treatment plant disposal system.

As a result of the 2014-2015 monitoring programme for the Opunake waste treatment and disposal system it is recommended:

1. THAT monitoring of the WWTP discharge consent (4248) be continued by way of a similar programme to that performed during the 2014-2015 period, and including a contact recreational water quality component integrated with the State of the Environment (SEM) programme and coastal receiving water monitoring of the effects of the land-based treatment disposal system.

2. THAT monitoring of the renewed coastal permit (0236) be undertaken during the 2015-2016 period by way of an appropriate programme designed to focus on possible impacts upon the bacteriological water quality of Opunake Beach and Middleton Bay, only if usage of the ocean outfall occurs, particularly during the recreational SEM period.

3. THAT the consent holder maintain and supply appropriate records to the Council of each occasion upon which the ocean outfall is utilised for the disposal of wastes as required by Special Conditions 7 and 8 of the Coastal Permit 0236. Such advice is required immediately should the ocean outfall discharge occur in the period between 1 November and 31 March.

4. THAT the consent holder liaises with the `Council with respect to any proposed industrial wastes discharges to the system in order that potential impacts may be addressed and if necessary, additional monitoring requirements formulated.

5. THAT the consent holder convenes a meeting with any interested submitters as required by Special Condition 12 of coastal permit 0236 to discuss any matter relating to the exercise of the permit.

5. Acknowledgements

The Job Manager for the programme was Chris Fowles (Scientific Officer) who was the author of this Annual Report. Field inspections and sampling surveys were undertaken by Ray Harris and Rae West (Technical Officers) with physicochemical water and wastewater analyses performed by the Taranaki Regional Council ISO-9000 accredited laboratory.

Glossary of common terms and abbreviations

The following abbreviations and terms are used within this report:

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
l/s	litres per second
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	appearance of the plume generated by a solid object lobbed into 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
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
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 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 South Taranaki District Council

Consent 4248-2

TARANAKI REGIONAL COUNCIL

CHIEF EXECUTIVE
PRIVATE BAG 713
47 CLOTEN ROAD
STRATFORD
NEW ZEALAND
PHONE 06-765 7127
FAX 06-765 5097

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
Consent Granted Date:	11 June 2003

Conditions of Consent

Consent Granted:	To discharge up to 2,074 cubic metres per day of treated municipal wastewater from the Opunake municipal oxidation pond and wetlands treatment system onto and into land and into an unnamed stream between the Otahi Stream and the Heimama Stream at or about GR: P20:819-953
Expiry Date:	1 June 2018
Review Date(s):	June 2004, June 2007, June 2010, June 2014
Site Location:	Headland bounded by State Highway 45 and the Heimama and Otahi Streams, Opunake
Legal Description:	Ngatitamarongo 20, 21, 22A, 22B Blk IX Opounake SD
Catchment:	Otahi Heimama

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 (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) 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 design, implementation and operation of the Opunake Wastewater Disposal System shall be undertaken in accordance with the information provided in support of applications 355 and 1650.

2. 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 any discharge at the site.

3. 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 operation, including discharge via the soakage trenches;
ii) plant failure; and
iii) pipeline collapse.

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

5. The oxidation pond shall be maintained in an aerobic condition at all times.

6. The consent holder shall ensure that after 31 March 2005 the discharge authorised by this consent shall not result in ponding on the land surface that remains for more than three hours.

7. The consent holder shall ensure that after 31 March 2005 the discharge authorised by this consent shall not result in overland flow of wastewater other than as authorised by this consent.

8. Appropriate monitoring, including cliff face stability and physicochemical, bacteriological and ecological monitoring of the wastewater treatment system and receiving waters shall be undertaken through the term of the consent, 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.

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. 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 provide to the Chief Executive, Taranaki Regional Council in December 2003, June 2004 and December 2004, a report outlining progress towards achieving:

    i) No ponding on the land surface that remains for more than three hours as authorised by this consent; and
    ii) No overland flow other than as authorised by this consent.

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 2004 and/or June 2007 and/or June 2010 and/or June 2014, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 11 June 2003

For and on behalf of
Taranaki Regional Council

Chief Executive

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
Change To Conditions Date:	7 April 2006 [Granted by the Minister of Conservation: 31 August 2004]

Conditions of Consent

Consent Granted:	To intermittently discharge up to 4666 cubic metres/day of comminuted wastewater, from an ocean outfall in Middleton Bay, Opunake, Taranaki, to the Tasman Sea at or about GR: P20:831-939
Expiry Date:	1 June 2018
Review Date(s):	June 2006, June 2008, June 2012
Site Location:	Lookout Headland outfall, Hector Place, Opunake
Legal Description:	Lot 2 DP 9250 Pt Sub 1 Borough of Opunake
Catchment:	Tasman Sea

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

Conditions 1 and 2 [no change]

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 resource consent.

2. The exercise of this resource consent shall be undertaken generally in accordance with the documentation submitted in support of application 4157. In the case of any contradiction between the documentation submitted in support of application 4157 and the conditions of this resource consent, the conditions of this resource consent shall prevail.

Condition 3 [Changed]

3. The sewage conveyance system shall be upgraded, substantially in accordance with recommended Option 3 contained in the document supporting application 4157 entitled 'Opunake Sewage Conveyance System Overflow Minimisation: Study of Options [Harrison Grierson Consultants Limited], June 2003. Implementation of this upgrade shall be completed by 30 October 2006.

Conditions 4 to 15 [no change]

4. The consent holder shall supply a progress report, on implementation under special condition 3, by June 2006 to the Chief Executive, Taranaki Regional Council.

5. Following compliance with special condition 3, the intermittent discharge of comminuted wastewater through a marine outfall structure into the Tasman Sea shall only occur when:

   i) storm and groundwater inflows to the system are such that the capacity of the Opunake wastewater treatment system pump station and upgraded conveyancing system is exceeded; or

   ii) pump or power failure at the pump station occurs.

6. There shall be no discharge of undisintegrated solids though the outfall.

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

8. The consent holder shall forward records relating to special condition 7 at annual intervals to the Chief Executive, Taranaki Regional Council.

9. The consent holder shall prepare and maintain a contingency plan for pump or power failure, or other emergency, at the pump station, to the satisfaction of the Chief Executive, Taranaki Regional Council. The initial plan shall be provided within three months of the granting of this consent.

10. The consent holder shall install and maintain suitable signage advising the public of the health risk on each and every occasion that an ocean outfall discharge occurs.

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

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

13. The consent holder shall continue to 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 2005 and each subsequent year.

14. The consent holder shall undertake bacteriological monitoring of the receiving water for contact recreational and shellfish-gathering purposes, and feral shellfish. 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), and shall also be directed towards major discharge events and shall be reported to the Chief Executive, Taranaki Regional Council, on an annual basis.

15. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2006 and/or June 2008 and/or June 2012, 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 7 April 2006

For and on behalf of
Taranaki Regional Council

_____

Director-Resource Management

Coastal Permit

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

Name of Consent Holder:	South Taranaki District Council Private Bag 902 HAWERA 4800
Consent Granted Date:	5 December 2005

Conditions of Consent

Consent Granted:	To place and maintain the Opunake marine outfall structure within the coastal marine area at Middletons Bay at or about GR: P20:828-938
Expiry Date:	1 June 2018
Review Date(s):	June 2008, June 2012
Site Location:	Middletons Bay, Hector Place, Opunake
Legal Description:	Lot 2 DP 9250 Pt Sub Sec 1 Town of Opunake
Catchment:	Tasman Sea

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, in writing at least 48 hours prior to and upon completion of any maintenance works which would involve disturbance of or deposition to the seabed or discharges to water.

2. During any maintenance works, the consent holder shall undertake all practicable measures to prevent the discharge or placement of silt and/or organics and/or cement products and/or any other contaminant into the sea, and to minimise the disturbance of the foreshore and seabed.

3. The consent holder shall maintain the structure to the satisfaction of the Chief Executive, Taranaki Regional Council.

4. 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.

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 2008 and/or June 2012, 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.

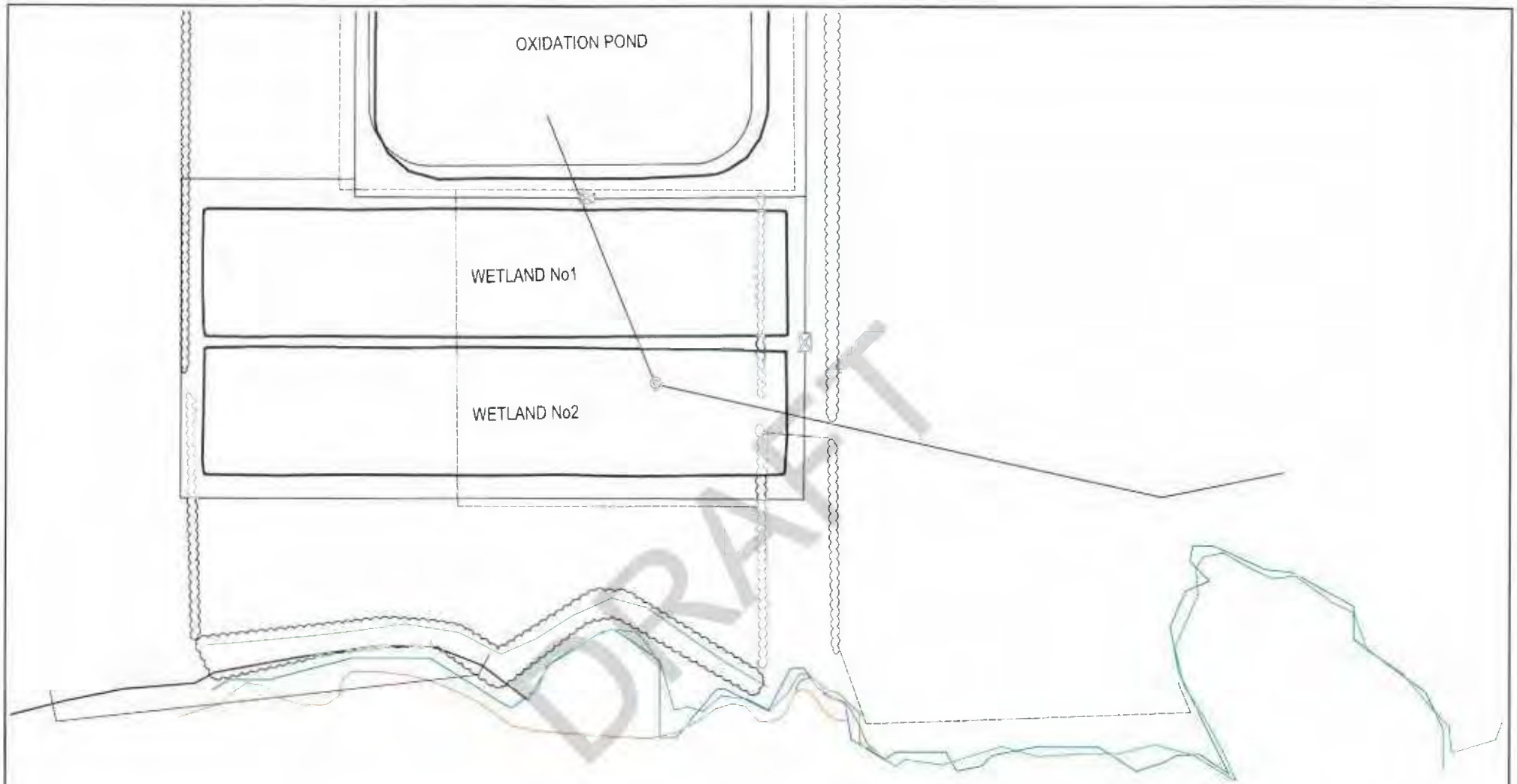
Signed at Stratford on 5 December 2005

For and on behalf of
Taranaki Regional Council

_____

Appendix II

Results of cliff erosion survey, November 2014



LEGEND

CLIFF SURVEY 1982

CLIFF SURVEY 2006

CLIFF SURVEY 2014

Scale 1:1000 A3

FOR INFORMATION
NOT FOR CONSTRUCTION

A	ISSUED FOR INFORMATION	HDB			28.11.14
Rev	Revision	By	Chk	Appd	Date

Beca

Original Scale (A1)	NTS	Design	HDB	28.11.14
Reduced Scale (A3)	NTS	Drawn	DR	28.11.14
		Dsg Verified		
		Dwg Check		

* Refer to Revision 1 for Original Signature

Approved For Construction

Date

South Taranaki District Council

TEL: 0800 111 323
FAX: (06) 278-8757
www.stdc.co.nz

MANAIA AND OPUNAKE
WATER TREATMENT PLANT
CLIFF SURVEYS

MANAIA WWTP
CLIFF SURVEY

Discipline

Drawing No: 3852890-CE-002

Rev: A

IF IN DOUBT ASK