South Taranaki District Council
Opunake WWTP
Monitoring Programme
Annual Report
2018-2019

Technical Report 2019-14

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Taranaki Regional Council
Private Bag 713
STRATFORD

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Executive summary

South Taranaki District Council (STDC) operates a municipal wastewater treatment plant (WWTP) located on South Road at Opunake, in the Otahi and Heimama catchments. This is a three-stage treatment system comprised of a primary oxidation pond, a wetlands treatment system, and a subsurface, reticulated soakage trench system that subsequently discharges to an unnamed stream between the Otahi Stream and the Heimama Stream. This report for the period July 2018 to June 2019 describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess the Company's environmental and consent compliance performance during the period under review. The report also details the results of the monitoring undertaken and assesses the environmental effects of the Company's activities.

STDC holds one resource consent to discharge treated wastewater, which include a total of 12 conditions setting out the requirements that it must satisfy. It also holds one resource consent allowing the intermittent discharge of comminuted wastewater from an ocean outfall in Middleton Bay, and another to place and maintain the outfall structure. These include a total of 20 conditions setting out requirements that STDC must satisfy. All three consents expired in June 2018 and STDC continued to operate under these as the renewal process was undertaken (renewed consents have since been granted in November 2019).

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

The Council's monitoring programme for the year under review included six inspections and 46 water samples collected for physicochemical analysis (ten samples analysing the effluent quality from the system, two measuring effects on receiving waters, and 34 samples monitoring water quality at nearby contact recreational beach bathing sites).

As in previous years, the monitoring indicated that the treatment system was treating the municipal wastewater to the extent that no significant effects were noted in the receiving waters of the Tasman Sea, and the water quality of nearby popular beach bathing sites remained at a high standard.

During the year, STDC demonstrated a high level of environmental and a good level of administrative performance with the resource consents. There were ongoing issues associated with ponding in the trench disposal area throughout the monitoring period. An abatement notice had been issued regarding this in the previous monitoring period and, although remedial earthworks were eventually undertaken, ponding was again noted in the final inspection for the year. There were no overflows from the Hector Place pumping station through the ocean outfall structure during the monitoring period.

For reference, in the 2018-2019 year, consent holders were found to achieve a high level of environmental performance and compliance for 83% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 13% of the consents, a good level of environmental performance and compliance was achieved.

In terms of overall environmental and compliance performance by the consent holder over the last several years, this report shows that the consent holder's performance remains at a good level.

This report includes recommendations for the 2019-2020 year.

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1 Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report is for the period July 2018 to June 2019 by the Council describing the monitoring programme associated with three resource consents held by South Taranaki District Council (STDC). STDC operates a municipal wastewater treatment plant (WWTP) situated on South Road at Opunake.

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 the discharge of treated wastewater in the Otahi and Heimama catchments. This is the 29th annual report to be prepared by the Council to cover STDC's discharge and its effects.

1.1.2 Structure of this report

Section 1 of this report is a background section. It sets out general information about:

- consent compliance monitoring under the *Resource Management Act 1991* (RMA) and the Council's obligations;
- the Council's approach to monitoring sites though annual programmes;
- the resource consents held by STDC in the Otahi/Heimama catchments and the Tasman Sea;
- the nature of the monitoring programme in place for the period under review; and
- a description of the activities and operations conducted at the Opunake WWTP.

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

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

Section 4 presents recommendations to be implemented in the 2019-2020 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 an activity, and may include cultural and social-economic effects;
b. physical effects on the locality, including landscape, amenity and visual effects;
c. ecosystems, including effects on plants, animals, or habitats, whether aquatic or terrestrial;
d. natural and physical resources having special significance (for example recreational, cultural, or aesthetic); and
e. risks to the neighbourhood or environment.

In drafting and reviewing conditions on discharge permits, and in implementing monitoring programmes, the Council is recognising the comprehensive meaning of 'effects' inasmuch as is appropriate for each activity. Monitoring programmes are not only based on existing permit conditions, but also on the

obligations of the RMA to assess the effects of the exercise of consents. In accordance with Section 35 of the RMA, the Council undertakes compliance monitoring for consents and rules in regional plans, and maintains an overview of the performance of resource users and consent holders. Compliance monitoring, including both activity and impact monitoring, enables the Council to continually re-evaluate its approach and that of consent holders to resource management and, ultimately, through the refinement of methods and considered responsible resource utilisation, to move closer to achieving sustainable development of the region's resources.

1.1.4 Evaluation of environmental and administrative performance

Besides discussing the various details of the performance and extent of compliance by the Company, this report also assigns them a rating for their environmental and administrative performance during the period under review.

Environmental performance is concerned with actual or likely effects on the receiving environment from the activities during the monitoring year. Administrative performance is concerned with 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 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 during investigations of incidents reported to the Council by a third party 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 during investigations of incidents reported to the Council by a third party. 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 during investigations of incidents reported to the Council by a third party. 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 2018-2019 year, consent holders were found to achieve a high level of environmental performance and compliance for 83% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 13% of the consents, a good level of environmental performance and compliance was achieved.[1]

1.2 WWTP system

1.2.1 Background

The Opunake WWTP 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 Hector Place, 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. Installation of storage at the pump station has been provided in the event of power outages, faults or breakdowns in the pumping system.

The second component is a land-based treatment system (Figure 1) and is comprised of an initial 1.25 hectare primary oxidation pond. Provision for aeration of this pond was made, but has not been required to date. After treatment in this pond the effluent passes through a series of two combined secondary oxidation pond/wetland systems (Photo 1). Final 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 intervals between use of the individual trenches. The trenches are located a minimum of 30 metres from the coastal cliff face. The land-based treatment system was constructed during the 1993-1994 period and has been operational during subsequent monitoring years. The groundwater monitoring bores were constructed in September 1994 and

[1] The Council has used these compliance grading criteria for 15 years. They align closely with the 4 compliance grades in the MfE Best Practice Guidelines for Compliance, Monitoring and Enforcement, 2018

are located as shown in Figure 1. This system operates under consent 4248-2, which was renewed in June 2003, and expired in June 2018.

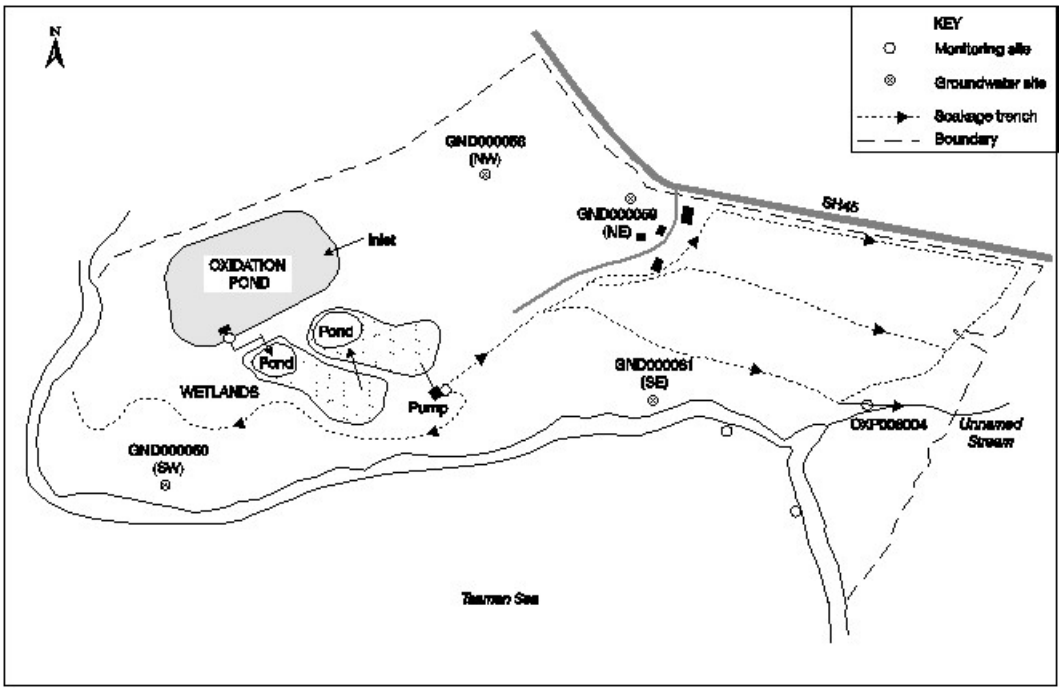

Figure 1 Schematic of Opunake WWTP design and layout

The site is currently leased 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). The public walkway through the area that is maintained by the Council was closed during the 2017/2018 period due to health and safety reasons.

In association with this land based sewage treatment scheme, a consent (coastal permit) was granted to allow for the use of the ocean outfall when storm and groundwater inflows exceed the capacity of the new pump station. This allows for the discharge of untreated wastewater via the ocean outfall.

1.3 Resource consents

STDC holds three resource consents in relation to the Opunake WWTP, the details of which are summarised in the table below. Summaries of the conditions attached to each permit are set out in Section 3 of this report.

A summary of the various consent types issued by the Council is included in Appendix I, as are copies of all permits held by the Company during the period under review.

Table 1 Summary of resource consents held by STDC in relation to Opunake WWTP

Consent number	Purpose	Granted	Review	Expires
Water discharge permits				
0236-6	To discharge up to 4,666 cubic metres per day of comminuted wastewater from an ocean outfall in Middleton Bay, Opunake, to the Tasman Sea	April 2006	-	June 2018*

Consent number	Purpose	Granted	Review	Expires
4248-2	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	June 2003	-	June 2018*
Coastal permit				
4577-3	To place and maintain the Opunake marine outfall structure within the coastal marine area at Middletons Bay	December 2005	-	June 2018*

* consent renewal underway during period under review, renewed consents granted in November 2019

1.4 Monitoring programme

1.4.1 Introduction

Section 35 of the RMA sets obligations upon the Council to gather information, monitor and conduct research on the exercise of resource consents within the Taranaki region. The Council is also required to assess the effects arising from the exercising of these consents and report upon them.

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

The monitoring programme for the Opunake WWTP site 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;
- discussion over monitoring requirements;
- preparation for any consent reviews, renewals or new consent applications;
- advice on the Council's environmental management strategies and content of regional plans; and
- consultation on associated matters.

1.4.3 Site inspections

The Opunake WWTP was visited six times during the monitoring period, four routine monitoring and two follow-up inspections. With regard to consent for discharge to water, the main points of interest were plant operation and performance, disposal trenches operation and the discharges of treated wastewater. Inspections provided for the operation, internal monitoring, and supervision of the plant to be reviewed by the Council. Sources of data being collected by STDC were identified and accessed, so that performance in respect of operation, internal monitoring, and supervision could be reviewed by the Council. The neighbourhood was surveyed for environmental effects.

1.4.4 Water quality

The Council undertook sampling of the discharges from the site, the water quality either side of the discharge point and mixing zone, and the summer water quality at nearby recreational bathing sites.

The Opunake WWTP primary pond effluent was analysed for dissolved oxygen and microfloral component on four occasions. The primary pond and wetland effluents were analysed for pH, conductivity, BOD, suspended solids, and bacterial components (*E.coli*) on three occasions.

Sampling of the soakage trench treated effluent was carried out on three occasions, while the Tasman Sea either side of the discharge was sampled once (due to access issues), and the samples analysed for conductivity and *E.coli* bacteria.

Contact recreational bacteriological water quality at Opunake Beach and at Middleton Bay was monitored by the Council on 21 and 13 separate occasions respectively between early November 2018 and late March 2019.

Photo 1 Opunake WWTP wetlands

2 Results

2.1 Inspections

14 August 2018

The influent screen was operating and wastes were fully contained. The level in the primary pond was fairly high at approximately 200 mm below the concrete waveband. The pond was light green and relatively clear. No odours were noted at the time of the inspection. It was noted by the inspecting officer that the wire netting on the main pond bridge had corroded resulting in the surface being very slippery to walk across, replacement wire netting was required.

The wetland ponds were high, with a relatively clear pale green colour. The southern pond had recently had wetland vegetation and silt removed from along the southern edge. The wetland sump pump was operating at the time of inspection.

Surface water from recent rain was discharging via three of the open trenches to the coast. Several (known) boggy areas discharging from the north trench line were contributing to ponding that was visible from the main highway.

The Hector Place pumping station and the emergency overflow structure were also inspected and found to be satisfactory.

6 November 2018

An influent flow of approximately 5 L/s was occurring at the time of the inspection, the influent screen was operating and wastes were fully contained. The primary pond was a turbid green brown colour and a normal level. More than 100 mallard and teal ducks, black swans and Canadian geese were observed on the pond.

The wetlands were turbid green brown in colour and contained relatively low levels of water. The wetland discharge pump was on standby and the sump was filling.

In the area of the overland trench system the paddocks and open trenches were comparatively dry, although localised ponding was still apparent in one area of the soakage trench field. Remedial work was still required around the boggy area in question (as per abatement notice EAC-22064 issued 15 June 2018). STDC staff were in attendance at this point and advised the inspecting officer that re-contouring work would begin once the surrounding area had fully dried out. The discharge flow rate was estimated at approximately 3 L/s and there was a noticeable environmental impact on the receiving waters in the mixing zone.

A health and safety assessment of the coastal access track was undertaken. It was noted that the entrance gate was locked to prevent public access.

Hector Place pumping station and the emergency overflow structure were also inspected and found to be satisfactory.

24 January 2019

A follow-up inspection was carried out to assess compliance with abatement notice EAC-22064. The soakage field was being grazed by sheep. No ponding was noted, nor was there evidence of recent ponding or overland flow from trenches. Previously-noted vehicle damage (tyre ruts) on the soakage field were not apparent, although these may have been obscured by the long grass. No evidence of recent earthworks or re-contouring was noted (as required by the abatement notice). The wetland discharge pump was not operating at the time, and the soakage trench valves were open with a low discharge rate of approximately 2 L/s estimated into the unnamed tributary.

11 February 2019

An inspection was carried out in fine weather with a light southerly wind. The step screen was operating and wastes were fully contained. The pond was dark green and turbid. It was noted that an accumulation of scum and feathers were floating along the western end of the pond. There was a noticeable odour, this was emanating downwind, towards and around the step screen area. Numerous wildlife were noted on the pond with over 1,000 mallard and paradise ducks, several black swans and Canadian geese.

The wetland ponds were a dark green brown. The effluent discharge sump pump was on standby and the sump was slowly filling. Waveband erosion was noticeable along the western perimeter. Approximately 150 paradise ducks were present on the wetland.

No boggy areas were apparent in the overland trench system and all trenches were dry. The treated wastewater discharge flow rate was estimated at 2.5 L/s (the sump pump was now operating).

Sampling of the sea monitoring sites either side of the unnamed tributary as per the monitoring program was not carried out as the coastal access track remained in an unsafe condition. STDC had yet to either improve the track or provide an alternative access.

The WWTP surrounds and facilities were found to be satisfactory, although it was noted that kikuyu grass growth needed controlling around sumps and sampling locations.

The Hector Place pumping station and the emergency overflow structure were also inspected and found to be in a satisfactory condition.

STDC was reminded that works to remediate the area where ponding had occurred had still not been completed and this was now overdue as per abatement notice EAC-22064 issued on 15 June 2018.

4 April 2019

A follow-up inspection was conducted following notification from STDC on 20 March 2019 that remedial works at the Opunake WWTP had been completed. The soakage field was dry underfoot and well-vegetated, with no sign of ponding or overland flow. Sheep were grazing the area. A stormwater cut-off drain had been installed in the northeast corner of the soakage field, and previous damage caused by heavy machinery had been filled in and re-sown. The sub-surface trenches were discharging to the outlet at a trickle flow. The remedial work undertaken complied with the abatement notice.

21 June 2019

An inspection was carried out in fine weather with a light southerly wind. The step screen was operating and wastes were fully contained. The pond was a dark green brown colour and turbid. No floatables were noted. There was a slight odour emanating downwind, towards and around the step screen area. Numerous wildlife were present with over 100 mallard, teal and paradise ducks, and several black swans and Canadian geese.

STDC staff were onsite clearing a blockage in the southern wetland pond. The wetlands were pale green brown in colour. Waveband erosion was noticeable along the western perimeters of both ponds. The sump pump was operating and the treated wastewater discharge flow rate was estimated at 5 L/s.

The soakage field was wet and boggy underfoot, with obvious ponding noted. Previous works undertaken to ensure compliance with abatement notice EAC-22064 (issued 15 June 2018) appeared to be insufficient. The location of the ponded area was noted and STDC staff working on site were alerted to the issue.

Sampling of the sea monitoring sites either side of the unnamed tributary as per the autumn monitoring program was not carried out as the coastal access track remained in an unsafe condition (Council have since notified the contractor to undertake repairs). These samples will instead be collected during the winter 2019-2020 inspection.

The WWTP surrounds and facilities were found to be satisfactory, although kikuyu grass growth around sumps and sampling locations required attention.

The Hectors Place pump station and emergency outfall were satisfactory.

2.2 Results of effluent monitoring

Effluent analyses were carried out at three locations throughout the treatment system, for the purpose of monitoring the effectiveness of each stage of treatment. These locations were the primary pond effluent (OXP001002), the partially treated wetlands effluent (OXP006001), and the fully treated final discharge from the subsurface trench system (OXP006004). The results of effluent monitoring at all three sites are displayed in Table 3 and discussed in section 2.2.4.

Along with a visual survey of each component of the system, dissolved oxygen levels (DO) and the microfloral component of the pond were measured during routine monitoring inspections. These are discussed in Sections 2.2.1 and 2.2.2 respectively.

All sampling sites are displayed below in Figure 2.

2.2.1 Dissolved oxygen levels

The dissolved oxygen concentration in WWTPs varies both seasonally and during the day as a result of a combination of factors. The photosynthetic activity of the pond's microflora together with fluctuations in influent waste loadings on the system are major influencing factors. Minimum dissolved oxygen concentrations are generally recorded in the early hours of daylight, and therefore pond performance has been evaluated by standardising sampling times toward mid-morning for all regular inspection visits during the monitoring period.

The results of dissolved oxygen monitoring in the primary pond recorded adjacent to outlet are included in Table 2.

Table 2 Dissolved oxygen levels at the surface of the Opunake WWTP primary pond

Date	Time (NZST)	Temperature (°C)	Dissolved Oxygen	
			Concentration (g/m^3)	Saturation (%)
14 August 2018	1015	12.3	1.3	13
6 November 2018	0915	17.3	8.8	89
11 February 2019	0910	21.2	1.9	21
20 June 2019	0950	10.0	6.6	58

The results in Table 1 show a relatively wide range of dissolved oxygen concentrations (between 13 to 89% saturation) in the surface layer of the primary pond near the outlet. These were typical of the levels generally recorded in this oxidation pond, and reflect seasonal influences. No mechanical aeration of the pond occurs.

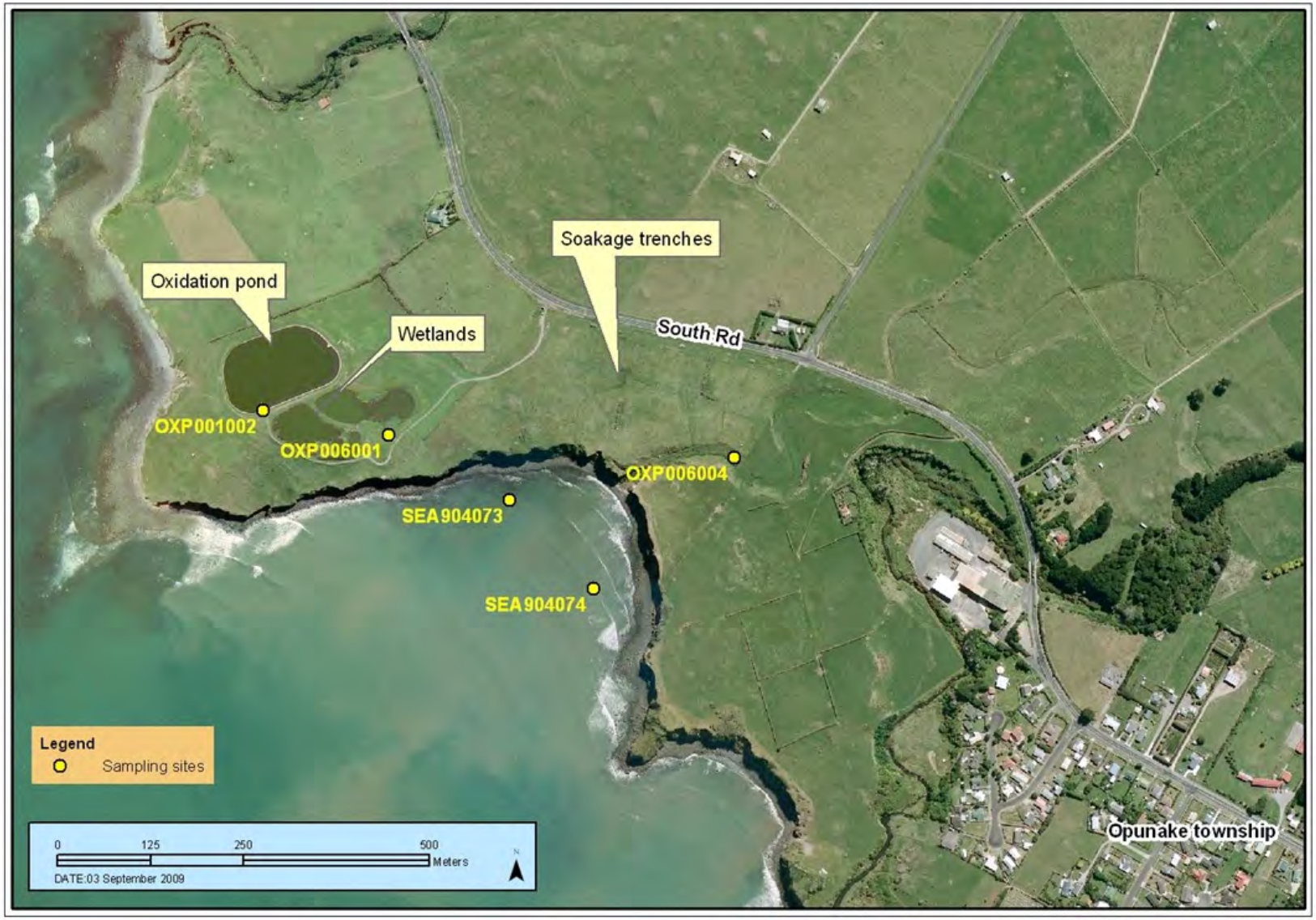

Figure 2 Aerial view of the Opunake WWTP and sampling locations

2.2.2 Microfloral component

Pond microflora are very important for the stability of the symbiotic relation between aerobic bacteria in the primary pond. These phytoplankton may be used as a bio-indicator of pond conditions, for example 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 primary pond effluent were collected during the four routine monitoring inspections for chlorophyll-a analyses. Chlorophyll-a concentration can be a useful indicator of the algal population present in the system. 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 change in algal populations and also dilution by stormwater infiltration might be expected to occur in any WWTP which, together with fluctuations in waste loadings, would result in chlorophyll-a variability.

The results of primary pond chlorophyll-a analyses are provided in Table 3 together with field observations of pond appearance.

Table 3 Chlorophyll-a levels and primary pond appearance

Date	Time	Appearance	Chlorophyll-a (mg/m^3)	Chlorophyll-a (mg/m^3) data from July 2017 to June 2018		
				N	Range	Median
14 August 2018	1015	Clear, very pale green	5.6	4	106-1,400	386
6 November 2018	0915	Turbid, green brown	230			
11 February 2019	0910	Turbid, dark green	650			
20 June 2019	0950	Turbid, green brown	350			

With the exception of the August result, the samples contained relatively high concentrations of chlorophyll-a in the primary pond, indicative of a significant phytoplanktonic component.

2.2.3 Wetlands effluent monitoring

No odours were associated with the system at the time of any inspection visit. Effluent levels in the wetlands were controlled by the wetland discharge pump, which was in operation during two of the four routine inspections. Minor bird numbers were observed on this section of the treatment plant, which has implications for the level of bacteria in the wetland effluent. Results of wetlands effluent sampling are presented in Table 4.

2.2.4 Trench system effluent monitoring

The trench system was operative for the duration of the monitoring year. Discharge flow rates estimated at the outfall of the final trench were around 2 to 3 L/s, prior to the rock rip-rap outfall through which the final effluent discharged into the stream.

Three samples of the trench system treated effluent were collected from the discharge point (OXP006004). This effluent quality continued to be indicative of a well-treated waste flowing out of the soakage trenches

to the stream. The discharge from the soakage trench showed a good reduction in the number of *E.coli* bacteria compared to the corresponding wetlands effluent with decreases of 53 and 60%.

The overland trench system, which drains surface water above the subsurface trench treatment system, contained some surface water that was discharging to the coast during the winter inspection; however no sampling was required as no significant run-off had occurred.

2.3 Results of receiving environment monitoring

Monitoring of the impacts of the Opunake WWTP on receiving waters is measured using both water quality surveys of the receiving waters of the Tasman Sea beyond the boundary of the mixing zone with the unnamed coastal stream; and contact recreational bacteriological quality surveys of the Tasman Sea at Middleton Bay and Opunake Beach (Figure 3).

Water quality surveys were carried out once during the 2018-2019 period (Section 2.3.1).

Figure 3 Location of receiving water sampling sites for Opunake WWTP

2.3.1 Tasman Sea monitoring

Three sampling surveys of the receiving waters of the Tasman Sea were scheduled to be undertaken during the monitoring period during mid-tide conditions. The sites have been established slightly beyond the 50 metre mixing zone in consideration of the wide and meandering nature of the stream mouth. Samples were not able to be collected during the inspections in February or June 2019 as the access track down the cliff to the coast was not safe. Results are presented in Table 5.

Very low bacterial counts were found in the sample collected. This was consistent with low levels found over the previous few years.

Table 4 Results of effluent analysis monitoring at each stage of the treatment plant

Site		Primary pond effluent				Wetlands polished effluent				Final treated discharge from soakage trenches			
Date		6 Nov 2018	11 Feb 2019	20 Jun 2019	2017-2018 Range	6 Nov 2018	11 Feb 2019	20 Jun 2019	2017-2018 Range	6 Nov 2018	11 Feb 2019	20 Jun 2019	2017-2018 Range
Time		0915	0910	0950		0940	0940	1010		1010	1000	1115	
Parameter	**Unit**												
Temp	°C	17.3	21.2	10.0	13.0 – 19.4	19.4	21.0	8.7	12.9 – 19.9	18.2	21.0	9.5	12.7 - 18
pH	pH	8.1	7.8	7.4	7.4 – 9.1	8.7	8.2	7.8	7.3 – 9.4	-	-	-	-
BOD_5	g/m³	4	3.2	25	9.5 - 33	3	3.4	17	9.7 - 23	-	-	-	-
Conductivity @25°C	mS/m	51.0	56.3	46.9	^	43.9	52.9	47.9	^	44.0	54.2	48.1	^
Ent	/100ml	6,900	> 1,000	16,000	155 – 5,260	120	60	1,300	18 – 2,030	-	-	-	-
*E.coli**	/100ml	14,000	-	80,000	5,630 – 105,000	800	-	15,000	144 – 17,330	380	-	6,000	196 – 7,750
SS	g/m³	44	53	48	13 - 63	82	35	43	19 -73	-	-	-	-

* *E.coli* replaces FC as a bacterial indicator following 2017 TRC protocol

^ Conductivity previously measured at 20°C

Table 5 Tasman Sea receiving water sampling results

Date		6 November 2018		11 February 2019*		20 June 2019*	
Site		SEA904073	SEA904074	SEA904073	SEA904074	SEA904073	SEA904074
Time (NZST)		1110	1055	-	-	-	-
Parameter	Unit						
Temp	°C	15.9	16.2	-	-	-	-
Conductivity	µS/cm@25°C	53,700	53,900	-	-	-	-
E.coli	/100ml	1	1	-	-	-	-
Appearance		Slightly turbid, green grey		-		-	

* Samples unable to be collected on these occasions due to lack of access to the sites

2.3.2 Bacteriological recreation water quality monitoring

Contact recreational bacteriological water quality at Opunake Beach and at Middleton Bay was monitored by the Council on 21 and 13 occasions, respectively, between early November 2018 and late March 2019.

There was no additional sampling required during the period as there was no usage of the ocean outfall.

2.3.2.1 MfE guidelines for contact recreation

Guidelines for microbiological water quality of marine recreational areas have been prepared by the Ministry for the Environment in conjunction with the Ministry of Health (MfE, 2003). The guidelines use a combination of a qualitative risk grading of the catchment, together with direct measurements of appropriate faecal indicators to assess the suitability of a site for recreation (see Section 3.2).

In addition, 'Alert' and 'Action' guideline levels are used for surveillance throughout the bathing season. These guideline levels are summarized in Table 1 and are based on keeping illness risk associated with recreational water use to less than approximately 2%. Levels are based on enterococci counts as these bacteria are the preferred indicators for marine waters. Research has shown that enterococci are the indicator most closely correlated with health effects in New Zealand marine waters, in common with general findings overseas (New Zealand Marine Bathing Study). 'Alert' and 'Action' guideline levels are used for surveillance throughout the bathing season, and are summarised in Table 6.

Table 6 Guideline levels for coastal contact recreation bathing sites

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

2.3.2.2 Suitability for recreation grading (SFRG)

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 indicate that 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 2013 to April 2018) preceding the current period. The relevant information for Opunake Beach is summarised in Table 7.

Table 7 SFRG for Opunake Beach for the five-year period from November 2013 to April 2018

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 3	30.1	108	A	Good	100

In general, high water quality has been measured at both contact recreation sites during the period from November 2013 to April 2018. Very few single samples have entered the 'Alert' mode at either of Opunake Beach or Middleton Bay over the period since 2003. Overall the seasonal enterococci medians 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.

It should be noted that there are also multiple potential sources of bacteriological components entering both Opunake Beach and Middleton Bay, including stormwater discharges and natural runoff.

2.3.2.3 Water quality at Opunake Beach

Contact recreational bacteriological water quality at Opunake Beach was monitored by the Council on 21 separate occasions respectively between early November 2018 and late March 2019. State of Environment (SEM) samples are collected approximately four times per month when hydrological flow conditions permit, within two hours of high tide. SEM sampling is performed only under dry weather flow conditions (i.e. not within three days of a fresh) to ensure, as far as practicable, consistent environmental factors. The revised guidelines for microbiological water quality of marine recreational areas (MfE, 2003) envisaged weekly surveillance monitoring during the 5-month recreational period, with a minimum of 20 sampling dates, regardless of weather conditions or state of the tide. This number of samples each season is regarded as providing the most robust dataset for site categorisation purposes. Seven extra samples are therefore collected at Opunake Beach during the bathing period. The results of this sampling are summarised in Table 8 and illustrated in Figure 4.

Table 8 Statistical summary of bacteriological monitoring at Opunake Beach

Parameter		Units	Number of samples	Minimum	Maximum	Median
SEM samples	Specific conductivity	µS/cm@25°C	13	53,400	54,900	54,300
	Enterococci	cfu/100 ml	13	<1	30	1
	Temperature	°C	13	17.5	23.7	20.0
SEM & MfE samples	Specific conductivity	µS/cm@25°C	21	47,000	55,200	54,500
	Enterococci	cfu/100 ml	21	<1	30	1
	Temperature	°C	21	17.0	23.7	19.9

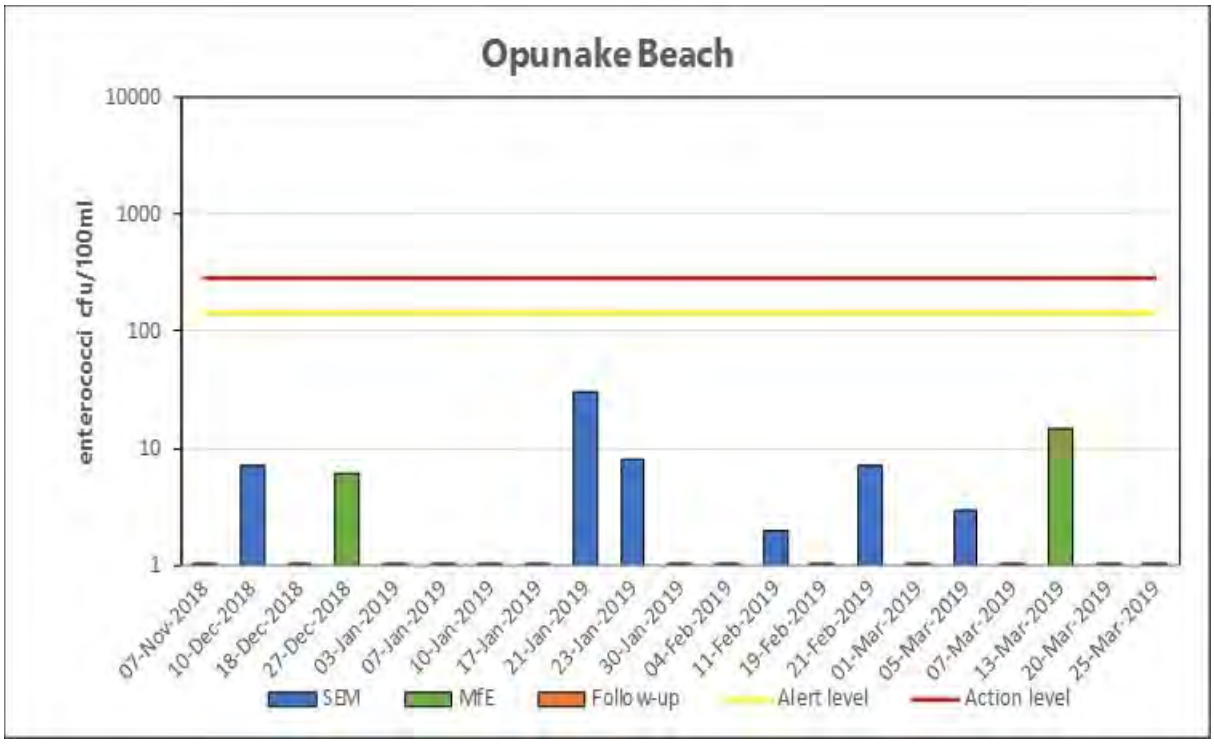

Figure 4 Enterococci results (presented on a logarithmic scale) for Opunake Beach summer 2018-2019

The coastal bacteriological water quality at Opunake Beach was very good throughout the monitoring period. With a maximum enterococci of 30 per 100 ml, all samples collected were well below the 'Alert' limit.

This high water quality was emphasised by a seasonal median count of 1 enterococci (per 100 ml) for the 21 samples collected during the survey period. These results may be compared with past bacteriological survey data for Opunake Beach (Figure 5).

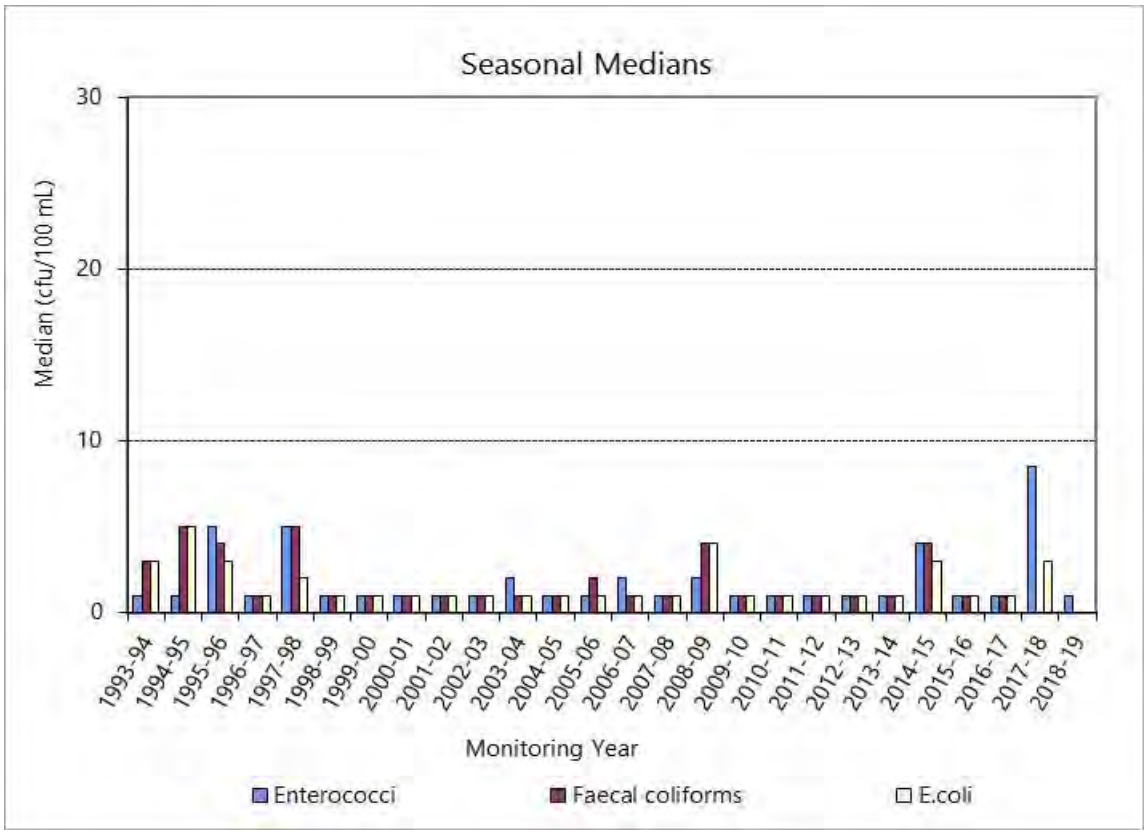

Figure 5 Median bacteriological results at Opunake Beach since summer 1993-1994

The results from Figure 5 indicate that in terms of median numbers, the high contact recreational water quality at this site in 2018-2019 was typical of the very narrow range of the median water quality recorded by past summer survey programmes.

2.3.2.4 Water quality at Middleton Bay

Contact recreational bacteriological water quality at Middleton Bay was monitored by the Council on 13 separate occasions respectively between early November 2018 and late March 2019. The results of this sampling are summarised in Table 9 and illustrated in Figure 6.

Table 9 Statistical summary of bacteriological monitoring at Middleton Bay

Parameter		Units	Number of samples	Minimum	Maximum	Median
SEM samples	Specific conductivity	µS/cm@25°C	13	53,400	55,000	54,100
	Enterococci	cfu/100 ml	13	<1	54	3
	Temperature	°C	13	16.7	23.1	20.1

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.

The very high water quality was emphasised by the seasonal median count of 3 enterococci (per 100 ml) for the 13 samples collected during the survey period.

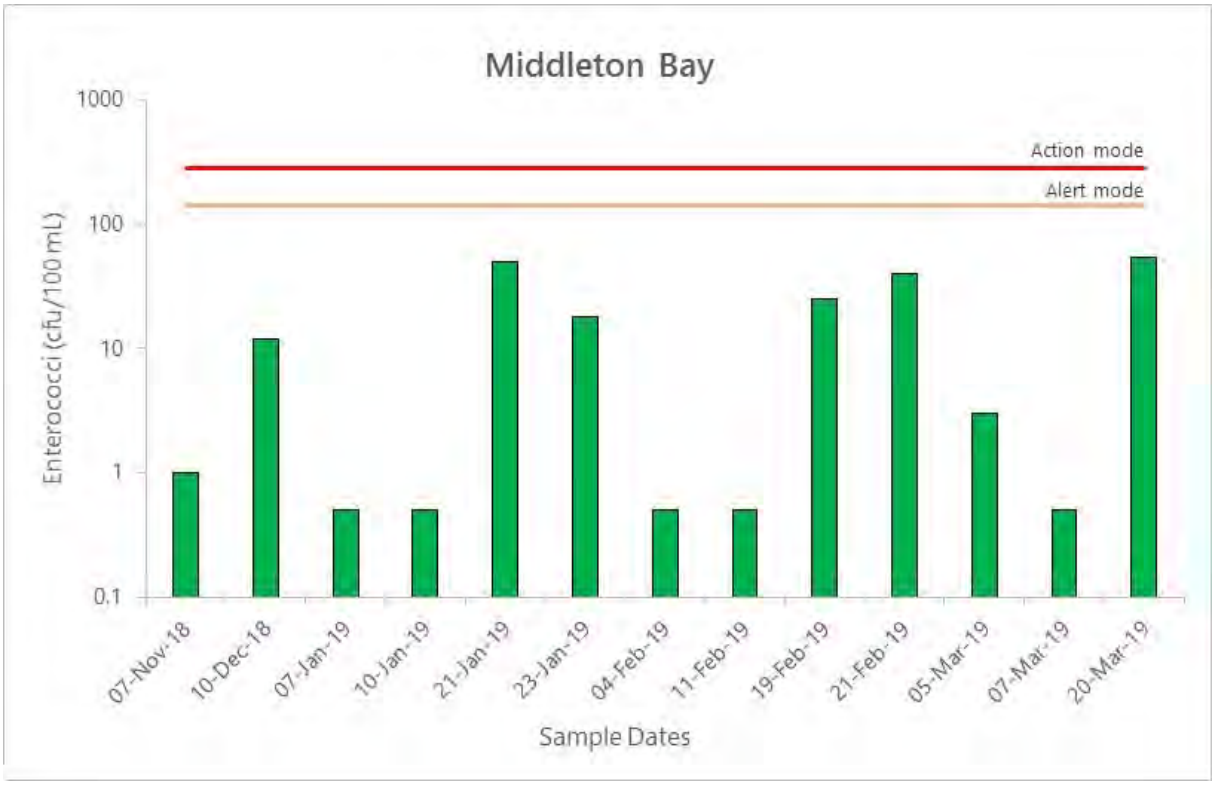

Figure 6 Bacteriological (enterococci) results from Middleton Bay during summer 2018-2019

2.4 Incidents, investigations, and interventions

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 STDC. 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 causes of non-compliance or failure to maintain good practices. A pro-active approach, that in the first instance avoids issues occurring, is favoured.

For all significant compliance issues, as well as complaints from the public, the Council maintains a database record. The record includes events where the individual/organisation concerned has itself notified the Council. Details of any investigation and corrective action taken are recorded for non-compliant events.

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 individual/organisation is indeed the source of the incident (or that the allegation cannot be proven).

Table 10 below sets out details of any incidents recorded, additional investigations, or interventions required by the Council in relation to the Opunake WWTP during the 2018-2019 period. This table presents details of all events that required further investigation or intervention regardless of whether these were found to be compliant or not.

Table 10 Incidents, investigations, and interventions summary table

Date	Details	Compliant (Y/N)	Enforcement Action Taken?	Outcome
14 Aug 2018	During routine monitoring it was found that ponding of partially treated sewage was occurring in the trench disposal area at the Opunake municipal treatment facility. The site is the subject of an Abatement Notice EAC-22064, which was issued requiring works to be undertaken by 29 June 2018.	N	Prior abatement notice (issued 15 June 2018)	An extension was granted to allow works to be completed when weather allowed.
24 Jan 2019	Follow-up inspection to assess compliance with abatement notice EAC-22064. There was no ponding or evidence of recent ponding or overland flow. No evidence of recent earthworks or re-contouring (required by abatement notice)	N	Prior abatement notice (issued 15 June 2018)	STDC advised to carry out earthworks as required by abatement notice.
11 Feb 2019	During routine monitoring it was found that the site was not operating within resource consent conditions. Ponding had occurred in contravention of special condition 6 of consent 4248-2 and works required by Abatement Notice EAC-22064 had not been undertaken.	N	Prior abatement notice (issued 15 June 2018)	An explanation was received.
4 Apr 2019	Follow-up inspection to assess compliance with abatement notice EAC-22064. Works had been completed and there was no sign of ponding or overland flow.	Y	Prior abatement notice (issued 15 June 2018)	Site compliant.

3 Discussion

3.1 Discussion of site performance

The STDC Opunake WWTP was found to be generally well managed during the 2018-2019 year. Good liaison was maintained between STDC and the Council.

There were ongoing issues with ponding on the soakage trenches following on from an abatement notice issued in the previous monitoring period. This took a number of months to resolve as the area needed to dry fully before recontouring could take place in the 2019 summer. During the final inspection of the year in June ponding was again noted in the area.

3.2 Environmental effects of exercise of consents

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 was very good, reflecting the consistently high performance of the WWTP system, with significant reductions in bacterial loadings. The discharge from the reticulated soakage trench system into the unnamed coastal tributary had no measurable effects on the bacteriological quality of the coastal receiving waters of the Tasman Sea in the vicinity of the stream's mouth, however visual effects were noted in the stream and receiving waters on the one occasion this was able to be accessed.

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. There were no exceedances of the contact recreational bacteriological 'Action' guideline during the season at either site. This continued the trend of high bacteriological water quality measured at Opunake Beach over the previous 24 summers.

3.3 Evaluation of performance

A tabular summary of the consent holder's compliance record for the year under review is set out in Tables 11-13.

Table 11 Summary of performance for consent 0236-6

Purpose*: To intermittently discharge up to 4,666 cubic metres/day of comminuted wastewater, from an ocean outfall in Middleton Bay, Opunake, Taranaki, to the Tasman Sea*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Adopt best practicable option	Inspection	Yes
2. Consent exercised in accordance with documentation	Inspections	Yes
3. Upgrade design and implementation	Liaison with consent holder	Yes
4. Upgrade reporting	Upgrade completed	Yes
5. Limits upon reasons for discharge	Reporting by consent holder	Yes
6. Limits on solids discharged	Inspections and reporting by consent holder	Yes
7. Notification of discharge	Notification received	Yes

Purpose: *To intermittently discharge up to 4,666 cubic metres/day of comminuted wastewater, from an ocean outfall in Middleton Bay, Opunake, Taranaki, to the Tasman Sea*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
8. Overflow reporting requirement	Report received	Yes
9. Provision of contingency plan	Reporting by consent holder	Yes
10. Maintenance of signage	Inspections	Yes
11. Notification to TDHB	Consent holder reporting	Yes
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	Yes
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**

Table 12 Summary of performance for consent 4248-2

Purpose: *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*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Requirements of system design and operation	Inspections	Yes
2. Adopt best practicable option	Inspection, chemical sampling and biomonitoring	Yes
3. Requirements of the management plan	Documents provided	Yes
4. Operator requirements	Liaison with STDC, inspections	Yes
5. Aerobic conditions in the pond	Dissolved oxygen monitoring	Yes
6. Limits to the duration of ponding on the land surface	Inspection	No – ongoing issues with ponding in trench soakage area
7. Limits on the overland flow of wastewater	Inspection	Yes
8. Monitoring requirements	Liaison with STDC, physiochemical monitoring	Yes
9. New trade wastes connections	Liaison with STDC	N/A
10. Effects of the discharge on receiving waters	Inspection, physicochemical sampling	Yes

Purpose: *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*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
11. Reporting requirements	Reports provided	Yes
12. Review of consent	No further review provision	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**Improvement required**
Overall assessment of administrative performance in respect of this consent		**High**

N/A = not applicable

Table 13Summary of performance for consent 4577-3

Purpose*: To place and maintain the Opunake marine outfall structure within the coastal marine area at Middletons Bay*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Notification of maintenance works	No maintenance performed	N/A
2. Prevention of seabed and foreshore disturbance during maintenance works	No maintenance performed	N/A
3. General maintenance provision	Liaison with STDC	Yes
4. Removal and reinstatement requirements	Structure still in place	N/A
5. 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**

Table 14 Evaluation of environmental performance over time

Year	High	Good	Improvement req	Poor
2010-11	1	-	-	-
2011-12	1	-	-	-
2012-13	1	-	-	-
2013-14	1	-	-	-
2014-15	1	-	-	-
2015-16	1	-	-	-
2016-17	-	1	-	-
2017-18	-	1	-	-

Year	High	Good	Improvement req	Poor
Totals	6	2	0	0

During the year, STDC demonstrated a high level of environmental and good level of administrative performance with the resource consent as defined in Section 1.1.4. During the year under review there were ongoing issues associated with ponding in the trench disposal area. An abatement notice had been issued regarding this in the previous monitoring period and, although remedial earthworks were eventually undertaken, ponding was again noted in the final inspection for the year. Ponding was again noted in the final winter inspection. There were no documented overflows from the emergency outfall.

Monitoring of receiving waters showed that the treated discharge from the WWTP was not having a minor significant impact on the receiving environment. Contact recreational monitoring throughout the summer period showed that there were no exceedances of the recommended guidelines, and water quality at both Opunake Beach and Middleton Bay continues to be of a high standard.

3.4 Recommendations from the 2017-2018 Annual Report

In the 2017-2018 Annual Report, it was recommended:

1. THAT in the first instance, monitoring of consented activities at Opunake WWTP in the 2018-2019 year continue at the same level as in 2017-2018.
2. THAT should there be issues with environmental or administrative performance in 2018-2019, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.

Recommendation one was implemented as programmed. Two additional site inspections were carried out to assess compliance with an abatement notice issued in the prior monitoring period as per recommendation two.

3.5 Alterations to monitoring programmes for 2019-2020

In designing and implementing the monitoring programmes for air/water discharges in the region, the Council has taken into account:

- the extent of information already made available through monitoring or other means to date;
- its relevance under the RMA;
- the Council's obligations to monitor consented activities and their effects under the RMA;
- the record of administrative and environmental performances of the consent holder; and
- reporting to the regional community.

The Council also takes into account the scope of assessments required at the time of renewal of permits, and the need to maintain a sound understanding of industrial processes within Taranaki exercising resource consents.

It is proposed that for 2019-2020 monitoring of consented activities at the Opunake WWTP continue at the same level as in 2017-2018. A recommendation to this effect is attached to this report.

It should be noted that the proposed programme represents a reasonable and risk-based level of monitoring for the site in question. The Council reserves the right to subsequently adjust the programme from that initially prepared, should the need arise if potential or actual non-compliance is determined at any time during 2019-2020.

4 Recommendations

1. THAT in the first instance, monitoring of consented activities at Opunake WWTP in the 2019-2020 year continue at the same level as in 2018-2019.
2. THAT should there be issues with environmental or administrative performance in 2019-2020, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.

Glossary of common terms and abbreviations

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

Biomonitoring	Assessing the health of the environment using aquatic organisms.
BOD	Biochemical oxygen demand. A measure of the presence of degradable organic matter, taking into account the biological conversion of ammonia to nitrate.
BODF	Biochemical oxygen demand of a filtered sample.
cfu	Colony forming units. A measure of the concentration of bacteria usually expressed as per 100 millilitre sample.
Conductivity	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 25°C and expressed in mS/m.
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 colony forming units per 100 millilitre sample.
Ent	Enterococci, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre of sample.
Fresh	Elevated flow in a stream, such as after heavy rainfall.
g/m^3	Grams per cubic metre, and equivalent to milligrams per litre (mg/L). In water, this is also equivalent to parts per million (ppm), but the same does not apply to gaseous mixtures.
Incident	An event that is alleged or is found to have occurred that may have actual or potential environmental consequences or may involve non-compliance with a consent or rule in a regional plan. Registration of an incident by the Council does not automatically mean such an outcome had actually occurred.
Intervention	Action/s taken by Council to instruct or direct actions be taken to avoid or reduce the likelihood of an incident occurring.
Investigation	Action taken by Council to establish what were the circumstances/events surrounding an incident including any allegations of an incident.
Incident Register	The Incident Register contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan.
L/s	Litres per second.
m^2	Square Metres.
MfE	Ministry for the Environment
mS/m	Millisiemens per metre.
NH_4^+	Ammonium, normally expressed in terms of the mass of nitrogen (N).
NH_3	Unionised ammonia, normally expressed in terms of the mass of nitrogen (N).
NO_3^-	Nitrate, normally expressed in terms of the mass of nitrogen (N).
NO_2^-	Nitrite, 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 including all subsequent amendments.
SFRG	Suitability for Recreational Grading. Describes the general condition of a site based on risk as well as indicator bacteria water quality.
SS	Suspended solids.
SEM	State of Environment
Temp	Temperature, measured in °C (degrees Celsius).
TKN	Total Kjeldahl nitrogen. Combination of organic nitrogen, NH_3, and NH_4^+.
Turb	Turbidity, expressed in NTU.
WWTP	Wastewater treatment plant.

For further information on analytical methods, contact a Science Services Manager.

Bibliography and references

Department of Health, 1992: *'Provisional microbiological water quality guidelines for recreational and shellfish gathering waters in New Zealand'*. Public Health Services, Department of Health, Wellington.

MfE, 1998: *Bacteriological water quality guidelines for marine and fresh water: Guidelines for the management of recreational and marine shellfish-gathering waters.* Ministry for the Environment publication.

MfE, 2003: *Microbiological water quality guidelines for marine and freshwater recreational areas.* Ministry for the Environment publication.

Ministry for the Environment. 2018. Best Practice Guidelines for Compliance, Monitoring and Enforcement under the Resource Management Act 1991. Wellington: Ministry for the Environment.

Resource and Environment, 2000: *Assessment of environmental effects for the renewal of coastal permit TRK970236, the occasional discharge of wastewater to Middleton Bay.* Report to South Taranaki District Council.

South Taranaki District Council 2007: *Management Plan for Opunake Wastewater Plant.* STDC report, 10pp.

South Taranaki District Council 2015: *Management Plan for Opunake Wastewater Plant.* STDC report, 11pp.

Taranaki Regional Council 2018: *South Taranaki District Council Opunake WWTP Monitoring Programme Annual Report 2017-2018.* TRC Technical Report 2018-36.

Taranaki Regional Council 2017: *South Taranaki District Council Opunake WWTP Monitoring Programme Annual Report 2016-2017.* TRC Technical Report 2017-40.

Taranaki Regional Council 2017a: *State of the Environment Monitoring Report. Bathing Beach Water Quality 2016-2017.* TRC Technical Report 2017-01.

Taranaki Regional Council 2016: *South Taranaki District Council Opunake WWTP Monitoring Programme Annual Report 2015-2016.* TRC Technical Report 2016-31.

Taranaki Regional Council 2016: *State of the Environment Monitoring Report. Bathing Beach Water Quality 2015-2016.* TRC Technical Report 2016-02.

Taranaki Regional Council 2015: *South Taranaki District Council Opunake Wastewater Treatment System Monitoring Programme Annual Report 2014-2015.* TRC Technical Report 2015-10.

Taranaki Regional Council 2015: *State of the Environment Monitoring Report. Bathing Beach Water Quality 2014-2015.* TRC Technical Report 2015-01.

Taranaki Regional Council 2014: *South Taranaki District Council Opunake Wastewater Treatment System Monitoring Programme Annual Report 2013-2014.* TRC Technical Report 2014-17.

Taranaki Regional Council 2013: *South Taranaki District Council Opunake Wastewater Treatment System Monitoring Programme Annual Report 2012-2013.* TRC Technical Report 2013-18.

Taranaki Regional Council 2012: *South Taranaki District Council Opunake Wastewater Treatment System Monitoring Programme Annual Report 2011-2012.* TRC Technical Report 2012-17.

Taranaki Regional Council 2011: *South Taranaki District Council Opunake Wastewater Treatment System Monitoring Programme Annual Report 2010-2011.* TRC Technical Report 2011-14.

Taranaki Regional Council 2010: *South Taranaki District Council Opunake Wastewater Treatment System Monitoring Programme Annual Report 2009-2010.* TRC Technical Report 2010-19.

Taranaki Regional Council 2009: *South Taranaki District Council Opunake Wastewater Treatment System Monitoring Programme Annual Report 2008-2009.* TRC Technical Report 2009-48.

Taranaki Regional Council 2008: *South Taranaki District Council Opunake Wastewater Treatment System Monitoring Programme Annual Report 2007-2008*. TRC Technical Report 2008-55.

Taranaki Regional Council 2008a: *Recreational use of coast, rivers and lakes in Taranaki 2007-2008*. TRC Report.

Taranaki Regional Council 2007: *South Taranaki District Council Opunake Wastewater Treatment System Monitoring Programme Annual Report 2006-2007*. TRC Technical Report 2007-67.

Taranaki Regional Council 2006: *South Taranaki District Council Opunake Wastewater Treatment System Monitoring Programme Annual Report 2005-2006*. TRC Technical Report 2006-71.

Taranaki Regional Council 2005: *South Taranaki District Council Opunake Wastewater Treatment System Monitoring Programme Annual Report 2004-2005*. TRC Technical Report 2005-53.

Taranaki Regional Council 2004: *South Taranaki District Council Opunake Wastewater Treatment System Monitoring Programme Annual Report 2003-2004*. TRC Technical Report 2004-33.

Taranaki Regional Council 2003: *South Taranaki District Council Opunake Wastewater Treatment System Monitoring Programme Annual Report 2002-2003*. TRC Technical Report 2003-42.

Taranaki Regional Council 2002: *South Taranaki District Council Opunake Wastewater Treatment System Monitoring Programme Annual Report 2001-2002*. TRC Technical Report 2002-12.

Taranaki Regional Council 2001: *South Taranaki District Council Opunake Wastewater Treatment System Monitoring Programme Annual Report 2000-2001*. TRC Technical Report 2001-53.

Taranaki Regional Council 2000: *South Taranaki District Council Opunake Wastewater Treatment System Monitoring Programme Annual Report 1999-2000*. TRC Technical Report 2000-26.

Taranaki Regional Council 1999: *South Taranaki District Council Opunake Wastewater Treatment System Monitoring Programme Annual Report 1998-99*. TRC Technical Report 99-66.

Taranaki Regional Council 1998b: *South Taranaki District Council: Hawera Municipal Wastewater Treatment System Monitoring Programme Annual report 1997-98*. TRC Technical Report 98-44.

Taranaki Regional Council 1998a: *South Taranaki District Council Opunake Wastewater Treatment System Monitoring Programme Annual Report 1997-98*. TRC Technical Report 98-40.

Taranaki Regional Council 1997: *South Taranaki District Council Opunake Wastewater Treatment System Monitoring Programme Annual Report 1996-97*. TRC Technical Report 97-62.

Taranaki Regional Council 1996: *South Taranaki District Council Municipal Oxidation Ponds Systems Monitoring Programme Annual Report 1995-96*. TRC Technical Report 96-43.

Taranaki Regional Council 1995: *South Taranaki District Council Municipal Oxidation Ponds Systems Monitoring Programme Annual Report 1994-95*. TRC Technical Report 95-46.

Taranaki Regional Council 1994: *South Taranaki District Council Municipal Oxidation Ponds Systems Monitoring Programme Annual Report 1993-94*. TRC Technical Report 94-9.

Taranaki Regional Council 1993: *South Taranaki District Council Municipal Oxidation Ponds Systems Monitoring Programmes Annual Report 1992-93*. TRC Technical Report 93-21.

Appendix I

Resource consents held by South Taranaki District Council

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

Consent number	Purpose	Granted	Review	Expires
Water discharge permits				
0236-6	To discharge up to 4,666 cubic metres per day of comminuted wastewater from an ocean outfall in Middleton Bay, Opunake, to the Tasman Sea	April 2006	-	June 2018*
4248-2	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	June 2003	-	June 2018*
Coastal permit				
4577-3	To place and maintain the Opunake marine outfall structure within the coastal marine area at Middletons Bay	December 2005	-	June 2018*

Water abstraction permits

Section 14 of the RMA stipulates that no person may take, use, dam or divert any water, unless the activity is expressly allowed for by a resource consent or a rule in a regional plan, or it falls within some particular categories set out in Section 14. Permits authorising the abstraction of water are issued by the Council under Section 87(d) of the RMA.

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. Permits authorising discharges to water are issued by the Council under Section 87(e) of the RMA.

Air discharge permits

Section 15(1)(c) of the RMA stipulates that no person may discharge any contaminant from any industrial or trade premises into air, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations. Permits authorising discharges to air are issued by the Council under Section 87(e) of the RMA.

Discharges of wastes to land

Sections 15(1)(b) and (d) of the RMA stipulate that no person may discharge any contaminant onto land if it may then enter water, or from any industrial or trade premises onto land under any circumstances, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations. Permits authorising the discharge of wastes to land are issued by the Council under Section 87(e) of the RMA.

Land use permits

Section 13(1)(a) of the RMA stipulates that no person may in relation to the bed of any lake or river use, erect, reconstruct, place, alter, extend, remove, or demolish any structure or part of any structure in, on, under, or over the bed, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations. Land use permits are issued by the Council under Section 87(a) of the RMA.

Coastal permits

Section 12(1)(b) of the RMA stipulates that no person may erect, reconstruct, place, alter, extend, remove, or demolish any structure that is fixed in, on, under, or over any foreshore or seabed, unless the activity is

expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations. Coastal permits are issued by the Council under Section 87(c) of the RMA.

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

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Director-Resource Management

Discharge Permit

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

Name of Consent Holder:	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

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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
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

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Director-Resource Management