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

Technical Report 2019-40

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Executive summary

The South Taranaki District Council (STDC) operates a municipal wastewater treatment plant (WWTP) located on Castle Street at Eltham, in the Waingongoro catchment. 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 STDC'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 STDC's activities.

STDC holds one resource consent to discharge treated wastewater into an unnamed tributary of the Mangawhero Stream only in the event of high rainfall. This consent includes nine conditions setting out the requirements that they must satisfy.

During the monitoring period, South Taranaki District Council demonstrated an overall good level of environmental performance.

The Council's monitoring programme for the year under review included five inspections and associated odour surveys, five pond effluent and 36 downstream water samples collected for physicochemical analysis, and two biomonitoring surveys of receiving waters.

The monitoring showed that activities at the Eltham WWTP were generally well managed. All wastewater was pumped to the Hawera WWTP and there were no consented overflows to the unnamed tributary of the Mangawhero Stream.

As in previous years, the monitoring indicated a continual improvement in water quality and the biological health of the downstream environment associated with the diversion of wastes out of the Mangawhero Stream to the Hawera WWTP in the 2010-2011 period.

There was one unauthorised incident in relation to odours from the WWTP during the year.

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

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 Taranaki Regional Council (the Council) on the monitoring programme associated with resource consents held by South Taranaki District Council (STDC), for the operation of a municipal wastewater treatment plant (WWTP) situated on Castle Street at Eltham.

The report includes the results and findings of the monitoring programme implemented by the Council in respect of the consent held by STDC that relates to the discharge of treated wastewater in the Waingongoro catchment (limited to events associated with high rainfall). This is the 32nd 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 Waingongoro catchment;
- the nature of the monitoring programme in place for the period under review; and
- a description of the activities and operations conducted at the Eltham 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, 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

Historically, the Eltham township sewage treatment has been provided by a two oxidation pond system. The original design was based on a population of 5,500 persons, prior to the installation of mechanical aeration. Various industrial wastes have also been accepted for treatment by this system. Mechanical aeration of the primary oxidation pond was introduced because of overloading of the two pond system as a consequence of the incorporation of these industrial wastes.

Over time it became evident that the treatment system was not capable of coping with the waste loadings it was receiving. From time to time complaints were received by STDC and the Council concerning objectionable odours emanating from the ponds system as well as various other environmental and maintenance issues.

Poor stream water quality conditions had also been identified on occasion upstream of the oxidation ponds' discharge.

During the 2004-2005 monitoring period, investigation and reviews relating to the proposed pipeline diversion of wastes (out of the Mangawhero Stream) to the Hawera WWTP were completed. The pipeline diversion was completed in June, 2010 following the pipeline and pump station construction.

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[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

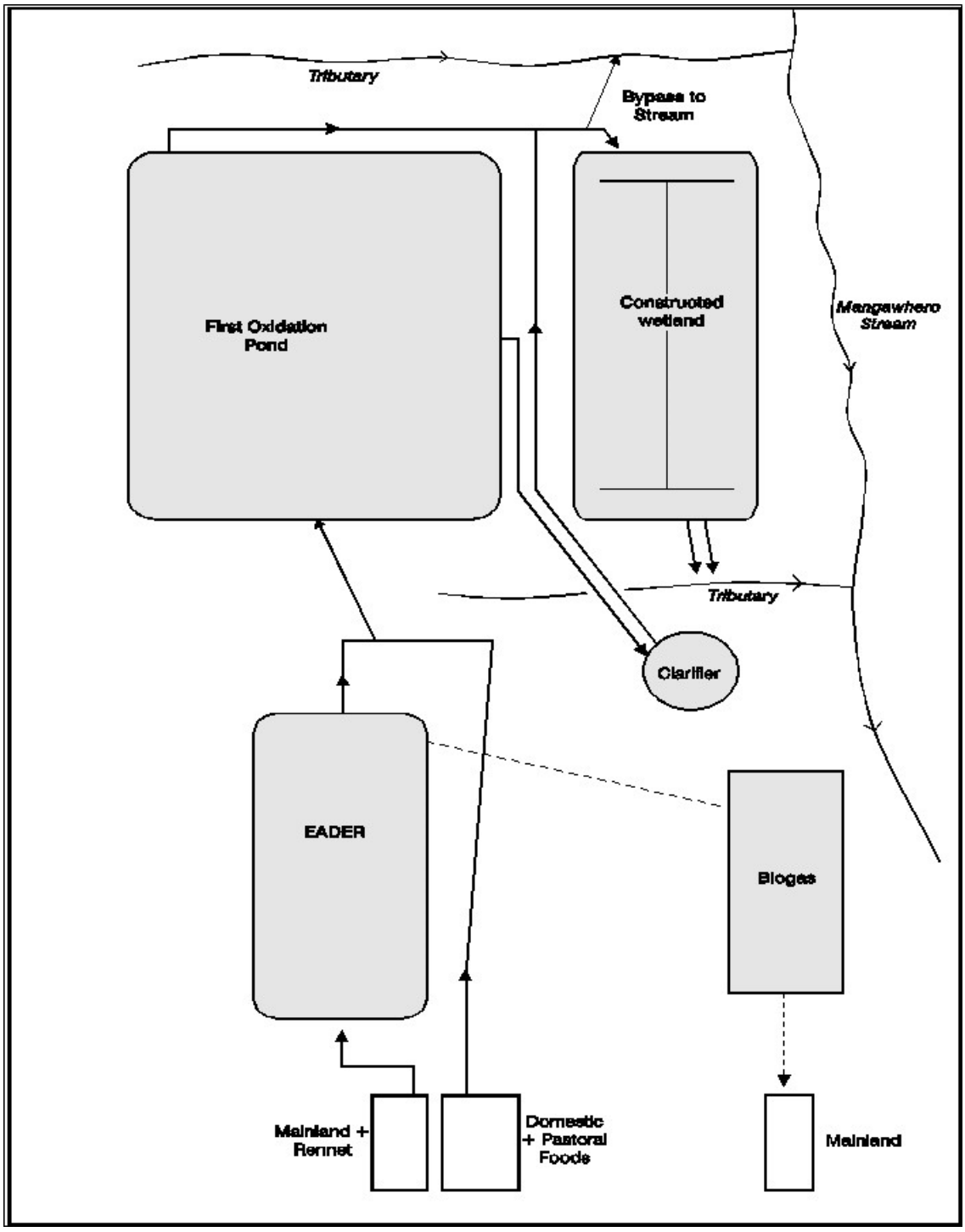

Figure 1 Schematic layout of Eltham WWTP prior to the diversion of wastewater to the Hawera WWTP

The layout of the wastewater plant as it existed prior to the new pipeline diversion is illustrated in Figure 1.

Reconfiguration of the wetland to act as a storage pond was undertaken following full diversion of wastes to the Hawera pipeline.

The primary pond was desludged during the 2006-2007 monitoring year with the dewatered sludge contained in geo-textile bags in an excavated, bunded area adjacent to the Earthen Anaerobic Digester (EADER) (Figure 2). A consent to discharge sludge from the WWTP and STDC water treatment plants to land at the Eltham WWTP site was granted in December 2009 following concerns voiced by neighbours in relation to STDC's disposal of water treatment sludge at the site.

Figure 2 Aerial view of the Eltham WWTP

Work commenced on the pipeline connection to the Hawera WWTP during the latter half of the 2008-2009 monitoring period. A step screen and new inlet to the primary pond were constructed on the raw wastewater reticulation and a new stormwater pipe from this area was directed to the wetland. The wetland was converted to a holding pond in early 2011 to provide high stormwater ingress containment in excess of the pumping capacity of the new pipeline connection. This system is anticipated to have an overflow frequency of one to two occasions in any five year period necessitating a new consent for this discharge which was granted in November, 2009 (consent 7521). Monitoring of overflows from the pond is provided and incorporated within the consent holder's telemetry system.

The new pipeline was operational by June 2010 and the full upgrade (e.g. conversion of the wetland to a storage pond) was completed in early 2011 with the vegetation removed and buried with the sludge. This was covered, levelled, and replanted by the consent holder in the latter part of the 2011-2012 monitoring period. Discharges to the stream ceased completely in late June 2010.

Stormwater infiltration investigative work has been continued by STDC, particularly in relation to illegal connections to the sewerage reticulation. Re-lining of sewerage pipelines has been undertaken by STDC since 2011, with 166 m of pipeline re-lined in the 2017-2018 period.

No authorised overflows as per consent 7521-1 to the Mangawhero Stream were necessary at any time during the 2018-2019 monitoring period.

The EADER was decommissioned during the 2015-2016 period by way of re-lining and burial.

No usage of the Eltham WWTP for disposal of industrial tanker wastes (e.g. septic tank wastes etc.) now occurs as there are purpose-built facilities in place to accept these wastes at the nearby Stratford oxidation ponds and more appropriately, the Hawera system. Monitoring of waste influent in the ponds is performed by STDC (by way of continuous recording of volume and periodic industrial wastewater quality sampling), ensuring that stricter control of such usage now occurs.

1.3 Resource consent

The Company holds one resource consent, 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 Appendix I, as is a copy of the permit.

Table 1 Summary of resource consent held by STDC in relation to the Eltham WWTP

Consent number	Purpose	Granted	Review	Expires
Water discharge permit				
7521-1	To discharge, as a consequence of high rainfall, partially treated wastewater from the Eltham Wastewater Treatment Plant into an unnamed tributary of the Mangawhero Stream in the Waingongoro catchment.	November 2009	June 2021	June 2027

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 Eltham WWTP consisted of four 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 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 Eltham WWTP was visited five times during the monitoring period. The main points of interest were plant processes with potential or actual discharges to receiving watercourses, including contaminated stormwater and process wastewaters. Air inspections focused on plant processes with associated actual and potential emission sources and characteristics, including potential odour, dust, noxious or offensive emissions. 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 Chemical sampling

The Council undertook sampling of the effluent in the primary pond adjacent to the discharge point on four occasions for microfloral quality and five times in relation to dissolved oxygen levels.

Routine monthly 'State of the Environment Monitoring' (SEM) occurs at three sites downstream of the WWTP. The results of this monitoring are included for comparison purposes and to provide baseline analysis in the event of any discharges from the Eltham WWTP.

1.4.5 Biomonitoring surveys

A biological survey was performed on two occasions in an unnamed tributary of the Mangawhero Stream to continue to monitor the improvement of the stream following diversion of the effluent to the Hawera WWTP.

This information will also be used to determine whether or not the discharge of treated wastewater from the site has had a detrimental effect upon the macroinvertebrate communities of the stream in the event of any discharges.

2 Results

2.1 Inspections

30 July 2018

Maintenance was being carried out to the step screen at the time of the inspection. Wastes were fully contained. The primary pond was relatively clear with a pale green colour. The pond level was normal with six bubble and two paddle aerators operating.

'Biobugs' were being continually dosed into the pond to maintain a desired sludge level. Over 100 mallard ducks were present on the pond's surface.

Surface water from the holding pond was being pumped back into the discharge sump as required.

The Eltham WWTP was discharging to the Hawera WWTP at a rate of 60 m^3/hr, this was being pumped continuously after a recent wet weather period. The WWTP and surrounding areas were found to be tidy with no odour issues noted.

15 October 2018

Screened wastes were fully contained and waste bins were covered resulting in minimal odour. The level in the primary pond was normal and this was turbid with a green-brown colour. Seven of the ten aerators were operating, creating good pond circulation.

'Biobugs' continued to be dosed into the pond to maintain a desired sludge level. Approximately 250 ducks were present.

Minor amounts of surface water were observed in the holding pond, this was being pumped back into the discharge sump as required.

The WWTP and surrounding areas were found to be tidy and no odour issues were noted from around the pond perimeter.

25 January 2019

An inspection was conducted in fine, calm conditions. The step screen was operating and wastes were fully contained. Pond level was normal in the primary pond and this was turbid brown. All aerators were operating apart from one set which was being serviced.

'Biobugs' continued to be dosed to the primary pond. There were numerous mallard and paradise ducks on the primary pond. Fish and Game were due to cull paradise duck numbers shortly.

There were slightly noticeable odours around the inlet and step screen areas. No odour issues were noted around the pond perimeter nor beyond the southern boundary. The WWTP surrounds were found to be tidy.

The Eltham WWTP was discharging to the Hawera WWTP daily between the hours of 4.00 pm and 8.00 am at a rate of 70 m^3/hr.

26 February 2019

An additional inspection was undertaken at the Eltham WWTP in response to receiving several odour complaints from nearby residents (Council Investigating Officers had also visited the site at the time these complaints were received).

The primary pond was turbid green-grey in colour. No scum or sheen was observed on the surface, which was operating at a normal level.

The weather was fine, with light north-easterly wind conditions prevailing. An odour survey was conducted along the southern pond perimeter. The odour strength emanating from off the pond was estimated at 3 (refer to section 2.1.1 for rating scale), with a very distinct sulphide-type smell.

Dissolved oxygen was measured at 0.90 ppm with a saturation of 9.4%. These very low dissolved oxygen levels indicated that high trade waste loadings were potentially an issue. STDC were dosing sodium nitrate into the inlet of the pond to help elevate the dissolved oxygen. An extra set of aerators were due to be put into service later in the day. Although the dissolved oxygen concentration in the pond was aerobic at the time of the inspection, there remained a potential that further discharges into the WWTP system could cause anaerobic conditions in the pond, potentially resulting in a pungent septic odour being emanated.

Eltham residents had been informed of issues with the pond via a public letter drop. Council Investigating Officers were scheduled to follow-up with STDC on progress with the pond over the following days.

30 April 2019

The step screen was operating and wastes were fully contained. The level in the primary pond was slightly higher than usual due to recent heavy rainfall throughout the catchment. This was turbid and green-brown in colour. All aerators except the large Fonterra aerator were operating. A set of '4 Earth' aerators had been set up on the pond inlet. There were numerous birds present on the pond with an estimated excess of 1,000 mallard and paradise ducks.

Minor amounts of stormwater were noted in the holding pond following the recent wet weather. Surface water was being pumped back to the main pond as required.

There were noticeable odours around the inlet and step screen areas, however no odour was noted around the pond perimeter or beyond the southern boundary. The WWTP surrounds were tidy.

Eltham WWTP was discharging continuously to the Hawera WWTP at a rate of 90 m^3/hr.

2.1.1 Odour surveys

Four routine odour surveys were carried out during the monitoring period in conjunction with all programmed site inspections. Odour strength was rated according to the following scale:

0 = no noticeable odours;

1 = slight occasional wafts;

2 = recognisable and noticeable;

3 = frequently noticeable;

4a = unpleasant odours, frequently strong;

4b = unpleasant odours, continuous and noticeable; and

5 = putrid.

The strength of odour beyond the boundaries of the WWTP site appears to be governed largely by weather conditions. Odour is strongest under calm condition, when aerial emissions from the pond accumulate. This effect is accentuated when it is overcast, as vertical mixing with ambient air is reduced, and under warm temperatures, when odour-generating bacteria in the pond are most active. Effects may be exacerbated by reduction in aeration capacity (mechanical) in the pond and deterioration in the microfloral population of this pond. Aeration capacity was maintained adequately throughout the 2018-2019 period.

Odours from the Eltham WWTP will occur from time to time and will vary in their effect depending upon ambient weather conditions. Therefore, they may only be documented by way of continuing monitoring and recording of incidents, in conjunction with the monitoring of the system now that connection to the Hawera

WWTP pipeline has been completed. It is essential that sufficient aeration is provided and capacity is maintained in the primary oxidation pond at all times, particularly coincident with seasonal changes in pond floral communities. It is also essential that the pre-treatment of industrial wastes is maintained to a satisfactory standard at all times prior to discharge into the WWTP.

No odour was detected beyond the boundary during any of the four routine inspections, however as noted in the additional inspection notes from 26 February, there were issues with odour at the site during late February 2019 (discussed further in Section 2.4).

2.2 Results of effluent monitoring

With the diversion of wastes to the Hawera WWTP in the 2010-2011 period, discharges from the Eltham WWTP now occur only as a result of high rainfall events that exceed the storage capacity of the primary and holding ponds, and the pumping capacity of the reticulated system to Hawera.

Analysis of the primary pond effluent was not required during the monitoring period, although the condition of the pond and any associated odour continues to be monitored during routine inspections.

Along with a visual survey of the primary pond and surrounds, dissolved oxygen levels (DO) and the microfloral component of the pond are measured during each inspection.

2.2.1 Dissolved oxygen levels

The dissolved oxygen concentrations in WWTPs vary 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. Another significant influence in the Eltham system is the degree of mechanical aeration provided in the primary pond (required by the high industrial wastes loadings on the system). 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 the aerators' DO probe are included in Table 2.

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

Date	Time (NZST)	Temperature (°C)	Dissolved Oxygen	
			Concentration (g/m^3)	Saturation (%)
30 Jul 2018	0950	10.6	5.1	46
15 Oct 2018	0925	14.3	8.3	81
25 Jan 2019	0805	21.6	3.3	49
26 Feb 2019 *	0900	17.6	0.9	9
30 Apr 2019	1030	14.8	5.2	52

* Follow up inspection due to excessive persistent odour at the WWTP

Results in Table 1 indicated a wide range of dissolved oxygen concentrations (between 9% and 81% saturation) in the surface layer of the primary pond near the outlet. These were typical of the levels generally recorded in this heavily loaded oxidation pond (i.e. supersaturation is seldom recorded). Mechanical aeration of the pond maintained positive dissolved oxygen concentrations on each survey occasion with the lowest concentration measured during the summer period.

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 scheduled 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 effluent 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
30 Jul 2018	0950	Clear, pale green	3	4	< 1-745	280
15 Oct 2018	0925	Turbid, green brown	3			
25 Jan 2019	0805	Turbid, brown	1,620			
30 Apr 2019	1030	Slightly turbid, green brown	70			

Levels of chlorophyll-a in the primary pond were found to be mostly low during the monitoring period, with the exception of January 2019 where chlorophyll-a was the highest ever recorded in the pond. The generally low levels are indicative of the high organic wastes' loadings on this system, particularly considering the additional mechanical aeration provided within this period to increase DO concentrations.

2.2.3 Holding pond conditions

No odours were associated with the holding pond at the time of any inspection visit. The pond contained stormwater or seepage only following wet weather. All water and wastes from the pond were pumped directly into the Hawera WWTP pipeline. No overflows occurred to the unnamed tributary of the Mangawhero Stream.

2.3 Results of receiving environment monitoring

Water quality monitoring is carried out downstream of the WWTP as required to assess the effects of any discharges from the WWTP. There were no discharges to the stream during the 2018-2019 period. Routine monthly 'State of the Environment Monitoring' (SEM) occurs at three sites downstream of the WWTP, and the results of this monitoring are included for comparison purposes and to provide baseline analysis in the event of any discharges from the Eltham WWTP.

In addition to this, two biomonitoring surveys, one in spring and one in summer, were carried out to assess the ecological impacts of the diversion, and to provide background data in the event that a discharge from the WWTP should occur.

The lower Mangawhero Stream and Waingongoro River biological and chemical sampling sites are shown in Figure 3.

2.3.1 Chemical sampling surveys

Monthly water quality monitoring is carried out at the lower Mangawhero Stream and two Waingongoro River sites as part of the State of the Environment Monitoring' (SEM) (Table 4), this is displayed for comparison purposes with any future discharges and to provide baseline water quality parameters for the Mangawhero Stream and Waingongoro River.

A summary of this data is presented in Table 4.

Table 4 Water quality results downstream of the Eltham WWTP

Parameter	Units	MWH000498		WGG000620		WGG000640	
		Range	Median	Range	Median	Range	Median
Temperature	°C	11.1-20.0	15.5	10.1-21.4	14.8	10.5-21.2	15.2
Conductivity @ 25°C	mS/m	18.8-24.8	19.5	12.1-14.9	13.5	13.8-16.6	15.2
Chloride	g/m^2	17.4-23.0	19.0	11.0-14.1	12.1	12.4-15.5	13.9
pH	pH	7.3-7.9	7.6	7.3-7.9	7.7	7.4-7.9	7.7
DRP	g/m^2 P	0.0085-0.056	0.026	0.0176-0.140	0.030	0.0027-0.104	0.031
Total phosphorus	g/m^2 P	0.032-0.120	0.062	0.028-0.156	0.050	0.036-0.122	0.054
Unionised Ammonia	g/m^2 N	<0.00006-0.01	0.00027	<0.00007-0.0059	0.00056	<0.00006-0.005	0.00062
Ammoniacal Nitrogen	g/m^2 N	<0.005-0.22	0.016	<0.005-0.84	0.032	<0.005-0.63	0.026
Nitrite Nitrogen	g/m^2 N	0.0032-0.032	0.0134	0.0046-0.112	0.0088	0.0022-0.083	0.0104
Nitrate Nitrogen	g/m^2 N	0.717-2.2	1.49	0.471-1.905	1.057	0.032-1.88	0.980
TKN	g/m^2 N	0.32-1.52	0.48	0.18-0.94	0.26	0.23-0.72	0.27
Total nitrogen	g/m^2 N	1.03-2.7	2.1	0.69-2.9	1.5	0.56-2.8	1.6
Turbidity	NTU	2.2-8.7	4.8	0.73-3.6	1.78	1.1-5.5	2.5

Median values of selected parameters indicate dilution of the Mangawhero Stream flow by the flow of the Waingongoro River over the sampling period.

Median nutrient concentrations in the Mangawhero Stream post-diversion of WWTP wastes continue to show a reduction in concentration, with ammoniacal nitrogen and dissolved reactive phosphorus medians lower by 99% and 95% respectively than prior to wastes diversion. Most minimum nutrient concentrations have been markedly lower since the diversion. This does not take into account additional inputs to the stream, including dairy discharge, which affect water quality.

Figure 3 Aerial map showing location of chemical and biomonitoring sampling sites

2.3.2 Biomonitoring surveys

Biological monitoring surveys are performed in an unnamed tributary of the Mangawhero Stream and the Waingongoro River to continue to monitor the improvement of the stream following diversion of the effluent to the Hawera WWTP.

These surveys also serve to determine whether or not treated wastewater from the site has had a detrimental effect upon the communities of the stream in the event of any discharges.

The Council's 'kick-sampling' technique was used to collect macroinvertebrates from two sites on the Mangawhero Stream (MWH000380 and MWH000490) and one site on the Waingongoro River (WGG000665, Figure 3) for the summer survey at the Eltham waste water treatment plant. This has provided data to assess whether discharges have had an effect on the macroinvertebrate communities present in the Mangawhero Stream and Waingongoro River. Samples were processed to provide number of taxa (richness), MCI, and SQMCI scores for each site.

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

During both surveys all three sites had higher than normal MCI and SQMCI scores indicating healthier than usual macroinvertebrate communities. The two 'impacted' sites had higher macroinvertebrate indices (taxa richness and MCI scores) than the 'control' site. This would be due to both 'impacted' sites having better physical stream habitat conditions for macroinvertebrates in combination with a lack of discharges from the Eltham WWTP and historic landfill.

Overall in the current monitoring period, there was no evidence that leachate from the Eltham WWTP or from the closed landfill site was having any impact on the macroinvertebrate communities of the Mangawhero Stream and Waingongoro River. Given the lack of discharges into the Mangawhero Stream it was recommended that biomonitoring be made provisional for the next monitoring year, and only take place should a significant discharge occur.

Copies of biomonitoring reports for this site are available from the Council upon request.

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 5 below sets out details of any incidents recorded, additional investigations, or interventions required by the Council in relation to the STDC's activities 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 5 Incidents, investigations, and interventions summary table

Date	Details	Compliant (Y/N)	Enforcement Action Taken?	Outcome
February 2019	The pond was experiencing lower dissolved oxygen levels that normal. Sulphide odour downwind and a number of complaints from residents	N	Remedial actions required and agreed	Installation of three new aerators fast tracked. STDC were dosing sodium nitrate into the inlet of the pond to help elevate the dissolved oxygen. The three Eltham industries contacted and asked to restrict flows.

3 Discussion

3.1 Discussion of site performance

In general the Eltham WWTP was well maintained and managed during the 2018-2019 year.

All wastewater from the WWTP was pumped to Hawera during the 2018-2019 year, with no overflows to the stream occurring.

There were some issues with trade wastes inflow over summer which led to breaches of Rule 41 of the Taranaki Regional Air Quality Plan (discharge must not result in offensive or objectionable odour at or beyond the boundary of the property), and several odour complaints were received from neighbouring properties. STDC undertook a number of measures to reduce the odour including; fast tracking the installation of three new aerators, dosing sodium nitrate into the inlet of the pond to help elevate the dissolved oxygen and asking the three Eltham industries to restrict flows where possible.

3.2 Environmental effects of exercise of consents

Past significant impacts on the receiving water quality of the Mangawhero Stream, and to a lesser effect on the Waingongoro River downstream of the confluence with the Mangawhero Stream, have been alleviated with the pipeline diversion of the wastewater to the Hawera WWTP. This is evidenced by the monthly SEM sampling of the lower reach of the Mangawhero Stream and mid-reaches of the Waingongoro River, which have confirmed marked improvements in water quality (such as nutrient reduction).

Improvements in the macroinvertebrate fauna and the flora of the Mangawhero Stream below the original discharge outfall were also recorded during the spring and summer biomonitoring surveys. No significant impacts were recorded on the Waingongoro River below the Mangawhero Stream confluence with improvements in the macroinvertebrate fauna noted at these sites in comparison with historical (pre-wastes diversion) data. State of the environment trend monitoring over a twenty year period has shown significant statistical and ecological improvements in stream and river biological health at both sites downstream of the wastewater outfall.

Future riparian planting and the movement towards dairy shed treated waste irrigation to land should further contribute to marked improvements in the water quality of the receiving waters of the Mangawhero Stream and the Waingongoro River.

3.3 Evaluation of performance

A tabular summary of the consent holder's compliance record for the year under review is set out in Table 6.

Table 6 Summary of performance for consent 7521-1

Purpose: ***To discharge, as a consequence of high rainfall, partially treated wastewater from the Eltham Wastewater Treatment Plant into an unnamed tributary of the Mangawhero Stream in the Waingongoro catchment.***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Limits on the timing of discharges	Inspection, liaison with consent holder – no discharge during period under review	Yes
2. Requirements of plant storage capacity	Inspection	Yes
3. Limits on plant modifications	Inspection, liaison with consent holder	Yes

Purpose: *To discharge, as a consequence of high rainfall, partially treated wastewater from the Eltham Wastewater Treatment Plant into an unnamed tributary of the Mangawhero Stream in the Waingongoro catchment.*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
4. Requirements of overflow reporting	No overflows during period under review	N/A
5. Consent holder to adopt best practicable option	Inspection	Yes
6. Requirements of overflow notification	No overflows during period under review	N/A
7. Requirements of contingency plan	Report received	Yes
8. Provisions for monitoring	Chemical and biological sampling	Yes
9. Review condition	Provision for optional review scheduled in June 2021	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 7 Evaluation of environmental performance over time

Year	High	Good	Improvement req	Poor
2009	-	-	-	1
2010	-	-	-	1
2011	1	-	-	-
2012	1	-	-	-
2013	1	-	-	-
2014	1	-	-	-
2015	-	1	-	-
2016	1	-	-	-
2017	1	-	-	-
2018	1	-	-	-
Totals	7	1	0	2

During the year, STDC demonstrated a good level of environmental and a high level of administrative performance with the resource consent as defined in Section 1.1.4. During the year under review there were some issues with odour which, while not regulated in the consent, breached Rule 41 of the Regional Air Quality Plan for Taranaki.

Downstream monitoring of receiving waters continues to document the improvement of the Mangawhero Stream health following the diversions of the treated wastes from the stream to the Hawera WWTP.

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 Eltham WWTP in the 2018-2019 year continue at the same level as in 2017-2018.
2. THAT the scheduled summer biomonitoring survey be reduced from five sites to three, with the existing two sites to be retained on a provisional basis in the event of future discharges from the Eltham WWTP.
3. 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.

All three recommendations were implemented.

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 Eltham WWTP continue at a similar level as in 2018-2019, however biological monitoring will be reduced from two macroinvertebrate surveys to one, with provision included in the programme for a second survey should a significant discharge occur.

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 Eltham WWTP in the 2019-2020 year continue at the same level as in 2018-2019, however biological monitoring will be reduced from two macroinvertebrate surveys to one, with provision included in the programme for a second survey should a significant discharge occur.
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.
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.
MCI	Macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the sensitivity of the taxa present to organic pollution in stony habitats.
mS/m	Millisiemens per metre.
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.
SQMCI	Semi quantitative macroinvertebrate community index.
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.

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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 permit				
7521-1	To discharge, as a consequence of high rainfall, partially treated wastewater from the Eltham Wastewater Treatment Plant into an unnamed tributary of the Mangawhero Stream in the Waingongoro catchment.	November 2009	June 2021	June 2027

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.

Discharge Permit

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

Name of Consent Holder:	South Taranaki District Council Private Bag 902 HAWERA 4640
Consent Granted Date:	10 November 2009

Conditions of Consent

Consent Granted:	To discharge, as a consequence of high rainfall, partially treated wastewater from the Eltham Wastewater Treatment Plant into an unnamed tributary of the Mangawhero Stream in the Waingongoro catchment at or about (NZTM) 1712439E-5633480N
Expiry Date:	1 June 2027
Review Date(s):	June 2015, June 2017, June 2021
Site Location:	Castle Street, Eltham
Legal Description:	Pt Lot 3 DP 1564 Lot 9 DP 2321
Catchment:	Waingongoro
Tributary:	Mangawharawhara Mangawhero

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 discharge shall only occur as a consequence of high rainfall events when the inflows to the wastewater treatment plant are such that the holding capacity of the treatment plant is exceeded.

2. The total storage capacity of the treatment plant shall be no less than 25,000 cubic metres.

3. The consent holder shall not undertake any modifications to the treatment plant that may result in an increase in the frequency of the discharge.

4. The consent holder shall record the timing and duration of the overflow to the unnamed stream, and report these records to the Chief Executive, Taranaki Regional Council, on request.

5. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.

6. The consent holder shall phone the Taranaki Regional Council immediately after becoming aware of each discharge authorised by this permit, in order to enable the undertaking monitoring of the discharge in accordance with special condition 8.

7. Within three months of the granting of this consent, the consent holder shall prepare and maintain a contingency plan. The contingency plan shall be adhered to in the event of a discharge and shall, to the satisfaction of the Chief Executive, Taranaki Regional Council, detail measures and procedures to be undertaken to avoid, remedy or mitigate the environmental effects of the discharge.

8. Subject to Section 36 of the Resource Management Act [1991], monitoring, including physicochemical, bacteriological and ecological monitoring of the wastewater treatment system and receiving waters shall be undertaken, as deemed reasonably necessary by the Chief Executive, Taranaki Regional Council, to understand the effects of the discharge.

9. 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 2015 and/or June 2017 and/or June 2021, 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 10 November 2009

For and on behalf of
Taranaki Regional Council

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Director-Resource Management