Stratford District Council

Stratford WWTP

Monitoring Programme

Annual Report

2020-2021

Technical Report 2021-16

Working with people | caring for Taranaki

Taranaki Regional Council

Taranaki Regional Council
Private Bag 713
Stratford

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Executive summary

The Stratford District Council (SDC) operates a municipal wastewater treatment plant (WWTP) located on Victoria Road at Stratford, in the Patea catchment. This report for the period July 2020 to June 2021 describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess SDC'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 SDC's activities.

During the monitoring period, SDC demonstrated that an improvement is required in their level of environmental performance.

SDC holds one resource consent to discharge treated wastewater into the Patea River. Consent 0196-5 includes a total of 17 conditions setting out the requirements that they must satisfy.

The Council's monitoring programme for the year under review included four inspections, wastewater analyses, and physicochemical and biological surveys (macroinvertebrate and periphyton) of the receiving waters of the Patea River.

In recent years, improvements in SDC's maintenance programme have generally enhanced the appearance of the plant and effectively controlled any produced odour. No complaints were received in relation to the operation of the WWTP. Regular inspections indicated no immediate problems with the performance of the plant, with no overflows recorded during the monitoring year.

Wastewater and river quality was generally good at the time of the low flow summer receiving water physicochemical survey. However, spring and summer biomonitoring surveys indicated a continuation of an ecologically significant impact on macroinvertebrate health between sites upstream and downstream of the effluent point, coincident with discharges from the Stratford WWTP. The results from the initial year of monitoring periphyton also indicated that the discharge was having an effect on biomass immediately downstream. The desirability of reducing such effects within the receiving waters has been recognised for some years. SDC has been working to find a solution to the excess nutrients and proposes to reduce the phosphorus in the influent, via a new Trade Waste Policy and Trade Waste Bylaw. This together with implementing a Diatomix process in Pond 2, should reduce phosphorus, nitrogen and algae levels downstream.

During the year, SDC demonstrated that an improvement is required in their level of environmental and a high level of administrative performance with the resource consents. SDC are actively pursuing options for reducing the effects of the discharge from the WWTP upon the Patea River.

For reference, in the 2020-2021 year, consent holders were found to achieve a high level of environmental performance and compliance for 86% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 11% 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 2021-2022 year, including a recommendation relating to an optional review of consent 0196-5.

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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 2020 to June 2021 by the Council describing the monitoring programme associated with resource consent held by Stratford District Council (SDC). SDC operates a municipal wastewater treatment plant (WWTP) situated on Victoria Road at Stratford.

This report covers the results and findings of the monitoring programme implemented by the Council in respect of the consent held by SDC that relate to discharge of treated wastewater in the Patea catchment. This is the 34th annual report to be prepared by the Council to cover SDC'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 SDC in the Patea 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 Stratford 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 2021-2022 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' in as much 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 SDC, 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 SDC'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 2020-2021 year, consent holders were found to achieve a high level of environmental performance and compliance for 86% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 11% of the consents, a good level of environmental performance and compliance was achieved. [1]

1.2 WWTP system

Stratford town sewage is treated by an oxidation pond system (Photo 1) and combined successive maturation cell system (2.6 ha and 1.7 ha in area), that was upgraded in 2009. Changes made to the system during the upgrade included:

- flow recorder installation at the inflow structure to the primary pond;
- splitter chamber replaced with an influent chamber (to prevent overflows);
- installation of a step screen system at the influent;
- relocation of the tanker waste disposal area to Esk Road;
- a new trade waste connection from the regional stockyards on Esk Road into the system; and
- improvements to the pond system itself.

A full history of the pond system and upgrade process can be found in the 2014-2015 annual report (TRC, 2015).

In 2013 a short-term consent was granted to SDC to cover an interim period of investigations covering issues and options for the Stratford wastewater treatment plant system going forward.

SDC now propose to reduce phosphorus in the influent primarily by implementing a new Trade Waste Policy and Trade Waste Bylaw which will prevent the high loading via trade waste, the majority of which was coming from outside the Stratford district. A Diatomix system will be installed in Pond 2 in order to reduce

[1] The Council has used these compliance grading criteria for more than 17 years. They align closely with the 4 compliance grades in the MfE Best Practice Guidelines for Compliance, Monitoring and Enforcement, 2018

phosphorus, nitrogen and algae levels. The Diatomix system is a natural, biological process which may take up to 12 months to produce obvious results once installed.

Photo 1 Stratford WWTP

1.2.1 Inflow and infiltration reduction

SDC continue to report on progress with the implementation of the inflow and infiltration reduction programme to minimise stormwater inflow. This programme includes visual infiltration surveys in winter and summer, followed by CCTV surveys within the reticulation to determine sections requiring repairs or replacement.

During the 2019-2020 year, 406 m of earthenware sewer pipe were replaced with PVC pipe. In conjunction with this work, fiberglass inserts were installed to ensure proper seals were achieved. Three manholes were sealed to prevent groundwater entering the system and three new manholes were installed to aid in future cleaning, inspection and relining.

During the 2020-2021 year, a total of 320 m of wastewater pipes were relined. Work planned to be undertaken in 2021-2022 includes further relining of pipes, manhole replacement and the inspection of stormwater discharges to gully traps at residential properties.

1.3 Resource consents

SDC holds one resource consent, the details of which are summarised in the table below. Summaries of the conditions attached to the 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 is a copy of the permit held by the SDC during the period under review.

Table 1 Resource consent held by SDC for the Stratford WWTP

Consent number	Purpose	Granted	Review	Expires
0196-5	To discharge treated wastewater from the Stratford Wastewater Treatment Plant into the Patea River	May 2020	June 2022	June 2034

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 Stratford WWTP consisted of five 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 Stratford WWTP was visited four times during the monitoring period. The main points of interest were plant operation, maintenance, upgrades, and performance and the discharges of treated wastewater. These inspections provided for the operation, internal monitoring, and supervision of the plant to be reviewed by the Council.

1.4.4 Chemical sampling

The Council undertook sampling of the discharge from the site, as well as the in-river water quality either side of the discharge point and mixing zone.

The Stratford WWTP final effluent from the maturation cells was sampled on four occasions.

Sampling of the Patea River either side of the discharge was carried out concurrently, with additional bacteriological (faecal coliform) and metal analyses included during one sampling occasion under summer low flow conditions.

1.4.5 Biomonitoring surveys

Two biological surveys were performed in the Patea River (one spring, one summer), to determine if the discharge of treated wastewater from the site has had a detrimental effect upon the communities of the stream.

1.4.6 Periphyton surveys

Periphyton biomass was assessed at four sites in the Patea River (Photo 2). These surveys are scheduled monthly, however due to high river flows there will be some months where these will not be able to be undertaken. Eleven surveys were carried out during the 2020-2021 year.

Photo 2 Periphyton monitoring at site PAT000356

2 Results

2.1 Inspections

31 July 2020

The step screen waste bin was covered and wastes were fully contained. Minimal odour was emanating from around this area. The influent flow rate was 94 m^3/hr (26 L/s). Three of the four aerators in the main pond were operating and the pond was a turbid, grey/brown colour. Pond level was normal, although it was noted that the outlet screen was partially blocked with accumulated debris impeding the discharge flow. Numerous mallard and teal ducks and black swans were present.

Cell 1 was just breaching the dividing walls via the overtopping channels. Several Canadian geese, mallard, teal and paradise ducks were observed, along with some black swans. The pond was turbid brown. The treated effluent discharge flow rate into the Patea River was estimated at 20 L/s with no visual environmental effect observed in the receiving water. No significant odour was noted around the ponds.

The SDC WWTP and surrounds were found to be satisfactory, although domestic rubbish had been dumped and strewn around the main entranceway. Cattle were not grazing the pond perimeters, although electric fences remained in situ. The Esk Road trade waste facility was also inspected and found to be compliant. SDC were asked to ensure the screen on the Pond 1 outlet was cleared and maintained to a satisfactory standard, especially during periods of high flows.

27 October 2020

The step screen waste bin was covered and wastes were fully contained. Noticeable odour was emanating from around this area. The influent flow rate was 119 m^3/hr (33 L/s). Three out of four aerators were operating on the main pond. The pond was slightly turbid and brown. The pond level was normal, although the outlet screen was partially blocked with accumulated debris impeding the discharge flow. Wildlife consisted of several mallard and teal ducks, and black swans.

Cell levels were normal, showing the dividing wall channels. Canadian geese, black swans, mallard, teal and paradise ducks were all present. The cells were slightly turbid, and green/brown in colour. The treated effluent discharge flow rate into the Patea River was estimated at around 30 L/s with no significant visual environmental effects noted at the point of discharge.

The SDC WWTP and surrounds were found to be satisfactory with cattle grazing around the pond perimeters. No significant odour was emanating from the ponds. The Esk Road trade waste facility was also inspected and found to be compliant. SDC was reminded to ensure the screen on Pond 1 outlet is cleared and maintained to a satisfactory standard, especially during periods of high flows.

3 February 2021

The step screen was operating and wastes were fully contained with minimal odour was noted. The influent flow rate was 56 m^3/hr. Three out of four aerators were operating. The pond was a turbid dark green. In excess of 250 mallard and paradise ducks were observed.

The pond cells were also covered in wildlife, with Canadian geese, mallard, teal and paradise ducks, plus several black swans. The effluent discharge into the Patea River was estimated at 10 L/sec and this resulted in a noticeable reduction in the black disc measurement downstream.

The Esk Road unloading facility was inspected and found to be compliant. As mentioned in previous inspection notices, SDC was reminded that the bird population needs to be controlled. They were advised to contact Fish & Game for suggestions.

4 May 2021

The step screen waste bin was covered and wastes were fully contained. Noticeable odour was emanating from around this area. The influent flow rate was 44 m^3/hr (12 L/s). Three out of four aerators were operating on the main pond and this was a turbid dark brown. The outlet screen was again partially blocked with accumulated debris which would impede the discharge during high flow. Numerous mallard and teal ducks, Canadian geese and black swans were observed.

Cell levels were low, exposing the dividing wall channels. Wildlife was also abundant with Canadian geese, mallard, teal and Paradise ducks, plus black swans. The pond was turbid and dark green/brown in colour. The treated effluent discharge flow rate into the Patea River was estimated at 12 L/s with no significant visual environmental effects noted in the receiving water.

The SDC WWTP and surrounds were found to be satisfactory. Cattle were grazing around the northern pond perimeters, electric fences remained in situ. No significant odour was emanating from the ponds. The Esk Road trade waste facility was also inspected and found to be compliant. SDC was reminded to ensure the screen on Pond 1 outlet was cleared and maintained to a satisfactory standard, especially during periods of high flow.

Photo 3 View of Stratford WWTP primary pond with aerators operating

2.2 Results of effluent monitoring

2.2.1 Effluent quality

Samples were collected from the outlet of the tertiary maturation cell during inspections. The sample was tested for additional parameters on 3 February in conjunction with the low flow survey of receiving waters. These results are presented in Table 2.

Table 2 Results of effluent monitoring on at site OXP005002

Parameter	Unit	Date				2009-2020 Range
		31 July 2020	27 Oct 2020	3 Feb 2021	4 May 2021	
BOD	g/m³	-	-	12.0	-	9 - 58
BODCF	g/m³	2.4	1.5	3.5	3.2	1.3 - 45
Chloride	g/m³	16	18	27	25	12 - 35
Conductivity	mS/m@25°C	-	-	41.9	-	36.7 - 37.3
E. coli	/100ml	-	-	3,650	-	1,515-8,660
pH	pH	7.2	7.5	7.8	7.6	7.1 - 8.8
SS	g/m³	-	-	16	-	5 - 86
Turbidity	FNU	11	14	43	21	3.7 - 71
Temperature	°C	10.3	18.0	21.9	12.3	6.2 - 22.8
Nutrient Analyses						
NH_3	g/m³	0.042	0.129	0.58	0.127	0.0438 - 0.4699
NH_4	g/m³ N	10.9	12.9	19.2	20.0	0.870 - 25.4
NNN	g/m³ N	0.31	0.63	0.47	-	0.45 - 4.28
DRP	g/m³ P	1.05	1.47	2.40	1.77	0.695 - 4.97
Metal Analyses (acid soluble)						
Cadmium	g/m³	-	-	< 0.0010	-	<0.001 - 0.005
Chromium	g/m³	-	-	< 0.010	-	<0.01 - 0.03
Zinc	g/m³	-	-	< 0.02	-	0.008 - 0.035
Appearance		Turbid, brown	Slightly turbid brown	Turbid, dark green	Turbid, dark green brown	

* conductivity previously measured at 20°C

The tertiary cell effluent quality was typical of a well-treated secondary oxidation pond waste with low filtered BOD_5 and moderate suspended solids levels and E. coli bacteria. Nutrient levels were typical of the secondary oxidation pond treated effluent.

Metal concentrations were less than minimum detectable levels. None of these metals' concentrations measured in the effluent at the time of the survey would be expected to exceed toxic levels for aquatic fauna given the dilution provided in the receiving waters of the Patea River.

2.2.2 Dissolved oxygen levels

The dissolved oxygen (DO) 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 the major influencing factors. Minimum DO 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 Stratford WWTP effluent was analysed for DO, chloride and temperature, and the results are displayed in Table 3.

The results indicate a relatively wide range of DO concentrations (between 10% and 76% saturation) in the surface layer of the tertiary maturation cell near the outlet. This was typical of the results generally recorded at this point (i.e. supersaturation is seldom recorded), and indicates that DO was present at all times in the surface layer of the cell. The highest DO reading was recorded during summer, in conjunction with a high chlorophyll-a level (indicating a significant phytoplankton component). The variation in saturation levels measured to date has been typical of a biological treatment system in which the photosynthetic contribution of the microfloral population often causes wide dissolved oxygen variations.

Table 3 Dissolved oxygen measurements from the Stratford WWTP

Date	Time (NZST)	Temperature (°C)	Chloride (g/m³)	Dissolved Oxygen	
				Concentration (g/m³)	Saturation (%)
31 July 2020	09:45	10.3	16	1.1	10
27 Oct 2020	09:45	18.9	18	4.1	44
3 Feb 2021	08:45	21.9	27	6.5	76
4 May 2021	11:10	12.3	25	2.6	25

Condition 4 of consent 0196-5 requires that (from June 2022) the dissolved oxygen concentration in the oxidation pond adjacent to the outlet shall exceed 0 g/m³ at all times, while condition 5 requires that the consent holder continuously measure the dissolved oxygen in Pond 1 and adjacent to the outlet. Review of this data (provided online via Wateroutlook) showed that both of these conditions were complied with at all times.

2.2.3 Phosphorus

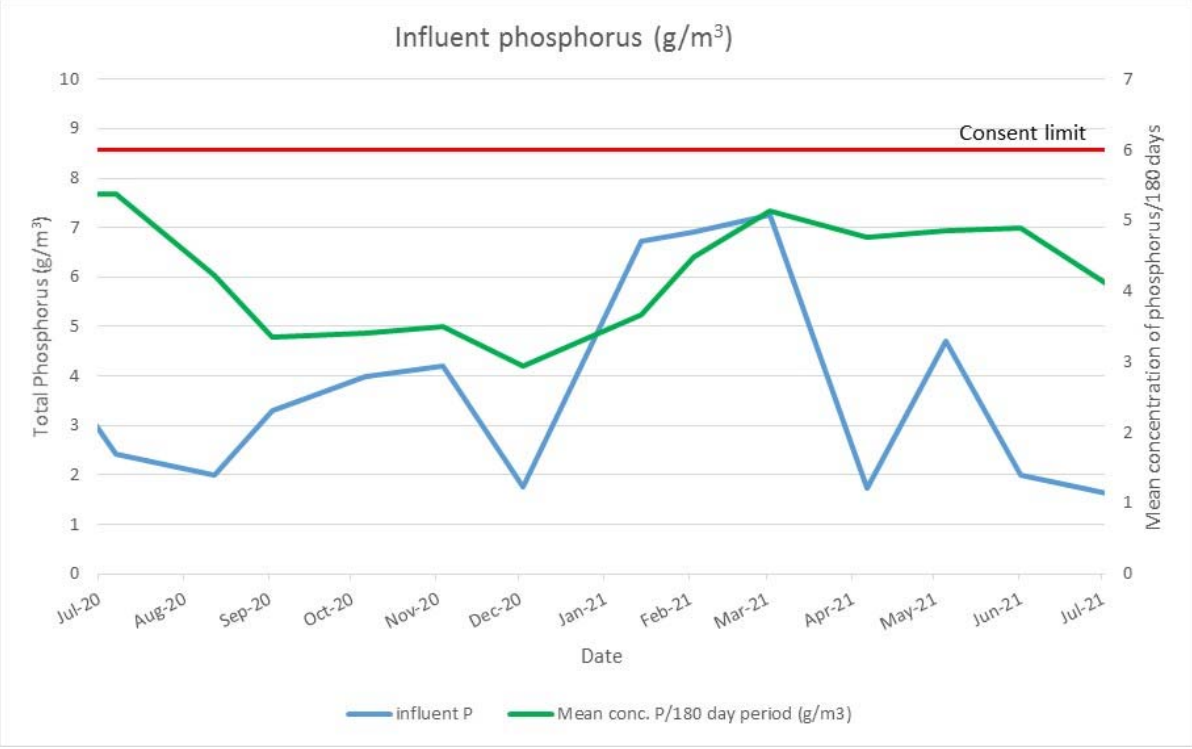

Figure 1 Influent phosphorus and mean concentration over 180 days

Condition 7 of consent 0196-5 requires that from 1 June 2020, the mean concentration of phosphorous over any 180 day period (based on a least one sample each month), shall be no more than 6 g/m^3 at the inlet of Pond 1. Monthly sampling of phosphorous by SDC found that the mean concentration over any 180 day period during 2020-2021 was below 6 g/m^3 at all times.

2.2.4 Nitrate

Condition 6 requires that SDC install a Datomix system in the oxidation pond before June 2022, while condition 8 requires that the nitrate concentration in Pond 2 generally trend downwards over the following 12 months to reach a practical minimum at which it is then maintained.

The Diatomix system has not yet been installed, however SDC has been collecting monthly nitrate data since December 2019 to establish a baseline from which a downwards trend will hopefully emerge once the system is in place (Figure 2).

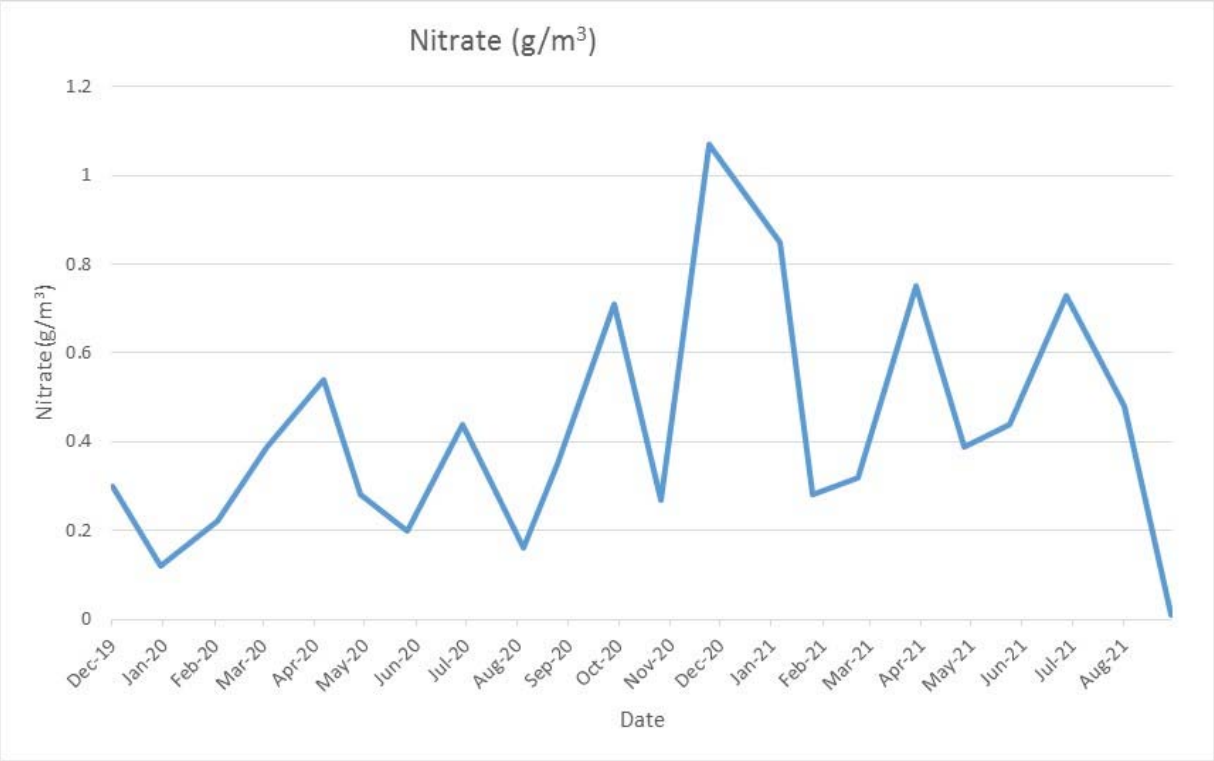

Figure 2 Effluent nitrate

2.2.5 Microfloral component

Pond microflora are very important for the stability of the symbiotic relation between aerobic bacteria in the 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 over-loaded 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 tertiary cell effluent were collected on all 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 the maturation cell effluent analyses are provided in Table 4 together with field observations of pond appearance.

Relatively poor microfloral populations were indicated by low chlorophyll-a concentrations, especially in the cooler months. These results have been attributed to wet weather conditions and stormwater dilution through the WWTP system. While the summer concentration was higher, this still did not indicate a significant phytoplanktonic component.

Table 4 Chlorophyll-a levels and tertiary cell appearance

Date	Time (NZST)	Appearance	Chlorophyll-a (mg/m^3)	Range for the period 2013-2020	
				Range	Median
31 July 2020	09:45	Turbid, brown	17	0.5 - 520	70
27 Oct 2020	09:45	Slightly turbid, brown	55		
3 Feb 2021	08:45	Turbid, dark green	230		
4 May 2021	11:10	Turbid, dark green-brown	89		

2.3 Results of receiving environment monitoring

Monitoring of the impacts of the Stratford WWTP on the receiving waters was measured using both chemical analyses of the receiving waters of the Patea River beyond the boundary of the mixing zone, biological monitoring surveys and periphyton biomass surveys. Chemical sampling was carried out on four occasions during the 2020-2021 period (Section 2.3.1). Two macroinvertebrate biomonitoring surveys were conducted, one during spring 2020 and one in summer 2021 (Section 2.3.2). Eleven periphyton biomass surveys were also conducted (Section 2.3.3).

2.3.1 Receiving water surveys

The locations of receiving water sampling sites are listed in Table 5 and displayed in Figure 3 below.

Table 5 Location of sampling sites

Site no.	Location	Site code
1	At Swansea Road bridge (u/s of landfill and WWTP discharges)	PAT000315
2	Approx. 250 m d/s of the WWTP original discharge (and 350 m u/s of the new outfall)	PAT000345
(Discharge)	At discharge point from rock riprap outfall	OXP005002
3a	Approx. 130 m d/s of the WWTP new outfall	PAT000350
4	Approx. 1 km u/s of the Kahouri Stream confluence	PAT000356

Figure 3 Aerial location map of sampling sites in relation to Stratford WWTP

2.3.1.1 Receiving water surveys of July and October 2020, and May 2021

Receiving water samples were collected on the 31 July and 27 October 2020, and 4 May 2021 at two sites in the Patea River, upstream and downstream of the Stratford WWTP discharge point. The results of these surveys are displayed in Table 6.

Table 6 Receiving water results July and October 2020, and May 2021

Site		PAT000345 (upstream)				PAT000350 (downstream)			
Date		31 Jul 2020	27 Oct 2020	4 May 2021	2009-2020 Range	31 Jul 2020	27 Oct 2020	4 May 2021	2009-2020 Range
Parameter	**Unit**	10:30	10:40	11:45		11:50	10:55	11:50	
CBOD	g/m³	<1.0	<1.0	<1.0	<0.5-<2	<1.0	<1.0	<1.0	<0.5-<2
Chloride	g/m³	9.3	8.8	8.5	7.5-11.8	9.6	9.0	8.8	7.6-10.0
pH	pH	7.5	7.7	7.4	7.3-9.5	7.5	7.6	7.5	7.4-10
Turbidity	FNU	1.31	1.31	0.73	0.54-1.8	1.25	1.70	1.50	0.74-4.8
Temp	°C	9.7	14.6	9.7	7.7-17.0	9.7	14.8	9.5	7.8-17.5
NH_3	g/m³ N	0.00033	0.00064	0.00016	0.00019-0.00187	0.0030	0.0044	0.0029	0.00013-0.01274
NH_4	g/m³ N	0.0052	0.048	0.038	0.019 - 0.148	0.40	0.41	0.52	0.038-1.07

Most parameters showed no significant effects in the Patea River below the WWTP discharge. On 4 May the downstream turbidity was 105% higher than the upstream level, breaching consent condition 14 which allows a 50% increase. Filtered carbonaceous BOD_5 concentration was below the 2.0 gm^3 limit, while unionised ammonia (NH_3) was well below the 0.025 gm^3 limit. It is noted that although unionised ammonia was well below the consent limit, both this and ammoniacal nitrogen increased significantly downstream.

2.3.1.2 Low flow receiving water survey of February 2021

A summer low flow assessment of the impact of the WWTP's effluent discharge on the receiving waters of the Patea River was performed on 3 February 2021. River flow at the Skinner Road recorder was 0.820 m^3/s during a low flow period, 25 days after a river fresh three times over the median flow. The flow was below both the average February 2021 mean monthly flow of 1.89 m^3/s and the mean February monthly flow for the period 1978 to 2021 of 2.57 m^3/s. There was a moderate rate of discharge from the ponds system,estimated at approximately 10 L/s at the time of the survey. The results of the survey are displayed in Table 7.

A dilution ratio of approximately 26 parts river flow to one part effluent discharge at the time of the sampling survey was indicated by reference to selected analytical results assuming complete mixing at the sampling site (PAT000350).

There was a notable decrease in black disc clarity between the upstream site and immediately downstream of the discharge, this had increased at PAT000356 and was similar to the upstream reading. The turbidity increase was 194% which is well above the 50% allowed by condition 14, but as both upstream and downstream results were relatively low at <2.5 FNU, it was not considered that there would be significant effects in the receiving water because of this. Suspended solid levels were low at all sites.

Nutrient concentrations increased over upstream concentrations, although remaining lower than typical. No significant impacts on the river were recorded for the other parameters measured (Table 7) with minimal or no increases in measured levels of chloride, conductivity, bacteria, and filtered carbonaceous BOD_5. These results were indicative of compliance with condition 15 of the consent. Of note but unexplained was pH, which only increased from 7.6 to 7.7 between the upstream and immediately downstream sites, but was 8.9 at the site 1 km downstream. Dissolved oxygen concentrations exceeded 100% saturation at all sites upstream and downstream of the discharge.

The river appearance was similar at the upstream sites and the site immediately downstream site, with no noticeable visual impact at the site 130 m downstream of the WWTP discharge.

Table 7 Low flow receiving water results, February 2021

Site		PAT000315 (u/s)		PAT000345 (u/s)		PAT000350 (d/s)		PAT000356 (d/s)	
Date		3 Feb 2021	2009-2020 Range	3 Feb 2021	2009-2020 Range	3 Feb 2021	2009-2020 Range	3 Feb 2021	2009-2020 Range
Parameter	Unit								
Black disc	m	1.98	1.94-3.13	2.10	1.27-3.92	1.48	1.10-3.02	1.83	1.21-2.65
BOD (total)	g/m^3	0.7	<0.5-0.8	1.2	<0.5-0.8	1.8	0.9-3.6	1.2	1.1-2.7
BODCF	g/m^3	<1.0	<0.5-<1.0	<1.0	<0.5-<1.0	<1.0	<0.5-<1.0	<1.0	<0.5-<1.0
Chloride	g/m^3	8.0	7.5-10.1	8.2	7.5-9.5	8.9	7.6-10	9.1	8.6-9.6
Conductivity	mS/m @25°C	10.6	8.6-11.5	10.8	7.2-11.6	12.0	7.7-12.7	11.2	9.2-12.1
DO (concentration)	g/m^3	10.2	9.2-10.4	9.9	9.1-10.3	10.3	9.20-10.3	12.7	10.2-12.5

Site		PAT000315 (u/s)		PAT000345 (u/s)		PAT000350 (d/s)		PAT000356 (d/s)	
Date		3 Feb 2021	2009-2020 Range	3 Feb 2021	2009-2020 Range	3 Feb 2021	2009-2020 Range	3 Feb 2021	2009-2020 Range
DO (saturation)	%	105	95-102	103	94-101	108	96-104	137	102-139
E.coli	/100ml	150	154-411	131	109-461	248	99-345	167	88-326
pH	pH	7.6	7.4-7.8	7.6	7.3-8.2	7.7	7.3-7.9	8.9	7.5-8.9
SS	g/m³	< 3	2.0-9.0	<3	<2.0-4.0	<3	<2-5	<3	2.0-4.0
Turbidity	FNU	1.1	0.46-3.6	0.85	0.50-1.8	2.5	0.74-4.8	2.1	0.63-3.6
Temperature	°C	15.4	11.9-17.4	15.7	7.70-17.6	15.7	8.0-18.2	17.7	12.8-19.3
Nutrient Analyses									
NH_3	g/m³ N	0.00014	0.00009-0.00064	0.00045	0.00019-0.00187	0.0102	0.00055-0.01274	<0.003	<0.003-0.00484
NH_4	g/m³ N	0.012	0.006-0.035	0.038	0.037-0.148	0.66	0.038-1.07	<0.010	0.006-0.123
NNN	g/m³ N	0.52	0.42-0.78	0.55	0.4-0.8	0.66	0.48-0.91	0.99	0.55-1.1
DRP	g/m³ P	0.016	0.019-0.057	0.009	0.006-0.051	0.089	0.020-0.206	0.056	0.051-0.152
Metal Analyses (dissolved)									
Cadmium	g/m³	<0.00005	<0.00005-0.005	<0.00005	<0.00005-0.005	<0.00005	<0.00005-0.005	<0.00005	<0.00005-0.005
Chromium	g/m³	<0.0005	<0.0005-0.003	<0.0005	<0.0005-0.03	<0.0005	<0.0005-0.03	<0.0005	<0.0005-0.03
Zinc	g/m³	<0.0010	<0.005-0.005	0.0014	0.0012-0.007	0.0011	<0.005-0.007	<0.0010	<0.0010-0.005
Appearance		Clear, slight grey		Clear, grey-brown		Clear, green-grey		Slightly turbid, green-brown	

2.3.2 Macroinvertebrate monitoring surveys

Subsequent to the WWTP upgrade in 2009, spring and summer biological monitoring surveys were undertaken to in order to assess the effectiveness of the upgraded system. Summer biomonitoring surveys only have been conducted since 2011, but due to concerns about impacts on river health from the discharge, spring and summer biomonitoring surveys are now routinely undertaken.

The Council collected streambed macroinvertebrates from four sites (Table 8, Figure 4) in the Patea River in spring (24 November 2020) and summer (1 March 2021) to investigate the effects of the Stratford WWTP discharge on macroinvertebrate health. Macroinvertebrates were identified and the number of different types of taxa counted (taxa richness), and MCI and SQMCI scores were calculated for each site.

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of nutrient pollution in streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to pollution. The SQMCI takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities. Significant differences in either the MCI or the SQMCI between sites indicate the degree of adverse effects (if any) of the discharges being monitored and enable the overall health of the macroinvertebrate communities to be determined.

Table 8 Location of sampling sites in the Patea River

Site No	Location	Site code
1	Swansea Road bridge (upstream of landfill and oxidation ponds' discharge)	PAT000315
2	150 m u/s Stratford oxidation ponds' discharge	PAT000330
3a	Approximately 130 m downstream of the WWTP new outfall	PAT000350
4	340 m downstream of new Stratford WWTP discharge	PAT000351

Spring survey – November 2020

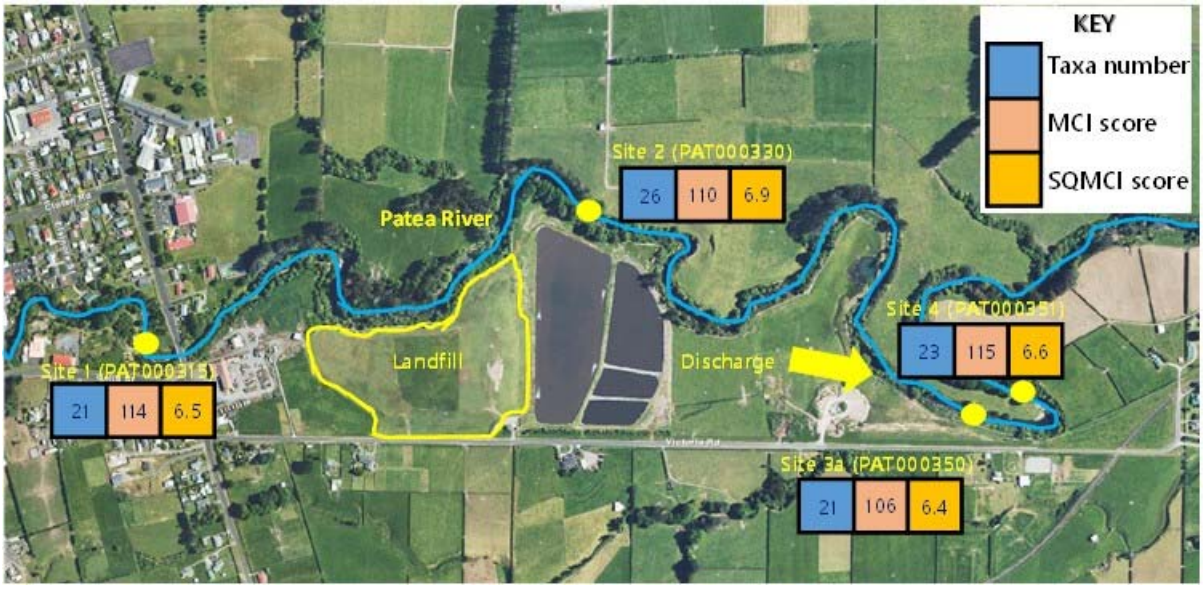

Figure 4 Taxa number, MCI scores and SQMCI scores for biomonitoring sites in the Patea River (spring)

The spring survey found macroinvertebrate richness at all four sites was moderate, with little relative difference between sites (Figure 2). Furthermore, there was little difference between current taxa richness and historic richness with deviation both above and below historic medians. Nutrient enrichment can raise taxa numbers in rivers with relatively good water quality but there was no evidence of that for the current survey. Nor was there evidence of any acute toxic discharges emanating from the closed landfill or sewerage outfall lowering taxa richness.

The MCI scores categorised all four sites as being in 'good' health. There were no significant differences in MCI scores between sites (one-nine MCI units) with the highest MCI score recorded at the bottom most site. In addition, there were no significant difference between the current scores and their historic medians apart from site 4 having a significantly higher score, and its highest score to date. This indicates that macroinvertebrate communities at sites 1, 2 and 3a were in typical health while site 4, which has limited historic data, was in significantly better than normal health.

The SQMCI can be more sensitive to organic pollution compared with the MCI as it also takes into account taxa abundances. The SQMCI categorised all four sites as being in 'very good' health. There were no significant differences between sites, and result were largely congruent with MCI results. The control sites for the WWTP discharge results were not significantly different to historic medians but both the impact sites had scores that were significantly higher than their respective historic medians, again highlighting the improvement in macroinvertebrate health at the impacts sites relative to previous surveys. The very wet spring conditions or reduction in trade waste inputs into the WWTP may have contributed to the positive results found for the survey.

No heterotrophic growths were noted at the time of the survey. This indicated that there was no highly significant enrichment from the WWTP discharges which would be expected for example if raw sewage was entering the river.

Overall, the results indicated there was no evidence that leachate from the closed Stratford landfill site or the discharge from the Stratford WWTP had negatively affected macroinvertebrate communities in the Patea River.

Summer survey - March 2021

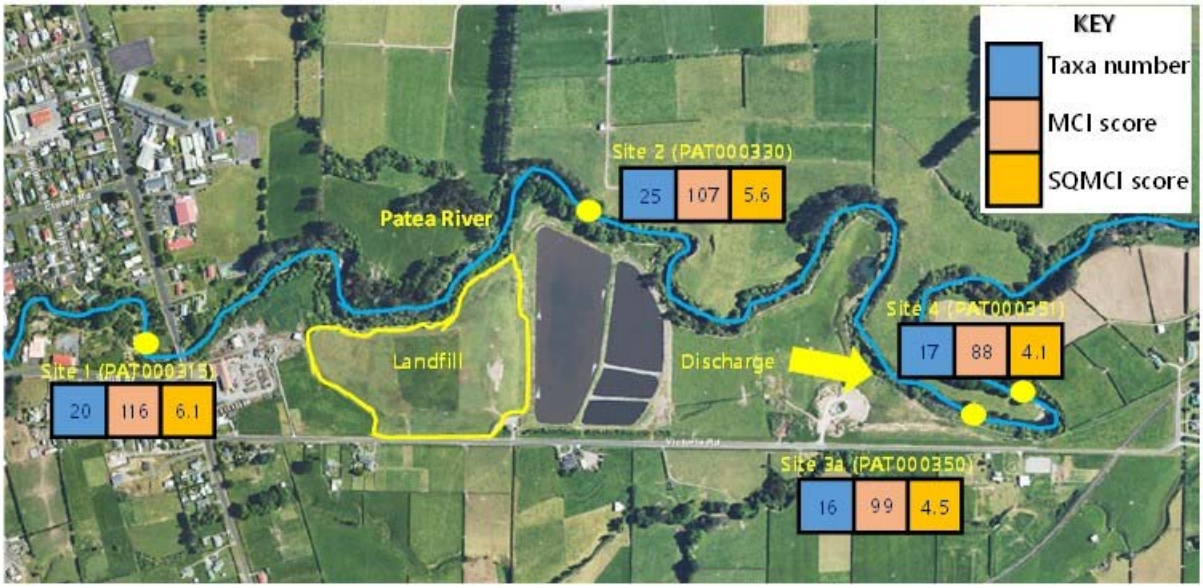

Figure 5 Taxa number, MCI scores and SQMCI scores for biomonitoring sites in the Patea River (summer)

During the summer survey macroinvertebrate taxa richness at all four sites were moderate to moderately high (Figure 3). There was a substantial decline between sites 2 and 3a of nine taxa. Other differences between adjacent sites were relatively minor (one-five taxa). Apart from site 2, taxa richness were lower than historic medians by six to seven taxa. Given the taxa decrease at site 1 (a control site) and the moderate taxa richness found at both impact sites for the WWTP (sites 3a and 4), it was unlikely that there had been any significant acute toxic discharges emanating from the sewerage outfall. The increase in taxa richness between sites 1 and 2 provided strong evidence for no significant effects of the closed landfill on taxa richness from toxic discharges.

The MCI scores categorised the two upstream sites as being in good health and the two downstream sites as being in fair health. There were significant differences between site 1 and 3a and 4 and site 2 and 4 and a consistent decline in MCI scores in a downstream direction (eight-11 MCI units). There were no significant differences between the current scores and historic medians, though site 4 had a lower than normal score by 8 MCI units and was also the only site to have declined significantly from the previous survey.

The SQMCI categorised site 1 as being in very good health, site 2 as being in good health, and sites 3a and 4 as being in fair health. These results were generally consistent with MCI scores and showed a decline in a downstream direction. Sites 3a and 4 had significantly lower SQMCI scores than site 1 and site 2. This indicated that the closed landfill was not having a significant impact on macroinvertebrate communities but provided further evidence that WWTP discharges were having a significant impact on downstream macroinvertebrate communities. Generally, late spring/early summer results are better than late summer/early autumn results due to cooler temperatures, less sunlight, and greater flushing flows etc. which partially explains why the previous spring results did not show any significant effects.

No heterotrophic growths were noted at the time of the survey. This indicates that there was no highly significant enrichment from the WWTP discharges which would be expected for example if raw sewage was entering the river.

Overall, the results indicate there was a significant decline in macroinvertebrate health in the Patea River. This was indicative of chronic nutrient enrichment coincident with discharges from the Stratford WWTP and consistent with results from previous surveys (e.g. see Sutherland, 2018). There was no evidence that leachate from the closed Stratford landfill site had negatively affected macroinvertebrate communities.

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

2.3.3 Periphyton biomass

Periphyton is the layer of slime that can form on stream beds and on submerged objects. It consists of a mixture of algae and cyanobacteria that naturally occurs in rivers and streams. It plays a fundamental role in stream ecosystem functioning by utilising sunlight via photosynthesis to absorb nutrients and organic compounds for growth, and subsequently becoming a food source for invertebrates which in turn provide food for other organisms such as fish and birds. Nuisance periphyton in the form of prolific thick mats, pervasive long filaments or cyanobacteria can cause a range of issues such as streams becoming un-inviting for recreational users, anglers having difficulty fishing, streams closures due to cyanobacteria toxins and adverse impacts on stream ecology

Condition 12 of consent 0196-5 requires that ecological monitoring in relation to periphyton biomass is undertaken. Sampling was carried out at four sites, one site upstream of the discharge and three sites downstream (Table 9, Figure 6). Monthly sampling is scheduled where possible, however where flow conditions prevented safe monitoring, neither periphyton biomass or periphyton cover were assessed.

Table 9 Location of periphyton sampling sites in the Patea River

Site No	Location	Site code
1	Above Stratford WWTP outfall	PAT000347
2	Below discharge (approximately 130 m downstream of the discharge)	PAT000350
3	Upstream of Kahouri confluence (approximately 3km downstream of discharge)	PAT000356
4	Skinner Road bridge (approximately 5km downstream of discharge)	PAT000360

Periphyton biomass samples were collected at all sites using a modified version of quantitative method 1b of the Stream Periphyton Monitoring Manual (Biggs & Kilroy 2000). These samples were processed for chlorophyll-a. Visual estimates of periphyton cover were made concurrently using Rapid assessment method 2 of the Stream Periphyton Monitoring Manual.

Eleven samples were collected during the 2020-2021 monitoring period, the results are presented in Table 10 and Figure 7.

Site PAT000350 (immediately downstream of the discharge) recorded the highest levels of Chlorophyll-a, likely due to the high levels of nutrients discharged from the Stratford WWTP. There also appeared to be a seasonal pattern, with most results from July through to early December below 120 mg/m^2. This could be attributed to a higher dilution of the WWTP discharge (i.e. increased stormwater in the system dilutes nutrients prior to discharge), cold water, high overall flows, and more frequent fresh flows. The highest values of Chlorophyll-a were recorded in the summer/autumn period which would coincide with warm water, low overall flows, and less freshes.

Figure 6 Periphyton sampling sites in the Patea River

Table 10 Periphyton biomass

Site	PAT000347		PAT000350		PAT000356		PAT000360	
Date	Chl-a mg/m²	Temp °C	Chl-a mg/m²	Temp °C	Chl-a mg/m²	Temp °C	Chl-a mg/m²	Temp °C
31-July-20	94	9.7	54	9.9	46	9.8	28	9.8
4-Sep-20	39	7.7	90	8.1	80	7.9	40	8.0
27-Oct-20	15	14.5	170	14.8	69	15.3	26	15.0
24-Nov-20	27	12.2	55	12.5	18	13.3	8	13.3
16-Dec-20	48	14.7	78	15.3	38	15.3	13	15.1
5-Jan-21	52	16.1	192	16.9	118	17.3	125	18.0
3-Feb-21	108	17.4	114	18.3	103	18.7	250	17.5
1-Mar-21	70	-	117	-	113	-	99	-
8-Apr-21	24	13.3	26	13.6	70	13.6	60	13.2
4-May-21	188	8.6	260	8.8	163	9.0	130	8.6
11-June-21	104	10.8	246	11.0	155	10.5	125	11.2

Figure 7 shows that periphyton biomass generally increased immediately downstream of the discharge, and then generally decreased in a downstream direction.

Guidelines in the National Policy Statement for Freshwater Management 2020 (NPS-FM 2020) set out a grading system for periphyton in rivers (Table 11). As this is the first year that periphyton monitoring has been undertaken, this information is included as a reference only as these grades are based on a monthly

monitoring regime and the minimum record length for grading a site based on periphyton (chlorophyll-a) is three years.

Table 11 Grading system for periphyton in rivers (modified from NPS-FM 2020)

Band	Description	Chl-a mg/m^2*
A	Rare blooms reflecting negligible nutrient enrichment and/or alteration of the natural flow regime or habitat	≤50
B	Occasional blooms reflecting low nutrient enrichment and/or alteration of the natural flow regime or habitat	>50 and ≤120
C	Periodic short-duration nuisance blooms reflecting moderate nutrient enrichment and/or moderate alteration of the natural flow regime or habitat	>120 and ≤200
National bottom line		200
D	Regular and/or extended-duration nuisance blooms reflecting high nutrient enrichment and/or significant alteration of the natural flow regime or habitat	>200

* exceeded in no more than 8% of samples

NOTE: Based on a monthly monitoring regime with three years data required for grading.

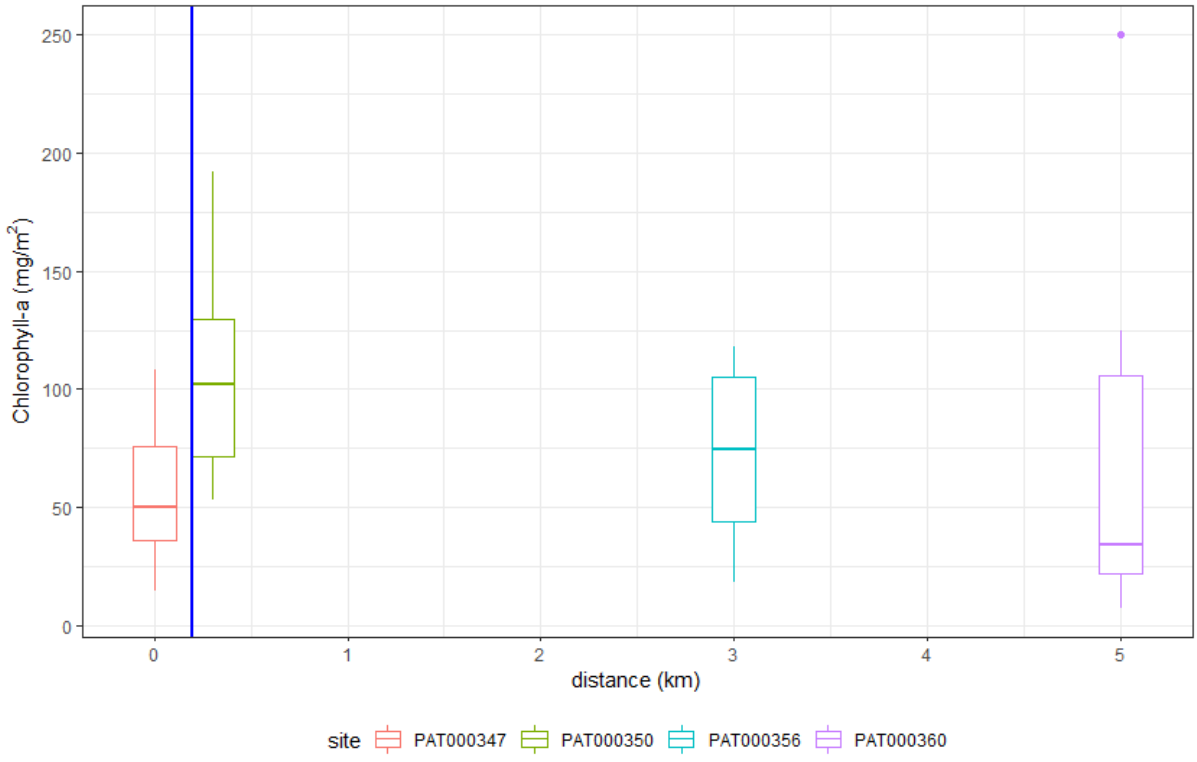

Figure 7 Periphyton biomass 2020-2021 shown in relation to distance from the discharge (blue line)

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 SDC. 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).

In the 2020-2021 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with SDC's conditions in resource consents or provisions in Regional Plans.

3 Discussion

3.1 Discussion of site performance

The Stratford WWTP system has continued to perform satisfactorily, with aerobic conditions maintained and a generally high standard of treated wastewater discharged throughout the monitoring period. Effluent quality was of a good standard. Monitoring of the microfloral component of the tertiary cell of the secondary pond (using chlorophyll-a measurements) indicated that the system had a low algal content, particularly following heavy rainfall events. Microfloral populations have not indicated poor performance of the treatment system to date and generally indicate an improvement in conditions in the tertiary cell since the last WWTP upgrade.

During the consent renewal process, SDC investigated a number of options to improve the performance of the WWTP system and hence decrease the amount of nutrients discharging to the river. Chemical dosing to reduce phosphorus was initially proposed, however this does not remove the phosphorus, merely locking it up and then requiring mechanical removal and disposal. Also investigated were land disposal options and nitrogen reduction using in-pond media. SDC now proposes to reduce the phosphorus in the influent via a new Trade Waste Policy and Trade Waste Bylaw, along with implementing a Diatomix process in Pond 2. This will hopefully reduce phosphorus, nitrogen and algae levels. Conditions on the renewed consent include a timeline for these measures to be in place.

SDC is planning to install bird scaring devices around the ponds to reduce the significant bird population.

Condition 1 of consent 0196-5 requires that the volume of wastewater discharged over any 24-hour period ending at midnight shall not exceed 4,800 m^3, unless there has been a total of more than 10 mm of rain over the previous three days. Discharge data provided by SDC showed that this condition was complied with for the majority of the 2020-2021 year. The discharge exceeded the 4,800 m^3 discharge limit following periods of high rainfall. There were a four occasions during the year where there was significant rainfall and the discharge had not quite dropped back to less than 4,800 m^3 after three days.

Condition 9 of consent 0196-5 requires that SDC provides an annual report on inflow and infiltration. This report is to include progress made towards reducing this, targets for reduction for the coming year, details of work undertaken to date, and the estimated amount of work remaining. During the 2020-2021 year a total of 320 m of wastewater pipes were relined. Work planned to be undertaken in 2021-2022 includes further relining of pipes, manhole replacement and the inspection of stormwater discharges to gully traps at residential properties.

Condition 11 of consent 0196-5 requires that SDC convene an annual meeting with Te Runanga o Ngati Ruanui and Fish & Game New Zealand. The first of these meetings was held in October 2020.

3.2 Environmental effects of exercise of consents

No significant impacts of the discharge were recorded on the physical and chemical quality of the Patea River during the late summer low flow survey. Localised and moderate increases in nutrients were recorded downstream of the rock riprap outfall, mitigated to a certain extent by the effluent quality which was of a good standard at the time of the survey. Turbidity increased by 194% below the discharge (consent condition 14 of 0196-5 allows for <50%), however both upstream and downstream results were low at <2.5 FNU. It was not considered that there would be significant effects in the receiving water because of this.

Three additional seasonal receiving water monitoring surveys found no significant effects in the Patea River below the WWTP discharge and levels of filtered carbonaceous BOD_5 and unionised ammonia complied with consent conditions. Turbidity was above the consent limit in one of the three samples, however, as with

the low flow survey, turbidity was relatively low even with the increase and no significant effects would be expected in the receiving water.

The late summer macroinvertebrate survey showed significant impacts of the discharge beyond the permitted mixing zone under low flow conditions. While no significant heterotrophic growths were found on the substrate of the riverbed and all effluent metal concentrations were low with levels unlikely to cause problems to the biota there was a decline in macroinvertebrate health in the Patea River. This was indicative of chronic nutrient enrichment coincident with discharges from the Stratford WWTP and consistent with results from previous surveys. Renewed consent 0196-5 requires that SDC reduce levels of phosphorus and nitrate in the WWTP. This should result in improved macroinvertebrate health in the Patea River below the discharge.

Periphyton monitoring found that biomass increased immediately downstream of the discharge, this was likely due to the high levels of nutrients discharged from the Stratford WWTP. There also appeared to be a seasonal pattern. This could be attributed to a higher dilution of the WWTP discharge (i.e. increased stormwater in the system dilutes wastewater, and therefore nutrients, prior to discharge), cold water, high overall flows, and more frequent fresh flows in wet/colder months. The highest values of Chlorophyll-a were recorded in the summer/autumn period which would coincide with warm water temperatures allowing for faster growth, longer daylight hours which promotes photosynthesis, low overall flows, and longer periods without freshes or floods to scour away periphyton.

3.3 Evaluation of performance

A tabular summary of SDC's compliance record for the year under review is set out in Table 12.

Table 12 Summary of performance for consent 0196-5

Purpose: ***To discharge treated wastewater from the Stratford Wastewater Treatment Plant into the Patea River***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Limits on the discharge volume	Data provided by consent holder	No
2. Consent holder to measure and record rate and volume of discharge	Data provided by consent holder	Yes
3. Best practicable option to prevent or minimise adverse environmental effects	Inspection, liaison with consent holder	Yes
4. Dissolved oxygen to exceed 0 g/m^3 at all times	Review of data on Wateroutlook – 100% compliance	Yes
5. Consent holder to continuously measure concentration of dissolved oxygen and provide data	Data available on Wateroutlook	Yes
6. Diatomix system to be installed before June 2022	Not due during period under review	N/A
7. Mean concentration of phosphorus over any 180 day period < 6 g/m^3	Data received from consent holder	Yes

Purpose: *To discharge treated wastewater from the Stratford Wastewater Treatment Plant into the Patea River*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
8. Nitrate concentration in Pond 2 to trend downwards following installation of Diatomix system	Not due during period under review	N/A
9. Reporting due 31 July annually	Report received	Yes
10. Maintenance of Contingency plan	Plan up to date as of July 2021	Yes
11. Annual meeting with Te Runanga o Ngati Ruanui and Fish & Game annually until at least 2025	Meeting held October 2020	Yes
12. Chemical, bacteriological and ecological monitoring of the oxidation pond system and Patea River to be carried out	SDC and Council monitoring	Yes
13. Limits on receiving water effects	Inspections, sampling, biological monitoring	**No. Negative effects on macroinvertebrates and periphyton**
14. Limits on turbidity downstream	Sampling	**No.** **2 out of 4 samples complied**
15. Limits on unionised ammonia and filtered carbonaceous BOD_5 downstream	Sampling	Yes
16. Consent holder to notify Council if trade wastes are accepted into the system that may change the general nature of the discharge	Liaison with consent holder	Yes
17. Review of consent	Optional review in June 2022, recommendation attached in section 3.6	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 13 Evaluation of environmental performance over time

Year	High	Good	Improvement req	Poor
2010	-	1	-	-
2011	-	1	-	-
2012	-	1	-	-
2013	-	1	-	-

Year	High	Good	Improvement req	Poor
2014	-	1	-	-
2015	-	1	-	-
2016	-	1	-	-
2017	-	1	-	-
2018	-	1	-	-
2019	-	1	-	-
2020	-	1		
Totals	0	11	0	0

During the year, SDC demonstrated an improvement is required in the level of environmental and a high level of administrative performance with the resource consents as defined in Section 1.1.4. As noted above, SDC are actively pursuing options for reducing the effects of the discharge from the WWTP upon the Patea River.

3.4 Recommendations from the 2019-2020 Annual Report

In the 2019-2020 Annual Report, it was recommended:

1. THAT in the first instance, monitoring of consented activities at Stratford WWTP in the 2020-2021 year be amended from that undertaken in 2019-2020, by including periphyton monitoring and additional nutrient sampling.
2. THAT should there be issues with environmental or administrative performance in 2020-2021, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.
3. THAT the option for a review of resource consent 0196 in June 2021, as set out in condition 17 of the consent, not be exercised, on the grounds that the current conditions are adequate.

Recommendations one and three were implemented, while it was not considered necessary to carry out additional monitoring as per recommendation two.

3.5 Alterations to monitoring programmes for 2021-2022

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.

No planned changes have been made to the 2021-2022 monitoring programme.

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 2021-2022.

3.6 Exercise of optional review of consent

Resource consent 0196-5 provides for an optional review of the consent in June 2022. Condition 17 allows the Council to review the consent, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment.

Based on the results of monitoring in the year under review, and in previous years as set out in earlier annual compliance monitoring reports, it is considered that there are no grounds that require a review to be pursued.

4 Recommendations

1. THAT in the first instance, monitoring of consented activities at Stratford WWTP in the 2021-2022 year continue at the same level as in 2020-2021.
2. THAT should there be issues with environmental or administrative performance in 2021-2022, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.
3. THAT the option for a review of resource consent 0196-5 in June 2022, as set out in condition 17 of the consent, not be exercised, on the grounds that the current conditions are adequate.

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.
BODCF	Carbonaceous 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.
COD	Chemical oxygen demand. A measure of the oxygen required to oxidise all matter in a sample by chemical reaction.
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 presence of pathological micro-organisms,
FC	Faecal coliforms, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre 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.
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.
Mixing zone	The zone below a discharge point where the discharge is not fully mixed with the receiving environment. For a stream, conventionally taken as a length equivalent to 7 times the width of the stream at the discharge point.

NH_4	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).
NNN	Nitrate-Nitrite nitrogen.
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.
SS	Suspended solids.
SQMCI	Semi quantitative macroinvertebrate community index.
Temp	Temperature, measured in °C (degrees Celsius).
Turb	Turbidity, expressed in NTU.
WWTP	Wastewater Treatment Plant.
Zn*	Zinc.

*an abbreviation for a metal or other analyte may be followed by the letters 'As', to denote the amount of metal recoverable in acidic conditions. This is taken as indicating the total amount of metal that might be solubilised under extreme environmental conditions. The abbreviation may alternatively be followed by the letter 'D', denoting the amount of the metal present in dissolved form rather than in particulate or solid form.

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

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Appendix I

Resource consents held by Stratford District Council

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

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:	Stratford District Council PO Box 320 Stratford 4352
Decision Date	7 April 2020
Commencement Date	1 May 2020

Conditions of Consent

Consent Granted:	To discharge treated wastewater from the Stratford Wastewater Treatment Plant into the Patea River
Expiry Date:	1 June 2034
Review Date(s):	June 2021, then annually until 2025, and 3-yearly thereafter and in accordance with special condition 17
Site Location:	Stratford Wastewater Treatment Plant, Victoria Road, Stratford
Grid Reference (NZTM)	1712836E-5644349N (approximate discharge point)
Catchment:	Patea

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

47 Cloten Road · Private Bag 713 · Stratford 4352 · New Zealand
T: 06 765 7127 · F: 06 765 5097 · E: info@trc.govt.nz · www.trc.govt.nz
www.facebook.com/TaranakiRegionalCouncil twitter.com/TaranakiRC
Please quote our document number in your reply

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General condition

a. The consent holder shall pay to the Taranaki Regional Council all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1) The volume of treated wastewater discharged over any 24-hour period ending at midnight shall not exceed 4,800 cubic metres, unless there has been a total of more than 10 mm of rain over the previous three days (as measured by the Taranaki Regional Council rain gauge at Stratford).

2) The consent holder shall install and maintain equipment that measures and records the rate and volume of the discharge to an accuracy of ± 5%, at intervals not exceeding 15 minutes. Records of the date, the time and the rate and volume of the discharge shall be transmitted to the Taranaki Regional Council's computer system within 2 hours of being recorded.

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

4) From 1 June 2022, the dissolved oxygen concentration in the oxidation pond adjacent to the outlet shall exceed 0 gm^{-3} at all times.

5) The consent holder shall continuously measure the concentration of dissolved oxygen in:

   (a) Pond 1; and
   (b) the oxidation pond adjacent to the outlet.

   The data shall be made available to the Taranaki Regional Council within 2 hours of being recorded.

6) Before 1 June 2022, the consent holder shall install the Diatomix system in the oxidation pond (as described in the addendum received by the Taranaki Regional Council on 30 September 2019), and advise the Taranaki Regional Council of the date of installation.

7) From 1 June 2020, the mean concentration of phosphorus over any 180 day period (based on at least one sample each month), shall be no more than 6 g/m^3 at the inlet of Pond 1.

8) Following installation of the Diatomix system the nitrate concentration in Pond 2 shall generally trend downwards. Within 12 months this nitrate concentration shall reach a practical minimum and then be maintained at a practical minimum.

9) Before 31 July each year, the consent holder shall provide to the Chief Executive, Taranaki Regional Council a report covering:

   (a) details of the progress made towards reducing inflow and infiltration reduction over the previous year ending 30 June;

   (b) the consent holder's target for reduction of inflow and infiltration in the coming year and details of the works proposed in order to meet that target; and

   (c) details of the total amount of work that has been undertaken to date, and the estimated amount of work remaining.

   Copies of the report shall be provided to Te Runanga o Ngati Ruanui and Fish & Game NZ for information purposes.

10) The consent holder shall maintain and annually update a 'Contingency Plan' that details measures and procedures to be undertaken to prevent, and to avoid environmental effects from any discharge of contaminants not authorised by this consent. The Plan and any amended version(s) shall be provided to the Chief Executive of the Taranaki Regional Council.

11) The consent holder shall convene an annual meeting with Te Runanga o Ngati Ruanui and Fish & Game New Zealand for the first 5 years following granting of this consent, and in subsequent years if requested by either party, to discuss the progress and effectiveness of the treatment system.

12) The consent holder shall, in conjunction with the Taranaki Regional Council, undertake chemical, bacteriological and ecological monitoring of the oxidation pond system and the Patea River as deemed reasonably necessary by the Chief Executive, Taranaki Regional Council subject to Section 36 of the Resource Management Act 1991. The monitoring shall specifically include dissolved reactive phosphorus (DRP), nitrogen-species, and periphyton biomass.

13) At a point 130 metres downstream of the discharge point the discharge shall not give rise to any of the following effects in the receiving waters of the Patea River:

   (a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
   (b) any conspicuous change in the colour or visual clarity;
   (c) any emission of objectionable odour;
   (d) any significant adverse effect on aquatic ecosystems.

14) At a point 130 metres downstream of the discharge point the discharge shall not give rise to an increase in turbidity of more than 50% (as determined using FNU ((Formazin Nephelometric Units)) in the Patea River.

15) At a point 130 metres downstream of the discharge point the discharge shall not cause the receiving waters of the Patea River to exceed the following concentrations:

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

16) The consent holder shall notify and advise the Chief Executive, Taranaki Regional Council if trade wastes are accepted from any trade premises into the consent holder's wastewater system, that may change the general nature of the discharge from that described in the consent application. Copies of the notification shall be provided to Te Runanga o Ngati Ruanui and Fish & Game NZ for information purposes.

17) 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:

(a) during the month of June 2021, then annually until 2025, and then 3-yearly thereafter;

(b) within 3 months of receiving a notification under special condition 16 above;

for the purposes of:

(a) reviewing or setting new discharge or receiving water standards following the implementation of the Diatomix system; and

(b) 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.

(c) within 12 months of a Regional Plan becoming operative that includes objectives, policies or rules relating to the setting of receiving water standards for dissolved reactive phosphorus (DRP) and dissolved inorganic nitrogen (DIN), for the purpose of ensuring that the conditions of consent are consistent with those objectives, policies and rules.

Signed at Stratford on 7 April 2020

For and on behalf of
Taranaki Regional Council

A D McLay
Director - Resource Management