Stratford District Council
Stratford WWTP
Monitoring Programme
Annual Report
2023/24
Technical Report 2024-41

Taranaki
Regional Council

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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 Pātea Catchment.

This report for the period July 2023 to June 2024 describes the monitoring programme implemented by Taranaki Regional Council (the Council) to assess the Company's environmental and consent compliance performance during the period under review. The report also details the results of the monitoring undertaken and assesses the environmental effects of SDC's activities.

During the monitoring period, Stratford District Council demonstrated a level of environmental performance that required improvement and high level of administrative performance.

SDC holds one resource consent to discharge treated wastewater into the Pātea 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 Pātea 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.

Wastewater and river quality was generally good at the time of sampling. There were occasions where visual clarity was obviously reduced (black disc and observation) and turbidity increased above consented limits, although both turbidity and suspended solids were both generally low. Some nutrients also showed an increase downstream, although unionised ammonia remained below consent limits in all samples.

The results of the spring biomonitoring survey did not show that the WWTP discharges were having a significant negative effect on the macroinvertebrate community health of the Pātea River however, the summer survey indicated that the macroinvertebrate communities of the Pātea River had been significantly adversely effected downstream of the Stratford WWTP discharges. The results from the fourth year of monitoring periphyton indicated that the discharge was resulting in an increase of 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 hoped to reduce the phosphorus in the influent, via a new Trade Waste Policy (effective October 2022) and Trade Waste Bylaw (effective June 2020). The implementation of a Diatomix process in Pond 2 in July 2022 has not had the desired effect of reducing phosphorus and nitrogen, and dosing was ceased in June 2024. SDC are working with their consultant on alternative treatment options.

For reference, in the 2023/24 year, consent holders were found to achieve a high level of environmental performance and compliance for 864 (89%) of a total of 967 consents monitored through the Taranaki tailored monitoring programmes, while for another 75 (8%) of the consents a good level of environmental performance and compliance was achieved. A further 26 (3%) of consents monitored required improvement in their performance, while the remaining two (<1%) achieved a rating of poor.

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 level that requires improvement.

This report includes recommendations for the 2024/25 year, including a recommendation relating to an optional review of Consent 0196-5 in June 2025.

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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 2023 to June 2024 by the Council describing the monitoring programme associated with resource consents 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 consents held by SDC that relates to discharge of treated wastewater in the Pātea Catchment. This is the 37th 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 *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 Pātea 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 2024/25 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 performance

Besides discussing the various details of the performance and extent of compliance by the consent holders, this report also assigns a rating as to each Company's environmental and administrative performance during the period under review. The rating categories are high, good, improvement required and poor for both environmental and administrative performance. The interpretations for these ratings are found in Appendix II.

For reference, in the 2023/24 year, consent holders were found to achieve a high level of environmental performance and compliance for 864 (89%) of a total of 967 consents monitored through the Taranaki tailored monitoring programmes, while for another 75 (8%) of the consents a good level of environmental performance and compliance was achieved. A further 26 (3%) of consents monitored required improvement in their performance, while the remaining two (<1%) achieved a rating of poor.[1]

1.2 WWTP system

Stratford town sewage is treated by an oxidation pond system (Photo 1) and combined successive maturation cell system (2.6ha and 1.7ha 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 entry;
- 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 2014/15 annual report (TRC Technical Report 2015-07).

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 proposed to reduce phosphorus in the influent primarily by implementing a new Trade Waste Policy (effective October 2022) and Trade Waste Bylaw (effective June 2020) which will prevent the high loading via trade waste, the majority of which was coming from outside the Stratford district. A Diatomix system was installed in Pond 2 in July 2022 in order to reduce phosphorus, nitrogen and algae levels. A Diatomix system is a natural, biological process which can take up to 12 months to produce obvious results once installed.

[1] The Council has used these compliance grading criteria for more than 20 years. They align closely with the 4 compliance grades in the MfE Best Practice Guidelines for Compliance, Monitoring and Enforcement, 2018

SDC trialled this technology for two years without the desired results (this is discussed further in the remainder of the report).

Photo 1 Stratford WWTP

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 SDC.

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 Pātea River	May 2020	June 2025	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 Pātea 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 Pātea 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 Pātea 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 2023/24 year.

Photo 2 Periphyton monitoring at site PAT000356

2. Results

2.1 Water

2.1.1 Inspections

9 August 2023

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 45m^3/hr (12.5L/s). Three of the four aerators in the main pond were operating and the pond was turbid and light brown in colour. Pond level was normal. Approximately 375 mallard ducks, Canadian geese and black swans were present.

Cell levels were normal with dividing walls exposed. In excess of 200 Canadian geese, mallard, and teal ducks were observed, along with some black swans nesting. The pond was slightly turbid with a light brown colour. The treated effluent discharge flow rate into the Pātea River was estimated at 15L/s with no visual effect observed in the receiving water. No significant odour was noted around the ponds.

The Esk Road trade waste facility was also inspected and found to be compliant.

23 November 2023

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 230m^3/hr (64L/s). Three out of four aerators were operating on the main pond. The pond was turbid and a green colour. Wildlife consisted of mallard ducks and black swans.

Cell levels were slightly high, and flow was discharging via the dividing wall channels. Dosing in relation to the Diatomix system had been increased to eight times per day. Wildlife consisted mainly of black swans and mallard ducks. The cells were slightly turbid, and light green in colour. The treated effluent discharge flow rate into the Pātea River was estimated at around 60L/s with a slight colour variation noted below the point of discharge.

No significant odour was emanating from the ponds. The Esk Road trade waste facility was also inspected and found to be compliant.

18 January 2024

The step screen was operating, and wastes were fully contained. The influent flow rate was 36m^3/hr (10L/s). Three out of four aerators were operating. The pond was turbid, with a dark green/brown colour. Paradise ducks were observed to be numerous.

Diatomix dosing was ongoing. Numerous paradise ducks were noted. The effluent discharge into the Pātea River was estimated at 10L/s and this resulted in a visible colour change in the receiving waters and a small reduction in the black disc measurement downstream.

Minimal odour was noted, mainly near the influent step screen end. The Esk Road unloading facility was inspected and found to be compliant.

21 June 2024

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 155m^3/hr (43L/s). Three out of four aerators were

operating on the main pond and this was a turbid light green/brown. The outlet screen was clear of debris. Wildlife was numerous, with in excess of 250 Canadian geese, mallard and teal ducks, and black swans observed.

Cell levels were low and light green/brown in colour. Diatomix dosing was being undertaken. Approximately 100 birds were observed. The treated effluent discharge flow rate into the Pātea River was estimated at 40L/s with no significant visual environmental effects noted in the receiving water.

The WWTP and surrounds were found to be satisfactory. No significant odour was emanating from the ponds. The Esk Road trade waste facility was also inspected and found to be compliant.

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 18 January 2024 in conjunction with the low flow survey of receiving waters. These results are presented in Table 2.

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 for cadmium, chromium and zinc. 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 Pātea River.

Table 2 Results of effluent monitoring on at site OXP005002

Parameter	Unit	Date				2009-2023 Range
		9 Aug 2023	23 Nov 2023	18 Jan 2024	21 Jun 2024	
BODCF	g/m³	8.1	5.8	2.6	2.7	1.3 - 45
Chloride	g/m³	27	20	30	21	12 - 35
Conductivity	mS/m@25°C	-	-	38.5	-	28.9 - 37.3*
E. coli	/100 ml	-	-	3,260	-	1,515-9,800
pH	pH	7.5	7.5	8.1	7.4	7.0 - 8.8
SS	g/m³	-	-	27	-	5 - 86
Turbidity	FNU	17	21	19	13	3.7 - 71
Temperature	°C	9.9	19.7	24.4	9.8	6.2 – 23.1
Nutrient Analyses						
NH_3	g/m³	0.19	0.20	0.89	0.067	0.019 - 0.58
NH_4	g/m³ N	28.0	17.3	15.2	15.8	0.870 - 25.4
NNN	g/m³ N	0.07	0.62	2.1	-	0.12 - 4.28
DRP	g/m³ P	3.2	2.1	2.8	2.2	0.64 - 4.97
Metal Analyses (acid soluble)						
Cadmium	g/m³	-	-	<0.001	-	<0.001 - 0.005
Chromium	g/m³	-	-	<0.01	-	<0.01 - 0.03
Zinc	g/m³	-	-	<0.02	-	0.008 - 0.035
Appearance		Turbid, light brown	Turbid, green	Turbid, green brown	Turbid, light green-brown	

* conductivity previously measured at 20°C

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 exhibited a wide range of DO concentrations (between 11% and 96% saturation) in the surface layer of the tertiary maturation cell near the outlet. These results indicated that DO was present at all times in the surface layer of the cell. 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.

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 0g/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 the data provided showed that both of these conditions were complied with at all times.

Table 3 Dissolved oxygen measurements from the Stratford WWTP

Date	Time (NZST)	Temperature (°C)	Chloride (g/m³)	Dissolved Oxygen	
				Concentration (g/m³)	Saturation (%)
9 Aug 2023	11:45	9.9	27	1.80	16
23 Nov 20223	08:55	19.7	20	7.79	78
18 Jan 2024	08:30	24.4	30	7.98	96
21 Jun 2024	10:05	9.8	21	1.19	11

2.2.3 Phosphorus

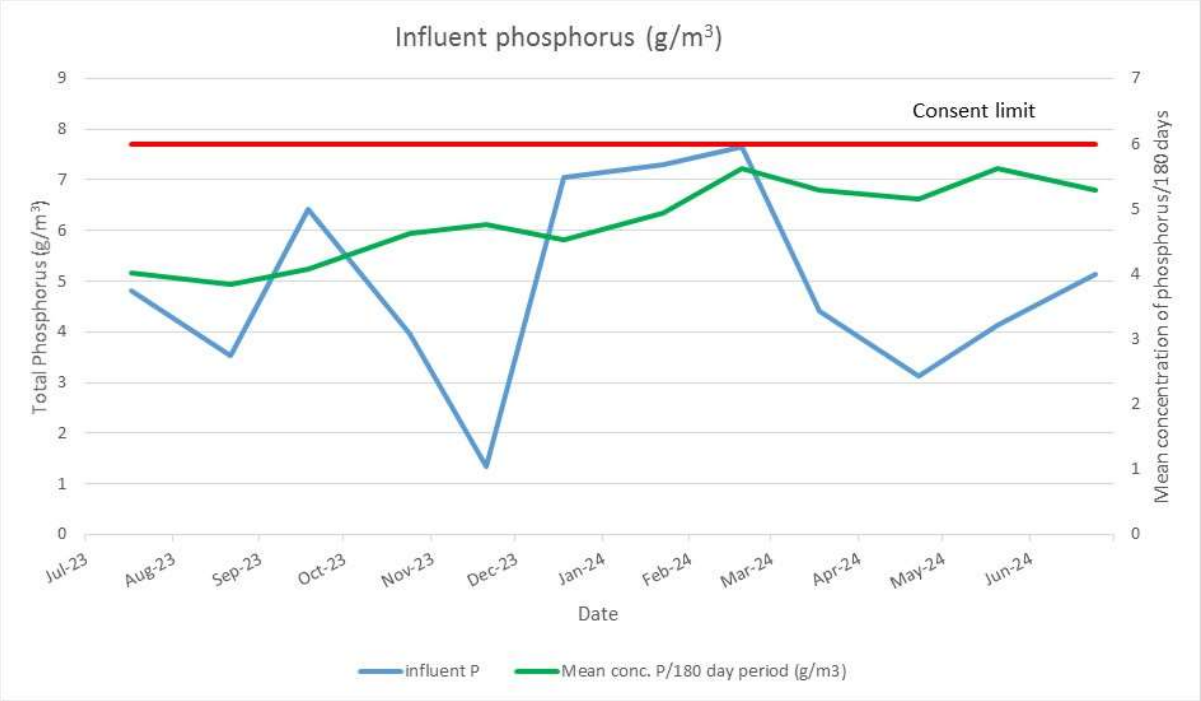

Figure 1 Influent phosphorus and mean concentration over 180 days

Condition 7 of Consent 0196-5 requires that from 1 June 2020, the mean concentration of phosphorus over any 180 day period (based on a least one sample each month), shall be no more than 6g/m^3 at the inlet of Pond 1. The mean concentration over any 180 day period during 2023/24 did not exceed 6g/m^3 at any time. The influent phosphorus results were quite high on occasion with 6.4g/m^3 recorded in September 2023, and 7.1, 7.3 and 7.7g/m^3, respectively, in December 2023, January and February 2024. SDC undertook some further investigation into the high results found, collecting extra samples for several months as composite samples which consistently found much lower influent phosphorus results when compared with the grab sample method.

2.2.4 Nitrate

Condition 6 requires that SDC install a Diatomix 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.

SDC has been collecting monthly nitrate data since December 2019 to establish a baseline from which a downwards trend would hopefully emerge (Figure 2). The Diatomix system began dosing the pond in August 2022. Although there was an initial drop in nitrate in the first four months following the start of dosing, levels since then have been variable with many of the results higher than found during the period of

December 2019 to December 2021. There is a slight upward trend in the results and a minimum has not been reached or maintained.

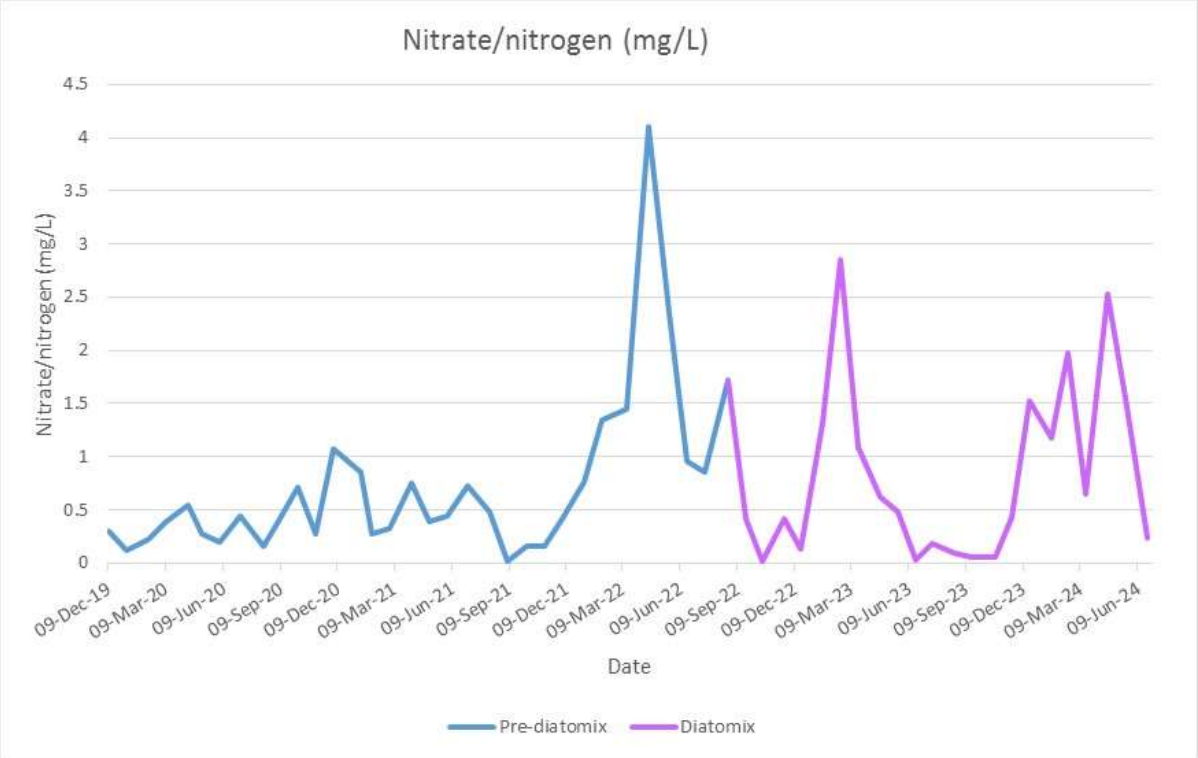

Figure 2 Effluent nitrate

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 300mg/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.

The Stratford pond usually contains relatively poor microfloral populations indicated by low chlorophyll-a concentrations. These results have been attributed to wet weather conditions and stormwater dilution through the WWTP system. The results from November 2023 were unusually high, the maximum recorded from the pond by a significant amount. The levels had dropped by January 2024, although at 280mg/m^3 this was still much higher than the median of 60mg/m^3.

Table 4 Chlorophyll-a levels and tertiary cell appearance

Date	Time (NZST)	Appearance	Chlorophyll-a (mg/m^3)	Range for the period 2013-2023	
				Range	Median
9 Aug 2023	11:45	Turbid, light brown	4	0.5 - 520	60
23 Nov 2023	08:55	Turbid, green	810		
18 Jan 2024	08:30	Turbid, green brown	280		
21 Jun 2024	10:05	Turbid, light green-brown	32		

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 Pātea 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 2023/24 period (Section 2.3.1). Two macroinvertebrate biomonitoring surveys were conducted, one during spring 2023 and one in summer 2024 (Section 2.3.2). Eleven periphyton biomass surveys were also undertaken (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. 250m 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. 130m d/s of the WWTP new outfall	PAT000350
4	Approx. 1km 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 August and November 2023, and June 2024

Receiving water samples were collected on 9 August and 23 November 2023, and 21 June 2024 at two sites in the Pātea 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 August and November 2023, and June 2024

Site		PAT000345 (upstream)				PAT000350 (downstream)			
Date		9 Aug 2023	23 Nov 2022	21 Jun 2024	2009-2023 Range	9 Aug 2023	23 Nov 2022	21 Jun 2024	2009-2023 Range
Parameter	Unit	12:15	10:20	11:10	-	12:00	10:00	10:45	
CBOD	g/m^3	1.0	1.1	<1.0	<0.5-<2	<1.0	<1.0	<1.0	<0.5-<2
Chloride	g/m^3	8	8	9	8-12	9	9	9	8-10
DRP	g/m^3	0.014	0.014	0.012	0.006-0.051	0.093	0.100	0.083	0.02-0.21
pH	pH	7.6	7.6	7.6	7.0-9.5	7.6	7.6	7.5	6.7-10
Turbidity	FNU	0.83*	1.1	1.2	0.54-1.8	1.2*	1.5	1.5	0.74-4.8
Temperature	°C	7.5	13.0	7.9	7.7-17.0	7.5	13.3	8.1	7.8-17.5
NH_3	g/m^3N	0.000029	0.00031	0.00017	0.00015-0.00187	0.0056	0.007	0.0029	0.00013-0.01274
NH_4	g/m^3N	0.038	0.032	0.03	0.019 - 0.148	0.72	0.75	0.53	0.038-1.07
Nitrate	g/m^3N	0.81	0.81	-	0.54-1.23	0.85	0.85	-	0.63-1.21

* unit is NTU

Turbidity levels increased by more than 50% in the samples collected on 9 August 2023, however the consent specifies FNU and the tests were incorrectly carried out in NTU so no further action was taken.

Filtered carbonaceous BOD_5 concentration was below the $2.0gm^3$ consent limit, while unionised ammonia (NH_3) was well below the $0.025gm^3$ limit. It is noted that although unionised ammonia was well below the consent limit, both this and ammoniacal nitrogen increased significantly downstream. Nitrate did not increase significantly downstream and remained in the 'A' band (NPS-FM, 2020) of annual median $\leq 1.0g/m^3$ and annual 95th percentile of $\leq 1.5g/m^3$.

DRP increased significantly below the discharge. Although we don't have monthly data, we do have a large dataset of four samples per year beginning in 2009 (Figure 4), which shows a median of $0.086g/m^3$ and a 95th percentile of $0.178g/m^3$. These values are much higher than the 'D' band values from the NPS-FM 2020 of $>0.018g/m^3$ (median) and $>0.054g/m^3$ (95th percentile). In combination with other conditions favouring eutrophication, DRP enrichment can drive excessive primary production and changes in macroinvertebrate and fish communities.

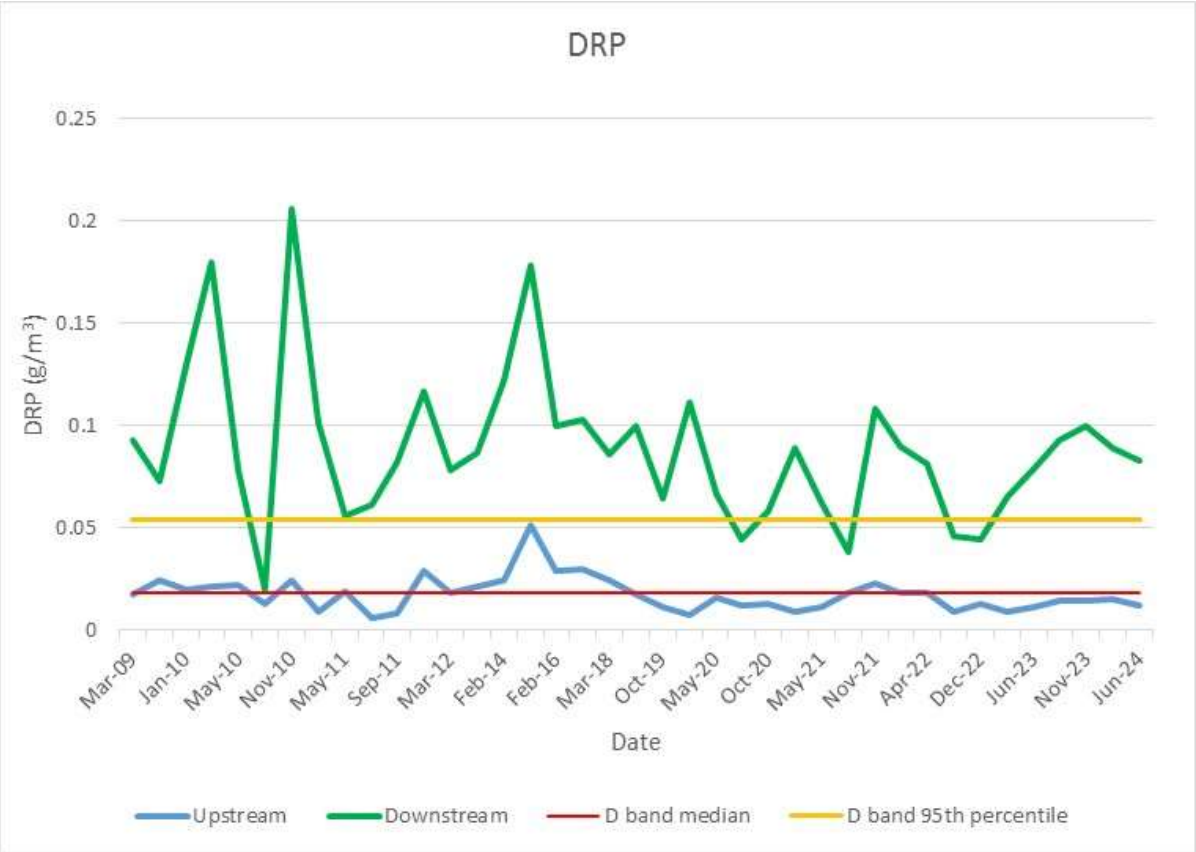

Figure 4 DRP upstream and downstream of the discharge 2009-2024

2.3.1.2 Low flow receiving water survey of January 2024

A summer low flow assessment of the impact of the WWTP's effluent discharge on the receiving waters of the Pātea River was performed on 18 January 2024. River flow at the Skinner Road recorder was 1.53m^3/s during a low flow period, 18 days after a river fresh three times over the median flow. There was a moderate rate of discharge from the ponds system, estimated at approximately 10L/s at the time of the survey. The results of the survey are displayed in Table 7.

A dilution ratio of approximately 40 to 50 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 the site immediately downstream of the discharge, and the clarity had not increased at the furthermost downstream site (PAT000356). This was a breach of condition 13(b) which states that there shall be no conspicuous change in colour or visual clarity downstream. The turbidity increase was 64% which is slightly above the 50% allowed by condition 14, but as both upstream and downstream results were relatively low it was not considered that there would be significant effects in the receiving water because of this. This is discussed further in Section 2.5 below. Suspended solid levels were 3 or <3g/m^3 at all sites.

Nutrient concentrations increased compared with upstream at the site immediately downstream. Unionised ammonia remained well under the consent limit of 0.025g/m^3. 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, pH and filtered carbonaceous BOD_5. These results were indicative of compliance with condition 15 of the consent. Dissolved oxygen concentrations exceeded 98% saturation at all sites upstream and downstream of the discharge.

Table 7 Low flow receiving water results, January 2024

Site		PAT000315 (u/s)		PAT000345 (u/s)		PAT000350 (d/s)		PAT000356 (d/s)	
Date		18 Jan 2024	2009-2023 Range	18 Jan 2024	2009-2023 Range	18 Jan 2024	2009-2023 Range	18 Jan 2024	2009-2023 Range
Parameter	Unit								
Black disc	m	1.83	1.94-3.13	1.90	1.27-3.92	1.70	1.10-3.02	1.75	1.21-2.65
BOD (total)	g/m³	1.0	<0.5-1.0	0.9	<0.5-1.2	1.3	0.9-3.6	1.2	0.8-2.7
BODCF	g/m³	<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/m³	9	8-10	9	8-10	9	8-10	9	8-10
Conductivity	mS/m @25°C	10.5	8.6-11.5	10.8	7.2-11.6	11.5	7.7-12.7	11.3	9.2-12.1
DO (concentration)	g/m³	8.96	9.2-10.4	9.27	9.1-10.3	9.45	9.20-10.3	9.81	10.2-12.7
DO (saturation)	%	98	95-105	102	94-106	105	96-109	110	102-139
E.coli	/100ml	1,733	150-517	1,733	109-461	1,986	99-548	687	88-411
pH	pH	7.7	7.4-7.8	7.8	7.3-8.2	7.8	7.3-7.9	7.9	7.5-8.9
SS	g/m³	<3	<3-9.0	<3	<2-4.0	3	<2-5	<3	<3-4.0
Turbidity	FNU	1.4	0.46-3.6	1.4	0.5-1.8	2.3	0.74-4.8	1.4	0.63-3.6
Temperature	°C	18.2	11.9-17.4	18.8	7.70-18.1	19.0	8.0-18.4	19.9	12.8-19.6
Nutrient Analyses									
NH_3	g/m³ N	0.0002	0.00009-0.00064	0.0005	0.00019-0.00187	0.0078	0.00055-0.01274	0.0008	<0.003-0.00484
NH_4	g/m³ N	0.012	0.006-0.035	0.023	0.032-0.148	0.31	0.038-1.07	0.025	0.006-0.123
NNN	g/m³ N	0.62	0.42-0.78	0.64	0.4-0.8	0.76	0.48-0.91	0.94	0.55-1.1
DRP	g/m³ P	0.022	0.015-0.057	0.015	0.006-0.051	0.089	0.020-0.206	0.081	0.049-0.152
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	0.003	<0.001-0.005	0.0018	0.0011-0.007	0.0016	<0.005-0.007	<0.001	<0.001-0.005
Appearance		Slightly turbid, green-grey		Clear, grey-brown tinge		Slightly turbid, brown tinge		Slightly turbid, brown tinge	

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, two biomonitoring surveys are now routinely undertaken.

The Council collected streambed macroinvertebrates from four sites (Table 8, Figure 4) in the Pātea River in spring (15 November 2023) and summer (22 February 2024) 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 Macroinvertebrate Community Index (MCI) and Semi-Quantitative Macroinvertebrate Community Index (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 Pātea River

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

Spring survey - November 2023

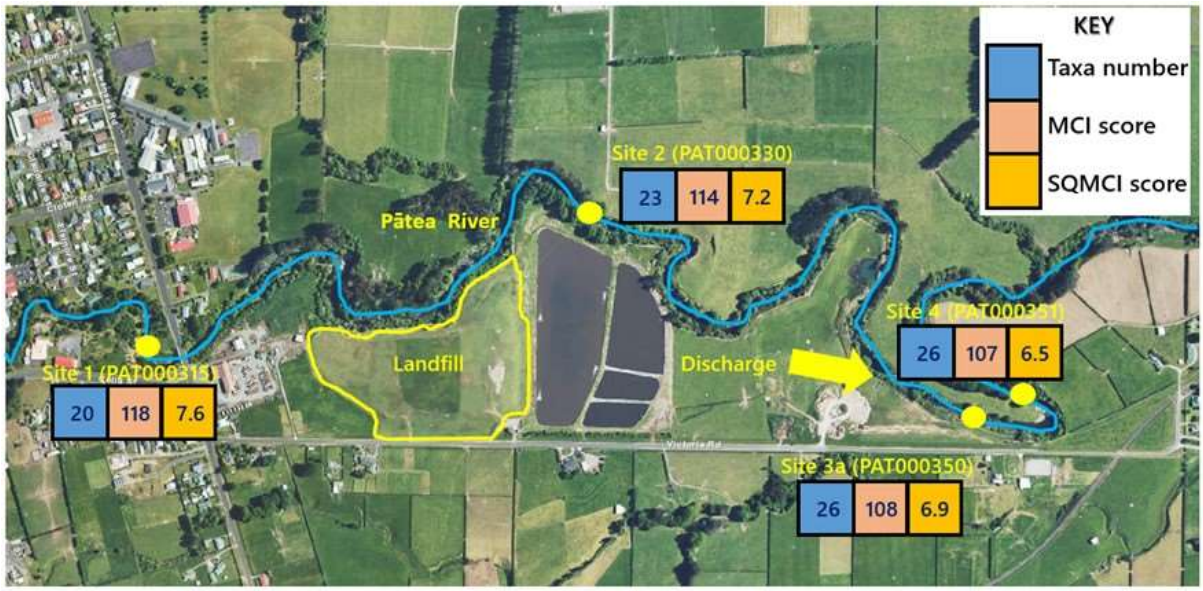

Figure 5 Results for biomonitoring sites in the Pātea River (spring)

The Pātea River sites had moderate to high macroinvertebrate community richness. The 'control' site (site 1) recorded 20 taxa, while site 2 recorded 23 taxa, and both sites 3a and 4, recorded 26 taxa each (Figure 5).

MCI scores were 118, 114, 108 and 107 units at the four sites in a downstream direction respectively. These scores categorized all sites as having 'good' macroinvertebrate community health. Overall, there was a decrease in MCI scores in a downstream direction, with a significantly lower score between the 'control' site 1 and the furthermost downstream site 4.

SQMCI scores were 7.6, 7.2, 6.9 and 6.5 units at the four sites in a downstream direction, respectively, with a significant difference of 1.1 units between sites 1 and 4. These scores were reflective of 'excellent' macroinvertebrate community health at sites 1 and 2, and 'very good' macroinvertebrate community health at sites 3a and 4.

In conclusion, there was no major difference in MCI and SQMCI scores between the 'control' sites 1 and site 2, suggesting the closed landfill was not adversely affecting the macroinvertebrate community. However, there was a downstream decrease in all macroinvertebrate metrics except taxa richness, with significant declines in the MCI and SQMCI scores between the 'control' site 1 and site 4, likely due to the WWTP discharge. Despite these changes, all sites maintained MCI scores of 'good'; and SQMCI scores of 'very

good' or higher macroinvertebrate community health. There was no major shift in the composition of sensitive taxa amongst sites, indicating that the decline is relatively subtle and did not adversely affect the macroinvertebrate community. Overall, the results of this survey indicate that the closed landfill and WWTP discharges did not have a significant negative effect on the macroinvertebrate community health of the Pātea River.

Summer survey - February 2024

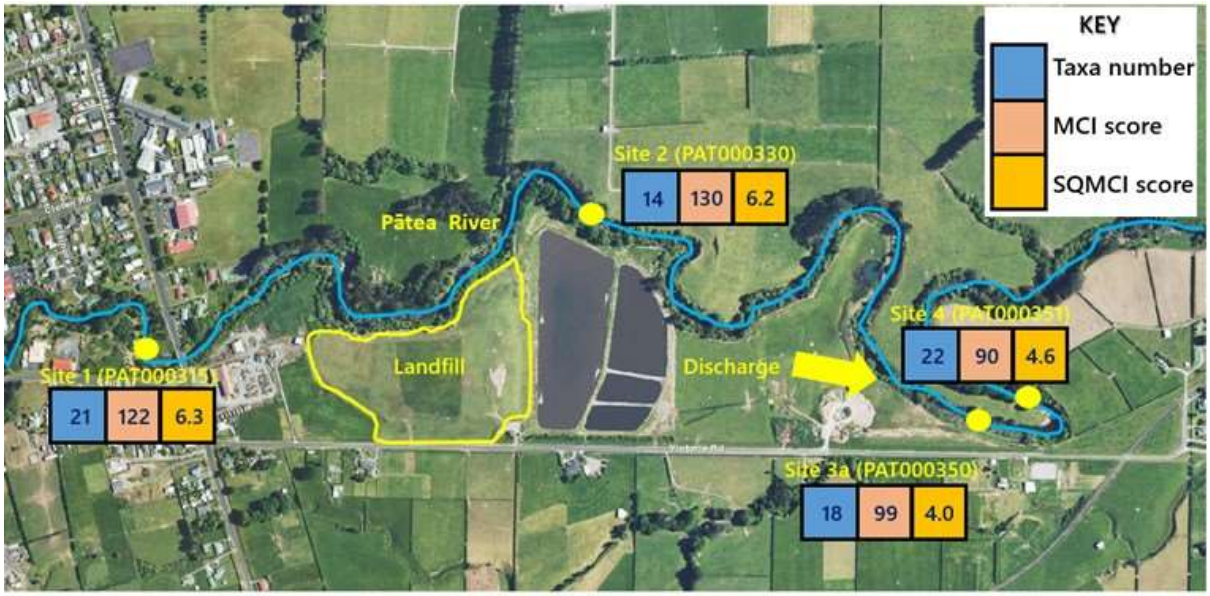

Figure 6 Reuslts for biomonitoring sites in the Pātea River (summer)

The Pātea River sites had low to moderate macroinvertebrate community richness, with sites 1 2, 3a and 4 recording 21, 14, 18 and 22 taxa, respectively (Figure 6). The number of EPT taxa decreased in a downstream direction (12, 9, 8, and 5 EPT taxa at sites 1, 2, 3a and 4 respectively), with the percentage of EPT taxa being 57%, 64%, 44% and 23% at sites 1, 2, 3a and 4, respectively.

MCI scores were 122, 130, 99 and 90 units at sites 1, 2, 3a and 4 respectively. These scores categorised sites 1 and 2 as having ‘very good’ macroinvertebrate community health, while sites 3a and 4 were categorised as having ‘fair’ health. Overall, sites 1 and 2 recorded MCI scores significantly greater than sites 3a and 4. Further, SQMCI scores were 6.3, 6.2, 4.0 and 4.6 units at sites 1, 2, 3a and 4, respectively. These scores were reflective of ‘very good’ macroinvertebrate community health at sites 1 and 2, and ‘fair’ macroinvertebrate community health at sites 3a and 4.

In conclusion, there was no major differences in MCI and SQMCI scores between the ‘control’ site 1 and site 2, suggesting that any discharges from the closed landfill had not adversely effected the macroinvertebrate communities of the Pātea River. However, the pronounced reduction in MCI and SQMCI scores between the two sites upstream of the WWTP discharges (sites 1 and 2) and the two downstream sites (sites 3a and 4), together with a decrease in EPT taxa, and increase of 'tolerant' taxa was indicative of adverse effects related to the WWTP discharges.

Overall, the results of this survey indicated that the macroinvertebrate communities of the Pātea river have been significantly adversely effected downstream of the Stratford WWTP discharges.

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 7). Monthly sampling is scheduled where possible however, where flow conditions prevented safe monitoring, neither periphyton biomass or periphyton cover were assessed.

Figure 7 Periphyton sampling sites in the Pātea River

Table 9 Location of periphyton sampling sites in the Pātea River

Site No	Location	Site code
1	Above Stratford WWTP outfall	PAT000347
2	Below discharge (approximately 130m 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 2023/24 monitoring period. The results are presented in Table 10 and Figure 8.

Table 10 Periphyton biomass during 2023/24 with overall grade from all data

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
26-Jul-23	141	8.1	279	8.1	361	8.6	255	8.7
30-Aug-23	9	6.9	185	7.5	124	8.2	53	8.6
10-Oct-23	4	10.0	62	10.3	101	11.7	3	11.9
6-Nov-23	7	11.7	12	12.1	68	13.4	6	13.8
1-Dec-23	6	11.7	4	12.0	17	12.7	5	12.9
19-Jan-24	8	19.5	64	19.7	114	21.7	63	21.3
19-Feb-24	15	16.3	167	16.7	157	18.1	52	19.7
18-Mar-24	23	12.4	31	12.7	183	13.2	53	13.1
23-Apr-24	12	10.9	83	11.2	110	11.7	75	12.5
17-May-24	49	10.0	184	10.1	142	10.2	191	10.7
19-Jun-24	12	9.8	31	9.8	*	*	38	10.5
Grade^	B		D		C		D	

* too swift to sample

^ Based on 4 years of data from July 2020 to June 2024

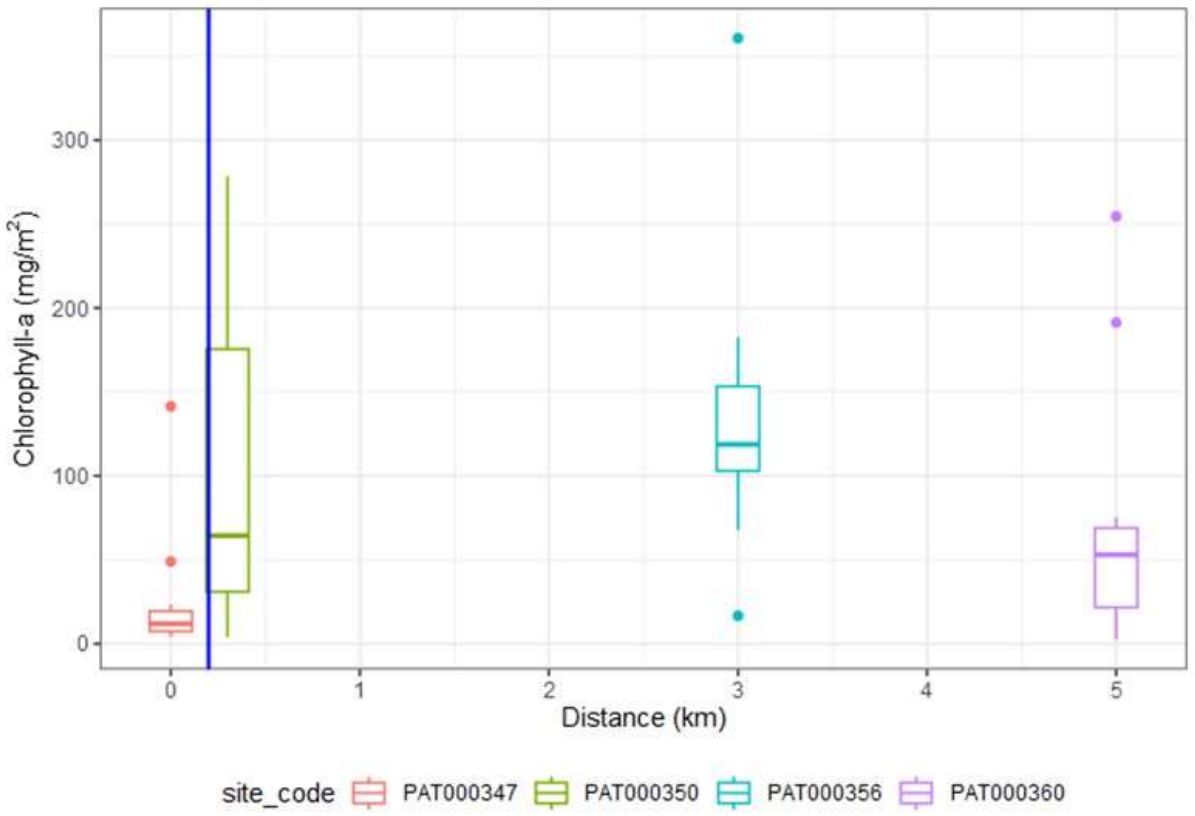

Figure 8 Periphyton biomass 2023/24 shown in relation to distance from the discharge (blue line)

Figure 8 shows that periphyton biomass generally increased immediately downstream of the discharge, increasing further at the site approximately 3km downstream. There was some decrease seen at the site 5km downstream, although this remained higher than the upstream site.

The data collected so far does show a general seasonal pattern, with lower values recorded at all sites in the winter and spring months, increasing into summer and autumn. 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. However, there are instances such as July 2023 where some of the highest levels do not follow this trend. The very high levels of chlorophyll-a found in July 2023 can be explained by a lack of early winter rainfall, it had been 51 days since a 7x fresh on the day of sampling.

Guidelines in the National Policy Statement for Freshwater Management 2020 (NPS-FM 2020) set out a grading system for periphyton in rivers (Table 11).

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.

During the 2023/24 monitoring period, three single chlorophyll-a results exceeded the National bottom line of 200mg/m^2 (7%), while 21% of samples fell into 'Band C'. The majority of samples were in 'Band A' at 44%, with 28% of sample results in 'Band B'.

The grades are based on a monthly monitoring regime with a minimum of three years record length required for grading a site based on periphyton (chlorophyll-a). Four years of data have now been collected for the sites (between 36 to 38 samples per site). Based on this, site 1 (above the Stratford WWTP) is graded B, site 2 (130m below the discharge) is graded D, site 3 (approximately 3km downstream) is graded C, while site 4 (approximately 5km downstream) has a D grade (Figure 9).

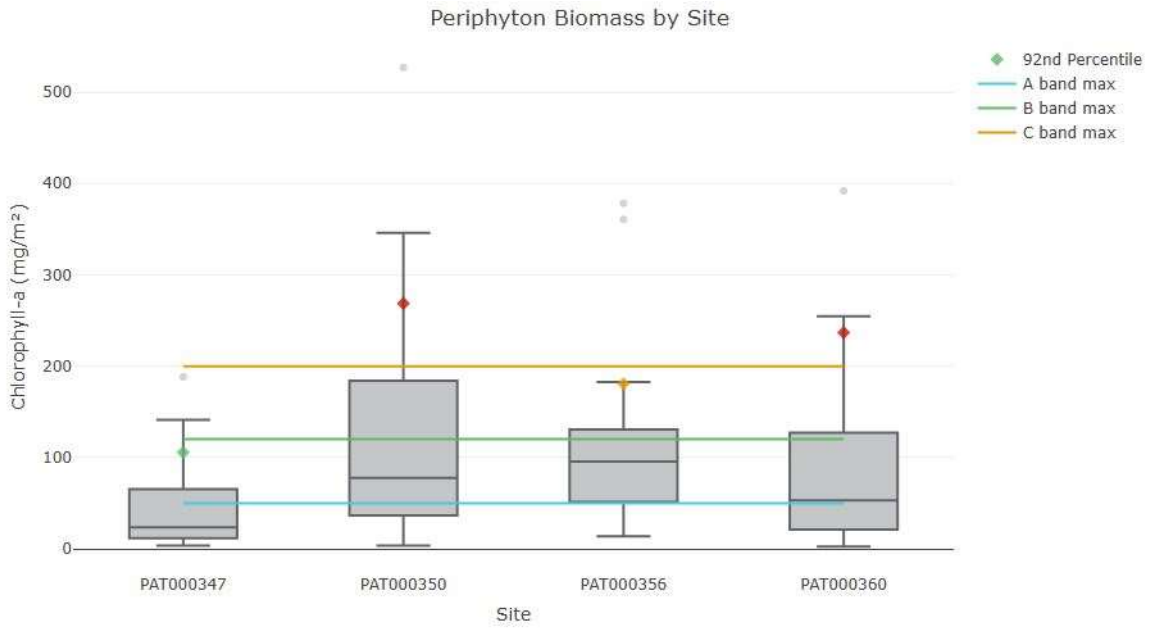

Figure 9 Periphyton biomass by site 2020-2024

2.4 Inflow and infiltration reduction

SDC continue to report on progress with the implementation of the inflow and infiltration reduction programme to minimise stormwater inflow as per condition 9 of Consent 0196-5. 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 2019/20 year, 406m 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 2020/21 year, a total of 320m of wastewater pipes were relined.

No pipe-lining work occurred in the 2021/22 monitoring period due to COVID restrictions, contractor availability and material supply chain issues. Stormwater infiltration assessments were made of properties within the Stratford township to restrict roof water and other hard stand areas discharging into the wastewater network. Ten properties were found to have stormwater ingress into the wastewater network through downpipes and hard stand areas; the inflow from these properties was stopped.

In November 2022 Pipetech were awarded a three-year contract to:

- undertake inflow and infiltration assessments of the wastewater reticulation network using remotely operated cameras;
- make recommendations on which sections of pipeline need lining;
- Clear debris and root intrusions from the pipeline;
- Install and form PVC liners within the pipeline, and;
- Seal defective lateral joins within the pipeline.

A total of 1,362m of PVC pipe lining was undertaken during 2022/23. In addition to the camera assessments and PVC liner installation, stormwater infiltration assessments were made of properties within the Stratford township to restrict roof water and other hard stand areas discharging into the wastewater network.

Fourteen properties were found to have stormwater ingress into the wastewater network through downpipes and hard stand areas and inflow from these properties was stopped.

A total of 1,827m of PVC pipe lining was undertaken during 2023/24. In addition to the camera assessments and PVC liner installation, stormwater infiltration assessments were made of properties within the Stratford township to restrict roof water and other hard stand areas discharging into the wastewater network. Thirteen properties were found to have stormwater ingress into the wastewater network through downpipes and hard stand areas and inflow from these properties was stopped.

SDC also procured ten binary sewer level monitors and installed them within the network to identify any surcharging caused by high rainfall events. These were initially deployed in December 2023 and after several rain events have been redeployed to a different catchment.

Work proposed in order to meet the objectives set for the 2024/25 financial year are targeted at three inflow and infiltration factors:

- Relining of sewer pipelines,
- Manhole remediation,
- Stormwater discharges into residential gully traps

A budget of $600,000 is available for work in the 2024/25 period. Camera assessments of pipelines is due to occur in the first quarter while lining of the areas identified as infiltration prone is expected to commence in the late 2024. It is expected that a further 1,500m of pipelining will occur.

2.5 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).

Table 12 below sets out details of any incidents recorded, additional investigations, or interventions required by the Council in relation to SDC's activities during the 2023/24 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 12 Incidents, investigations, and interventions summary table

Date	Details	Compliant (Y/N)	Enforcement Action Taken?	Outcome
18-Jan-2024	Routine monitoring found that the turbidity in the downstream sample exceeded the 50% increase as allowed by condition 14 of the consent	N	N	Turbidity increased from 1.4 to 2.3 FNU. As the numbers were low, combined with suspended solid readings below detectable limits, no further action was taken on this occasion.

3. Discussion

3.1 Discussion of site performance

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 proposed to reduce the phosphorus in the influent via a new Trade Waste Policy (effective October 2022) and Trade Waste Bylaw (effective June 2020), along with implementing a Diatomix process in Pond 2 (operational from July 2022). After two years of operation dosing of the diatomix ceased in June 2024 as it was obviously not performing as anticipated. It is likely that the climate of high rainfall (with high inflow and infiltration as a result) and low temperatures contributed to the system not working in Stratford. SDC are now working with their consultant on alternative treatment options.

Some of the conditions on the renewed consent were specific to the diatomix process and Council is liaising with SDC to ascertain whether changes to the consent are required.

Condition 1 of Consent 0196-5 requires that the volume of wastewater discharged over any 24-hour period ending at midnight shall not exceed 4,800m^3, unless there has been a total of more than 10mm of rain over the previous three days. The data supplied by SDC indicated that the 4,800 limit was complied with throughout 2023/24.

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. PVC lining was applied to 1,827m of pipe during 2023/24. In addition to the PVC liner installation, stormwater infiltration assessments were made of properties within the Stratford township to restrict roof water and other hard stand areas discharging into the wastewater network. Thirteen properties were found to have stormwater ingress into the wastewater network through downpipes and hard stand areas and inflow from these properties was stopped. SDC also procured ten binary sewer level monitors and installed them within the network to identify any surcharging caused by high rainfall events. These were initially deployed in December 2023 and after several rain events have been redeployed to a different catchment.

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 third of these meetings was held in 2024.

3.2 Environmental effects of exercise of consents

Some impacts of the discharge were observed in the chemical quality of the Pātea River during the late summer low flow survey. Nutrient concentrations increased compared with upstream at the site immediately downstream however, unionised ammonia remained well under the consent limit. There was a notable decrease in black disc clarity between the upstream site and the site immediately downstream of the discharge, and the clarity had not increased at the furthermost downstream site (PAT000356). This was a breach of condition 13(b) which states that there shall be no conspicuous change in colour or visual clarity downstream. The turbidity increase was 64% which is slightly above the 50% allowed by condition 14, but as both upstream and downstream results were relatively low it was not considered that there would be significant effects in the receiving water because of this. This is discussed further in Section 2.5 below. Suspended solid levels were 3 or <3g/m^3 at all sites.

Three additional seasonal receiving water monitoring surveys showed that levels of filtered carbonaceous BOD_5 and unionised ammonia complied with consent conditions. It was noted that DRP increased significantly below the discharge.

The results of the spring biomonitoring survey did not show that the WWTP discharges were having a significant negative effect on the macroinvertebrate community health of the Pātea River however, the summer survey indicated that the macroinvertebrate communities of the Pātea river had been significantly adversely effected downstream of the Stratford WWTP discharges.

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. Three single chlorophyll-a results exceeded the National bottom line of 200mg/m^2. Now that four years of data have been collected (between 36 to 38 samples per site), the sites can be graded according to the NPS-FM 2020. Based on this, site 1 (above the Stratford WWTP) is graded B, site 2 (130m below the discharge) is graded D, site 3 (approx 3km downstream) is graded C, while site 4 (approximately 5km downstream) has a D grade.

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 13.

Table 13 Summary of performance for Consent 0196-5

Purpose: To discharge treated wastewater from the Stratford Wastewater Treatment Plant into the Pātea River		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Limits on the discharge volume	Review of data provided by consent holder	Yes
2. Consent holder to measure and record rate and volume of discharge	Review of 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 0g/m^3 at all times	Review of telemetered data	Yes
5. Consent holder to continuously measure concentration of dissolved oxygen and provide data	Data provided	Yes
6. Diatomix system to be installed before June 2022	System installed and operational during monitoring period	Yes
7. Mean concentration of phosphorus over any 180 day period < 6g/m^3	Review of data received from consent holder	Yes
8. Nitrate concentration in Pond 2 to trend downwards following installation of Diatomix system	Analysis of data provided by consent holder	**No**
9. Reporting on inflow and infiltration due 31 July annually	Report received	Yes
10. Maintenance of Contingency plan	Plan up to date as of July 2023	Yes
11. Annual meeting with Te Runanga o Ngati Ruanui and Fish & Game annually until at least 2025	Meeting held	Yes
12. Chemical, bacteriological and ecological monitoring of the oxidation pond system and Pātea River to be carried out	SDC and Council monitoring	Yes

Purpose: To discharge treated wastewater from the Stratford Wastewater Treatment Plant into the Pātea River		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
13. Limits on receiving water effects	Inspections, sampling, biological monitoring	**No. Change in colour and clarity. Increase in periphyton**
14. Limits on turbidity downstream	Sampling	**No. Turbidity exceeded in 1 out of 4 samples**
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 2025, recommendation attached in section 3.6	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**Improvement Required** **High**

N/A = not applicable

Table 14 Evaluation of environmental performance over time

Year	Consent number	High	Good	Improvement req	Poor
2019/20	0196-5	-	1	-	-
2020/21	0196-5	-	1	-	-
2021/22	0196-5	-	-	1	-
2022/23	0196-5	-	-	1	-
2023/24	0196-5	-	-	1	-

During the year, SDC demonstrated a level of environmental performance that required improvement, and a high level of administrative performance, with the resource consents as defined in Appendix II.

3.4 Recommendations from the 2022/23 Annual Report

In the 2022/23 Annual Report, it was recommended:

1. THAT in the first instance, monitoring of consented activities at Stratford WWTP in the 2023/24 year continue at the same level as in 2022/23.
2. THAT should there be issues with environmental or administrative performance in 2023/24, 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 2024, 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 undertaken additional investigations or monitoring as per recommendation two.

3.5 Alterations to monitoring programmes for 2024/25

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 2024/25 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 2024/25.

3.6 Exercise of optional review of consent

Resource Consent 0196-5 provides for an optional review of the consent in June 2025. 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 recommended that a review be pursued.

4. Recommendations

1. THAT in the first instance, monitoring of consented activities at Stratford WWTP in the 2024//25 year continue at the same level as in 2023/24.
2. THAT should there be issues with environmental or administrative performance in 2024/25, 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 2025, as set out in condition 17 of the consent, be exercised, on the grounds that the current conditions are not 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.
EPT taxa	EPT stands for Ephemeroptera (mayfly), Plecoptera (stonefly) and Trichoptera (caddisfly) which are macroinvertebrateds that are sensitive to water pollution. Because these species are generally found in streams with good water quality, their abundance can give us an idea about how healthy a stream is.
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 manager within the Environment Quality Department.

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Appendix I

Resource consents held by Stratford District Council

(For a copy of resource consents please email compliance.monitoring@trc.govt.nz)

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

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Please quote our document number in your reply

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

Appendix II

Categories used to evaluate environmental and administrative performance

Categories used to evaluate environmental and administrative performance

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

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

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

Environmental Performance

High: No or inconsequential (short-term duration, less than minor in severity) breaches of consent or regional plan parameters resulting from the activity; no adverse effects of significance noted or likely in the receiving environment. The Council did not record any verified unauthorised incidents involving 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.