

Stratford District Council
Stratford WWTP
Monitoring Programme
Annual Report
2019-2020

Technical Report 2020-61

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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 2019 to June 2020 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.

SDC holds one resource consent to discharge treated wastewater into the Patea River. Consent 0196-4 was replaced by 0196-5 on 1 May 2020, and includes a total of 17 conditions setting out the requirements that they must satisfy.

During the monitoring period, SDC demonstrated an overall good level of environmental performance.

The Council's monitoring programme for the year under review included four inspections, wastewater analyses, and physicochemical and biological surveys 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 that were upstream and downstream of the effluent point, coincident with discharges from the Stratford WWTP.

During the year, SDC demonstrated a good level of environmental and a high level of administrative performance with the resource consents. Biological effects from the discharge on the receiving waters continue to be recorded, with impacts on macroinvertebrate communities noted in the downstream mixing zone. 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), along with implementing a Diatomix process in Pond 2, which will hopefully reduce phosphorus, nitrogen and algae levels downstream.

For reference, in the 2019-2020 year, consent holders were found to achieve a high level of environmental performance and compliance for 81% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 17% 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 2020-2021 year, including a recommendation relating to an optional review of consent 0194-5.

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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 2019 to June 2020 by the Council describing the monitoring programme associated with the 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 the SDC that relate to the discharge of treated wastewater in the Patea catchment. This is the 33rd 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 through 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 2020-2021 monitoring year.

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

1.1.3 The Resource Management Act 1991 and monitoring

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

- a. the neighbourhood or the wider community around an activity, and may include cultural and social-economic effects;
- b. physical effects on the locality, including landscape, amenity and visual effects;
- c. ecosystems, including effects on plants, animals, or habitats, whether aquatic or terrestrial;
- d. natural and physical resources having special significance (for example recreational, cultural, or aesthetic); and
- e. risks to the neighbourhood or environment.

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

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

1.1.4 Evaluation of environmental and administrative performance

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

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

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

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

Environmental Performance

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

Good: Likely or actual adverse effects of activities on the receiving environment were negligible or minor at most. There were some such issues noted during monitoring, from self reports, or during investigations of incidents reported to the Council by a third party but these items were not critical, and follow-up inspections showed they have been dealt with. These minor issues were resolved positively, co-operatively, and quickly. The Council was not obliged to issue any abatement notices or infringement notices in relation to the minor non-compliant effects; however abatement notices may have been issued to mitigate an identified potential for an environmental effect to occur.

For example:

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

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

Poor: Likely or actual adverse effects of activities on the receiving environment were significant. There were some items noted during monitoring, from self reports, or during investigations of incidents reported

to the Council by a third party. Cumulative adverse effects of a persistent moderate non-compliant activity could elevate an 'improvement required' issue to this level. Typically there were grounds for either a prosecution or an infringement notice in respect of effects.

Administrative performance

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

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

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

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

For reference, in the 2019-2020 year, consent holders were found to achieve a high level of environmental performance and compliance for 81% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 17% 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 15 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 the 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.

The pipe lining and manhole work was completed at a cost of \$178,274.

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. Consent 0196-4 expired on 1 June 2016 and SDC continued to operate under the consent as per Section 124 of the RMA until the renewed consent was granted in May 2020.

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 |
|----------------|--|---------------|--------|-----------|
| 0196-4 | To discharge treated wastewater from the Stratford Wastewater Treatment Plant into the Patea River | November 2013 | - | June 2016 |

| Consent number | Purpose | Granted | Review | Expires |
|----------------|---------|----------|-----------|-----------|
| 0196-5 | | May 2020 | June 2021 | 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 four primary components.

1.4.2 Programme liaison and management

There is generally a significant investment of time and resources by the Council in:

- ongoing liaison with resource consent holders over consent conditions and their interpretation and application;
- 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 whether or not the discharge of treated wastewater from the site has had a detrimental effect upon the communities of the stream.

2 Results

2.1 Water

2.1.1 Inspections

13 August 2019

The step screen waste bin was covered and wastes were fully contained. Minimal odour was noted around this area. The influent flow rate was 395 m³/hr (110 L/s). All four aerators were operating in the main pond. This was a slightly turbid, green/grey colour. The pond level was relatively high due to a high influent flow and the outlet screen was partially blocked, with accumulated debris impeding the discharge flow. Numerous mallard and teal ducks and black swans were observed on the pond surface.

Cells one and two were just breaching the dividing walls via the overtopping channels. Approximately 40 mallard ducks and several black swans were present. The treated effluent discharge flow rate into the Patea River was estimated at 80 L/s and this was showing a slight visual environmental effect (discolouration) at the point of discharge.

In general the WWTP and surrounds were satisfactory. It was noted that the concrete wave band along the eastern perimeter of the main pond had been undermined via wave action and this required attention.

High influent flow rates appeared to be related to significant stormwater ingress, despite the implementation of the Inflow and Infiltration Reduction Programme. SDC was asked to ensure that the screen on the Pond 1 outlet was cleared and maintained to a satisfactory standard, especially during periods of high flows.

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

31 October 2019

The step screen waste bin was covered and wastes were fully contained. The influent flow rate was 84 m³/hr (23.3 L/s). The four aerators were operating on the main pond. This was a normal level and a slightly turbid, green/grey. The outlet screen was partially blocked with debris. Over 100 mallard and several black swans were observed.

All cell levels were normal with dividing walls exposed. In excess of 200 mallard ducks and several black swans were noted on these. The water was relatively clear, and light grey in colour with abundant water fleas noted. The treated effluent discharge flow rate into the Patea River was estimated at approximately 20 L/s and there was a slight visual environmental effect (light green discolouration) at the point of discharge.

Minimal odour was noted around the site, mainly near the step screen and flume shed area.

The WWTP and surrounds were found to be satisfactory, although it was noted (as in the previous inspection) that the concrete wave band along the eastern perimeter of the main pond had been undermined via wave action.

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

24 January 2020

All four aerators were operating in the primary pond. The influent flow rate was 60 m³/hr (16.6 L/sec). The step screen was operating and wastes were fully contained. The pond was turbid with a dark green/ brown colour. Approximately 100 mallard and paradise ducks were present.

Wildlife was abundant on the cells, with Canadian geese, mallard, teal and paradise ducks, and several black swans. The effluent discharge into the Patea River was estimated at 15 L/sec, with no significant reduction in clarity downstream (as measured by black disc).

Odour around the site was minimal, mainly near the influent step screen end. SDC was advised that the bird population needed to be controlled. It was noted that dissolved oxygen analyser cables had been installed at both ponds.

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

15 May 2020

The step screen was operating in the primary pond and wastes were fully contained. Minimal odour was emanating from around this area. The influent flow rate was 98 m³/hr (27 L/s). All aerators were operating and the pond was slightly turbid, with a green/brown colour. The pond level was relatively high as the outlet screen was partially blocked by debris. SDC was reminded to ensure that the screen on the Pond 1 outlet is cleared and maintained to a satisfactory standard, especially during periods of high flows. Wildlife was abundant, consisting of Canadian geese, mallard ducks and several black swans.

The levels in cells one and two were normal. The treated effluent discharge flow rate into the Patea River was estimated to be approximately 25 L/s with no significant visual environmental effect at the point of discharge.

It was noted that an electric fence had been erected around the pond perimeter and cattle were grazing this area. Although not a Council consent condition, cattle are prohibited from grazing near raw human effluent due to the potential for *Cysticercus bovis*, (tapeworm) cysts being transferred between cattle and humans.

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

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 24 January 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 | | | | 2009-2019 Range |
|----------------|------------------|-------------|-------------|-------------|-------------|-----------------|
| | | 20 Aug 2019 | 31 Oct 2019 | 24 Jan 2020 | 15 May 2020 | |
| BOD | g/m ³ | - | - | 9.0 | - | 12 - 58 |
| BODCF | g/m ³ | 1.3 | 2.8 | 4.8 | 2.3 | 2.7 - 45 |
| Chloride | g/m ³ | 15 | 17 | 24 | 21 | 12 - 35 |
| Conductivity | mS/m@25°C | - | - | 36.7 | - | 37.3 |
| <i>E. coli</i> | /100ml | - | - | 1,515 | - | 1,789-8,660 |
| pH | pH | 7.7 | 7.4 | 7.8 | 7.5 | 7.1 - 8.8 |
| SS | g/m ³ | - | - | < 15 | - | 5.0 - 86 |
| Turbidity | FNU | 10.5 | 3.7 | 12 | 13.1 | 5.7 - 71 |
| Temperature | °C | 9.1 | 15.4 | 22.8 | 12.7 | 6.2 - 22.1 |

| Parameter | Unit | Date | | | | 2009-2019 Range |
|--------------------------------------|--------------------|-----------------------------|-------------------------|--------------------|---------------------|-----------------|
| | | 20 Aug 2019 | 31 Oct 2019 | 24 Jan 2020 | 15 May 2020 | |
| Nutrient Analyses | | | | | | |
| NH ₃ | g/m ³ | 0.089 | 0.098 | 0.42 | 0.126 | 0.0438 - 0.4699 |
| NH ₄ | g/m ³ N | 7.7 | 14.9 | 15.0 | 18.0 | 0.870 - 25.4 |
| NNN | g/m ³ N | - | - | 0.45 | - | 0.85 - 4.28 |
| DRP | g/m ³ P | - | 1.85 | 2.7 | 1.69 | 0.695 - 4.97 |
| Metal Analyses (acid soluble) | | | | | | |
| Cadmium | g/m ³ | - | - | < 0.0010 | - | <0.001 - 0.005 |
| Chromium | g/m ³ | - | - | < 0.010 | - | <0.01 - 0.03 |
| Zinc | g/m ³ | - | - | < 0.02 | - | 0.008 - 0.035 |
| Appearance | | Slightly turbid, green grey | Clear, light green grey | Turbid, dark green | Turbid, 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 BOD₅ and moderate suspended solids levels and faecal coliform bacteria number. 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.

Results in Table 3 indicate a relatively wide range of DO concentrations (between 7% and 86% 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/m ³) | Dissolved Oxygen | |
|-------------|-------------|------------------|------------------------------|-----------------------------------|----------------|
| | | | | Concentration (g/m ³) | Saturation (%) |
| 20 Aug 2019 | 09:50 | 9.1 | 15 | 7.7 | 69 |
| 31 Oct 2019 | 08:45 | 15.4 | 17 | 0.7 | 7 |
| 24 Jan 2020 | 08:35 | 22.8 | 24 | 7.2 | 86 |
| 15 May 2020 | 10:15 | 12.7 | 21 | 3.3 | 31 |

2.2.3 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/m³ 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.

Table 4 Chlorophyll-a levels and tertiary cell appearance

| Date | Time (NZST) | Appearance | Chlorophyll-a (mg/m ³) | Range for the period 2013-2019 | |
|-------------|-------------|-----------------------------|------------------------------------|--------------------------------|--------|
| | | | | Range | Median |
| 20 Aug 2019 | 09:50 | Slightly turbid, green grey | 93 | 4.6 - 520 | 70 |
| 31 Oct 2019 | 08:45 | Clear, light green grey | 0.5 | | |
| 24 Jan 2020 | 08:35 | Turbid, dark green | 110 | | |
| 15 May 2020 | 10:15 | Turbid, green brown | 37 | | |

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.



Photo 2 View of Stratford WWTP primary pond with aerators operating

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, and biological monitoring surveys at the same locations. Chemical sampling was carried out on four occasions during the 2019-2020 period (Section 2.3.1). Two biomonitoring surveys were conducted, one during spring 2019 and one in summer 2020 (Section 2.3.2). The locations of sampling sites are listed in Table 5 and displayed in Figure 1 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 | EXP005002 |
| 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 1 Aerial location map of sampling sites in relation to Stratford WWTP



2.3.1 Receiving water surveys of August 2019, October 2019, and May 2020

Receiving water samples were collected on the 20 August 2019, 31 October 2019, and 15 May 2020 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 August 2019, October 2019, and May 2020

| Site | | PAT000345 | | | | PAT000350 | | | |
|-----------------|--------------------|-------------|-------------|-------------|-----------------|-------------|-------------|-------------|-----------------|
| Date | | 20 Aug 2019 | 31 Oct 2019 | 15 May 2020 | 2009-2019 Range | 20 Aug 2019 | 31 Oct 2019 | 15 May 2020 | 2009-2019 Range |
| Parameter | Unit | 10:20 | 09:05 | 12:00 | | 10:45 | 09:30 | 11:30 | |
| CBOD | g/m ³ | <1.0 | <1.0 | <1.0 | <0.5-<2 | <1.0 | <1.0 | <1.0 | <0.5-<2 |
| Chloride | g/m ³ | 9.2 | 8.9 | 9.5 | 7.5-11.8 | 9.3 | 9.3 | 9.9 | 7.6-10.0 |
| pH | pH | 7.6 | 7.6 | 7.6 | 7.3-9.5 | 7.6 | 7.6 | 7.7 | 7.4-10 |
| Turbidity | FNU | 0.97 | 0.91 | 0.91 | 0.54-1.8 | 1.5 | 0.94 | 1.3 | 0.74-4.8 |
| Temp | °C | 7.7 | 11.6 | 9.0 | 7.7-17.0 | 7.8 | 11.6 | 9.3 | 8.0-17.5 |
| NH ₃ | g/m ³ N | 0.00058 | 0.00050 | 0.00018 | 0.00019-0.00187 | 0.0031 | 0.0044 | 0.0058 | 0.00013-0.01274 |
| NH ₄ | g/m ³ N | 0.073 | 0.057 | 0.027 | 0.019 - 0.148 | 0.37 | 0.52 | 0.64 | 0.038-1.07 |

Most parameters showed no significant effects in the Patea River below the WWTP discharge. The downstream turbidity was below the 50% increase allowed by consent conditions. Filtered carbonaceous BOD₅ concentration was below the 2.0 gm³ limit, while unionised ammonia (NH₃) was well below the 0.025 gm³ limit. It is noted that although unionised ammonia was well below the consent limit, both this and ammoniacal nitrogen increased significantly downstream.

2.3.2 Low flow receiving water survey of January 2020

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 24 January 2020. River flow (at the Skinner Road recorder) was 0.760 m³/s during a low flow period, 34 days after a river fresh three times over the median flow. The flow was below both the average January mean monthly flow (1.14 m³/s) and the mean monthly flow for the period 1978 to 2020 (2.953 m³/s). There was a moderate rate of discharge from the ponds system (estimated at approximately 15 L/s) at the time of the survey. The results of the survey are displayed in Table 7.

A dilution ratio of approximately 21 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 minimal decrease in black disc clarity between the upstream site and immediately downstream of the discharge. Although it is noted that, unusually, there was a significant decrease at the site much further downstream. There was an increase in turbidity of 0.3 FNU (60% increase), but a minimal rise in suspended solids levels in the receiving waters. 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 pH, total nitrogen (NNN), conductivity, bacteria, and filtered BOD₅. These results were indicative of compliance with Special Conditions 13 and 15 of the consent. The turbidity increase was above the 50% allowed by condition 8 (0196-4), but as both upstream and downstream results were very low at <1 FNU, it was not considered that there would be significant effects in the receiving water because of this.

The river appearance was clear and uncoloured at both upstream sites, with no noticeable visual impact at the site 130 m downstream of the WWTP discharge. Dissolved oxygen concentrations exceeded 100% saturation at all sites upstream and downstream of the discharge.

Table 7 Low flow receiving water results, January 2020

| Site | | PAT000315 | | PAT000345 | | PAT000350 | | PAT000356 | |
|--------------------|------------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|
| Date | | 24 Jan 2020 | 2009-2019 Range | 24 Jan 2020 | 2009-2019 Range | 24 Jan 2020 | 2009-2019 Range | 24 Jan 2020 | 2009-2019 Range |
| Parameter | Unit | | | | | | | | |
| Black disc | m | 3.17 | 1.94-3.13 | 3.18 | 1.27-3.92 | 3.10 | 1.10-3.02 | 2.65 | 1.21-2.46 |
| BOD (total) | g/m ³ | <0.8 | <0.5-0.8 | 1.0 | <0.5-0.8 | 1.7 | 0.9-3.6 | 1.4 | 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 | 8.5 | 7.5-10.1 | 8.6 | 7.5-9.5 | 9.3 | 7.6-10 | 9.6 | 8.6-9.6 |
| Conductivity | mS/m @25°C | 11.4 | 8.6-11.5 | 12.8 | 7.2-11.6 | 12.7 | 7.7-12.4 | 11.8 | 9.2-12.1 |
| DO (concentration) | g/m ³ | 9.51 | 9.2-10.4 | 9.35 | 9.1-10.3 | 10.1 | 9.20-10.3 | 12.5 | 10.2-11.4 |
| DO (saturation) | % | 102 | 95-101 | 101 | 94-101 | 101 | 96-104 | 139 | 102-117 |

| Site | | PAT000315 | | PAT000345 | | PAT000350 | | PAT000356 | |
|-----------------------------------|--------------------|-------------------|-----------------|-------------------|-----------------|-------------------|-----------------|-----------------------------------|-----------------|
| Date | | 24 Jan 2020 | 2009-2019 Range | 24 Jan 2020 | 2009-2019 Range | 24 Jan 2020 | 2009-2019 Range | 24 Jan 2020 | 2009-2019 Range |
| <i>E.coli</i> | /100ml | 411 | 154-214 | 109 | 461 | 99 | 153-345 | 147 | 88-326 |
| pH | pH | 7.7 | 7.4-7.8 | 7.7 | 7.3-8.2 | 7.9 | 7.3-7.8 | 8.9 | 7.5-8.4 |
| SS | g/m ³ | < 4 | 2.0-9.0 | <3 | <2.0-4.0 | <5 | <2-5 | <3 | 2.0-4.0 |
| Turbidity | FNU | 0.46 | 0.58-3.6 | 0.50 | 0.54-1.8 | 0.80 | 0.74-4.8 | 0.63 | 1.1-3.6 |
| Temperature | °C | 17.4 | 11.9-16.5 | 17.6 | 7.70-17.0 | 18.2 | 8.0-17.5 | 19.3 | 12.8-18.8 |
| Nutrient Analyses | | | | | | | | | |
| NH ₃ | g/m ³ N | <0.00018 | 0.00009-0.00064 | 0.00067 | 0.00019-0.00187 | 0.0162 | 0.00055-0.01274 | <0.003 | 0.00041-0.00484 |
| NH ₄ | g/m ³ N | <0.010 | 0.006-0.035 | 0.041 | 0.037-0.148 | 0.56 | 0.038-1.07 | <0.010 | 0.006-0.123 |
| NNN | g/m ³ N | 0.45 | 0.42-0.78 | 0.46 | 0.4-0.8 | 0.57 | 0.48-0.91 | 0.80 | 0.55-1.1 |
| DRP | g/m ³ P | 0.013 | 0.019-0.057 | 0.007 | 0.006-0.051 | 0.111 | 0.020-0.206 | 0.070 | 0.051-0.152 |
| Metal Analyses (dissolved) | | | | | | | | | |
| Cadmium | g/m ³ | <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/m ³ | <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/m ³ | 0.0013 | <0.005-0.005 | 0.0012 | 0.0015-0.007 | 0.0013 | <0.005-0.007 | <0.0010 | 0.0011-0.005 |
| Appearance | | Clear, uncoloured | | Clear, uncoloured | | Clear, uncoloured | | Light green-grey, slightly turbid | |

2.3.3 Biological monitoring surveys

Subsequent to the WWTP upgrade in 2009, spring and summer biological monitoring surveys were undertaken 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 scheduled to be undertaken.

The Council collected streambed macroinvertebrates from four sites (Table 8, Figure 2) in the Patea River in spring (30 October 2019) and summer (11 March 2020) 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 | Site code | Grid reference | Location |
|---------|-----------|-------------------|---|
| 1 | PAT000315 | E1711801 N5644382 | Swansea Road bridge (upstream of landfill and oxidation ponds' discharge) |
| 2 | PAT000330 | E1712403 N5644580 | 150 m u/s Stratford oxidation ponds' discharge |
| 3a | PAT000350 | E1712956 N5644292 | Approximately 130 m downstream of the WWTP new outfall |
| 4 | PAT000351 | E1713032 N5644330 | 340 m downstream of new Stratford WWTP discharge |

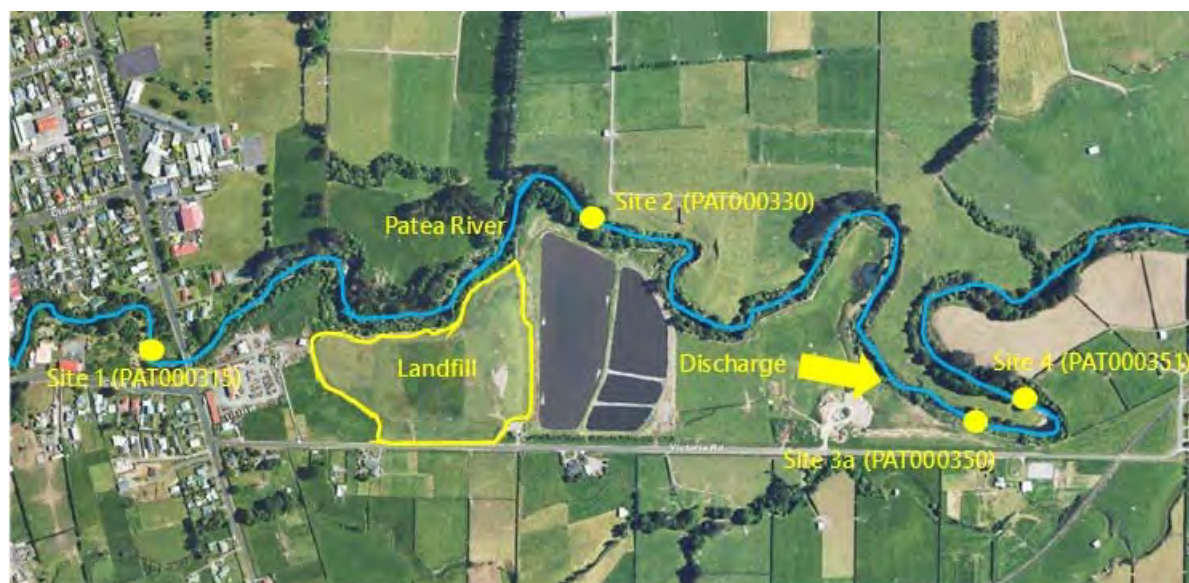


Figure 2 Biomonitoring sites in the Patea River in relation to the Stratford landfill and wastewater discharge

Spring macroinvertebrate richness were moderate to moderately high for all four sites and were similar to historical medians. In the summer survey macroinvertebrate richness at sites 1, 2 and 3a was moderate, while at site 4 it was moderately low. Sites 1, 2 and 3a were slightly lower than historic medians (2-3 taxa) while at site 4 it was substantially lower by ten taxa. There was no evidence of any acute toxic discharges emanating from the closed landfill or sewerage outfall lowering taxa richness during either survey.

During spring the MCI scores categorised site 1 as in 'very good' health and sites 2, 3 and 4 in 'good' health. There was a significant decrease between site 1 and site 3a and 4. Compared with the previous survey, sites 3a and 4, the two sites downstream of the Stratford wastewater treatment plant discharge, had significantly higher results. However, all four sites had scores not significantly different to historical medians. In summer the MCI scores categorised sites 1 and 2 as being in 'good' health and sites 3a and 4 in 'poor' health. There were highly significant declines in MCI scores between the two sites upstream of the Stratford WWTP discharge and the two sites downstream of the discharge. In addition, sites 3a and 4 had scores that were significantly lower than their historic median and both recorded low MCI scores. Furthermore, results from another survey indicates that the negative affect of the discharge was occurring as least as far downstream as Skinner Road (DS138).

The SQMCI can be more sensitive to organic pollution compared with the MCI as it also takes into account taxa abundances. In the spring survey the SQMCI categorised sites 1 and 2 as being in 'very good' health, site 3a being in 'good' health and site 4 being in 'fair' health. There was a significant decline between sites 1 and 2 compared with sites 3 and 4, coincident with the sewerage outfall discharge. SQMCI is heavily influenced by the most abundant taxa. The significant decline at site 3a was mainly due to the high numbers

of *Cladocera*, which was likely to have a source population existing at the sewerage ponds. At site 4 oligochaete worms were 'very abundant' and the dominant taxa. Oligochaete worms in particular are highly pollution tolerant and a good indicator of nutrient enrichment. During summer the SQMCI categorised site 1 as being in 'good' health, site 2 in 'fair' health, and sites 3a and site 4 as being in 'poor' health. There was a highly significant decline between sites 1 and 2 and sites 3a and 4, largely congruent with the MCI results. Blood worms (*Chironomus*), as well as oligochaete worms, were abundant at both sites 3a and 4, but not sites 1 and 2. Both taxa are highly pollution tolerant and a good indicator of nutrient enrichment.

Overall, the results indicate there was a highly significant, serious, decline in macroinvertebrate health in the Patea River. This was indicative of chronic nutrient enrichment between sites 2 and 3a, and coincident with discharges from the Stratford WWTP.

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

2.4 Incidents, investigations, and interventions

The monitoring programme for the year was based on what was considered to be an appropriate level of monitoring, review of data, and liaison with 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 2019-2020 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with the Company'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, which will hopefully reduce phosphorus, nitrogen and algae levels. Conditions on the renewed consent include a timeline for these measures to be in place.

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 60% (consent condition 8 of 0196-4 allowed for <50%), however both upstream and downstream results were very low at <1 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 compliance with conditions of the consent.

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 highly significant, serious, decline in macroinvertebrate health in the Patea River. This was indicative of chronic nutrient enrichment between sites 2 and 3a, and coincident with discharges from the Stratford WWTP. 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.

3.3 Evaluation of performance

A tabular summary of SDC's compliance record for the year under review is set out in Tables 9 and 10.

Table 9 Summary of performance for consent 0196-4 (current until 1 May 2020)

| 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. Adopt best practicable option | Inspection and chemical sampling | Yes |
| 2. Limits on the discharge volume | Inspection, records | Yes |
| 3. Requirements of Inflow and Infiltration Reduction programme | Inspection, liaison with consent holder | Yes |
| 4. Requirements of Management Plan | Inspection, liaison with consent holder | Yes |
| 5. Aerobic conditions to be maintained in ponds | Inspection and chemical sampling | Yes |
| 6. Trade wastes connections | Liaison with consent holder | Yes |
| 7. Limits on receiving water effects | Inspection and chemical and biological sampling | No – biological monitoring shows impact downstream |
| 8. Limits on turbidity | Chemical sampling (samples collected before May 2020 covered by this consent) | Mostly – 2 out of 3 surveys compliant, minor exceedance |
| 9. Monitoring provisions | Monitoring undertaken | Yes |
| 10. Requirements for nutrient monitoring | Chemical sampling | Yes |
| 11. Limits on unionised ammonia and filtered BOD in receiving waters | Chemical sampling (samples collected before May 2020 covered by this consent) | Yes |
| 12. Issues and Options report provided to Council before 30 June 2015 | Report provided | Yes |
| Overall assessment of consent compliance and environmental performance in respect of this consent | | Good |
| Overall assessment of administrative performance in respect of this consent | | High |

N/A = not applicable

Table 10 Summary of performance for consent 0196-5 (current from 1 May 2020)

| 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 | Yes |
| 2. Consent holder to measure and record rate and volume of discharge | Data available on WaterOutlook | 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 | Condition applies from June 2022 (Note: data available from May 2020 shows compliance) | N/A |
| 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 | Condition applies from June 2020 | N/A |
| 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 | Next due July 2021 | N/A |
| 10. Maintenance of Contingency plan | Plan up to date as of August 2020 | Yes |
| 11. Annual meeting with Te Runanga o Ngati Ruanui and Fish & Game annually until at least 2025 | Not required during period under review | N/A |
| 12. Chemical, bacteriological and ecological monitoring of the oxidation pond system and Patea River to be carried out | Monitoring undertaken during 2019-2020, programme extended for 2020-2021 period | Yes |
| 13. Limits on receiving water effects | Inspections, sampling, biological monitoring | Potential negative effects on macroinvertebrates |
| 14. Limits on turbidity downstream | Sampling (only May 2020 sample falling under this consent) | Yes |
| 15. Limits on unionised ammonia and filtered carbonaceous BOD ₅ downstream | Sampling (only May 2020 sample falling under this consent) | 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? |
| 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 2021, recommendation attached in section 3.6 | N/A |
| Overall assessment of consent compliance and environmental performance in respect of this consent | | Good |
| Overall assessment of administrative performance in respect of this consent | | High |

N/A = not applicable

Table 11 Evaluation of environmental performance over time

| Year | High | Good | Improvement req | Poor |
|--------|------|------|-----------------|------|
| 2010 | - | 1 | - | - |
| 2011 | - | 1 | - | - |
| 2012 | - | 1 | - | - |
| 2013 | - | 1 | - | - |
| 2014 | - | 1 | - | - |
| 2015 | - | 1 | - | - |
| 2016 | - | 1 | - | - |
| 2017 | - | 1 | - | - |
| 2018 | - | 1 | - | - |
| 2019 | - | 1 | - | - |
| Totals | 0 | 10 | 0 | 0 |

During the year, SDC demonstrated a good 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 2018-2019 Annual Report

In the 2018-2019 Annual Report, it was recommended:

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

Recommendation one was implemented, while it was not considered necessary to carry out additional monitoring as per recommendation two.

3.5 Alterations to monitoring programmes for 2020-2021

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

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

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

It is proposed that for 2020-2021 that the programme is altered in order to enable monitoring of conditions attached to the new consent. This will include approximately monthly periphyton monitoring at four sites in the Patea River and some additional nutrient sampling.

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 2020-2021.

3.6 Exercise of optional review of consent

Resource consent 0196 provides for an optional review of the consent in June 2021. 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 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.

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 | <i>Escherichia coli</i> , 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 | <i>Resource Management Act 1991</i> 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*

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 $\pm 5\%$, 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.

Consent 0196-5.0

- 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:

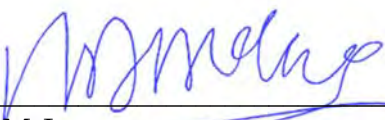
| Contaminant | Concentration |
|--|------------------------|
| Unionised ammonia | 0.025 gm ⁻³ |
| Filtered carbonaceous BOD ₅ | 2.0 gm ⁻³ |

Consent 0196-5.0

- 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