South Taranaki District Council
Eltham WWTP
Monitoring Programme
Annual Report
2017-2018

Technical Report 2018-35

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Executive summary

The South Taranaki District Council (STDC) operates a municipal wastewater treatment plant (WWTP) located on Castle Street at Eltham, in the Waingongoro catchment. This report for the period July 2017 to June 2018 describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess STDC's environmental and consent compliance performance during the period under review. The report also details the results of the monitoring undertaken and assesses the environmental effects of STDC's activities.

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

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

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

The monitoring showed that activities at the Eltham WWTP were well managed. There were no issues with operation of the plant or odour associated with plant processes. The level of the primary pond was well managed by the diversion pumping system to Hawera, and the holding pond was not required to be used as short-term storage. As a result of this, no consented overflows to the unnamed tributary of the Mangawhero Stream were recorded.

As in previous years, the monitoring indicated a continual improvement in water quality and the biological health of the downstream environment associated with the diversion of wastes out of the Mangawhero Stream to the Hawera WWTP in the 2010-2011 period. There were no unauthorised incidents in relation to the operation of the WWTP during the year.

During the year, STDC demonstrated a high level of environmental and administrative performance with the resource consent. During the year under review there were no overflows from the system or odour complaints relating to operation of the plant. STDC maintained excellent communication with the Council, regularly informing on the state of the primary pond and what, if any, action was being undertaken to maintain optimal operating conditions.

For reference, in the 2017-2018 year, consent holders were found to achieve a high level of environmental performance and compliance for 76% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 20% 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 is improving.

This report includes recommendations for the 2018-2019 year.

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1 Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report is for the period July 2017 to June 2018 by the Taranaki Regional Council (the Council) and describes the monitoring programme associated with a resource consent held by South Taranaki District Council (STDC), for the operation of a municipal wastewater treatment plant (WWTP) situated on Castle Street at Eltham.

This report covers the results and findings of the monitoring programme implemented by the Council in respect of the consent held by STDC that relates to the discharge of treated wastewater in the Waingongoro catchment (limited to events associated with high rainfall). This is the 31st annual report to be prepared by the Council to cover STDC's discharge and its effects.

1.1.2 Structure of this report

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

- consent compliance monitoring under the Resource Management Act 1991 (RMA) and the Council's obligations;
- the Council's approach to monitoring sites though annual programmes;
- the resource consent held by STDC in the Waingongoro catchment;
- the nature of the monitoring programme in place for the period under review; and
- a description of the activities and operations conducted at STDC's site.

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 2018-2019 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 STDC, 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 STDC'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 significant 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 in response to unauthorised incident reports, 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 in response to unauthorised incident reports. 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 in response to unauthorised incident reports. 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 2017-2018 year, consent holders were found to achieve a high level of environmental performance and compliance for 76% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 20% of the consents, a good level of environmental performance and compliance was achieved.

1.2 WWTP system

1.2.1 Background

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

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

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

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

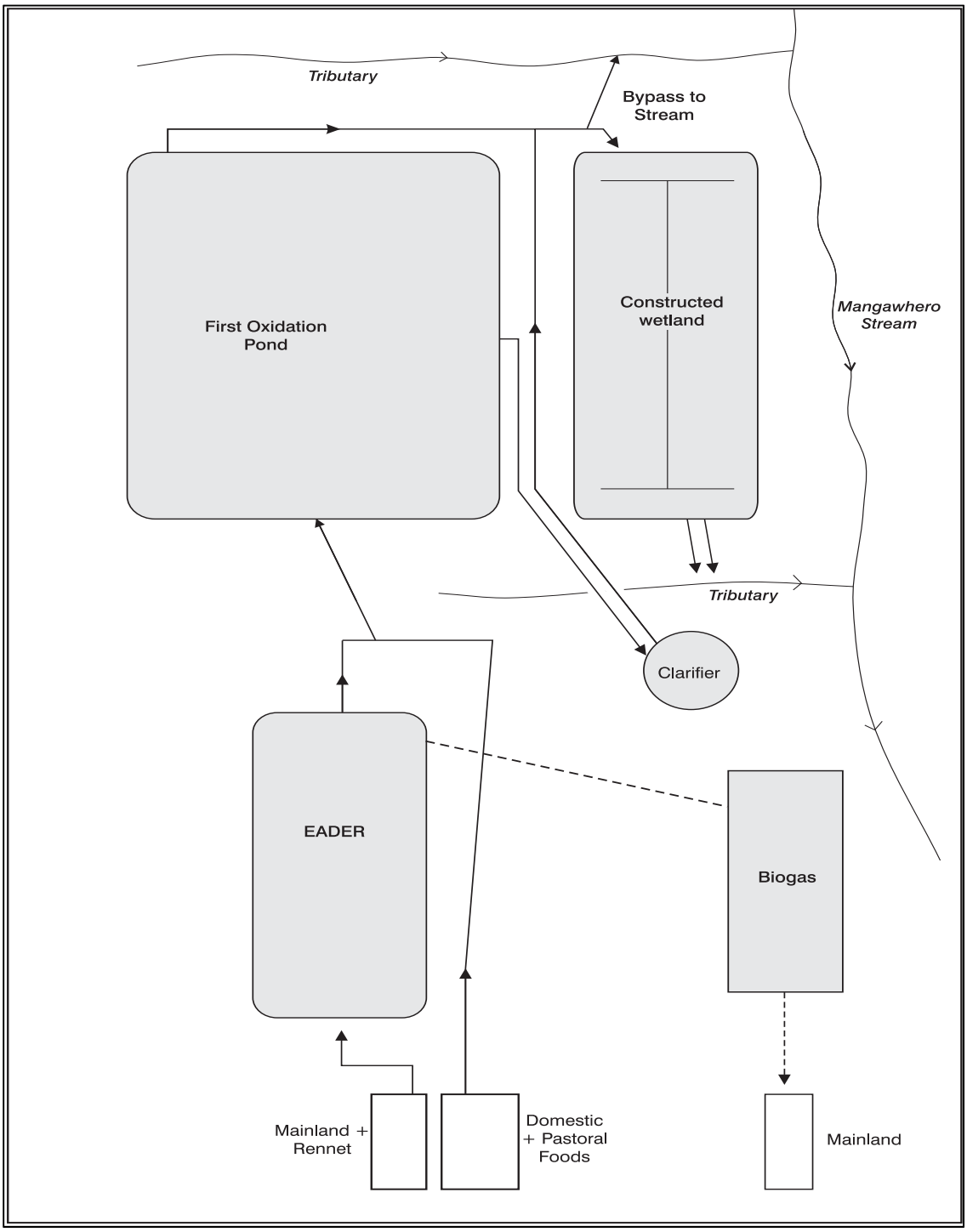

Figure 1 Schematic layout of Eltham WWTP prior to the diversion of wastewater to the Hawera WWTP

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

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

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

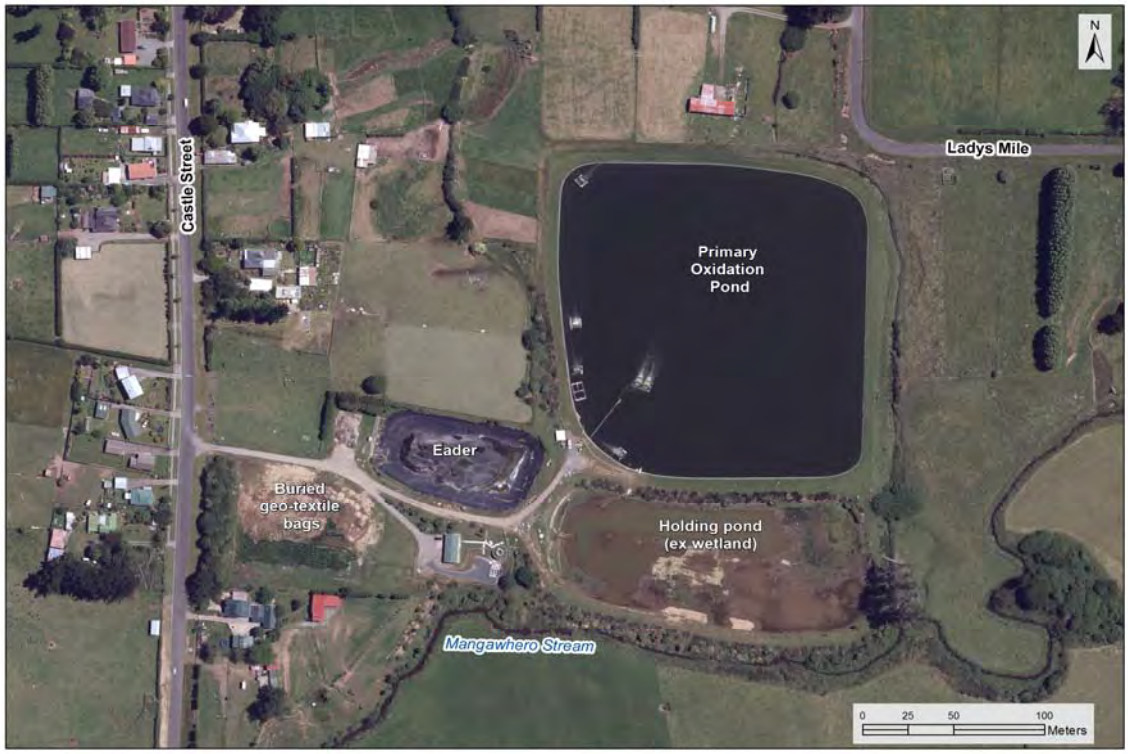

Figure 2 Aerial view of the Eltham WWTP

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

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

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

No authorised overflows as per consent 7521-1 to the Mangawhero Stream were necessary at any time during the 2017-2018 monitoring period.

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

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

1.3 Resource consent

1.3.1 Water discharge permit

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.

STDC holds water discharge permit **7521-1** to discharge, as a consequence of high rainfall, partially treated wastewater from the Eltham Wastewater Treatment Plant into an unnamed tributary of the Mangawhero Stream in the Waingongoro catchment. This permit was issued by the Council on 10 November 2009 under Section 87(e) of the RMA. It is due to expire on 1 June 2027.

Condition 1 sets limits on when the discharge may occur.

Condition 2 details requirements on storage capacity of the system.

Condition 3 limits modifications to the treatment plant that may cause increases in discharge frequency.

Condition 4 sets out requirements of overflow recording and reporting.

Condition 5 requires the consent holder to adopt the best practicable option.

Condition 6 details requirements of notification following overflow events.

Condition 7 details requirements of the contingency plan.

Condition 8 details requirements relating to monitoring.

Condition 9 is a review provision.

The permit is attached to this report in Appendix I.

This summary of consent conditions may not reflect the full requirements of each condition. The consent conditions in full can be found in the resource consent which is appended to this report.

1.4 Monitoring programme

1.4.1 Introduction

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

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

The monitoring programme for the Eltham WWTP consisted of four primary components.

1.4.2 Programme liaison and management

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

- ongoing liaison with resource consent holders over consent conditions and their interpretation and application;
- in discussion over monitoring requirements;
- preparation for any consent reviews, renewals or new consent applications;
- advice on the Council's environmental management strategies and content of regional plans; and
- consultation on associated matters.

1.4.3 Site inspections

The Eltham WWTP was visited four times during the monitoring period. The main points of interest were plant processes with potential or actual discharges to receiving watercourses, including contaminated stormwater and process wastewaters. Air inspections focused on plant processes with associated actual and potential emission sources and characteristics, including potential odour, dust, noxious or offensive emissions. Sources of data being collected by STDC were identified and accessed, so that performance in respect of operation, internal monitoring, and supervision could be reviewed by the Council. The neighbourhood was surveyed for environmental effects.

1.4.4 Chemical sampling

The Council undertook sampling of the effluent microfloral quality of the primary pond adjacent to the discharge point on four occasions.

1.4.5 Biomonitoring surveys

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

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

2 Results

2.1 Inspections

5 July 2017

A compliance monitoring site inspection was undertaken at the STDC Eltham WWTP in fine weather with calm wind conditions.

The step screen was operating and wastes were fully contained. The primary pond level was normal and the surface was flat. It was lightly coloured and relatively clear, with seven bubble and two paddle aerators operating. Dissolved oxygen (DO) readings were taken adjacent to the pond outlet and a sample was collected for chlorophyll-a analysis.

'Biobugs' were being continually dosed into the pond to maintain a desired sludge level. Over 200 mallard ducks and two black swans were observed on the pond's surface.

The holding pond contained minor amounts of stormwater after a recent wet weather event. Any overflow effluent from the primary pond was pumped back into the discharge sump as required.

The Eltham WWTP was discharging to the Hawera WWTP at a rate of 80 m^3/hr. The plant and surrounds were tidy with no odour issues noted.

27 October 2017

A compliance monitoring inspection was undertaken in fine weather with calm wind conditions.

The step screen was operating and wastes were fully contained. The primary pond level was slightly higher than normal, with a flat surface. It was a slightly turbid light green brown colour, with all but one of the aerators operating. DO readings were taken adjacent to the pond outlet, and a sample was collected for chlorophyll-a analysis. 'Biobugs' continued to be dosed to the primary pond, which was occupied by over 30 mallard ducks.

The holding pond contained no water, however stormwater and overflow effluent from the primary pond are pumped back to the discharge sump as necessary.

The plant and surrounds were tidy, with no odour issues noted onsite. The remediated EADER site was stable with no changes since the previous visit. The Eltham WWTP was discharging to Hawera WWTP at the time of inspection.

9 January 2018

A compliance monitoring inspection was undertaken in fine weather with light northerly wind conditions.

The step screen was operating and wastes were fully contained. The level in the primary pond was normal, and it was a turbid green brown colour with a mainly flat surface. All aerators were operating at the time of inspection. DO readings were taken adjacent to the pond outlet.

'Biobugs' continued to be dosed into the pond, and an algal sample was collected for chlorophyll-a analysis. Large numbers of mallard and paradise duck were observed on the primary pond.

The holding pond contained minor amounts of surface water. The EADER area remained stable and well-managed.

The WWTP and surrounds were tidy, with no odour issues noted around the pond perimeter or southern boundary. The Eltham WWTP was discharging to the Hawera WWTP at 70 m^3/hr.

6 April 2018

A compliance monitoring inspection was undertaken in fine weather with calm wind conditions.

The step screen was operating and wastes were fully contained. The level in the primary pond was normal with a mainly flat surface and a turbid, green brown colour. All but one of the aerators were operating. DO readings were taken adjacent to the pond outlet and a sample was collected for chlorophyll-a analysis. 'Biobugs' were being continually dosed into the primary pond, which was occupied by mallard and paradise ducks, and several black swans.

The holding pond contained some surface water, with no effluent observed. The remediated EADER area was well-managed, although it appeared that the bulge near the centre may have moved slightly.

The WWTP and surrounds were tidy, with no odour issues noted. The Eltham WWTP was not discharging to the Hawera WWTP at the time, and the pumps were on standby.

2.1.1 Odour surveys

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

0 = no noticeable odours;

1 = slight occasional wafts;

2 = recognisable and noticeable;

3 = frequently noticeable;

4a = unpleasant odours, frequently strong;

4b = unpleasant odours, continuous and noticeable; and

5 = putrid.

The strength of odour beyond the boundaries of the WWTP site appears to be governed largely by weather conditions. Odour is strongest under calm condition, when aerial emissions from the pond accumulate. This effect is accentuated when it is overcast, as vertical mixing with ambient air is reduced, and under warm temperatures, when odour-generating bacteria in the pond are most active. Effects may be exacerbated by reduction in aeration capacity (mechanical) in the pond and deterioration in the microfloral population of this pond. Aeration capacity was maintained adequately throughout the 2017-2018 period.

Odours from the Eltham WWTP will occur from time to time and will vary in their effect depending upon ambient weather conditions. Therefore, they may only be documented by way of continuing monitoring and recording of incidents, in conjunction with the monitoring of the system now that connection to the Hawera WWTP pipeline has been completed. It is essential that sufficient aeration is provided and capacity is maintained in the primary oxidation pond at all times, particularly coincident with seasonal changes in pond floral communities. It is also essential that the pre-treatment of industrial wastes is maintained to a satisfactory standard at all times prior to discharge into the WWTP.

No odour was detected beyond the boundary during any of the four odour surveys, and no odour complaints were received during the period under review.

2.2 Results of effluent monitoring

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

Primary pond effluent analyses were not required during the monitoring period, although the condition of the pond and any associated odour continues to be monitored during routine inspections.

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

2.2.1 Dissolved oxygen levels

The dissolved oxygen concentrations in WWTPs vary both seasonally and during the day as a result of a combination of factors. The photosynthetic activity of the pond's microflora together with fluctuations in influent waste loadings on the system are major influencing factors. Another significant influence in the Eltham system is the degree of mechanical aeration provided in the primary pond (required by the high industrial wastes loadings on the system). Minimum dissolved oxygen concentrations are generally recorded in the early hours of daylight, and therefore pond performance has been evaluated by standardising sampling times toward mid-morning for all regular inspection visits during the monitoring period.

The results of dissolved oxygen monitoring in the primary pond recorded adjacent to the aerators DO probe are included in Table 1.

Table 1 Dissolved oxygen levels at the surface of the Eltham WWTP primary pond

Date	Time (NZST)	Temperature (°C)	Dissolved Oxygen	
			Concentration (g/m^3)	Saturation (%)
05 Jul 2017	1000	10.4	4.6	42
27 Oct 2017	0815	17.6	4.7	51
09 Jan 2018	0835	23.9	6.8	82
06 Apr 2018	0945	19.1	3.2	35

Results in Table 1 indicated a narrow range of dissolved oxygen concentrations (between 35 % and 82 % saturation) in the surface layer of the primary pond near the outlet. These were typical of the levels generally recorded in this heavily loaded oxidation pond (i.e. supersaturation is seldom recorded). Mechanical aeration of the pond (by 8 to 9 aerators) maintained positive dissolved oxygen concentrations on each survey occasion with the lowest concentration measured during the autumn period.

2.2.2 Microfloral component

Pond microflora are very important for the stability of the symbiotic relation between aerobic bacteria in the primary pond. These phytoplankton may be used as a bio-indicator of pond conditions, for example cyanobacteria are often present in under-loaded conditions and chlorophyceae are present in overloaded conditions. To maintain facultative conditions in a pond system there must be an algal community present in the surface layer.

The principal function of algae is the production of oxygen which maintains aerobic conditions while the main nutrients are reduced by biomass consumption. Elevated pH (due to algal photosynthetic activity) and solar radiation combine to reduce faecal bacteria numbers significantly.

Samples of the primary pond effluent were collected on all four inspections for chlorophyll-a analyses. Chlorophyll-a concentration can be a useful indicator of the algal population present in the system. Pearson (1996) suggested that a minimum in-pond chlorophyll-a concentration of 300 mg/m^3 was necessary to maintain stable facultative conditions. However, seasonal change in algal populations and also dilution by stormwater infiltration might be expected to occur in any WWTP which, together with fluctuations in waste loadings, would result in chlorophyll-a variability.

The results of primary pond effluent analyses are provided in Table 2 together with field observations of pond appearance.

Table 2 Chlorophyll-a levels and primary pond appearance

Date	Time	Appearance	Chlorophyll-a (mg/m^3)	Chlorophyll-a (mg/m^3) data from July 2016 to June 2017		
				N	Range	Median
05 Jul 2017	1000	Clear, very pale green brown	<1	4	108-1,070	628
27 Oct 2017	0815	Slightly turbid, green brown	39			
09 Jan 2018	0835	Turbid, green brown	520			
06 Apr 2018	0945	Turbid, green brown	745			

Despite high concentrations of chlorophyll-a in the primary pond at times, which are indicative of a significant phytoplanktonic component, relatively low DO levels (3.2 g/m^3 to 6.8 g/m^3) were measured. This is indicative of the high organic wastes' loadings on this system, particularly considering the additional mechanical aeration provided within this period to increase DO concentrations.

2.2.3 Holding pond conditions

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

2.3 Results of receiving environment monitoring

Water quality monitoring is carried out downstream of the WWTP as required to assess the effects of any discharges from the WWTP. There were no discharges during the 2017-2018 period. Routine monthly 'State of the Environment Monitoring' (SEM) occurs at three sites downstream of the WWTP, and the results of this monitoring are included for comparison purposes and to provide baseline analysis in the event of any discharges from the Eltham WWTP.

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

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

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

2.3.1 Chemical sampling surveys

Monthly water quality monitoring continues to be measured at the lower Mangawhero Stream and two Waingongoro River sites (Table 4), this is displayed for comparison purposes with any future discharges and to provide baseline water quality parameters for the Mangawhero Stream and Waingongoro River.

A summary of this data is presented in Table 3.

Table 3 Water quality results downstream of the Eltham WWTP

Parameter	Units	MWH000498		WGG000620		WGG000640	
		Range	Median	Range	Median	Range	Median
Temperature	°C	9.0-20.5	13.4	9.0-20.9	12.2	9.0-21.0	12
Conductivity @ 20°C	mS/m	8.8-22.8	17.4	4.2-12.8	10.4	5.0-14.3	12.2
Chloride	g/m^2	9.9-23.2	19.2	5.7-13.4	11.7	6.9-16.8	13.6
pH	pH	6.8-7.9	7.4	7.1-8.0	7.5	7.0-8.0	7.4
DRP	g/m^2 P	0.018-0.046	0.024	0.025-0.109	0.046	0.025-0.091	0.04
Total phosphorus	g/m^2 P	0.044-0.434	0.072	0.041-0.482	0.066	0.043-0.487	0.07
Unionised Ammonia	g/m^2 N	0.00021-0.0014	0.00048	0.00024-0.0022	0.00085	0.00034-0.0018	0.00072
Ammoniacal Nitrogen	g/m^2 N	0.006-0.499	0.07	0.024-0.435	0.119	0.018-0.447	0.112
Nitrite Nitrogen	g/m^2 N	0.007-0.036	0.017	0.004-0.225	0.024	0.004-0.176	0.024
Nitrate Nitrogen	g/m^2 N	1.05-3.15	1.63	0.458-1.824	0.93	0.548-1.88	1.47
TKN	g/m^2 N	0.26-1.70	0.5	0.05-1.78	0.28	0.04-177	0.36
Total nitrogen	g/m^2 N	1.43-4.60	2.34	0.59-2.74	1.84	0.73-2.87	2.06
Turbidity	NTU	2.5-72	7.7	0.98-58	2.85	1.4-61	4.6

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

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

All of the parameters excluding one showed decreases in the main river below the Mangawhero Stream confluence subsequent to the diversion of the Eltham WWTP discharge out of the Mangawhero Stream. The only exception was turbidity with an increase of 39% compared to pre-diversion results; the reasons for which are unclear.

2.3.2 Biomonitoring surveys

Biological monitoring surveys are performed in an unnamed tributary of the Mangawhero Stream and the Waingongoro River to continue to monitor the improvement of the stream following diversion of the effluent to the Hawera WWTP. Each site is described in Table 4 and referenced in Figure 4.

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

Table 4 Monitoring sites in the Mangawhero Stream and Waingongoro River

Site No	Site code	Grid reference	Location
1	MWH000380	E1712475 N5633431	Mangawhero Stream: upstream of wastewater treatment plant's discharge
5	MWH000490	E1710795 N5632738	Mangawhero Stream: approximately 200 m downstream of rail bridge
6	WGG000620	E1710708 N5632961	Waingongoro River: approx 150 m upstream of Mangawhero Stream confluence
7	WGG000640	E1710554 N5632790	Waingongoro River: approx 200 m downstream of Mangawhero Stream confluence
8	WGG000665	E1709784 N5632049	Waingongoro River: approx 2 km downstream of Mangawhero Stream confluence (off Stuart Road)

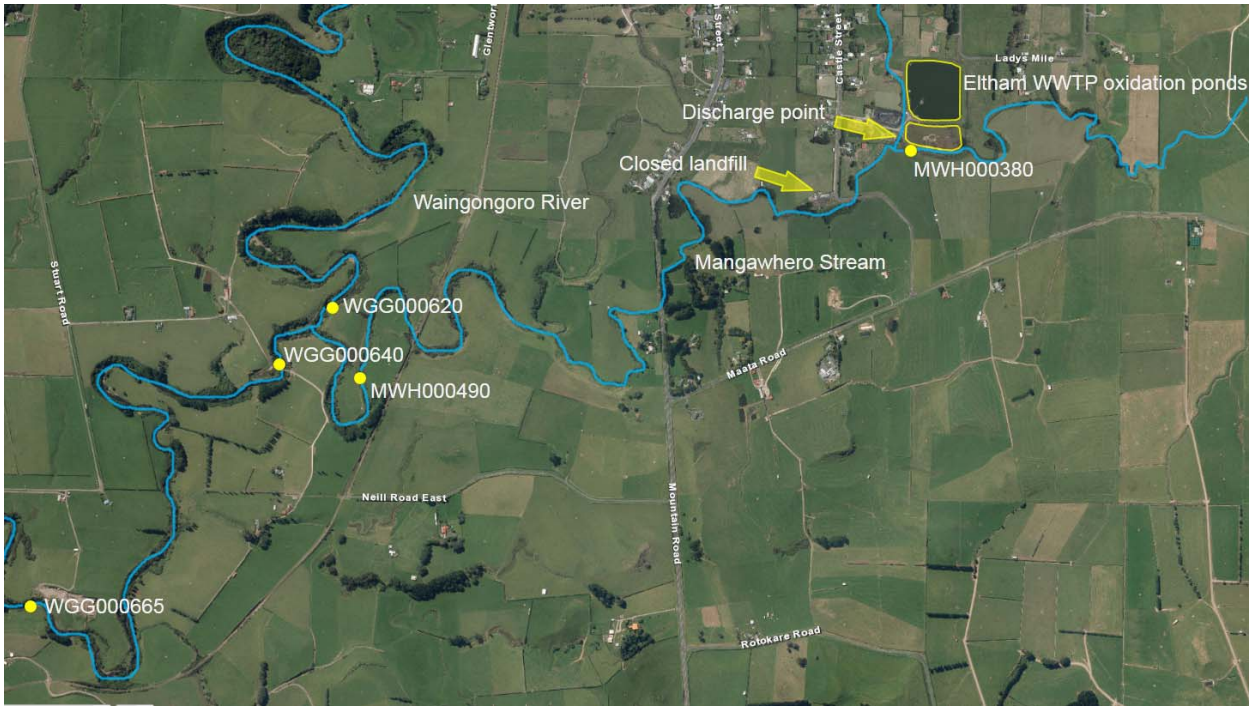

Figure 4 Aerial map of biomonitoring site locations in the Mangawhero Stream and Waingongoro River

2.3.2.1 Spring 2017

The Councils 'kick-sampling' technique was used at two sites and a combination of 'kick-sampling' and 'sweep netting' used at one site to collect macroinvertebrates from two sites on the Mangawhero Stream and one site on the Waingongoro River for the spring survey at the Eltham WWTP. This has provided data to assess the removal of historical discharges on the macroinvertebrate communities present in the Mangawhero Stream and Waingongoro River. Samples were processed to provide number of taxa (richness), MCI, and $SQMCI_S$ scores for each site.

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of nutrient enrichment in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The $SQMCI_S$ takes into account taxa abundances as well as sensitivity to

pollution. Significant differences in either the taxa richness, MCI or the $SQMCI_S$ between sites may indicate the degree of adverse effects (if any) of the discharge being monitored.

The 'impacted' sites had higher macroinvertebrate indices (taxa number, MCI score and $SQMCI_S$ score) than the 'control' site. This would be due to both 'impacted' sites having better physical stream habitat conditions for macroinvertebrates in combination with a lack of discharges from the Eltham WWTP. Site 5 also had non-significant improvement for MCI and $SQMCI_S$ scores compared with its historical median and site 8 showed a significant improvement for the $SQMCI_S$ score compared with its historical median consistent with post diversion results.

Overall, there was no evidence that the Eltham WWTP was having any impact on the macroinvertebrate communities of the Mangawhero Stream and Waingongoro River for the current monitoring period.

2.3.2.2 Summer 2018

The Council's 'kick-sampling' technique was used at one site on the Mangawhero Stream and three sites on the Waingongoro River and a combination of 'kick-sampling' and 'sweep netting' used at one site on the Mangawhero Stream to collect macroinvertebrates for the summer survey in relation to the Eltham WWTP. This has provided data to assess improvements in the macroinvertebrate communities present in the Mangawhero Stream and Waingongoro River following diversion of the wastewater. Samples were processed to provide number of taxa (richness), MCI, and $SQMCI_S$ scores for each site.

Taxa richnesses were similar to historical median taxa richnesses at the Mangawhero Stream sites, while there was an overall drop in richnesses at the Waingongoro River sites. The MCI and $SQMCI_S$ scores for the three potentially impacted sites (sites 5, 7 and 8) were all higher or not significantly different to historical medians in the Mangawhero Stream and there were significant increases in MCI and $SQMCI_S$ scores between sites 1 and 5. There was probably a slight decrease in overall macroinvertebrate health in a downstream direction for the Waingongoro River sites, as reflected in the historic medians, probably as a result of cumulative impacts, particularly for the furthest downstream site (site 8) and the influence of the Mangawhero Stream which would appear to be more eutrophic than the Waingongoro River.

Overall, there was little evidence that the Eltham WWTP for the current monitoring period was having any impact on the macroinvertebrate communities present in the Mangawhero Stream and Waingongoro River.

The results of past biomonitoring surveys performed at the various established stream sites are summarised in Table 5.

Table 5 Summary of macroinvertebrate taxa numbers and MCI values for previous surveys performed between January 1985 and November 2017 and the current survey

Site No.	N	No of taxa			MCI value			$SQMCI_s$ value		
		Median	Range	Current survey	Median	Range	Current survey	Median	Range	Current survey
1	56	16	10-25	17	74	58-85	64	4.1	1.5-6.3	2.5
5	51	20	13-30	21	79	63-102	87	3.2	1.5-6.4	3.4
6	32	26	16-35	21	96	77-116	101	5.7	3.7-6.8	7.4
7	31	26	17-35	16	92	78-109	96	4.5	2.2-7.0	6.0
8	45	20	14-30	15	95	77-111	89	4.4	2.4-7.6	6.8

2.4 Investigations, interventions, and incidents

The monitoring programme for the year was based on what was considered to be an appropriate level of monitoring, review of data, and liaison with STDC. During the year matters may arise which require additional activity by the Council, for example provision of advice and information, or investigation of potential or actual causes of non-compliance or failure to maintain good practices. A pro-active approach that in the first instance avoids issues occurring is favoured.

The Council operates and maintains a register of all complaints or reported and discovered excursions from acceptable limits and practices, including non-compliance with consents, which may damage the environment. The incident register includes events where STDC has itself notified the Council. The register contains details of any investigation and corrective action taken.

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 company is indeed the source of the incident (or that the allegation cannot be proven).

In the 2017-2018 period, the Council was not required to record an incident in association with STDC's conditions in their resource consent and provisions in Regional Plans.

3 Discussion

3.1 Discussion of site performance

All aspects of plant performance and normal maintenance were compliant during the 2017-2018 year, with good liaison maintained between STDC and the Council. Ongoing management of the pond operation and trade wastes inflow led to no odour complaints being received from neighbouring properties or any breaches of the Taranaki Regional Air Quality Plan.

No significant overflows from the holding pond (previously the wetland) have occurred since the installation of the diversion pipeline, and it has seldom been necessary to utilise the storage pond at all. The most recent brief duration overflow occurred during the 2011-2012 monitoring year.

As no significant overflows occurred from the primary pond to the holding pond, there were no consented discharges to the stream. Relatively low dissolved oxygen concentrations were recorded in the primary pond through the period. These were lower than normal on occasions due to additional dairy industrial wastes loadings placed upon the system. No odours were detected at locations about the WWTP during the period under review. Previous works to decommission and remediate the EADER area appear to have been successful, with no issues or odour complaints associated with this area.

3.2 Environmental effects of exercise of consents

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

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

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

3.3 Evaluation of performance

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

Table 6 Summary of performance for consent 7521-1

Purpose: ***To discharge, as a consequence of high rainfall, partially treated wastewater from the Eltham Wastewater Treatment Plant into an unnamed tributary of the Mangawhero Stream in the Waingongoro catchment.***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Limits on the timing of discharges	Inspection, liaison with consent holder	Yes
2. Requirements of plant storage capacity	Inspection	Yes
3. Limits on plant modifications	Inspection, liaison with consent holder	Yes
4. Requirements of overflow reporting	No overflows – not applicable	N/A
5. Consent holder to adopt best practicable option	Inspection	Yes
6. Requirements of overflow notification	No overflows – not applicable	N/A
7. Requirements of contingency plan	Inspection, report received	Yes
8. Provisions for monitoring	Chemical and biological sampling	Yes
9. Review condition	No review sought by Council	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		**High**
Overall assessment of administrative performance in respect of this consent		**High**

N/A = not applicable

Table 7 Evaluation of environmental performance for consent 7521-1 over time

Year	High	Good	Improvement req	Poor
2009				1
2010				1
2011	1			
2012	1			
2013	1			
2014	1			
2015		1		
2016	1			
2017	1			
Totals	6	1	0	2

During the year, STDC demonstrated a high level of environmental and high level of administrative performance with the resource consent as defined in Section 1.1.4. During the year under review there were no significant issues associated with the performance or operation of the treatment plant. There were no overflows from the system, and the holding pond was not required to be used for temporary storage during the monitoring period.

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

3.4 Recommendations from the 2016-2017 Annual Report

In the 2016-2017 Annual Report, it was recommended:

1. THAT in the first instance, monitoring of consented activities at Eltham WWTP in the 2017-2018 year continue at the same level as in 2016-2017.
2. THAT should there be issues with environmental or administrative performance in 2017-2018, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.

All recommendations were carried out and the consent holder maintained liaison and reporting to the Council in relation to the diversion of the wastewater out of the Mangawhero Stream. The consent holder maintained manual on-site dissolved oxygen monitoring throughout the period and this data was made available to the Council via online automated telemetry throughout the monitoring period.

The requisite consent granted for occasional overflow of treated wastes from the upgraded system to the Mangawhero Stream was operative but was not utilised during the period. The Council continued inspections of waste disposal practices in the upstream catchment of the Mangawhero Stream (by way of the regular annual round of dairy shed inspections), as required by Recommendation 5, with follow-up inspections where necessary and internal reporting within the existing consents' database. The (reduced) monitoring programme was performed as scheduled by the Council in recognition of the significant upgrade to the waste disposal system. No additional wastes disposal occurred into the WWTP system during the 2017-2018 period.

3.5 Alterations to monitoring programmes for 2018-2019

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 2018-2019 monitoring of consented activities at the Eltham WWTP continue at the same level as in 2017-2018, with the exception of a change to the summer biomonitoring survey. Based on the consistently high biomonitoring results associated with the removal of the WWTP discharge from the stream, and the lack of regular discharge events since this upgrade, the summer biomonitoring survey will be reduced from five sites to three, identical to the spring survey. The remaining two sites will be held as

provisional sites in the event of future discharges from the WWTP. A recommendation to this effect is attached to this report.

It should be noted that the proposed programme represents a reasonable and risk-based level of monitoring for the site in question. The Council reserves the right to subsequently adjust the programme from that initially prepared, should the need arise if potential or actual non-compliance is determined at any time during 2018-2019.

4 Recommendations

1. THAT in the first instance, monitoring of consented activities at Eltham WWTP in the 2018-2019 year continue at the same level as in 2017-2018.
2. THAT the scheduled summer biomonitoring survey be reduced from five sites to three, with the existing two sites to be retained on a provisional basis in the event of future discharges from the Eltham WWTP.
3. THAT should there be issues with environmental or administrative performance in 2018-2019, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.

Glossary of common terms and abbreviations

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

Biomonitoring	Assessing the health of the environment using aquatic organisms.
BOD	Biochemical oxygen demand. A measure of the presence of degradable organic matter, taking into account the biological conversion of ammonia to nitrate.
BODF	Biochemical oxygen demand of a filtered sample.
cfu	Colony forming units. A measure of the concentration of bacteria usually expressed as per 100 millilitre sample.
Conductivity	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 20°C and expressed in mS/m.
DO	Dissolved oxygen.
DRP	Dissolved reactive phosphorus.
Fresh	Elevated flow in a stream, such as after heavy rainfall.
g/m^3	Grams per cubic metre, and equivalent to milligrams per litre (mg/L). In water, this is also equivalent to parts per million (ppm), but the same does not apply to gaseous mixtures.
Incident	An event that is alleged or is found to have occurred that may have actual or potential environmental consequences or may involve non-compliance with a consent or rule in a regional plan. Registration of an incident by the Council does not automatically mean such an outcome had actually occurred.
Intervention	Action/s taken by Council to instruct or direct actions be taken to avoid or reduce the likelihood of an incident occurring.
Investigation	Action taken by Council to establish what were the circumstances/events surrounding an incident including any allegations of an incident.
Incident register	The incident register contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan.
L/s	Litres per second.
m^2	Square Metres.
MCI	Macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the sensitivity of the taxa present to organic pollution in stony habitats.
mS/m	Millisiemens per metre.
NH_4^+	Ammonium, normally expressed in terms of the mass of nitrogen (N).
NH_3	Unionised ammonia, normally expressed in terms of the mass of nitrogen (N).
NO_3^-	Nitrate, normally expressed in terms of the mass of nitrogen (N).
NO_2^-	Nitrite, normally expressed in terms of the mass of nitrogen (N).
NTU	Nephelometric Turbidity Unit, a measure of the turbidity of water.

pH	A numerical system for measuring acidity in solutions, with 7 as neutral. Numbers lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength. For example, a pH of 4 is ten times more acidic than a pH of 5.
Physicochemical	Measurement of both physical properties (e.g. temperature, clarity, density) and chemical determinants (e.g. metals and nutrients) to characterise the state of an environment.
Resource consent	Refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15).
RMA	*Resource Management Act 1991* and including all subsequent amendments.
SQMCI	Semi quantitative macroinvertebrate community index.
Temp	Temperature, measured in °C (degrees Celsius).
TKN	Total Kjeldahl nitrogen. Combination of organic nitrogen, NH_3, and NH_4^+.
Turb	Turbidity, expressed in NTU.
WWTP	Wastewater treatment plant.

*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 the Science Services Manager.

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Appendix I

Resource consent held by South Taranaki District Council

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

Discharge Permit

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

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

Conditions of Consent

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

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

General conditions

a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.

b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.

c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:

   i) the administration, monitoring and supervision of this consent; and
   ii) charges authorised by regulations.

Special conditions

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

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

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

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

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

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

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

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

9. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2015 and/or June 2017 and/or June 2021, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 10 November 2009

For and on behalf of
Taranaki Regional Council

_____

Director-Resource Management

Appendix II

Biomonitoring reports

To	Rae West, Job manager
From	Darin Sutherland, Environmental Scientist
Document	2042220
Report	DS087
Date	27 April 2018

Biomonitoring of the Mangawhero Stream and Waingongoro River in relation to the South Taranaki District Council's Eltham Wastewater Treatment Plant System and Rubbish Tip leachate discharge, November 2017

Introduction

This spring survey was the first of two surveys programmed for the 2017-2018 monitoring period. Since summer 2011, biomonitoring surveys in the Mangawhero Stream have been reduced from four sites to two sites in recognition of the minimal usage of the WWTP consented overflow facility to the Mangawhero Stream in recent years. No overflows to the stream have occurred since this time.

Method

This survey was the 22nd spring biomonitoring programme coincident with riparian planting of the Mangawhero Stream banks and stream willow clearance work over the past several years. It was performed some six years after commissioning of the pipeline for conveyance of the Eltham WWTP wastewater to the Hawera WWTP and the cessation of the discharge of partially treated wastewater into the Waingongoro catchment. No (consented) overflows from the WWTP to the Mangawhero Stream had occurred during this period. Current biomonitoring sites are presented in Table 1.

The standard 400 ml 'kick sampling' technique was used for site 1 and site 5 in the Mangawhero Stream and site 8 in the Waingongoro River (illustrated in Figure 1) on 6 November 2017.

Table 1 Biomonitoring sites in the Mangawhero Stream and Waingongoro River in relation to the South Taranaki District Council's Eltham Wastewater Treatment Plant System and Rubbish Tip leachate discharge

Site No	Site code	Grid reference	Location
1	MWH000380	E1712475 N5633431	Mangawhero Stream: upstream of wastewater treatment plant's discharge
5	MWH000490	E1710795 N5632738	Mangawhero Stream: approximately 200 m downstream of rail bridge
8	WGG000665	E1709784 N5632049	Waingongoro River: approx 2 km downstream of Mangawhero S. confluence (off Stuart Road)

The 'kick-sampling' and 'vegetation sweep' techniques are very similar to Protocol C1 (hard-bottomed, semi-quantitative) and C2 (soft-bottomed, semi-quantitative) of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark et al, 2001).

Figure 1 Aerial location map of biomonitoring site locations in the Mangawhero Stream and Waingongoro River in relation to Eltham WWTP and landfill

The 'kick-sampling' and 'vegetation sweep' techniques are very similar to Protocol C1 (hard-bottomed, semi-quantitative) and C2 (soft-bottomed, semi-quantitative) of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark et al, 2001).

Samples were preserved with Kahle's Fluid for later stereomicroscopic sorting and identification according to documented Taranaki Regional Council methodology and macroinvertebrate taxa abundances scored based on the categories in Table 2.

Table 2 Macroinvertebrate abundance categories

Abundance category	Number of individuals
R (rare)	1-4
C (common)	5-19
A (abundant)	20-99
VA (very abundant)	100-499
XA (extremely abundant)	500+

Table 3 Macroinvertebrate health based on MCI ranges which has been adapted for Taranaki streams and rivers (TRC, 2015) from Stark's classification (Stark, 1985, Boothroyd and Stark, 2000, and Stark and Maxted, 2007)

TRC Grading	MCI	$SQMCI_s$
Excellent	>140	>7.00
Very Good	120-140	6.00-7.00
Good	100-119	5.00-5.99
Fair	80-99	4.00-4.99
Poor	60-79	3.00-3.99
Very Poor	<60	<3.00

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams. Highly `sensitive' taxa were assigned the highest scores of 9 or 10, while the most `tolerant' forms scored 1. Sensitivity scores for certain taxa have been modified in accordance with Taranaki experience. By averaging the scores obtained from a list of taxa collected from one site and multiplying by a scaling factor of 20, a Macroinvertebrate Community Index (MCI) value was obtained. The MCI is a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. A gradation of biological water quality conditions based upon MCI ranges which has been adapted for Taranaki streams and rivers (TRC, 2013) from Stark's classification (Stark, 1985 and Boothroyd and Stark, 2000) (Table 3). More 'sensitive' communities inhabit less polluted waterways. A difference of 11 units or more in MCI values is considered significantly different (Stark 1998).

A semi-quantitative MCI value, SQMCIS (Stark, 1999) has also been calculated for the taxa present at each site by multiplying each taxon score by a loading factor (related to its abundance), totalling these scores, and dividing by the sum of the loading factors. The loading factors were 1 for rare (R), 5 for common (C), 20 for abundant (A), 100 for very abundant (VA) and 500 for extremely abundant (XA).

Where necessary sub-samples of algal and detrital material were also taken from the macroinvertebrate samples at all sites and were scanned under 40-400x magnification to determine the presence or absence of any mats, plumes or dense growths of bacteria, fungi or protozoa ('undesirable biological growths') at a microscopic level. The presence of masses of the organisms is an indicator of organic enrichment within a stream.

Results

Site habitat characteristics and hydrology

This spring survey was performed under moderate flow conditions, 26 days after a fresh in excess of 3 times median flow and 29 days after a fresh in excess of 7 times median flow in the Waingongoro River.

The water temperatures during the survey were in the range 14.4-15.5 °C. Water levels were moderate and water speed was swift. The water was brown and cloudy for site 1, uncoloured and cloudy for site 5 and uncoloured and clear for site 8. The substrate at the three sites comprised either entirely of hard clay (site 1), a mixture of gravel/cobble/boulder (sites 5 and 8).

Site 1 had no algal mats and widespread filamentous algae. Site 5 had widespread algal mats and filamentous algae. Site 8 had slippery algal mats and no filamentous algae.

Macroinvertebrate communities

The results of past biomonitoring surveys performed at the various established stream sites are summarised in Table 3 and illustrated in Figure 2.

Table 4 Summary of macroinvertebrate taxa numbers and MCI values for previous surveys performed between January 1985 and March 2017

Site No.	N	No of taxa			MCI value			SQMCIs value		
		Median	Range	Current survey	Median	Range	Current survey	Median	Range	Current survey
1	55	16	10-25	13	74	58-85	72	4.1	1.5-6.3	3.0
5	50	20	13-30	16	79	63-102	88	3.1	1.5-6.4	3.2
8	44	20	14-30	19	94	77-111	101	4.3	2.4-7.6	7.4

The macroinvertebrate fauna recorded by the current survey at each of the three sites are presented in Table 5.

Table 5 Macroinvertebrate fauna of the Mangawhero Stream (sites 1 and 5) and the Waingongoro River at Stuart Road (site 8) in relation to the Eltham WWTP, sampled on 6 November 2017

Taxa List	Site Number	MCI score	1	5	8
	Site Code		MWH000380	MWH000490	WGG000665
	Sample Number		FWB17412	FWB17413	FWB17409
NEMATODA	Nematoda	3	R	-	-
ANNELIDA (WORMS)	Oligochaeta	1	C	A	R
	Lumbricidae	5	R	-	-
MOLLUSCA	*Potamopyrgus*	4	C	R	-
CRUSTACEA	*Paracalliope*	5	C	R	-
	Talitridae	5	-	C	-
EPHEMEROPTERA (MAYFLIES)	*Austroclima*	7	-	-	R
	Coloburiscus	7	-	-	C
	Deleatidium	8	R	C	XA
	Nesameletus	9	-	-	R
	Zephlebia group	7	-	-	R
PLECOPTERA (STONEFLIES)	*Zelandobius*	5	-	R	R
MEGALOPTERA (DOBSONFLIES)	*Archichauliodes*	7	-	-	R
TRICHOPTERA (CADDISFLIES)	*Hydropsyche (Aoteapsyche)*	4	R	C	A
	Costachorema	7	-	R	C
	Hydrobiosis	5	C	-	R
	Pycnocentria	7	-	R	-
	Pycnocentrodes	5	-	R	R
DIPTERA (TRUE FLIES)	*Aphrophila*	5	-	A	R
	Chironomus	1	R	-	-
	Maoridiamesa	3	C	VA	A
	Orthocladiinae	2	A	A	A
	Polypedilum	3	R	R	-
	Tanytarsini	3	-	R	R
	Ephydridae	4	-	-	R
	Austrosimulium	3	R	R	C
	Tanyderidae	4	-	-	R
	No of taxa		13	16	19
	MCI		72	88	101
	SQMCIs		3.0	3.2	7.4
	EPT (taxa)		3	6	10
	%EPT (taxa)		23	38	53

'Tolerant' taxa | 'Moderately sensitive' taxa | 'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant

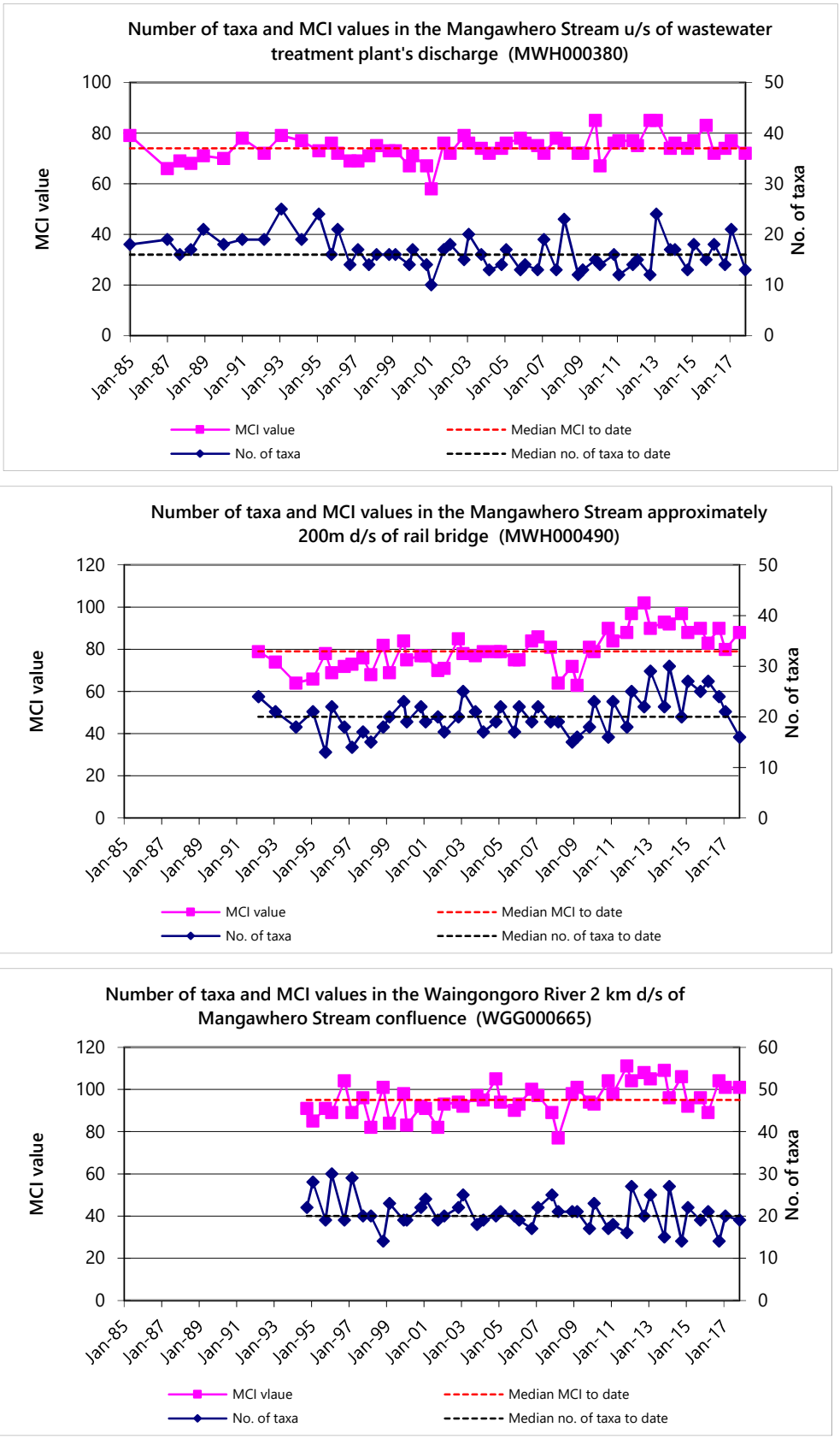

Figure 2 Taxa richness and MCI scores recorded at each site to date for Mangawhero Stream sites sampled in relation to the Eltham WWTP

Site 1 (upstream of the WWTP outfall)

A moderately low macroinvertebrate community richness of 14 taxa was found at site 1 ('control' site) at the time of the spring survey (Table 3) which was two less taxa than the historic median (16 taxa) and seven taxa less than the previous survey on February 2017 (21 taxa).

The MCI score of 72 units indicated a community of 'poor' biological health which was not significantly different to the median MCI score (74 units) and to the previous survey (77 units). The $SQMCI_S$ score of 3.0 units was significantly lower (Stark, 1998) than the median $SQMCI_S$ score (4.1 units) (Table 3) and to the previous survey (4.5 units).

The community was characterised by one 'tolerant' taxon [midges (Orthocladiinae)] (Table 5).

Site 5 (downstream of Mangawharawhara Stream confluence; approx 3 km below the WWTP outfall and old landfill)

A moderately low macroinvertebrate community richness of 16 taxa was found at site 5 ('primary impacted' site) (Table 3) which was four less taxa than the historic median (20 taxa) and five taxa less than the previous survey on February 2017 (21 taxa).

The MCI score of 88 units indicated a community of 'fair' biological health which was not significantly higher (Stark, 1998) than the median MCI score (79 units) and the previous survey (80 units). The $SQMCI_S$ score of 3.1 units was not significantly different to the median $SQMCI_S$ score of 3.2 units (Table 3) and to the previous survey (3.4 units).

The community was characterised by three 'tolerant' taxa [oligochaete worms and midges (*Maoridiamesa* and Orthocladiinae)] (Table 5).

Waingongoro River site (downstream of the Mangawhero Stream confluence (site 8))

A moderately low macroinvertebrate community richness of 19 taxa was found at site 8 ('secondary impacted' site) at the time of the spring survey (Table 3) which was one taxon less than the historic median (20 taxa) and the previous survey on February 2017 (20 taxa).

The MCI score of 101 units indicated a community of 'good' biological health which was not significantly different (Stark, 1998) to the median MCI score (94 units) and to the previous survey (101 units). The $SQMCI_S$ score of 7.4 units was significantly higher than the median $SQMCI_S$ score of 4.3 units (Table 3) and the previous survey (4.8 units).

The community was characterised by three 'tolerant' taxa [caddisfly (*Hydropsyche/Aoteapsyche*) and midges (*Maoridiamesa* and Orthocladiinae)] and by one extremely abundant 'highly sensitive' taxon [mayflies (*Deleatidium*] (Table 5).

Microscopic streambed heterotrophic assessment

The microscopic heterotrophic assessments of substrate growths performed for all sites indicated an absence of any mats, plumes or dense growths of heterotrophic organisms at each of the three sites.

Discussion and conclusions

Macroinvertebrate richnesses were slightly lower than historical medians at all three surveyed sites (by 3-4 taxa) with a typical downstream increase in taxa richness at the 'impacted' sites (sites 5 and 8) compared with the control site (site 1).

The 'impacted' sites also had significantly higher MCI scores than the 'control' site and site 8 had a significantly higher $SQMCI_S$ score than the control site. This would largely be due to both 'impacted' sites having better physical stream habitat conditions for macroinvertebrates. For example, the cobble/boulder and gravel/boulder substrates of sites 5 and 8 respectively provide superior macroinvertebrate habitat compared with the hard clay of site 1. The median values for both taxa number, MCI and $SQMCI_S$ support this observation.

There has been a noticeable improvement in MCI scores at site 5 and to a slightly lesser extent site 8 since waste water discharges were stopped in mid 2011 (Figure 2); presumably due to site 8 being further away from the discharge point and diluted by the Waingongoro River. Therefore, historic waste discharges had less of an effect on the macroinvertebrate community present at site 8 making a significant improvement less likely.

No impacts of leachate from the old landfill on the macroinvertebrate community of the lower Mangawhero Stream site were indicated by the results of this spring survey.

The results of the current survey support the current situation where no WWTP discharges are currently entering the Mangawhero Stream and therefore the two downstream sites are not being impacted by the Eltham WWTP. Differences among sites largely reflect habitat differences.

Summary

The Councils 'kick-sampling' technique was used at two sites and a combination of 'kick-sampling' and 'sweep netting' used at one site to collect macroinvertebrates from two sites on the Mangawhero Stream and one site on the Waingongoro River for the spring survey at the Eltham waste water treatment plant. This has provided data to assess whether discharges have had an effect on the macroinvertebrate communities present in the Mangawhero Stream and Waingongoro River. Samples were processed to provide number of taxa (richness), MCI, and $SQMCI_S$ scores for each site.

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

The 'impacted' sites had higher macroinvertebrate indices (taxa number, MCI score and $SQMCI_S$ score) than the 'control' site. This would be due to both 'impacted' sites having better physical stream habitat conditions for macroinvertebrates in combination with a lack of discharges from the Eltham WWTP. Site 5 also had non-significant improvement for MCI and $SQMCI_S$ scores compared with its historical median and site 8 showed a significant improvement for the $SQMCI_S$ score compared with its historical median consistent with post diversion results.

Overall, there was no evidence that leachate from the Eltham WWTP or from the closed landfill site for the current monitoring period was having any impact on the macroinvertebrate communities of the Mangawhero Stream and Waingongoro River.

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To	Rae West, Job manager
From	Darin Sutherland, Environmental Scientist
Document	2079218
Report	DS096
Date	29 June 2018

Biomonitoring of the Mangawhero Stream and Waingongoro River in relation to the South Taranaki District Council's Eltham Wastewater Treatment Plant System and rubbish tip leachate discharge, March 2018

Introduction

This summer survey was the second of two surveys programmed for the 2017-2018 monitoring period. Since summer 2011, biomonitoring surveys in the Mangawhero Stream have been reduced from four sites to two sites in recognition of the minimal usage of the wastewater treatment plant (WWTP) consented overflow facility to the Mangawhero Stream in recent years. No overflows to the stream have occurred since this time.

This survey was performed some seven and a half years after commissioning of the pipeline for conveyance of the Eltham WWTP wastewater to the Hawera WWTP and the cessation of the discharge of partially treated wastewater into the Waingongoro catchment. No (consented) overflows from the WWTP to the Mangawhero Stream had occurred during this period, nor were occurring at the time of the survey. In recognition of the successful diversion of the wastewater, recent surveys have been reduced (by two sites in the Mangawhero Stream) from the previous intensity (see CF528 and other references) and will continue at this level in order to address temporal stream and river 'health' recovery.

Methods

Current biomonitoring sites are presented in Table 1. The standard '400 ml kick sampling' technique was used to collect streambed (benthic) macroinvertebrates from the Mangawhero Stream and Waingongoro River on 21 March 2018.

Table 1 Biomonitoring sites in the Mangawhero Stream and Waingongoro River in relation to the South Taranaki District Council's Eltham Wastewater Treatment Plant System and Rubbish Tip leachate discharge

Site No	Site code	Grid reference	Location
1	MWH000380	E1712475 N5633431	Mangawhero Stream: upstream of wastewater treatment plant discharge
5	MWH000490	E1710795 N5632738	Mangawhero Stream: approximately 200 m downstream of rail bridge
6	WGG000620	E1710708 N5632961	Waingongoro River: approx 150 m upstream of Mangawhero S. confluence
7	WGG000640	E1710554 N5632790	Waingongoro River: approx 200 m downstream of Mangawhero S. confluence
8	WGG000665	E1709784 N5632049	Waingongoro River: approx 2 km downstream of Mangawhero S. confluence (off Stuart Road)

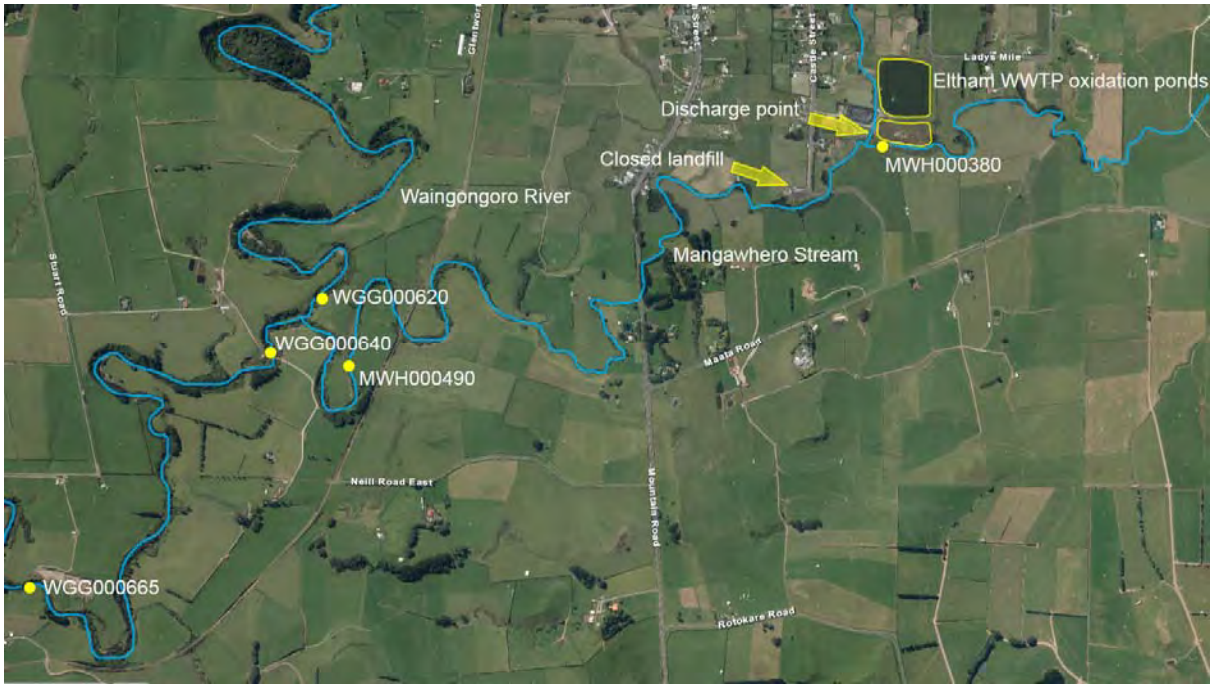


Figure 1 Aerial location map of biomonitoring site locations in the Mangawhero Stream and Waingongoro River in relation to Eltham WWTP and landfill

This 'kick-sampling' technique is very similar to Protocol C1 (hard-bottomed, semi-quantitative) of the New Zealand Macroinvertebrate Working Group (NZMWG) protocols for macroinvertebrate samples in wadeable streams (Stark et al, 2001).

Samples were preserved with Kahle's Fluid for later stereomicroscopic sorting and identification according to documented Taranaki Regional Council methodology and macroinvertebrate taxa abundances scored based on the categories in Table 2.

Table 2 Macroinvertebrate abundance categories

Abundance category	Number of individuals
R (rare)	1-4
C (common)	5-19
A (abundant)	20-99
VA (very abundant)	100-499
XA (extremely abundant)	500+

Stark (1985) developed a scoring system for macroinvertebrate taxa according to their sensitivity to organic pollution in stony New Zealand streams. Highly 'sensitive' taxa were assigned the highest scores of 9 or 10, while the most 'tolerant' forms scored 1. Sensitivity scores for certain taxa have been modified in accordance with Taranaki experience.

By averaging the scores obtained from a list of taxa taken from one site and multiplying by a scaling factor of 20, a Macroinvertebrate Community Index (MCI) value was obtained (Table 3). The MCI is a measure of the overall sensitivity of macroinvertebrate communities to the effects of organic pollution. More 'sensitive' communities inhabit less polluted waterways. A difference of 11 units or more in MCI values is considered significantly different (Stark 1998).

A semi-quantitative MCI value ($SQMCI_s$) has also been calculated for the taxa present at each site by multiplying each taxon score by a loading factor (related to its abundance), totalling these products, and dividing by the sum of the loading factors (Stark, 1998 and 1999). The loading factors were 1 for rare (R), 5 for common (C), 20 for abundant (A), 100 for very abundant (VA) and 500 for extremely abundant (XA). Unlike the MCI, the $SQMCI_s$ is not multiplied by a scaling factor of 20, so that its corresponding range of values is 20x lower. A difference of 0.9 units or more in $SQMCI_s$ values is considered significantly different (Stark 1998).

Table 3 Macroinvertebrate health based on MCI ranges which has been adapted for Taranaki streams and rivers (TRC, 2015) from Stark's classification (Stark, 1985, Boothroyd and Stark, 2000, and Stark and Maxted, 2007)

Grading	MCI
Excellent	>140
Very Good	120-140
Good	100-119
Fair	80-99
Poor	60-79
Very Poor	<60

Where necessary sub-samples of algal and detrital material were also taken from the macroinvertebrate samples at all sites and were scanned under 40-400x magnification to determine the presence or absence of any mats, plumes or dense growths of bacteria, fungi or protozoa ('undesirable biological growths') at a microscopic level. The presence of masses of the organisms is an indicator of organic enrichment within a stream.

Results

Site habitat characteristics and hydrology

This summer survey was performed under low flow conditions (approximate 550 l/s) approaching MALF (443 l/s), 22 days after a fresh in excess of 3 times median flow and 23 days after a fresh in excess of 7 times median flow in the Waingongoro River (flow gauging site: Waingongoro River at Eltham). The survey followed a typical summer period with only one significant fresh and three minor freshes recorded over the preceding month.

For the Mangawhero Stream sites the water temperatures during the survey were in the range 16.1-16.3 °C. Water speed was swift and the water was brown and cloudy at site 1 and grey and cloudy at site 5. The substrate at site 1 was hard clay while at site 5 it was a mixture of fine and coarse gravels, cobble and boulder. Site 1 had slippery algal mats and no filamentous algae. There was patchy leaves on the streambed and macrophytes growing on the streambed. Site 5 had widespread algal mats and patchy filamentous algae. Site 5 had patchy leaves on the streambed and there were macrophytes growing on the edge of the stream. Site 1 had partial shading from overhanging vegetation and site 5 had no shading.

For the Waingongoro River sites the water temperatures during the survey were in the range 15.6-16.3. Water speed was swift and the water was uncoloured and cloudy at sites 6 and 8. Site 7 had grey cloudy water. The substrate at all three sites comprised predominately cobble/ coarse gravel. Site 6 had slippery algal mats and no filamentous algae. There was patchy leaves on the streambed. Site 7 also had slippery algal mats and no filamentous algae. There were also patchy leaves on the streambed. Site 8 had patchy algal mats and no filamentous algae. There was patchy moss and leaves on the streambed. All sites had no shading.

Macroinvertebrate communities

The results of past biomonitoring surveys performed at the various established stream sites are summarised in Table 4 and illustrated in Figure 2.

Table 4 Summary of macroinvertebrate taxa numbers and MCI values for previous surveys performed between January 1985 and November 2017 and the current survey

Site No.	N	No of taxa			MCI value			SQMCIs value		
		Median	Range	Current survey	Median	Range	Current survey	Median	Range	Current survey
1	56	16	10-25	17	74	58-85	64	4.1	1.5-6.3	2.5
5	51	20	13-30	21	79	63-102	87	3.2	1.5-6.4	3.4
6	32	26	16-35	21	96	77-116	101	5.7	3.7-6.8	7.4
7	31	26	17-35	16	92	78-109	96	4.5	2.2-7.0	6.0
8	45	20	14-30	15	95	77-111	89	4.4	2.4-7.6	6.8

The macroinvertebrate fauna recorded by the current survey at each of the five sites are presented in Table 5.

Table 5 Macroinvertebrate fauna of the Mangawhero Stream (sites 1 and 5) and the Waingongoro River (sites 6, 7 and 8) in relation to the Eltham WWTP, sampled on 21 March 2018

Taxa List	Site Number	MCI score	1	5	6	7	8
	Site Code		MWH000380	MWH000490	WGG000620	WGG000640	WGG000665
	Sample Number		FWB18179	FWB18180	FWB18174	FWB18175	FWB18176
PLATYHELMINTHES (FLATWORMS)	*Cura*	3	R	R	-	-	-
NEMERTEA	Nemertea	3	C	A	C	C	R
NEMATODA	Nematoda	3	R	R	-	-	-
ANNELIDA (WORMS)	Oligochaeta	1	A	R	-	-	R
	Lumbricidae	5	C	R	R	-	-
MOLLUSCA	*Physa*	3	-	-	-	R	-
	Potamopyrgus	4	A	A	R	R	R
	Sphaeriidae	3	R	-	-	-	-
CRUSTACEA	Ostracoda	1	C	-	-	-	-
	Paracalliope	5	R	A	-	-	-
EPHEMEROPTERA (MAYFLIES)	*Austroclima*	7	-	-	R	C	-
	Coloburiscus	7	-	-	A	C	R
	Deleatidium	8	-	C	XA	VA	VA
	Zephlebia group	7	-	-	R	-	-
COLEOPTERA (BEETLES)	Elmidae	6	-	A	A	R	R
MEGALOPTERA (DOBSONFLIES)	*Archichauliodes*	7	-	C	A	R	C
TRICHOPTERA (CADDISFLIES)	*Hydropsyche (Aoteapsyche)*	4	R	A	A	A	A
	Hydrobiosis	5	R	C	C	C	R
	Beraeoptera	8	-	-	R	-	-
	Oxyethira	2	A	-	-	-	-
	Pycnocentria	7	-	R	R	R	-
	Pycnocentrodes	5	-	R	A	A	-
	Triplectides	5	-	R	-	-	-
DIPTERA (TRUE FLIES)	*Aphrophila*	5	-	-	C	-	R
	Eriopterini	5	-	-	-	-	R
	Limonia	6	R	-	-	-	-
	Chironomus	1	C	-	-	-	-
	Harrisius	6	-	R	-	-	-
	Maoridiamesa	3	-	R	-	-	-
	Orthocladiinae	2	A	VA	C	A	C
	Polypedilum	3	-	-	C	C	-
	Tanytarsini	3	-	A	C	C	C
	Empididae	3	-	-	R	-	-
	Muscidae	3	R	C	-	-	-
	Austrosimulium	3	C	C	R	C	R
	Tanyderidae	4	-	-	R	-	R
	No of taxa		17	21	21	16	15
	MCI		64	87	101	96	89
	SQMCIs		2.5	3.4	7.4	6.0	6.8
	EPT (taxa)		2	6	9	7	4
	%EPT (taxa)		12	29	43	44	27

'Tolerant' taxa	'Moderately sensitive' taxa	'Highly sensitive' taxa

R = Rare C = Common A = Abundant VA = Very Abundant XA = Extremely Abundant

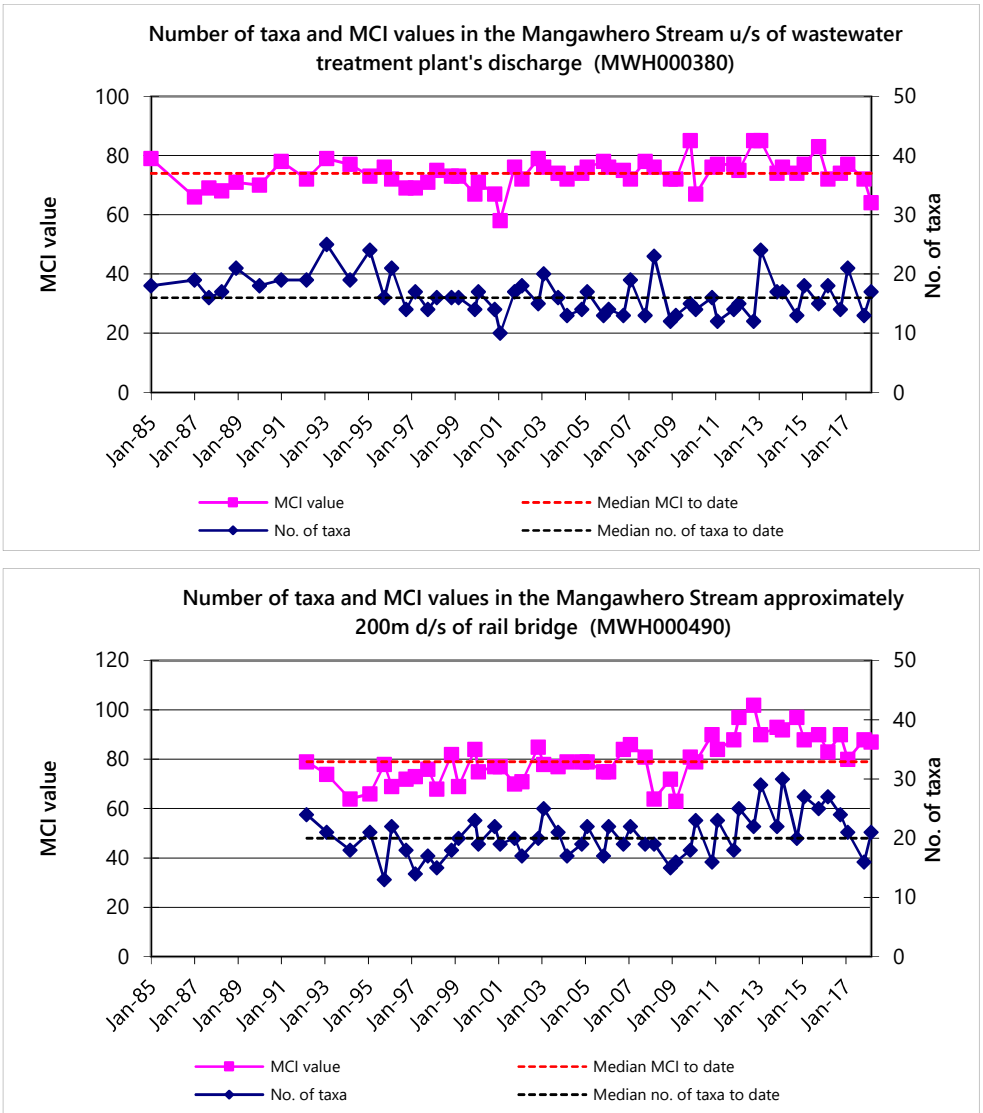


Figure 2 Taxa richness and MCI scores recorded at each site to date for Mangawhero Stream sites

Site 1 (upstream of the WWTP outfall)

A moderate macroinvertebrate community richness of 17 taxa was found at site 1 ('control' site) at the time of the summer survey (Table 3) which was one taxon more than the historic median (16 taxa) and three taxa more than the previous survey on November 2017 (13 taxa) (Figure 2).

The MCI score of 64 units indicated a community of 'poor' biological health which was not significantly different to the median MCI score (74 units) and to the previous survey (72 units). The $SQMCI_S$ score of 2.5 units was significantly lower (Stark, 1998) than the median $SQMCI_S$ score (4.1 units) (Table 3) but not significantly different to the previous survey (3.0 units).

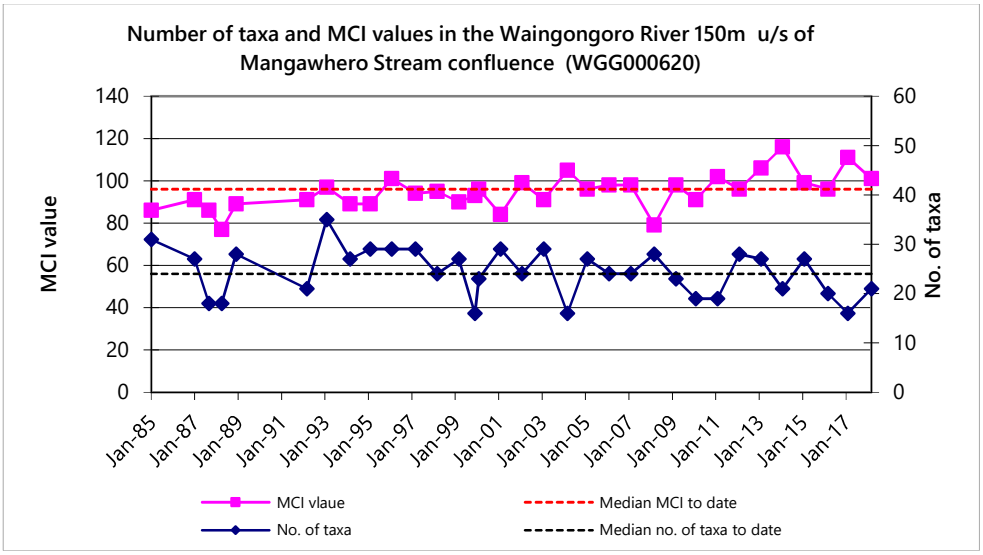
The community was characterised by four 'tolerant' taxa [oligochaete worms, snail (*Potamopyrgus*), caddisfly (*Oxyethira*) and midge (Orthocladiinae)] (Table 3).

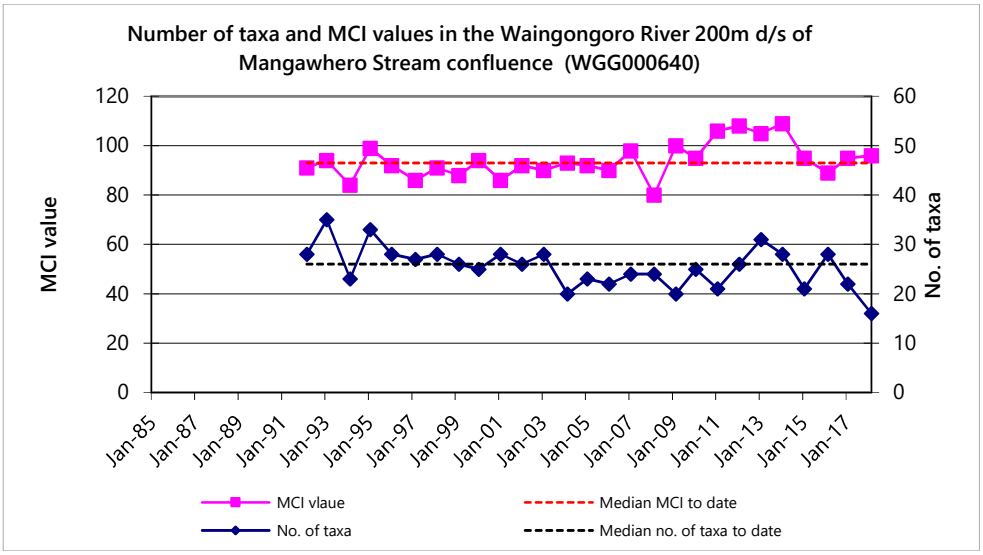
Site 5 (downstream of Mangawharawhara Stream confluence; approx 3 km below the WWTP outfall and old landfill)

A moderate macroinvertebrate community richness of 21 taxa was found at site 5 ('primary impacted' site) (Table 3) which was one more than the historic median (20 taxa) and five taxa more than the previous survey (16 taxa) (Figure 2).

The MCI score of 87 units indicated a community of 'fair' biological health which was not significantly different (Stark, 1998) to the median MCI score (79 units) and the previous survey (88 units) (Figure 2). The $SQMCI_S$ score of 3.4 units was not significantly different to the median $SQMCI_S$ score of 3.2 units (Table 3) and to the previous survey (3.2 units).

The community was characterised by six 'tolerant' taxa [proboscis worm (Nemertea), oligochaete worms, snail (*Potamopyrgus*), caddisfly (*Hydropsyche/Aoteapsyche*) and midges (*Maoridiamesa* and Tanytarsini)] and two 'moderately sensitive' taxa [amphipod (*Paracalliope*) and beetle (Elmidae)] (Table 3).





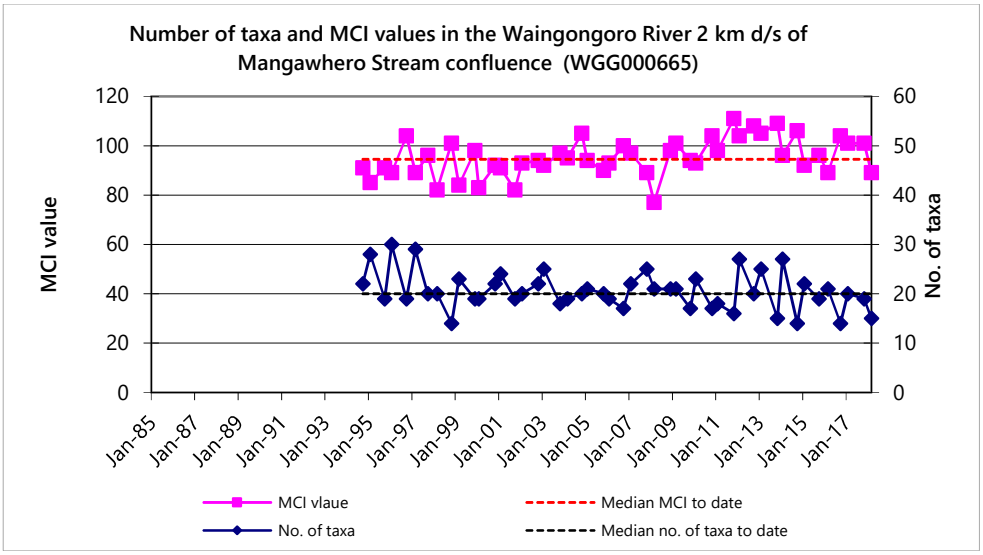


Figure 3 Taxa richness and MCI scores recorded at each site to date for Waingongoro River sites

Waingongoro River site (Upstream of Mangawhero River confluence (site 6))

A moderate macroinvertebrate community richness of 21 taxa was found at site 6 (Waingongoro River 'control' site) at the time of the survey (Table 4) which was lower than the median taxa richness of 26 taxa but five taxa higher than the previous survey on February 2017 (16 taxa) (Figure 3).

The MCI score of 101 units indicated a community of 'good' biological health which was not significantly different (Stark, 1998) to the median MCI score of 95 units, or the previous survey (111 units). The $SQMCI_S$ score of 7.4 units was significantly higher than the median $SQMCI_S$ score of 5.7 units but not significantly different to the previous survey (6.8 units) (Table 4).

The community was dominated by one 'tolerant' taxon [caddisfly (*Hydropsyche/Aoteapsyche*)], four 'moderately sensitive' taxa [mayfly (*Coloburiscus*), beetle (Elmidae), dobsonfly (*Archichauliodes*), caddisfly (*Pycnocentrodes*)], and a 'highly sensitive' taxon [mayfly (*Deleatidium*)] (Table 5).

Waingongoro River site (Downstream of Mangawhero River confluence (site 7))

A moderate macroinvertebrate community richness of 16 taxa was found at site 7 ('secondary impact' site) at the time of the survey (Table 4) which was substantially lower than the median taxa richness of 26 taxa and six taxa lower than the previous survey on February 2017 (22 taxa) (Figure 3).

The MCI score of 96 units indicated a community of 'fair' biological health which was not significantly different (Stark, 1998) to the median MCI score of 92 units and the previous survey (95 units) (Figure 3). The $SQMCI_S$ score of 6.0 units was significantly higher (Stark, 1998) than the median $SQMCI_S$ score of 4.5 units but not significantly different to the previous survey (5.5 units) (Table 4).

The community was dominated by two 'tolerant' taxa [caddisfly (*Hydropsyche/Aoteapsyche*) and orthoclad midges], one 'moderately sensitive' taxon [caddisfly (*Pycnocentrodes*)], and one 'highly sensitive' taxon [mayfly (*Deleatidium*)] (Table 5).

Waingongoro River site (downstream of the Mangawhero Stream confluence (site 8))

A moderate macroinvertebrate community richness of 15 taxa was found at site 8 ('tertiary impact site) at the time of the survey (Table 4) which was five taxa lower than the median taxa richness (20 taxa) taxa and five taxa lower than the previous survey on November 2017 (20 taxa) (Figure 3).

The MCI score of 89 units indicated a community of 'fair' biological health which was not significantly different (Stark, 1998) to the median MCI score of 95 units but was significantly lower than the previous survey (101 units) (Figure 3). The $SQMCI_S$ score of 6.8 units was significantly higher (Stark, 1998) than the median $SQMCI_S$ score of 4.4 units and to the previous survey (4.8 units) (Table 4).

The community was dominated by one 'tolerant' taxon [caddisfly (*Hydropsyche/Aoteapsyche*) and one 'highly sensitive' taxon [mayfly (*Deleatidium*)] (Table 5).

Microscopic streambed heterotrophic assessment

The microscopic heterotrophic assessments of substrate growths performed for all sites indicated an absence of any mats, plumes or dense growths of heterotrophic organisms at each of the five sites.

Discussion and conclusions

Taxa richnesses at the Mangawhero Stream sites were within one taxon of historic median levels for both sites, with a slight increase in richness of four taxa from the upstream 'control' site to the downstream' impact site. The Mangawhero Stream 'control' site had 'poor' health which was typical for the site with the MCI score not significantly different to the historic median. The downstream 'impact' site had 'fair' health which was again typical for that site as the MCI score was not significantly different to the historic median. The low MCI score at the 'control' site was due to the low quality habitat as the sites' substrate was largely comprised of hard clay which makes poor quality habitat for macroinvertebrates compared with the gravel/cobble substrate at the 'impact' site. The $SQMCI_S$ score was significantly lower than usual at the 'control' site but was typical at the 'impact' site. Congruent with the MCI score, there was a significant downstream decrease in score. Overall, the 'control' site macroinvertebrate community appears to be in poorer health than normal while the 'impact' site was in typical health. There was no evidence of discharges or leakage from the WWTP or closed landfill site having any impact on the macroinvertebrate community between the two sites at the time of the survey.

The Waingongoro River sites, including the 'control' site, all had lower than usual taxa richnesses (by 5-10 taxa) compared with historic medians. MCI scores were not significantly different from historic medians and there was no significant difference between the 'control' site, site 6, and site 7 and between sites 7 and 8 though there was an overall significant decrease between sites 6 and 8. This would be due to a general deterioration of macroinvertebrate health in a downstream direction as observed in the majority of Taranaki ringplain streams and rivers and would not be directly attributable to pollution from the Mangawhero Stream.

Taxa composition was noticeably different between the Mangawhero Stream sites and Waingongoro River sites. The Waingongoro River had more 'highly sensitive' taxa (e.g. Deleatidium mayfly) at higher abundances and less tolerant 'taxa' such (e.g. Potamopyrgus mud snails) which were at lower abundances compared with the Mangawhero Stream. This caused significant differences in SQMCIS scores between the two waterbodies. There was a significant difference between sites 6 and 7 but not sites 6 and 8 which was largely caused by a decrease in Deleatidium mayflies downstream of site 6 and an increase in orthoclad

midges at site 7. This may be due to nutrient enrichment as the Mangawhero Stream may be more eutrophic than the Waingongoro River.

The results of the current survey largely support the current situation where no WWTP discharges are currently entering the Mangawhero Stream and therefore the three downstream sites are not being impacted by the Eltham WWTP. No significant impacts could also be attributed to the closed landfill. Given the lack of impacts from the WWTP and closed landfill site the five site summer survey is unnecessary. Therefore, it is recommended that the three site survey used for the spring period be implemented for the summer period as well with the two additional sites used as provisional survey sites in the event of significant discharges occurring from the WWTP.

Summary

On the 21st March 2018 the Councils 'kick-sampling' technique was used at one site on the Mangawhero Stream and three sites on the Waingongoro River and a combination of 'kick-sampling' and 'sweep netting' used at one site on the Mangawhero Stream to collect macroinvertebrates for this summer survey in relation to the Eltham waste water treatment plant and a retired landfill site. This has provided data to assess whether discharges from the Eltham WWTP and closed landfill have had an effect on the macroinvertebrate communities present in the Mangawhero Stream and Waingongoro River. Samples were processed to provide number of taxa (richness), MCI, and $SQMCI_S$ scores for each site.

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

Taxa richnesses were similar to historical median taxa richnesses at the Mangawhero Stream sites, while there was an overall drop in richnesses at the Waingongoro River sites. The MCI and $SQMCI_S$ scores for the three potentially impacted sites (sites 5, 7 and 8) were all higher or not significantly different to historical medians in the Mangawhero Stream and there were significant increases in MCI and $SQMCI_S$ scores between sites 1 and 5. There was probably a slight decrease in overall macroinvertebrate health in a downstream direction for the Waingongoro River sites, as reflected in the historic medians, probably as a result of cumulative impacts, particularly for the furthest downstream site (site 8) and the influence of the Mangawhero Stream which would appear to be more eutrophic than the Waingongoro River.

Overall, there was little evidence that leachate from the Eltham WWTP or closed landfill site for the current monitoring period was having any impact on the macroinvertebrate communities present in the Mangawhero Stream and Waingongoro River.

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Appendix III

STDC Supplied Annual Report

South Taranaki District Council
882/15

17 August 2018

The Chief Executive Officer
Taranaki Regional Council
Private Bag 713
Stratford

Dear Sir

Wastewater Annual Reports - July 2017 to June 2018

This report covers the operation, maintenance, improvements, inflow and infiltration effects and actions for our municipal wastewater schemes Hawera, Manaia, Eltham, Kaponga, Waverley, Wai-inu, Patea and Opunake for the year 1 July 2017 to 30 June 2018.

Hawera Wastewater Treatment Site - Consent 5079

Dissolved oxygen grab sampling from the maturation cells indicates that the compliant limit of 2ppm was achieved for 90% of the time and in-line dissolved oxygen continuous recording in pond 1 was above the minima for an average of 50% of the time and pond 2 was above the 2ppm for 58% of the time. No objectionable odours were evident from either of the aerobic ponds however anaerobic pond odours were noticeable at close proximity on site although unnoticeable at the site boundaries.

A new and additional aerator, Aquarator brand, was installed in Pond 2 in May 2018 as a trial. A decommissioned brush aerator is being refurbished and is to be installed in Pond 2 to provide extra aeration capacity by September this year.

Pond 2 inlet fouled on several occasions; this affected the flow split and loading portions for the ponds at times. The fault was rectified by cleaning the internals with a water blaster. Manual flow monitoring in the open channels discharging to the two ponds is being undertaken at more regular intervals to identify any obstruction early; continuous flow indication is being investigated.

Parklink Ltd continues to carry out bacterial dosing of Pond 1 for the purpose of sludge digestion to maintain pond capacity.

No overflows took place from any of the retention basins to the environment, however the outfall discharge figures show the consented 7 day average, of 12,000m^3, being exceeded on 46 days during prolonged rainfall events. Specific reports were provided to TRC and Iwi at the time for these excursions, and the associated norovirus sampling results for reef shellfish.

Cyclonic grit removal and washing equipment was installed however is yet to be fully commissioned due to prolonged issues with the control cabinet. These are expected to be corrected by the end of 2018. The anaerobic lagoon effluent quality has been variable so performance monitoring has been increased with a view to planning improvements in conjunction with Silver Fern Farms Ltd, the prime user.

The existing tankered waste disposal structure has been in use throughout the year. Solids are separated for disposal at the Colson Road landfill, and the liquid portions are discharged either to the anaerobic lagoon or to the aerobic ponds. Dumping of less desirable wastes, fats and gross

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solids, occurs from time to time, however truck operators are controlled more effectively now via Trade Waste Bylaw provisions. Use of security swipe card activated automated entry gate and on-site camera monitoring is a possibility for future.

With the introduction of a Trade Waste Bylaw in mid-2017 a Trade Waste Officer was appointed, systems were setup, consenting progressed and monitoring of trade premises is occurring with mostly positive results to date.

Data and graphical reports covering the pond dissolved oxygen levels and discharge flows continue to be posted on "WaterOutlook" cloud website which TRC officers can access. Annual summary reports are attached for reference.

The marine outfall discharge consent renewal was granted by the TRC in June 2018 and STDC are now operating under this, implementing changes, setting up interest groups and studies in accordance with the new consent conditions.

Other wastewater plant sites

A stream assessment study was initiated for Waverley's receiving waterway and the working party is established under a draft Memorandum of Understanding (MOU). A flow meter was installed on the discharge from the plant and a control valve has been installed on the outflow to maintain the discharge within consented limits. Fencing for riparian planting was carried out, and the planting has occurred. A stream assimilative study is underway as-with monitoring of the discharge and the receiving water.

Opunake's consent renewal was lodged and is being considered by the TRC officers. Performance has been satisfactory although wet weather poses difficulties with inflow and disposal to land. Resulting in an Abatement Notice issued on 15 June from the TRC. Corrective actions were put in place to alleviate occurrences of localised wetland ponding and overland flow

Eltham pond had an extra 'bubbler' aerator installed, along with a stand-by 55kW aerator loaned by Fonterra.

Manaia pond has a trial of bacterial enhancement dosing underway via ForEarth Pty Ltd Dosing and their brand of aerators was installed near the inlet. Both are performing well and have improved pond performance. The coastal cliff access track was upgraded to ease inspection and sampling.

Patea York Street pump station had an overflow for 4 hours on 10 April 2018, as result of a mains power outage during a storm. TRC, the District Health Board and the local iwi were informed and warning signs erected. A backup generator was put on stand-by at the site for later that day when storm conditions were forecasted to worsen but was not needed.

Wai-inu plant replacement was tendered and installation and commissioning is expected in 2019.

Inflow and Infiltration

Resource Consents for the following consents require progress reports covering inflow and infiltration reduction. Manaia's Consent 1204-4, condition 12; Hawera's Consent 5079-1, condition 11 and Hector Place, Opunake's Consent 1236-6, condition 13.

The table below shows pipe lining work carried out during the 2017/18 year to reduce infiltration, totalling 1,382 metres at a cost of $515,900.

Area	Street	Length (m)
Hawera	213-215 Glover Road	34
	41-49 Union Street	74
	2 Waihi Road	50
	141-151 Waihi Road	94
	100-104 Manawapou Road	93
	97-99 Camberwell Road	111
	54-64 Camberwell Road	84
	7-13 Milmoe Street	51
	3 Regent Street	44
	199-207 Glover Road	66
	70-80 Camberwell Road	71
	73-81 Camberwell Road	70
	Union Street	158
	Total	1,000
Eltham	Conway Road	166
	Total	166
Normanby	Waihi Road	204
	Kerry Lane	12
	Total	216
District	*Grand total*	1,382

Other infiltration reduction work consisted of:

- 1,382m of CCTV was carried out in Nolantown, Hawera, costing $83,779.
- Sub-standard manhole lids were also identified during manhole inspections of Kaponga with 9 replaced, Nolantown had 9 replaced, Patea 26 replaced, Normanby 8 replaced, Eltham 33 replaced, Manaia 7 replaced and Waverley with 4 replaced. Work is on-going in Waverley.
- Manaia house inspections and smoke testing carried out with 28 properties needing repairs; 3 have yet to be corrected.
- Nolantown and Normanby had 18 faults found during house inspections and smoke testing.

The priority for inflow and infiltration works for next year will again concentrate in Eltham, Hawera and Normanby whilst expanding to Waverley and Opunake with house inspections and smoke testing to identify and resolve faulty connections.

Yours sincerely

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Hawera WWTP Dissolved Oxygen: July 2017 - July 2018

Consent: 5079-2.0 | **Expiry: 01/06/52** | **Condition: For 90% of the time between 11 am - 2 pm, ponds must contain at least 2.0 g/m³ dissolved oxygen**

Dissolved Oxygen Western Pond				
Date	Consent Limit: Minimum percent at or above 2.0 g/m³	Actual % of time at or above 2.0 g/m³	Average [g/m³]	Maximum [g/m³]
July 2018	90.0%	94.8%	7.65	15.03
June 2018	90.0%	[illegible]	4.54	13.92
May 2018	90.0%	90.1%	6.49	14.32
April 2018	90.0%	[illegible]	9.07	20.00
March 2018	90.0%	98.0%	12.62	20.00
February 2018	90.0%	[illegible]	10.71	20.00
January 2018	90.0%	[illegible]	9.27	20.00
December 2017	90.0%	[illegible]	10.69	19.99
November 2017	90.0%	99.5%	18.61	19.99
October 2017	90.0%	[illegible]	1.87	18.30
September 2017	90.0%	[illegible]	4.52	13.00
August 2017	90.0%	90.2%	7.55	20.02
July 2017	90.0%	94.8%	7.03	13.38

Dissolved Oxygen Eastern Pond				
Date	Consent Limit: Minimum Percent at or above 2.0 g/m³	Actual % of time at or above 2.0 g/m³	Average [g/m³]	Maximum [g/m³]
July 2018	90.0%	[illegible]	6.73	20.05
June 2018	90.0%	[illegible]	4.99	20.05
May 2018	90.0%	97.5%	6.39	20.04
April 2018	90.0%	94.1%	6.24	19.67
March 2018	90.0%	95.4%	7.10	20.03
February 2018	90.0%	92.6%	8.45	20.03
January 2018	90.0%	99.0%	11.81	20.18
December 2017	90.0%	[illegible]	5.06	13.40
November 2017	90.0%	[illegible]	6.81	19.99
October 2017	90.0%	90.6%	6.83	19.62
September 2017	90.0%	93.8%	7.92	20.00
August 2017	90.0%	[illegible]	5.74	19.99
July 2017	90.0%	[illegible]	6.28	19.73

Values in the tables above relate to the hours between 11am and 2pm each day, based on 5-minute average readings

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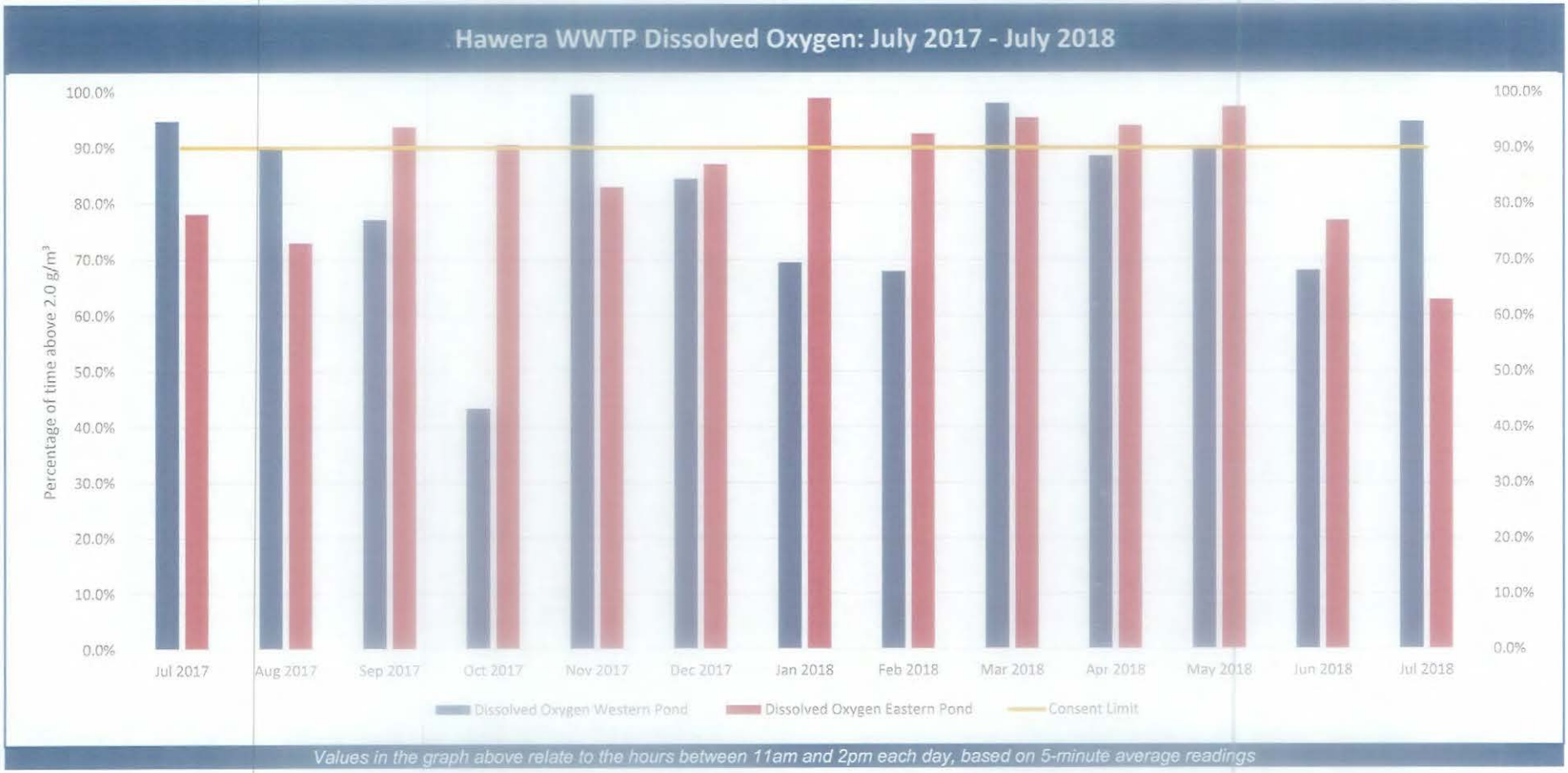

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Hawera WWTP Flow - Year to Date

Monthly Figures: On-Demand

Aug 2018

			Works Inflow	Eastern Trunk Inflow	Western Trunk Inflow	Total Inflow	Plant Outflow
Sep 17	TOTAL	m^3	17,998	112,023	228,202	358,223	391,115
	Minimum	m^3/d	80	3,118	6,077	9,675	11,947
	Average	m^3/d	600	3,734	7,607	11,941	13,037
	Maximum	m^3/d	1,797	4,603	9,626	15,889	15,677
Oct 17	TOTAL	m^3	14,344	80,089	150,984	245,417	308,484
	Minimum	m^3/d	79	2,004	2,999	5,714	5,526
	Average	m^3/d	463	2,584	4,870	7,917	9,951
	Maximum	m^3/d	1,775	2,983	6,947	9,959	15,138
Nov 17	TOTAL	m^3	36,036	48,533	83,757	168,326	155,350
	Minimum	m^3/d	115	1,119	1,818	3,838	3,213
	Average	m^3/d	1,201	1,618	2,792	5,611	5,178
	Maximum	m^3/d	2,726	2,107	3,512	7,217	7,012
Dec 17	TOTAL	m^3	54,455	44,737	67,647	166,840	152,452
	Minimum	m^3/d	129	981	1,193	2,959	2,067
	Average	m^3/d	1,757	1,443	2,182	5,382	4,918
	Maximum	m^3/d	3,015	2,496	2,773	8,128	8,740
Jan 18	TOTAL	m^3	53,132	42,812	81,949	177,893	174,573
	Minimum	m^3/d	72	1,086	1,207	2,787	2,752
	Average	m^3/d	1,714	1,381	2,644	5,738	5,631
	Maximum	m^3/d	2,999	2,151	3,974	8,843	9,033
Feb 18	TOTAL	m^3	40,871	34,773	67,681	143,325	136,134
	Minimum	m^3/d	-1	1,114	1,794	3,510	-11
	Average	m^3/d	1,460	1,242	2,417	5,119	4,862
	Maximum	m^3/d	3,131	1,588	3,357	7,759	8,849
Mar 18	TOTAL	m^3	57,873	55,629	110,229	223,732	242,967
	Minimum	m^3/d	138	1,148	2,049	3,572	2,975
	Average	m^3/d	1,867	1,794	3,556	7,217	7,838
	Maximum	m^3/d	3,443	3,061	5,654	11,755	12,372
Apr 18	TOTAL	m^3	61,866	60,232	125,882	247,980	263,698
	Minimum	m^3/d	174	1,279	1,979	3,525	3,184
	Average	m^3/d	2,062	2,008	4,196	8,266	8,790
	Maximum	m^3/d	4,072	3,955	6,101	13,683	14,509
May 18	TOTAL	m^3	78,576	52,744	172,647	304,002	322,577
	Minimum	m^3/d	216	-8	2,531	5,687	5,407
	Average	m^3/d	2,535	1,701	5,569	9,807	10,406
	Maximum	m^3/d	3,467	2,909	9,382	13,285	14,314
Jun 18	TOTAL	m^3	64,011	62,135	184,778	321,886	359,613
	Minimum	m^3/d	134	-2,400	4,865	6,363	11,957
	Average	m^3/d	2,134	2,071	6,159	10,730	11,987
	Maximum	m^3/d	3,376	3,902	8,373	15,296	12,004
Jul 18	TOTAL	m^3	42,629	81,115	156,200	279,944	352,325
	Minimum	m^3/d	200	2,330	4,085	6,952	3,671
	Average	m^3/d	1,375	2,617	5,039	9,030	11,365
	Maximum	m^3/d	2,717	3,071	5,737	10,855	14,881
Aug 18	TOTAL	m^3	3,195	3,876	6,001	13,072	13,354
	Minimum	m^3/d	0	0	0	0	0
	Average	m^3/d	103	125	194	422	431
	Maximum	m^3/d	1,888	2,455	3,985	8,329	9,244
Year to Date	TOTAL	m^3	524,986	678,699	1,435,958	2,650,639	2,872,641
	Minimum	m^3/d	-1	-2,400	0	0	-11
	Average	m^3/d	1,439	1,860	3,935	7,265	7,866
	Maximum	m^3/d	4,072	4,603	9,626	15,889	15,677

Hawera WWTP Flow - Year to Date

Daily Totals: On-Demand

Aug 2018

Date	Month	Works Inflow m³/day	Eastern Trunk Inflow m³/day	Western Trunk Inflow m³/day	Total Inflow m³/day	Plant Outflow m³/day	7-Day Avg Outflow m³/day
01/08/2017	42948	1,686	-2,400	6,788	8,474	11,965	
02/08/2017	42948	1,821	-2,400	7,986	9,808	11,995	
03/08/2017	42948	1,286	-2,400	8,057	9,343	11,989	
04/08/2017	42948	1,494	-2,400	8,055	9,550	11,997	
05/08/2017	42948	276	-2,400	7,911	8,187	11,995	
06/08/2017	42948	307	-2,400	7,226	7,533	11,991	
07/08/2017	42948	435	-2,400	6,131	6,566	11,997	11,990
08/08/2017	42948	1,529	-2,400	6,971	8,501	11,980	11,992
09/08/2017	42948	1,856	-2,400	7,068	8,924	11,982	11,990
10/08/2017	42948	1,889	-2,400	6,951	8,841	11,966	11,987
11/08/2017	42948	1,426	-2,400	6,841	8,267	11,971	11,983
12/08/2017	42948	270	-2,400	6,705	6,975	11,974	11,980
13/08/2017	42948	284	-2,400	5,426	5,710	11,975	11,978
14/08/2017	42948	513	-2,400	5,211	5,724	11,979	11,975
15/08/2017	42948	1,758	-2,400	6,424	8,182	11,988	11,976
16/08/2017	42948	1,967	-2,400	7,218	9,185	11,977	11,976
17/08/2017	42948	2,131	1,336	8,602	12,069	11,968	11,976
18/08/2017	42948	1,678	3,638	9,490	14,806	11,969	11,976
19/08/2017	42948	249	3,840	9,586	13,675	11,958	11,973
20/08/2017	42948	259	3,698	9,498	13,455	11,955	11,970
21/08/2017	42948	459	3,779	9,196	13,434	11,986	11,971
22/08/2017	42948	1,692	3,652	8,622	13,966	11,970	11,969
23/08/2017	42948	1,660	3,465	8,103	13,228	11,981	11,969
24/08/2017	42948	1,478	3,291	7,539	12,308	11,986	11,972
25/08/2017	42948	1,727	3,233	6,589	11,549	11,964	11,971
26/08/2017	42948	280	2,981	6,031	9,292	11,980	11,974
27/08/2017	42948	264	2,797	5,737	8,798	11,960	11,975
28/08/2017	42948	885	4,384	8,349	13,618	11,990	11,976
29/08/2017	42948	1,551	3,760	8,698	14,009	11,921	11,969
30/08/2017	42948	1,813	3,815	8,029	13,657	11,962	11,966
31/08/2017	42948	2,194	4,257	8,643	15,094	11,978	11,965
01/09/2017	42979	513	3,848	8,829	13,190	11,959	11,964
02/09/2017	42979	305	3,888	8,600	12,793	11,972	11,963
03/09/2017	42979	288	3,711	8,091	12,091	11,981	11,966
04/09/2017	42979	507	3,655	7,390	11,551	11,980	11,965
05/09/2017	42979	1,766	3,412	6,934	12,113	11,974	11,972
06/09/2017	42979	1,612	3,425	6,914	11,951	11,947	11,970
07/09/2017	42979	1,710	3,466	6,077	11,253	11,954	11,967
08/09/2017	42979	1,668	3,326	7,023	12,017	11,950	11,966
09/09/2017	42979	348	4,395	8,330	13,074	11,959	11,964
10/09/2017	42979	583	4,249	9,319	14,152	11,964	11,961
11/09/2017	42979	1,660	4,603	9,626	15,889	11,966	11,959
12/09/2017	42979	1,797	4,429	9,453	15,679	11,993	11,962
13/09/2017	42979	1,739	4,258	8,775	14,773	11,960	11,964
14/09/2017	42979	318	4,148	7,908	12,374	11,959	11,964
15/09/2017	42979	212	3,942	7,667	11,820	11,980	11,969
16/09/2017	42979	206	4,011	7,642	11,859	11,965	11,970
17/09/2017	42979	310	3,861	7,423	11,594	11,993	11,974
18/09/2017	42979	689	3,914	7,587	12,189	11,983	11,976
19/09/2017	42979	221	3,855	7,720	11,796	11,977	11,974
20/09/2017	42979	84	3,618	7,319	11,021	11,947	11,972
21/09/2017	42979	158	3,774	7,073	11,006	14,441	[redacted]
22/09/2017	42979	152	3,561	7,016	10,729	15,677	[redacted]
23/09/2017	42979	80	3,360	6,585	10,025	15,537	[redacted]
24/09/2017	42979	83	3,285	6,307	9,675	15,530	[redacted]
25/09/2017	42979	336	3,261	6,348	9,945	15,304	[redacted]
26/09/2017	42979	215	3,700	7,253	11,168	14,175	[redacted]
27/09/2017	42979	83	3,339	7,580	11,002	15,417	[redacted]
28/09/2017	42979	87	3,348	7,400	10,834	15,333	[redacted]
29/09/2017	42979	173	3,261	7,043	10,478	15,179	[redacted]
30/09/2017	42979	96	3,118	6,969	10,184	15,156	[redacted]
01/10/2017	43009	94	2,983	6,800	9,877	15,041	[redacted]
02/10/2017	43009	93	2,919	6,947	9,959	15,044	[redacted]
03/10/2017	43009	97	2,891	6,692	9,680	15,137	[redacted]
04/10/2017	43009	375	2,864	6,547	9,786	15,138	[redacted]
05/10/2017	43009	88	2,745	5,876	8,708	14,982	[redacted]
06/10/2017	43009	87	2,660	5,320	8,067	12,000	[redacted]
07/10/2017	43009	174	2,776	5,345	8,296	11,988	[redacted]
08/10/2017	43009	87	2,815	4,798	7,698	13,451	[redacted]
09/10/2017	43009	92	2,881	4,773	7,746	10,173	[redacted]
10/10/2017	43009	81	2,819	5,526	8,426	9,841	[redacted]
11/10/2017	43009	194	2,973	6,215	9,382	9,986	11,774
12/10/2017	43009	175	2,900	6,371	9,446	9,552	10,999
13/10/2017	43009	90	2,789	6,157	9,036	9,299	10,613
14/10/2017	43009	90	2,859	4,393	7,341	9,157	10,208
15/10/2017	43009	286	2,803	5,666	8,756	9,158	9,595
16/10/2017	43009	1,306	2,611	5,318	9,235	8,593	9,369
17/10/2017	43009	1,316	2,575	4,751	8,641	9,254	9,285
18/10/2017	43009	1,419	2,548	4,483	8,450	8,599	9,087
19/10/2017	43009	1,304	2,601	4,433	8,338	9,242	9,043
20/10/2017	43009	301	2,458	4,240	6,999	9,054	9,008
21/10/2017	43009	195	2,473	4,099	6,766	8,515	8,916
22/10/2017	43009	230	2,365	3,993	6,588	9,050	8,901
23/10/2017	43009	251	2,284	3,926	6,461	8,078	8,827
24/10/2017	43009	1,042	2,342	3,821	7,205	8,969	8,787
25/10/2017	43009	1,110	2,132	3,678	6,920	7,962	8,696
26/10/2017	43009	1,775	2,282	3,718	7,775	8,241	8,553
27/10/2017	43009	118	2,289	3,679	6,087	8,155	8,424
28/10/2017	43009	79	2,194	3,597	5,870	7,013	8,210
29/10/2017	43009	104	2,214	3,595	5,913	6,201	7,803
30/10/2017	43009	448	2,037	3,229	5,714	6,086	7,518
31/10/2017	43009	1,246	2,004	2,999	6,249	5,526	7,026
01/11/2017	43040	1,450	2,107	3,077	6,634	7,012	6,891
02/11/2017	43040	1,599	1,975	3,241	6,816	6,279	6,610
03/11/2017	43040	343	1,898	3,487	5,728	6,710	6,404
04/11/2017	43040	140	1,865	3,512	5,518	5,590	6,201
05/11/2017	43040	115	1,993	3,425	5,534	5,452	6,094
06/11/2017	43040	186	1,988	2,936	5,110	5,118	5,955
07/11/2017	43040	1,461	1,895	3,359	6,715	5,100	5,894
08/11/2017	43040	1,673	2,057	3,487	7,217	6,642	5,842
09/11/2017	43040	1,766	1,882	2,844	6,492	6,290	5,843
10/11/2017	43040	1,634	1,726	2,686	6,046	5,984	5,739
11/11/2017	43040	176	1,793	2,834	4,804	5,069	5,665

Hawera WWTP Flow - Year to Date

Daily Totals: On-Demand

Aug 2018

Date	Month	Works Inflow m³/day	Eastern Trunk Inflow m³/day	Western Trunk Inflow m³/day	Total Inflow m³/day	Plant Outflow m³/day	7-Day Avg Outflow m³/day
12/11/2017	43040	162	1,723	2,822	4,707	4,862	5,581
13/11/2017	43040	1,474	1,712	2,482	5,669	4,782	5,533
14/11/2017	43040	1,560	1,576	2,700	5,836	4,712	5,477
15/11/2017	43040	1,544	1,616	2,665	5,825	4,479	5,168
16/11/2017	43040	1,883	1,626	3,269	6,778	4,895	4,969
17/11/2017	43040	243	1,529	3,316	5,088	5,757	4,936
18/11/2017	43040	155	1,556	2,893	4,604	4,877	4,909
19/11/2017	43040	183	1,563	2,856	4,603	4,298	4,828
20/11/2017	43040	1,430	1,522	2,469	5,422	3,213	4,604
21/11/2017	43040	1,758	1,466	2,314	5,538	4,675	4,599
22/11/2017	43040	1,657	1,397	2,128	5,181	4,797	4,645
23/11/2017	43040	1,705	1,349	2,422	5,476	4,794	4,630
24/11/2017	43040	1,650	1,298	2,359	5,307	4,955	4,516
25/11/2017	43040	1,340	1,351	2,460	5,152	4,943	4,525
26/11/2017	43040	231	1,238	2,369	3,838	4,799	4,597
27/11/2017	43040	1,495	1,320	2,609	5,424	4,366	4,762
28/11/2017	43040	1,745	1,205	2,851	5,802	4,847	4,786
29/11/2017	43040	2,549	1,184	2,067	5,801	5,002	4,815
30/11/2017	43040	2,726	1,119	1,818	5,663	5,049	4,852
01/12/2017	43070	2,621	1,078	2,668	6,368	5,314	4,903
02/12/2017	43070	2,202	1,211	2,773	6,186	4,972	5,107
03/12/2017	43070	287	1,177	2,466	3,929	5,043	5,142
04/12/2017	43070	2,619	981	1,903	5,504	4,782	5,201
05/12/2017	43070	2,852	1,089	2,249	6,191	4,681	5,178
06/12/2017	43070	2,858	1,364	2,088	6,310	5,036	5,182
07/12/2017	43070	2,977	1,354	2,031	6,362	5,378	5,229
08/12/2017	43070	2,806	1,460	2,032	6,297	5,526	5,260
09/12/2017	43070	1,599	1,403	2,221	5,223	5,372	5,117
10/12/2017	43070	302	1,367	2,243	3,913	4,829	5,086
11/12/2017	43070	2,654	1,307	1,944	5,905	4,149	4,996
12/12/2017	43070	2,718	1,262	2,387	6,367	4,665	4,994
13/12/2017	43070	2,968	1,381	1,953	6,302	5,009	4,990
14/12/2017	43070	3,015	2,496	2,617	8,128	8,740	5,470
15/12/2017	43070	2,737	1,670	2,099	6,506	7,465	5,747
16/12/2017	43070	2,315	1,507	2,419	6,241	5,898	5,822
17/12/2017	43070	593	1,464	2,383	4,440	5,094	5,860
18/12/2017	43070	2,484	1,535	2,314	6,333	4,899	5,967
19/12/2017	43070	2,827	1,663	2,313	6,802	5,084	6,027
20/12/2017	43070	2,827	1,638	2,255	6,720	5,464	6,092
21/12/2017	43070	2,845	1,556	2,239	6,640	5,945	5,693
22/12/2017	43070	2,800	1,606	2,263	6,669	5,952	5,477
23/12/2017	43070	637	1,440	2,275	4,351	5,500	5,420
24/12/2017	43070	254	1,553	2,322	4,129	4,884	5,390
25/12/2017	43070	217	1,350	1,714	3,282	4,548	5,339
26/12/2017	43070	235	1,531	1,193	2,959	2,668	4,994
27/12/2017	43070	213	1,476	1,547	3,235	2,489	4,569
28/12/2017	43070	528	1,522	2,251	4,301	2,067	4,015
29/12/2017	43070	149	1,467	2,170	3,786	2,919	3,582
30/12/2017	43070	187	1,356	2,193	3,736	3,309	3,269
31/12/2017	43070	129	1,473	2,123	3,726	3,371	3,053
01/01/2018	43101	116	1,289	2,083	3,488	3,165	2,856
02/01/2018	43101	202	1,377	1,207	2,787	3,090	2,916
03/01/2018	43101	2,080	1,311	1,855	5,246	2,961	2,983
04/01/2018	43101	2,919	1,836	3,069	7,824	5,239	3,436
05/01/2018	43101	2,999	2,151	3,595	8,744	8,479	4,231
06/01/2018	43101	2,897	1,972	3,974	8,843	9,033	5,048
07/01/2018	43101	285	1,588	3,465	5,338	7,843	5,687
08/01/2018	43101	2,500	1,457	3,264	7,221	7,910	6,365
09/01/2018	43101	2,845	1,385	3,277	7,507	7,783	7,035
10/01/2018	43101	2,814	1,332	2,482	6,628	7,492	7,683
11/01/2018	43101	2,944	1,406	2,707	7,057	6,267	7,829
12/01/2018	43101	2,891	1,313	2,668	6,872	6,357	7,526
13/01/2018	43101	2,522	1,252	1,826	5,600	6,214	7,124
14/01/2018	43101	228	1,199	1,764	3,191	4,875	6,700
15/01/2018	43101	2,074	1,264	2,547	5,885	4,513	6,214
16/01/2018	43101	2,581	1,086	2,442	6,109	5,255	5,853
17/01/2018	43101	2,689	1,654	2,682	7,024	6,452	5,705
18/01/2018	43101	3,204	1,590	2,788	6,582	8,969	6,091
19/01/2018	43101	1,777	1,436	3,018	6,231	6,756	6,148
20/01/2018	43101	193	1,234	2,638	4,065	5,629	6,064
21/01/2018	43101	307	1,225	2,697	4,228	4,862	6,062
22/01/2018	43101	1,750	1,487	2,829	6,066	5,613	6,219
23/01/2018	43101	1,855	1,324	3,051	6,231	5,122	6,200
24/01/2018	43101	2,104	1,275	3,078	6,457	5,745	6,099
25/01/2018	43101	1,857	1,241	2,906	6,005	5,505	5,605
26/01/2018	43101	403	1,266	2,342	4,011	5,075	5,364
27/01/2018	43101	72	1,163	2,412	3,647	4,773	5,242
28/01/2018	43101	89	1,165	2,046	3,300	3,267	5,014
29/01/2018	43101	188	1,118	2,112	3,418	3,071	4,651
30/01/2018	43101	2,145	1,190	2,333	5,668	2,752	4,313
31/01/2018	43101	2,604	1,226	2,792	6,622	4,507	4,136
01/02/2018	43132	2,112	1,177	2,721	6,010	6,029	4,211
02/02/2018	43132	588	1,222	2,777	4,587	5,775	4,311
03/02/2018	43132	-1	1,188	2,705	3,893	3,217	4,088
04/02/2018	43132	79	1,119	2,311	3,510	2,709	4,009
05/02/2018	43132	126	1,203	2,258	3,586	3,304	4,042
06/02/2018	43132	118	1,146	2,291	3,555	2,863	4,058
07/02/2018	43132	2,498	1,237	1,928	5,663	2,864	3,823
08/02/2018	43132	2,817	1,168	2,093	6,078	4,025	3,537
09/02/2018	43132	2,457	1,160	1,938	5,555	4,990	3,425
10/02/2018	43132	206	1,141	2,229	3,576	5,121	3,697
11/02/2018	43132	187	1,277	2,405	3,869	5,099	4,038
12/02/2018	43132	271	1,306	2,338	3,915	5,198	4,309
13/02/2018	43132	2,776	1,256	2,975	7,008	5,101	4,628
14/02/2018	43132	2,877	1,225	3,357	7,460	6,670	5,172
15/02/2018	43132	2,978	1,198	2,518	6,694	6,574	5,536
16/02/2018	43132	3,131	1,243	2,044	6,418	4,494	5,465
17/02/2018	43132	502	1,122	2,256	3,880	7,174	5,759
18/02/2018	43132	227	1,114	2,231	3,571	-11	5,029
19/02/2018	43132	286	1,287	2,088	3,660	7,674	5,382
20/02/2018	43132	2,831	1,528	2,777	7,136	1,839	4,916
21/02/2018	43132	2,665	1,287	1,794	5,746	8,849	5,227
22/02/2018	43132	2,983	1,588	3,187	7,759	6,821	5,263

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Date	Month	Works Inflow m³/day	Eastern Trunk Inflow m³/day	Western Trunk Inflow m³/day	Total Inflow m³/day	Plant Outflow m³/day	7-Day Avg Outflow m³/day
23/02/2018	43132	2,013	1,287	2,471	5,771	7,533	5,697
24/02/2018	43132	168	1,139	2,302	3,609	4,969	5,382
25/02/2018	43132	155	1,126	2,264	3,545	4,708	6,056
26/02/2018	43132	288	1,299	2,049	3,636	2,915	5,376
27/02/2018	43132	2,861	1,441	2,577	6,879	2,753	5,507
28/02/2018	43132	2,668	1,291	2,797	6,756	6,879	5,225
01/03/2018	43160	2,751	1,265	2,629	6,644	8,014	5,396
02/03/2018	43160	2,467	1,212	2,111	5,790	5,972	5,173
03/03/2018	43160	681	1,168	2,334	4,183	5,368	5,230
04/03/2018	43160	185	1,148	2,287	3,620	4,832	5,248
05/03/2018	43160	304	1,218	2,049	3,572	3,797	5,374
06/03/2018	43160	2,692	1,183	2,131	6,005	2,975	5,405
07/03/2018	43160	3,443	2,982	3,764	10,189	8,278	5,605
08/03/2018	43160	3,254	3,061	5,441	11,755	12,372	6,228
09/03/2018	43160	2,895	2,347	3,800	9,042	12,086	7,101
10/03/2018	43160	573	2,170	5,654	8,398	11,786	8,018
11/03/2018	43160	267	1,913	5,374	7,553	11,382	8,934
12/03/2018	43160	199	1,944	5,270	7,413	10,089	9,853
13/03/2018	43160	1,580	1,968	4,914	8,462	7,989	10,569
14/03/2018	43160	2,889	1,917	4,719	9,525	8,048	10,536
15/03/2018	43160	2,952	1,925	4,479	9,357	9,128	10,073
16/03/2018	43160	3,010	1,862	3,897	8,769	9,390	9,687
17/03/2018	43160	681	1,734	3,180	5,595	7,965	9,142
18/03/2018	43160	141	1,668	3,162	4,971	5,110	8,246
19/03/2018	43160	2,644	1,658	3,049	7,351	5,268	7,557
20/03/2018	43160	2,621	1,623	3,214	7,457	6,872	7,397
21/03/2018	43160	2,938	1,589	3,163	7,690	7,214	7,278
22/03/2018	43160	2,862	1,873	3,113	7,848	7,881	7,100
23/03/2018	43160	2,983	2,046	3,543	8,571	9,780	7,156
24/03/2018	43160	723	1,983	3,952	6,658	10,464	7,513
25/03/2018	43160	323	1,826	3,929	6,077	8,128	7,944
26/03/2018	43160	2,562	1,796	3,785	8,143	6,639	8,140
27/03/2018	43160	2,750	1,716	3,390	7,856	7,918	8,289
28/03/2018	43160	2,850	1,716	2,737	7,304	7,231	8,291
29/03/2018	43160	2,876	1,804	3,644	8,324	8,161	8,331
30/03/2018	43160	640	1,649	2,989	5,277	7,793	8,048
31/03/2018	43160	138	1,666	2,529	4,333	5,036	7,272
01/04/2018	43191	174	1,440	3,564	5,178	5,202	6,854
02/04/2018	43191	226	1,536	3,203	4,965	4,854	6,599
03/04/2018	43191	2,537	1,517	2,519	6,573	4,830	6,158
04/04/2018	43191	3,179	1,520	3,016	7,715	5,610	5,926
05/04/2018	43191	3,215	1,471	3,129	7,814	7,217	5,792
06/04/2018	43191	3,002	1,444	2,647	7,093	7,304	5,722
07/04/2018	43191	664	1,381	2,795	4,840	6,396	5,916
08/04/2018	43191	266	1,279	1,979	3,525	4,857	5,867
09/04/2018	43191	2,596	1,380	2,365	6,340	4,367	5,797
10/04/2018	43191	3,144	3,020	3,846	10,010	7,237	6,141
11/04/2018	43191	4,072	3,955	5,657	13,683	11,253	6,947
12/04/2018	43191	3,183	2,462	6,101	11,746	13,624	7,863
13/04/2018	43191	2,969	2,437	5,933	11,340	14,363	8,871
14/04/2018	43191	768	2,235	5,805	8,808	14,509	10,030
15/04/2018	43191	262	2,140	5,666	8,069	12,961	11,188
16/04/2018	43191	2,894	2,315	5,662	10,870	11,736	[illegible]
17/04/2018	43191	3,199	2,174	5,505	10,878	11,487	[illegible]
18/04/2018	43191	2,949	2,394	5,570	10,913	11,545	[illegible]
19/04/2018	43191	3,012	2,196	5,454	10,663	10,051	[illegible]
20/04/2018	43191	3,097	2,089	5,384	10,570	8,323	11,516
21/04/2018	43191	526	2,107	5,314	7,948	10,888	10,999
22/04/2018	43191	445	2,096	5,269	7,811	10,502	10,648
23/04/2018	43191	2,597	2,101	4,434	9,133	10,198	10,428
24/04/2018	43191	3,035	2,019	4,017	9,071	10,240	10,249
25/04/2018	43191	740	2,019	3,635	6,394	10,174	10,054
26/04/2018	43191	2,685	1,990	3,822	8,296	3,184	9,073
27/04/2018	43191	2,929	1,972	3,438	8,339	5,125	8,616
28/04/2018	43191	682	1,743	3,562	5,988	8,054	8,211
29/04/2018	43191	217	1,790	3,662	5,669	8,338	7,902
30/04/2018	43191	2,599	2,012	3,126	7,737	9,270	7,769
01/05/2018	43221	2,988	2,123	3,932	9,043	14,314	8,351
02/05/2018	43221	3,084	1,915	3,857	8,855	9,060	8,192
03/05/2018	43221	3,013	1,900	3,788	8,701	9,691	9,122
04/05/2018	43221	2,847	1,841	3,064	7,751	5,407	9,162
05/05/2018	43221	2,152	1,744	3,184	7,080	8,192	9,182
06/05/2018	43221	216	2,071	3,399	5,687	8,180	9,159
07/05/2018	43221	2,644	1,952	3,533	8,129	6,890	8,819
08/05/2018	43221	3,147	1,841	3,661	8,650	7,906	7,903
09/05/2018	43221	3,158	1,776	2,920	7,854	8,301	7,795
10/05/2018	43221	3,449	1,781	2,800	8,030	7,797	7,525
11/05/2018	43221	3,313	1,764	2,531	7,608	10,416	8,240
12/05/2018	43221	1,941	1,635	3,361	6,937	7,585	8,153
13/05/2018	43221	426	2,195	3,932	6,553	9,442	8,334
14/05/2018	43221	2,768	2,131	3,807	8,707	8,078	8,504
15/05/2018	43221	3,172	2,141	4,482	9,795	10,791	8,916
16/05/2018	43221	3,290	2,494	4,742	10,527	11,519	9,375
17/05/2018	43221	3,193	2,229	5,997	11,419	10,482	9,759
18/05/2018	43221	3,419	2,463	6,363	12,245	11,473	9,910
19/05/2018	43221	804	2,672	6,783	10,260	12,012	10,542
20/05/2018	43221	375	2,613	7,099	10,087	11,834	10,884
21/05/2018	43221	2,960	2,766	7,072	12,797	11,807	11,417
22/05/2018	43221	3,467	2,843	6,673	12,983	11,806	11,562
23/05/2018	43221	3,183	2,900	7,078	13,161	12,993	11,772
24/05/2018	43221	3,061	2,909	7,314	13,285	12,650	[illegible]
25/05/2018	43221	3,204	78	8,065	11,347	11,985	[illegible]
26/05/2018	43221	645	-3	9,382	10,027	12,002	[illegible]
27/05/2018	43221	272	-5	9,338	9,610	12,008	[illegible]
28/05/2018	43221	2,743	-7	9,075	11,819	11,990	[illegible]
29/05/2018	43221	3,242	-8	8,827	12,069	11,995	[illegible]
30/05/2018	43221	3,061	-5	8,499	11,560	11,975	[illegible]
31/05/2018	43221	3,337	-7	8,089	11,426	11,998	11,993
01/06/2018	43252	3,007	-1,361	7,484	10,491	12,003	11,996
02/06/2018	43252	1,610	-2,400	6,911	8,520	11,979	11,992
03/06/2018	43252	134	-2,400	6,332	6,466	11,997	11,991
04/06/2018	43252	204	-2,400	6,159	6,363	11,998	11,992
05/06/2018	43252	2,630	-2,400	6,112	8,742	11,990	11,991

Hawera WWTP Flow - Year to Date

Daily Totals: On-Demand

Aug 2018

Date	Month	Works Inflow m³/day	Eastern Trunk Inflow m³/day	Western Trunk Inflow m³/day	Total Inflow m³/day	Plant Outflow m³/day	7-Day Avg Outflow m³/day
06/06/2018	43252	3,136	686	6,451	10,273	12,000	11,995
07/06/2018	43252	3,376	2,926	6,522	12,824	11,985	11,993
08/06/2018	43252	3,145	2,735	6,244	12,125	11,997	11,992
09/06/2018	43252	2,389	2,712	5,787	10,888	11,986	11,993
10/06/2018	43252	313	2,557	5,314	8,183	11,974	11,990
11/06/2018	43252	2,749	2,613	4,962	10,324	11,980	11,987
12/06/2018	43252	3,136	2,555	4,865	10,556	11,987	11,987
13/06/2018	43252	3,132	2,964	5,591	11,686	11,995	11,986
14/06/2018	43252	3,052	2,617	5,582	11,252	11,970	11,984
15/06/2018	43252	3,084	2,513	4,908	10,505	11,990	11,983
16/06/2018	43252	1,007	2,482	5,283	8,772	11,984	11,983
17/06/2018	43252	142	2,507	4,908	7,558	11,973	11,983
18/06/2018	43252	2,803	3,902	6,164	12,869	11,983	11,983
19/06/2018	43252	3,108	3,815	8,373	15,296	11,990	11,983
20/06/2018	43252	3,164	3,890	8,092	15,146	11,996	11,984
21/06/2018	43252	2,246	3,638	7,500	13,384	12,000	11,988
22/06/2018	43252	2,887	3,436	6,909	13,232	11,980	11,987
23/06/2018	43252	339	3,134	6,376	9,849	11,981	11,986
24/06/2018	43252	194	3,072	5,963	9,229	11,991	11,989
25/06/2018	43252	2,006	3,129	6,224	11,359	11,985	11,989
26/06/2018	43252	2,818	3,050	6,244	11,913	12,004	11,991
27/06/2018	43252	2,737	2,898	6,176	11,811	12,001	11,992
28/06/2018	43252	2,521	3,308	6,192	12,020	11,957	11,986
29/06/2018	43252	2,432	3,060	5,621	11,113	11,976	11,985
30/06/2018	43252	712	2,896	5,529	9,137	11,981	11,985
01/07/2018	43282	200	2,533	4,618	7,352	11,993	11,985
02/07/2018	43282	2,619	2,670	5,566	10,855	11,983	11,985
03/07/2018	43282	2,717	2,608	5,442	10,767	14,775	[illegible]
04/07/2018	43282	2,580	2,591	5,049	10,160	14,850	[illegible]
05/07/2018	43282	2,329	2,491	4,518	9,337	14,843	[illegible]
06/07/2018	43282	2,195	2,460	4,761	9,417	11,834	[illegible]
07/07/2018	43282	529	2,338	4,085	6,952	9,119	[illegible]
08/07/2018	43282	383	2,483	4,158	7,024	3,671	11,582
09/07/2018	43282	1,661	2,626	5,348	9,635	5,929	10,717
10/07/2018	43282	1,839	2,730	5,533	10,102	12,665	10,416
11/07/2018	43282	1,851	2,509	5,526	9,886	14,881	10,420
12/07/2018	43282	1,863	2,414	5,481	9,758	12,807	10,129
13/07/2018	43282	1,777	2,571	5,462	9,811	11,324	10,056
14/07/2018	43282	511	2,421	5,332	8,264	11,324	10,371
15/07/2018	43282	323	2,658	4,964	7,945	11,326	11,465
16/07/2018	43282	1,723	3,071	5,734	10,528	11,339	[illegible]
17/07/2018	43282	1,868	2,998	5,737	10,604	11,330	[illegible]
18/07/2018	43282	1,765	2,867	5,521	10,153	11,774	11,603
19/07/2018	43282	1,786	2,822	5,358	9,965	11,977	11,485
20/07/2018	43282	1,840	2,797	5,366	10,003	11,974	11,578
21/07/2018	43282	200	2,693	5,098	7,991	11,966	11,669
22/07/2018	43282	616	2,693	5,300	8,609	11,974	11,762
23/07/2018	43282	827	2,635	5,033	8,494	11,772	11,824
24/07/2018	43282	995	2,593	4,778	8,366	11,765	11,886
25/07/2018	43282	1,772	2,671	4,818	9,260	11,350	11,826
26/07/2018	43282	302	2,330	4,836	7,468	10,851	11,665
27/07/2018	43282	1,745	2,759	4,472	8,976	10,438	11,445
28/07/2018	43282	209	2,544	4,571	7,324	10,398	11,221
29/07/2018	43282	268	2,581	4,640	7,489	10,298	10,982
30/07/2018	43282	1,553	2,559	4,698	8,809	9,976	10,725
31/07/2018	43282	1,783	2,459	4,398	8,641	9,819	10,447
01/08/2018	43313	1,888	2,455	3,985	8,329	9,244	10,029
02/08/2018	43313	1,307	1,420	2,015	4,743	4,110	8,974
03/08/2018	43313	0	0	0	0	0	7,241
04/08/2018	43313	0	0	0	0	0	5,525
05/08/2018	43313	0	0	0	0	0	3,862
06/08/2018	43313	0	0	0	0	0	2,226
07/08/2018	43313	0	0	0	0	0	1,908
08/08/2018	43313	0	0	0	0	0	582
09/08/2018	43313	0	0	0	0	0	0
10/08/2018	43313	0	0	0	0	0	0
11/08/2018	43313	0	0	0	0	0	0
12/08/2018	43313	0	0	0	0	0	0
13/08/2018	43313	0	0	0	0	0	0
14/08/2018	43313	0	0	0	0	0	0
15/08/2018	43313	0	0	0	0	0	0
16/08/2018	43313	0	0	0	0	0	0
17/08/2018	43313	0	0	0	0	0	0
18/08/2018	43313	0	0	0	0	0	0
19/08/2018	43313	0	0	0	0	0	0
20/08/2018	43313	0	0	0	0	0	0
21/08/2018	43313	0	0	0	0	0	0
22/08/2018	43313	0	0	0	0	0	0
23/08/2018	43313	0	0	0	0	0	0
24/08/2018	43313	0	0	0	0	0	0
25/08/2018	43313	0	0	0	0	0	0
26/08/2018	43313	0	0	0	0	0	0
27/08/2018	43313	0	0	0	0	0	0
28/08/2018	43313	0	0	0	0	0	0
29/08/2018	43313	0	0	0	0	0	0
30/08/2018	43313	0	0	0	0	0	0
31/08/2018	43313	0	0	0	0	0	0

Hawera WWTP Flow - Year to Date

Outflow Graph: On-Demand

Aug 2018