

Report

Seddon Sewage Treatment Plant Consent Compliance Report 1 July 2017 - 30 June 2018

Prepared for Marlborough District Council

By CH2M Beca Limited

17 September 2018



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Revision History

Revision N°	Prepared By	Description	Date
A	Julia van Eeden	Draft for client review	30/08/2018
B	Julia van Eeden	Final (updated with MDC comments)	17/09/2018

Document Acceptance

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Prepared by	Julia van Eeden		17/09/2018
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1 Introduction

The purpose of this report is to summarise and interpret the monitoring data collected from the Seddon Sewage Treatment Plant (STP) in respect of the requirements of Consent U060927. Condition 8 of this consent requires that an Annual Monitoring Report be prepared but does not specify an annual reporting period. The period 1 July 2017 to 30 June 2018 has been selected by Marlborough District Council (MDC), which generally aligns with other STP reporting requirements.

A copy of Consent U060927, which expired on 31 July 2017, is included in **Appendix A**. A new consent application was lodged in April 2017 seeking a five year term for the existing discharge while MDC completes investigations into alternative discharge solutions. Consent U170260 was granted on 24 May 2018, and hence this report will be the last submitted under Consent U060927.

The Seddon STP is operated by MDC and consists of a two-stage oxidation pond system with maturation cells. Treated wastewater is discharged into Starborough Creek, which is a tributary of the Awatere River. This creek runs through a narrow, high-sided valley before emerging on the gravel flats of the Awatere River. A map showing the oxidation pond and sampling locations in the river is included in **Appendix B**.

The STP was last upgraded in 1997. The upgrade included removing accumulated sludge from the pond, installing a low-permeability clay liner and sub-dividing the tertiary pond into a series of five ponds.

Only those consent conditions that have numerical or qualitative monitoring requirements are assessed. For clarity, consent conditions are quoted in *italics*.

2 Consent Conditions

2.1 Consent Purpose

Consent U060927 allows for the discharge of up to 750m³/day from the Seddon STP to Starborough Creek.

2.2 Condition 2 – Maximum Discharge

The discharge shall be up to 750 cubic metres per day (averaged over any one week) of treated wastewater from the Seddon Sewage Treatment Plant only.

Table 2-1 shows the discharge flow monitoring results for the STP for the current consent compliance monitoring period, as well as the past seven years. Readings from the outlet flow meter were recorded for the 2017/2018 monitoring period.

The measured average and maximum daily discharge flow rates from the STP in 2017/18 were 111 m³ and 452 m³, respectively. Therefore, the 750 m³/day limit was not exceeded and compliance with the requirements of Condition 2 was achieved. The daily discharge readings are shown in **Appendix C**.

Table 2-1 also shows that the maximum daily discharge has been reasonably consistent over the past six annual monitoring periods. There was a significant increase in average daily discharge rates in the 2012/2013 reporting period and this has remained at similar levels in subsequent years.

The 2017/2018 monitoring year has the highest average and maximum flows to date.

Table 2-1 – Annual average and maximum daily discharges from Seddon STP

Year (1 July – 30 June)	Average Daily Discharge (m ³ /day)	Maximum Daily Discharge (m ³ /day)
2010/2011	48.1	334.0 on 24 July 2010
2011/2012	38.6	365.5 on 22 March 2012
2012/2013	95.0	385.6 on 21 April 2013
2013/2014	75.7	414.6 on 29 November 2013
2014/2015*	72.5	376.4 on 4 June 2015
2015/2016	88.0	381.6 on 23 September 2015
2016/2017	98.0	351.0 on 13 April 2017
2017/2018	111.1	452.4 on 13 June 2018

*Accurate flow data for 1 July – 5 September 2014 was not available due to grape vine wrappers blocking the flowmeter.

2.3 Condition 3 – Weekly Flow Readings

The consent holder shall install a flow meter, of such type that accurately measures the volume of wastewater discharged to Starborough Creek. Records shall be kept on a weekly basis and shall be provided to the Team Leader, Compliance at the Marlborough District Council on an annual basis.

A flow meter was installed on the outlet of the final pond, in August 2008, to measure the daily treated wastewater flow discharged to Starborough Creek. Readings from this flowmeter are taken

at least weekly and the records for the 2017/2018 monitoring year are summarised in Table 2-1 and presented in **Appendix C**. Therefore, compliance with this condition was achieved.

2.4 Condition 4 – Wastewater Sampling

The wastewater (post treatment, immediately before discharge) within the ponds shall be monitored using a grab sample at a frequency as defined in Condition 5. This grab sample shall be taken using best practice techniques by a person suitably qualified to take such samples.

See Section 2.5 for commentary. Grab samples are taken using standard procedures.

2.5 Condition 5 – Wastewater Sample Parameters

Grab samples (as required in Condition 4) shall be taken at regular three monthly intervals for the duration of the consent and shall be analysed for the following;

- a) Biochemical Oxygen Demand*
- b) Total Suspended Solids*
- c) Conductivity*
- d) Total Nitrogen*
- e) Total Phosphorus*
- f) E. coli*
- g) Faecal Coliforms*
- h) Dissolved Oxygen*
- i) pH*

Grab samples of treated wastewater were taken from the outlet of the final tertiary treatment pond in July 2017, October 2017, January 2018, and April 2018. The wastewater sample results are set out in Table 2-2. Four grab samples were taken at the required frequency in the sampling period and compliance with Conditions 4 and 5 was therefore achieved.

Carbonaceous biochemical oxygen demand (cBOD) was recorded as well as biochemical oxygen demand. It is noted that the use of cBOD is preferred when analysing wastewater samples as the test uses nitrification inhibitors to prevent nitrification in the sample, which would otherwise result in a higher oxygen demand. As nitrifying bacteria are more likely to be present in secondary treated wastewater, the cBOD test results are considered more appropriate.

Table 2-2 – Treated Wastewater parameters from grab samples taken in 2017/2018

Parameter	12 July 2017	16 October 2017	16 January 2018	16 April 2018
Carbonaceous biochemical oxygen demand (g/m ³)	43	27	10	36
Biological oxygen demand (g/m ³)	49	34	8	28
Total suspended solids (g/m ³)	46	78	21	45
Conductivity (mS/m at 25°C)	821	6960	602	568
Total nitrogen (g/m ³)	49	40	6.4	16.3
Total phosphorus (g/m ³)	8.4	7.8	4.4	8.2
E. coli (MPN/100mL)	490	240	45	540
Faecal coliforms (cfu/100mL)	490	240	45	540
Dissolved oxygen (mg/l)	7.50	10.23	6.48	15.38
pH	8.12	8.88	9.38	8.74

2.6 Condition 6 – Starborough Creek Samples

Upstream and downstream water quality of Starborough Creek shall be monitored using a grab sample. The sites for this shall be;

Upstream; where State Highway 1 crosses Starborough Creek.

Downstream; 300 metres downstream of the discharge point, (or as close to that point as is practical, taking into account the ephemeral nature of Starborough Creek).

Compliance with this consent condition was achieved (see discussion in Section 2.7).

2.7 Condition 7 – Starborough Creek Sample Parameters

The samples required in Condition 6 shall be taken at regular three monthly intervals for the duration of the consent and shall be for the following;

- a) Biochemical Oxygen Demand*
- b) Total Suspended Solids*
- c) Conductivity*
- d) Total Nitrogen*
- e) Total Phosphorus*
- f) E. coli*
- g) Faecal Coliforms*
- h) Dissolved Oxygen*
- i) pH*

Grab samples were taken at locations required by Condition 6 in July 2017, October 2017, January 2018 and April 2018. The results of the analysis carried out on the collected samples are set out in Table 2-3. All samples were taken at the required frequency, therefore the requirements of Condition 7 were met.

From Table 2-3, it can be seen that there is generally little or no change between upstream and downstream sample results. However, the relatively low concentration of E.coli at the upstream site

in the January 2018 sample, relative to the downstream site, is noted. The E.coli concentration recorded in the pond wastewater, on the same day in January (45 MPN/100mL), was of a similar magnitude to the upstream sample. It seems therefore unlikely that the STP discharge is a major contributory factor to the higher E.coli result in the downstream sample. As the distance between the STP discharge point and the downstream sampling site is approximately 300m, the possibility of other sources of contamination between these sites cannot be fully discounted. Field meter measurement errors are also a possible explanation.

A higher E. coli result is also noted at the downstream site in the April 2018 sample. The discharge sample result for the same day was an order of magnitude higher (i.e. 540 MPNs/100mL), than the January 2018 discharge result and may have influenced the downstream site result. Also worth noting is that the E. coli and faecal coliform counts are the same for all samples. This is generally unusual for municipal wastewater, as E. coli are a subset of faecal coliforms and are generally not the only species present. However, the bacterial analysis of the Seddon samples is carried out by Hill Laboratories; an IANZ-accredited laboratory who routinely perform these tests for many clients, including MDC's other sewage treatment plants, where this phenomenon is not observed. Hill Laboratories has previously advised that the same bacterial growth plates are used for both tests, with the faecal coliform count performed first, followed by the E. coli count. In this case, therefore, the similarity of the results is likely due to the level of accuracy of the testing procedure.

It is also noted that the total phosphorus concentration at the downstream site, in April 2018, was an order of magnitude higher than the upstream results. The total phosphorus concentration measured in the wastewater discharge, on the same day as the stream samples were taken, was not any higher than previously in the year. The difference in upstream and downstream readings cannot therefore be easily explained and could also be due to other sources of contamination between these sites.

Table 2-3 – Starborough Creek water sample parameters from grab samples taken in July and October 2017 and January and April 2018

Parameter	12 July 2017		16 October 2017		16 January 2018		16 April 2018	
	U/S	D/S	U/S	D/S	U/S	D/S	U/S	D/S
Biochemical oxygen demand (g/m ³)	3	< 2	< 2	< 2	< 2	< 2	< 2	2
Total suspended solids (g/m ³)	5	3	12	15	4	4	4	4
Conductivity (mS/m at 25°C)	862	866	4710	4980	744	776	783	693
Total nitrogen (g/m ³)	10.6	10.5	7.80	7.9	8.0	6.9	10.8	7.3
Total phosphorus (g/m ³)	0.22	0.04	0.10	0.13	0.03	0.11	0.05	0.39
E. coli (MPN/100mL)	79	49	540	280	23	330	220	540
Faecal coliforms (cfu/100mL)	79	49	540	280	330	330	220	540
Dissolved oxygen (mg/l)	8.72	9.09	8.02	7.23	9.88	9.47	7.21	6.62
Temperature (°C)	6.6	6.8	13.7	13.3	21.4	21.1	18.0	15.0
Dissolved oxygen saturation (temperature corrected) (%)	70.1	73.1	76.2	68.7	102.4	98.1	74.7	65.7
pH	7.62	7.85	8.19	8.32	7.64	7.84	7.75	7.70

2.8 Condition 8 – Annual Monitoring Report

An annual monitoring report shall be prepared tabulating and providing comparison/analysis of the sampling results, discussing (at the least) trends over time.

This annual monitoring report has been prepared and submitted to fulfil the requirements of Condition 8.

2.8.1 Weekly measurement of Pond DO and pH

Sampling of Pond Dissolved Oxygen (DO) and pH is not required by this consent. However, wastewater DO concentrations and pH are generally measured weekly by MDC at the outlet of the tertiary pond. This is good practice as continued low DO readings can indicate poor pond health which may cause odour nuisance. Measured DO concentrations ranged from 1.24 to 33 mg/l in 52 readings taken over the 2017/18 monitoring period. Only one measurement was recorded below 2 mg/l (i.e. 1.24 mg/l at 8:10 am on 24 April 2018). The reading was measured early in the day and so can be considered to be within the natural daily diurnal variation of pond DO.

The upper end of the measured DO values is quite high, but not as high as in previous years.

The pH of the tertiary pond over the 2017/2018 monitoring period ranged between 7.49 and 10.68, which is typical of pond systems with longer retention times. An outlier of 16.03 measured on the 20

November 2017 was removed from the data as this value was not considered feasible. The low faecal coliform concentration in the final wastewater recorded in January 2018 (see Table 2-2), may be due, in part, to the disinfectant properties of the higher pH and DO that can occur in ponds due to rapid photosynthesis by pond algae.

2.8.2 Management for Fisheries Purposes

While Consent U060927 does not impose receiving water quality limits, Starborough Creek discharges into the Awatere River downstream of the Seddon STP. The Wairau/Awatere Resource Management Plan (WARMP) requires the Awatere River (and tributaries), below Medway Bridge, to be managed for fisheries purposes. Under this plan, eight standards are listed to achieve water quality sufficient for fisheries purposes. These are:

1. No conspicuous oil or grease films or foams or floatable or suspended material

No evidence of oil or grease films, or foam was recorded by MDC at the time of sampling.

The Cawthron *Ecological Effect of Seddon Sewage Discharge (2012 Survey)* stated that no films, scums, foams or fungal growths were visible on the water surface at the downstream sampling locations during the February 2012 survey.

2. No conspicuous change in colour or visual clarity

Turbidity and black disk monitoring are not required by the consent and the colour and visual clarity in Starborough Creek is only observed when sampling occurs. MDC will continue to monitor the colour and clarity of samples taken within the creek to determine whether there are any trends towards greater discoloration in the downstream samples.

The wastewater total suspended solids (TSS) concentrations (as shown in Table 2-2), are unlikely to cause a conspicuous change in background clarity in the creek. As shown in Table 2-3, all TSS concentrations recorded in the upstream site samples were low (i.e. range from 4 - 12 g/m³), with similar readings at the downstream site.

Cawthron (2007) notes that during the 2006 survey, discoloration of the creek water was obvious between 5m upstream and 10m downstream of the discharge due to the presence of algae. However, the 2012 survey showed that water clarity had generally improved downstream of the discharge, to at least the clarity of the upstream sites (Cawthron, 2012).

3. No objectionable odour shall be emitted

One odour complaint was received during the 2017/2018 period. However, this was not thought to be related to the Seddon STP (refer to Section 2.15 for further discussion). No other odour complaints have been received, and it is therefore assumed that no objectionable odour is being emitting from the ponds.

4. Shall not be rendered unsuitable for consumption by farm animals

Although there is no numeric interpretation of this standard, guidance is provided by the ANZECC (2000) guidelines for animal drinking water quality. An assessment of the most relevant guidelines is included for completeness.

Pathogens and parasites - *Drinking water for livestock should contain less than 100 thermotolerant coliforms [also known as faecal coliforms] /100 mL (median value).*

The faecal coliforms concentrations measured in Starborough Creek during 2017/18 are shown in Table 2-3. Faecal coliform concentrations above 100 cfu/100 ml were recorded at the upstream and downstream sites on 16 October 2017, 16 January 2018 and 16 April 2018. Only the 16 April 2018 sample demonstrated values higher at the downstream site which could be due to the impact of the STP discharge, or other sources between the discharge and the sampling site. The upstream sites are likely to be impacted by runoff from animal sources.

Nitrate and nitrite - *Nitrate concentrations less than 400 mg/L in livestock drinking water should not be harmful to animal health. Stock may tolerate higher nitrate concentrations in drinking water provided nitrate concentrations in feed are not high. Water containing more than 1500 mg/L nitrate is likely to be toxic to animals and should be avoided. Concentrations of nitrite exceeding 30 mg/L may be hazardous to animal health.*

As nitrate concentrations are not measured in Starborough Creek, a direct comparison with the above guideline is not possible. However, treatment ponds are not typically significant sources of nitrate as conditions are not generally conducive to significant nitrification. It is noted that the total nitrogen concentrations, at both upstream and downstream samplings sites in 2017/18 (see Table 2-3), were well below the WARMP guideline values for livestock drinking water.

5. Any significant effects on aquatic life

Light penetration

The creek is ephemeral by nature and vegetation overhanging the creek also reduces light penetration. While wastewater TSS concentrations can vary, light penetration into the receiving water will be most affected by other factors.

Ammonia Toxicity

Table 2-2 shows that total nitrogen concentrations at the STP effluent during 2017/18 ranged between 6.4 – 49 mg/l. Neither the STP wastewater, nor Starborough Creek, are required by the consent to be tested for ammonia concentrations. However, ammonia will comprise a significant proportion of the total nitrogen in the STP discharge, particularly during the winter period when the potential for nitrification is lowest.

The *Seddon Sewage Treatment Plant Consent Compliance Report July 2010 - June 2011* (CH2M Beca 2011), states that, based on limited sampling carried out during that monitoring period, ammonia concentrations in Starborough Creek were below the ANZECC (2000) freshwater guideline of 0.90 g/m³ (95% level of protection for aquatic species at pH of 8). During this reporting period, an Issues and Options Report was prepared with one of the aims being to identify upgrade

methods for reducing total nitrogen in the STP discharge. To date, no further work in regard to nitrogen reduction at the plant has been carried out.

Particulate Organic Matter

Cawthron (2007) noted that *“Observations by Cawthron staff during the biological surveys suggest the discharge causes a build-up of organic material on the stream bed of Starborough Creek to approximately 300m downstream of the discharge”*.

Cawthron (2012, pg.21) stated that *“The presence of bloodworm midges downstream of the discharge in the two past surveys has been indicative of quite severe organic enrichment and sedimentation”*. However, it was also noted in page 21 of the 2012 report that *“Worms, which inhabit organic-rich sediments, were not a feature of the 2012 survey”*.

There have been no further Starborough Creek surveys carried out by Cawthron since 2012.

6. The temperature shall not be changed by more than 3°C and shall not exceed 20°C.

The upstream and downstream water temperature measured on 16 January 2018 in the Starborough Creek exceeded 20 °C. Temperatures measured since 2008 have shown to exceed 20 °C on occasion and can be attributed to summer heating across the catchment. The difference between upstream and downstream water temperatures never exceeded 3 °C (noting however that there was an exact 3°C difference recorded between the upstream and downstream sites during the 16 April 2018 monitoring round).

Cawthron (2012) noted that the creek water temperature measured within the discharge plume, on 15 February 2012, was similar to both the upstream and downstream sample location temperatures. This result is consistent with previous surveys.

7. The dissolved oxygen shall exceed 80% of saturation.

The only dissolved oxygen (DO) saturation results (temperature corrected) (%), upstream or downstream of the discharge, that were above 80% were those recorded on 16 January 2018. Dissolved oxygen saturation (temperature corrected) (%) of water was slightly lower for the downstream sites in all samples taken in 2017/18. This indicates a possible impact from the discharge although the 300m distance between the discharge and the downstream site is noted.

8. Shall not be rendered unsuitable for human consumption of fish due to presence of contaminants

The 2007 Cawthron report found that eels were the only fish present in Starborough Creek that could be harvested for human consumption. This report also concluded that as the Seddon STP receives mainly domestic sewage, potentially toxic chemical contaminant concentrations would be low, and unlikely to significantly affect these fish. Any flesh tainting substances, such as copper, zinc and phenols in stormwater, entering the sewage network would be significantly reduced through the ponds. The impacts of emerging man-made contaminants (endocrine disrupters) in wastewater that can interfere with the hormonal function of organisms have not been assessed.

The fish survey was not repeated in the 2012 ecological assessment (Cawthron, 2012).

2.8.3 Management for Contact Recreation

Starborough Creek is not required to be managed for contact recreation purposes under the WARMP. However, there is some potential for human contact with creek water where public access is possible (i.e. where it emerges from the steep, narrow valley onto river bed gravels before discharging into the Awatere River). Contact recreation does occur in the Awatere River. There are three standards in the Plan to help protect water quality for contact recreation:

Visual Clarity – *shall not be so low as to be unsuitable for bathing.*

Due to the shallow, overgrown and generally inaccessible nature of Starborough Creek, it is unlikely to be used for bathing. There are more accessible and attractive recreation opportunities in the Awatere River.

Microbiological Contaminants – *the median concentration of enterococci of at least 20 samples taken throughout the bathing season shall not exceed 33 per 100 mL, nor shall any sample exceed 107 enterococci per 100 ml. The bathing season is defined as the period of 1 November to 1 April inclusive.*

Consent U060927 does not require enterococci concentrations to be measured in either the wastewater or in Starborough Creek. Therefore, no direct comparison can be made with the WARMP guideline. The *Microbiological Water Quality Guidelines for Marine and Freshwater Areas* (MfE, 2003) do not recommend the use of enterococci as an indicator organism for pond-derived wastewater, because there is evidence that enterococci from sources other than wastewater can replicate in ponds (thus giving a falsely high reading).

The MfE guidelines use *E. coli* as the faecal contamination indicator organism for freshwater. These guidelines recommend a weekly sampling regime over the bathing season, generally referring to the dates between 1 November and 31 March in any year. Four categories are presented that assess the microbiological results based on five years of historical data (at least 100 samples). This categorisation is then used to determine the suitability of the water source for bathing. As *E. coli* concentrations have not been measured weekly between November and March for five years, no direct comparison with the MfE guidelines can be made. However, results from the October 2017 upstream and downstream samples, and January and April 2018 downstream samples indicate that *E. coli* concentrations can exceed the MfE guideline surveillance (or acceptable for bathing) levels of <260 *E. coli*/100mls. This indicates that the creek may not be always suitable for contact recreation, upstream or downstream of the STP discharge point.

Biological Growths – *There shall be no undesirable growths and seasonal maximum cover of stream or river beds by periphyton as filamentous growths or mats (more than 3mm thick) shall not exceed 40%, and the biomass on the bed shall not exceed 100mg chlorophyll a/m².*

The 2006 ecological survey (Cawthron, 2007) showed growths of bed algae to be sparse in Starborough Creek and concluded that this was likely due to a high level of shading, smothering of the creek bed by sediment and low water clarity.

The 2012 ecological survey (Cawthron, 2012) found one blue-green alga with toxin-producing potential (in very low abundance), at the site 10m downstream of the discharge. No cyanobacterial benthic algal mats of the genus *Phormidium* were found. Cawthron (2012, pg.27) stated that “*While there is potential for the oxidation pond to “seed” pools in Starborough Creek, it seems this is unlikely to be a concern to human and animal health unless there is an algal bloom event occurring in the oxidation pond coupled with low flows in Starborough Creek.*”

2.8.4 Summary of Starborough Creek Water Quality Monitoring Results

From an analysis of the Starborough Creek water monitoring results, compliance was achieved with some of the WARMP requirements for management of the creek for fisheries purposes.

Starborough Creek is not required to be managed for contact recreational purposes under the WARMP. Limited monitoring results show that bathing would not be adversely affected by lack of visual clarity or undesirable biological growths. However, *E. coli* concentrations measured during 2017/18 indicate that the creek, both upstream and downstream of the discharge, may not always meet the MfE (2003) bathing guideline.

Cawthron (2012) reported that dissolved organic nitrogen (DIN) and dissolved reactive phosphorus (DRP) concentrations exceeded ANZECC 2000 nutrient guidelines at all of the sites measured in Starborough Creek. While this result was consistent with previous ecological surveys, in 2012 extensive macrophyte plant growth was also visible both upstream and downstream of the discharge. This is attributed to decreased shading of the creek from a reduced number of willows.

The Cawthron (2012) ecological assessment stated that the Starborough Creek upstream sampling site had high background nutrient and faecal coliform concentrations and that the STP “*discharge did not appear to be further reducing water quality in the 2012 survey*”.

Table 2-4 provides a summary of compliance with WARMP requirements.

Table 2-4 - Summary of WARMP Results

Description	Comment
<i>No conspicuous oil or grease films or foams or floatable or suspended material</i>	No evidence of oil or grease films or foams or debris recorded in the creek.
<i>No conspicuous change in colour or visual clarity</i>	No conspicuous change in colour or visual clarity was observed.
<i>No objectionable odour shall be emitted</i>	One odour complaint received on 5 June 2018. This was investigated and not thought to be related to the Seddon STP.
<i>Shall not be rendered unsuitable for consumption by farm animals</i>	Faecal coliform concentrations recorded upstream and downstream of the discharge above the ANZECC (2000) guideline for livestock drinking water for all but the July 2017 sample. Upstream site concentrations likely affected by animal contamination.
<i>Any significant effects on aquatic life</i>	No significant ecological effects have been noted by Cawthron during regular surveys.
<i>The temperature shall not be changed by more than 3°C and shall not exceed 20°C</i>	No increase in temperature greater than 3 °C between downstream and upstream sites. Temperatures greater than 20 °C recorded in the January 2018 sample.
<i>The dissolved oxygen shall exceed 80% of saturation</i>	Only the samples taken on 16 January 2018 had dissolved oxygen saturation above 80 %.
<i>Shall not be rendered unsuitable for human consumption of fish due to presence of contaminants</i>	No indication that eels in the creek are unsuitable for human consumption.
<i>Recreational purposes</i>	Creek generally unsuitable for bathing. E. coli concentrations are sometimes higher than MfE (2003) bathing water guidelines upstream and downstream of the discharge point.

2.9 Condition 9 – Ecological Assessment

That within 6 months of the granting of this consent an ecological assessment of the effect that the discharge is having on Starborough Creek shall be undertaken by a suitably qualified and experienced scientific provider. This assessment shall include (but not be limited to) assessments on the effect of the discharge on the water quality and in-stream and surrounding ecology, downstream of the discharge point. This assessment shall also provide an assessment of the risk (if any) that this discharge poses to the wider environment, and to human health and stock contacting Starborough Creek.

This consent condition was fulfilled by the preparation of the Cawthron (August 2007) report *Ecological Effect of Seddon Sewage Discharge and Assessment of Effects in Relation to the Marlborough District Council Water Quality Plan*.

2.10 Condition 10 – Ecological Assessment

The ecological assessment required in Condition 9 shall be repeated within 6 months of the 3rd anniversary of the granting of this consent.

The required ecological assessment was carried out in February 2012 (one year later than required). The results are presented in the appended Cawthron (2012) report *Ecological Effect of Seddon Sewage Discharge (2012 Survey)*.

2.11 Condition 11 – Reports

All sampling results (and associated report) and the reports produced as part of the ecological assessment shall be provided to the Team Leader, Compliance at the Marlborough District Council within 2 weeks of receipt by the consent holder.

This Annual Monitoring report has been written to fulfil this consent condition.

2.12 Condition 12 – Options for Improvement

That within 12 months of the granting of this consent the consent holder shall provide the Council with options for the improvement and/or alteration of the discharge to Starborough Creek. The primary purpose of this plan shall be to reduce the environmental effect on Starborough Creek and of the discharge in general. A preferred option shall be provided with a staged approach (including timeline) for these proposed works to be implemented. These options shall take into account (but not be limited to) the concerns and issues raised through the cultural impact assessment provided with the application.

The review of options was completed by MDC on 19 August 2008, therefore compliance was achieved.

2.13 Condition 13 – Operation and Maintenance

That the Seddon Wastewater plant shall be maintained and operated in a condition that minimises (as much as practicable) the environmental effect of the discharge on Starborough Creek.

Based on the available upstream and downstream water quality monitoring data, the Seddon STP discharge has only a limited and localised impact on the Starborough Creek receiving environment. Therefore, it is considered that compliance with this condition has been achieved.

2.14 Condition 14 – Warning Sign

A warning sign highlighting the presence of the discharge shall be placed and maintained in the bed of the Awatere River in such a place that people are made aware of the potential contamination of water in the vicinity.

This condition has been fulfilled as a warning sign has been placed where Starborough Creek enters the Awatere River bed.

2.15 Discharge to Air

2.15.1 Condition 3

Upon the notification of the occurrence of the discharge of an objectionable odour from the site, the consent holder shall;

- (a) Take all reasonable steps to stop the discharge of objectionable odour from the site.*
- (b) Record the details of the complaint, including factors such as weather and wind direction.*
- (c) Inform (as soon as is practicable) the Team Leader, Compliance, Marlborough District Council, of the complaint and the steps taken to stop/reduce the level of the discharge.*

One odour-related complaint was received by MDC during the 2017/2018 period (on 5 June 2018), from a neighbour to the south-east of the STP site. Site notes for the day, which were recorded two hours later, indicate a south-easterly wind that day, and no noticeable odour at the ponds. It is noted that a wind from the southeast would be blowing in the opposite direction to someone located to the southeast of the STP.

The dissolved oxygen readings in the ponds, on the day of the complaint, were within acceptable levels, and there was no evidence of floating sludge or other issues which could have caused an odour release. Hence, it is considered unlikely that the odour came from the STP. No odour complaints have been received since.

2.15.2 Condition 4

In the event that there are more than 4 complaints in any one calendar year regarding the discharge of objectionable odour from the site, the consent holder shall employ an independent professional to investigate the potential cause and to provide options to reduce the incidences of objectionable odour. The results of the investigation shall be in writing and shall be provided to the Team Leader Compliance, Marlborough District Council, upon request.

The requirement to obtain an independent professional assessment of STP odour was not activated, as there was only one odour complaint received during the period 1 July 2017 to 30 June 2018.

3 Summary

Based on the monitoring results recorded in 2017/18, there were no identifiable non-compliances with a quantitative consent condition.

Discharge flow was measured for the entire monitoring period. While one odour complaint was received, this was not thought to be related to the operations of the STP.

Consent U060927 does not include receiving water quality limits. However, the Wairau/Awatere Resource Management Plan (WARMP) requires the Awatere River (and tributaries), below Medway Bridge, be managed for fisheries purposes. Under this plan, eight standards are listed to achieve water quality sufficient for fisheries purposes.

Starborough Creek was found to generally meet a majority of the requirements of these eight standards, with the exception of:

- Dissolved oxygen percentage saturation - only the January 2018 results were above the recommended minimum of 80%.
- Temperature - the January 2018 results exceeded the recommended maximum of 20 °C.
- Livestock water supply requirements - the faecal coliform measurements, for both upstream and downstream sites, had concentrations greater than 100 cfu/100mL for all but the July 2018 sample.

Although Starborough Creek is not required to be managed for contact recreation purposes under the WARMP, there is some potential for human contact where the public can access the creek where it meets the Awatere River. Sampling shows that E. coli concentrations can be higher than MfE (2003) recreational guidelines for bathing upstream and downstream of the discharge. However, it is unlikely that this represents a significant risk to the public, as access is difficult and the water is generally too shallow to be considered suitable for bathing.

It is noted that Consent U060927 expired on 31st July 2017. A consent application for a new consent was lodged in April 2017 seeking a five year term for the existing discharge while MDC completes investigations into alternative discharge solutions. Consent U170260 was granted on 24 May 2018 for this five year term, and hence this report will be the last submitted under Consent U060927.

4 Conclusions

The Seddon STP continues to perform well, producing a good wastewater quality that is considered typical for the current pond design and layout.

The requirements of Consent U060927 were generally met over the 2017/18 monitoring period. There was one complaint in June 2018 relating to odour but after further investigation, this is considered unlikely to be related to the STP.

References

ANZECC (2000). *Water Quality Guidelines. Volume 3 – Primary Industries, Chapter 9.3 livestock drinking water quality guidelines.*

Cawthron (2007). *Ecological Effect of Seddon Sewage Discharge and Assessment of Effects in Relation to the Marlborough District Council Water Quality Plan*, received by Marlborough District Council.

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CH2M Beca (2011). *Seddon Sewage Treatment Plant Consent Compliance Report July 2010 - June 2011.*

MfE (2003). *Microbiological Water Quality Guidelines for Marine and Freshwater Areas*. Ministry for the Environment.

WARMP (2009). *Wairau Awatere Resource Management Plan*. Marlborough District Council

Appendix A

Consent U060927

Conditions for U060927 Marlborough District Council – Seddon Treatment Ponds**Discharge to Starborough Creek**

1. This consent shall expire on 31 July 2017.
2. That the discharge shall be up to 750 cubic metres per day (averaged over any one week) of treated wastewater from the Seddon Waste Treatment Plant only.
3. The consent holder shall install a flow meter, of such a type that accurately measures the volume of wastewater discharged to Starborough Creek. Records shall be kept on a weekly basis and shall be provided to the Team Leader, Compliance at the Marlborough District Council on an annual basis.
4. That the wastewater (post treatment, immediately before discharge) within the ponds shall be monitored using a grab sample at a frequency as defined in Condition 5. This grab sample shall be taken using best practice techniques by a person suitably qualified to take such samples.
5. Grab samples (as required in condition 4) shall be taken at regular three monthly intervals for the duration of the consent and shall be analysed for the following:
 - a) Biochemical Oxygen Demand
 - b) Total Suspended Solids
 - c) Conductivity
 - d) Total Nitrogen
 - e) Total Phosphorus
 - f) E.coli
 - g) Faecal Coliforms
 - h) Dissolved Oxygen
 - i) pH
6. Upstream and Downstream water quality of Starborough Creek shall be monitored using a grab sample, the sites for this shall be:

Upstream; where State Highway 1 crosses Starborough Creek.

Downstream; 300 metres downstream of the discharge point, (or as close to that point as is practical, taking into account the ephemeral nature of Starborough Creek).

7. The samples required in condition 6 shall be taken at regular three monthly intervals for the duration of the consent and shall be for the following;
 - a) Biochemical Oxygen Demand
 - b) Total Suspended Solids
 - c) Conductivity
 - d) Total Nitrogen
 - e) Total Phosphorus
 - f) E.coli
 - g) Faecal Coliforms
 - h) Dissolved Oxygen
 - i) pH
8. An annual monitoring report shall be prepared tabulating and providing comparison/analysis of the sampling results, discussing (at the least) trends over time.
9. That within 6 months of the granting of this consent an ecological assessment of the effect that the discharge is having on Starborough Creek shall be undertaken by a suitably qualified and experienced scientific provider. This assessment shall include (but not be limited to) assessments on the effect of the discharge on the water quality and in-stream and surrounding ecology, downstream of the discharge point. This assessment shall also provide an assessment of the risk (if any) that this discharge poses to the wider environment, and to human health and stock contacting Starborough Creek.
10. The ecological assessment required in condition 9 shall be repeated within 6 months of the 3rd anniversary of the granting of this consent.
11. All sampling results (and associated report) and the reports produced as part of the ecological assessment shall be provided to the Team Leader, Compliance at the Marlborough District Council within 2 weeks of receipt by the consent holder.
12. That within 12 months of the granting of this consent the consent holder shall provide the Council with options for the improvement and/or alteration of the discharge to Starborough Creek. The primary purpose of this plan shall be to reduce the environmental effect on Starborough Creek and of the discharge in general. A preferred option shall be provided with a staged approach (including time line) for these proposed works to be implemented. These options shall take into account (but not be limited to) the concerns and issues raised through the cultural impact assessment provided with the application.

13. That the Seddon Wastewater plant shall be maintained and operated in a condition that minimises (as much as practicable) the environmental effect of the discharge on Starborough Creek.
14. A warning sign highlighting the presence of the discharge shall be placed and maintained in the bed of the Awatere River in such a place that people are made aware of the potential contamination of water in the vicinity.
15. In accordance with Section 128 of the Resource Management Act 1991, the Marlborough District Council may review the conditions of this resource consent. This review may be conducted six monthly in the months of February and August, for the duration of the consent, for the following purposes:
 - a. To review the effectiveness of the existing resource consent conditions in avoiding or mitigating any adverse effects on the environment from the exercise of this resource consent and, if necessary, to avoid, remedy or mitigate such effects by way of further or amended conditions; or
 - b. To review the adequacy of and necessity for monitoring the effect of the discharge on the environment; or
 - c. To require the consent holder to adopt the best practicable option to remove or reduce adverse effects on the surrounding environment.

The consent holder may be charged for actual and reasonable costs associated with this review.

Discharge to Air

1. This consent shall expire on 31 July 2017.
2. The discharge of objectionable odour to air from the Seddon Waste Water Treatment Plant site (the site) shall be minimised as much as practicable. This shall include taking preventative steps to minimise the instances and intensity of the discharge of objectionable odour from the site.
3. Upon the notification of the occurrence of the discharge of an objectionable odour from the site, the consent holder shall;
 - a) Take all reasonable steps to stop the discharge of objectionable odour from the site.
 - b) Record the details of the complaint, including factors such as weather and wind direction.

- c) Inform (as soon as is practicable) the Team Leader, Compliance, Marlborough District Council, of the complaint and the steps taken to stop/reduce the level of the discharge.
4. In the event that there are more than 4 complaints in any one calendar year regarding the discharge of objectionable odour from the site, the consent holder shall employ an independent professional to investigate the potential cause and to provide options to reduce the incidences of objectionable odour. The results of the investigation shall be in writing and shall be provided to the Team Leader Compliance, Marlborough District Council, upon request

Appendix B

Oxidation Pond and Sampling Locations



Appendix C

Flow Monitoring Data

Jul-17	Seddon Flow (m³/day)	Aug-17	Seddon Flow (m³/day)	Sep-17	Seddon Flow (m³/day)	Oct-17	Seddon Flow (m³/day)	Nov-17	Seddon Flow (m³/day)	Dec-17	Seddon Flow (m³/day)
1	166.81	1	104.13	1	137.52	1	66.46	1	43.85	1	29.23
2	254.95	2	107.18	2	84.79	2	67.81	2	35.63	2	3.76
3	179.41	3	106.05	3	50.54	3	61.70	3	42.26	3	0.00
4	128.39	4	102.26	4	83.21	4	47.00	4	57.46	4	0.00
5	106.25	5	96.50	5	81.34	5	48.66	5	47.54	5	46.83
6	98.75	6	116.60	6	115.23	6	47.19	6	17.34	6	140.43
7	98.49	7	122.75	7	123.13	7	114.58	7	13.45	7	78.85
8	106.86	8	120.81	8	99.99	8	344.15	8	63.69	8	18.52
9	115.72	9	138.32	9	83.41	9	357.33	9	104.86	9	0.96
10	111.41	10	145.15	10	81.77	10	235.28	10	71.91	10	16.81
11	105.59	11	115.87	11	92.97	11	159.72	11	62.32	11	51.43
12	99.37	12	95.06	12	95.06	12	125.40	12	66.53	12	17.07
13	101.49	13	84.65	13	91.37	13	93.55	13	56.39	13	14.56
14		14	147.17	14	84.15	14	77.29	14	24.69	14	300.00
15		15	178.30	15	76.51	15	67.70	15	10.86	15	189.54
16		16	124.92	16	96.09	16	63.78	16	4.81	16	97.57
17	136.41	17	119.96	17	138.83	17	65.70	17	2.30	17	67.83
18	120.98	18	106.88	18	177.57	18	66.12	18	24.87	18	31.75
19	109.42	19	94.13	19	300.89	19	54.75	19	29.56	19	12.04
20	113.59	20	201.06	20	185.79	20	67.05	20	55.97	20	29.54
21	329.02	21	166.79	21	152.12	21	70.32	21	214.45	21	27.05
22	295.32	22	111.86	22	254.18	22	51.06	22	129.97	22	16.64
23	174.36	23	99.56	23	211.80	23	44.10	23	76.10	23	9.26
24	133.35	24	93.61	24	136.84	24	44.12	24	64.10	24	33.29
25	115.21	25	87.17	25	102.86	25	45.10	25	50.90	25	138.92
26	107.02	26	85.93	26	94.39	26	41.03	26	26.09	26	139.94
27	109.95	27	93.60	27	84.76	27	38.38	27	8.68	27	225.37
28	105.83	28	135.62	28	75.46	28	50.20	28	112.97	28	105.15
29	93.26	29	157.80	29	64.97	29	62.42	29	77.77	29	46.17
30	96.16	30	120.64	30	59.77	30	55.25	30	74.04	30	16.01
31	99.37	31	151.27			31	54.83			31	3.13

Jan-18	Seddon Flow (m ³ /day)	Feb-18	Seddon Flow (m ³ /day)	Mar-18	Seddon Flow (m ³ /day)	Apr-18	Seddon Flow (m ³ /day)	May-18	Seddon Flow (m ³ /day)	Jun-18	Seddon Flow (m ³ /day)
1	67.31	1	29.16	1	135.40	1	75.19	1	122.08	1	116.07
2	89.52	2	77.75	2	93.33	2	65.96	2	85.71	2	115.77
3	64.06	3	78.20	3	87.59	3	77.57	3	71.18	3	130.08
4	62.24	4	68.43	4	52.32	4	79.59	4	58.72	4	205.97
5	300.55	5	54.70	5	71.30	5	82.79	5	44.97	5	227.96
6	326.03	6	31.52	6	85.16	6	139.28	6	74.34	6	164.26
7	163.66	7	15.97	7	76.95	7	100.05	7	94.61	7	147.49
8	103.81	8	31.17	8	69.81	8	62.14	8	104.55	8	143.52
9	73.48	9	50.82	9	58.48	9	89.85	9	79.18	9	132.64
10	62.18	10	59.65	10	40.34	10	290.17	10	71.46	10	137.03
11	135.01	11	197.37	11	20.75	11	194.99	11	81.13	11	107.18
12	191.67	12	329.38	12	11.41	12	111.28	12	94.00	12	281.67
13	167.54	13	176.82	13	38.32	13	94.91	13	292.01	13	452.42
14	120.98	14	95.72	14	106.00	14	89.83	14	302.79	14	252.82
15	87.34	15	51.22	15	38.34	15	96.40	15	190.54	15	228.35
16	58.71	16	22.98	16	19.08	16	228.62	16	296.73	16	179.23
17	54.23	17	30.13	17	23.12	17	170.16	17	327.73	17	158.93
18	108.19	18	80.63	18	88.97	18	101.10	18	194.43	18	182.59
19	97.65	19	66.17	19	122.80	19	80.27	19	194.15	19	369.89
20	56.74	20	224.89	20	98.20	20	72.52	20	123.82	20	273.77
21	84.57	21	350.96	21	100.34	21	67.07	21	130.95	21	224.02
22	87.29	22	338.31	22	267.95	22	75.71	22	112.10	22	179.96
23	87.65	23	211.14	23	330.92	23	88.57	23	223.87	23	163.73
24	83.50	24	125.41	24	94.48	24	82.31	24	169.02	24	158.44
25	31.19	25	72.56	25	100.65	25	76.70	25	124.17	25	154.04
26	7.21	26	178.71	26	119.28	26	80.24	26	77.74	26	150.97
27	37.13	27	210.75	27	42.49	27	81.44	27	48.64	27	141.26
28	49.24	28	176.36	28	20.62	28	88.53	28	213.19	28	138.02
29	117.96			29	118.39	29	226.61	29	195.45	29	139.55
30	174.15			30	121.87	30	188.50	30	135.88	30	144.30
31	66.48			31	81.00			31	121.18		