

Report

Seddon Sewage Treatment Plant Consent Compliance Report 1 July 2015 - 30 June 2016

Prepared for Marlborough District Council

By CH2M Beca Limited

29 August 2016



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Table of Contents

1	Introduction	1
2	Consent Conditions	2
2.1	Consent Purpose	2
2.2	Condition 2 – Maximum Discharge	2
2.3	Condition 3 – Weekly Flow Readings	2
2.4	Condition 4 – Effluent Samples.....	3
2.5	Condition 5 – Effluent Sample Parameters.....	3
2.6	Condition 6 – Starborough Creek Samples	4
2.7	Condition 7 – Starborough Creek Sample Parameters	4
2.8	Condition 8 – Annual Monitoring Report.....	6
2.9	Condition 9 – Ecological Assessment.....	12
2.10	Condition 10 – Ecological Assessment.....	12
2.11	Condition 11 – Reports	12
2.12	Condition 12 – Options for Improvement	12
2.13	Condition 13 – Operation and Maintenance	13
2.14	Condition 14 – Warning Sign	13
2.15	Discharge to Air.....	13
3	Summary.....	14
4	Conclusions.....	14

Appendices

Appendix A - Consent U060927

Appendix B - Oxidation Pond and Sampling Locations

Appendix C - Flow Monitoring Data

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 2015 to 30 June 2016 has been selected by Marlborough District Council (MDC), which generally aligns with the district's other STP reporting requirements.

A copy of Consent U060927, which will expire on 31 July 2017, is included in **Appendix A**.

The Seddon STP is operated by Marlborough District Council (MDC) and consists of a two-stage oxidation pond system with maturation cells. Treated effluent is discharged into Starborough Creek, which is a tributary of the Awatere River. A map showing the oxidation pond and sampling locations 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.

Further upgrades to the treatment are currently being investigated and will be reported on in a separate document.

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 five years. Readings from the outlet flow meter were recorded for the 2015/2016 monitoring period.

The measured average and maximum daily discharge flow rates from the STP in 2015/16 were 88.0 m³ and 381.6 m³, respectively. Therefore, the 750 m³/day limit was not exceeded and compliance with the requirements of Condition 2 were 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 high in recent years.

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

*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 in August 2008 to measure the daily treated effluent flow discharged to Starborough Creek. Therefore, compliance with this condition was achieved.

2.4 Condition 4 – Effluent Samples

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.

2.5 Condition 5 – Effluent 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 effluent were taken from the outlet of the tertiary treatment pond in July 2015, October 2015, and April 2016. A sample was not collected in January 2016 as it was mistakenly left off the sampling schedule. Precautions have been taken to avoid this occurring again next year. The omission of this sample mean that compliance with Conditions 4 and 5 was not fully 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 result in a higher oxygen demand. As nitrifying bacteria are more likely to be present in secondary treated effluent, the cBOD test is considered more appropriate.

The effluent sample results are set out in Table 2-2.

**Table 2-2 - Effluent parameters from grab samples taken in
July and October 2015 and April 2016**

Parameter	3 July 2015	19 October 2015	27 April 2016
Carbonaceous biochemical oxygen demand (g/m ³)	33	33	12
Biological oxygen demand (g/m ³)	49	50	14
Total suspended solids (g/m ³)	50	43	13
Conductivity (mS/m at 25°C)	64.3	61.7	72
Total nitrogen (g/m ³)	41	29	17.5
Total phosphorus (g/m ³)	7.8	8.6	11.9
E. coli (MPN/100mL)	240	130	78
Faecal coliforms (cfu/100mL)	240	130	130
Dissolved oxygen (mg/l)	11.62	5.31	3.35
pH	8.3	8.08	7.79

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 2015, October 2015, and April 2016. A sample was not collected in January 2016 but precautions have been taken to avoid this omission in the future. Therefore, compliance with the three-monthly sampling frequency required by this condition was not achieved. The collected samples were analysed in compliance with the consent and the sample results are set out in Table 2-3.

From Table 2-3, it can be seen that there is generally little or no change between upstream and downstream results, with the exception of the concentrations of dissolved oxygen at the downstream site in July 2015 and April 2016. The reason for the relatively low dissolved oxygen readings downstream of the outlet point is unknown but has occurred in the past. The dissolved oxygen concentration recorded in the pond effluent in July was high while the reading recorded in April was similar to that recorded at the downstream sampling location. It seems unlikely that the STP discharge is a major contributory factor for the drop in dissolved oxygen in July but it is possible that it contributed to the lower reading in April. As the distance between the STP discharge point and the downstream sampling site is approximately 300m, the possibility of other sources of contamination between the discharge point and the downstream site cannot be fully discounted. Field meter measurement errors are also a possible explanation.

It is noted that the E. coli and faecal coliform counts are the same for all samples. This is unusual as, while E. coli are a subset of faecal coliforms and are prevalent in human wastewater, they are generally not the only species present. The bacterial analysis is carried out by Hill Laboratories who are an IANZ-accredited laboratory who routinely perform these test for many clients. Hills 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.

Table 2-3 – Starborough Creek water sample parameters from grab samples taken in July and October 2015 and April 2016

Parameter	3 July 2015		19 October 2015		27 April 2016	
	U/S	D/S	U/S	D/S	U/S	D/S
Biochemical oxygen demand (g/m ³)	<2.00	7	<2.00	2	<2.00	<2.00
Total suspended solids (g/m ³)	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Conductivity (mS/m at 25°C)	97.8	100.2	91.1	94.2	105.6	103.8
Total nitrogen (g/m ³)	3.5	5.1	3.5	2.2	3.4	3
Total phosphorus (g/m ³)	0.029	0.87	0.043	0.24	0.062	2.2
E. coli (MPN/100mL)	350	23	490	20	78	20
Faecal coliforms (cfu/100mL)	350	23	490	20	78	20
Dissolved oxygen (mg/l)	10.27	5.8	10.21	9.05	9.17	3.88
Temperature (°C)	8.8	8.4	13.8	13.6	12.9	10.8
Dissolved oxygen percentage saturation (temperature corrected) (%)	87	49	97	86	85	34
pH	7.84	7.64	8.06	8	7.63	7.47

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, DO concentrations and pH are generally measured weekly by MDC at the outlet of the tertiary pond. DO concentrations ranged from 0.5 to 34 mg/l in 60 readings taken over the 2015/16 monitoring period. Only two measurements were recorded as below 2 mg/l. These readings were 1.75 mg/l at 9:35 am on 16 February 2016 and 0.5 mg/l at 11:15 am on 7 March 2016. The reading recorded on 16 February was measured early in the day and so can be considered to be within the natural daily variation of pond DO. Continued low DO readings can indicate poor pond health which may cause odour nuisance. As only one low reading was recorded around the middle of the day, there is unlikely to be an issue but regular monitoring should continue.

The upper end of the measured DO values is high which may indicate that the probe needs recalibration, or that supersaturation has occurred because of rapid photosynthetic activity of algae in the ponds¹.

The pH of the tertiary pond over the 2014/2015 monitoring period ranged between 7.65 and 10.7, which is typical of pond systems with longer retention times. The low faecal coliform concentration in the final effluent (see Table 2-2), may be due, in part, to the higher pH that can occur in the tertiary pond. High pH values (ie ~9) occur 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*

Comments about the visual appearance of the upstream and downstream Starborough Creek samples were recorded at the time of collection. No evidence of oil or grease films or foam was recorded. Vineyard wrappings were noted at the tertiary pond outlet. While it is most likely that the wrappings blew into the pond from nearby vineyards, it is also possible that some debris entered the STP through the sewerage system.

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 monitored when sampling occurs. A slight yellow colour was noted in both upstream and downstream sites in July and October 2015. The fact that these observations were seen at both these locations means that the discharge is not the source of this colour and were most likely caused by runoff during heavy rainfall. MDC should continue to monitor the colour and clarity of samples taken within the creek to determine whether there is any trends towards greater discoloration in the downstream samples.

The effluent 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 and downstream sample sites were very low (i.e. <3.0 g/m³).

Cawthron (2007) notes that during the 2006 survey, discolouration 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).

¹ See page 56-57 of Pond Treatment Technology (2005) edited by Andy Shilton

3. No objectionable odour shall be emitted

No complaints regarding odour from Starborough Creek were received during the period 1 July 2015 to 30 June 2016.

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 2015/16 are shown in Table 2-3. Faecal coliform concentrations above 100 cfu/100 ml were recorded at the upstream site on 3 July and 19 October 2015. All recorded concentrations at the downstream were below 100 cfu/100 ml and they were all lower than the upstream values. This indicates that the STP outlet is not making a significant contribution to the downstream faecal coliform concentrations in Starborough Creek. The higher upstream concentration was likely due to contamination 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 was not possible. However, the total nitrogen concentrations, at both upstream and downstream samplings sites in 2015/16 (see Table 2-3), were well below the WARMF guidelines for livestock drinking water.

5. Any significant effects on aquatic life

Light penetration

Light penetration into the receiving water will not be significantly affected by the discharge due to the very low effluent TSS concentrations. The creek is ephemeral by nature and vegetation overhanging the creek also reduces light penetration.

Ammonia Toxicity

Neither the STP effluent 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 effluent, particularly during the winter period when the potential for nitrification is lowest. Table 2-2 shows that total nitrogen concentrations at the STP effluent during 2015/16 ranged between 17.5 – 41 mg/l. While the current STP is not specifically configured to remove significant amounts of ammonia, some nitrification is likely when aerobic conditions and higher water temperatures are present (i.e. during the summer months).

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 0.90g/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, which could, in turn, promote excessive algae growth.

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.

Although not required by the consent, the temperature in Starborough Creek is recorded when samples are taken (see Table 2-3). All temperatures recorded in the 2015/16 period were less than 20°C and the recorded maximum change in temperature was 2.1°C.

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.

Six of the eight dissolved oxygen (DO) percentage saturation values shown in Table 2-3 exceed the 80% DO limit. The two samples that were below this value were 49% on 3 July 2015 and 34% on 27 April 2016, both taken downstream of the outlet. The reason for the drop in creek DO is unknown. However, it seems unlikely that the STP discharge is a major contributory factor to the drop in in July as the concentration recorded at the pond outlet was high. It is possible that it the STP discharge contributed to the low April creek reading as effluent DO was similar to that recorded at the downstream sampling location.

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. While effluent ammonia concentrations are not measured, the 2011 Monitoring Report noted that ammonia concentrations in the creek were well below the ANZECC 2000 ammonia guideline for 95% level of protection for aquatic species at pH of 8.

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. The creek runs through gravels before discharging the Awatere River where contact recreation does occur. There are three standards in the Plan to help protect contact recreation:

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

Due to the shallow, over grown 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 WARMP states that *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 effluent or in Starborough Creek. Therefore, no direct comparison can be made with the WARMP guideline. MfE (2003) *Microbiological Water Quality Guidelines for Marine and Freshwater Areas* do not recommend the use of enterococci as an indicator organism for pond-derived effluent, because there is evidence that enterococci from sources other than wastewater can replicate in ponds.

The MfE (2003) guidelines uses *E. coli* as the faecal contamination indicator organism for freshwater. The guidelines recommend a weekly sampling regime over the bathing season, generally referring to the dates between 1 November and 31 March. 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 (2003) guidelines can be made. However, results from the July, October and April 2015/16 samples indicate that both upstream and downstream *E. coli* concentrations can exceed the MfE guideline median and maximum concentrations. This indicates that the creek may not be always suitable for contact recreation, upstream or downstream of the STP discharge point.

Biological Growths – The WARMP states that:

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, concluding 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 the WARMP requirements for management of the creek for fisheries purposes, with the exception of two of the eight DO percentage saturation values.

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 2015/16 indicate that the creek would not always meet the MfE (2003) bathing water guidelines.

Cawthron (2012) report that dissolved organic nitrogen (DIN) and dissolved reactive phosphorus (DRP) concentrations exceeded ANZECC 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 willow trees.

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 has been recorded in the creek but debris including vineyard wrappings has been collected within the ponds.
<i>No conspicuous change in colour or visual clarity</i>	Generally meets this requirement although the both the upstream and downstream samples, on 3 July and 19 October 2015, were noted as being “slightly yellow”. As this occurred both upstream and downstream, it is unlikely to be a result of the STP discharge.
<i>No objectionable odour shall be emitted</i>	No odour complaints have been received.
<i>Shall not be rendered unsuitable for consumption by farm animals</i>	Faecal coliform concentrations recorded downstream of the discharge were below the ANZECC (2000) guideline for livestock drinking water. Two of the three upstream site concentrations were above the guideline, most likely due to runoff.
<i>Any significant effects on aquatic life</i>	No significant effects have been noted by Cawthron during regular surveys.
<i>The temperature shall not be changed by more</i>	Temperatures were recorded in the upstream and downstream location three times during the

<i>than 3°C and shall not exceed 20°C</i>	2015/2016 period. The temperature was never above 20°C and the change between locations was never more than 3°C.
<i>The dissolved oxygen shall exceed 80% of saturation</i>	6 of the 8 samples exceeded 80% saturation. Lower levels of saturation were recorded on two occasions upstream and downstream of the discharge.
<i>Shall not be rendered unsuitable for human consumption of fish due to presence of contaminants</i>	Only eels are found in the creek and there is no indication that they are unsuitable for human consumption.
Recreational purposes	The creek is not generally suitable for bathing due to its shallow, inaccessible nature. 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.*

No odour complaints were received in 2015/16.

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 were no odour complaints during the period 1 July 2015 to 30 June 2016.

3 Summary

Based on the monitoring results recorded in 2015/16, the only identifiable non-compliance with a quantitative consent condition was the gap in effluent, as well as upstream and downstream receiving water sampling, which occurred in January 2016. It is recommended that samples taken are collected and analysed according to consent requirements.

Discharge flow was measured for the entire monitoring period and no odour complaints were received.

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 the requirements of these eight standards. It is noted, however that a slight discoloration was recorded at the downstream sampling location. It is also noted that DO was below 80% saturation on two occasions, both upstream and downstream of the discharge. Water temperature was similar upstream and downstream of the discharge.

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. Sampling shows that E. coli concentrations can be higher than MfE (2003) recreational guidelines upstream and downstream of the discharge. It is unlikely that this is a significant risk to the public, as access is difficult and the water is generally too shallow to be considered suitable for bathing.

4 Conclusions

The Seddon STP continues to perform well, producing an effluent quality that is considered typical for the current pond design and layout. The STP does not produce any noticeable odours. The requirements of Consent U060927 were generally met over the 2015/16 monitoring period. However, improvements with regard the collection and analysis of effluent and receiving water samples are recommended.

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.

Cawthron (2012). *Ecological Effect of Seddon Sewage Discharge (2012 Survey)*. Report No.2119

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

Seddon Flow		Seddon Flow		Seddon Flow		Seddon Flow		Seddon Flow		Seddon Flow	
Jul-15	(m ³ /day)	Aug-15	(m ³ /day)	Sep-15	(m ³ /day)	Oct-15	(m ³ /day)	Nov-15	(m ³ /day)	Dec-15	(m ³ /day)
1	132.58	1	93.40	1	282.12	1	63.57	1	55.44	1	48.88
2	99.06	2	101.88	2	354.76	2	87.53	2	29.97	2	44.82
3	105.59	3	106.77	3	198.78	3	54.53	3	9.06	3	99.59
4	114.71	4	89.75	4	119.45	4	20.44	4	6.05	4	69.01
5	108.94	5	73.83	5	76.24	5	36.12	5	76.82	5	49.88
6	100.34	6	121.75	6	50.34	6	47.39	6	240.31	6	50.88
7	96.54	7	161.09	7	90.70	7	44.64	7	135.72	7	60.66
8	100.91	8	139.51	8	211.65	8	40.54	8	66.13	8	55.08
9	102.30	9	116.40	9	141.08	9	48.50	9	54.11	9	37.09
10	98.86	10	100.76	10	104.32	10	63.35	10	26.96	10	35.11
11	100.49	11	91.63	11	66.14	11	62.85	11	25.68	11	56.29
12	99.72	12	87.29	12	73.37	12	29.04	12	111.25	12	87.28
13	102.09	13	89.98	13	99.14	13	8.63	13	94.77	13	82.05
14	100.85	14	97.54	14	86.74	14	48.47	14	75.52	14	60.29
15	106.14	15	129.43	15	81.80	15	71.10	15	44.66	15	58.41
16	127.60	16	153.59	16	87.72	16	44.67	16	41.16	16	53.52
17	144.37	17	129.87	17	79.97	17	39.32	17	137.06	17	70.87
18	130.16	18	67.17	18	60.67	18	29.58	18	57.79	18	47.48
19	142.22	19	172.96	19	47.16	19	25.78	19	18.38	19	16.48
20	135.65	20	164.13	20	76.55	20	30.39	20	5.60	20	4.04
21	115.42	21	100.47	21	36.09	21	24.00	21	151.93	21	28.22
22	108.59	22	88.92	22	33.44	22	16.06	22	129.95	22	124.65
23	116.43	23	89.58	23	381.61	23	11.33	23	59.21	23	76.08
24	113.31	24	92.25	24	365.41	24	81.54	24	13.75	24	58.52
25	111.15	25	112.70	25	193.42	25	82.08	25	55.11	25	31.80
26	125.29	26	153.19	26	124.51	26	10.44	26	43.37	26	14.29
27	133.57	27	114.93	27	90.14	27	2.30	27	29.06	27	6.89
28	110.91	28	101.76	28	80.84	28	20.46	28	25.15	28	2.66
29	115.05	29	120.30	29	68.89	29	110.52	29	29.49	29	0.74
30	100.73	30	143.67	30	40.13	30	45.06	30	54.02	30	0.00
31	93.61	31	127.37			31	68.20			31	0.00

Jan-16	Seddon Flow (m³/day)	Feb-16	Seddon Flow (m³/day)	Mar-16	Seddon Flow (m³/day)	Apr-16	Seddon Flow (m³/day)	May-16	Seddon Flow (m³/day)	Jun-16	Seddon Flow (m³/day)
1	13.55	1	92.50	1	2.73	1	41.34	1	68.99	1	119.74
2	53.41	2	76.40	2	0.68	2	193.57	2	72.72	2	119.12
3	135.01	3	51.26	3	12.03	3	179.90	3	71.97	3	117.57
4	253.84	4	24.65	4	28.82	4	101.09	4	68.18	4	115.00
5	111.63	5	18.70	5	50.77	5	74.53	5	108.76	5	115.01
6	59.13	6	41.01	6	62.72	6	67.01	6	123.18	6	115.68
7	26.12	7	58.18	7	31.85	7	61.33	7	99.73	7	122.28
8	158.22	8	33.60	8	15.80	8	60.51	8	96.42	8	101.55
9	92.34	9	16.78	9	27.79	9	58.27	9	102.47	9	62.59
10	33.54	10	14.34	10	19.50	10	64.55	10	95.04	10	218.26
11	8.43	11	49.39	11	35.74	11	73.33	11	110.76	11	203.12
12	3.04	12	131.07	12	39.16	12	70.18	12	113.74	12	183.81
13	36.26	13	102.82	13	33.97	13	69.41	13	133.60	13	190.04
14	61.60	14	51.38	14	26.83	14	64.84	14	100.38	14	135.44
15	63.31	15	27.09	15	71.50	15	64.18	15	88.49	15	99.11
16	58.46	16	46.38	16	63.62	16	66.28	16	121.25	16	112.76
17	63.67	17	51.42	17	78.31	17	69.62	17	132.73	17	120.81
18	39.84	18	74.42	18	108.16	18	70.65	18	140.08	18	116.87
19	243.42	19	126.58	19	94.52	19	72.13	19	125.59	19	114.87
20	206.23	20	101.17	20	70.60	20	70.98	20	100.79	20	132.10
21	104.68	21	70.18	21	55.64	21	68.56	21	124.58	21	120.93
22	58.06	22	66.39	22	62.28	22	64.05	22	156.52	22	139.86
23	53.34	23	56.14	23	69.08	23	54.06	23	201.35	23	193.10
24	49.58	24	50.51	24	285.78	24	77.17	24	159.35	24	166.33
25	40.74	25	48.32	25	242.14	25	62.74	25	213.96	25	126.53
26	38.93	26	45.40	26	108.16	26	60.27	26	181.91	26	219.73
27	36.33	27	18.45	27	59.97	27	68.82	27	127.24	27	265.14
28	45.01	28	12.11	28	59.24	28	74.43	28	315.00	28	157.99
29	126.31	29	10.05	29	58.27	29	71.17	29	277.56	29	134.51
30	116.71			30	54.75	30	69.79	30	177.23	30	0.00
31	105.65			31	38.06			31	158.41		