

Veolia Water Services Limited  
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Attention: Phil Smith

Dear Phil

## **2020 Hahei Wastewater Treatment Plant Ecological Monitoring Data**

This data report presents the results from the 2020 annual ecological monitoring of the Hahei Wastewater Treatment Plant (HWTP) discharge to the Wigmore Stream, located in Hahei Township, Coromandel.

Veolia Water Services Limited (Veolia) operates the HWTP for the Thames-Coromandel District Council (TCDC). TCDC holds resource consent number AUTH135636.01.01 to discharge treated wastewater to Wigmore Stream and any associated seepage discharge to groundwater from the HWTP treatment ponds.

Condition 16 and 19 require annual ecological monitoring of instream macroinvertebrate population, physical habitat and aquatic vegetation to be carried out in January or February at sites upstream and downstream of the discharge point. Fish surveys are also required once every five years in January or February (last collected in 2019). Detailed reporting to Waikato Regional Council (WRC) is required on a two-yearly basis, with a brief data report provided on alternate years.

Veolia has engaged Tonkin & Taylor Ltd (T+T) to complete the summer 2020 ecological monitoring and prepare a brief data report outlining the findings as per the letter of engagement dated 13 December 2019.

The 2020 data will be analysed in detail in the two yearly report which is due in 2021.

## **1 Methods**

### **1.1 Survey sites**

Two sites in Wigmore Stream were surveyed on 20 January 2020. Survey sites comprised 100 m long stream reaches located upstream and downstream of the discharge and as monitored in previous surveys. The DS site was located 50 m below the HWTP discharge point extending downstream, and the US site was located approximately 30 m upstream of the discharge point extending upstream (Table 1.1). Both sites are located within the tidally influenced reach of Wigmore Stream<sup>1</sup>, with assessments conducted at low tide.

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<sup>1</sup> Kessels Ecology Ltd (May 2017). Hahei Wastewater Treatment Plant Assessment of Ecological Effects. Report prepared for Thames-Coromandel District Council.

The Wigmore Stream discharges to the sea at the southern end of Hahei beach. The Wigmore Stream is subject to periodic closure at the outlet due to wave and wind transporting sand across the mouth, coupled with low flow from the Wigmore Stream. Throughout the 2020 summer season Veolia operators dug out sand from the stream mouth 2-3 times a week, and sometimes daily to keep the outlet open to the sea. During this ecological monitoring sampling round, the mouth was closed<sup>2</sup>.

**Table 1.1 Monitoring locations with associated GPS coordinates for Wigmore Stream sampling sites (World Geodetic System 1984)**

Site	Location	Latitude	Longitude
US	30 m above the discharge	-36.5130	175.4831
DS	50 m below the HWTP	-36.5051	175.4824

\* GPS locations are for the upstream end of the site

## 1.2 Habitat assessment

A qualitative habitat assessment (QHA) was conducted at each site using a soft bottomed field assessment form provided in the WRC guidelines<sup>3</sup>. Assessments involved the measurement of riparian, bank and channel condition on a scale from 1 to 20 (where 1 is the lowest condition and 20 is the highest). Scores are interpreted as follows:

- Scores between 1 and 5 labelled as “poor”;
- Scores ranging from 6-10 labelled as “marginal”;
- Scores ranging from 11-15 labelled as “suboptimal” ; and
- Scores ranging from 16-20 labelled as “optimal”.

Stream morphology was measured at five transects within the 100 m reach, 20 m apart to record wetted width, channel width and depth (five depth measurements at each transect). Percentage substrate composition was estimated by undertaking a modified Wolman assessment with 50 points sampled across five evenly spaced transects (10 per transect).

## 1.3 Spot water quality

Temperature, pH, dissolved oxygen, and conductivity were measured at each site using a calibrated ProODO YSI, an Oakton waterproof pHTestr 30 and Oakton multi-parameter pocket meter.

## 1.4 Aquatic vegetation

Percent coverage of periphyton and macrophytes in the stream were assessed at survey sites in accordance with the WRC guidelines<sup>3</sup>. Because of site constraints, (deep water, soft sediment, limited water clarity) we were unable to complete a periphyton assessment on the downstream site. Visual assessments of any periphyton present (particularly filamentous algae on hard substrate) was recorded across the five transects, where practical. Any macrophyte species present were also recorded. Periphyton type was recorded under the following categories:

- Thin mat or film (less than 0.5mm thick) – Any colour;
- Medium mat (0.5 to 3mm thick) – Green, light brown or black/dark brown;

<sup>2</sup> Pers comms. Graham Crook, Veolia Operator of HWTP. Email dated 16 April 2020.

<sup>3</sup> Collier, K; Hamer, M and Champion, P. (2014). Regional Guidelines for Ecological Assessments of Freshwater Environments – Aquatic Plant cover in wadeable streams - version 2. Environment Waikato Technical Report 2014/03.

- Thick mat (more than 3 mm thick) – Green, light brown or black/dark brown;
- Short filaments (less than about 2 cm long) – Green, brown/reddish; and
- Long filaments (more than about 2 cm long) – Green, brown/reddish.

## 1.5 Aquatic macroinvertebrates

There was a total of 27.5 mm of rainfall in the 21 days leading up to the sampling on 20 January 2020<sup>4</sup>. Tairua River, the closest gauged river to Wigmore Stream, had a maximum flowrate of 1.1 m<sup>3</sup>/s in the 21 days prior<sup>5</sup>, which is considered a low flowrate. Conditions were therefore suitable for undertaking the macroinvertebrate sampling as per the national sampling protocols<sup>6</sup>. Four replicate macroinvertebrate samples were collected at each sampling reach, and processed in accordance with national protocol C2 (soft bottom streams semi-quantitative) for macroinvertebrate sampling in wadeable streams. Samples were processed by a suitably qualified taxonomist (Brett Stansfield from Environmental Impact Assessments Ltd) using protocol P2 (200 count with scan for rare taxa)<sup>6</sup>. The raw data are provided in Appendix A.

The following metrics were calculated:

- Macroinvertebrate Community Index soft-bottom (MCI-sb): assesses organic enrichment in a stream by scoring the occurrence of specific macroinvertebrate taxa. Invertebrates are assigned a score from 1 to 10 based on tolerance to organic pollution. Taxa with a high score are classified as the least tolerant taxa to organic pollution – Refer to Table 1.2 for interpretation of MCI-sb scores<sup>7</sup>;
- Semi-Quantitative Macroinvertebrate Community Index soft-bottom (QMCI-sb): is similar to MCI-sb but includes a weighting for taxa abundance within the community. Refer to Table 1.2 for interpretation of QMCI-sb scores;
- Ephemeroptera, Plecoptera and Trichoptera (EPT) taxa: an insect group generally comprising pollution-sensitive species. An increased number of EPT taxa generally indicates improved long-term water quality; and
- The total number of taxa reflects the diversity of the community however generally does not determine higher water quality.

<sup>4</sup> Rainfall data was requested from Waikato Regional Council for the Pinnacles rainfall station on 14 April 2020.

<https://www.waikatoregion.govt.nz/services/regional-services/river-levels-and-rainfall/rainfall-latest-reading/>

<sup>5</sup> Flowrate data was available from Waikato Regional Council for the Tairua River station (#940.2).

<http://riverlevelsmap.waikatoregion.govt.nz/cgi-bin/hydwebserver.cgi/points/details?point=162&catchment=17>

<sup>6</sup> Stark, J.D.; Boothroyd, I.K.J.; Harding, J.S.; Maxted, J.R.; Scarsbrook, M.R., 2001. Protocols for Sampling Macroinvertebrates in Wadeable Streams. Prepared by the New Zealand Macroinvertebrate Working Group for the Ministry for the Environment.

<sup>7</sup> Stark, J, D., Maxted, J, R., 2007. A user guide for the macroinvertebrate community index. Report prepared for the Ministry for the Environment. Nelson, Cawthron Institute. 66 p.

**Table 1.2: Interpretation of macroinvertebrate community index values<sup>8</sup>**

Quality Class A	Quality Class B	MCI-sb	QMCI-sb
Clean water	Excellent	> 119	> 5.99
Doubtful quality	Good	100 – 119	5.00 – 5.99
Probable moderate pollution	Fair	80 – 99	4.00 – 4.99
Probable severe pollution	Poor	< 80	< 4.00

## 2 Results

### 2.1 Habitat assessment

Table 2.1 outlines the QHA parameters for the upstream and downstream sites in the Wigmore Stream. The majority of the habitat parameters were within the 'Marginal' to 'Suboptimal' category at the upstream site and the 'Suboptimal' and 'Poor' category for the downstream site. The total QHA scores were similar for both sites.

Table 2.2 displays the physical parameter measurements and substrate composition. Both sites were dominated by silt, with the upstream (US) site having a higher proportion of gravel and cobble sized substrates. The downstream (DS) site was on average deeper and wider than the US site.

**Table 2.1: Soft-bottom Qualitative Habitat Assessment at US and DS sites, Wigmore Stream, January 2020.**

Parameters	US	DS
Riparian vegetation zone width	Marginal	Suboptimal
Vegetation protection	Marginal	Marginal
Bank stability	Suboptimal	Suboptimal
Channel sinuosity	Marginal	Poor
Channel alteration	Optimal	Optimal
Sediment deposition	Marginal	Poor
Pool variability	Suboptimal	Suboptimal
Abundance and diversity of habitat	Marginal	Poor
Periphyton	Suboptimal	Suboptimal
<b>Total Score</b>	<b>93</b>	<b>91</b>

<sup>8</sup> Stark, J, D., Maxted, J, R., 2007. A user guide for the macroinvertebrate community index. Report prepared for the Ministry for the Environment. Nelson, Cawthron Institute. 66 p.

**Table 2.2: Substrate percent composition, mean depth and width at the survey sites in Wigmore Stream, January 2020.**

Substrate type (% composition)	US	DS
Bedrock	-	-
Boulder	-	-
Cobble	20	-
Coarse Gravel	-	-
Fine Gravel	22	4
Sand	-	6
Silt	58	90
Mean Width and depth (m)		
Depth	0.44	1.0
Wetted width	5.90	6.88

## 2.2 Spot water quality measurements

Table 2.3 outlines water quality parameters recorded at one location per site. The results show that dissolved oxygen concentrations were low at the DS site and oversaturated at the US site. The water quality meter was unable to gauge conductivity, which indicates a highly conductive saline environment at both sites. Temperature was high at both sites, and greater at the US site. The pH was neutral at the US site and slightly acidic at the DS site.

**Table 2.3: Spot water quality measurements collected at one location per site in Wigmore Stream, January 2020.**

Site	Time	Visual clarity	Dissolved oxygen (%)	Dissolved oxygen (mg/L)	Conductivity (µS/m)	Temperature (°C)	pH
US	12:10	stained	148.5	11.27	Off scale	29.2	7.72
DS	9:45	stained	61.6	5.03	Off scale	23.5	6.95

'Off scale' represents readings that are too conductive for the Oakton multi-parameter pocket meter to register. This indicates a saline environment.

## 2.3 Aquatic vegetation

Table 2.4 identifies summary aquatic vegetation values for periphyton and macrophyte cover. The US site had a low cover of periphyton dominated by thin film. No comparison can be made between the US and DS sites due to the unsuitable DS site conditions. There were no submerged or emergent macrophytes recorded at either site.

**Table 2.4: Periphyton and macrophyte summary data at the US and DS survey sites at Wigmore Stream in January 2020.**

Survey Sites	US	DS
Mean periphyton cover (%)	32	N/A <sup>1</sup>
Dominant periphyton type	Thin film	N/A
Mean macrophyte cover (%)	0	0

1 We were unable to undertake a periphyton assessment at the downstream site due to site constraints (soft sediment, lack of water clarity, depth).

## 2.4 Aquatic macroinvertebrates

Table 2.5 outlines the mean and standard deviation of macroinvertebrate metrics. The number of taxa was the same at both sites and was low. There were no EPT taxa recorded at either site. The MCI-sb was slightly higher at the US site, with both sites having a 'Fair' quality class. Both sites were dominated by Mysid shrimps (*mysidae tenagomysis*) which has a soft-bottom MCI tolerance score of 6.4.

**Table 2.5: Macroinvertebrate data for the US and DS sites in Wigmore Stream January 2020 (mean and standard deviation).**

Survey Sites	US	DS
Number of taxa	5.0 ± 0.6	5.0 ± 0.6
% EPT taxa	0	0
MCI-sb	95.2 ± 6.0	89.5 ± 3.1
QMCI-sb	6.2 ± 0.1	5.9 ± 0.2
Dominant taxa	Mysid shrimps ( <i>mysidae tenagomysis</i> )	Mysid shrimps ( <i>mysidae tenagomysis</i> )
Quality Class: 1.SBMCI and 2.QMCI- sb	1. Fair 2.Excellent	1. Fair 2. Excellent

## 3 Summary

In summary this report presents the ecological monitoring and results for habitat, aquatic vegetation and macroinvertebrate data collected on 20 January 2020. The above data satisfies Condition 16 and 19 of the HWTP resource consent. Data will be analysed next year along with 2021 ecological monitoring data.

## 4 Applicability

This report has been prepared for the exclusive use of our client Veolia Water Services Limited, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

We understand and agree that this report will be used by Thames-Coromandel District Council in connection with the Hahei Wastewater Treatment Plant (HWTP) and its resource consent AUTH135636.01.01.

Tonkin & Taylor Ltd

Environmental and Engineering Consultants

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## Appendix A: Macroinvertebrate Raw Data

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Bottle No.			Hahei US	Hahei US	Hahei US	Hahei US	Hahei DS	Hahei DS	Hahei DS	Hahei DS
			Replicate 1	Replicate 2	Replicate 3	Replicate 4	Replicate 1	Replicate 2	Replicate 3	Replicate 4
Sample No.										
Site Name										
Taxa	MCI score	MCI-sb score								
Crustacea Helice crabs	3	6.6			1					
Crustacea Isopoda	5	4.5	3	4					3	
Crustacea Mysid shrimps	5	6.4	185	175	179	18	190	195	140	160
Crustacea Paracalliope	5	5.5								1
Crustacea Paratya	5	3.6	20	6	16	1	2	4	10	15
Crustacea Talitridae	5	5				2	2			2
MITES	5	5.2			1			1		
Mollusc Potamopyrgus	4	2.1	1	13	1		8	2	22	
Mollusc Sphaeriidae	3	2.9		4					21	23
PADDLEWORMS	3	6.7		3	14	80			2	3
Number of Taxa			4	6	6	4	4	4	6	6
EPT Value			0	0	0	0	0	0	0	0
Number of Individuals			209	205	212	101	202	202	198	204
% EPT (taxa number)			0	0	0	0	0	0	0	0
Sum of recorded scores			16.6	26.2	30.6	21.7	17.1	17.3	26.2	29.6
SBMCI Value			83.00	87.33	102.00	108.50	85.50	86.50	87.33	98.67
Sum of abundance load			1271.60	1218.60	1310.90	664.80	1250.00	1271.80	1066.00	1179.80
QMCI-sb Value			6.08	5.94	6.18	6.58	6.19	6.30	5.38	5.78