

ANZCO Foods Eltham Ltd
Monitoring Programme
Annual Report
2020-2021

Technical Report 2021-93



Taranaki Regional Council
Private Bag 713
Stratford

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Executive summary

ANZCO Foods Eltham Ltd (the Company) operates a meat processing plant located at Eltham, in the Waingongoro catchment. Until May 2014, the site was known as Riverlands Eltham. The plant has an associated wastewater treatment system from which treated effluent is disposed of either to land or to surface water. This report covers the Company's processing season from October 2020 to September 2021 and describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess the Company's environmental performance during the period under review. The report also details the results of the monitoring undertaken and assesses the environmental effects of the Company's activities.

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

The Company held eight resource consents during the review period, which included a total of 91 conditions setting out the requirements that the Company must satisfy. The Company held one consent to allow it to take and use water, two consents to discharge effluent and stormwater into the Waingongoro River, two consents to discharge effluent and solids to land, two consents for structures in watercourses, and one consent to discharge emissions into the air at the plant site.

Monitoring is carried out by both the Company and the Council. The Company monitors water abstraction rate, effluent flow rate and composition, receiving water quality, odour at the plant boundaries, effluent loadings and soil and herbage for irrigation areas. The Council undertakes inspections of the plant site and irrigation areas. Monitoring includes effluent quality checks and inter-laboratory comparisons, water quality, air quality and biological monitoring.

The Council's monitoring programmes for the period under review included three inspections, 45 groundwater and 22 surface water samples collected for physicochemical analysis and two biomonitoring surveys of receiving waters. In addition to the regular compliance monitoring programme undertaken an additional six groundwater and eight surface water samples were also collected during the period. These samples were collected to provide a baseline for future compliance monitoring in relation to the Paulwell Farm site once effluent irrigation has commenced.

The abstraction of water from the Waingongoro River was not found to have any adverse effect on the river and the physicochemical monitoring of the river showed compliance with consent conditions.

The biomonitoring surveys did not find any detrimental impact on the river caused by discharges from the meat processing plant to water.

The information still required to complete the report submitted to assess the impacts, if any, on dissolved reactive phosphorus (DRP) concentrations in the Waingongoro River was submitted on 19 February 2021. The pipeline failure contingency report and the water conservation report were both submitted late.

The groundwater monitoring programme indicates that irrigation of effluent by the Company has had an observable effect on localised groundwater quality over time. Some improvement can be seen in regard to nitrate concentrations in groundwater over the last few years in response to recent mitigation measures undertaken by the Company.

During the 2020-2021 monitoring period 63% (307,555 m³) of the total plant effluent (489,378 m³) was sprayed onto grazed pasture. The irrigation period lasted 33 weeks between the week commencing 6 October 2021 and the week ending 7 June 2021. The limit on nitrogen loading was not exceeded in any paddock during the irrigation season.

With regard to emissions to air over the 2020-2021 period, no incidents were recorded.

During the period under review, the Company demonstrated a good level of environmental performance and a good level in their administrative performance.

For reference, in the 2020-2021 year, consent holders were found to achieve a high level of environmental performance and compliance for 86% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 11% of the consents, a good level of environmental performance and compliance was achieved.

In terms of overall environmental and compliance performance by the Company over the last few years, this report shows that the Company's performance has remained at a good level, with some improvement required in their administrative performance.

This report includes recommendations to be implemented during the 2021–2022 monitoring period.

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1 Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report is for the period October 2020 to September 2021 by the Taranaki Regional Council (the Council) on the monitoring programme associated with resource consents held by ANZCO Foods Eltham Ltd (the Company). The Company operates a meat processing plant situated on London Street, Eltham within the Waingongoro catchment. The period being reviewed in this report coincides with the killing season and the Company's financial year.

The Company held eight resource consents relating to the Company's surface water take and discharges to water, land, and air during the reporting period. The consents include a number of special conditions which set out specific requirements the Company must satisfy.

This report covers the results and findings of the monitoring programme implemented by the Council in respect of the consents held by the Company.

One of the intents of the *Resource Management Act 1991* (RMA) is that environmental management should be integrated across all media, so that a consent holder's use of water, air, and land should be considered from a single comprehensive environmental perspective. Accordingly, the Council generally implements integrated environmental monitoring programmes and reports the results of the programmes jointly. This report is the 29th combined annual report and the 32nd water-related report by the Council and its predecessors for the Company.

1.1.2 Structure of this report

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

- consent compliance monitoring under the RMA and the Council's obligations;
- the Council's approach to monitoring sites through annual programmes;
- the resource consents held by the Company;
- the nature of the monitoring programme in place for the period under review; and
- a description of the activities and operations conducted by the Company at the Eltham site.

Section 2 presents the results of monitoring during the period under review, including scientific and technical data.

Section 3 discusses the results, their interpretations, and their significance for the environment.

Section 4 presents recommendations to be implemented in the 2021-2022 monitoring year.

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

1.1.3 The Resource Management Act 1991 and monitoring

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

- a. the neighbourhood or the wider community around an activity, and may include cultural and social-economic effects;

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

In drafting and reviewing conditions on discharge permits, and in implementing monitoring programmes, the Council is recognising the comprehensive meaning of 'effects' inasmuch as is appropriate for each activity. Monitoring programmes are not only based on existing permit conditions, but also on the obligations of the RMA to assess the effects of the exercise of consents. In accordance with Section 35 of the RMA, the Council undertakes compliance monitoring for consents and rules in regional plans, and maintains an overview of the performance of resource users and consent holders. Compliance monitoring, including both activity and impact monitoring, enables the Council to continually re-evaluate its approach and that of consent holders to resource management and, ultimately, through the refinement of methods and considered responsible resource utilisation, to move closer to achieving sustainable development of the region's resources.

1.1.4 Evaluation of environmental and administrative performance

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

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

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

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

Environmental Performance

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

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

For example:

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

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

Poor: Likely or actual adverse effects of activities on the receiving environment were significant. There were some items noted during monitoring, from self reports, or during investigations of incidents reported to the Council by a third party. Cumulative adverse effects of a persistent moderate non-compliant activity could elevate an 'improvement required' issue to this level. Typically there were grounds for either a prosecution or an infringement notice in respect of effects.

Administrative performance

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

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

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

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

For reference, in the 2020-2021 year, consent holders were found to achieve a high level of environmental performance and compliance for 86% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 11% of the consents, a good level of environmental performance and compliance was achieved.¹

1.2 Process description

The meat processing plant is situated in the Waingongoro catchment, on the outskirts of Eltham in South Taranaki (Figure 1). There has been a meat processing plant on the site since about 1894.

The meat processing plant has the capacity to process about 200,000 beef units and 120,000 calves per year. The beef season runs from early October to mid-July, peaking between January and May depending on livestock availability. Generally, peak kill occurs earlier and is higher in dry seasons owing to the reduced availability of stock feed. Calves are slaughtered between July and September. The majority of the processed

¹ The Council has used these compliance grading criteria for 17 years. They align closely with the 4 compliance grades in the MfE Best Practice Guidelines for Compliance, Monitoring and Enforcement, 2018

output is exported. There are no fellmongery or rendering facilities. Blood and renderable material are taken off-site for processing.

Water for plant operation is abstracted from the Waingongoro River and also taken from the Eltham town supply. The river abstraction point is situated at the upstream boundary of the site, immediately above the confluence with a small tributary that runs past the stockyards. The water taken from the river augments the supply of potable water from the municipal system.

Wastewater is derived from four sources: killing, gutting (paunch material), processing, and the stockyards. On-site wastewater treatment comprises of solids separation, followed by biological degradation.

Paunch contents are segregated by 'dry dumping' into hoppers, dewatered, and trucked off-site for use in vermiculture. Liquid effluent from paunch opening areas and the stockyards is passed through a 0.5 mm rotary screen. The screened solids are disposed of with the paunch material. All red meat streams are discharged to a sump through a coarse bar screen and pumped through a rotary screen. The separated solids are de-watered in a press and removed daily to an off-site rendering plant. The remaining liquid is then combined with the screened paunch/stockyard effluent and is discharged to the lagoon system. All blood is transported off-site for processing.

The on-site treatment system consists of eight lagoons in series with a total volume of about 40,000 m³. The first five (ponds 1, 2, 3, 3A and 4), about 20,000 m³ in volume, are anaerobic. The sixth (pond 5) is an aerated facultative lagoon, about 3 metres in depth, with aeration capacity of 44 kW. The seventh (pond 6), about 4.8 m in depth, is for settling and allows some denitrification. The final lagoon (pond 7) is shallow, with a maximum depth of 1.5 m and an area of 0.76 ha.

Effluent from the final lagoon is discharged either to land by irrigation or to the Waingongoro River during times of high flow. The disposal system is managed so as to maximise discharge to land, thereby minimising any potential adverse effects on the river.

The current irrigation area is a dairy farm immediately across the river from the plant that is accessed from Lower Stuart Road. The area irrigated increased progressively, from 60 ha when the reticulation system was commissioned in January 2001, to 265 ha in 2012-2013.

An additional area (Paulwell Farm) has also been equipped and irrigation is planned to commence during the 2021-2022 monitoring year.

When effluent is discharged to the river, it is through a variable-rate pump via a pipe that projects over the river by about one third of its width. Flow is measured at a v-notch weir above the pipe inlet and is recorded electronically.

1.3 Resource consents

The Company holds eight resource consents, the details of which are summarised in Table 1 below. Summaries of the conditions attached to each permit are set out in Section 3 of this report.

A summary of the various consent types issued by the Council is included in Appendix I, as are copies of all permits held by the Company during the period under review.

Table 1 Summary of resource consents held by the Company

Consent number	Purpose of consent	Granted	Next review	Expires
1968-4	To discharge stormwater into the Waingongoro River	09/07/2012	June 2023	01/06/2029
2039-4.1	To discharge treated wastewater into the Waingongoro River	13/10/2017	June 2023	01/06/2029
4644-3	To discharge emissions to air	05/05/2016	June 2023	01/06/2035
5437-3.1	To take and use water from the Waingongoro River	13/10/2017	June 2023	01/06/2029
5569-1	To discharge up to 3,500 m ³ of treated wastewater by irrigation onto and into land (Stuart Road)	23/12/1999	-	01/06/2026
5736-2	To discharge up to 3,500 m ³ of treated wastewater by irrigation onto and into land (Eltham Road)	09/07/2012	June 2023	01/06/2026
5739-2	To erect, place and maintain a pipeline under the bed of the Waingongoro River	02/05/2017	June 2023	01/06/2035
6455-1	To erect, place and maintain a culvert in and to realign, an unnamed tributary of the Waingongoro River	20/09/2004	-	01/06/2023

1.4 Monitoring programme

1.4.1 Introduction

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

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

Monitoring in relation to the meat processing plant is undertaken by the Company and the Council and is outlined below.

1.4.2 Monitoring by the Company

Monitoring undertaken by the Company consists of four primary components outlined below.

1.4.2.1 Water abstraction

The volume of water abstracted from the Waingongoro River is monitored continuously and is provided directly to the Council electronically. A record is kept of the volume of water taken from the Eltham town supply.

1.4.2.2 Discharge to Waingongoro River

Wastewater discharge rate to the river is monitored continuously and is provided directly to the Council electronically. The chemical composition of the discharge and the receiving water upstream and downstream is monitored as prescribed by the Council. The frequency of chemical monitoring is at least weekly.

The chemical composition of wastewater is monitored at several points within the wastewater treatment system, as part of the management of that system. The Company makes a financial contribution to Council for riparian planting and management in the Waingongoro catchment, which aids in the ongoing protection and enhancement of the water course and its ecosystems.

1.4.2.3 Discharge to land

Wastewater discharge rate to land is monitored continuously and provided to the Council upon request. The chemical composition of the discharge and the soil, herbage and adjacent surface waters of the irrigation areas are monitored as prescribed by the Council, or as required in the Company's Effluent Management Plan. An assessment of the results is also provided in the Company's annual environmental monitoring report.

1.4.2.4 Odour surveys

Odour surveys are carried out at four points around the plant boundary at approximately weekly intervals. The frequency may be increased if significant odour is detected.

1.4.3 Monitoring by Taranaki Regional Council

The consent monitoring programme for the Company's site undertaken by the Council consists of six primary components as described below.

1.4.3.1 Programme liaison and management

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

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

1.4.3.2 Review of the Company's monitoring data

The monitoring data gathered by the Company is provided to the Council and reviewed to determine compliance with resource consent conditions, and to assess trends in water usage, in wastewater discharge volume and composition and effects on the Waingongoro River, land irrigation areas, and in odour generation.

1.4.3.3 Site inspections

An officer of the Council visits the plant at generally quarterly intervals. The main points of interest are the water abstraction system, plant processes with potential or actual discharges to receiving watercourses, including contaminated stormwater and process wastewaters, and sources of emission to air. The land used

for irrigation is also inspected for any signs of ponding or adverse effects from the discharge and the neighbourhood is surveyed for environmental effects, particularly odour.

1.4.3.4 Water quality monitoring

1.4.3.4.1 Surface water

Routine monitoring by the Council is undertaken on at least two occasions annually at four sites in relation to river discharge consent conditions. Inter-laboratory comparison exercises are generally carried out concurrently. Additional monitoring may be carried out if any breach of consent conditions occurs, or if there is a significant difference between the inter-laboratory results provided by the Company and the Council's surface water monitoring results.

Stormwater discharge sampling is also undertaken from a stormwater drain located directly above the weir on the Waingongoro River, to ensure any stormwater discharged meets consent requirements.

Surface water sampling is undertaken quarterly at three stream sites in relation to the Stuart Road irrigation consent.

Up to five additional stream sites will also be sampled quarterly in relation to irrigation at Paulwell Farm once the activity has commenced.

The location of surface water monitoring sites are displayed on Figure 2 and Figure 3. A description of each site is summarised in Table 2.

Table 2 Surface water monitoring site details

Site	Eastings	Northings	Description	Location
IND004001	1710611	5634427	Sampled from the pond sump prior to discharging to the river.	Discharge
STW002005	1710939	5634565	Culvert situated upstream of weir, 5-10 m before entering the receiving waters.	Stormwater
WGG000510	1710574	5634444	Approximately 50 m upstream of the discharge location.	Upstream
WGG000540	1710727	5634084	400 m downstream of discharge location.	Downstream
WGG000620	1710708	5632961	2.5 km downstream of discharge location.	Downstream
WGG000657	1709599	5634635	Lower Stuart Road culvert.	Northern
WGG000660	1709984	5634044	800 m upstream of Lower Stuart Road culvert.	Central
WGG000663	1709513	5633289	1.8 km downstream of WGG000657.	Southern
WGG000708	1707983	5635243	80 m downstream of Eltham/Opunake Road	Northern
WGG000712	1708395	5634453	Entrance to piped section at Paulwell/Hawkes boundary	Southern
WGG000715	1708736	5634745	80m downstream of old effluent ponds.	Eastern
WGG000716	1708620	5634451	Entrance to piped section at Paulwell/Hawkes boundary	Southern
WGG000720	1708827	5635027	45 m d/s of Eltham Rd. 650 m East of Upper Stuart Rd	Northern

1.4.3.4.2 Groundwater

Groundwater in the vicinity of the wastewater irrigation areas on Lower Stuart Road is monitored quarterly at 9 sites for any effects on the aquifer and nearby shallow surface water resources. The farm supply well GND1189 was recently removed from the programme as the well is no longer in use.

An additional three groundwater monitoring sites will also be sampled quarterly in relation to irrigation at Paulwell Farm once the activity has commenced.

Details of each site are summarised below in Table 3 and locations are displayed on Figure 2 and Figure 3.

Table 3 Groundwater monitoring site details

Site	Eastings	Northings	bore/well depth	type
GND1189	1709868	5634097	6.3	Old supply well
GND1196	1709272	5634442	8.5	Monitoring bore
GND0849	1709130	5636145	14.9	Control site
GND1187	1710269	5633127	6.7	Supply well
GND1188	1709623	5633310	27.0	Supply well
GND1197	1709520	5633783	9.1	Monitoring bore
GND1198	1710088	5634327	8.6	Monitoring bore
GND1306	1709547	5634072	7.2	Old supply well
GND1344	1710054	5633834	8.8	Monitoring bore
GND1345	1709444	5632453	8.8	Monitoring bore
GND3116	1708237	5635121	10.3	Monitoring bore
GND3117	1708488	5634823	10.3	Monitoring bore
GND3118	1708720	5634807	10.3	Monitoring bore

1.4.3.5 Biomonitoring surveys

Surveys of streambed macroinvertebrates and algae collected from several sampling sites in the Waingongoro River are carried out on a biannual basis, during spring and during summer/autumn under low flow conditions. An additional survey may be carried out if a particularly low receiving water flow coincides with high kill rate at the plant.

Biological surveys determine whether or not the discharge of stormwater and treated wastewater from the site has had a detrimental effect upon the communities of the stream. Biomonitoring site details are summarised in Table 4 and locations are displayed on Figure 1.

Table 4 Biomonitoring site details

Site No	Site code	Grid reference	Location
1	WGG000500	E1710576 N5634824	Eltham road bridge (upstream of discharge)
2	WGG000535	E1710725 N5634193	Approximately 300 m downstream of the discharge
3	WGG000540	E1710727 N5634084	Approximately 200 m downstream of rail bridge and approximately 400 m downstream of discharge

1.4.3.6 Water level monitoring station

The Council maintains a water level monitoring station on the Waingongoro River at Eltham Road, about 900 m above the river discharge point. Data from the station includes river level, river flow and temperature. Data is telemetered to the Council offices at Stratford.

The information from flow is useful in the management of the Company's discharge to the river in terms of estimating available dilution.

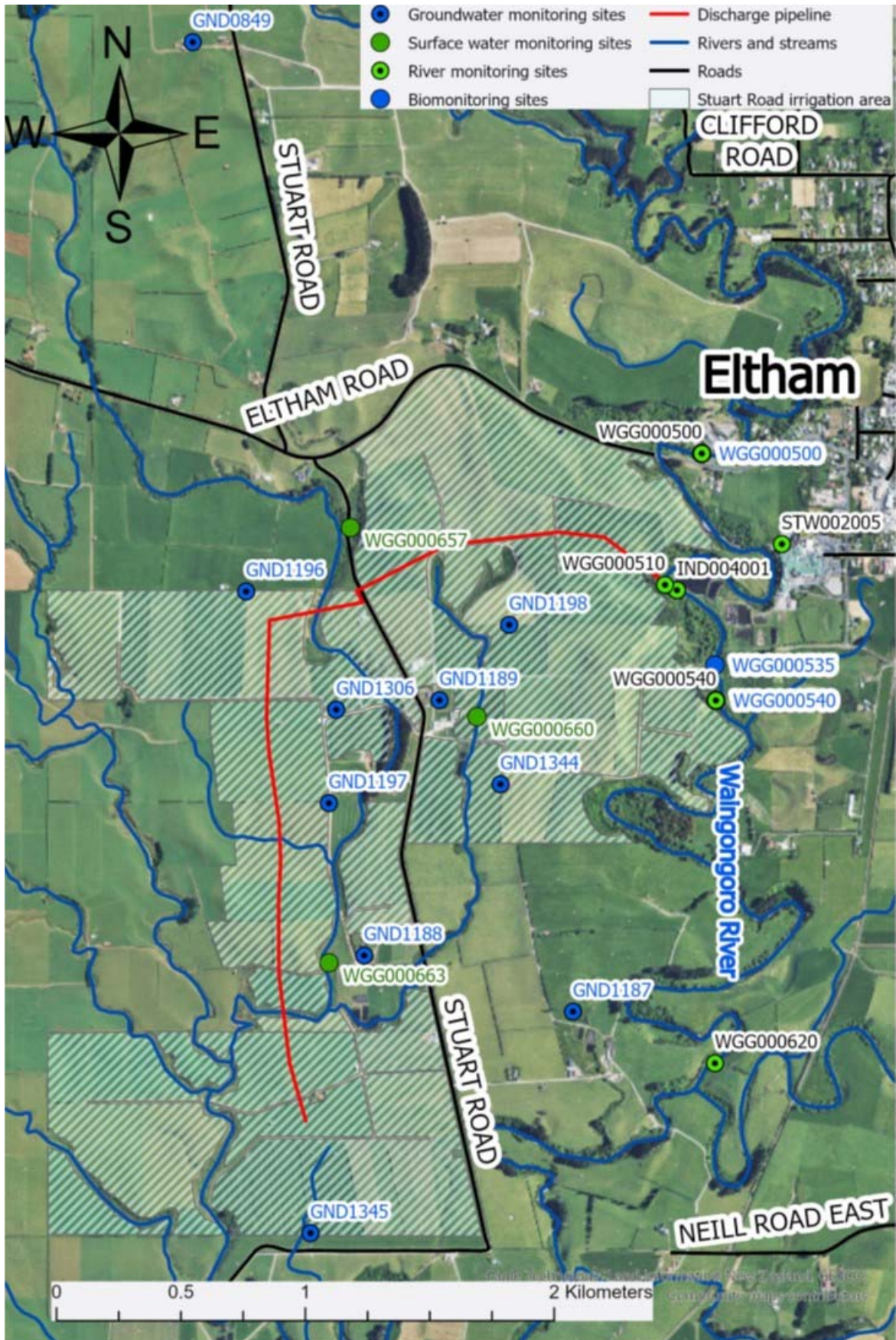


Figure 2 Groundwater and surface water monitoring locations – Stuart Road

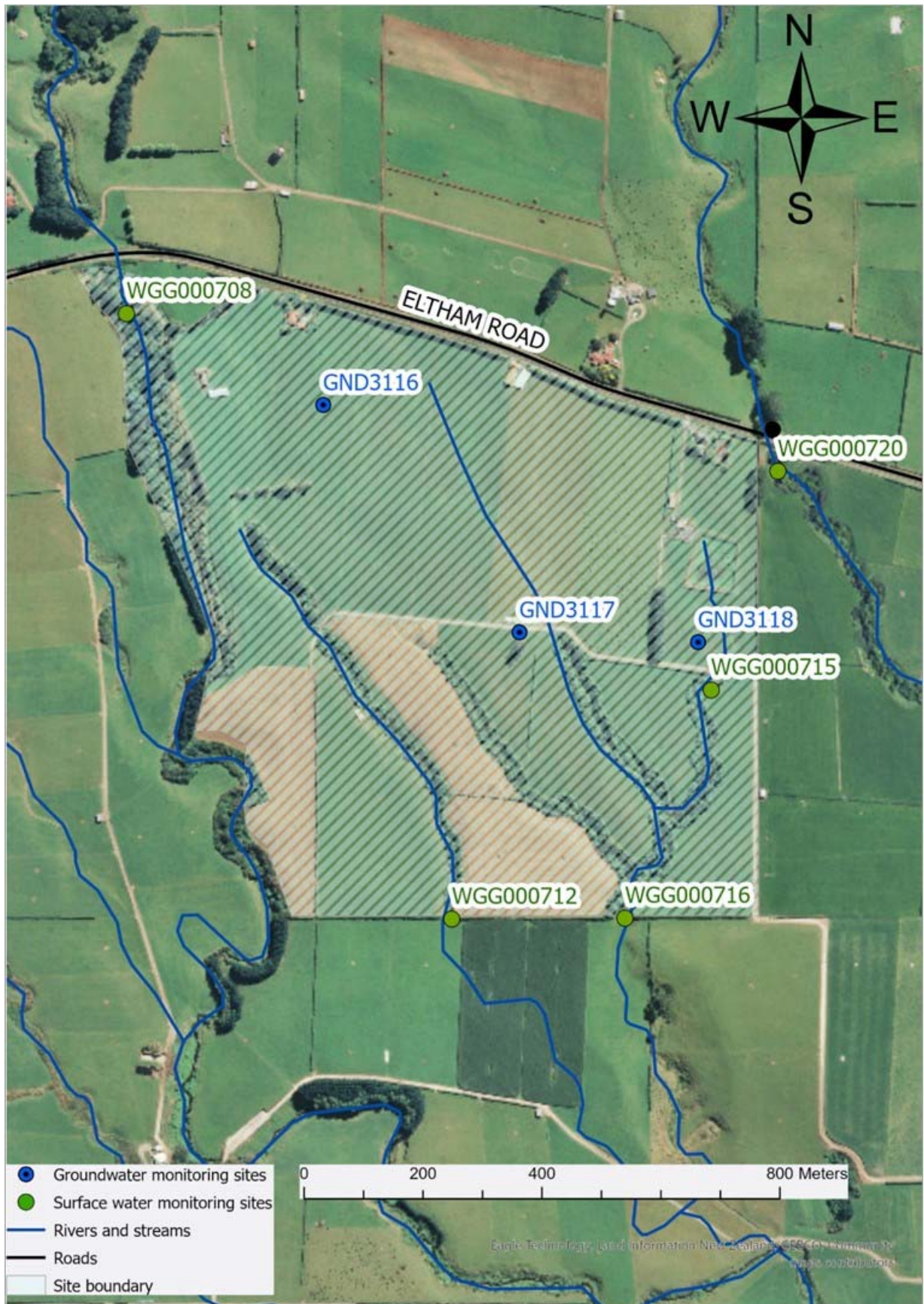


Figure 3 Groundwater and surface water monitoring locations – Paulwell Farm

2 Results

2.1 Inspections

During the period under review, the Council carried out five inspections in relation to the Company's activities. Three inspections were carried out around the production facilities and Stuart Road irrigation site on 25 September 2020, 25 June 2021 and 30 September 2021. The remaining two inspections were carried out at the Paulwell Farm site on 10 November 2020 and 21 March 2021 in conjunction with the baseline sampling.

No significant odour was detected during any inspection or at any designated monitoring site beyond the plant boundary. There were no ponding issues noted at the irrigation sites.

All storm water drains, swales and collection sumps inspected were found to be running clear.

The blood, offal and paunch areas was surveyed during each inspection and found to be tidy.

No significant issues were identified during inspections and the facilities appeared tidy and well-managed.

2.1.1 Provision of consent holder data

The consent holder provides data on abstraction volumes, discharge rates and effluent quality on a regular basis as laid out in the various management plans, or at the request of the Council. Any changes to the irrigation and discharge systems, are also provided. During the monitoring period the following changes to the discharge systems or related issues were reported:

- Eight new irrigators were installed, six replacing the old irrigators operating under consent 5569-1 and two were installed at Paulwell Farm under consent 5736-2.

The data provided by the Company and the data collected by the Council is summarised below.

2.1.1.1 Abstraction data

Abstraction of water from the Waingongoro River is permitted under consent 5437-3.1. Data is recorded electronically at 15 minute intervals and is provided daily to the Council for assessment.

The Company also provide the volumes of water taken from the municipal supply. Monthly abstraction volumes from the river and the town supply are displayed in Figure 4.

During the October 2020 to September 2021 monitoring year 288,706 m³ of water use on-site was sourced from the Waingongoro River under consent 5437-3.1 and 184,056 m³ was sourced from the Eltham town water supply.

The Company is also required to provide a water use report under the requirements of Consent 5437. The report summarises the results of data collected and provides the details of any water conservation measures undertaken during the previous year. The report which is required prior to 31 May each year was submitted late.

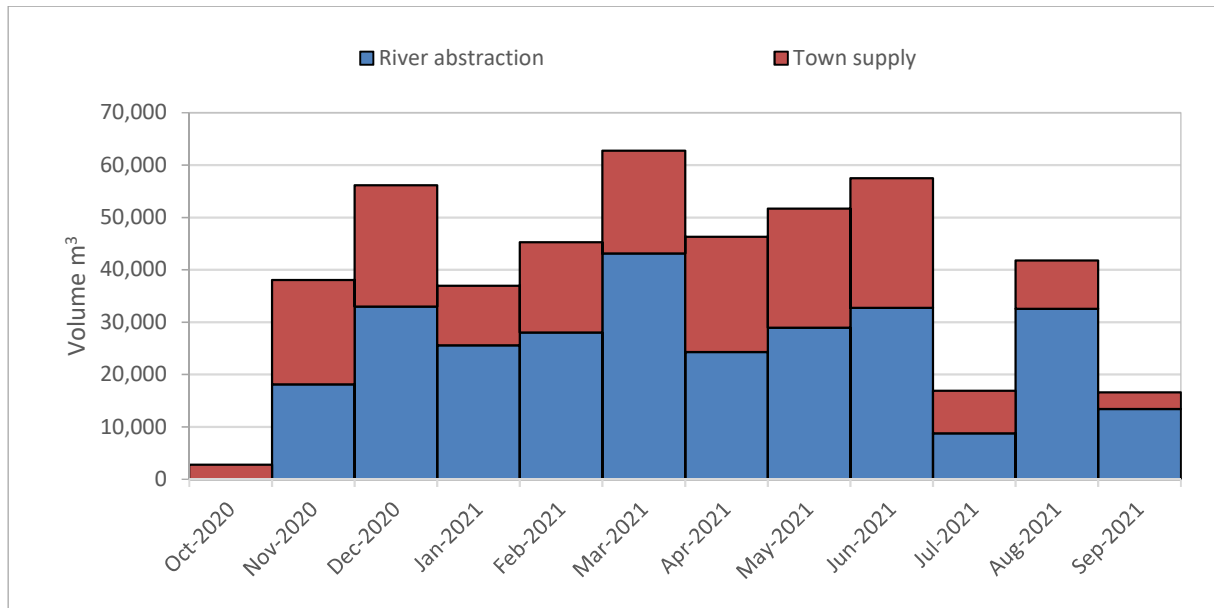


Figure 4 River abstraction and municipal water supply volumes

2.1.1.2 Discharge data

2.1.1.2.1 Discharge of treated wastewater to the river Consent 2039-4

Discharge to the river preferentially occurs during periods of high flow in the river, to provide adequate dilution of the discharge. During low flow periods discharge occurs to land via the irrigation system.

Routine monitoring by the Council was undertaken on 25 June 2021 and 30 September 2021 in relation to river discharge consent conditions. Inter-laboratory comparison were also carried out concurrently. During the monitoring period average river flows were significantly higher than mean flows recorded historically from 1974 to date during November and December 2020 and July and August 2021 (Figure 5).

A total of 181,823 m³ of treated wastewater was discharged to the Waingongoro River under consent 2039-4.1 during the reported period. The volume of wastewater discharged to the river equates to 37% of the total effluent (489,378 m³) discharged during the period. The maximum daily discharge of 3,218 m³ was recorded on 15 June 2021 and the maximum average rate over a 15 minute interval of 57 L/s was recorded on 17 July 2021.

2.1.1.2.2 Discharge of stormwater to the river Consent 1968-4

Stormwater is discharged directly to the river. Restrictions on the quality of the stormwater and any consequential impacts on the river are covered by consent conditions. During the monitoring period the stormwater discharged was sampled twice as part of the surface water monitoring programme to ensure it met the requirements of the consent.

2.1.1.2.3 Discharge of treated wastewater to land data Consent 5736-2 and 5569-1

No discharge occurred under consent 5736-2. All discharge to land occurred under consent 5569-1. Discharge data was provided by the Company when requested.

Between December 2020 and May 2021 the Company predominantly discharged to land and between July 2021 and October 2021, the Company solely discharged to the river. During the remaining months, discharge occurred to both the river and to land (Figure 5).

In summary, a total of 307,555 m³ or 63% of total discharge was irrigated to land during the monitoring period and a total of 181,823 m³ or 37% of the total discharge of 489,378 m³ was discharged to the river.

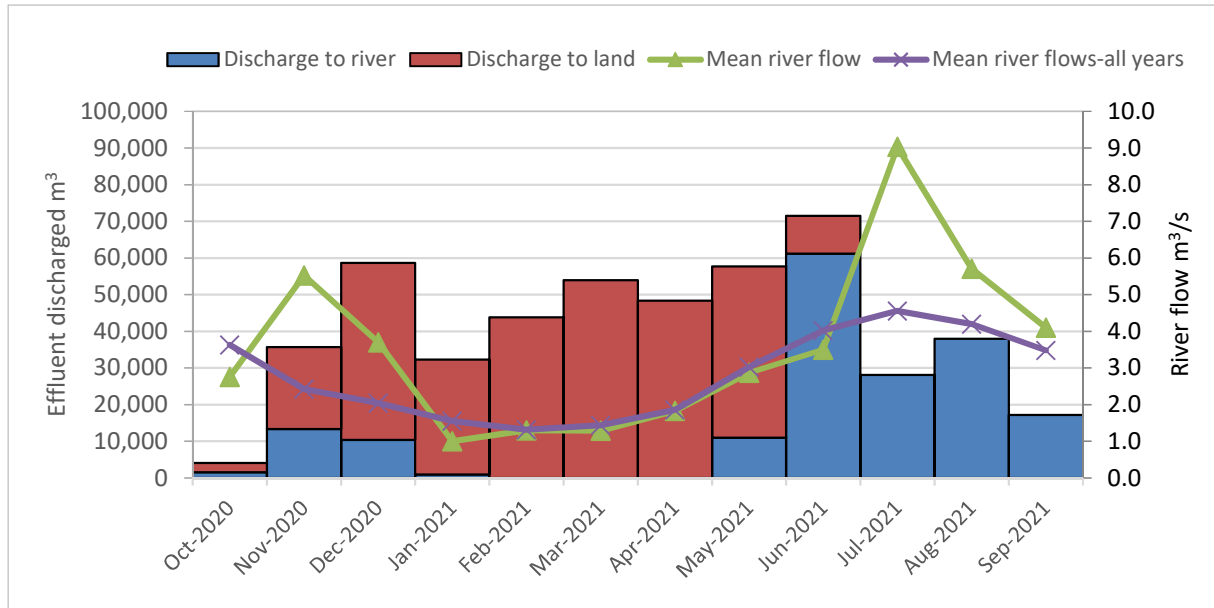


Figure 5 Effluent discharged to land and to the river October 2020 to September 2021

2.1.2 Results of receiving environment monitoring

To monitor for any significant impacts downstream of the river discharge site, water quality parameters are monitored at various locations along the river. Groundwater and surface water monitoring is also undertaken at and around any site receiving discharge to land. Inspections are undertaken at the site, adjoining areas and any discharge locations where impacts could potentially occur.

2.1.2.1 Surface water monitoring undertaken by the Council

Surface water quality sampling in relation to the river discharge for the period was undertaken on 25 June 2021 and 30 September 2021 at five sites.

Two sites are located upstream of the discharge (WGG000500 and WGG000510), one site at the discharge location (IND00400) and two sites located downstream (WGG000540 and WGG000620) of the discharge. Black disc measurements were also taken upstream and downstream of the discharge to assess compliance with the requirements of consent 2039-4.1.

Stormwater sampling was undertaken by the Council, during the two sampling rounds. Sampling was not undertaken during or immediately following any heavy rainfall periods when stormwater runoff would be at its highest.

The results of surface water sampling undertaken by the Council are included in Table 5 and Table 6 and are presented against results undertaken during the previous reporting period on 26 June 2020 and 25 September 2020.

Water quality is also undertaken weekly by the Company during periods of discharge to the river and is discussed in Section 2.1.2.2. As a quality assurance measure surface water quality monitoring by the Council is undertaken in conjunction with the weekly surface water monitoring undertaken by the Company. A comparison of the data is discussed in Section 2.1.3.3 and data is displayed in Table 7.

Limits have been set on some water quality parameters in the river after adequate mixing has occurred. A summary of these limits are as follows:

- Filtered carbonaceous biological oxygen demand (CBOD) must not exceed 2 g/m³;
- Dissolved oxygen (DO) must remain above 6 g/m³; and
- Maximum total ammonium concentration for a given pH must remain below the concentrations indicated in Table 1 of the discharge consent 2039-4.1.

The monitoring programme was carried out as per the requirements of the consent conditions and associated discharge management plans. Results indicate that phosphorus, nitrogen and ammonium have all been significantly diluted by the time they reach the downstream monitoring location. Dissolved reactive phosphorus (DRP) concentrations are significantly higher downstream of the site in comparison to those upstream (Figure 6). All water quality limits were met during the period. Inspections undertaken by Council officers downstream of the discharge site indicated that there were no visible impacts on the river from the discharge.

A reduced suite of parameters were also analysed as part of the Council's scheduled State of Environment Monitoring (SEM) programme for the Waingongoro River during both low and high flow conditions.

2.1.2.2 Surface water monitoring undertaken by the Company

Monitoring of a reduced suite of analytes is undertaken by the Company weekly and analysed in their on-site laboratory. Downstream dissolved oxygen (DO) concentrations are displayed in Figure 7 and indicate that DO remained above the 6 g/m³ limit during periods of discharge. Downstream ammonium (NH₃) and pH are displayed in Figure 8. The highest ammonium concentrations can be seen downstream between late May and September 2021. Concentrations increase as river flows increase within the catchment and during periods of discharge to the river. The increases are likely a result of a combination of both the increased runoff from the surrounding catchment, which is predominantly rural in nature, due to winter rainfall and the commencement of discharge to the river by the Company.

Results from the inter-laboratory comparisons undertaken on 25 June 2021 and 30 September 2021 are displayed in Table 8. There are some minor differences (generally >5%) seen between results reported by the Company's on-site laboratory and the Council. These differences seen between soluble analytes may be a result of the heterogeneity of the fluids sampled, which are collected at the same time but side by side. The discrepancies in temperature readings indicate that either the Council's or Company's temperature probes may require calibration. The small discrepancies between pH (which is a time sensitive parameter) may be a consequence of samples being analysed outside of recommended laboratory holding times. Samples collected by the Council are sent off-site for analysis and therefore can easily exceed the recommended maximum holding time of eight hours. The differences between results are not environmentally significant.

Table 5 Surface water quality results 2020

Surface water monitoring 2019-2020	Site	Limit	Discharge	Stormwater	Upstream		Downstream		Discharge	Stormwater	Upstream		Downstream	
			IND004001	STW002005	WGG000500	WGG000510	WGG000540	WGG000620	IND004001	STW002005	WGG000500	WGG000510	WGG000540	WGG000620
	Sample	TRC201757	TRC201759	TRC201754	TRC201756	TRC201758	TRC201760	TRC202995	TRC202997	TRC202993	TRC202994	TRC202996	TRC202998	
	Date	26 Jun 2020						25 Sep 2020						
Parameter	Time	-	9:11	10:08	10:35	9:28	9:45	11:30	9:15	10:15	11:25	9:25	9:47	11:55
Total alkalinity	g/m ³ as CaCO ₃	-	460	-	-	-	-	-	66	-	-	-	-	-
Electrical conductivity	µS/cm	-	1,478	269	131	132	140	142	653	238	108	107	110	110
PH	pH	-	7.9	7.7	7.5	7.0	7.4	7.2	7.9	7.5	7.1	7.4	6.9	7.4
Temperature	° C	-	10.5	-	-	-	-	-	13	19.3	11.4	10.6	10.7	11.8
Dissolved oxygen	g/m ³	<6	5.13	-	11.13	11.13	11.12	11.03	7.08	-	11.33	11.26	11.22	11.15
Dissolved oxygen saturation	%	-	46.5	-	99.6	98.3	99	98.8	81.5	-	103.7	101.2	101.1	103
Dissolved calcium	g/m ³	-	17.2	-	-	-	-	-	14.4	-	-	-	-	-
Total calcium	g/m ³	-	17.9	-	-	-	-	-	15.2	-	-	-	-	-
Chloride	g/m ³	-	80	-	12.3	11.4	13.2	13.3	45	-	10.6	10.6	10.7	10.9
Dissolved potassium	g/m ³	-	48	-	-	-	-	-	16.7	-	-	-	-	-
Total potassium	g/m ³	-	46	-	-	-	-	-	17.8	-	-	-	-	-
Dissolved magnesium	g/m ³	-	5.7	-	-	-	-	-	3.6	-	-	-	-	-
Total magnesium	g/m ³	-	5.7	-	-	-	-	-	4	-	-	-	-	-
Dissolved sodium	g/m ³	-	137	-	-	-	-	-	63	-	-	-	-	-
Nitrate and nitrite as N (NNN)	g/m ³ N	-	23	-	1.74	1.73	1.87	1.87	36	-	1.09	1.07	1.09	1.17
Nitrite	g/m ³ N	-	22	-	0.005	0.005	0.116	0.112	28	-	0.007	0.007	0.007	0.048
Nitrate	g/m ³ N	-	-	-	1.74	1.73	1.87	1.75	-	-	1.08	1.06	1.08	1.13
Total kjeldahl nitrogen	g/m ³ N	-	74	-	-	-	-	-	20	-	-	-	-	-
Total nitrogen	g/m ³	-	97	-	-	-	-	-	56	-	-	-	-	-
Free Ammonia as N	g/m ³	-	1.01	0.0036	<0.00006	0.000036	0.00194	0.00107	0.41	0.0059	0.00004	0.00018	0.000085	0.00028
Total Ammoniacal-N	g/m ³	-	71	0.47	<0.010	0.02	0.4	0.35	21	0.5	0.0017	0.041	0.049	0.056
Dissolved reactive phosphorus	g/m ³ P	-	16.5	<0.004	0.013	0.014	0.078	0.071	7.1	<0.004	0.015	0.017	0.016	0.032
Total phosphorus	g/m ³	-	21.0	-	-	-	-	-	8.2	-	-	-	-	-
Sulphate	g/m ³	-	12.8	-	-	-	-	-	6.0	-	-	-	-	-
Total biochemical oxygen demand (BOD)	g O ₂ /m ³	-	27	<0.4	<0.4	<0.8	0.9	1	12	3	0.5	<0.8	1.1	<0.8
Dissolved C-biochemical oxygen demand (CBOD)	g O ₂ /m ³	>2	11	-	-	<1.0	<1.0	<1.0	1.3	-	-	<1.0	<1.0	<1.0

Surface water monitoring 2019-2020	Site	Limit	Discharge	Stormwater	Upstream		Downstream		Discharge	Stormwater	Upstream		Downstream	
			IND004001	STW002005	WGG000500	WGG000510	WGG000540	WGG000620	IND004001	STW002005	WGG000500	WGG000510	WGG000540	WGG000620
	Sample	TRC201757	TRC201759	TRC201754	TRC201756	TRC201758	TRC201760	TRC202995	TRC202997	TRC202993	TRC202994	TRC202996	TRC202998	
Date	-	26 Jun 2020						25 Sep 2020						
Parameter	Time	-	9:11	10:08	10:35	9:28	9:45	11:30	9:15	10:15	11:25	9:25	9:47	11:55
Chemical oxygen demand (COD)	g O ₂ /m ³	-	120	-	-	-	-	-	104	-	-	-	-	-
Escherichia coli	/100ml	-	160,000	30	400	320	1,000	800	800	80	280	300	280	600
Enterococci	/100ml	-	5,600	30	30	10	40	70	60	190	30	10	20	10
Faecal coliforms	/100ml	-	-	-	-	-	-	-	-	-	-	-	-	-
Suspended solids	g/m ³	-	187	10	10.4	10.1	10.2	3	35	20	<3	3	<3	<3
Turbidity	FNU	-	-	-	-	-	-	-	20	13.4	1.62	1.36	1.84	1.69
Black disc	m	-	-	-	1.32	-	-	1.27	-	-	1.2	-	-	1.25
Oil and grease	g/m ³	-	7	<5	-	-	-	-	<4	<4	-	-	-	-
Sodium absorption ratio (dissolved)	-	-	7.3	-	-	-	-	-	3.8	-	-	-	-	-
Potassium absorption ratio	(mmol/L)0.5	-	1.4	-	-	-	-	-	0.6	-	-	-	-	-
Free chlorine	g/m ³	-	-	<0.05	-	-	-	-	-	<0.05	-	-	-	-
Total/combined chlorine	g/m ³	-	-	<0.08	-	-	-	-	-	<0.08	-	-	-	-

Table 6 Surface water quality results 2021

Surface water monitoring 2020-2021	Site	Limit	Discharge	Stormwater	Upstream		Downstream		Discharge	Stormwater	Upstream		Downstream	
			IND004001	STW002005	WGG000500	WGG000510	WGG000540	WGG000620	IND004001	STW002005	IND004001	STW002005	WGG000500	WGG000510
	Sample	TRC212146	TRC212148	TRC212144	TRC212145	TRC212147	TRC212149	TRC212981	TRC212983	TRC212146	TRC212148	TRC212144	TRC212145	
Date	-	25 Jun 2021						30 Sep 2021						
Parameter	Time	-	9:20	10:05	11:15	9:35	9:50	11:40	8:20	9:00	9:20	10:05	11:15	9:35
Total alkalinity	g/m ³ as CaCO ₃	-	730	-	-	-	-	-	270	-	730	-	-	-
Electrical conductivity	µS/cm	-	1,833	268	129	129	136	138	868	199	1,833	268	129	129
PH	pH	-	8.1	7.2	7.8	6.8	7.3	7.2	8.2	7.1	8.1	7.2	7.8	6.8
Temperature	° C	-	10	15.5	10.2	9.9	9.9	10.3	13	14.1	10	15.5	10.2	9.9
Dissolved oxygen	g/m ³	<6	1.02	-	11.35	11.29	11.34	11.11	0.84	-	1.02	-	11.35	11.29
Dissolved oxygen saturation	%	-	9	-	-	100.9	101.2	100.2	5.8	-	9	-	-	100.9
Dissolved calcium	g/m ³	-	18.6	-	-	-	-	-	16.7	-	18.6	-	-	-
Total calcium	g/m ³	-	20	-	-	-	-	-	16.7	-	20	-	-	-

Surface water monitoring 2020-2021	Site	Limit	Discharge	Stormwater	Upstream		Downstream		Discharge	Stormwater	Upstream		Downstream	
			IND004001	STW002005	WGG000500	WGG000510	WGG000540	WGG000620	IND004001	STW002005	IND004001	STW002005	WGG000500	WGG000510
	Sample	TRC212146	TRC212148	TRC212144	TRC212145	TRC212147	TRC212149	TRC212981	TRC212983	TRC212146	TRC212148	TRC212144	TRC212145	
	Date	-	25 Jun 2021						30 Sep 2021					
Parameter	Time	-	9:20	10:05	11:15	9:35	9:50	11:40	8:20	9:00	9:20	10:05	11:15	9:35
Chloride	g/m ³	-	71	-	12.2	12.6	12.9	13	45	-	71	-	12.2	12.6
Dissolved potassium	g/m ³	-	50	-	-	-	-	-	17.4	-	50	-	-	-
Total potassium	g/m ³	-	50	-	-	-	-	-	18	-	50	-	-	-
Dissolved magnesium	g/m ³	-	5.6	-	-	-	-	-	4.6	-	5.6	-	-	-
Total magnesium	g/m ³	-	6.7	-	-	-	-	-	4.6	-	6.7	-	-	-
Dissolved sodium	g/m ³	-	122	-	-	-	-	-	60	-	122	-	-	-
Nitrate and nitrite as N (NNN)	g/m ³ N	-	8.2	-	1.98	1.98	2.1	2.1	10.4	-	8.2	-	1.98	1.98
Nitrite	g/m ³ N	-	4.0	-	0.004	0.005	0.023	0.03	1.1	-	4.0	-	0.004	0.005
Nitrate	g/m ³ N	-	-	-	1.97	1.98	2.00	2.1	-	-	-	-	1.97	1.98
Total kjeldahl nitrogen	g/m ³ N	-	166	-	-	-	-	-	62	-	166	-	-	-
Total nitrogen	g/m ³	-	174	-	-	-	-	-	72	-	174	-	-	-
Free Ammonia as N	g/m ³	-	3.3	0.0032	0.0002	0.00002	0.0017	0.0011	1.68	0.0015	3.3	0.0032	0.0002	0.00002
Total Ammoniacal-N	g/m ³	-	135	0.69	0.015	0.022	0.51	0.42	49	0.48	135	0.69	0.015	0.022
Dissolved reactive phosphorus	g/m ³ P	-	20	<0.004	0.016	0.014	0.078	0.073	5.5	<0.004	20	<0.004	0.016	0.014
Total phosphorus	g/m ³	-	22	-	-	-	-	-	7.4	-	22	-	-	-
Sulphate	g/m ³	-	12	-	-	-	-	-	11.7	-	12	-	-	-
Total biochemical oxygen demand (BOD)	g O ₂ /m ³	-	27	1.4	<0.4	<0.8	<0.8	<0.8	16	1.5	27	1.4	<0.4	<0.8
Dissolved C-biochemical oxygen demand (CBOD)	g O ₂ /m ³	>2	15.1	-	-	<1.0	<1.0	<1.0	3.2	-	15.1	-	-	<1.0
Chemical oxygen demand (COD)	g O ₂ /m ³	-	300	-	-	-	-	-	88	-	300	-	-	-
Escherichia coli	/100ml	-	62,000	23	230	300	550	180	900	200	62,000	23	230	300
Enterococci	/100ml	-	3,300	3	41	65	65	30	50	10	3,300	3	41	65
Faecal coliforms	/100ml	-	-	-	-	-	-	-	-	-	-	-	-	-
Suspended solids	g/m ³	-	68	25	7	7	7	6	32	18	68	25	7	7
Turbidity	FNU	-	-	-	-	-	-	-	19.6	14.4	-	-	-	-
Black disc	m	-	-	-	1.5	-	-	1.48	-	-	-	-	1.5	-
Oil and grease	g/m ³	-	9	<5	-	-	-	-	5	<4	9	<5	-	-
Sodium absorption ratio (dissolved)	-	-	6.4	-	-	-	-	-	3.4	-	6.4	-	-	-
Potassium absorption ratio	(mmol/L)0.5	-	1.5	-	-	-	-	-	0.6	-	1.5	-	-	-

Surface water monitoring 2020-2021	Site	Discharge	Stormwater	Upstream		Downstream		Discharge	Stormwater	Upstream		Downstream		
	Limit	IND004001	STW002005	WGG000500	WGG000510	WGG000540	WGG000620	IND004001	STW002005	IND004001	STW002005	WGG000500	WGG000510	
	Sample	TRC212146	TRC212148	TRC212144	TRC212145	TRC212147	TRC212149	TRC212981	TRC212983	TRC212146	TRC212148	TRC212144	TRC212145	
Date	-	25 Jun 2021						30 Sep 2021						
Parameter	Time	-	9:20	10:05	11:15	9:35	9:50	11:40	8:20	9:00	9:20	10:05	11:15	9:35
Free chlorine	g/m ³	-	-	<0.05	-	-	-	-	-	<0.05	-	<0.05	-	-
Total/combined chlorine	g/m ³	-	-	<0.08	-	-	-	-	-	<0.08	-	<0.08	-	-

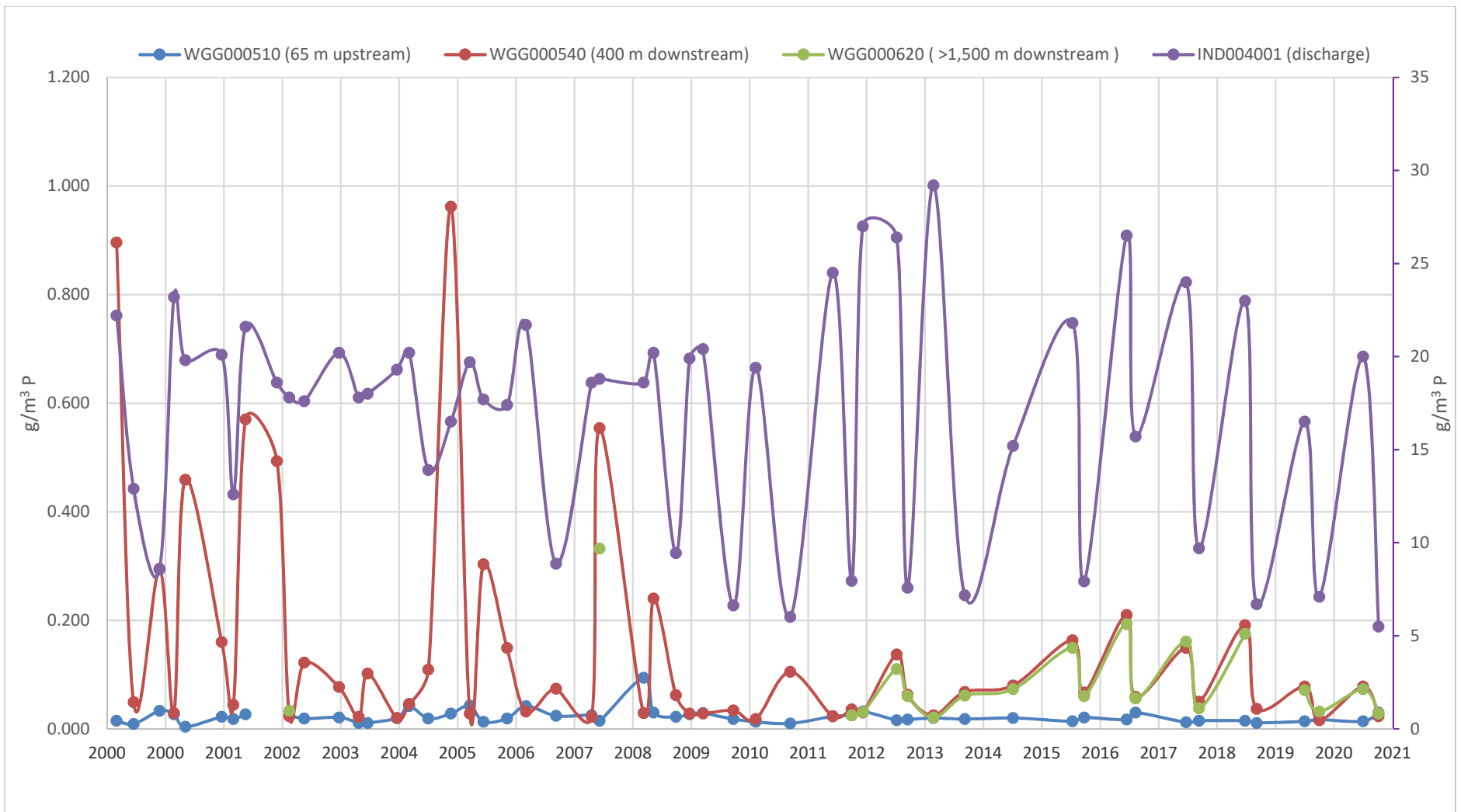


Figure 6 Dissolved reactive phosphorus concentrations

Table 7 Inter-laboratory comparison results June 2021 and September 2021

Surface water monitoring 2020-2021	Site	Discharge		Upstream		Downstream		Discharge		Upstream		Downstream	
		IND004001		WGG000510		WGG000540		IND004001		WGG000510		WGG000540	
	Sample	TRC	ANZCO	TRC	ANZCO	TRC	ANZCO	TRC	ANZCO	TRC	ANZCO	TRC	ANZCO
	Date	25 Jun 2021						30 Sep 2021					
Parameter	Time	9:20		9:35		9:50		9:20		9:30		9:45	
PH	pH	8.1	8.1	6.8	7.6	7.3	7.6	8.2	8.3	7.3	7.7	7.3	7.6
Temperature	° C	10.0	9.5	9.9	9.5	9.9	9.5	13.0	11.2	10.6	10.6	11.0	10.7
Total Ammoniacal-N	g/m ³	135	152	0.02	0.04	0.51	0.55	49	50	0.13	0.05	0.048	0.13
Chemical oxygen demand	g O ₂ /m ³	300	218	-	-	-	-	88	59	-	-	-	-
Suspended solids	g/m ³	68	80	-	-	-	-	32	50	-	-	-	-

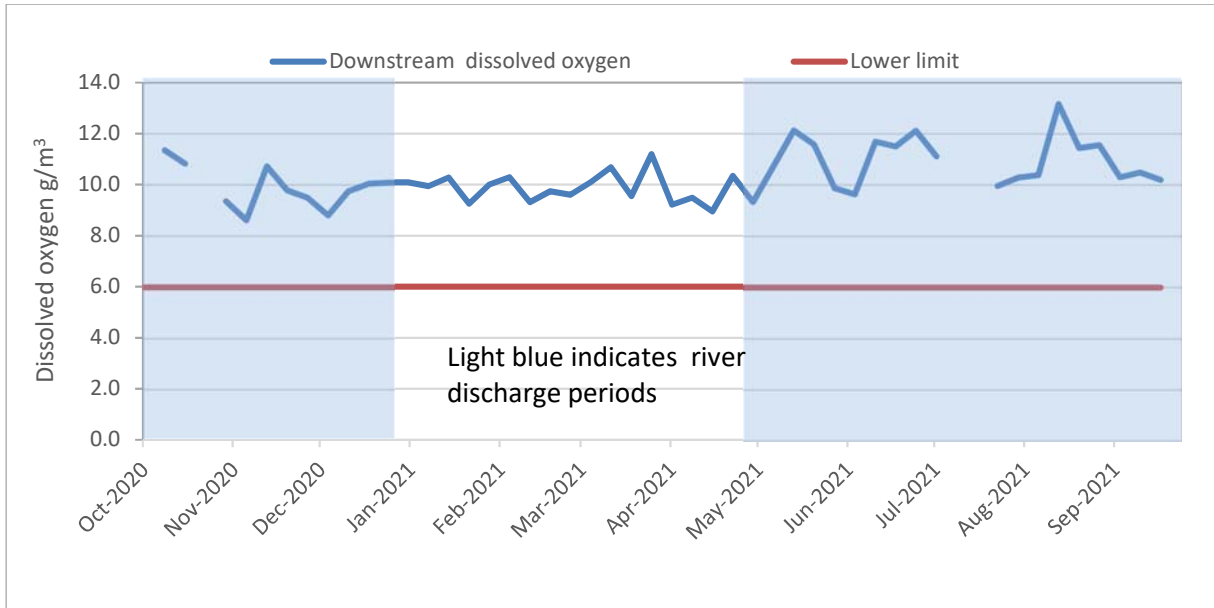


Figure 7 Dissolved oxygen concentrations downstream of discharge 2020-2021

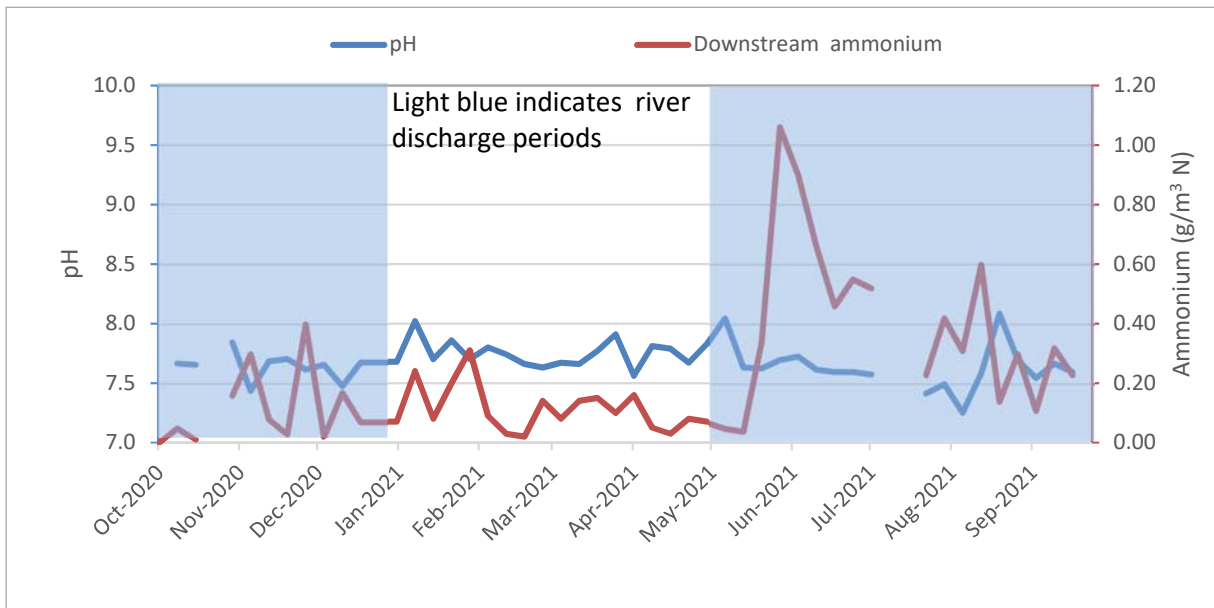


Figure 8 Ammonium and pH concentrations downstream of discharge 2020-2021

2.1.2.3 Discharge to land

Discharge to land by irrigation is permitted under consent 5569-1 and 5736-2. Limits have been set on the daily rate of discharge and the effects of odour and spray drift on the land irrigated and surrounding the activity. The Company are also required to provide a management plan that details how the discharge and any effects will be monitored and where feasible minimised. Consent 5736-2 was not exercised during the period. All discharges to land during the review period occurred under consent 5569-1.

Water quality monitoring is undertaken by the Council at quarterly intervals at 9 groundwater monitoring sites and three shallow surface water monitoring sites. The sampling is undertaken to assess any impacts from irrigation on shallow water resources. Results from sampling undertaken between September 2020 and

October 2021 for surface water monitoring sites are displayed in Table 8 to Table 10 and for groundwater monitoring sites in Table 11 to Table 19.

During the period under review irrigation to land occurred for 33 weeks between the week commencing 6 October 2021 and the week ending 7 June 2021 with the greatest volume of discharge occurring between February and May 2021. The total volume of effluent irrigated to land was 307,555 m³ accounting for 63% of the total effluent (489,378 m³) discharged during the monitoring period.

2.1.2.3.1 Surface water quality monitoring

Surface water monitoring is undertaken at three sites WG000657, GW000660 and WG000663 in the vicinity of the irrigation discharge site. Results are displayed in Table 8, Table 9 and Table 10. Highlighted columns are for the period irrigation was to land. Results indicate there have been no significant changes in surface water quality during the review period.

Historically an increase in nitrate and nitrite as N concentrations can be observed in WGG000657 and WGG000660, located to the east and in the centre of the irrigation site respectively (Figure 9). Results indicate there are no significant seasonal changes in nitrogen concentrations at the site. The local shallow groundwater resources, which have also been shown to be impacted, are the primary source of baseflow to the streams. Therefore the slight increase seen historically in WGG000657 and the more significant increase observed in WGG000660 over time, are likely a direct response to irrigation at the site.

More recently since 2017, the nitrate and nitrite as N concentrations in WGG000657 and WGG00663 are exhibiting a slight decreasing trend whilst concentrations in WGG00660 continue to increase slightly. These changes are likely a response to measures undertaken by the Company to reduce the nitrogen concentrations in the wastewater discharged.

Baseline surface water quality sampling was undertaken at five sites in November 2020 and three sites in March 2021 in relation to the Paulwell Farm site. Results are included as Appendix II. This data will be used for comparison against future sampling results once irrigation has commenced at the site.

2.1.2.3.2 Groundwater quality monitoring

Groundwater monitoring was undertaken at quarterly intervals at 9 sites. Results are displayed in Table 11 to Table 19. The results indicate that there are no significant observable differences between the concentrations of analytes reported during periods of irrigation to land (highlighted columns) and periods of discharge to the river. Concentrations of all analytes appear to have remained relatively stable over the review period.

Baseline groundwater quality sampling was undertaken at three sites in March 2021 in relation to the Paulwell Farm site. Results are included as Appendix II. This data will be used for comparison against future sampling results once irrigation has commenced at the site.

Table 8 Surface water quality results WGG000657

Sample details	Units	WGG000657				
		TRC202766	TRC203935	TRC210867	TRC211923	TRC212542
Date	Collected	8-Sep-20	20-Nov-20	23-Feb-21	26-May-21	21-Sep-21
Time	Time	13:50	12:45	10:40	13:45	13:40
PH	pH	7.0	7.7	7.2	7.5	6.8
Electrical conductivity	µS/cm@25°	214	229	218	224	214
Temperature	°C	12.6	14.4	14.8	12.6	12.5
Turbidity	NTU	4.2	4.3	3.3	9.2	4.3
Dissolved reactive phosphorus	g/m ³ P	0.007	0.013	0.007	0.006	0.005
Total ammoniacal-N	g/m ³	0.017	0.139	0.012	<0.010	<0.010

Sample details	Units	WGG000657				
		TRC202766	TRC203935	TRC210867	TRC211923	TRC212542
Date	Collected	8-Sep-20	20-Nov-20	23-Feb-21	26-May-21	21-Sep-21
Time	Time	13:50	12:45	10:40	13:45	13:40
Free ammonia as N	g/m ³ N	0.00004	0.00194	0.00005	<0.00007	<0.000015
Nitrate and nitrite as N	g/m ³ N	3.8	3.9	3.6	3.8	4.0
Nitrate	g/m ³ N	3.8	3.8	3.6	3.8	4.0
Nitrite	g/m ³ N	0.005	0.098	0.002	0.005	0.004

Table 9 Surface water quality results WGG000660

Sample details	Units	WGG000660				
		TRC202756	TRC203925	TRC210858	TRC211913	TRC212533
Date	Collected	8-Sep-20	20-Nov-20	23-Feb-21	26-May-21	21-Sep-21
Time	Time	9:40	9:10	8:25	10:05	9:55
PH	pH	7.0	7.4	7.3	7.3	6.9
Electrical conductivity	µS/cm@25°	245	250	247	244	235
Temperature	°C	11	14.4	15.4	11.1	12.3
Turbidity	NTU	2.3	8.6	2.1	2.9	1.8
Dissolved reactive phosphorus	g/m ³ P	<0.004	0.015	0.006	0.005	0.005
Total ammoniacal-N	g/m ³	0.046	0.063	0.04	0.031	0.03
Free ammonia as N	g/m ³ N	0.0001	0.00043	0.00022	0.00012	0.000052
Nitrate and nitrite as N	g/m ³ N	4.0	3.4	2.3	3.0	3.6
Nitrate	g/m ³ N	4.0	3.4	2.3	3.0	3.6
Nitrite	g/m ³ N	0.011	0.015	0.008	0.005	0.004

Table 10 Surface water quality results WGG000663

Sample details	Units	WGG000663				
		TRC202764	TRC203933	TRC210865	TRC211921	TRC212540
Date	Collected	8-Sep-20	20-Nov-20	23-Feb-21	26-May-21	21-Sep-21
Time	Time	12:05	11:10	9:30	12:05	12:05
PH	pH	7.1	7.7	7.3	7.4	6.9
Electrical conductivity	µS/cm@25°	195	200	213	201	193
Temperature	°C	11.5	14.4	15.1	10.2	12.8
Turbidity	NTU	7.8	7.4	2.0	7.4	5.8
Dissolved reactive phosphorus	g/m ³ P	<0.004	0.005	0.005	0.007	0.006
Total ammoniacal-N	g/m ³	0.019	<0.010	0.013	<0.010	<0.010
Free ammonia as N	g/m ³ N	0.00005	<0.00013	0.00008	<0.00005	<0.000017
Nitrate and nitrite as N	g/m ³ N	2.9	2.6	2.7	2.8	3.0
Nitrate	g/m ³ N	2.9	2.6	2.7	2.8	3.0
Nitrite	g/m ³ N	0.003	0.003	0.003	0.06	0.003

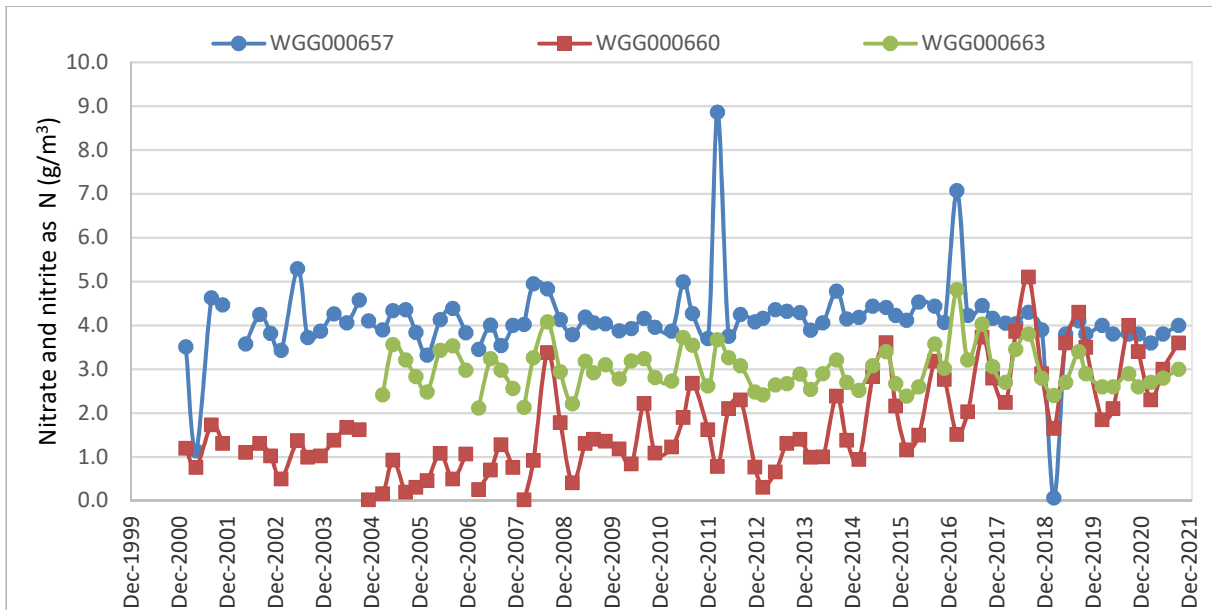


Figure 9 Nitrate and nitrite as N concentrations in surface water 1999-2021

2.1.2.3.3 Nitrogen in groundwater

An increase in the concentration of nitrate and nitrite as N can be seen in some bores (GND198, GND1189, GND1306, GND197 and GND1345) over time (Figure 10). The up-gradient control bore GND0849, which provides an indication of concentrations outside the area of effects, has exhibited a decrease in concentrations since monitoring commenced. (Figure 10).

GND1344 located in the east of the irrigation site although exhibiting significantly lower concentrations of nitrogen than the other bores has also been impacted by the discharge. The high chemical oxygen demand (COD) at this site, which is a measure of the capacity of the groundwater to consume oxygen during the decomposition of organic matter, indicates that GND1344 is undergoing denitrification due to anoxic groundwater conditions (redox).

More recently, since 2016 a slight decrease in nitrate and nitrite as N concentrations can be seen in some bores (GND1345, GND1197 and GND1187) whilst others (GND1306, GND1189 and GND1188) continue to show an increase or appear to have stabilised (GND1196, GND1198 and GND1306). The up-gradient control bore GND0849 although exhibiting an overall decline since monitoring commenced also shows a slight increasing trend since 2016, which is likely a response to the overall land use, (predominantly dairy) in the vicinity of the bore.

The slight improvements seen recently in GND1345 and GND1197 are likely a response to the reduced nitrogen loadings in the wastewater following the decision to transport blood offsite for processing (Figure 11)

Nitrate concentrations in GND1345, GND1197, GND1306, GND1189 and GND1188 all currently exceed the recommended limit of 11.3 mg/L (as N) for drinking water. GND1189 which has reported the highest concentrations to date, is a wide diameter well previously used to supply water to a nearby dwelling. Due to the high nitrates in the well this supply is no longer utilised and all pumping equipment has been removed from the well. As a result of the pumping equipment being removed and the well no longer being utilised for supply, it is no longer sampled as part of the groundwater monitoring programme.

Table 11 Groundwater sampling undertaken by the Council at GND1196

Sample details	Units	GND1196				
		TRC202762	TRC203931	TRC210863	TRC211919	TRC212538
Date	-	08-Sep-20	20-Nov-20	23-Feb-21	26-May-21	21-Sep-21
Time	-	0.479166667	10:15	9:05	11:00	11:05
PH	pH	6.8	7.1	6.7	6.9	6.6
Electrical conductivity	$\mu\text{S}/\text{cm}@25^\circ$	199	193	200	212	197
Temperature	$^\circ\text{C}$	14.2	13.9	14.4	13.7	13.6
COD	g/m^3	<6	<6	<6	<6	<6
Calcium	g/m^3	10.3	10.0	10.3	11.2	12.2
Magnesium	g/m^3	4.4	4.4	4.6	4.9	4.5
Potassium	g/m^3	6.2	6.1	6.1	6.2	5.9
Chloride	g/m^3	19	20	20	22	20
Sodium	g/m^3	19	19	19	19	18
Total ammoniacal-N	g/m^3	0.021	<0.010	<0.010	<0.010	<0.010
Free ammonia as N	$\text{g}/\text{m}^3 \text{ N}$	0.000031	<0.00003	<0.00003	<0.000019	<0.000010
Nitrate and nitrite as N	$\text{g}/\text{m}^3 \text{ N}$	2.7	2.3	2.8	2.8	2.7
Nitrate	$\text{g}/\text{m}^3 \text{ N}$	2.7	2.3	2.8	2.8	2.7
Nitrite	$\text{g}/\text{m}^3 \text{ N}$	<0.002	<0.002	<0.002	<0.002	<0.002

Table 12 Groundwater sampling undertaken by the Council at GND1197

Sample details	Units	GND1197				
		TRC202763	TRC203932	TRC210864	TRC211920	TRC212539
Date	-	8-Sep-20	20-Nov-20	23-Feb-21	26-May-21	21-Sep-21
Time	-	11:50	10:45	9:25	11:40	11:40
PH	pH	6.3	6.9	6.3	6.5	6.5
Electrical conductivity	$\mu\text{S}/\text{cm}@25^\circ$	351	349	359	350	345
Temperature	$^\circ\text{C}$	14.3	14	14.5	14.4	13.6
COD	g/m^3	<6	<6	<6	<6	<6
Calcium	g/m^3	19.5	19.6	19.2	19.3	19.8
Magnesium	g/m^3	8.1	8.5	8.5	8.2	7.8
Potassium	g/m^3	8.4	9.4	8.8	8.5	8.6
Chloride	g/m^3	31	28	30	30	33
Sodium	g/m^3	29	31	30	30	31
Total ammoniacal-N	g/m^3	<0.010	<0.010	<0.010	<0.010	<0.010
Free ammonia as N	$\text{g}/\text{m}^3 \text{ N}$	<0.000010	<0.000019	<0.000010	<0.000010	<0.000010
Nitrate and nitrite as N	$\text{g}/\text{m}^3 \text{ N}$	15.7	15.3	15.7	16.4	12.4
Nitrate	$\text{g}/\text{m}^3 \text{ N}$	15.7	15.3	15.7	16.4	12.4
Nitrite	$\text{g}/\text{m}^3 \text{ N}$	<0.002	<0.002	<0.002	<0.002	<0.002

Table 13 Groundwater sampling undertaken by the Council at GND1198

Sample details	Units	GND1198				
		TRC202758	TRC203927	TRC210859	TRC211915	TRC212534
Date	-	8-Sep-20	20-Nov-20	23-Feb-21	26-May-21	21-Sep-21
Time	-	10:40	9:20	8:45	10:15	10:20
PH	pH	6.7	6.8	6.6	6.8	6.5
Electrical conductivity	$\mu\text{S}/\text{cm}@25^\circ$	236	228	228	227	236
Temperature	$^\circ\text{C}$	13.8	13.8	15	14.3	13.4
COD	g/m^3	>6	<6	<6	<6	>6

Sample details	Units	GND1198				
		TRC202758	TRC203927	TRC210859	TRC211915	TRC212534
Date	-	8-Sep-20	20-Nov-20	23-Feb-21	26-May-21	21-Sep-21
Time	-	10:40	9:20	8:45	10:15	10:20
Calcium	g/m ³	12.7	12.3	11.6	12.1	14.2
Magnesium	g/m ³	6.3	6.4	6.1	6.1	6.3
Potassium	g/m ³	4.5	4.2	4.4	4.2	4.3
Chloride	g/m ³	25	23	23	21	27
Sodium	g/m ³	22	21	21	24	22
Total ammoniacal-N	g/m ³	<0.010	<0.010	<0.010	<0.010	<0.010
Free ammonia as N	g/m ³ N	<0.000014	<0.000017	<0.000011	<0.000015	<0.000010
Nitrate and nitrite as N	g/m ³ N	8.3	7.5	6.6	6.4	6.8
Nitrate	g/m ³ N	8.3	7.5	6.6	6.4	6.8
Nitrite	g/m ³ N	<0.002	<0.002	<0.002	<0.002	<0.002

Table 14 Groundwater sampling undertaken by the Council at GND1344

Sample details	Units	GND1344				
		TRC202755	TRC203924	TRC210857	TRC211912	TRC212532
Date	-	8-Sep-20	20-Nov-20	23-Feb-21	26-May-21	21-Sep-21
Time	-	9:15	8:55	0.4375	9:45	9:30
PH	pH	7.2	7	6.8	7.2	6.9
Electrical conductivity	µS/cm@25°	257	245	249	252	266
Temperature	°C	13.7	13.6	14.5	14.1	13.2
COD	g/m ³	23	28	10	22	10
Calcium	g/m ³	13	13.2	14.6	12.6	14
Magnesium	g/m ³	7.2	7.5	8.7	7.1	7.2
Potassium	g/m ³	8.1	7.8	7.2	7.8	7.2
Chloride	g/m ³	22	22	24	22	24
Sodium	g/m ³	24	23	23	23	23
Total ammoniacal-N	g/m ³	1.16	1.01	1.05	1.16	0.68
Free ammonia as N	g/m ³ N	0.0044	0.0024	0.00183	0.0046	0.00131
Nitrate and nitrite as N	g/m ³ N	0.078	0.033	0.128	0.054	0.46
Nitrate	g/m ³ N	0.059	0.024	0.12	0.014	0.45
Nitrite	g/m ³ N	0.018	0.008	0.007	0.04	0.01

Table 15 Groundwater sampling undertaken by the Council at GND1345

Sample details	Units	GND1345				
		TRC202760	TRC203929	TRC210861	TRC211917	TRC212536
Date	-	8-Sep-20	20-Nov-20	23-Feb-21	26-May-21	21-Sep-21
Time	-	13:20	12:20	10:15	12:10	13:10
PH	pH	6.3	6.5	6.2	6.4	6.3
Electrical conductivity	µS/cm@25°	344	349	311	351	295
Temperature	°C	14.8	14.5	14.6	15	13.7
COD	g/m ³	<6	<6	<6	<6	<6
Calcium	g/m ³	17.0	16.4	15.1	17.2	16.1
Magnesium	g/m ³	10.1	9.8	9.2	10.3	8.6
Potassium	g/m ³	6.4	6.3	6.1	6.3	5.3
Chloride	g/m ³	32	31	29	34	30
Sodium	g/m ³	29	28	26	28	25
Total ammoniacal-N	g/m ³	<0.010	<0.010	<0.010	<0.010	<0.010

Sample details	Units	GND1345				
		TRC202760	TRC203929	TRC210861	TRC211917	TRC212536
Date	-	8-Sep-20	20-Nov-20	23-Feb-21	26-May-21	21-Sep-21
Time	-	13:20	12:20	10:15	12:10	13:10
Free ammonia as N	g/m ³ N	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Nitrate and nitrite as N	g/m ³ N	16.1	15.8	12.5	16.9	9.7
Nitrate	g/m ³ N	16.1	15.8	12.5	16.9	9.7
Nitrite	g/m ³ N	<0.002	<0.002	<0.002	<0.002	<0.002

Table 16 Groundwater sampling undertaken by the Council at GND0849 (control site)

Sample details	Units	GND0849				
		TRC202767	TRC203936	TRC210868	TRC211924	TRC212543
Date	-	8-Sep-20	20-Nov-20	23-Feb-21	26-May-21	21-Sep-21
Time	-	14:15	13:10	10:45	14:15	14:10
PH	pH	6.8	6.7	6.6	6.9	6.4
Electrical conductivity	µS/cm@25°	168	148	165	17.3	181
Temperature	°C	13.8	14.8	15.2	14.3	13
Total ammoniacal-N	g/m ³	<0.010	<0.010	<0.010	<0.010	<0.010
Free ammonia as N	g/m ³	<0.000017	<0.000013	<0.000013	<0.00003	<0.000010
Nitrate and nitrite as N	g/m ³ N	4.3	4.5	3.8	4.8	5.2
Nitrate	g/m ³ N	4.3	4.5	3.8	4.8	5.2
Nitrite	g/m ³ N	<0.002	<0.002	<0.002	<0.002	<0.002

Table 17 Groundwater sampling undertaken by the Council at GND1187

Sample details	Units	GND1187				
		TRC202759	TRC203928	TRC210860	TRC211916	TRC212535
Date	-	8-Sep-20	20-Nov-20	23-Feb-21	26-May-21	21-Sep-21
Time	-	13:00	11:50	10:00	12:20	12:30
PH	pH	6.7	6.9	6.7	7	6.6
Electrical conductivity	µS/cm@25°	254	250	260	283	254
Temperature	°C	14.8	15.6	15.2	13.3	14.6
Total ammoniacal-N	g/m ³	<0.010	<0.010	<0.010	<0.010	<0.010
Free ammonia as N	g/m ³	<0.000014	<0.00003	<0.000014	<0.00003	<0.000012
Nitrate and nitrite as N	g/m ³ N	4.9	4.8	4.6	5.2	4.2
Nitrate	g/m ³ N	4.9	4.8	4.6	5.2	4.2
Nitrite	g/m ³ N	<0.002	<0.002	<0.002	<0.002	<0.002

Table 18 Groundwater sampling undertaken by the Council at GND1188

Sample details	Units	GND1188				
		TRC202765	TRC203934	TRC210866	TRC211922	TRC212541
Date	-	8-Sep-20	20-Nov-20	23-Feb-21	26-May-21	21-Sep-21
Time	-	12:15	11:30	9:35	12:10	12:15
PH	pH	6.4	6.8	6.5	6.8	6.5
Electrical conductivity	µS/cm@25°	288	273	289	284	285
Temperature	°C	14.8	15.8	16.1	15.1	14.9
Total ammoniacal-N	g/m ³	<0.010	0.011	<0.010	<0.010	<0.010
Free ammonia as N	g/m ³	<0.000010	0.00002	<0.000010	<0.000017	<0.000010
Nitrate and nitrite as N	g/m ³ N	11.7	11.2	11.9	11.6	10.5

Sample details	Units	GND1188				
		TRC202765	TRC203934	TRC210866	TRC211922	TRC212541
Date	-	8-Sep-20	20-Nov-20	23-Feb-21	26-May-21	21-Sep-21
Time	-	12:15	11:30	9:35	12:10	12:15
Nitrate	g/m ³ N	11.7	11.2	11.9	11.6	10.5
Nitrite	g/m ³ N	<0.002	<0.002	<0.002	<0.002	<0.002

Table 19 Groundwater sampling undertaken by the Council at GND1306

Sample details	Units	GND1306				
		TRC202761	TRC203930	TRC210862	TRC211918	TRC212537
Date	-	8-Sep-20	20-Nov-20	23-Feb-21	26-May-21	21-Sep-21
Time	-	11:10	9:40	8:55	10:40	10:45
PH	pH	6.3	6.9	6.3	6.7	6.3
Electrical conductivity	µS/cm@25°	386	358	351	342	337
Temperature	°C	14	15.1	14.2	13.2	13.6
Total ammoniacal-N	g/m ³	<0.010	<0.010	<0.010	<0.010	<0.010
Free ammonia as N	g/m ³	<0.000010	<0.00003	<0.00001	<0.000013	<0.000010
Nitrate and nitrite as N	g/m ³ N	16.6	14.9	12.5	13.9	11.4
Nitrate	g/m ³ N	16.6	14.9	12.5	13.9	11.4
Nitrite	g/m ³ N	<0.002	0.008	<0.002	<0.002	<0.002

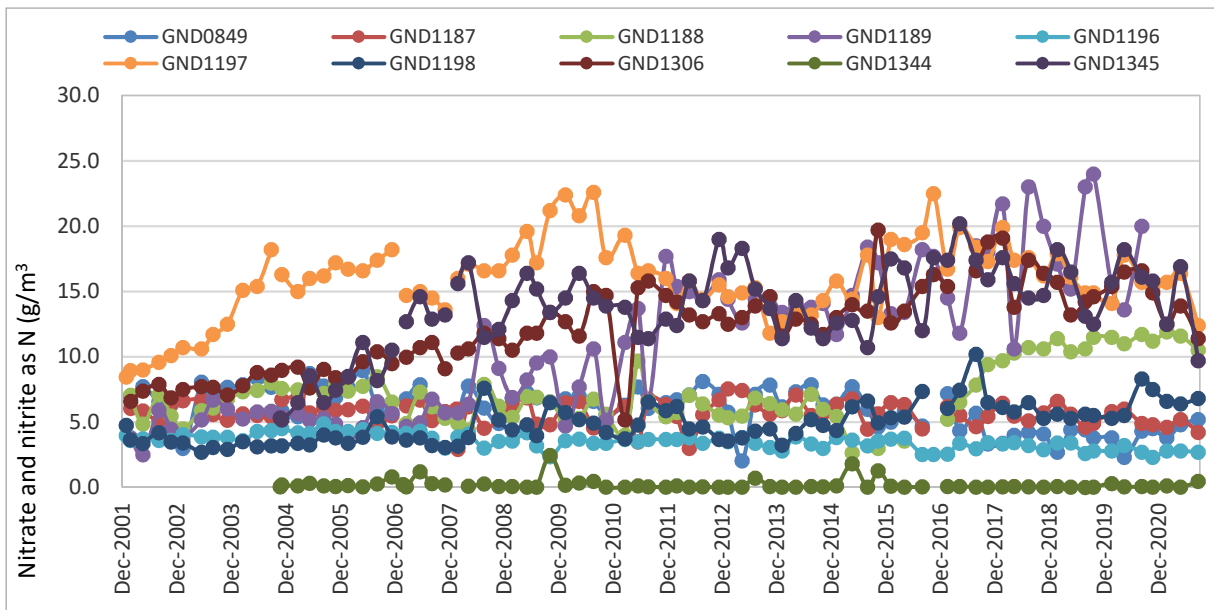


Figure 10 Nitrate and nitrite as N concentrations in groundwater 2001-2021

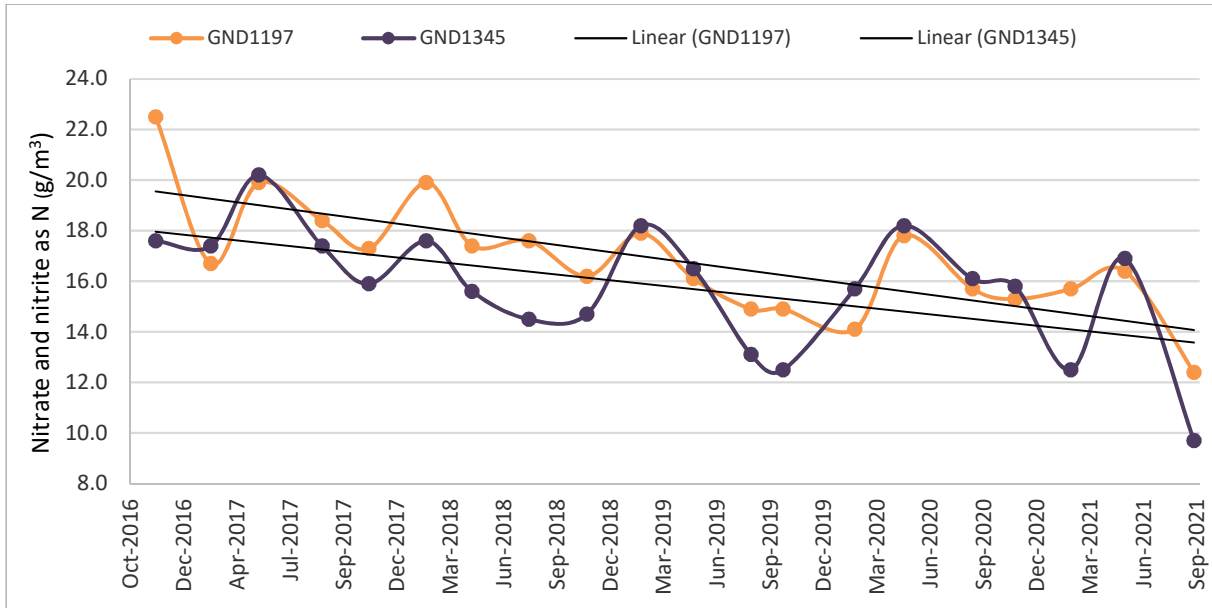


Figure 11 Decreasing nitrate and nitrite as N concentrations in groundwater 2016-2021

2.1.2.3.4 Effluent and nitrogen loading application rates

The Company monitors the volume of effluent pumped from the plant for discharge to land and uses this to calculate the volume of effluent irrigated to each paddock, using the area of the paddock and an assumed standard application depth of 45 mm. Nitrogen loadings are then calculated using the weekly total nitrogen value per hectare.

The consent requires that effluent application rates not exceed 300 kg per hectare per year. The calculated nitrogen rates per hectare indicate no exceedances of the limit occurred during the review period (Table 20).

Irrigation to land was undertaken between October 2020 and June 2021 for a period of 33 weeks. A total of 307,555 m³ of effluent was irrigated, which accounted for 63% of the total effluent discharged over the review period. This represents a total of 32,924 kg of nitrogen, which is slightly higher than was applied last year. During the last three years the total nitrogen discharged has decreased significantly from previous years. The significant reduction in nitrogen is a result of blood now being transported off-site for processing rather than being treated on-site through the settlement pond system. During the 2020-2021 irrigation period the average nitrogen loading per hectare of paddock irrigated was 123.5 kg.

Table 20 Nitrogen loadings October 2020 to October 2021

Nitrogen loadings from irrigation to Stuart Road Block 2020-2021 season											
Paddock	kg/Ha	Paddock	kg/Ha	Paddock	kg/Ha	Paddock	kg/Ha	Paddock	kg/Ha	Paddock	kg/Ha
B1	135.0	Y1	0.0	P1	119.3	O1	0.0	G1	122.0	G23	127.4
B2	112.1	Y2	0.0	P2	163.8	O2	131.4	G2	0.0	G24	156.2
B3	110.3	Y3	163.4	P3	144.5	O3	134.6	G3	153.5	G25	144.5
B4	107.3	Y4	156.6	P4	128.3	O4	115.2	G4	101.7	G26	159.8
B5	134.1	Y5	158.4	P5	113.9	O5	0.0	G5	116.6	G27	145.4
B6	174.2	Y6	0.0	P6	156.6	O6	165.2	G6	104.0	G28	142.7
B7	0.0	Y7	106.7	P7	108.5	O7	112.5	G7	145.4	G29	140.0
B8	136.8	Y8	154.4	P8	158.9	O8	112.5	G8	151.7	-	-
B9	152.6	Y9	162.9	P9	89.6	O9	167.4	G9	92.3	-	-
B10	134.1	Y10	150.8	P10	116.6	O10	119.3	G10	160.7	-	-
B11	166.1	Y11	124.2	-	-	O11	141.3	G11	95.0	-	-
B12	115.7	Y12	141.8	-	-	O12	132.8	G12	120.2	-	-
B13	112.5	Y13	86.0	-	-	O13	153.5	G13	149.9	-	-

Nitrogen loadings from irrigation to Stuart Road Block 2020-2021 season											
Paddock	kg/Ha	Paddock	kg/Ha	Paddock	kg/Ha	Paddock	kg/Ha	Paddock	kg/Ha	Paddock	kg/Ha
B14	127.8	Y14	126.0	-	-	O14	162.5	G14	172.8	-	-
B15	108.5	Y15	115.2	-	-	O15	100.4	G15	140.0	-	-
B16	103.1	Y16	132.3	-	-	-	-	G16	135.0	-	-
B17	104.9	Y17	147.8	-	-	-	-	G17	145.4	-	-
B18	145.8	Y18	107.1	-	-	-	-	G18	166.5	-	-
B19	160.2	Y19	0.0	-	-	-	-	G19	119.3	-	-
-	-	Y20	159.8	-	-	-	-	G20	124.7	-	-
-	-	Y21	0.0	-	-	-	-	G21	0.0	-	-
-	-	Y22	0.0	-	-	-	-	G22	112.1	-	-

2.1.3 Biological surveys

The Council's standard 'kick-sampling' technique was used at three established sites to collect streambed macroinvertebrates from the Waingongoro River. Samples were processed to provide number of taxa (richness), MCI and SQMCI_s scores, and EPT taxa for each site.

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The SQMCI_s takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities. It may be the more appropriate index if non-organic impacts are occurring.

Significant differences in either the MCI or the SQMCI_s between sites indicate the degree of adverse effects (if any) of the discharges being monitored.

January 2021 (Spring Survey)

Macroinvertebrate richness were moderate for all three sites. Site 1 had a higher taxa richness than sites 2 and 3 by six to seven taxa respectively with site 3 seven taxa lower than its historical median but only one taxon different from the previous survey. Given the moderate taxa richness present at all three sites and the high taxa abundances there was no evidence that the discharge was having a negative effect on macroinvertebrate communities.

The MCI scores indicated 'good' health at all the sites with no significant differences between sites and with no decline in MCI scores below the discharge. Furthermore, all three sites had MCI scores higher than historic medians. Therefore, there was no evidence that the discharge affected macroinvertebrate health below the discharge point.

SQMCI scores indicated that all three sites were in 'excellent' health with no significant differences between sites. This provides further evidence that the macroinvertebrate communities were not being affected by nutrient enrichment from the ANZCO plant at the time of the survey.

No heterotrophic growths were recorded indicating that discharges from ANZCO were not causing high levels of dissolved organic compounds in the Waingongoro River downstream of the discharge, which was consistent with the macroinvertebrate indices.

March 2021 (Summer Survey)

Macroinvertebrate richness were moderate for all three sites. Site 1 (the control site) had a taxa richness equal to site 2 (primary impact site) and six taxa less than site 3 (secondary impact site). Taxa richness were lower than historical medians by 1-7 taxa. Given the moderate taxa richness present at all three sites and the high taxa abundances (e.g. extremely abundant *Deleatidium* at the impact sites) there was no evidence that the discharge was having a negative effect on macroinvertebrate communities.

The MCI scores indicated 'good' health at all the sites with the primary impact site having a score significantly higher than that of the control site. Furthermore, all three sites had MCI scores equal to or higher than historic medians. Therefore, there was no evidence that the discharge affected macroinvertebrate health below the discharge point.

SQMCI scores indicated that site 1 was in good health, site 2 was in excellent health and site 3 in very good health. Both impact sites has significantly higher scores than the control site and higher than their respective historic medians. This provides further evidence that the macroinvertebrate communities were not being affected by nutrient enrichment from the ANZCO plant at the time of the survey.

No heterotrophic growths were recorded indicating that discharges from ANZCO were not causing high levels of dissolved organic compounds in the Waingongoro River downstream of the discharge, which was consistent with the macroinvertebrate indices.

Summary

Overall, the results of the January 2021 and March 2021 macroinvertebrate surveys indicated that the discharge of waste from the ANZCO meatworks had not had any recent significant detrimental effects on the macroinvertebrate communities of the Waingongoro River.

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

2.1.3.1.1 Soil and herbage monitoring

Industrial Chemistry Services undertake soil and herbage sampling and analysis on behalf of the Company at five sites across the irrigated area. Soil samples are collected from 75 - 150 mm below ground and analysed for a selection of parameters. Sampling was undertaken on 27 September 2021. Results are included in Table 21 below and indicate the following:

- Total nitrogen concentrations ranged between 4.2 and 5.2% of dry matter (DM);
- The concentrations of the majority of analytes exceeded plant and animal requirements during the sampling round.

Table 21 Herbage monitoring results September 2021

Soil analysis	Site	Eltham Spray Irrigation Area					Requirements	
Parameter	Area	Area 2	Area 3	Area 4	Area 5	Area 6	Plant	Animal
Date	Unit	27 September 2021						
Nitrogen	% of DM	4.9	5.2	4.5	4.3	4.2	4.5 - 5.5	1.52
Phosphorus	% of DM	0.48	0.49	0.47	0.39	0.41	0.34 - 0.42	0.31
Potassium	% of DM	4.8	4.1	3.8	3.9	3.5	2.5 - 3.0	0.4
Sulphur	% of DM	0.4	0.37	0.33	0.32	0.3	0.27 - 0.32	0.11
Magnesium	mg/kg DM	0.22	0.23	0.22	0.18	0.19	0.16 - 0.22	0.11
Calcium	mg/kg DM	0.24	0.35	0.35	0.4	0.4	0.35 - 0.50	0.35
Sodium	mg/kg DM	0.13	0.17	0.32	0.24	0.27	n/a	0.09
Manganese	mg/kg DM	60	49	71	40	53	25 - 30	25
Zinc	mg/kg DM	60	55	47	40	41	14 - 20	26
Copper	mg/kg DM	13	12	9.2	9.3	9.3	6 - 7	10
Iron	mg/kg DM	130	91	81	70	93	50 - 65	50
Molybdenum	mg/kg DM	2.4	3.7	3.9	2.8	3.3	n/a	0.15 - 0.30
Chloride	mg/kg DM	1.9	1.6	1.9	1.5	1.6	10 - 20	n/a

Soil analysis	Site	Eltham Spray Irrigation Area					Requirements	
Parameter	Area	Area 2	Area 3	Area 4	Area 5	Area 6	Plant	Animal
Date	Unit	27 September 2021						
Grass staggers index		6.0	4.4	4.2	4.6	4.0	Safe <1.8	Risk >2.2
DCAD		473	452	384	488	380	n/a	Risk >200

2.1.4 Air

The discharge of emissions to air is permitted under consent 4644-3 for emissions relating to meat processing and associated activities at the premises.

2.1.4.1 Inspections

The Company undertakes weekly walkovers of the site and the Council undertakes additional air surveys during site inspections and in response to any public complaints.

During the period under review there were no incidents reported by the public and no significant odours detected by the Company or the Council during inspections.

Surveys undertaken by the Company reported the following:

- Slight occasional wafts (level 1) were reported during some of the weekly odour surveys across some months;
- A slight but constant waft (level 2) was also reported during June 2021; and
- When slight odours were reported they were noted to be emanating from either the ponds or yards.

Surveys undertaken by the Council during the quarterly site inspections reported no significant odour was detected during any inspection or at any designated monitoring site beyond the plant boundary.

2.2 Investigations, interventions and incidents

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

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

Complaints may be alleged to be associated with a particular site. If there is potentially an issue of legal liability, the Council must be able to prove by investigation that the identified company is indeed the source of the incident (or that the allegation cannot be proven).

Table 23 below sets out details of any incidents recorded, additional investigations, or interventions required by the Council in relation to the Company's activities during the 2020-2021 period. This table presents details of all events that required further investigation or intervention regardless of whether these were found to be compliant or not.

In relation to the 2020-2021 period, the Company provided the information required to complete the report providing options for reducing DRP levels in their discharge and the feasibility of implementing the reduction options on 19 February 2021.

The contingency plan that details measures and procedures to be undertaken in the event of a pipeline failure under Condition 2 of Consent 5739-2 was submitted late.

The annual report summarising the Company's water conservation measures in compliance with condition 6 of Consent 5437-3.1 required for submission by 31 May each year was submitted late.

The administrative oversights were a result of staff shortages and issues related to the ongoing COVID19 pandemic. The administrative compliance evaluation has been assessed as "good" to reflect the minor non-compliances.

Table 22 Incidents, investigations, and interventions summary table

Date	Details	Compliant (Y/N)	Enforcement Action Taken?	Outcome
15/05/2019	The DRP report received on 5 April 2019 did not fully meet the requirements of Condition 13 of Consent 2039-4.1	N	N/A	The additional information was submitted 19 February 2021
17/11/2021	Annual report required by 31 May each year under Consent 5437-3.1 was not provided	N	Administration performance rating reduced	Provided late 20/01/2022
18/01/2022	The contingency report required by condition 2 of consent 5739-2 has not been provided	N	Administration performance rating reduced	Submitted late 20/01/2022

3 Discussion

3.1 Discussion of site performance

Inspections

Regular inspections of the site were undertaken by a Council Officer to assess compliance with consent conditions. During the inspections the site was found to be tidy and being well managed.

Surface water abstraction

During the monitoring year, the Company met the abstraction rate limits of their surface water abstraction consent.

Discharge to water

In general, discharges to water were compliant with consent conditions.

DRP concentrations recorded in sites monitored downstream of the Company's discharge were significantly higher than those monitored upstream. No measurable impacts on the macroinvertebrate communities were observed downstream of the site during either biomonitoring survey. Stormwater sampling was undertaken as part of the surface water sampling programme.

Discharge to air

For the discharge to air, compliance with consent conditions was achieved. Inspection of the site and odour surveys were carried out by the consent holder and Council's officers. No complaints were received from the public.

Discharge to land

For the discharge to land, the disposal of treated wastewater was generally well managed. Sampling undertaken reported no observable significant changes in groundwater or surface water quality during the period under review. Compliance with consent conditions was achieved with the following exception.

Historical data indicate there may be some long term effects on groundwater and shallow surface water quality over time as a result of irrigation of effluent to land. This is discussed further in the next section. The Company have improved the management of nitrogen at the site resulting in a reduction of loading to the paddocks over time (Table 23). The slight reduction in nitrogen concentrations seen in some bores over recent years may be a direct result of these measures. However, due to the slow movement of groundwater it may be several years before any significant improvement in nitrogen concentrations can be seen across the whole site.

Table 23 Nitrogen irrigated to the paddocks since 2016-2017 period

Period	Kg nitrogen	Period	Kg nitrogen
2020-2021	32,924	2017-2018	52,030
2019-2020	30,294	2016-2017	66,081
2018-2019	37,269	-	-

Provision of data

In regard to administrative performance, some issues were identified in respect of the timely provision and/or content of reports as summarised below:

- The additional information required for the report investigating DRP levels under Condition 13 of Consent 2039-4.1 was submitted late;

- The contingency plan required by condition 2 of consent 5739-2 issued 2 May 2017, was submitted late; and
- The annual water conservation report required under Condition 8 of Consent 5437-3.1 was submitted late.

3.2 Environmental effects of exercise of consents

Surface water abstraction

During the October 2020 to September 2021 monitoring year 288,706 m³ of water use on-site was sourced from the Waingongoro River under consent 5437-4 and 184,056 m³ was sourced from the Eltham municipal water supply. There were no recorded or observable impacts to the river as a result of the abstraction and all relevant conditions were complied with.

Discharge to water

The results of January 2021 (spring) and March 2021 (summer) macroinvertebrate surveys indicated that the discharge of treated wastewater and uncontaminated stormwater discharges from the Company's site had not had any detrimental effect on the macroinvertebrate communities of the Waingongoro River beyond consented limits. No observable impacts were noted during inspection and all prescribed surface water quality limits were met.

DRP concentrations recorded in sites monitored downstream of the Company's discharge are significantly higher than those monitored upstream. To date increased concentrations downstream do not appear to have had any detrimental effects on macroinvertebrate communities.

Discharge to air

Some slight occasional wafts of odour were reported during some of the weekly inspections undertaken by the Company. These events did not result in objectionable or offensive odours beyond the site boundary. No complaints were received by the Council from the public regarding any odours or emissions to air.

Discharge to land

Groundwater results remained relatively stable in all bores during the period under review. However, historical data since 2001 indicates that nitrate concentrations have increased significantly in some bores and at one surface water monitoring site over time. The historical data indicates there may be some long term effects on groundwater and shallow surface water quality over time as a result of irrigation of effluent to land. Five of the bores currently exhibit nitrate concentrations that exceed the New Zealand guidelines for nitrate in drinking water. The impacts appear to be localised to the centre of the irrigated area and due to the slow movement of groundwater are not expected to be affecting groundwater at any significant distance beyond the site boundaries at this stage. To alleviate the impacts on groundwater at the site the Company have plans to commence irrigation at Paulwell Farm under Consent 5736-2 during the 2021-2022 season.

3.3 Evaluation of performance

A tabular summary of the consent holder's compliance record for the year under review is set out in Table 24 to Table 31. A summary of the consent holder's compliance record from 2014 to date is set out in Table 32 for comparison.

Table 24 Summary of performance for consent 1968-4

Purpose: To discharge stormwater from various locations at a meat processing plant site into the Waingongoro River		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adopt best practicable option	Site inspection – checking that standard operating procedures to achieve compliance with conditions are followed	Yes
2. Limit on catchment area	Site inspection	Yes
3. Concentration limits upon potential contaminants in discharge	Stormwater sampling	Yes
4. Controls on effect of discharge in receiving water	Inspection, river sampling and bio-monitoring	Yes
5. Maintenance of contingency plan	Receipt and certification of Plan. Plan received, approved 11 September 2008. Updated Plan received 12 February 2015	Yes
6. Maintenance of stormwater management plan	Receipt and certification of Plan. Plan received, approved 11 September 2008. Updated Plan received 12 February 2015	Yes
7. Consultation over significant proposed changes	Liaison during visits. No significant changes undertaken during year	N/A
8. Optional review provision re environmental effects	Option not available. Next review date June 2023	N/A
Overall assessment of environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 25 Summary of performance for consent 2039-4.1

Purpose: To discharge treated wastewater into the Waingongoro River		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Limits of discharge rates and volumes	Inspections of data and discharge point inspections	Yes
2. Concentration limits upon potential contaminants in discharge	Chemical sampling and biomonitoring	Yes
3. Notification of significant proposed changes	Inspections and receipt of notification. No significant changes undertaken during year	Yes

Purpose: To discharge treated wastewater into the Waingongoro River		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
4. Installation of meter and datalogger	Inspection and receipt of data	Yes
5. Provision of records	Records received	Yes
6. Activities to be exercised in accordance with a management plan	Inspections and liaison and receipt of Company reports	Yes
7. Review and update of management plan	Plan received by Council and approved in 1997. Most recent update Sept 2003 approved by Council	Yes
8. Option for review of wastewater plan	No review sought by either Council or Company. Not requested	N/A
9. Plan to be implemented	Inspections and liaison and receipt of Company reports	Yes
10. Designated staff member	Officer introduced to Council	Yes
11. Adopt the best practical option (bpo)	Review of management plan and inspections	Yes
12. Donation to Taranaki Tree Trust	Confirmation with Council finance department that donation received	Yes
13. Provide a report investigating dissolved reactive phosphorus DRP	Receipt of report	Yes
14. Optional review following receipt of DRP report	Review of report	N/A
15. Optional review provision re environmental effects	Next consideration June 2023	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 26 Summary of performance for consent 4644-3

Purpose: To discharge emissions into the air arising from meat processing and associate activities		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Discharge to take place from authorised area	Inspection by Council	Yes
2. Discharge to take place as described in application	Inspection by Council	Yes
3. Consultation over significant proposed changes	On-going liaison. No significant changes undertaken during year	N/A

Purpose: To discharge emissions into the air arising from meat processing and associate activities		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
4. Adopt best practicable option (bpo) to prevent or minimise adverse effects	Liaison with Company and inspection by Council	Yes
5. Minimise emissions and effects by most appropriate equipment and operational controls	Inspection by Council	Yes
6. No offensive or objectionable odour beyond boundary	Odour surveys by both Company and Council, and keeping of complaints record	Yes
7. Provision of air quality management plan	Plan received by Council and approved in 1997. Most recent update received 11 February 2015	Yes
8. Optional review provision re environmental effects	Option not available. Next review date 1 June 2023.	N/A
Overall assessment of environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 27 Summary of performance for consent 5437-3.1

Purpose: To take and use water from the Waingongoro River for use in a meat processing plant		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Limit on maximum abstraction rate	Continuous flow metering by consent holder	Yes
2. Installation of flow meter and provision of records	Inspection, review of data	Yes
3. Certification of flow meter	Receipt of certification. (Provided 17 November 2019)	Yes
4. Reporting of monitoring equipment faults	Inspection, receipt of reports	Yes
5. Access to metering system	Inspection	Yes
6. Formatting of records	Inspection, and review of data received	Yes
7. Adopt best practicable option for conservation of water	Site inspection – checking that standard operating procedures to achieve compliance with conditions are followed	Yes
8. Annual report on water use and recycling	Receipt of waste minimisation report within the Company's annual report	Submitted late
9. Intake screened and designed to protect fish	Inspection	Yes
10. Intake modifications not to affect juvenile fish	Inspection	N/A
11. Donation to Council for riparian protection	Confirmation with Council finance dept. that donation received	Yes

Purpose: To take and use water from the Waingongoro River for use in a meat processing plant		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
12. Optional review provision re environmental effects	Next review date June 2023	Yes
Overall assessment of environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		High Good

Table 28 Summary of performance for consent 5569-1

Purpose: To discharge up to 3500 cubic/metres/day of treated wastewater from meat processing and associated activities by irrigation onto and into land, and to discharge emissions into the air in the vicinity of various unnamed tributaries of the Waingongoro River		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Operational within 12 months of issue	Irrigation commenced January 2001	N/A
2. Provision of spray irrigation management plan	Plan received by Council and approved in 2001. Most recent update received 6 September 2019	Yes
3. Plan to be followed	Liaison, inspections and provision of monitoring reports	Yes
4. Optional review of management plan	Updated plan requested and received by Council	Yes
5. Designated staff member	Part of Company Technical Manager's job description	Yes
6. Prohibition of untreated blood	Inspections	Yes
7. No offensive or objectionable odour beyond boundary	Inspections and complaint register	Yes
8. No spray drift beyond boundary	Inspections, and complaint register	Yes
9. Biosolids/sludge from aerobic ponds only	Inspections. No bio-solids/sludge discharged on Stuart Road property	N/A
10. Limit on sodium adsorption ratio	Chemical monitoring	Yes
11. Prohibition of ponding and run-off	Inspections	Yes
12. Spray buffer zones	Inspections	Yes
13. Limit on nitrogen application rate to 300 kg/ha/year	Monitoring by Company and data review by Council.	Yes
14. Provisions for contamination of groundwater or water supply	Monitoring by Council	No, nitrate increasing over time
15. Maintenance of monitoring bores	Inspection and sampling	Yes

Purpose: To discharge up to 3500 cubic/metres/day of treated wastewater from meat processing and associated activities by irrigation onto and into land, and to discharge emissions into the air in the vicinity of various unnamed tributaries of the Waingongoro River		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
16. Baseline and operational monitoring	Soil, herbage and water quality sampling by the Company	Yes
17. Optional review provision for operational requirements	Not sought by Company	N/A
18. Optional review provision to assess design of treatment/disposal system	Option no longer available	N/A
19. Optional review provision re environmental effects	Options no longer available. Consent expires June 2026	N/A
Overall assessment of environmental performance in respect of this consent		Good
Overall assessment of administrative performance in respect of this consent		High

Table 29 Summary of performance for consent 5736-2

Purpose: To discharge treated wastewater from meat processing and associated activities by irrigation onto and into land, and to discharge the associated emissions into the air at or about (NZTM) 1708468E-5634921N		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Discharge only from pond 6 or 7	Inspection by Council	N/A
2. No offensive or objectionable odour beyond boundary	Inspections and complaint register	N/A
3. No spray drift beyond boundary	Inspections, and complaint register	N/A
4. Limit on sodium adsorption ratio	Chemical monitoring	N/A
5. Prohibition of ponding and run-off	Inspection and complaint register	N/A
6. Spray buffer zones	Inspection by Council	N/A
7. Limit on Nitrogen application rate	Monitoring by Company and data review by Council	N/A
8. Provisions for contamination of groundwater or water supply	No local groundwater use downslope, no contamination of roof water	N/A
9. Provision of wastewater irrigation management plan	Plan for disposal of bio-solids produced August 2005	N/A
10. Review of plan following a request from the Council	Receipt and review of plan	N/A

Purpose: To discharge treated wastewater from meat processing and associated activities by irrigation onto and into land, and to discharge the associated emissions into the air at or about (NZTM) 1708468E-5634921N		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
11. Plan to be provided to third parties for review		N/A
12. Designated staff member	Part of Company Technical Manager's job description	Yes
13. Adopt best practicable option (bpo) to prevent or minimise adverse effects	Liaison with Company and inspections	N/A
14. Maintenance of monitoring bores	Bores installed in during 2020-2021 year	N/A
15. Monitoring of surface waters to be undertaken downstream	Chemical and microbiological monitoring by Council	N/A
16. Baseline and operational monitoring of herbage, soil and water	Water monitoring by Council and soil/herbage monitoring by Company	N/A
17. Annual report on consent compliance	Receipt of annual report	N/A
18. Optional review provision re environmental effects	Next review date June 2023	N/A
Overall assessment of environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		Not exercised

Table 30 Summary of performance for consent 5739-2

Purpose: To erect, place and maintain a pipeline under the bed of the Waingongoro River		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Requirement if changes to structure required	Receipt of notification	N/A
2. Maintain and review Contingency Plan for pipeline failure	Receipt of Contingency Plan	Submitted late
3. Requirement for maintenance of structure	Inspection of structure	Yes
4. Optional review provision re environmental effects	Next review data June 2023	N/A
Overall assessment of environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		High Good

Table 31 Summary of performance for consent 6455-1

Purpose: <i>To erect, place and maintain a culvert in, and to realign, an unnamed tributary of the Waingongoro River for site access purposes</i>		
Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adopt best practicable option (bpo) to avoid or minimise adverse effects	Liaison with Company and inspection of structure	Yes
2. Construction and maintenance in accordance with documentation	Inspection by Council	Yes
3. Notification prior to and after works	Notifications given 17 and 30 April 2007	Yes
4. Timing of maintenance works	Liaison with Company and inspection	Yes
5. Riverbed disturbance and reinstatement	Inspection by Council	Yes
6. Lapse of consent if not exercised	Consent exercised	N/A
7. Optional review provision re environmental effects	Option not available. Consent expires June 2023	N/A
Overall assessment of environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		High

Table 32 Evaluation of environmental performance since 2014

Year	Consent no	High	Good	Improvement required	Poor
2020-2021	1968-4	1	-	-	-
	2039-4.1	1	-	-	-
	4644-3	1	-	-	-
	5437-3.1	1	-	-	-
	5569-1	1	-	-	-
	5736-2	1	-	-	-
	5739-2	-	1	-	-
	6455-1	1	-	-	-
2019-2020	1968-4	1	-	-	-
	2039-4.1	1	-	-	-
	4644-3	1	-	-	-
	5437-3.1	1	-	-	-
	5569-1	-	1	-	-
	5736-2	Not exercised			
	5739-2	1	-	-	-

Year	Consent no	High	Good	Improvement required	Poor
	6455-1	1	-	-	-
2018-2019	1968-4	1	-	-	-
	2039-4.1	-	-	1	-
	4644-3	1	-	-	-
	5437-3.1	1	-	-	-
	5569-1	-	1	-	-
	5736-2	Not exercised			
	5739-2	1	-	-	-
	6455-1	1	-	-	-
2017-2018	1968-4	1	-	-	-
	2039-4.1	1	-	-	-
	4644-3	1	-	-	-
	5437-3.1	1	-	-	-
	5569-1	-	-	1	-
	5604-1	Consent no longer required			
	5736-2	Not exercised			
	5739-2	1	-	-	-
6455-1	1	-	-	-	
2016-2017	1968-4	-	1	-	-
	2039-4	1	-	-	-
	4644-3	1	-	-	-
	5437-3	1	-	-	-
	5569-1	-	-	1	-
	5604-1	1	-	-	-
	5736-2	Not exercised			
	5739-1	1	-	-	-
	5739-2	1	-	-	-
	6455-1	1	-	-	-
	7487-1	Lapsed 30 September 2015			
2015-2016	1968-4	1	-	-	-
	2039-4	1	-	-	-
	4644-2	1	-	-	-
	4644-3	1	-	-	-
	5437-3	-	1	-	-
	5569-1	-	-	1	-
	5604-1	-	1	-	-

Year	Consent no	High	Good	Improvement required	Poor
	5736-2	Not exercised			
	5739-1	1	-	-	-
	6455-1	1	-	-	-
	7487-1	Lapsed 30 September 2015			
2014-2015	1968-4	1	-	-	-
	2039-4	1	-	-	-
	4644-3	1	-	-	-
	5437-3	1	-	-	-
	5569-1	-	1	-	-
	5604-1	1	-	-	-
	5736-2	Not exercised			
	5739-1	1	-	-	-
	6455-1	1	-	-	-
	7487-1	Not exercised			
Totals		43	7	3	0

During the year, the Company demonstrated a good level of environmental performance and good level of administrative performance with the resource consents as defined in Section 1.1.4. There are some issues in the supply of reporting in a timely manner and some improvement required under consent 5569-1 in environmental performance, relating to nitrate concentrations in groundwater.

Since 2014 the Company has generally maintained either a good or high level of environmental and administrative performance with resource consents.

3.4 Recommendations from the 2019-2020 Annual Report

In the 2019-2020 Annual Report, it was recommended:-

1. THAT monitoring of water abstraction and discharges in relation to the meat processing plant of ANZCO Foods Eltham Ltd in the 2019-2020 year continue at the same level as in 2018-2019.
2. THAT the DRP report provided under condition 13 of Consent 2039-4.1 be updated to include the following requirements;
 - Options for further reducing DRP levels; and
 - The feasibility of implementing DRP reduction options.
3. THAT the contingency report required by condition 2 of consent 5739-2 be submitted for review.

The recommendations above were implemented during the period under review.

3.5 Alterations to monitoring programmes for 2021-2022

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

- the extent of information already made available through monitoring or other means to date;
- its relevance under the RMA;

- the Council's obligations to monitor consented activities and their effects under the RMA;
- the record of administrative and environmental performances of the consent holder; and
- reporting to the regional community.

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

It is proposed that for 2021-2022:

1. THAT monitoring of water abstraction and discharges in relation to the meat processing plant of ANZCO Foods Eltham Ltd in the 2021-2022 year continue at the same level as in 2020-2021.

A recommendation to this effect is attached to this report.

It should be noted that the proposed programme represents a reasonable and risk-based level of monitoring for the site(s) in question. The Council reserves the right to subsequently adjust the programme from that initially prepared, should the need arise if potential or actual non-compliance is determined at any time during 2021-2022.

4 Recommendations

1. THAT monitoring of water abstraction and discharges in relation to the meat processing plant of ANZCO Foods Eltham Ltd in the 2021-2022 year continue at the same level as in 2020-2021.

Glossary of common terms and abbreviations

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

Biomonitoring	Assessing the health of the environment using aquatic organisms.
BOD	Biochemical oxygen demand. A measure of the presence of degradable organic matter, taking into account the biological conversion of ammonia to nitrate.
BODF	Biochemical oxygen demand of a filtered sample.
Bund	A wall around a tank to contain its contents in the case of a leak.
CBOD	Carbonaceous biochemical oxygen demand. A measure of the presence of degradable organic matter, excluding the biological conversion of ammonia to nitrate.
cfu	Colony forming units. A measure of the concentration of bacteria usually expressed as per 100 millilitre sample.
COD	Chemical oxygen demand. A measure of the oxygen required to oxidise all matter in a sample by chemical reaction.
Conductivity	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 25°C and expressed in $\mu\text{S}/\text{cm}$.
DCAD	Dietary cation-anion difference. Calculated by adding together the milliequivalents of dietary cations (sodium + potassium) and subtracting the sum of the milliequivalents of dietary anions (chloride + sulfur).
DO	Dissolved oxygen.
DRP	Dissolved reactive phosphorus.
E.coli	Escherichia coli, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample.
Ent	Enterococci, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre of sample.
F	Fluoride.
FC	Faecal coliforms, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample.
Fresh	Elevated flow in a stream, such as after heavy rainfall.
$\text{g}/\text{m}^2/\text{day}$	grams/metre ² /day.
g/m^3	Grams per cubic metre, and equivalent to milligrams per litre (mg/L). In water, this is also equivalent to parts per million (ppm), but the same does not apply to gaseous mixtures.
Incident	An event that is alleged or is found to have occurred that may have actual or potential environmental consequences or may involve non-compliance with a consent or rule in a regional plan. Registration of an incident by the Council does not automatically mean such an outcome had actually occurred.
Intervention	Action/s taken by Council to instruct or direct actions be taken to avoid or reduce the likelihood of an incident occurring.
Investigation	Action taken by Council to establish what were the circumstances/events surrounding an incident including any allegations of an incident.

Incident Register	The Incident Register contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan.
L/s	Litres per second.
M ³	Cubic Metres.
MCI	Macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the sensitivity of the taxa present to organic pollution in stony habitats.
mS/m	Millisiemens per metre.
Mixing zone	The zone below a discharge point where the discharge is not fully mixed with the receiving environment. For a stream, conventionally taken as a length equivalent to 7 times the width of the stream at the discharge point.
NH ₄	Ammonium, normally expressed in terms of the mass of nitrogen (N).
NH ₃	Unionised ammonia, normally expressed in terms of the mass of nitrogen (N).
NNN	Nitrate and nitrate combined, expressed in terms of the mass of nitrogen (N).
NO ₃	Nitrate, normally expressed in terms of the mass of nitrogen (N).
NTU	Nephelometric Turbidity Unit, a measure of the turbidity of water.
O&G	Oil and grease, defined as anything that will dissolve into a particular organic solvent (e.g. hexane). May include both animal material (fats) and mineral matter (hydrocarbons).
PM ₁₀ , PM _{2.5} , PM _{1.0}	Relatively fine airborne particles (less than 10 or 2.5 or 1.0 micrometre diameter, respectively).
pH	A numerical system for measuring acidity in solutions, with 7 as neutral. Numbers lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength. For example, a pH of 4 is ten times more acidic than a pH of 5.
Physicochemical	Measurement of both physical properties (e.g. temperature, clarity, density) and chemical determinants (e.g. metals and nutrients) to characterise the state of an environment.
Resource consent	Refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15).
RMA	<i>Resource Management Act 1991</i> and including all subsequent amendments.
SS	Suspended solids.
SQMCI	Semi quantitative macroinvertebrate community index.
Temp	Temperature, measured in °C (degrees Celsius).
Turb	Turbidity, expressed in NTU.
UI	Unauthorised Incident.
µS/cm	Microsiemens per centimetre.

For further information on analytical methods, contact a Science Services Manager.

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Appendix I

Resource consents held by ANZCO Foods Eltham Ltd

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

Water abstraction permits

Section 14 of the RMA stipulates that no person may take, use, dam or divert any water, unless the activity is expressly allowed for by a resource consent or a rule in a regional plan, or it falls within some particular categories set out in Section 14. Permits authorising the abstraction of water are issued by the Council under Section 87(d) of the RMA.

Water discharge permits

Section 15(1)(a) of the RMA stipulates that no person may discharge any contaminant into water, unless the activity is expressly allowed for by a resource consent or a rule in a regional plan, or by national regulations. Permits authorising discharges to water are issued by the Council under Section 87(e) of the RMA.

Air discharge permits

Section 15(1)(c) of the RMA stipulates that no person may discharge any contaminant from any industrial or trade premises into air, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations. Permits authorising discharges to air are issued by the Council under Section 87(e) of the RMA.

Discharges of wastes to land

Sections 15(1)(b) and (d) of the RMA stipulate that no person may discharge any contaminant onto land if it may then enter water, or from any industrial or trade premises onto land under any circumstances, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations. Permits authorising the discharge of wastes to land are issued by the Council under Section 87(e) of the RMA.

Land use permits

Section 13(1)(a) of the RMA stipulates that no person may in relation to the bed of any lake or river use, erect, reconstruct, place, alter, extend, remove, or demolish any structure or part of any structure in, on, under, or over the bed, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations. Land use permits are issued by the Council under Section 87(a) of the RMA.

Coastal permits

Section 12(1)(b) of the RMA stipulates that no person may erect, reconstruct, place, alter, extend, remove, or demolish any structure that is fixed in, on, under, or over any foreshore or seabed, unless the activity is expressly allowed for by a resource consent, a rule in a regional plan, or by national regulations. Coastal permits are issued by the Council under Section 87(c) of the RMA.

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

Name of
Consent Holder: Riverlands Eltham Limited
P O Box 124
ELTHAM 4353

Decision Date: 9 July 2012

Commencement
Date: 9 July 2012

Conditions of Consent

Consent Granted: To discharge stormwater from various locations at a meat processing plant site into the Waingongoro River at or about (NZTM) 1710920E-5634567N

Expiry Date: 1 June 2029

Review Date(s): June 2017, June 2023, and/or within 3 months of receiving notification under special condition 7

Site Location: London Street, Eltham

Legal Description: Lot 1 DP 11593 [Discharge source & site]

Catchment: Waingongoro

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

General condition

- a. The consent holder shall pay to the Taranaki Regional Council [the Council] all the administration, monitoring and supervision costs of this consent, fixed in accordance to section 36 of the Resource Management Act.

Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.
2. The stormwater discharged shall be from a catchment area not exceeding 1.8 hectares
3. Constituents of the discharge shall meet the standards shown in the following table.

Constituent	Standard
pH	Within the range 6.0 to 10
suspended solids	Concentration not greater than 100 gm ⁻³
oil and grease	Concentration not greater than 15 gm ⁻³

This condition shall apply before entry of the treated stormwater into the receiving waters at a designated sampling point approved by the Chief Executive, Taranaki Regional Council.

4. After allowing for reasonable mixing, within a mixing zone extending 20 metres downstream of the discharge point, the discharge shall not, either by itself or in combination with other discharges, give rise to any or all of the following effects in the receiving water:
 - a) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
 - b) any conspicuous change in the colour or visual clarity;
 - c) any emission of objectionable odour;
 - d) the rendering of fresh water unsuitable for consumption by farm animals;
 - e) any significant adverse effects on aquatic life.
5. The consent holder shall maintain a contingency plan that details measures and procedures to be undertaken to prevent spillage or any discharge of contaminants not authorised by this consent. The contingency plan shall be followed in the event of a spill or unauthorised discharge and shall be certified by the Chief Executive, Taranaki Regional Council as being adequate to avoid, remedy or mitigate the environmental effects of such a spillage or discharge.
6. The consent holder shall maintain a stormwater management plan that documents how the site is to be managed to minimise the contaminants that become entrained in the stormwater. This plan shall be followed at all times, shall be certified by the Chief Executive, Taranaki Regional Council, and shall include but not necessarily be limited to:

Consent 1968-4

- a) the loading and unloading of materials;
- b) maintenance of conveyance systems;
- c) general housekeeping; and
- d) management of the interceptor system.

A Stormwater Management Plan template is available in the Environment section of the Taranaki Regional Council's web site www.trc.govt.nz.

7. The consent holder shall notify the Chief Executive, Taranaki Regional Council, prior to making any changes to the processes or operations undertaken at the site, or the chemicals used or stored on site, that could alter the nature of the discharge. Any such change shall then only occur following receipt of any necessary approval under the Resource Management Act 1991. Notification shall include the consent number, a brief description of the activity consented and an assessment of the environmental effects of any changes, and be emailed to consents@trc.govt.nz.
8. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review:
 - a) during the month of June 2017 and/or June 2023 and/or
 - b) within 3 months of receiving a notification under special condition 7 above;

for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 9 July 2012

For and on behalf of
Taranaki Regional Council

Director-Resource Management

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

Name of
Consent Holder: Riverlands Eltham Limited
PO Box 124
Eltham 4353

Decision Date
(Review): 13 October 2017

Commencement Date
(Review): 13 October 2017 (Granted Date: 9 July 2012)

Conditions of Consent

Consent Granted: To discharge treated wastewater into the Waingongoro River

Expiry Date: 1 June 2029

Review Date(s): June 2023, June 2026

Site Location: London Street, Eltham

Grid Reference (NZTM) 1710612E-5634427N

Catchment: Waingongoro

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

General condition

- a. The consent holder shall pay to the Taranaki Regional Council all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. The discharge shall not exceed 3500 cubic metres per day and the rate of discharge shall not exceed 81 litres per second.
2. After allowing for reasonable mixing, within a mixing zone extending 100 metres downstream of the discharge point, the discharge shall not give rise to any of the following effects in the receiving water:
 - (a) a reduction in the dissolved oxygen concentration below 6 gm⁻³;
 - (b) the concentration of total (un-ionised and ionised) ammonia nitrogen as gm⁻³ nitrogen exceeding the values given in Table 1 below for the corresponding pH;
 - (c) the concentration of filtered carbonaceous Biochemical Oxygen Demand (20 °C, 5-day test) exceeding 2 gm⁻³;
 - (d) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials;
 - (e) any conspicuous change in the colour or visual clarity;
 - (f) any emission of objectionable odour;
 - (g) the rendering of fresh water unsuitable for consumption by farm animals;
 - (h) any significant adverse effects on aquatic life, habitats, or ecology; and
 - (i) a decrease in water clarity of greater than 33% as determined using the standard black disc measurement.
3. The consent holder shall advise the Taranaki Regional Council prior to making any change in the processes undertaken at the site which could significantly alter the nature of the discharge. The advice shall be given by emailing consents@trc.govt.nz.
4. Before exercising this consent the consent holder shall install, and thereafter maintain a meter and a datalogger at the site of discharge. The meter and datalogger shall be tamper-proof and shall measure and record the rate and volume of the discharge to an accuracy of ± 5%, at intervals not exceeding 15 minutes. Records of the date, the time and the rate and volume the discharge, shall be made available to the Chief Executive, Taranaki Regional Council on request.
5. The records of water discharged shall:
 - a) be in a format that, in the opinion of the Chief Executive, Taranaki Regional Council, is suitable for auditing;
 - b) specifically record the water discharged as 'zero' when no water is discharged; and
 - c) be transmitted to the Taranaki Regional Council's computer system within two hours of being recorded.

Consent 2039-4.1

6. Subject to the other conditions this consent, this consent shall be exercised in accordance with a 'Wastewater Disposal Management Plan' (the 'Management Plan') that has been approved by the Chief Executive, Taranaki Regional Council, acting in a certification capacity. The Management Plan shall detail the management of the discharge in combination with the land disposal authorised by consents 5569-1 and 5736-2 (Joblin Farm and Paulwell Farm), and the methods and procedures undertaken by the consent holder to ensure that the conditions of this consent are met and can be shown to be met. It shall address but not necessarily be limited to the following matters:
 - (a) monitoring the water quality and rate of the discharge;
 - (b) monitoring the water quality and flow in the receiving water;
 - (c) management of the wastewater treatment system;
 - (d) minimisation of phosphorous and nitrogen in the wastewater discharge and how this is being achieved;
 - (e) treatment and disposal of screenings and oxidation pond sludges;
 - (f) criteria for the use of spray irrigation or discharge to surface water;
 - (g) reporting on the exercise of the consent; and
 - (h) methods and procedures utilised to minimise the discharge to the Waingongoro River, and the effects of that discharge, and to maximise the discharge to land.
7. Within three months of the granting of this consent, the consent holder shall update and review the management plan required by condition 6 and resubmit the plan for certification by the Chief Executive, Taranaki Regional Council.
8. Within one months notice given by the Taranaki Regional Council, the consent holder shall review the management plan required by condition 6 and resubmit the plan for certification by the Chief Executive, Taranaki Regional Council.
9. A copy of any reviewed Plan, as per conditions 7 and 8, shall be provided to the Department of Conservation and Fish and Game New Zealand (Taranaki Region), for the Taranaki Regional Council to take into account any comments received (within a two week timeframe from when the Plan was provided).
10. The consent holder shall designate an officer with the necessary qualifications and/or experience to manage the wastewater system. The officer shall be regularly trained on the content and implementation of the wastewater disposal management plan, and shall be advised immediately of any revision or additions to the management plan.
11. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act, to prevent or minimise any adverse effects on the environment from the exercise of this consent.
12. The consent holder shall mitigate the effects of the discharge by making annual payments of \$9000 (GST exclusive) to the Taranaki Regional Council as a financial contribution for the purpose of providing riparian planting and management in the Waingongoro River catchment excluding that area being irrigated under consent 5569. The amount to be paid shall be adjusted annually according to the consumer price index, or similar index, to account for the effects of inflation, and be made no later than 1 September each year.

Consent 2039-4.1

13. Before 31 December 2013 the consent holder shall engage a suitably qualified independent person to prepare a report investigating Dissolved Reactive Phosphorus (DRP) in the discharge and options for reducing it. The report shall include, but not necessary be limited to:
 - (a) Details the DRP levels in the discharge and its potential environmental effect on the Waingongoro River;
 - (b) Benchmarking of DRP levels with other discharges of a similar nature;
 - (c) Options for further reducing DRP levels; and
 - (d) The feasibility of implementing DRP reduction options.
14. The Council may, pursuant to section 128 of the Resource Management Act 1991, review any or all of the conditions of this consent by giving notice of review within 60 days of receiving a report required by condition 13 for the purpose of requiring specific conditions to reduce the levels of Dissolved Reactive Phosphorus (DRP) in the discharge.
15. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2017 and/or June 2023 and/or June 2026 for the purposes of:
 - (a) ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time; and/or
 - (b) to require any data collected in accordance with the conditions of this consent to be transmitted directly to the Council's computer system, in a format suitable for providing a 'real time' record over the internet.

Signed at Stratford on 13 October 2017

For and on behalf of
Taranaki Regional Council

A D McLay
Director - Resource Management

Table 1: Maximum total ammonia concentration in the Waingongoro River for a given pH

pH of receiving water	Total Ammonia (gm ⁻³)	pH of receiving water	Total Ammonia (gm ⁻³)	pH of receiving water	Total Ammonia (gm ⁻³)
		7.1	2.96	8.1	1.09
		7.2	2.81	8.2	0.935
		7.3	2.65	8.3	0.795
		7.4	2.47	8.4	0.673
6.5	3.48	7.5	2.28	8.5	0.568
6.6	3.42	7.6	2.07	8.6	0.480
6.7	3.36	7.7	1.87	8.7	0.406
6.8	3.28	7.8	1.66	8.8	0.345
6.9	3.19	7.9	1.46	8.9	0.295
7.0	3.08	8.0	1.27	9.0	0.254

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

Name of
Consent Holder: ANZCO Foods Limited
PO Box 124
Eltham 4353

Decision Date: 5 May 2016

Commencement Date: 5 May 2016

Conditions of Consent

Consent Granted: To discharge emissions into the air arising from meat processing and associated activities at the factory premises

Expiry Date: 1 June 2035

Review Date(s): June 2023, June 2029

Site Location: 75 London Street, Eltham

Grid Reference (NZTM) 1710980E-5634465N

Catchment: Waingongoro

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

General condition

- a. The consent holder shall pay to the Taranaki Regional Council all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. This consent authorises emissions only from the area shown on the attached map.
2. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of the original application for this consent and any subsequent applications to change conditions. In the case of any contradiction between the documentation submitted in support of previous applications and the conditions of this consent, the conditions of this consent shall prevail.
3. Prior to undertaking any alterations to the plant, processes or operations which may significantly change the nature or quantity of contaminants emitted from the site, the consent holder shall consult with the Chief Executive, Taranaki Regional Council, and shall obtain any necessary approvals under the Resource Management Act 1991.
4. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this resource consent.
5. The consent holder shall minimise the emissions and impacts of contaminants discharged into air from the site by:
 - a) the selection of the most appropriate process equipment;
 - b) process control equipment and emission control equipment;
 - c) the methods of control;
 - d) supervision and operation; and
 - e) the proper and effective operation, supervision, maintenance and control of all equipment and processes at all times.
6. The discharges authorised by this consent shall not give rise to any odour at or beyond the boundary of the site that is offensive or objectionable.
7. The site shall be operated in accordance with an 'Odour Management Plan' prepared by the consent holder and approved by the Chief Executive, Taranaki Regional Council, acting in a certification capacity. The plan shall detail how the site will be managed to achieve compliance with the conditions of this consent and shall address, as a minimum:
 - a. possible sources of objectionable air discharge;
 - b. air emissions control; and
 - c. air monitoring.

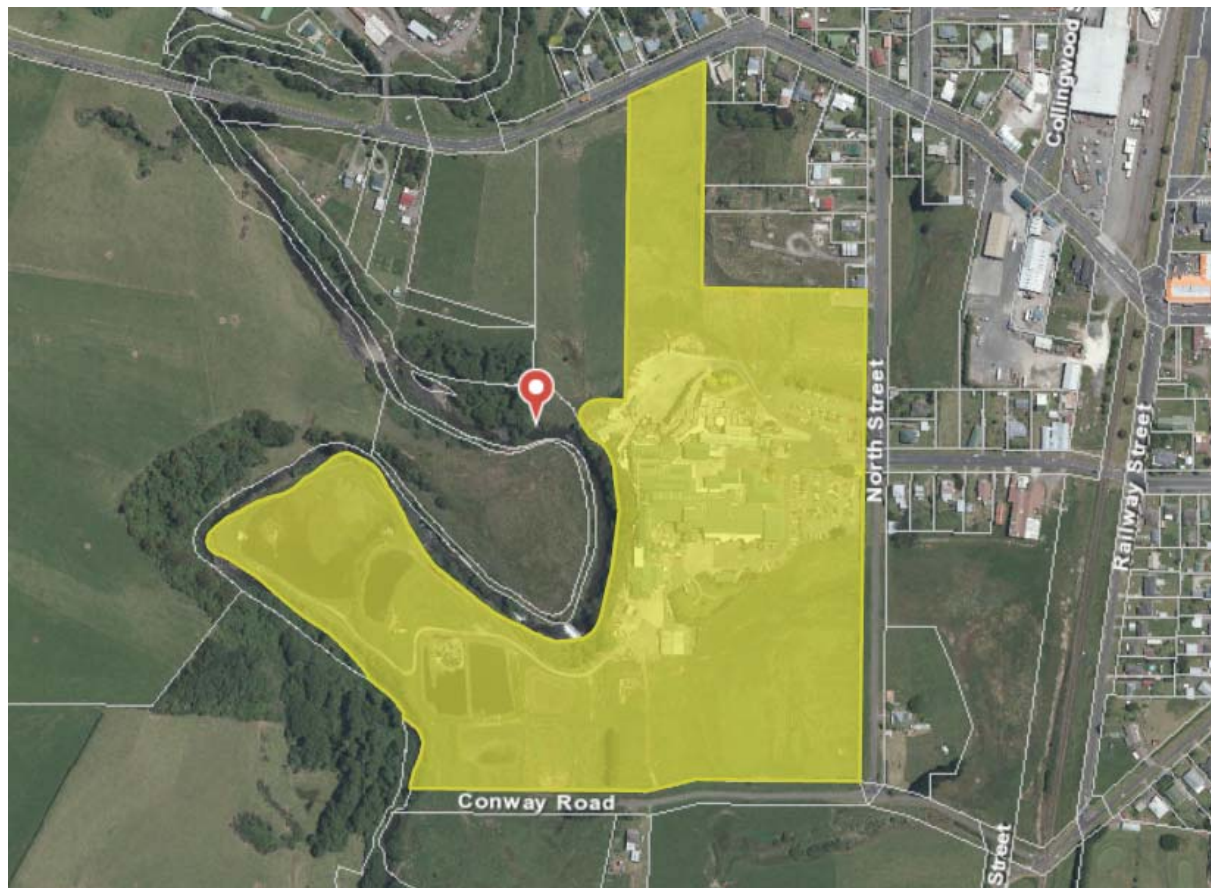
Consent 4644-3.0

8. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2023 and/or June 2029, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 5 May 2016

For and on behalf of
Taranaki Regional Council

A D McLay
Director - Resource Management



Area in which emissions are authorised by this consent.

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

Name of
Consent Holder: Riverlands Eltham Limited
PO Box 124
Eltham 4353

Decision Date
(Review): 13 October 2017

Commencement Date
(Review): 13 October 2017 (Granted Date: 9 July 2012)

Conditions of Consent

Consent Granted: To take and use water from the Waingongoro River for
use in a meat processing plant

Expiry Date: 1 June 2029

Review Date(s): June 2023

Site Location: London Street, Eltham

Grid Reference (NZTM) 1710920E-5634567N

Catchment: Waingongoro

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

General condition

- a. The consent holder shall pay to the Taranaki Regional Council all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. The volume of water taken shall not exceed 1972 cubic metres per day (22.8 litres per second).
2. Before exercising this consent the consent holder shall install, and thereafter maintain a water meter and a datalogger at the site of taking. The water meter and datalogger shall be tamper-proof and shall measure and record the rate and volume of water taken to an accuracy of $\pm 5\%$. Records of the date, the time and the rate and volume of water taken at intervals not exceeding 15 minutes, shall be made available to the Chief Executive, Taranaki Regional Council at all reasonable times.

Note: Water meters and dataloggers must be installed, and regularly maintained, in accordance with manufacturer's specifications in order to ensure that they meet the required accuracy. Even with proper maintenance water meters and dataloggers have a limited lifespan.

3. The consent holder shall provide the Chief Executive, Taranaki Regional Council with a document from a suitably qualified person certifying that water measuring and recording equipment required by the conditions of this consent ('the equipment'):
 - (a) has been installed and/or maintained in accordance with the manufacturer's specifications; and/or
 - (b) has been tested and shown to be operating to an accuracy of $\pm 5\%$.

The documentation shall be provided:

- (i) within 30 days of the installation of a water meter or datalogger;
 - (ii) at other times when reasonable notice is given and the Chief Executive, Taranaki Regional Council has reasonable evidence that the equipment may not be functioning as required by this consent; and
 - (iii) no less frequently than once every five years.
4. If any measuring or recording equipment breaks down, or for any reason is not operational, the consent holder shall advise the Chief Executive, Taranaki Regional Council immediately. Any repairs or maintenance to this equipment must be undertaken by a suitably qualified person.
5. The water meter and datalogger shall be accessible to Taranaki Regional Council officers at all reasonable times for inspection and/or data retrieval.
6. The records of water taken shall:
 - a) be in a format that, in the opinion of the Chief Executive, Taranaki Regional Council, is suitable for auditing;
 - b) specifically record the water taken as 'zero' when no water is taken; and
 - c) be transmitted to the Taranaki Regional Council's computer system within two hours of being recorded.

Consent 5437-3.1

7. At all times the consent holder shall adopt the best practicable option to prevent or minimise any actual or likely adverse effect on the environment associated with the taking of water, including, but not limited to, the efficient and conservative use of water.
8. The consent holder shall annually investigate and report on compliance with condition 6 including water conservation measures, plant water recycling and reuse. The report to be received by the Chief Executive, Taranaki Regional Council, by 31 May each year.
9. The consent holder shall ensure that the intake is screened and designed to avoid fish entering the intake or being trapped against the screen.
10. The consent holder shall ensure that no modification is made to the intake that in any way could increase the likelihood of juvenile fish entering the intake or being trapped against the screen.
11. The consent holder shall mitigate the effects of the discharge by making annual payments of \$5000 (GST exclusive) to the Taranaki Regional Council as a financial contribution for the purpose of providing riparian planting and management in the Waingongoro River catchment excluding that area being irrigated under consent 5569. The amount to be paid shall be adjusted annually according to the consumer price index, or similar index, to account for the effects of inflation, and be made no later than 1 September each year.
12. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2017 and/or June 2023 for the purposes of:
 - (a) ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time; and/or
 - (b) to require any data collected in accordance with the conditions of this consent to be transmitted directly to the Council's computer system, in a format suitable for providing a 'real time' record over the internet.

Signed at Stratford on 13 October 2017

For and on behalf of
Taranaki Regional Council

A D McLay
Director - Resource Management

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

Name of
Consent Holder: Riverlands Eltham Limited
P O Box 124
ELTHAM

Change To
Conditions Date: 15 December 2000 [Granted: 23 December 1999]

Conditions of Consent

Consent Granted: To discharge up to 3500 cubic metres/day of treated wastewater from meat processing and associated activities by irrigation onto and into land, and to discharge emissions into the air, in the vicinity of various unnamed tributaries of the Waingongoro River and the Waingongoro River [area bounded by following GRs]:

Q20:186-932	Q20:189-962	Q20:198-962	Q20:195-966
Q20:200-969	Q20:210-962	Q20:209-954	Q20:203-954
Q20:202-940	Q20:191-931		

Expiry Date: 1 June 2026

Review Date(s): June 2002, June 2004, June 2006, June 2008, June 2013, June 2018

Site Location: Lower Stuart Road, Eltham

Legal Description: Lot 1 DP 11593 & Lot 2 DP 12254 Ngaere SD [plant site]
Pt Sec 51 Blk XIII Ngaere SD
Lot 1 DP 3895 & Pt Sec 51 Blk XIII Ngaere SD
Pt Sec 38 Blk IX Ngaere SD
Sec 47 Blk IX Ngaere SD
Lot 1 DP 7965 & Pt Sec 38 Blk IX Ngaere SD
Lot 1 DP 3463 & Lot 2 DP 16398 & Pt Sec DP 3535 Blk IX Ngaere SD
Lot 1 DP 16398 Blk IX Ngaere SD
Lot 2 DP 17749 Blk IX Ngaere SD
Pt Sec 39 Blk IX Ngaere SD
Lot 1 DP 5241 Blk IX Ngaere SD
Pt Sec 40 Blk IX Ngaere SD

Catchment: Waingongoro

Tributary: Various unnamed

Consent 5569-1

General conditions

- a) That on receipt of a requirement from the Chief Executive, Taranaki Regional Council (hereinafter the Chief Executive), the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) That unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) That the consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

Irrigation system

1. The irrigation system shall be installed and operational by 15 February 2001.

Management Plan

2. Prior to the exercise of this consent, the consent holder shall provide a spray irrigation management plan, to the approval of the General Manager, Taranaki Regional Council, outlining the management of the system, which shall demonstrate ability to comply with consent conditions and shall address the following matters:
 - (a) designated application areas;
 - (b) selection of appropriate irrigation methods for different types of terrain;
 - (c) application rate and duration;
 - (d) application frequency;
 - (e) farm management and operator training;
 - (f) soil and herbage management;
 - (g) prevention of runoff and ponding;
 - (h) minimisation and control of odour effects offsite;
 - (i) operational control and maintenance of the spray irrigation system;
 - (j) monitoring of the effluent [physicochemical];
 - (k) monitoring of soils and herbage [physicochemical];
 - (l) monitoring of groundwater beneath and beyond the irrigated area [physicochemical];
 - (m) remediation measures;
 - (n) mitigation measures including screening of any storage facilities and riparian planting;
 - (o) reporting monitoring data;
 - (p) monitoring of the Waingongoro River and relevant tributaries;
 - (q) procedures for responding to complaints; and
 - (r) notification to the council of non-compliance with the conditions of this consent.

The objective of the plan shall be to minimise discharges to the Waingongoro River under consent 2039 and maximise discharges to land.

3. The consent shall be exercised in accordance with the procedures set out in the spray irrigation management plan, and the consent holder shall subsequently adhere to and comply with the procedures, requirements, obligations and other matters specified in the management plan, except by the specific agreement of the General Manager, Taranaki Regional Council. In the case of any contradiction between the management plan and the conditions of this resource consent, the conditions of this resource consent shall prevail.

Consent 5569-1

4. The spray irrigation management plan described in special condition 2 of this consent shall be subject to review upon two months notice by either the consent holder or the Taranaki Regional Council.
5. The consent holder shall designate an officer with the necessary qualifications and/or experience to manage the spray irrigation system. The officer shall be regularly trained on the content and implementation of the spray irrigation management plan, and shall be advised immediately of any revision or additions to the spray irrigation management plan.

Odour and spray effects

6. No raw or untreated animal blood shall be discharged.
7. There shall be no offensive or objectionable odour at or beyond the boundary of the property or properties on which spray irrigation is occurring.
8. There shall be no spray drift as a result of the irrigation of treated wastewater at or beyond the boundary of the property or properties on which spray irrigation is occurring.

Land effects

9. The discharge of biosolids or sludge from the wastewater treatment system as a result of the exercise of this consent shall only take place from aerated or aerobic ponds or the oxidation pond.
10. The sodium absorption ration [SAR] of the wastewater shall not exceed 10.
11. There shall be no ponding of wastewater, and/or any direct discharge to a watercourse due to the exercise of this consent.
12. The edge of the spray zone shall be at least:
 - a) 20 metres from the banks of any watercourse;
 - b) 50 metres from any bore, well or spring actively used for water supply purposes;
 - c) 20 metres from any public road;
 - d) 20 metres from any property boundary that is not part of the irrigation area, unless the written approval of the landowner has been obtained to allow the discharge at a lesser distance;
 - e) 150 metres from any dwellinghouse [except that listed in condition 12(f)] unless the written approval of the occupier has been obtained to allow discharge at a closer distance; and
 - f) 300 metres from the boundary of the property described as Lot 1 DP 17749 Blk IX Ngaere SD, unless the written approval of the occupier has been obtained to allow the discharge at a closer distance.
13. The effluent application rate shall not exceed 300 kg nitrogen/ha/year. This condition shall be reviewed in accordance with condition 18 to assess the possible reduction of the loading rate.
14. That should monitoring of the discharge under conditions 13, 15 and 16 indicate contamination of local groundwater or a water supply from the roof of a dwellinghouse as a result of the exercise of this consent the consent holder shall:
 - a) undertake appropriate remedial action as soon as practicable as described in the spray irrigation management plan prepared under condition 2, or other such action reasonably required by the General Manager, Taranaki Regional Council;
 - b) shall review the spray irrigation management plan and incorporate such reasonable modifications as are considered necessary by the General Manager, Taranaki Regional Council; and
 - c) where water supplies are significantly affected, immediately provide alternative supplies as reasonably required by the General Manager, Taranaki Regional Council.

Monitoring

15. The consent holder shall site, install and maintain to the satisfaction of the General Manager, Taranaki Regional Council, monitoring bores for the purpose of determining groundwater quality in the vicinity of the discharge.
16. The consent holder shall undertake such baseline and operational monitoring of the activities licensed by this consent as deemed reasonably necessary by the General Manager, Taranaki Regional Council.

Review

17. The consent holder may apply to the Taranaki Regional Council for a change or cancellation of the conditions of this consent, in accordance with section 127(1)(a) of the Resource Management Act 1991, to take account of operational requirements, the results of monitoring, or irrigation scheme expansion.
18. The Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2002 and June 2004, for the purpose of assessing the need to increase the land area of the scheme, reduce nitrogen loading to land and/or increase treatment at the wastewater treatment system to reduce the nitrogen concentration of the effluent.
19. The Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during June 2002, June 2004, June 2006, June 2008, June 2013 and/or June 2018, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects on the environment arising from the exercise of this consent, which either were not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 15 December 2000

For and on behalf of
Taranaki Regional Council

Director-Resource Management

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

Name of
Consent Holder: Riverlands Eltham Limited
P O Box 124
ELTHAM 4353

Decision Date: 9 July 2012

Commencement
Date: 9 July 2012

Conditions of Consent

Consent Granted: To discharge treated wastewater from meat processing and associated activities by irrigation onto and into land, and to discharge the associated emissions into the air at or about (NZTM) 1708468E-5634921N

Expiry Date: 1 June 2026

Review Date(s): June 2017, June 2023

Site Location: Paulwell Farm, Eltham Road, Eltham

Legal Description: Lot 2 DP 13131 Blk IX Ngaere SD [Discharge site]

Catchment: Waingongoro

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

General condition

- a. The consent holder shall pay to the Taranaki Regional Council [the Council] all the administration, monitoring and supervision costs of this consent, fixed in accordance to section 36 of the Resource Management Act.

Special conditions

1. The discharge of wastewater as a result of the exercise of this consent shall only take place from either pond 6 or 7.
2. The discharge authorised by this consent shall not give rise to an odour at or beyond the boundary of the property boundary that is offensive or objectionable.
3. There shall be no spray drift, as a result of the irrigation of treated wastewater, at or beyond the property boundary.
4. The sodium adsorption ratio (SAR) of the wastewater shall not exceed 15.
5. There shall be no ponding of wastewater for more than three hours, and/or any overland flow of wastewater to a watercourse due to the exercise of this consent.
6. The edge of the spray zone shall be at least:
 - (a) 20 metres from the water's edge in any watercourse, and outside of the riparian buffer zone as specified in the riparian management plan supplied by the applicant;
 - (b) 50 metres from any bore, well or spring actively used for water supply purposes;
 - (c) 20 metres from any public road;
 - (d) 20 metres from any property boundary that is not part of the irrigation area, unless the written approval of the landowner has been obtained to allow the discharge at a lesser distance;
 - (e) 150 metres from any dwelling house unless the written approval of the occupier has been obtained to allow discharge at a closer distance;
 - (f) 45 metres from any milking shed.
7. The Total Nitrogen applied to any hectare of land shall not exceed:
 - (a) 600 kilograms in any 12-month period for 'cut and carry areas'; or
 - (b) 300 kilograms in any 12-month period for any other land (including grazed pasture).

For the purposes of this consent 'cut and carry areas' is land that is not grazed and any vegetation is routinely cut and removed.

8. Should monitoring of the discharge under conditions 15 and 16 indicate, in the opinion of the Chief Executive, Taranaki Regional Council, contamination of local groundwater or a water supply from the roof of a dwelling house as a result of the exercise of this consent the consent holder shall:

- (a) undertake appropriate remedial action as soon as practicable as described in the wastewater irrigation management plan prepared under condition 9, or other such action reasonably required by the Chief Executive, Taranaki Regional Council;
 - (b) shall review the wastewater irrigation management plan and incorporate such reasonable modifications as are considered necessary by the Chief Executive, Taranaki Regional Council; and
 - (c) where water supplies are significantly affected, immediately provide alternative supplies as reasonably required by the Chief Executive, Taranaki Regional Council.

9. Subject to the other conditions this consent, this consent shall be exercised in accordance with a 'Wastewater Irrigation Management Plan' (the 'Management Plan') that has been approved by the Chief Executive, Taranaki Regional Council, acting in a certification capacity. The Management Plan shall detail methods and procedures undertaken by the consent holder to ensure that the conditions of this consent are met and can be shown to be met, and shall address but not necessarily be limited to the following matters:
 - (a) designated application areas and buffer zones for streams and the property boundary;
 - (b) selection of appropriate irrigation methods for different types of terrain;
 - (c) application rate and duration;
 - (d) application frequency and nitrogen loading rate;
 - (e) farm management and operator training;
 - (f) soil and herbage management;
 - (g) prevention of runoff and ponding;
 - (h) minimisation and control of offsite odour and spray drift effects;
 - (i) operational control and maintenance of the spray irrigation system;
 - (j) monitoring of the effluent (physicochemical);
 - (k) monitoring of soils and herbage (physicochemical);
 - (l) monitoring of groundwater beneath and beyond the irrigated area (physicochemical);
 - (m) monitoring of local water supplies and remediation;
 - (n) mitigation measures including riparian planting to be undertaken according to the riparian management plan supplied by the applicant;
 - (o) reporting monitoring data;
 - (p) monitoring of the tributaries draining the property;
 - (q) procedures for responding to complaints; and
 - (r) notification to the council of non-compliance with the conditions of this consent;
 - (s) procedures for recording maintenance and repairs; and
 - (t) procedures for draining and flushing the irrigation mainlines and laterals to prevent anaerobic conditions.

An objective of the plan shall be to minimise discharges to the Waingongoro River under consent 2039 and maximise discharges to land.

10. The consent holder shall review the Management Plan, required by condition 9, and submit it for certification within 3 months of receiving such a request from the Chief Executive, Taranaki Regional Council.

Consent 5736-2

11. A copy of the reviewed Management Plan shall be provided to the Department of Conservation and Fish and Game New Zealand (Taranaki Region), for the Taranaki Regional Council to take into account any comments received (within a two week timeframe from when the Plan was provided).
12. The consent holder shall designate an officer with the necessary qualifications and/or experience to manage the wastewater irrigation system. The officer shall be regularly trained on the content and implementation of the wastewater irrigation management plan, and shall be advised immediately of any revision or additions to the wastewater irrigation management plan.
13. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.
14. Prior to the exercise of this consent, the consent holder shall after consultation with the Chief Executive, Taranaki Regional Council, install a minimum of three groundwater monitoring bores. The bores shall be at locations and to depths, that enable monitoring to determine any change in groundwater quality resulting from the exercise of this consent. The bores shall be installed in accordance with NZS 4411:2001 and all associated costs shall be met by the consent holder.
15. The consent holder shall undertake surface water monitoring that is certified by the Chief Executive, Taranaki Regional Council as being adequate to determine any change in surface water quality resulting from the exercise of this consent
16. The consent holder shall undertake such baseline and operational monitoring of the activities licensed by this consent that may be fixed in accordance with section 36 of the Resource Management Act 1991. Baseline monitoring shall include, but not be limited to, sampling herbage, soil, surface water and groundwater. Operational monitoring shall include, but not be limited to spray drift characterisation.
17. The consent holder shall, after the consent is exercised, annually by 1 July, provide to the Chief Executive, Taranaki Regional Council a written report on the implementation of the Wastewater Irrigation Management Plan required in condition 9, and compliance with this consent.
18. The Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during the month of June 2017 and/or June 2023, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects on the environment arising from the exercise of this consent, which either were not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 9 July 2012

For and on behalf of
Taranaki Regional Council

Director-Resource Management

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

Name of
Consent Holder: Riverlands Eltham Limited
PO Box 124
Eltham 4353

Decision Date: 2 May 2017

Commencement Date: 2 May 2017

Conditions of Consent

Consent Granted: To use a pipeline under the bed of the Waingongoro River

Expiry Date: 1 June 2035

Review Date(s): June 2023, June 2029

Site Location: 75 London Street, Eltham

Grid Reference (NZTM) 1710634E-5634514N

Catchment: Waingongoro

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

General condition

- a. The consent holder shall pay to the Taranaki Regional Council all the administration, monitoring and supervision costs of this consent, fixed in accordance with section 36 of the Resource Management Act 1991.

Special conditions

1. This consent authorises the ongoing use of the pipeline structure existing at the time the application for this consent was lodged, and as described in the application. Any change to the nature or scale of the structure may therefore need to be authorised by a formal process in accordance with the Resource Management Act, 1991.
2. The consent holder shall maintain and regularly review a 'Contingency Plan' that details measures and procedures that will be undertaken in the event of pipeline failure or any escape of contaminants from the pipeline. The plan shall be approved by the Chief Executive, Taranaki Regional Council, acting in a certification capacity as being adequate to avoid, remedy or mitigate the environmental effects of such an event.
3. The consent holder shall maintain the structure in a safe and sound condition such that it continues to function effectively.
4. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month June 2023 and/or June 2029, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 2 May 2017

For and on behalf of
Taranaki Regional Council

A D McLay
Director - Resource Management

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

Name of
Consent Holder: Riverlands Eltham Limited
P O Box 124
ELTHAM

Consent Granted
Date: 20 September 2004

Conditions of Consent

Consent Granted: To erect, place and maintain a culvert in, and to realign, an unnamed tributary of the Waingongoro River for site access purposes at or about GR: Q20:209-962

Expiry Date: 1 June 2023

Review Date(s): June 2011, June 2017

Site Location: Lower London Street, Eltham

Legal Description: Lot 3 DP 1622 Lots 5-7 14 DP 1623 Lot 1 DP 11593 Sec 101 Eltham Vill Sett Blk X Ngaere SD

Catchment: Waingongoro

General conditions

- a) On receipt of a requirement from the Chief Executive, Taranaki Regional Council the consent holder shall, within the time specified in the requirement, supply the information required relating to the exercise of this consent.
- b) Unless it is otherwise specified in the conditions of this consent, compliance with any monitoring requirement imposed by this consent must be at the consent holder's own expense.
- c) The consent holder shall pay to the Council all required administrative charges fixed by the Council pursuant to section 36 in relation to:
 - i) the administration, monitoring and supervision of this consent; and
 - ii) charges authorised by regulations.

Special conditions

1. The consent holder shall at all times adopt the best practicable option, as defined in section 2 of the Resource Management Act 1991, to prevent or minimise any adverse effects on the environment from the exercise of this consent.
2. The exercise of this consent shall be undertaken generally in accordance with the documentation submitted in support of application 3311. In the case of any contradiction between the documentation submitted in support of application 3311 and the conditions of this consent, the conditions of this consent shall prevail.
3. The consent holder shall notify the Chief Executive, Taranaki Regional Council, in writing at least 48 hours prior to the commencement and upon completion of the initial installation and again at least 48 hours prior to and upon completion of any subsequent maintenance works which would involve disturbance of or deposition to the riverbed or discharges to water.
4. Once initial work is complete, any further instream works shall take place only between 1 November and 30 April inclusive, except where this requirement is waived in writing by the Chief Executive, Taranaki Regional Council.
5. The consent holder shall ensure that the area and volume of riverbed disturbance shall, so far as practicable, be minimised and any areas which are disturbed shall, so far as practicable, be reinstated.
6. This consent shall lapse on the expiry of five years after the date of issue of this consent, unless the consent is given effect to before the end of that period or the Taranaki Regional Council fixes a longer period pursuant to section 125(1)(b) of the Resource Management Act 1991.
7. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2011 and/or June 2017, for the purpose of ensuring that the conditions are adequate to deal with

Consent 6455-1

any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 20 September 2004

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Appendix II

Baseline sampling results



Certificate of Analysis

Client:	Taranaki Regional Council	Lab No:	2470936	SPV1
Contact:	Jane Harvey C/- Taranaki Regional Council Private Bag 713 Stratford 4352	Date Received:	11-Nov-2020	
		Date Reported:	18-Nov-2020	
		Quote No:	107731	
		Order No:		
		Client Reference:	Paulwell Farms Baseline Sampling	
		Submitted By:	Jane Harvey	

Sample Type: Aqueous

Sample Name:	WGG000720 10-Nov-2020 12:20 pm	WGG000715 10-Nov-2020 12:40 pm	WGG000716 10-Nov-2020 1:05 pm	WGG000712 10-Nov-2020 1:28 pm	WGG000708 10-Nov-2020 2:05 pm
Lab Number:	2470936.1	2470936.2	2470936.3	2470936.4	2470936.5

Individual Tests

Parameter	Unit	WGG000720	WGG000715	WGG000716	WGG000712	WGG000708
Free Ammonia as N*	g/m ³ at Client Temperature	0.00010	0.00005	0.00007	< 0.00004	0.00136
Turbidity	NTU	7.2	1.16	10.8	7.2	9.4
pH	pH Units	7.2	6.9	7.3	7.2	7.5
Total Alkalinity	g/m ³ as CaCO ₃	42	55	48	41	30
Carbonate	g/m ³ at 25°C	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bicarbonate	g/m ³ at 25°C	51	67	58	50	37
Total Hardness	g/m ³ as CaCO ₃	40	63	52	44	31
Electrical Conductivity (EC)	mS/m	16.5	23.0	18.9	17.5	13.1
Total Suspended Solids	g/m ³	13	12	24	21	19
Total Dissolved Solids (TDS)	g/m ³	133	173	154	142	105
Sample Temperature*†	°C	12.4	13.2	12.6	12.4	11.7
Dissolved Aluminium	g/m ³	0.031	0.008	0.025	0.020	0.029
Total Aluminium	g/m ³	0.36	1.67	0.59	0.59	0.60
Dissolved Barium	g/m ³	0.023	0.046	0.020	0.021	0.042
Total Barium	g/m ³	0.025	0.067	0.025	0.026	0.049
Dissolved Boron	g/m ³	0.017 #1	0.031 #1	0.043 #1	0.023 #1	0.015 #1
Total Boron	g/m ³	0.0164 #1	0.030 #1	0.041 #1	0.022 #1	0.0138 #1
Dissolved Calcium	g/m ³	10.1 #1	15.9	12.5 #1	10.9 #1	8.5 #1
Total Calcium	g/m ³	9.4 #1	15.9	12.0 #1	10.3 #1	8.1 #1
Dissolved Iron	g/m ³	0.49	0.09	0.16	0.12	0.13
Total Iron	g/m ³	1.29	3.4	1.53	1.08	0.72
Dissolved Magnesium	g/m ³	4.4 #1	5.9 #1	5.3 #1	4.6 #1	2.8 #1
Total Magnesium	g/m ³	4.1 #1	5.7 #1	5.2 #1	4.4 #1	2.7 #1
Dissolved Manganese	g/m ³	0.052	0.094	0.049	0.039	0.0103
Total Manganese	g/m ³	0.085	0.50	0.133	0.065	0.041
Dissolved Mercury	g/m ³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Total Mercury	g/m ³	< 0.00008	< 0.00008	< 0.00008	< 0.00008	< 0.00008
Dissolved Potassium	g/m ³	5.1 #1	9.7 #1	5.6	5.0	5.7 #1
Total Potassium	g/m ³	5.0 #1	9.3 #1	5.6	5.0	5.5 #1
Dissolved Sodium	g/m ³	13.3 #1	13.4 #1	13.5 #1	13.8	10.2 #1
Total Sodium	g/m ³	13.0 #1	13.0 #1	13.3 #1	13.8	9.3 #1
Potassium Absorption Ratio (PAR) *	(mmol/L) ^{0.5}	0.2	0.3	< 0.2	< 0.2	0.3
Sodium Absorption Ratio (SAR) *	(mmol/L) ^{0.5}	0.9	0.7	0.8	0.9	0.8
Chloride	g/m ³	16.9	15.6	14.8	14.6	13.0
Fluoride	g/m ³	0.09	0.08	0.09	0.09	0.06
Total Nitrogen	g/m ³	1.60	5.0	2.8	2.9	2.4



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised. The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Aqueous						
Sample Name:	WGG000720 10-Nov-2020 12:20 pm	WGG000715 10-Nov-2020 12:40 pm	WGG000716 10-Nov-2020 1:05 pm	WGG000712 10-Nov-2020 1:28 pm	WGG000708 10-Nov-2020 2:05 pm	
Lab Number:	2470936.1	2470936.2	2470936.3	2470936.4	2470936.5	
Individual Tests						
Total Ammoniacal-N	g/m ³	0.028	0.024	0.015	< 0.010	0.193
Nitrite-N	g/m ³	0.004	0.012	0.011	0.005	0.015
Nitrate-N	g/m ³	1.31	4.4	2.4	2.6	1.74
Nitrate-N + Nitrite-N	g/m ³	1.31	4.5	2.4	2.6	1.76
Total Kjeldahl Nitrogen (TKN)	g/m ³	0.29	0.50	0.41	0.33	0.67
Dissolved Reactive Phosphorus	g/m ³	0.009	< 0.004	0.005	< 0.004	0.034
Total Phosphorus	g/m ³	0.070	0.047	0.079	0.038	0.140
Reactive Silica	g/m ³ as SiO ₂	32	32	36	41	30
Sulphate	g/m ³	5.3	11.7	9.5	8.9	4.3
Carbonaceous Biochemical Oxygen Demand (cBOD ₅)	g O ₂ /m ³	< 2	< 2	< 2	< 2	< 2
Chemical Oxygen Demand (COD)	g O ₂ /m ³	17	22	18	12	17
Total Organic Carbon (TOC)	g/m ³	6.8	5.0	5.8	5.2	7.6
Oil and Grease	g/m ³	< 4	< 4	< 4	< 4	< 4
Escherichia coli	MPN / 100mL	5,400	490	490	790	3,500
Faecal Coliforms	cfu / 100mL	3,700	300	330	700 #2	6,000 #2
Enterococci	cfu / 100mL	290	120 #2	40 #2	70 #2	330
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m ³	< 0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Copper	g/m ³	0.0014	0.0010	0.0010	0.0013	0.0015
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	< 0.00010	< 0.00010
Dissolved Nickel	g/m ³	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dissolved Zinc	g/m ³	0.0017	< 0.0010	0.0016	0.0012	0.0014
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Arsenic	g/m ³	< 0.0011	< 0.0011	< 0.0011	< 0.0011	< 0.0011
Total Cadmium	g/m ³	< 0.000053	< 0.000053	< 0.000053	< 0.000053	< 0.000053
Total Chromium	g/m ³	< 0.00053	0.00107	< 0.00053	< 0.00053	< 0.00053
Total Copper	g/m ³	0.00175	0.0046	0.0022	0.0027	0.0035
Total Lead	g/m ³	< 0.00011	0.00046	0.00020	0.00014	0.00020
Total Nickel	g/m ³	< 0.00053	< 0.00053	< 0.00053	< 0.00053	< 0.00053
Total Zinc	g/m ³	0.0032	0.0077	0.0051	0.0030	0.0043

Analyst's Comments

† Customer supplied data. Please note: Hill Laboratories cannot be held responsible for the validity of this customer supplied data, or any subsequent calculations that rely on this information.

#1 It has been noted that the result for the dissolved fraction was greater than that for the total fraction, but within analytical variation of the methods.

#2 Statistically estimated count based on the theoretical countable range for the stated method.

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Free Ammonia as N*	Calculation from Un-ionised Ammonia. ANZECC: Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Vol. 2, Chapter 8, Table 8.3.6, October 2000.	0.000010 g/m ³ at Client Temperature	1-5
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn	0.45µm Filtration, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.00005 - 0.0010 g/m ³	1-5
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017 / US EPA 200.8.	0.000053 - 0.0011 g/m ³	1-5
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-5

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) 23 rd ed. 2017.	-	1-5
Turbidity	Analysis by Turbidity meter. APHA 2130 B 23 rd ed. 2017 (modified).	0.05 NTU	1-5
pH	pH meter. APHA 4500-H ⁺ B 23 rd ed. 2017. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-5
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (modified for Alkalinity <20) 23 rd ed. 2017.	1.0 g/m ³ as CaCO ₃	1-5
Carbonate	Calculation: from alkalinity and pH, valid where TDS is not >500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO ₂ D 23 rd ed. 2017.	1.0 g/m ³ at 25°C	1-5
Bicarbonate	Calculation: from alkalinity and pH, valid where TDS is not >500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO ₂ D 23 rd ed. 2017.	1.0 g/m ³ at 25°C	1-5
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 23 rd ed. 2017.	1.0 g/m ³ as CaCO ₃	1-5
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 23 rd ed. 2017.	0.1 mS/m	1-5
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D (modified) 23 rd ed. 2017.	3 g/m ³	1-5
Total Dissolved Solids (TDS)	Filtration through GF/C (1.2 µm), gravimetric. APHA 2540 C (modified; drying temperature of 103 - 105°C used rather than 180 ± 2°C) 23 rd ed. 2017.	10 g/m ³	1-5
Sample Temperature*	Temperature of the sample at the time of sampling, supplied by customer.	0.1 °C	1-5
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 23 rd ed. 2017.	-	1-5
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.003 g/m ³	1-5
Total Aluminium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017 / US EPA 200.8.	0.0032 g/m ³	1-5
Dissolved Barium	Filtered sample, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.005 g/m ³	1-5
Total Barium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017 / US EPA 200.8.	0.0053 g/m ³	1-5
Dissolved Boron	Filtered sample, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.005 g/m ³	1-5
Total Boron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.0053 g/m ³	1-5
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.05 g/m ³	1-5
Total Calcium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.053 g/m ³	1-5
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.02 g/m ³	1-5
Total Iron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.021 g/m ³	1-5
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.02 g/m ³	1-5
Total Magnesium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.021 g/m ³	1-5
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.0005 g/m ³	1-5
Total Manganese	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017 / US EPA 200.8.	0.00053 g/m ³	1-5
Dissolved Mercury	0.45µm filtration, bromine oxidation followed by atomic fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m ³	1-5
Total Mercury	Bromine Oxidation followed by Atomic Fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m ³	1-5
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.05 g/m ³	1-5
Total Potassium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.053 g/m ³	1-5
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.02 g/m ³	1-5

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.021 g/m ³	1-5
Potassium Absorption Ratio*	Calculation; from potassium, calcium and magnesium, as follows; $(K / 39) / [(Ca / 20 + Mg / 24.305)/2]^{0.5}$ where the concentrations of these ions (K, Ca and Mg) are expressed as g/m ³ .	0.2 (mmol/L) ^{0.5}	1-5
Sodium Absorption Ratio (Dissolved)*	Calculation; from sodium, calcium and magnesium, as follows; $(Na / 23) / [(Ca / 20 + Mg / 12.15)/2]^{0.5}$ where the concentrations for these ions (Na, Ca and Mg) are expressed as g/m ³ .	0.2 (mmol/L) ^{0.5}	1-5
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 23 rd ed. 2017.	0.5 g/m ³	1-5
Fluoride	Direct measurement, ion selective electrode. APHA 4500-F- C 23 rd ed. 2017.	0.05 g/m ³	1-5
Total Nitrogen	Calculation: TKN + Nitrate-N + Nitrite-N. Please note: The Default Detection Limit of 0.05 g/m ³ is only attainable when the TKN has been determined using a trace method utilising duplicate analyses. In cases where the Detection Limit for TKN is 0.10 g/m ³ , the Default Detection Limit for Total Nitrogen will be 0.11 g/m ³ .	0.05 g/m ³	1-5
Total Ammoniacal-N	Phenol/hypochlorite colourimetry. Flow injection analyser. (NH ₄ -N = NH ₄ ⁺ -N + NH ₃ -N). APHA 4500-NH ₃ H (modified) 23 rd ed. 2017.	0.010 g/m ³	1-5
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO ₂ I (modified) 23 rd ed. 2017.	0.002 g/m ³	1-5
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO ₂ N. In-House.	0.0010 g/m ³	1-5
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO ₃ I (modified) 23 rd ed. 2017.	0.002 g/m ³	1-5
Total Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-N _{org} D (modified) 4500 NH ₃ F (modified) 23 rd ed. 2017.	0.10 g/m ³	1-5
Dissolved Reactive Phosphorus	Filtered sample. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified) 23 rd ed. 2017.	0.004 g/m ³	1-5
Total Phosphorus	Total phosphorus digestion, ascorbic acid colorimetry. Discrete Analyser. APHA 4500-P B & E (modified from manual analysis and also modified to include a reductant to reduce interference from any arsenic present in the sample) 23 rd ed. 2017. NWASCO, Water & soil Miscellaneous Publication No. 38, 1982.	0.004 g/m ³	1-5
Reactive Silica	Filtered sample. Heteropoly blue colorimetry. Flow Injection Analyser. APHA 4500-SiO ₂ F (modified) 23 rd ed. 2017.	0.10 g/m ³ as SiO ₂	1-5
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 23 rd ed. 2017.	0.5 g/m ³	1-5
Carbonaceous Biochemical Oxygen Demand (cBOD ₅)	Incubation 5 days, DO meter, nitrification inhibitor added, seeded. APHA 5210 B (modified) 23 rd ed. 2017.	2 g O ₂ /m ³	1-5
Chemical Oxygen Demand (COD), trace level	Dichromate/sulphuric acid digestion in Hach tubes, colorimetry. Trace Level method. APHA 5220 D 23 rd ed. 2017.	6 g O ₂ /m ³	1-5
Total Organic Carbon (TOC)	Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC - TIC. The uncertainty of the calculated result is a combination of the uncertainties of the two analytical determinands in the subtraction calculation. Where both determinands are similar in magnitude, the calculated result has a significantly higher uncertainty than would normally be achieved if one of the results was significantly less than the other. In such cases, the elevated uncertainty should be kept in mind when interpreting the data. APHA 5310 C (modified) 23 rd ed. 2017.	0.5 g/m ³	1-5
Oil and Grease	Sample filtration through filter aid, Soxhlet extraction, gravimetric determination of extracted Oil & Grease. APHA 5520 D (modified) 23 rd ed. 2017.	4 g/m ³	1-5
Escherichia coli	MPN count in LT Broth at 35°C for 48 hours, TBX or EC MUG Broth at 44.5°C for 24 hours. APHA 9221 B & F (modified if TBX method used) 23 rd ed. 2017.	2 MPN / 100mL	1-5
Faecal Coliforms	Membrane Filtration, Count on mFC agar, Incubated at 44.5°C for 22 hours, Confirmation. APHA 9222 D 23 rd ed. 2017.	1 cfu / 100mL	1-5
Enterococci	Membrane filtration, Count on mE agar, Incubated at 41°C for 48 hours, Confirmation. APHA 9230 C (modified) 23 rd ed. 2017.	1 cfu / 100mL	1-5

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 11-Nov-2020 and 18-Nov-2020. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.

A handwritten signature in blue ink, consisting of several overlapping, stylized strokes that form a unique, illegible mark.

Ara Heron BSc (Tech)
Client Services Manager - Environmental



Certificate of Analysis

Client: Taranaki Regional Council	Lab No: 2551717	SPV1
Contact: Jane Harvey	Date Received: 10-Mar-2021	
C/- Taranaki Regional Council	Date Reported: 18-Mar-2021	
Private Bag 713	Quote No: 107731	
Stratford 4352	Order No: 72831	
	Client Reference: #6616 - Paulwell Farm BAseline Monitoring	
	Submitted By: Kelby Clements	

Sample Type: Aqueous

Sample Name:	TRC211036 (GND3116) 09-Mar-2021 10:01 am	TRC211037 (GND3117) 09-Mar-2021 11:07 am	TRC211038 (GND3118) 09-Mar-2021 12:10 pm		
Lab Number:	2551717.1	2551717.2	2551717.3		

Individual Tests

Parameter	Unit	2551717.1	2551717.2	2551717.3		
Free Ammonia as N*	g/m ³ at Client Temperature	< 0.00003	0.00072	0.0032	-	-
pH	pH Units	7.0	7.0	7.4	-	-
Total Alkalinity	g/m ³ as CaCO ₃	81	80	73	-	-
Carbonate	g/m ³ at 25°C	< 1.0	< 1.0	< 1.0	-	-
Bicarbonate	g/m ³ at 25°C	98	98	89	-	-
Total Hardness	g/m ³ as CaCO ₃	78	72	46	-	-
Electrical Conductivity (EC)	mS/m	25.9	24.8	21.3	-	-
Total Suspended Solids	g/m ³	59	11	76	-	-
Total Dissolved Solids (TDS)	g/m ³	160	145	150	-	-
Sample Temperature*†	°C	14.6	15.8	15.2	-	-
Dissolved Aluminium	g/m ³	0.005	0.031	0.28	-	-
Total Aluminium	g/m ³	0.42	0.35	2.5	-	-
Dissolved Barium	g/m ³	0.030	0.048	0.013	-	-
Total Barium	g/m ³	0.036	0.053	0.028	-	-
Dissolved Boron	g/m ³	0.046 #1	0.032	0.026	-	-
Total Boron	g/m ³	0.046 #1	0.033	0.026	-	-
Dissolved Calcium	g/m ³	24 #1	21 #1	10.0 #1	-	-
Total Calcium	g/m ³	22 #1	18.5 #1	9.4 #1	-	-
Dissolved Iron	g/m ³	< 0.02	0.02	1.16	-	-
Total Iron	g/m ³	0.142	0.22	3.2	-	-
Dissolved Magnesium	g/m ³	6.6 #1	6.7 #1	5.9	-	-
Total Magnesium	g/m ³	5.6 #1	6.2 #1	5.4	-	-
Dissolved Manganese	g/m ³	0.0195	0.47 #1	0.23	-	-
Total Manganese	g/m ³	0.025	0.47 #1	0.25	-	-
Dissolved Mercury	g/m ³	< 0.00008	< 0.00008	< 0.00008	-	-
Total Mercury	g/m ³	< 0.00008	< 0.00008	< 0.00008	-	-
Dissolved Potassium	g/m ³	6.3 #1	7.6	5.9	-	-
Total Potassium	g/m ³	6.1 #1	7.6	6.1	-	-
Dissolved Sodium	g/m ³	22 #1	22 #1	24 #1	-	-
Total Sodium	g/m ³	19.7 #1	21 #1	22 #1	-	-
Chloride	g/m ³	16.9	14.4	18.9	-	-
Fluoride	g/m ³	0.17	0.14	0.32	-	-
Total Nitrogen	g/m ³	1.85	0.58	0.54	-	-
Total Ammoniacal-N	g/m ³	< 0.010	0.25	0.49	-	-
Nitrite-N	g/m ³	< 0.002	0.003	< 0.002	-	-
Nitrate-N	g/m ³	1.75	0.183	< 0.002	-	-



This Laboratory is accredited by International Accreditation New Zealand (IANZ), which represents New Zealand in the International Laboratory Accreditation Cooperation (ILAC). Through the ILAC Mutual Recognition Arrangement (ILAC-MRA) this accreditation is internationally recognised. The tests reported herein have been performed in accordance with the terms of accreditation, with the exception of tests marked * or any comments and interpretations, which are not accredited.

Sample Type: Aqueous						
Sample Name:	TRC211036 (GND3116) 09-Mar-2021 10:01 am	TRC211037 (GND3117) 09-Mar-2021 11:07 am	TRC211038 (GND3118) 09-Mar-2021 12:10 pm			
Lab Number:	2551717.1	2551717.2	2551717.3			
Individual Tests						
Nitrate-N + Nitrite-N	g/m ³	1.75	0.187	< 0.002	-	-
Total Kjeldahl Nitrogen (TKN)	g/m ³	0.10	0.39	0.54	-	-
Dissolved Reactive Phosphorus	g/m ³	0.008	0.008	0.158	-	-
Total Phosphorus	g/m ³	0.057	0.030	0.40	-	-
Reactive Silica	g/m ³ as SiO ₂	39	51	51	-	-
Sulphate	g/m ³	11.9	15.3	< 0.5	-	-
Carbonaceous Biochemical Oxygen Demand (cBOD ₅)	g O ₂ /m ³	< 2	< 2	< 2	-	-
Chemical Oxygen Demand (COD)	g O ₂ /m ³	< 6	< 6	< 6	-	-
Total Organic Carbon (TOC)	g/m ³	1.3	1.1	1.0	-	-
Escherichia coli	MPN / 100mL	2	5	< 2	-	-
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Dissolved Arsenic	g/m ³	< 0.0010	< 0.0010	< 0.0010	-	-
Dissolved Cadmium	g/m ³	< 0.00005	< 0.00005	< 0.00005	-	-
Dissolved Chromium	g/m ³	< 0.0005	< 0.0005	< 0.0005	-	-
Dissolved Copper	g/m ³	0.0036	0.0010	0.0017	-	-
Dissolved Lead	g/m ³	< 0.00010	< 0.00010	< 0.00010	-	-
Dissolved Nickel	g/m ³	0.0057	0.0010	< 0.0005	-	-
Dissolved Zinc	g/m ³	0.0047	0.0047 #1	0.0014	-	-
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn						
Total Arsenic	g/m ³	< 0.0011	< 0.0011	0.0016	-	-
Total Cadmium	g/m ³	< 0.000053	< 0.000053	< 0.000053	-	-
Total Chromium	g/m ³	< 0.00053	< 0.00053	< 0.00053	-	-
Total Copper	g/m ³	0.0058	0.0021	0.0090	-	-
Total Lead	g/m ³	0.00019	0.00015	0.00057	-	-
Total Nickel	g/m ³	0.0059	0.00121	< 0.00053	-	-
Total Zinc	g/m ³	0.0069	0.0038 #1	0.0034	-	-

Analyst's Comments

† Customer supplied data. Please note: Hill Laboratories cannot be held responsible for the validity of this customer supplied data, or any subsequent calculations that rely on this information.

#1 It has been noted that the result for the dissolved fraction was greater than that for the total fraction, but within analytical variation of the methods.

Samples 1-3 Comment:

Please note that the level of Uncertainty of Measurement (UOM) for the TOC result is significantly greater than that usually reported for this analyte (>300% at the 95% confidence level).

Summary of Methods

The following table(s) gives a brief description of the methods used to conduct the analyses for this job. The detection limits given below are those attainable in a relatively simple matrix. Detection limits may be higher for individual samples should insufficient sample be available, or if the matrix requires that dilutions be performed during analysis. A detection limit range indicates the lowest and highest detection limits in the associated suite of analytes. A full listing of compounds and detection limits are available from the laboratory upon request. Unless otherwise indicated, analyses were performed at Hill Laboratories, 28 Duke Street, Frankton, Hamilton 3204.

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Free Ammonia as N*	Calculation from Un-ionised Ammonia. ANZECC: Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Vol. 2, Chapter 8, Table 8.3.6, October 2000.	0.000010 g/m ³ at Client Temperature	1-3
Heavy metals, dissolved, trace As,Cd,Cr,Cu,Ni,Pb,Zn	0.45µm Filtration, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.00005 - 0.0010 g/m ³	1-3
Heavy metals, totals, trace As,Cd,Cr,Cu,Ni,Pb,Zn	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017 / US EPA 200.8.	0.000053 - 0.0011 g/m ³	1-3
Filtration, Unpreserved	Sample filtration through 0.45µm membrane filter.	-	1-3
Total Digestion	Nitric acid digestion. APHA 3030 E (modified) 23 rd ed. 2017.	-	1-3

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
pH	pH meter. APHA 4500-H ⁺ B 23 rd ed. 2017. Note: It is not possible to achieve the APHA Maximum Storage Recommendation for this test (15 min) when samples are analysed upon receipt at the laboratory, and not in the field. Samples and Standards are analysed at an equivalent laboratory temperature (typically 18 to 22 °C). Temperature compensation is used.	0.1 pH Units	1-3
Total Alkalinity	Titration to pH 4.5 (M-alkalinity), autotitrator. APHA 2320 B (modified for Alkalinity <20) 23 rd ed. 2017.	1.0 g/m ³ as CaCO ₃	1-3
Carbonate	Calculation: from alkalinity and pH, valid where TDS is not >500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO ₂ D 23 rd ed. 2017.	1.0 g/m ³ at 25°C	1-3
Bicarbonate	Calculation: from alkalinity and pH, valid where TDS is not >500 mg/L and alkalinity is almost entirely due to hydroxides, carbonates or bicarbonates. APHA 4500-CO ₂ D 23 rd ed. 2017.	1.0 g/m ³ at 25°C	1-3
Total Hardness	Calculation from Calcium and Magnesium. APHA 2340 B 23 rd ed. 2017.	1.0 g/m ³ as CaCO ₃	1-3
Electrical Conductivity (EC)	Conductivity meter, 25°C. APHA 2510 B 23 rd ed. 2017.	0.1 mS/m	1-3
Total Suspended Solids	Filtration using Whatman 934 AH, Advantec GC-50 or equivalent filters (nominal pore size 1.2 - 1.5µm), gravimetric determination. APHA 2540 D (modified) 23 rd ed. 2017.	3 g/m ³	1-3
Total Dissolved Solids (TDS)	Filtration through GF/C (1.2 µm), gravimetric. APHA 2540 C (modified; drying temperature of 103 - 105°C used rather than 180 ± 2°C) 23 rd ed. 2017.	10 g/m ³	1-3
Sample Temperature*	Temperature of the sample at the time of sampling, supplied by customer.	0.1 °C	1-3
Filtration for dissolved metals analysis	Sample filtration through 0.45µm membrane filter and preservation with nitric acid. APHA 3030 B 23 rd ed. 2017.	-	1-3
Dissolved Aluminium	Filtered sample, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.003 g/m ³	1-3
Total Aluminium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017 / US EPA 200.8.	0.0032 g/m ³	1-3
Dissolved Barium	Filtered sample, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.005 g/m ³	1-3
Total Barium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017 / US EPA 200.8.	0.0053 g/m ³	1-3
Dissolved Boron	Filtered sample, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.005 g/m ³	1-3
Total Boron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.0053 g/m ³	1-3
Dissolved Calcium	Filtered sample, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.05 g/m ³	1-3
Total Calcium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.053 g/m ³	1-3
Dissolved Iron	Filtered sample, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.02 g/m ³	1-3
Total Iron	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.021 g/m ³	1-3
Dissolved Magnesium	Filtered sample, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.02 g/m ³	1-3
Total Magnesium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.021 g/m ³	1-3
Dissolved Manganese	Filtered sample, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.0005 g/m ³	1-3
Total Manganese	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017 / US EPA 200.8.	0.00053 g/m ³	1-3
Dissolved Mercury	0.45µm filtration, bromine oxidation followed by atomic fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m ³	1-3
Total Mercury	Bromine Oxidation followed by Atomic Fluorescence. US EPA Method 245.7, Feb 2005.	0.00008 g/m ³	1-3
Dissolved Potassium	Filtered sample, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.05 g/m ³	1-3
Total Potassium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.053 g/m ³	1-3
Dissolved Sodium	Filtered sample, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.02 g/m ³	1-3
Total Sodium	Nitric acid digestion, ICP-MS, trace level. APHA 3125 B 23 rd ed. 2017.	0.021 g/m ³	1-3
Chloride	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 23 rd ed. 2017.	0.5 g/m ³	1-3

Sample Type: Aqueous			
Test	Method Description	Default Detection Limit	Sample No
Fluoride	Direct measurement, ion selective electrode. APHA 4500-F C 23 rd ed. 2017.	0.05 g/m ³	1-3
Total Nitrogen	Calculation: TKN + Nitrate-N + Nitrite-N. Please note: The Default Detection Limit of 0.05 g/m ³ is only attainable when the TKN has been determined using a trace method utilising duplicate analyses. In cases where the Detection Limit for TKN is 0.10 g/m ³ , the Default Detection Limit for Total Nitrogen will be 0.11 g/m ³ . In-house calculation.	0.05 g/m ³	1-3
Total Ammoniacal-N	Phenol/hypochlorite colourimetry. Flow injection analyser. (NH ₄ -N = NH ₄ ⁺ -N + NH ₃ -N). APHA 4500-NH ₃ H (modified) 23 rd ed. 2017.	0.010 g/m ³	1-3
Nitrite-N	Automated Azo dye colorimetry, Flow injection analyser. APHA 4500-NO ₃ I (modified) 23 rd ed. 2017.	0.002 g/m ³	1-3
Nitrate-N	Calculation: (Nitrate-N + Nitrite-N) - NO ₂ N. In-House.	0.0010 g/m ³	1-3
Nitrate-N + Nitrite-N	Total oxidised nitrogen. Automated cadmium reduction, flow injection analyser. APHA 4500-NO ₃ I (modified) 23 rd ed. 2017.	0.002 g/m ³	1-3
Total Kjeldahl Nitrogen (TKN)	Total Kjeldahl digestion, phenol/hypochlorite colorimetry. Discrete Analyser. APHA 4500-N _{org} D (modified) 4500 NH ₃ F (modified) 23 rd ed. 2017.	0.10 g/m ³	1-3
Dissolved Reactive Phosphorus	Filtered sample. Molybdenum blue colourimetry. Flow injection analyser. APHA 4500-P G (modified) 23 rd ed. 2017.	0.004 g/m ³	1-3
Total Phosphorus	Total phosphorus digestion, automated ascorbic acid colorimetry. Flow Injection Analyser. APHA 4500-P H 23 rd ed. 2017.	0.002 g/m ³	1-3
Reactive Silica	Filtered sample. Heteropoly blue colorimetry. Flow Injection Analyser. APHA 4500-SiO ₂ F (modified) 23 rd ed. 2017.	0.10 g/m ³ as SiO ₂	1-3
Sulphate	Filtered sample. Ion Chromatography. APHA 4110 B (modified) 23 rd ed. 2017.	0.5 g/m ³	1-3
Carbonaceous Biochemical Oxygen Demand (cBOD ₅)	Incubation 5 days, DO meter, nitrification inhibitor added, seeded. APHA 5210 B (modified) 23 rd ed. 2017.	2 g O ₂ /m ³	1-3
Chemical Oxygen Demand (COD), trace level	Dichromate/sulphuric acid digestion in Hach tubes, colorimetry. Trace Level method. APHA 5220 D 23 rd ed. 2017.	6 g O ₂ /m ³	1-3
Total Organic Carbon (TOC)	Supercritical persulphate oxidation, IR detection, for Total C. Acidification, purging for Total Inorganic C. TOC = TC - TIC. The uncertainty of the calculated result is a combination of the uncertainties of the two analytical determinands in the subtraction calculation. Where both determinands are similar in magnitude, the calculated result has a significantly higher uncertainty than would normally be achieved if one of the results was significantly less than the other. In such cases, the elevated uncertainty should be kept in mind when interpreting the data. APHA 5310 C (modified) 23 rd ed. 2017.	0.5 g/m ³	1-3
Escherichia coli	MPN count in LT Broth at 35°C for 48 hours, TBX or EC MUG Broth at 44.5°C for 24 hours. APHA 9221 F (modified if TBX method used) 23 rd ed. 2017.	2 MPN / 100mL	1-3

These samples were collected by yourselves (or your agent) and analysed as received at the laboratory.

Testing was completed between 10-Mar-2021 and 18-Mar-2021. For completion dates of individual analyses please contact the laboratory.

Samples are held at the laboratory after reporting for a length of time based on the stability of the samples and analytes being tested (considering any preservation used), and the storage space available. Once the storage period is completed, the samples are discarded unless otherwise agreed with the customer. Extended storage times may incur additional charges.

This certificate of analysis must not be reproduced, except in full, without the written consent of the signatory.

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