Riverlands Eltham Limited Monitoring Programme Biennial Report 2012 - 2014

Technical Report 2014-86

ISSN: 0114-8184 (Print)
ISSN: 1178-1467 (Online)
Document: 1429633 (Word)
Document: 1460708 (Pdf)

Taranaki Regional Council
Private Bag 713
STRATFORD

February 2015

Executive summary

Riverlands Eltham Limited [Riverlands] operates a meat processing plant located at Eltham, in the Waingongoro catchment. Since May 2014, the site has been known as ANZCO Foods Eltham. The plant has an associated wastewater treatment ponds system from which effluent is disposed of either to land or to the river. This report for the two killing seasons from October 2012-September 2014 describes the monitoring programme implemented by the Taranaki Regional Council (the Council) to assess the Company's environmental performance during the period under review, and the results and environmental effects of the Company's activities.

The Company holds 11 resource consents, which include a total of 118 conditions setting out the requirements that the Company must satisfy. The Company holds one consent to allow it to take and use water, two consents to discharge effluent and stormwater into the Waingongoro River, three consents to discharge effluent and solids to land, four consents for structures in watercourses, and one consent to discharge emissions into the air at the plant site.

During the monitoring period, Riverlands demonstrated an overall high level of environmental performance.

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

The Council's monitoring programmes for the period under review together included eight inspections, 129 water samples collected for physico-chemical analysis, and four bio-monitoring surveys of receiving waters.

The abstraction of water from the Waingongoro River was not found to have any adverse effect on the river. The large reduction in the amount of water abstracted that occurred in 2010-2011, as the result of improved efficiency in water use, was maintained, with the average water use per body in 2013-2014 the lowest yet recorded.

The physico-chemical monitoring of the river showed full compliance with consent conditions.

It is noted that the implementation of the "dual" land/river wastewater disposal system, which is managed so as to maximise discharge to land, has resulted in significant improvement in the quality of the Waingongoro River since the system was adopted in 2001. The bio-monitoring surveys in 2012-2014 did not find any detrimental impact on the river caused by discharges from the meat plant to either land or water.

During the 2012-2013 monitoring period 65 percent of the total plant effluent was sprayed onto grazed pasture. The irrigation period lasted 30 weeks, from 1 November 2012 to 26 May 2013, that included the low flow periods for the river. In 2013-2014, 70 percent of effluent was irrigated, over 34 weeks between 29 October and 22 June. The limit on nitrogen loading was

complied with overall, with minor exceedences on some paddocks. No significant adverse effect of the irrigation was found in groundwater.

With regard to emissions to air, no incident was recorded over the 2012-2014 period. A significant emissions source, the incinerator, was removed from the site, and materials previously burned were recycled.

During the period under review, Riverlands demonstrated a high level of environmental performance. Improvement is required in administrative compliance, in respect of the provision of updated/new plans for wastewater disposal and stormwater management.

For reference, in the 2012-2013 year, 35% of consent holders in Taranaki monitored through tailored compliance monitoring programmes achieved a high level of environmental performance and compliance with their consents, while another 59% demonstrated a good level of environmental performance and compliance with their consents. In the 2013-2014 year, 60% of consent holders achieved a high level of environmental performance and compliance with their consents, while another 29% demonstrated a good level of environmental performance and compliance.

This report includes recommendations for the 2014-2015 year.

Table of contents

List of tables

List of figures

1. Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report provides the combined Annual Reports for the period October 2012-September 2014 by the Taranaki Regional Council on the monitoring programme associated with resource consents held by Riverlands Eltham Limited (Riverlands). The Company operates a meat processing plant situated on London Street at Eltham, in the Waingongoro catchment. Since May 2014, the site has been known as ANZCO Foods Eltham, after the parent company, ANZCO Foods Limited. The period covered coincides with the killing season and the Company's financial year.

This report covers the results and findings of the monitoring programme implemented by the Council in respect of the consents held by Riverlands that relate to abstractions and discharges of water within the Waingongoro catchment, and the air discharge permit held by Riverlands to cover emissions to air from the site.

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 Taranaki Regional Council generally implements integrated environmental monitoring programmes and reports the results of the programmes jointly. This report discusses the environmental effects of Riverlands's use of water, land, and air, and represents the twenty-second and twenty-third combined annual reports and the twenty-fourth and twenty-fifth water-related reports by the Taranaki Regional 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 compliance monitoring under the Resource Management Act and the Council's obligations and general approach to monitoring sites through annual programmes, the resource consents held by Riverlands, the nature of the monitoring programme in place for the period under review, and a description of the activities and operations conducted by Riverlands Eltham Limited in the Waingongoro catchment.

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

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

Section 4 presents recommendations to be implemented in the 2014-2015 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 *Resource Management Act 1991 (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 a discharger, and may include cultural and socio-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 (e.g., recreational, cultural, or aesthetic);
(e) risks to the neighbourhood or environment.

In drafting and reviewing conditions on discharge permits, and in implementing monitoring programmes, the Taranaki Regional 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 performance of resource users and consent holders. Compliance monitoring, including both activity and impact monitoring, enables the Council to continuously assess its own performance in resource management as well as that of resource users, particularly consent holders. It further 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 consent holder/s during the period under review, this report also assigns a rating as to each Company's environmental and administrative performance.

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 (i.e. a defence under the provisions of the *RMA* can be established) may be excluded with regard to the performance rating applied. For example loss of data due to a flood destroying deployed field equipment.

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

Environmental Performance

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

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

For example:

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

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

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

Administrative compliance

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.

1.2 Process description

The meat processing plant is situated in mid-catchment, about 42 km by river from the sea (Figure 1). There has been a meat plant on the site since about 1894. Until the current monitoring period, the effluent was one of two major point source discharges to the river. The other discharge, comprising domestic and industrial effluent from Eltham municipal oxidation ponds, entered the Waingongoro River via the Mangawhero Stream about 3.2 km downstream of the Riverlands plant. The municipal effluent was diverted to Hawera via pipeline in June 2010. There is one major water abstraction (13 km) downstream, for the ammonia urea plant at Kapuni. Intensive pastoral farming occurs above and below the meat processing plant.

The Waingongoro River is ranked second highest among Taranaki streams as a recreational resource and highest as a recreational fishery. The median flow at Eltham Road is about 1,745 litres/second. The one-day duration mean annual low flow (MALF) is 448 litres/second.

The meat processing plant of Riverlands Eltham Limited on lower London Street, Eltham has the capacity to process about 200,000 beef units and 120,000 calves per year. Maximum kill rate is approximately 1,000 beef units per day. 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.

Annual kills since the 1993-94 season are shown in Figure 2. Since the mid-1990s, annual kill has increased from about 60,000 to 180,000 beef units, a factor of about 200%, and calf processing has been introduced. (The low kill in 1995-96 occurred as a result of an industrial labour dispute).

The majority of the processed 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 drawn from the Waingongoro River, both from Eltham town supply and from the river directly. The river abstraction point at the plant site is situated at the upstream boundary, immediately above the confluence with a small tributary that runs past the stockyards. A water treatment plant, commissioned at the abstraction site in August 2000, augments the supply of potable water from the municipal system.

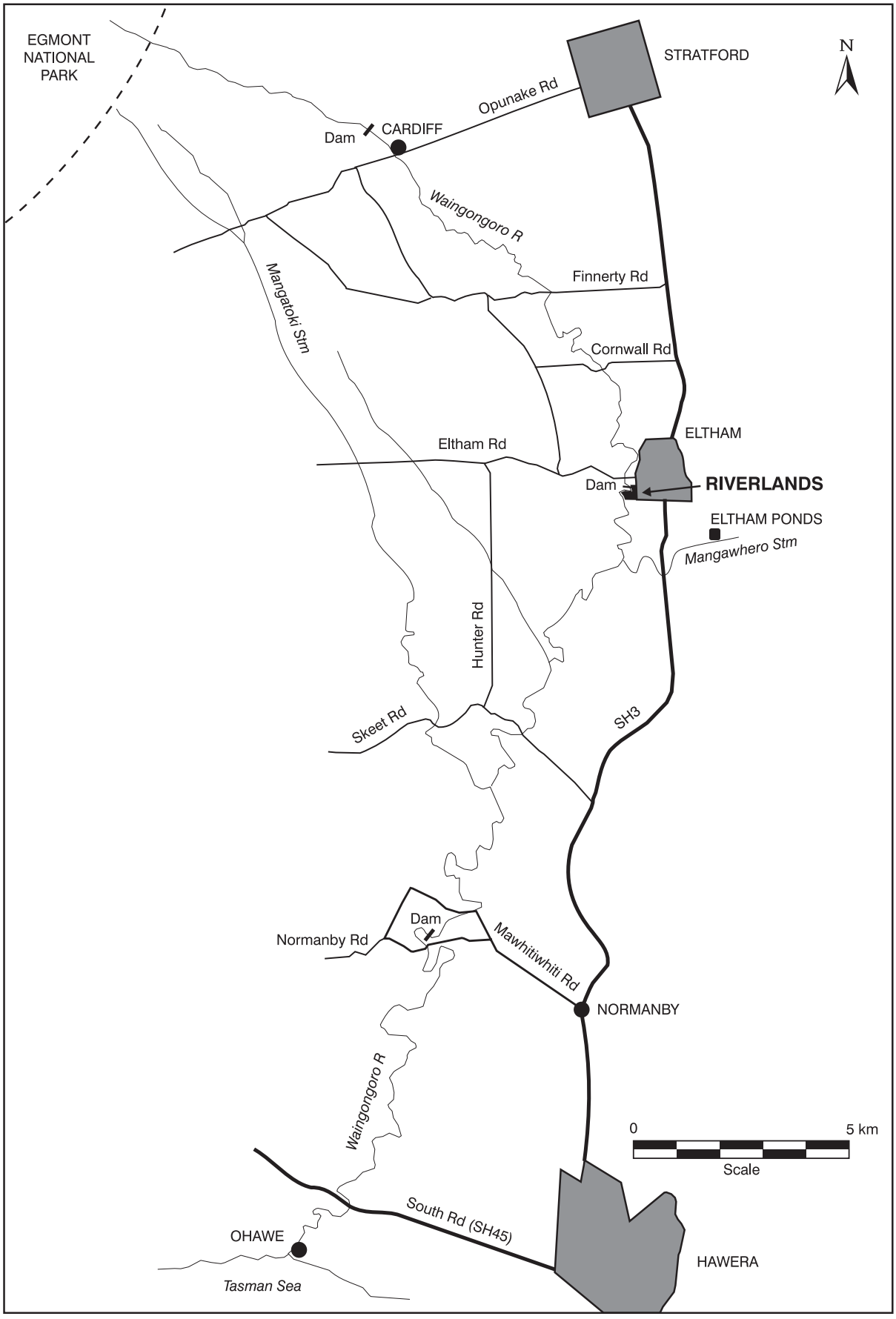


Figure 1 Riverlands site location in the Waingongoro catchment

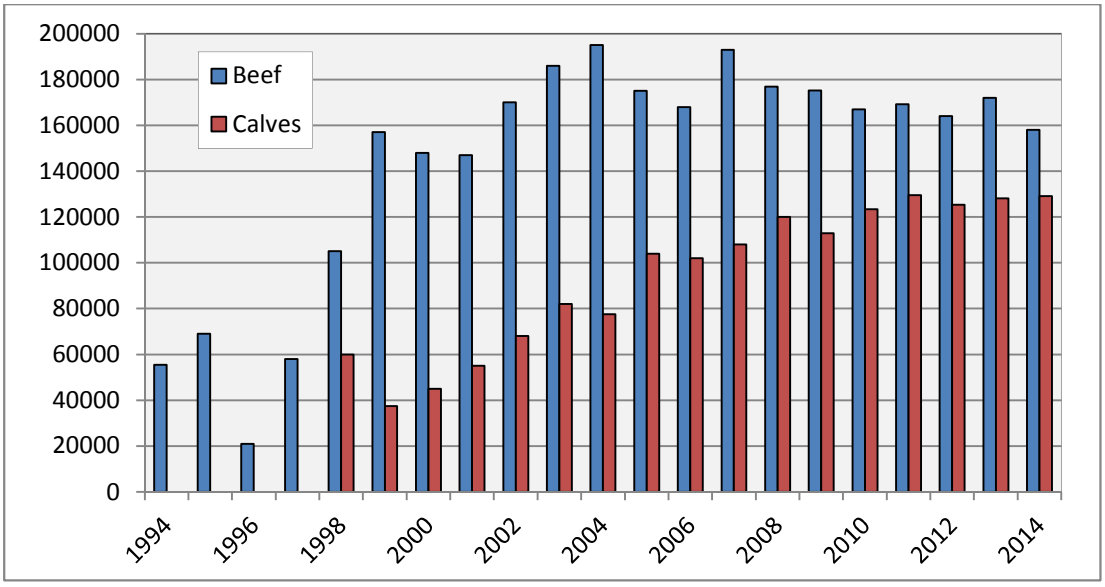


Figure 2 Annual beef and calf kills since 1993-94 season

Wastewater derives from four sources: killing, gutting (paunch material), processing, and the stockyards. Wastewater treatment comprises solids separation, followed by biological degradation in lagoons.

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 liquid effluent stream combines with the screened paunch/stockyard effluent and is discharged to the lagoon system.

There are eight lagoons in series with a total volume of about 40,000 m^3. The first five (ponds 1, 2, 3, 3A and 4), about 20,000 m^3 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 metres 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 or to the Waingongoro River. The disposal system is managed so as to maximise discharge to land, thereby to minimise any adverse effects of the effluent on the river.

The 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 215 ha in 2004-2005. The reticulated area was increased further in 2008-2009, as far as the southern boundary east of Lower Stuart Road, to about 235 ha.

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

A summary of the consents held by Riverlands in relation to activities at its Eltham plant is given in Table 1 below and the consents are discussed in Sections 1.3.1 to 1.3.5. A copy of each of the consents can be found in Appendix I.

Table 1 Summary of resource consents held by Riverlands Eltham Limited

Consent number	Purpose	Volume	Next review date	Expiry date
1968-4	Discharge stormwater to Waingongoro River		2017	2029
2039-4	Discharge treated wastewater to Waingongoro River	3,500 m³/day (81 L/s)	2017	2029
4644-2	Discharge emissions to air		-	2016
5437-3	Take from Waingongoro River	1,972 m³/day (22.8 L/s)	2017	2029
5569-1	Discharge treated wastewater to land (Stuart Road)	3,500 m³/day	2013	2026
5604-1	Structure for erosion control at water intake		2011	2017
5736-2	Discharge treated wastewater to land (Eltham Road)			2026
5739-1	Structure for pipeline crossing of Waingongoro River		-	2017
6455-1	Structure for piping of unnamed tributary		2017	2023
7487-1	Discharge solids to land and emissions to air		2017	2029

Five of the consents associated with the operation of the meat processing plant expired on 1 June 2011. Applications for replacement of four of the consents were lodged on 13 December 2010.

Consents **1968**, **2039**, **5437** and **5736** were replaced on 9 July 2012. These consents remained in force while applications for new consents were being processed. Conditions on the new consents were similar to those on the old.

Consent **5794-1,** that covered a structure for erosion control at a river pipeline crossing, was not replaced, as the activity it allowed had become permitted under the Regional Freshwater Plan that was promulgated in October 2001.

1.3.1 Water abstraction permit

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.

Water permit **5437-3** covers the take and use of water from the Waingongoro River for stock drinking, yard wash-down and miscellaneous purposes. This permit was issued by the Taranaki Regional Council on 7 July 2012 under Section 87(d) of the RMA. It is due to expire on 1 June 2029.

There are 12 special conditions attached to this permit.

Condition 1 limits maximum abstraction rate.

Conditions 2 to 6 relate to metering and the keeping of records.

Conditions 7 and 8 relate to use of the best practicable option to conserve water and to reporting.

Conditions 9 and 10 address intake screen design for protection of fish.

Condition 11 sets out a requirement for a donation to Council for riparian planting and management in the Waingongoro catchment.

Condition 12 is a review provision.

1.3.2 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.

Riverlands Eltham Limited holds two water discharge permits.

1.3.2.1 Wastewater discharge

Water permit **2039-4** covers the discharge of treated meat processing wastewater from the meat processing plant into the Waingongoro River. This permit was issued by the Taranaki Regional Council on 7 July 2012 under Section 87(d) of the RMA. It is due to expire on 1 June 2029.

There are 14 special conditions attached to this permit.

Condition 1 limits maximum discharge rate.
Condition 2 addresses receiving water effects after mixing.

Condition 3 requires consultation with Council prior to significant changes on the site.

Condition 4 addresses flow metering and provision of records.

Conditions 5 to 8 relate to a Wastewater Management Plan.

Condition 9 requires the appointment of a suitable wastewater operator on the site.

Condition 10 requires adoption of the best practicable option to avoid adverse environmental effects.

Condition 11 sets out a requirement for a donation to Council for riparian planting and management in the Waingongoro catchment.

Conditions 12 and 13 deal with reduction of dissolved reactive phosphorus in the discharge, requiring a report and providing for subsequent review of consent.

Condition 14 is a review provision.

1.3.2.2 Stormwater discharge

Water permit **1968-4** covers the discharge of stormwater from various locations at the plant site into the Waingongoro River. This permit was issued by the Taranaki Regional Council on 7 July 2012 under Section 87(d) of the RMA. It is due to expire on 1 June 2029.

There are 8 special conditions attached to this permit.

Condition 1 requires adoption of the best practicable option to avoid adverse environmental effects.

Condition 2 limits the catchment area.

Condition 3 imposes limits on significant potential contaminants.
Condition 4 addresses receiving water effects after mixing.

Condition 5 requires a contingency plan in case of accidental spillage of contaminants.

Condition 6 requires the maintenance of a stormwater management plan.

Condition 7 requires consultation with Council prior to significant changes on the site.

Condition 8 is a review provision.

1.3.3 Air discharge permit

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.

Riverlands Eltham Limited holds air discharge permit **4644-2** to cover the discharge of emissions into the air arising from meat processing and associated activities at the factory premises. This permit was issued by the Taranaki Regional Council on 8 June 2005 under Section 87(e) of the RMA. It is due to expire on 1 June 2016.

Condition 1 requires that the procedures and requirements set out in the consent application be followed, except when there is a conflict between such matters and the resource consent. (In the case of conflict, the consent prevails).

Condition 2 requires consultation with Council before any significant changes on the site.

Conditions 3 and 4 require the adoption of the best practicable option for controlling effects of discharges on the environment, and that processes be operated to minimise discharges.

Condition 5 prohibits significant adverse effect on the environment.

Conditions 6 to 9 address odour, including the provision of an air quality management plan.

Conditions 10 and 11 relate to an incinerator and to natural gas-fired equipment.

Condition 12 is a review provision.

1.3.4 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.

Riverlands Eltham Limited holds three discharge permits that provide for disposal of wastewater and solids onto land in the Waingongoro catchment.

1.3.4.1 Wastewater - Lower Stuart Road

Discharge permit **5569-1** covers the discharge of treated wastewater from meat processing and associated activities by irrigation onto and into land on Lower Stuart Road, Eltham and to discharge of emissions into the air, in the vicinity of various unnamed tributaries of the Waingongoro River and the Waingongoro River. This permit was issued by the Taranaki Regional Council on 23 December 1999 under Section 87(e) of the RMA. It is due to expire on 1 June 2026.

Condition 1 sets a date for installation of the irrigation system.

Conditions 2 to 5 relate to the implementation of a spray irrigation management plan.

Conditions 6 to 8 address odour and spray effects.

Conditions 9 to 13 place controls on the source, composition and application of wastewater.

Condition 14 deals with any contamination of local groundwater or water supply.

Conditions 15 and 16 address monitoring the exercise of consent.

Conditions 17 to 19 are review provisions.

1.3.4.2 Wastewater - Eltham Road

Discharge permit **5736-2** covers the discharge of treated wastewater from meat processing and associated activities by irrigation onto and into land known as Paulwell Farm, Eltham Road, Eltham and the discharge of emissions into the air. This permit was issued by the Taranaki Regional Council on 7 July 2012 under Section 87(e) of the RMA. It is due to expire on 1 June 2026.

There are 18 conditions attached to this permit.

Condition 1 defines the sources of wastewater.

Conditions 2 and 3 address odour and spray effects.

Conditions 4 to 7 place controls on the composition and application of wastewater.

Condition 8 deals with any contamination of local groundwater or water supply.

Conditions 9 to 11 relate to the implementation of a wastewater irrigation management plan.

Condition 12 requires the appointment of a suitable irrigation manager.

Condition 13 requires adoption of the best practicable option to avoid adverse environmental effects.

Conditions 14, 15 and 16 address monitoring of the discharge and receiving environment.

Condition 17 requires a written annual report on exercise of the consent.

Condition 18 is a review provision.

1.3.4.3 Waste solids

Discharge permit **7487-1** covers the discharge of anaerobic pond solids and paunch solids onto and into land and contaminants to air in the Waingongoro catchment at locations on Lower Stuart, Eltham and Anderson Roads, Eltham. This permit was issued by the Taranaki Regional Council on 17 September 2010 under Section 87(e) of the RMA. It is due to expire on 1 June 2029.

Condition 1 relates to location of the disposal sites

Condition 2 addresses the keeping of records.

Condition 3 requires adoption of the best practicable option for controlling effects of discharges on the environment, and that processes be operated to minimise discharges.

Conditions 4 and 5 prohibit entry to surface water and define buffer zones.

Condition 6 limits nitrogen application rate.

Condition 7 addresses odour.

Conditions 8 relates to implementation of a management plan for solids disposal.

Condition 9 deals with complaints.

Conditions 10 and 11 relate to lapse and review of consent.

1.3.5 Land use consents

Section 13(1)(a) of the RMA stipulates that no person may use, erect, reconstruct, place, alter, extend, remove, or demolish any structure or part of any structure in, or under, or over the bed of any lake or river, unless the activity is expressly allowed for by a resource consent, or a rule in a regional plan and in any relevant proposed regional plan.

Riverlands Eltham Limited holds three land use consents in relation to structures in the Waingongoro River and a tributary.

1.3.5.1 Water intake

Land use consent **5604-1** covers the construction, placement, use and maintenance of an intake structure and associated bank protection works on the true left bank of the Waingongoro River. This permit was issued by the Taranaki Regional Council on 9 March 2000 as a resource consent under Section 87(a) of the RMA. It is due to expire on 1 June 2017.

Condition 1 relates to notification of construction and maintenance works.

Conditions 2 to 7 relate to structure design and construction method.

Condition 8 relates to removal of the structure.

Condition 9 is a review condition.

1.3.5.2 Pipeline crossings

Land use consent **5739-1** covers the erection, placement and maintenance of a pipeline under the Waingongoro River. The pipeline carries treated effluent from the meat plant site to where it is irrigated onto land. This permit was issued by the Council on 14 December 2000 as a resource consent under Section 87(a) of the RMA. It is due to expire on 1 June 2017.

Condition 1 relates to notification of construction and maintenance works.

Conditions 2 to 4 relate to structure design and construction method.

Condition 5 relates to removal of the structure.

Condition 6 is a review condition.

1.3.5.3 Culvert and stream alignment

Consent **6455-1** covers the placement and maintenance of a culvert in, and the realignment of, an unnamed of tributary of the Waingongoro River immediately upstream of the water intake. This permit was issued by the Taranaki Regional Council on 20 September 2004 as a resource consent under Section 87(a) of the RMA. It is due to expire on 1 June 2023.

Condition 1 requires that the best practicable option be used to prevent adverse effects on the environment.

Condition 2 requires the consent to be exercised in accordance with documentation submitted.

Conditions 3 and 4 relate to notification and timing of maintenance works.

Condition 5 requires that the area of river bed disturbance be minimised.

Conditions 6 and 7 relate to lapse and review of consent.

1.4 Monitoring programme

1.4.1 Introduction

Section 35 of the RMA sets out an obligation upon the Taranaki Regional Council to: gather information, monitor, and conduct research on the exercise of resource consents, and the effects arising, within the Taranaki region and report upon these.

The Taranaki Regional 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 carried out by both Riverlands and the Council, as outlined below.

1.4.2 Monitoring by Riverlands Eltham Limited

Monitoring undertaken by Riverlands covers four main areas as described below. The results are reported to the Council monthly.

Water abstraction

The volume of water abstracted from the Waingongoro River is monitored continuously. A record is also kept of the volume of water taken from Eltham town supply.

Discharge to Waingongoro River

Wastewater discharge rate to the river is monitored continuously. 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 depends on the ability of the river to assimilate the discharge, particularly its ammonia component. The minimum frequency is weekly.

The chemical composition of wastewater is also monitored at several points within the wastewater treatment system, as part of management of that system.

Discharge to land

Wastewater discharge rate to land is monitored continuously. 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.

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 Riverlands Eltham Limited site undertaken by the Council consists of six primary components as described below.

Programme liaison and management

There is generally a significant investment of time and resources by the Taranaki Regional Council in ongoing liaison with resource consent holders over consent conditions and their interpretation and application, in discussion over monitoring requirements, preparation for any reviews, renewals, or new consents, advice on the Council's environmental management strategies and the content of regional plans, and consultation on associated matters.

Review of Riverlands's monitoring data

Monitoring data gathered by Riverlands are 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 and land irrigation areas, and in odour generation.

Site inspections

An officer of the Council visits the Riverlands Eltham plant at 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 irrigation system is inspected. Sources of data being collected by the consent holder are identified and accessed, so that performance in respect of operation, internal monitoring, and supervision can be reviewed by the Council. The neighbourhood is surveyed for environmental effects, particularly from odour.

Chemical sampling

Routine monitoring by the Council includes two chemical checks relating to the discharge permit conditions and an annual survey relating to river water quality and the discharge during low flow conditions in the river. Additional monitoring may be carried out if any breach of consent occurs.

Groundwater in the vicinity of the wastewater irrigation area on Lower Stuart Road is monitored quarterly for effects on water quality. A small surface stream is also monitored.

Inter-laboratory comparison exercises are carried out concurrently on the sampling dates of the two chemical compliance checks and the annual water quality survey. Additional exercises may be carried out if there is a disagreement on monitoring results.

Biological 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 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 meat plant.

Biological surveys are used to determine the impacts that discharges may cause over a period of time, as distinct from chemical surveys which give detailed information upon the constituents of a discharge at the time of sampling, but cannot give information upon previous discharge characteristics and effects. Biological surveys also directly indicate any significant adverse effects of discharges upon in-stream flora and fauna, so that cause-effect relationships do not have to be established as for critical levels of individual chemical parameters.

Water level and quality monitoring station

The Council maintains a water level and water quality monitoring station on the Waingongoro River at Eltham Road, about 900 metres above Riverlands's discharge point. Data from the station are telemetered to the Council offices at Stratford. Flow records date from December 1974.

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

2. Results

2.1 Inspections

Eight routine inspections were conducted during the 2012-2014 review period. Inspections were also carried out at the times of effluent and receiving water chemistry monitoring. Each inspection by an officer of the Council is usually conducted in conjunction with a Company employee, though not always for odour surveys.

Particular attention is given to the following items:

- stormwater drains
- stockyard drains
- by-product load-out areas
- septic tanks
- chemical and oil/fuel storage areas
- wastewater treatment system
- land irrigation system
- offsite odour

In general, housekeeping was good. No objectionable odour was noted beyond the boundaries of the plant.

2.2 Water abstractions

Records of abstraction volume were supplied by Riverlands, providing data on volume of water drawn from the river directly and the town supply, and on average use per body. Annual reports produced by Riverlands under consent 5437-2, condition 2 on minimising water usage are given in Appendix IV.

2.2.1 Monitoring records

Under the Resource Management (Measurement and Reporting of Water Takes) Regulations 2010, Riverlands was required by 10 November 2012 to take continuous measurements and keep daily records of volume taken, and thereafter supply by 31 July each year the record for the preceding 1 July to 30 June period. Suitable flow metering was already in place, and appropriate records kept, at the time the regulations came into force.

The daily abstraction record for 1 October 2012 to 30 September 2014 is presented in Figure 3.

The record shows that the limit of 1,972 m^3/day on maximum daily abstraction volume was complied with throughout the period monitored, when the allowable error of ±5% is taken into account. The measured daily volume exceeded the limit on 10 days in November/December 2012, by factors of up to 4.5%, and on 21 days between March and June 2014, by up to 4.6%.

Verification of the accuracy of the system was pending at the end of the reporting period, subject to the availability of suitably qualified persons. (Certification was produced on 18 November 2014).

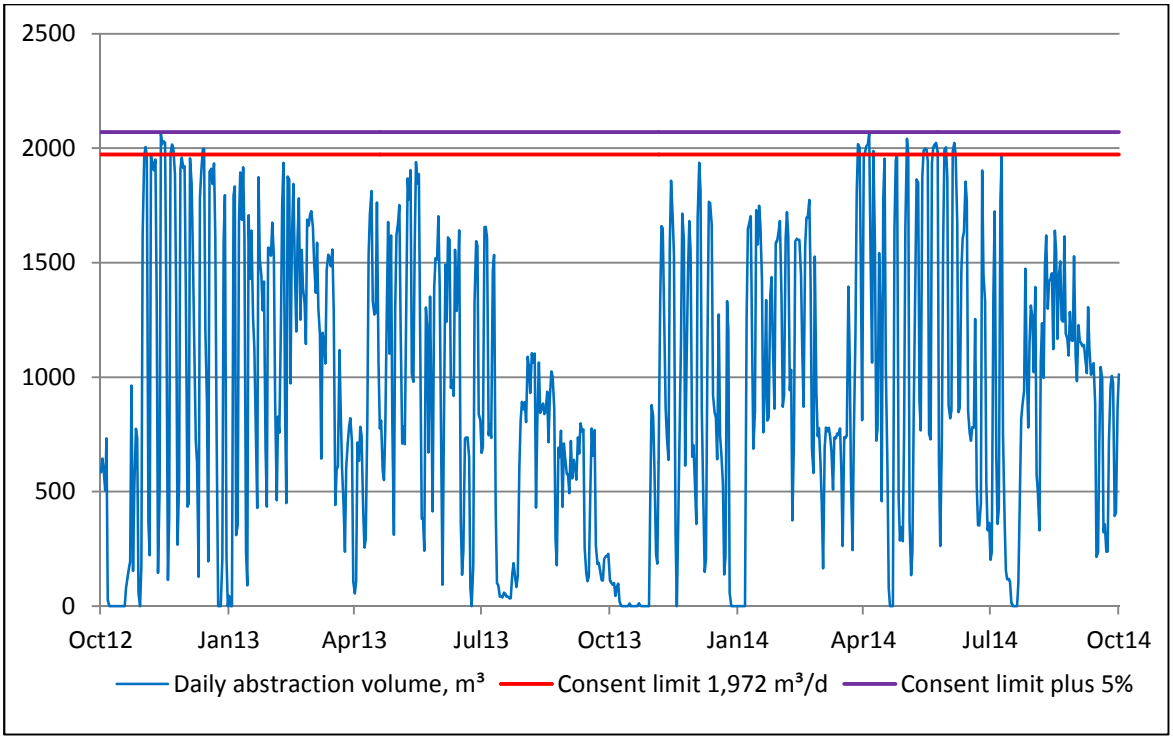


Figure 3 Daily water abstraction by Riverlands Eltham, October 2012 – September 2014, m³

2.2.2 Reports on water use minimisation

2012 – 2013 report

The annual report required by 31 May 2014 (under condition 8 on consent **5437**) was received on 30 June 2014.

The period covered by the 2012-2013 annual water use report ended on 10 July 2013, in order to cover the entire beef season and thus allow direct comparison with data from previous seasons.

The total river abstraction volume recorded was 290,272 m³. This amounted to 57% of the total volume of 509,542 m³ used at the plant, and was a decrease from the 64% recorded in 2011-2012 as the result of increased down-time in the treatment plant. The maximum daily river abstraction rate, reported on the basis of weekly records (to allow comparison with older records made before daily values were taken), was 11,164 m³, for the week ending 4 March 2013. This equates to 81% of the 1,972 m³/day limit that is allowed under water permit **5437**.

Water usage per cattle beast processed increased, from about 2.85 to 2.96 m³ per cattle beast processed. This change related to an increase in both non-potable and potable use. Non-potable use decreased by 8% to 0.68 m³ per body, and potable use increased by 2.7% to 2.28 m³ per body.

Non-potable water is used in the yards washing down the cattle, on stock trucks, cleaning the by-products and effluent pre-treatment areas, and in the outside rumblers and gut-washer. The increase in water use was due to increased hygiene requirements.

This was the third year of the new water conservation programme, in which the large savings of the first year were essentially maintained. Planned improvements for the 2013-2014 season included changes to the belly wash in the yards, whereby non-potable instead of potable water would be used, and the length of wash and the nozzle size would be reduced to save water.

2013 – 2014 report

The annual report required by 31 May 2015 was received on 26 November2014.

The period covered by the 2013-2014 annual water use report ended on 3 July 2014, in order to cover the entire beef season and thus allow direct comparison with data from previous seasons.

The total river abstraction volume recorded was 232,170 m^3. This amounted to 55% of the total volume of 426,665 m^3 used at the plant, and was a decrease from the 57% recorded in 2012-2013. The maximum daily river abstraction rate, reported on the basis of weekly records, was 8,734 m^3, for the week ending 7 April 2014. This equates to 63% of the 1,972 m^3/day limit that is allowed under water permit **5437**.

Water usage per cattle beast processed was reduced from the previous season, decreasing significantly from about 2.96 to 2.70 m^3 per cattle beast processed. Non-potable use was 0.53 m^3 per body, and potable use was 2.17 m^3 per body. The reduction comprised about 0.15 m^3 per body of non-potable water, largely the result of changes in body wash in the yards, and 0.11 m^3 per body of potable water.

Total annual water use during the 2013-2014 beef season decreased by a factor of 16.4%, as a result of the combined effect of an 8.2% reduction in beef kill with an 8.8% reduction in water use per animal processed. The water use per body was the lowest yet achieved, in the fourth year of the water conservation programme that began in 2010-2011.

2.3 Discharges to Waingongoro River

Monitoring for compliance with conditions on the discharge permits is carried out by both Riverlands and the Council. Riverlands measures effluent discharge rate continuously, and undertakes chemical analysis of the discharge and the river upstream and downstream of the discharge point weekly. Results are reported to the Council monthly. The Council monitors at the same points during two of the quarterly site inspections.

A survey of effects of the discharge on the river under low-flow conditions was carried out annually by the Council in summer/autumn between 1987 and 2000. This annual survey continued to be undertaken after the cessation of discharge to the river during low flows, in order to assess whether there was any unknown discharge or seepage from the plant site. Several points along the river, which encompass the main wastewater discharge and the tributary beside the stockyards, are monitored for chemical composition and bacteriological quality (Figure 4). The effects of the discharge from Eltham municipal ponds were surveyed concurrently. Given the small difference in river water quality found across the plant site in recent years, a low flow survey was not carried out during the 2012-2013 or 2013-2014 monitoring periods.

Interlaboratory comparisons are carried out during the two compliance monitoring checks and (any) low-flow survey.

2.3.1 Monitoring by Riverlands

Effluent discharge rate to the river is measured continuously and is recorded with an electronic data logger. Effluent flow measurement is necessary to determine mass discharges of effluent components. Such information enables assessment of the effects of changes in waste management practices, and estimation of the effects of the discharge on the river under various killing schedules and river flows.

The discharge and two river sites are sampled weekly and analysed for temperature, dissolved oxygen, pH, and ammonia. The discharge is also monitored weekly for chemical oxygen demand (COD) and nitrate. A record is provided of the daily kill.

Although 5-day biochemical oxygen demand (BOD) is controlled on the discharge permit, it is not monitored, as dissolved oxygen is monitored for the river, and COD, a quicker and technically easier test, is monitored for the discharge.

The time of sampling is usually early to mid-morning. The data set for the effluent discharge for the 2012-2014 monitoring period is attached in Appendix II of this report.

Riverlands also monitors the discharges from Pond 5 and Pond 6 weekly in order to assess the effects of aeration in Pond 5. Parameters monitored are temperature, dissolved oxygen, pH, ammonia and nitrate. Pond 4 is also monitored for temperature, pH and ammonia.

The results of monitoring by Riverlands show compliance with conditions on discharge permit 2039 throughout the 2012-2014 review period, in terms of discharge

volume, and concentration of dissolved oxygen and total ammonia in the receiving water.

2.3.2 Monitoring by Taranaki Regional Council

The Council monitors for the same parameters as does Riverlands, and some additional parameters. BOD (5-day test at 20^{o}C) is measured, both with and without nitrifier inhibition. This enables determination both of compliance with the consent limit on BOD increase in the receiving water, and of the degree of nitrogenous oxygen demand exerted by the treated wastewater. Enterococci and *E coli* (mTEC) tests are performed to produce information on micro-organisms that are used as indicators of water quality for contact recreation. Cations are measured to assess potential effects on soil of irrigation areas, and sulphate for generation of odour. Dissolved and total phosphorus are monitored as nutrients, and chloride is measured to assist in calculation of effluent dilution. Conductivity, turbidity and total alkalinity are measured as general water quality parameters.

For the summer low flow run, black disk measurements have been made in relation to water clarity.

The flow record for the Waingongoro River at Eltham Road hydrologic station over the monitoring period is attached as Appendix III.

Compliance monitoring checks

Routine discharge permit compliance checks were made on 4 December 2012, 4 July and 10 September 2013, and 18 February and 2 September 2014. The results are presented in Table 2 to Table 6. Discharge (entirely) to land was occurring during the 4 December 2012 and 18 February 2014 checks. Discharge to the river was occurring on 4 July 2013, at the end of the beef processing season, and on 10 September 2013 and 2 September 2014, during the calf processing season. Discharge rates to the river are taken from the Riverlands flow meter, which agreed reasonably well with rates calculated from mass balances on total ammonia, using river flow data from Eltham Road hydrometric station.

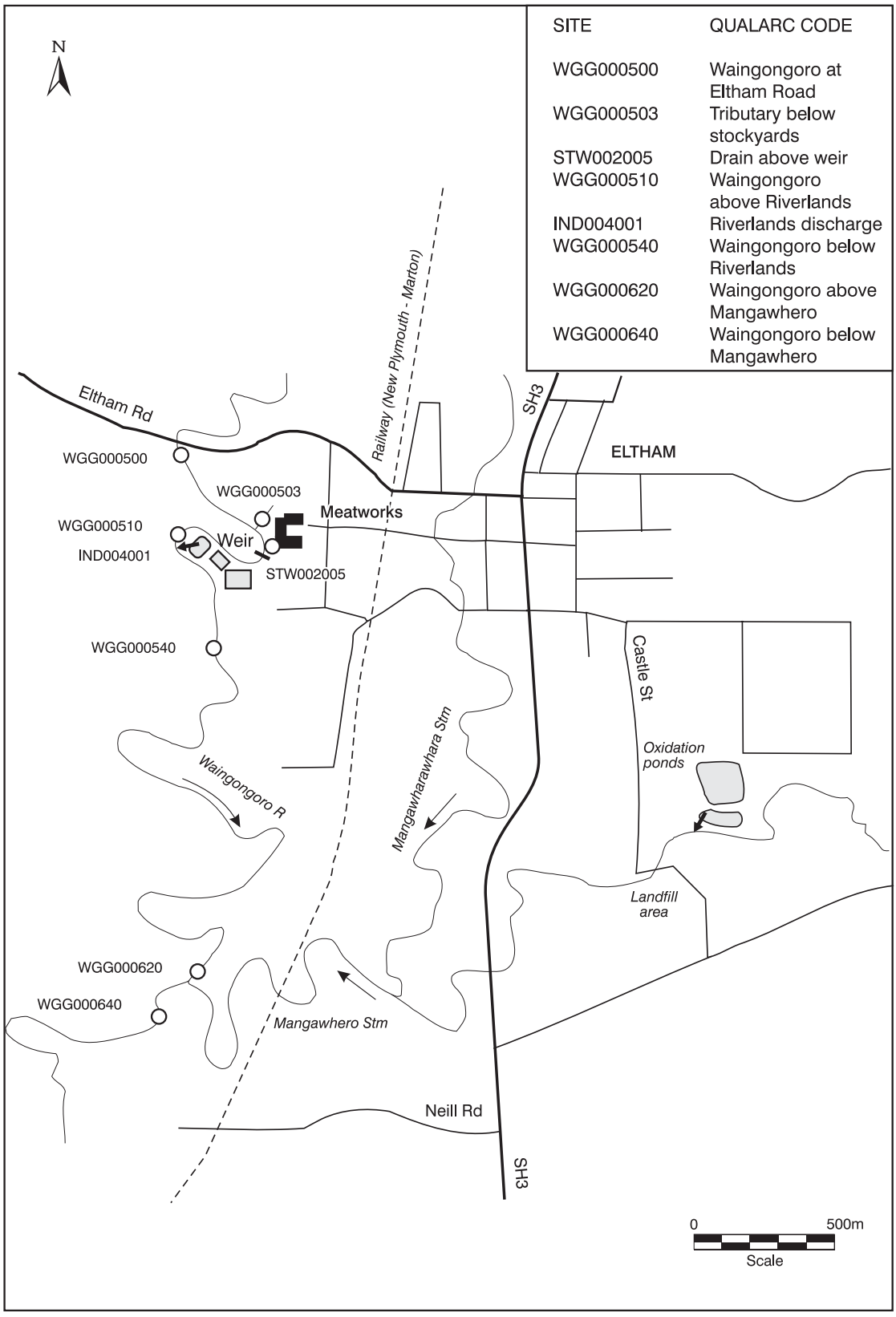


Figure 4 Chemical sampling sites

Table 2 Results of chemical analysis of Riverlands's discharge and Waingongoro River, 4 December 2012. Waingongoro River flow: 717 L/s. Discharge rate: 0 L/s

Parameter	Unit	Discharge	Upstream	Downstream	Downstream	Consent Limit
		IND004001	WGG000510	WGG000540	WGG000620	
Time	NZST	0920	0900	1000	1140	
Temperature	ºC	22.0	14.9	15.9	16.1	
Dissolved oxygen	g/m^3	4.6	10.2	10.0	10.2	>6
Conductivity @ 20ºC	mS/m	178	12.6	12.7	12.7	
pH	pH	7.6	7.8	7.8	7.8	
Alkalinity, total	g/m^3CaCO_3	780				
Turbidity	NTU	79	1.6	1.5	1.5	
Suspended solids	g/m^3	110	2	<2	3	
Total grease	g/m^3	6				
COD	g/m^3	290				
BOD_5, total	g/m^3	64	1.0	1.2		
BOD_5, filtered carbonaceous	g/m^3	15	0.7	0.8		<+2.0
Ammonia, total	g/m^3N	151	0.045	0.078	0.031	1.66
Un-ionised ammonia	g/m^3NH_3	3.3	0.001	0.002	0.001	
Kjeldahl nitrogen	g/m^3N	154				
Nitrite	g/m^3N	7.5	0.011	0.011	0.011	
Nitrate	g/m^3N	0.87	1.23	1.23	1.19	
Total nitrogen	g/m^3N	162				
Dissolved reactive phosphorus	g/m^3P	27	0.032	0.030	0.030	
Total phosphorus	g/m^3P	31				
Chloride	g/m^3	76	13.2	13.3	13.4	
Sulphate	g/m^3	12				
Sodium	g/m^3	140				
Potassium	g/m^3	44				
Calcium	g/m^3	25				
Magnesium	g/m^3	6.3				
Sodium adsorption ratio		6.5				
Faecal coliforms	cfu/100ml	2500	170	200	120	
Enterococci	cfu/100ml	870	13	9	21	

Table 3 Results of chemical analysis of Riverlands's discharge and Waingongoro River, 4 July 2013. Waingongoro River flow: 2,103 L/s. Discharge rate: 15.7 L/s

Parameter	Unit	Discharge	Upstream	Downstream	Downstream	Consent Limit
		IND004001	WGG000510	WGG000540	WGG000620	
Time	NZST	1015	1005	1045	1140	
Temperature	ºC	11.0	10.7	10.8	11.2	
Dissolved oxygen	g/m^3	2.9	11.0	10.9	10.6	>6
Conductivity @ 20ºC	mS/m	143	11.9	12.7	12.6	
pH	pH	7.7	7.7	7.7	7.6	
Alkalinity, total	g/m^3CaCO_3	540				
Turbidity	NTU	52	3.8	3.4	3.0	
Suspended solids	g/m^3	77	4	5	3	
Total grease	g/m^3	9				
COD	g/m^3	210				
BOD_5, total	g/m^3	51	0.6	1.6		
BOD_5, filtered carbonaceous	g/m^3	26	<0.5	0.5		<+2.0
Ammonia, total	g/m^3N	116	0.026	0.74	0.49	1.87
Un-ionised ammonia	g/m^3NH_3	1.41	0.000	0.009	0.005	
Kjeldahl nitrogen	g/m^3N	132				
Nitrite	g/m^3N	19	0.006	0.124	0.101	
Nitrate	g/m^3N	0.	1.64	1.68	1.70	
Total nitrogen	g/m^3N	150				
Dissolved reactive phosphorus	g/m^3P	26	0.016	0.137	0.110	
Total phosphorus	g/m^3P	22				
Chloride	g/m^3	72	13.5	14.1	13.9	
Sulphate	g/m^3	8.1				
Sodium	g/m^3	91				
Potassium	g/m^3	43				
Calcium	g/m^3	18				
Magnesium	g/m^3	5.4				
Sodium adsorption ratio		4.8				
Faecal coliforms	cfu/100ml	3600	92	130	88	
Enterococci	cfu/100ml	770	17	14	48	

Table 4 Results of chemical analysis of Riverlands's discharge and Waingongoro River, 10 September 2013. Waingongoro River flow: 1,719 L/s. Discharge rate: 18 L/s

Parameter	Unit	Discharge	Upstream	Downstream	Downstream	Consent
		IND004001	WGG000510	WGG000540	WGG000620	Limit
Time	NZST	0835	0820	0850	1128	
Temperature	ºC	10.5	9.6	9.8	10.7	
Dissolved oxygen	g/m^3	-	-	-	-	>6
Conductivity @ 20ºC	mS/m	101	12.2	12.8	12.7	
pH	pH	7.8	7.5	7.6	7.6	
Alkalinity, total	g/m^3CaCO_3	108				
Turbidity	NTU	70	2.8	2.8	2.7	
Suspended solids	g/m^3	100	4	4	4	
Total grease	g/m^3	6				
COD	g/m^3	180				
BOD_5, total	g/m^3	16	0.8	1.0	2.2	
BOD_5, filtered carbonaceous	g/m^3	3.2	<0.5	<0.5	<0.5	<+2.0
Ammonia, total	g/m^3N	64	0.034	0.41	0.31	2.07
Un-ionised ammonia	g/m^3NH_3	0.95	0.000	0.004	0.003	
Kjeldahl nitrogen	g/m^3N	90				
Nitrite	g/m^3N	0.127	0.007	0.010	0.028	
Nitrate	g/m^3N	60	1.52	1.95	2.1	
Total nitrogen	g/m^3N	150				
Dissolved reactive phosphorus	g/m^3P	7.6	0.017	0.063	0.060	
Total phosphorus	g/m^3P	9.3				
Chloride	g/m^3	55	13.6	13.7	13.6	
Sulphate	g/m^3	25				
Sodium	g/m^3	50				
Potassium	g/m^3	23				
Calcium	g/m^3	27				
Magnesium	g/m^3	5.7				
Sodium adsorption ratio		2.3				
Faecal coliforms	cfu/100ml	300	150	160	48	
Enterococci	cfu/100ml	120	21	23	4	

Table 5 Results of chemical analysis of Riverlands's discharge and Waingongoro River, 18 February 2014. Waingongoro River flow: 558 L/s. Discharge rate: 0 L/s

Parameter	Unit	Discharge	Upstream	Downstream	Downstream	Consent
		IND004001	WGG000510	WGG000540	WGG000620	Limit
Time	NZST	0855	0910	0935	1225	
Temperature	ºC	23.0	17.7	18.3	20.0	
Dissolved oxygen	g/m^3	10.0	9.8	9.5	11.3	>6
Conductivity @ 20ºC	mS/m	181	11.7	11.7	11.8	
pH	pH	8.1	8.0	8.1	8.7	
Alkalinity, total	g/m^3CaCO_3	830				
Turbidity	NTU	66	0.86	1.0	0.94	
Suspended solids	g/m^3	86	<2	<2	<2	
Total grease	g/m^3	6				
COD	g/m^3	270				
BOD_5, total	g/m^3	84	0.7	0.8	0.9	
BOD_5, filtered carbonaceous	g/m^3	16	<0.5	<0.5	<0.5	<+2.0
Ammonia, total	g/m^3N	153	0.032	0.076	0.018	1.09
Un-ionised ammonia	g/m^3NH_3	10.9	0.002	0.004	0.004	
Kjeldahl nitrogen	g/m^3N	153				
Nitrite	g/m^3N	2.1	0.006	0.007	0.008	
Nitrate	g/m^3N	0.86	0.69	0.65	0.60	
Total nitrogen	g/m^3N	154				
Dissolved reactive phosphorus	g/m^3P	29	0.020	0.025	0.021	
Total phosphorus	g/m^3P	31				
Chloride	g/m^3	88	12.0	12.0	12.2	
Sulphate	g/m^3	19				
Sodium	g/m^3	147				
Potassium	g/m^3	59				
Calcium	g/m^3	22				
Magnesium	g/m^3	6.5				
Sodium adsorption ratio		7.1				
Faecal coliforms	cfu/100ml	3500	280	440	110	
Enterococci	cfu/100ml	1400	150	200	110	

Table 6 Results of analysis of Riverlands's discharge and Waingongoro River, 2 September 2014. Waingongoro River flow: 1,313 L/s; Discharge rate: 8.2 L/s

Parameter	Unit	Discharge	Upstream	Downstream	Downstream	Consent Limit
		IND004001	WGG000510	WGG000540	WGG000620	
Time	NZST	0745	0730	0800	0850	
Temperature	ºC	9.8	9.3	9.3	9.5	
Dissolved oxygen	g/m^3	7.8	11.3	11.2	11.1	>6
Conductivity @ 20ºC	mS/m	106	12.2	13.0	13.0	
pH	pH	7.6	7.6	7.6	7.6	
Alkalinity, total	g/m^3CaCO_3	153				
Turbidity	NTU	29	2.0	2.0	1.8	
Suspended solids	g/m^3	35	2	<2	4	
Total grease	g/m^3	8				
COD	g/m^3	120				
BOD_5, total	g/m^3	30	0.7	0.8	1.9	
BOD_5, filtered carbonaceous	g/m^3	7.3	<0.5	<0.5	<0.5	<+2.0
Ammonia, total	g/m^3N	86	0.044	0.55	0.41	2.07
Un-ionised ammonia	g/m^3NH_3	0.76	0.000	0.005	0.004	
Kjeldahl nitrogen	g/m^3N	83				
Nitrite	g/m^3N	57	0.012	0.41	0.35	
Nitrate	g/m^3N	6.0	1.68	1.89	2.2	
Total nitrogen	g/m^3N	146				
Dissolved reactive phosphorus	g/m^3P	7.2	0.018	0.068	0.061	
Total phosphorus	g/m^3P	8.2				
Chloride	g/m^3	65	13.0	13.8	13.9	
Sulphate	g/m^3	20				
Sodium	g/m^3	63				
Potassium	g/m^3	24				
Calcium	g/m^3	28				
Magnesium	g/m^3	6.1				
Sodium adsorption ratio		2.8				
Faecal coliforms	cfu/100ml	320	220	280	160	
Enterococci	cfu/100ml	110	82	62	44	

Compliance with consent conditions on minimum dissolved oxygen and on maximum increase in filtered carbonaceous BOD, was achieved on each monitoring occasion.

A summary of the results of compliance monitoring checks on total ammonia nitrogen is given in Table 7. Compliance with the pH-dependent limit was achieved on each monitoring occasion.

Table 7 Summary of total ammonia nitrogen results from compliance monitoring by TRC

Date	Time NZST	Flow, L/s		pH	Total ammonia, g/m^3N			
		Waingo-ngoro. River*	Effluent		Upstream	Down-stream	Limit	Percent of limit
04.12.12	1000	717	0	7.8	0.045	0.078	1.66	5
04.07.13	1045	2,103	16	7.7	0.026	0.74	1.87	40
10.09.13	0850	1,719	18	7.6	0.034	0.41	2.07	20
18.02.14	0935	558	0	8.1	0.032	0.076	1.09	7
02.09.14	0800	1,313	8.2	7.6	0.044	0.55	2.07	27

* at Eltham Road

Annual low-flow survey

A low-flow survey was not carried out during the review period, as Riverlands did not discharge to the Waingongoro River during low flows. Low-flow surveys were carried out over the previous several years, also when there was no discharge, which

showed that there was little change in water quality in the river between sites immediately above and below the meat plant site, a slight increase in ammonia concentration being apparent.

2.3.3 Interlaboratory comparisons

Routine inter-laboratory comparison exercises for 2012-2014 were carried out on 4 December 2012, 4 July and 10 September 2013, and 18 February and 2 September 2014. The results are given in Table 8.

Significant differences are highlighted in bold, taking into account the heterogeneity of the effluent, the accuracy and detection limits of the test methods employed, and the importance of the results in determining the potential for adverse effect in receiving water.

Table 8 Results of inter-laboratory comparisons 2012-2014 monitoring period

Parameter	Unit	Discharge		Upstream		Downstream	
		Riverlands	TRC	Riverlands	TRC	Riverlands	TRC
4 December 2012							
Temperature	ºC	22.0	22.0	14.7	14.9	14.8	15.9
Dissolved oxygen	g/m³	2.7	4.6	9.1	10.2	9.2	10.0
pH		7.8	7.6	7.5	7.8	7.6	7.8
Ammonia	g/m³N	174	162	0.19	0.045	0.14	0.078
Nitrate + nitrite	g/m³N	3	8.3				
Chemical oxygen demand	g/m³	284	290				
Suspended solids	g/m³	60	110				
4 July 2013							
Temperature	ºC	11.2	11.0	10.7	10.7	11.2	10.8
Dissolved oxygen	g/m³	4.1	2.9	10.8	11.0	10.8	10.9
pH		7.7	7.7	7.3	7.7	7.3	7.7
Ammonia	g/m³N	127	116	0.24	0.028	0.80	0.74
Nitrate + nitrite	g/m³N	23	18.2				
Chemical oxygen demand	g/m³	455	210				
Suspended solids	g/m³	116	77				
10 September 2013							
Temperature	ºC		10.5		9.6		9.8
Dissolved oxygen	g/m³		-		-	10.8	-
pH		7.86	7.8	7.72	7.5	7.71	7.6
Ammonia	g/m³N	73	64		0.034	0.50	0.41
Nitrate + nitrite	g/m³N	55	60				
Chemical oxygen demand	g/m³		180				
Suspended solids	g/m³		100				
18 February 2014							
Temperature	ºC	24.2	23.0	18.0	17.7	18.0	18.3
Dissolved oxygen	g/m³	10.8	10.0	9.9	9.8	9.4	9.5
pH		8.0	8.1	7.3	8.0	7.3	8.1
Ammonia	g/m³N	168	153	0.09	0.032	0.11	0.076
Nitrate + nitrite	g/m³N	1.5	0.86				
Chemical oxygen demand	g/m³	295	270				
Suspended solids	g/m³	100	86				
2 September 2014							
Temperature	ºC	10.8	9.8	10.3	9.3	10.4	9.3
Dissolved oxygen	g/m³	7.7	7.8	10.9	11.3	10.6	11.2
pH		7.4	7.6	7.6	7.6	7.6	7.6
Ammonia	g/m³N	94	86	0.22	0.044	0.74	0.55
Nitrate + nitrite	g/m³N	65.0	63				
Chemical oxygen demand	g/m³	159	120				
Suspended solids	g/m³	32	35				

* samples taken by Riverlands

Overall, the results are satisfactory in terms of ability to determine compliance with relevant conditions on consent 2039, except for pH in the receiving water.

Agreement on dissolved oxygen in the river has always been good. For the discharge, nitrification (microbial oxidation of ammonia) during transport to the Council laboratory sometimes resulted in Council values being the lower when using the Winkler (iodometric) method. The use of a field dissolved oxygen meter by Council appears to have remedied this.

The pH value is important in the determination of compliance with the consent limit on total ammonia. Low pH value leads to a false high value for the ammonia concentration that is allowed in the river. There was poor agreement for the river on two exercises, the Riverlands values being the lower on 4 July 2013 and 18 February 2014. Intermediate and subsequent exercises gave better agreement.

Agreement on total ammonia was reasonable for the effluent, Riverlands's results being slightly higher. For the receiving water, Riverlands results were the higher at low concentrations. This probably owed to the relatively low sensitivity of the test employed by Riverlands.

Chemical oxygen demand and nitrate are used to assess the performance of the wastewater treatment system. For chemical oxygen demand, Riverlands results have usually been higher than those of the Council because a more rigorous digestion is used in the test. There was reasonable agreement on nitrate, given the relatively low sensitivity of the method employed by Riverlands. It is trends derived from weekly monitoring, rather than great accuracy for individual determinations, that matter for these parameters.

2.3.4 Biological surveys

The four routine streambed community surveys of the Waingongoro River for the 2012-2014 review period included spring surveys on 31 October 2012 and 13 November 2013 and late summer surveys on 25 February 2013 and 25 February 2014.

The 2012 spring survey was carried out on the day that discharge of the treated wastewater to land commenced, following five days of continuous discharge to the river at the beginning of the beef killing season. The survey was carried out following a wet spring period, under moderate recession flow conditions of about 1,260 litres/second.

The 2013 late summer survey was carried out during low flow conditions of about 535 litres/second after a period of about four months of no river discharge, while 100% of wastewater had been irrigated to land.

The 2013 spring survey was carried out in the third week of the beef killing season, the week after continuous discharge to land commenced. The survey was carried out under moderate recession flow conditions of about 1,430 litres/second.

The 2014 autumn survey was carried out during very low flow conditions of about 450 litres/second after a period of about 4.5 months of no river discharge, while 100% of wastewater had been irrigated to land.

All surveys involved the assessment of macroinvertebrate communities (aquatic insects, crustacea, etc) and riverbed algae (microscopic plants). For the spring surveys, samples were collected from three sites in the Waingongoro River: one upstream and two downstream of the Riverlands discharge (Figure 5). For the late summer surveys, four sites were sampled downstream, encompassing the sites formerly monitored to assess the influence of discharges from Eltham town wastewater treatment system.

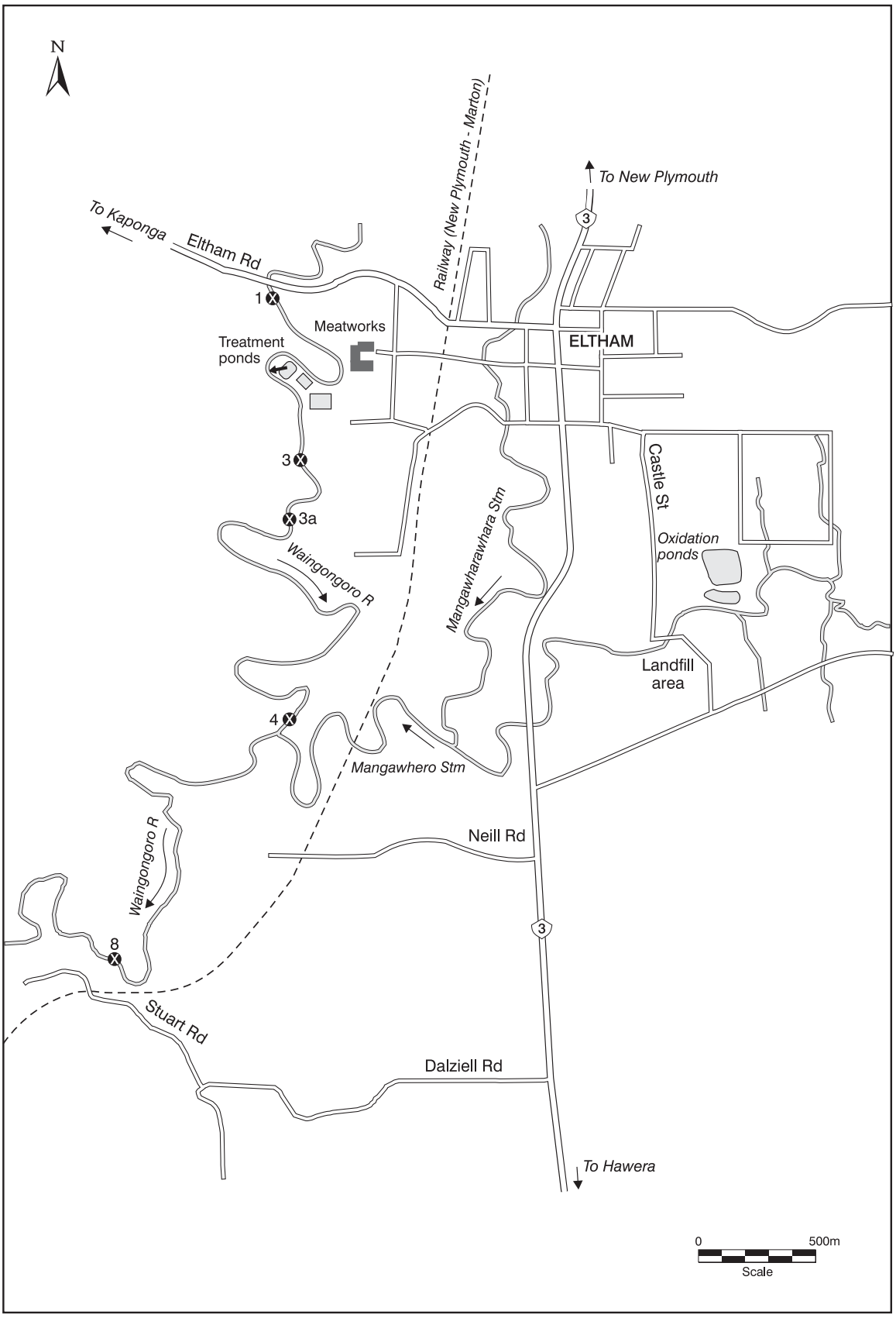


Figure 5 Biological sampling sites

31 October 2012

This spring macroinvertebrate survey indicated that following a period of wastewater discharge there were no significant effects on the macroinvertebrate communities' compositions downstream of the discharge outfall beyond the designated mixing zone. Few significant changes in individual taxon abundances were recorded in a downstream direction. There were no heterotrophic growths found on the riverbed at any of the three sites which was also indicative of no significant impacts of any preceding authorised wastewater discharge on the biological communities of the Waingongoro River below the discharge and no evidence of any unauthorised spillage(s) to the river, the sources of which had been identified and successfully contained on the property in recent years.

In general, the macroinvertebrate communities of the Waingongoro River contained high proportions of 'sensitive' taxa at all sites and the communities were dominated only by 'sensitive' taxa. Taxonomic richnesses (numbers of taxa) were within ranges and slightly below medians of those found by previous surveys at all sites, whereas MCI scores were higher than historical maxima at each of the three sites.

MCI and $SQMCI_S$ scores indicated that the stream communities were of 'good' to 'very good' health and 'better than' to 'well above expected' predicted conditions recorded for reaches of similar Taranaki rivers. The very few significant differences in the numerical abundances amongst the characteristic taxa accounted for the minor variability in $SQMCI_s$ values through the river reach surveyed.

25 February 2013

This late summer macroinvertebrate survey indicated that, coincident with the absence of treated meatworks wastes discharges to the river from the Riverlands site (due to a lengthy period of diversion to land irrigation), no significant changes in the macroinvertebrate communities were found between the upstream 'control' site and either of the two sites downstream of this site discharge.

The macroinvertebrate communities of the Waingongoro River contained relatively similar proportions of 'sensitive' taxa at all sites with the communities dominated by more 'sensitive' than 'tolerant' taxa at all sites. Community richnesses (numbers of taxa), although higher than historical median richnesses, were similar at most sites at the time of this late summer survey but slightly higher in comparison with most previous summer surveys.

MCI scores indicated that the stream communities were all of 'good' generic health, and 'well above expected' predicted conditions recorded for reaches of similar Taranaki rivers and streams. The community at the site downstream of the Mangawhero Stream confluence, normally affected by the Eltham WWTP discharge, showed improvement and was similar to that immediately upstream of the confluence. This improvement was due to the more recent diversion of this discharge out of the catchment (by pipeline to the Hawera WWTP).

13 November 2013

This spring macroinvertebrate survey indicated that following a period of partial wastewater discharge to the river there were limited, relatively insignificant effects on the macroinvertebrate communities' compositions downstream of the discharge outfall beyond the designated mixing zone. Very few significant changes in

individual taxon abundances were recorded in a downstream direction. There were no heterotrophic growths found on the riverbed at any of the three sites which was also indicative of limited impacts of any preceding authorised wastewater discharge on the biological communities of the Waingongoro River below the discharge and no evidence of any unauthorised spillage(s) to the river, the sources of which had been identified and successfully contained on the property in recent years.

In general, the macroinvertebrate communities of the Waingongoro River contained high proportions of 'sensitive' taxa at all sites and the communities were dominated almost entirely by 'sensitive' taxa. Taxonomic richnesses (numbers of taxa) were within ranges and slightly below medians of those found by previous surveys at all sites, whereas MCI scores were above medians but lower than historical maxima at each of the three sites.

MCI and $SQMCI_S$ scores indicated that the stream communities were of 'fair' to 'good' generic health and ' expected' predicted health conditions recorded for reaches of similar Taranaki rivers. The very few significant differences in the numerical abundances amongst the characteristic taxa accounted for the very similar in $SQMCI_s$ values through the river reach surveyed.

25 February 2014

This late summer macroinvertebrate survey indicated that, coincident with the absence of treated meatworks wastes discharges to the river from the Riverlands site (due to a lengthy period of diversion to land irrigation), marginally significant changes in the macroinvertebrate communities were found between the upstream 'control' site and the first of the two sites downstream of this site discharge coincident with poorer habitat at this downstream site.

The macroinvertebrate communities of the Waingongoro River contained relatively similar proportions of 'sensitive' taxa at all sites with the communities dominated by more 'sensitive' than 'tolerant' taxa at all sites. Community richnesses (numbers of taxa), although generally higher than, or similar to, historical median richnesses, had a moderate range of seven taxa at the time of this late summer survey but were slightly more variable in comparison with most previous summer surveys, although not significantly poorer in richness.

MCI scores indicated that the stream communities were all of 'good' generic health with the exception of 'fair' generic health at the furthest downstream site (Stuart Road), and generally of 'expected' predicted conditions recorded for reaches of similar Taranaki rivers and streams. The community at the site downstream of the Mangawhero Stream confluence, previously affected by the Eltham WWTP discharge, maintained improvement and was similar to those in the reach downstream of the meatworks outfall. This improvement, in the absence of the meatworks discharge, primarily was due to the more recent diversion of this discharge out of the catchment (by pipeline to the Hawera WWTP).

2.4 Discharges to land

Treated wastewater from Riverlands is irrigated on a 272 ha dairy farm on Lower Stuart Road (Figure 7). The soil is well suited to irrigation; being Stratford Series yellow-brown loams (iic3-N11) with a moderately high saturated infiltration rate of about 31 mm/h (range 24-48mm/h). The contour of irrigation areas is flat to moderately rolling, with slope up to 17°.

Figure 6 Travelling irrigator showing low discharge trajectory to minimise spray drift

Irrigation commenced in late January 2001, on an area of about 60 ha on the eastern side of Lower Stuart Road. A total of 100,050 m^3 was irrigated over a period until the middle of May.

In spring 2002, the mainline was extended through land on the western side of Lower Stuart Road, increasing the reticulated area to 133 ha. In December 2002, the mainline was further extended, increasing the reticulated area to 171 ha. In the 2004-2005 season, the area reticulated was 215 ha. The area available for irrigation is 264.71ha, with approximately 252.0 ha used in 2012-2013 and 238.8 ha in 2013-14.

The irrigation system is operated by the farmer in accordance with the procedures of a management plan written by Riverlands and approved by the Council. The governing factors are nitrogen application rate, prevention of ponding and run-off, and avoidance of odour or spray drift beyond the property boundary.

Applications are typically 45 mm (range 20-70 mm) in depth, with a minimum stand-down period before grazing of 10 days. Buffer zones are marked around residential dwellings (150 m), property boundaries, public roads and waterways (20 m), and wells or bores used for water supply (50 m).

Discharges to land and their effects are monitored by both Riverlands and the Council. Riverlands monitors effluent composition and application rate, and employs an independent consultant to monitor soil, foliage and surface waters of the irrigation areas. The Council monitors groundwater in the vicinity of the irrigation areas.

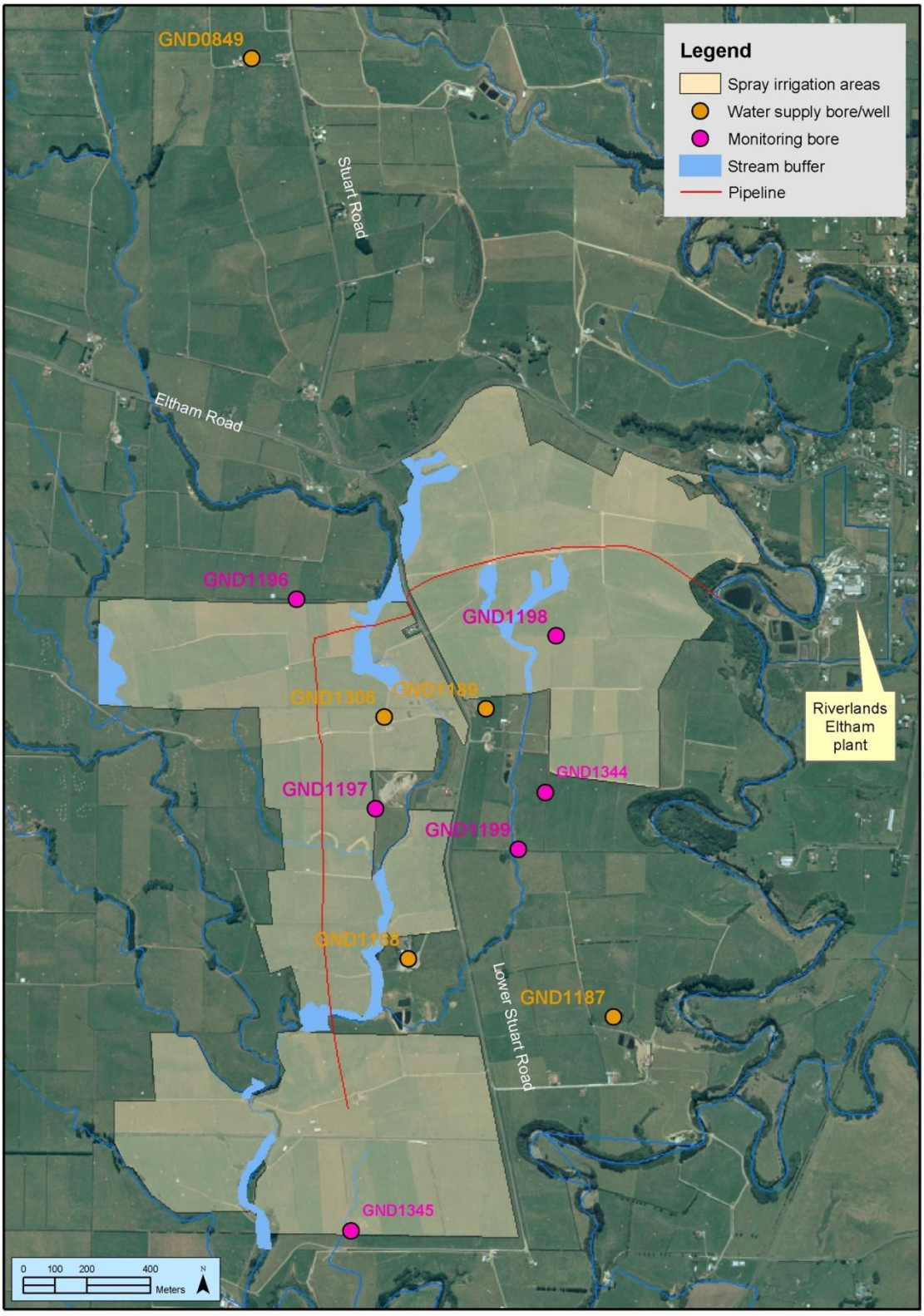


Figure 7 Wastewater irrigation areas in 2012-2014, showing groundwater monitoring sites

2.4.1 Monitoring by Riverlands

Hydraulic and nitrogen application rates

Effluent application rate is monitored by two methods. First, the volume of effluent pumped is metered at the meat plant. Secondly, a record is kept of every application on each paddock, and the standard depth of effluent applied (45mm) is multiplied by the area irrigated to give a volume. Agreement between the methods has been reasonable, though actual application depths need to be checked.

Effluent composition is tested weekly by Riverlands for temperature, dissolved oxygen, pH, total ammonia, nitrate, suspended solids and COD (section 2.3.1). In addition, an independent laboratory (Industrial Chemical Services Limited) analyses the effluent monthly for pH, total dissolved solids, total Kjeldahl nitrogen and sodium, and bi-monthly for those parameters plus nitrate, nitrite, total ammonia, potassium, calcium and magnesium, total and dissolved reactive phosphorus, oil and grease, chemical oxygen demand, biochemical oxygen demand and faecal coliforms.

2012-2013

In the 2012-2013 period, irrigation occurred over a total period of 30 weeks, between 1 November 2012 and 26 May 2013. Total metered volume of effluent applied was 380,429 m^3, being 65% of the estimated total effluent generated over the year (582,893 m^3), and 74% of effluent generated during the beef processing season, 511,044 m^3.

A total mass of 59,071 kg of nitrogen (based on weekly tests for ammonia-nitrogen and nitrate/nitrite-nitrogen, and assuming 15 g/m^3 organic nitrogen) was applied at concentrations ranging from 79 to 251 g/m^3 (average 155 g/m^3). Average nitrogen application rate was 234 kg/ha over 30 weeks, on the basis of pumped volumes. In comparison, nitrogen application rate on the basis of assumed application depth of 45mm, on 88 paddocks totalling 252.0 ha in area (mostly two or three applications, up to five), was 164.8 kg/ha.

Loadings on individual paddocks ranged from 58.5 to 352 kg/ha/y. The maximum nitrogen application limit of 300 kg/ha/y was exceeded in three paddocks over an area of 10.0 ha (3.9 %). In comparison, in 2011-2012, the limit was exceeded on a total of five paddocks over an area of 12.6 ha with a maximum application rate of 320 kg.

2013-2014

In the 2013-2014 period, irrigation occurred over a total period of 34 weeks, between 29 October 2013 and 22 June 2014. Total metered volume of effluent applied was 325,625 m^3, being 70% of the estimated total effluent generated over the year (467,619 m^3), and about 81% of effluent generated during the beef processing season, 400,411 m^3.

A total mass of 55,258 kg of nitrogen (based on weekly tests for ammonia-nitrogen and nitrate/nitrite-nitrogen, and assuming 15 g/m^3 organic nitrogen) was applied at concentrations ranging from 64 to 223 g/m^3 (average 170 g/m^3). Average nitrogen application rate was 231 kg/ha over 34 weeks, on the basis of pumped volumes. In comparison, nitrogen application rate on the basis of assumed application depth of 45mm, on 84 paddocks totalling 238.8 ha in area (mostly two or three applications, up to four), was 186.4 kg/ha.

Loadings on individual paddocks ranged from 69.8 to 357 kg/ha/y. The maximum nitrogen application limit of 300 kg/ha/y was exceeded in five paddocks over an area of 16.8 ha (6.5 %).

Soil and herbage

Shallow soil, up to 150 mm depth, is monitored monthly for parameters which give early indication of potential for nitrogen leaching, and for damage to soil structure. The parameters monitored are pH, water extractable nitrate, exchangeable ammonia, total nitrogen and exchangeable sodium.

Major soil components are monitored bi-annually for evaluation of fertiliser and soil conditioner requirements.

Foliage of the irrigation areas is monitored quarterly to assess major and trace nutrient uptake, for the purpose of checking pasture health and the suitability of the pasture as stock feed.

For the 2012-2014 review period, the results of shallow soil monitoring indicated that the nitrogen and sodium loadings applied are sustainable.

Soil analysis for major ions showed that calcium (as gypsum) application was needed in all areas. Herbage analysis indicated nutrient uptake to be in good condition. These factors were addressed through topdressing with appropriate (non-nitrogen) fertilisers.

Surface waters

Surface waters that exit the irrigation areas are monitored monthly at up to eight sites to detect any leaching or surface run-off. Parameters determined are pH, total dissolved solids, nitrate, nitrite, ammonia, Kjeldahl nitrogen, total and dissolved reactive phosphorus, and sodium.

In the 2012-2014 review period, the results of surface steam monitoring showed nitrate concentration in the tributary west of Lower Stuart Road at the downstream site to be fairly stable, in the range 2.4 to 3.2 g/m^{3}N.

2.4.2 Monitoring by Taranaki Regional Council

Groundwater in the vicinity of the irrigation areas is monitored quarterly by the Council at wells and bores used for water supply, and at dedicated monitoring bores. The monitoring sites are depicted in Figure 7 and described in Table 9.

Table 9 Groundwater monitoring sites

Site name	Site code	Depth m	Grid reference	
			Easting	Northing
Water supply				
Edwards	GND0849	14.9	2619191	6197881
Gribble	GND1187	6.7	2620329	6194862
Joblin 1	GND1188		2619683	6195045
Joblin 2	GND1306	7.2	2619607	6195807
Joblin 3	GND1189	6.3	2619928	6195832

Site name	Site code	Depth m	Grid reference	
			Easting	Northing
Monitoring				
Bore A	GND1196	9.0	2619332	6196178
Bore B	GND1197	9.1	2619580	6195518
Bore C	GND1198	8.6	2620148	6196062
Bore D	GND1199	8.6	2620030	6195390
Bore D2	GND1344	8.8	2620114	6195569
Bore E	GND1345	8.8	2619503	6194188

Monitoring at water supply wells and bores commenced in February 2001. Up to five supplies are sampled, four within or downgradient of the irrigation areas, and one control bore 1.3 km north on Stuart Road that previously was monitored for nitrate.

Four dedicated groundwater monitoring bores were drilled on 10/11 January 2002 under the supervision of the Council. The sampling interval is between 2.5 and 8.5 metres depth. Bore A is the control; Bore B is at the downgradient boundary of the (initial) irrigation area west of Lower Stuart Road; Bore C is in the centre of the irrigation area east of Lower Stuart Road and is at the downgradient boundary of a leased property; and Bore D is at the downgradient irrigation boundary east of Lower Stuart Road.

Two more monitoring bores were drilled on 6 November 2004. Bore D2 was installed upgradient of and to replace Bore D, which spans an organic layer and had produced variable results. Bore E is at the downgradient boundary of the southern extension of the irrigation area, west of Lower Stuart Road.

During the 2012-2014 review period, groundwater sampling was conducted at all wells on 10 December 2012, 7 February, 13 May 2011, 9 August and 15 November 2013, and 4 February, 8 May and 18 August 2014. The results from groundwater monitoring are summarised in Table 10 and Table 11.

Table 10 Water quality results for supply bores and wells, October 2012– September 2014

Parameter	Unit	Edwards	Gribble	Joblin 1	Joblin 2	Joblin 3
		GND0849	GND1187	GND1188	GND1306	GND1189
Groundwater level	m	4.46 – 11.81	-	-	3.23 – 5.51	4.14 – 5.20
Temperature	ºC	12.0 – 17.7	13.2 – 15.2	13.9 – 15.1	10.5 – 16.1	13.3 – 14.3
Conductivity, 20ºC	mS/m	16.8 – 20.3	22.9 – 25.3	21.3 – 23.2	28.2 – 30.1	26.4 – 31.4
pH	pH	6.1 – 6.3	6.4 – 6.7	6.3 – 6.6	6.1 – 6.4	6.1 – 6.2
Nitrate + Nitrite	g/m^{3}N	2.0 – 7.9	5.5 – 7.6	5.4 – 7.1	11.6 – 14.6	12.6 – 15.9
Ammoniacal N	g/m^{3}N	<0.003 – 0.009	<0.003 – 3.0	<0.003 – 0.022	<0.003 – 0.007	<0.003 – 0.016

Table 11 Water quality results for monitoring bores, October 2012 – September 2014

Parameter	Unit	Bore A	Bore B	Bore C	Bore D2	Bore E
		GND1196	GND1197	GND1198	GND1344	GND1345
Groundwater level	m	3.05 – 6.06	2.99 – 3.94	1.96 – 3.11	1.91 – 2.40	2.97 – 3.58
Temperature	ºC	13.0 – 14.4	13.5 – 14.4	13.0 – 14.8	13.0 – 14.7	13.7 – 15.3
Conductivity, 20ºC	mS/m	17.5 – 19.7	26.5 – 29.6	16.5 – 18.8	21.7 – 23.8	26.6 – 32.1
pH	pH	6.5 – 6.7	6.1 – 6.3	6.4 – 6.6	6.8 – 6.9	6.0 – 6.2

Parameter	Unit	Bore A GND1196	Bore B GND1197	Bore C GND1198	Bore D2 GND1344	Bore E GND1345
Nitrate + Nitrite	g/m³N	2.8 – 3.9	11.8 – 15.5	3.2 – 5.2	0.01 – 0.71	11.4 – 19.0
Ammoniacal N	g/m³N	<0.003 – 0.024	<0.003 – 0.018	<0.003 – 3.0	0.83 – 1.18	<0.003 – 0.011
Calcium	g/m³	9.6 – 11	18 - 20	9.6 - 11	12 – 13	16 - 19
Magnesium	g/m³	4.1 – 4.9	7.7 – 9.3	5.0 – 5.8	6.6 – 7.3	9.8 - 13
Potassium	g/m³	5.8 – 6.3	5.9 – 7.0	3.2 – 4.4	7.1 – 8.0	4.9 – 5.6
Sodium	g/m³	18.9 – 20.6	21.2 – 21.9	16.2 – 17.0	21.0 – 23.2	20.5 – 21.9
Chloride	g/m³	21 - 28	24 - 31	18 – 22	20 - 24	28 - 38
COD	g/m³	<5 - 11	<5 - 8	<5 - 29	6 - 39	<5 - 12

These monitoring results indicate that the irrigation of effluent from Riverlands has had some effect on groundwater quality at two monitoring bores and two wells through increase in nitrate/nitrite concentration (Figure 8).

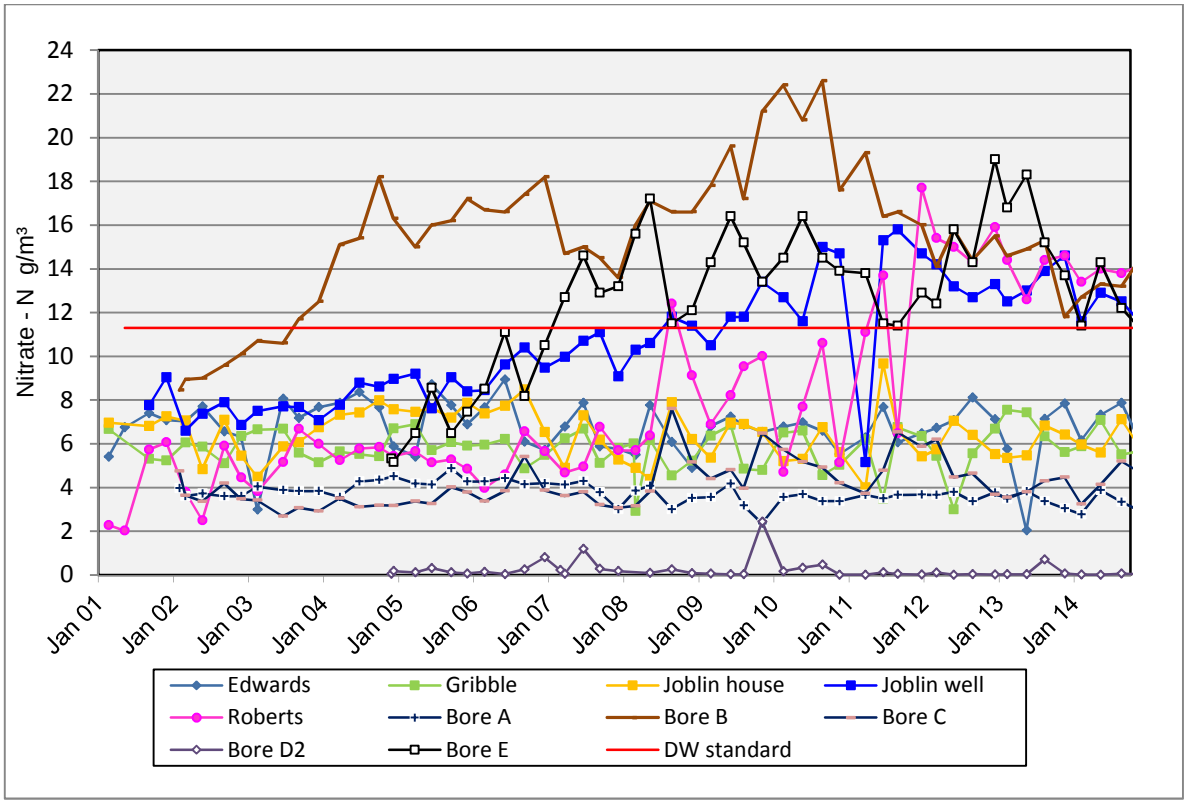


Figure 8 Nitrate concentration at groundwater monitoring bores and wells, 2001 - 2014

The concentration of nitrate in Bore B (GND1197) increased from 8.4 to 22.6 g/m³N from when monitoring began in January 2002 until August 2010, then decreased to 13.2 g/m³N in August 2014. At Bore E (GND1345), at the downgradient irrigation area boundary, nitrate concentration increased from 5.2 in November 2004 to 17.2 g/m³N in June 2008, then has undergone seasonal variation, peaking near the end of each irrigation period, with a highest value of 19.0 g/m³ in December 2012. At Joblin's disused livestock well (GND1306), 300 m upgradient of Bore B, nitrate concentration underwent a rising seasonal cycle, until a peak of 15.8 g/m³N in August 2011, after which the concentration has fallen slightly. At the well south of Joblin's new cowshed, (GND1189, old Roberts property), nitrate level rose sharply in

August 2008, from 6.4 to 12.4 g/m^{3}N, then underwent seasonal variation with peaks of up to 17.7 g/m^{3}N, in December 2011, which appear to be reducing.

Overall, monitored groundwater nitrate levels were stable or decreased during the 2012-2014 review period, reflecting more even application of effluent over a greater area.

The New Zealand drinking water standard for nitrate is 11.3 g/m^{3}N (Ministry of Health, 1995). None of the wells affected is used for domestic water supply.

2.5 Discharges to air

The Council undertook eight routine inspections during the review period in relation to aerial emissions from the Company's site. On several inspections, depending on wind direction, faint or noticeable odours as a result of operations at the site were detected beyond the site boundary. Stockyard odour was noticeable at the site entrance. Slight sulphide odour was noticeable in the dip in the road east of the site (North Street), but not as far as the main road through Eltham. At the end of Conway Road, SE of the site, a musty smell from the adjacent Pond 1 was noted. No odour was detected on Eltham Road (Bridge Street), north of the plant.

No offensive odour from the plant was found by the inspecting officer beyond the plant boundary.

During the 2012-2014 monitoring period, Riverlands undertook weekly odour surveys at four points situated around the site boundary, with particular attention given to potential effects on the neighbouring residential areas, and reported the results to the Council monthly. The time of monitoring was usually Monday morning. Odour is assessed on a scale of 0 to 5, ranging from no noticeable odours, to slight occasional wafts, to slight but constant odour, to very noticeable odour, to unpleasant odours (frequently strong or continuously noticeable), to putrid. The monitoring sites are located to the south and to the east of the wastewater treatment system (Conway Road and North Street), the main gate, and north of the plant on Bridge Street.

Odour was detected at some point beyond the site boundary on 25% of occasions in 2012-2013, and 26% of occasions in 2013-2014, the reported strength being slight occasional wafts on all but one occasion, and slight but constant odour on the other. Sources of reported odour were mainly the stock yards at the entrance gate and on North Street to the east, with ponds odour detected on Conway Road to the south and Eltham Road to the north. No very noticeable, unpleasant or putrid odours were recorded from the boundary surveys. No complaint was received about odour.

In view of the potential for generation of objectionable odour at the meat plant, continuation of weekly monitoring by Riverlands is recommended.

2.6 Development of non-dairy land for irrigation

In October 2001, Riverlands was granted consent to discharge treated wastewater onto a 54 ha property owned by the Company on Eltham Road, about 2.5 km from

the meat plant and adjacent to the existing irrigation area on Lower Stuart Road. Consent **5736** was obtained to provide for disposal of wastewater on land that is not used for dairy farming, in case disposal of meat plant wastewater on dairy farms is prohibited. The block is capable of assimilating up to about half of the meat plant effluent at times of low flow in the Waingongoro River, depending on effluent nitrogen concentration.
The consent has not been exercised for disposal of wastewater, though biosolids from de-sludging of Ponds 6 and 7 were applied on the block in September/October 2005 by irrigation with wastewater in accordance with a Biosolids Discharge Management Plan that had been approved by Council.

Certain works were required to be undertaken if the consent were to be exercised.

Special conditions 10 and 11 on consent **5736** require the consent to be exercised in accordance with the procedures of an irrigation management plan which shall incorporate, among other things, mitigation measures detailed in a riparian management plan that was prepared by the Council. The riparian management plan includes the removal of willows from watercourses, the fencing off and planting of riparian margins, and the planting of a shelterbelt along Eltham Road for the purpose of protecting a neighbour from irrigation spray drift.

The required works of clearing water courses, fencing and planting of riparian margins, and planting of shelter along Eltham Road were carried out to a high standard in Winter/Spring 2002, and were maintained well during the 2012-2014 reporting period.

2.6.1 Fonterra policy on meat processing waste application to dairy land

In March 2005, the dairy company Fonterra Co-operative Group Limited [Fonterra] notified Riverlands that there was to be no application of wastewater from meat processing on any pasture grazed by or harvested for dairy animals that would supply Fonterra after 1 June 2006. The possibility that this might happen had been raised by the dairy company in 1999 when application was made for consent 5569 to discharge to the dairy farm on lower Stuart Road.

The Regional Council advised Riverlands that the conditions on consents to discharge to river (**2039**) and land (**5569** and **5736**) requiring that discharge to land be maximised would hold, irrespective of the Fonterra decision.

Riverlands commissioned a consultant to investigate alternative methods of wastewater treatment and disposal, and, together with the meat industry and government agencies, negotiated with the dairy company various options for acceptance of meat processing wastes.

In October 2006, Fonterra advised that, as a result of a number of factors including the recent recognition of New Zealand being BSE free, changes within some of its major markets, and ongoing discussion with the Meat Industry Association, Fonterra would continue to accept milk from suppliers that irrigate pasture with meat processing waste provided certain wastewater treatment standards were met and suppliers meet enhanced animal health recording requirements. Riverlands has advised that its wastewater treatment system already meets the required standard.

2.7 Riparian management

To mitigate, in part, any effect of its abstraction of water from, and discharge of wastewater to, the Waingongoro River, Riverlands has since 1999 donated to the Taranaki Tree Trust $10,000 or more per year for the purpose of riparian planting and management in the Waingongoro catchment (GST exclusive and adjusted according to the consumer price index).

This agreement was rewritten into water permit **5437** (special condition 11, for $5,000) and discharge permit **2039** (special condition 11, for $9,000), when the consents were replaced in July 2012.

These donations, together with donations received from Ballance Agri-Nutrients Limited (abstractor) and South Taranaki District Council (abstractor and discharger), have been used to subsidise riparian planting and fencing along the main river and its tributaries. The effect of these measures will be to increase shading, with consequent decrease in water temperature and in nuisance algal growth; to reduce stock access and bank erosion; to reduce nutrient and sediment input to watercourses; and to enhance the appearance of the riparian margins.

At the end of the 2012-2014 reporting period, a total of $174,117 of Riverlands funding had been spent on or was committed to riparian management covering planting, fencing, and some willow control. The works were carried out throughout the catchment, mainly along reaches above the Eltham plant. Funding was granted to landholders at a rate of 50% on plants, and 50% on all works in certain situations.

2.8 Annual reports by Riverlands

Riverlands is required under the Effluent Management Plan to produce an annual report on the operation of its waste treatment and disposal systems.

2012-2013

The annual report for 2012-2013 was received on 19 September 2014. The report is attached at Appendix VI.

Subjects covered in the report include processing activity, ponds/treatment system changes, site management, effluent quality, irrigation, paunch material disposal, odour, water use, stormwater and inter-laboratory comparisons. Data on weekly kill, water usage, and effluent volume and quality are appended.

In summary, the report states:

> *The irrigation season for 2012/13 saw a 6% decrease on the previous season from 71% to 65% of the waste water going to land in terms of actual cubic metres of treated effluent to land is concerned, there was approximately 10,364 m³ more of treated effluent irrigated this season. This was largely due to an increase in the total water used for processing compared to the previous year.*
>
> *As has been for previous seasons, accurate monitoring of air quality, effluent, site inspections at Riverlands, and monitoring on the Joblin farm will continue to be carried*

out to a high standard in order to achieve an excellent standard of compliance with consent conditions.

Overall, we consider that we have achieved an excellent level of environmental performance for the 2012/2013 year.

In the 2013/14 season, Riverlands are planning to have another successful year where we achieve compliance with all our consents and will continue to make innovative changes within the plant to improve our environmental outcomes.

2013-2014

The annual report for 2013-2014 was received on 9 January 2015. The report is attached at Appendix VI.

In summary, the report states:

The irrigation season for 2013/14 saw a major decrease in the volume of the waste water going to land. In terms of actual cubic metres of treated effluent to land is concerned, there was approximately 55,000m³ less of treated effluent irrigated this season. Part of the reason for this was due to less cattle being processed this season. The other part was that we took a more vigilant approach to our water conservation programme which had a massive impact on the decrease in the total water used for processing compared to the previous year.

As has been for previous seasons, accurate monitoring of air quality, effluent, site inspections at Anzco Foods Eltham Limited, and monitoring on the Joblin farm will continue to be carried out to a high standard in order to achieve an excellent standard of compliance with consent conditions.

Overall, we consider that we have achieved an excellent level of environmental performance for the 2013/14 year.

In the 2014/15 season, Anzco Foods Eltham Limited is planning to have another successful year where we achieve compliance with all our consents and will continue to make innovative changes within the plant to improve our environmental outcomes.

2.9 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 consent holder. During the year matters may arise which require additional activity by the Council eg 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 Taranaki Regional 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 Unauthorised Incident Register (UIR) 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).

In the 2012-2014 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with Riverlands's conditions in resource consents or provisions in Regional Plans.

2.10 Effluent, stormwater and air emissions management plans

Under consents held at the beginning of the review period, Riverlands was required to produce management and contingency plans under five consents. Plans were required for management of wastewater disposal to the Waingongoro River (consent **2039-3**) and to land by spray irrigation (consent **5569-1,** condition 2), for management of solids waste disposal (consent **7487-1**, special condition 8), for management of emissions to air (consent **4644-2**, special condition 8), and for spill contingency (consent **1968-3**).

Riverlands has combined all four of the required plans (spill contingency, and river, land and air discharge management), in a single document, which was updated in January 2008.

The combined plan was found to be comprehensive and satisfactory.

Review/provision of Wastewater Disposal and Stormwater Management Plans

Consents **2039** and **1968**, to provide for discharges of treated wastewater and of stormwater to the Waingongoro River, were both replaced on 9 July 2012. The new consents require maintenance of the existing Wastewater Disposal Management Plan (consent **2039-4**, condition 5) and spill contingency plan, and the provision of a specific Stormwater Management Plan (consent **1968-4**, conditions 5 and 6).

An update and review of the Wastewater Disposal Management Plan was required to be submitted within three months of the granting of consent **2039-4** (under condition 6), that is, by 9 October 2012. The reviewed Management Plan was to be provided to the Department of Conservation and Fish and Game New Zealand (Taranaki Region) for Council to take into account any comments received (under condition 8).

The required update and review of the Wastewater Disposal Management Plan has not been carried out. The Stormwater Management Plan has not been produced. Officers of Council have been following this up with the Company.

In the meantime, the Company has operated under the existing Wastewater Disposal Management Plan and spill contingency plan.

3. Discussion

3.1 Discussion of plant performance

Generally, the on-site management and operation of the Riverlands Eltham site was undertaken in a satisfactory manner. Continuous liaison between Riverlands staff and the Council has contributed to this performance.

No environmental incident was recorded in relation to the activities of Riverlands Eltham Limited in 2012-2014.

Two management plans, one an update and review of the Wastewater Disposal Management Plan, the other a (new) Stormwater Management Plan, were not submitted to Council as required under replacement consents issued in July 2012. In the meantime, the Company operated under the existing wastewater disposal management and spill contingency plans.

3.1.1 Water abstraction

For water abstraction, flow measurement was made, volume records provided, and annual reports produced, as required.

There was full compliance with the limit on maximum daily abstraction rate for water taken from the Waingongoro River during the 2012-2014 review period, when measurement error was taken into account. Verification of meter accuracy had not yet been undertaken at the end of the monitoring period.

The large reduction in the amount of water used at the plant that was recorded in 2010-2011, as the result of a water conservation programme initiated by the new Environmental Officer, was maintained in 2012-2013 and 2013-2014. In 2013-2014, average water use per body reduced to the lowest value recorded, at 2.70 m^3.

Close monitoring of water usage within the plant was continued.

3.1.2 Wastewater treatment

Improvements were made to the wastewater treatment and disposal system.

In December 2012, red and green waste streams were separated so that green waste could be directed away from the fat reclaim units, thereby reducing loading and improving fat removal efficiency.

A holding pond was constructed on the Riverlands Farm on Eltham Road, for containing solids piped from cleanout of ponds 6 and 7, should storage be required before disposal to land. The pond had not been used at the end of the review period.

3.1.3 Discharges to water

Weekly water chemistry monitoring undertaken by Riverlands showed that limits on minimum dissolved oxygen and maximum total ammonia concentration, imposed for the protection of fish, were complied with throughout the 2012-2014 monitoring period. The level of dissolved oxygen remained near saturation throughout.

Requirements on flow measurement, and monitoring of discharge and receiving water quality were met. Some monitoring reports were late.

During the 2012-14 monitoring period, the proportion of treated wastewater discharged to the river was similar to 2010-2012, at 65% to 70%.

There was no discharge to the river between 1 November 2012 and 26 May 2013, and between 29 October 2013 and 22 June 2014, during the periods when flows were low. These were similar periods to those in 2010-2012.

3.1.4 Discharge to land

The irrigation system was, in general, well managed. Routine recording of wastewater application, and monitoring of soil, herbage and water quality carried on.

The irrigated area encompassed virtually all of 264.7 ha area of land available to be irrigated, taking buffer zones into account. About 65%to 70% of the treated effluent was applied to land during the 2012-2014 review period, similar to the 2010-2012 period. The limit on maximum nitrogen loading rate of 300 kg/ha per year was complied with on average, with three and five (of up to 88) paddocks irrigated receiving more than the limit, by factors of up to 17% in 2012-2013 and 19 % in 2013-2014. The reported average nitrogen loading rate was 165 and 186 kg/ha/y, respectively.

Irrigation occurred over 30 weeks in 2012-2013 and 34 weeks in 2013-2014 , similar periods as those for the previous six years.

The sodium adsorption ratio in the treated effluent was found to comply with the value of 10 set on the consent to prevent adverse effects on soil structure.

3.1.5 Discharges to air

For emissions to air, weekly odour surveys and monthly reports by Riverlands continued.

Riverlands staff detected faint odour on 25 to 26% of routine monitoring occasions. The reported sources were the anaerobic treatment ponds and the stockyards. No very noticeable or unpleasant odour was recorded. Council staff findings were similar.

The incinerator was removed in March 2013, taking away a source of emissions.

No complaint about emissions to air, including odour, was received by Council.

3.2 Environmental effects of exercise of consents

3.2.1 Abstraction

The abstraction was not found to have any adverse environmental effect on the Waingongoro River.

The maximum allowable abstraction rate amounts to about 4% of the mean annual low flow in the river.

From August 2000 until the 2009-2010 year, about 50 to 65% of water used by Riverlands has been taken directly from the river at the plant site, the remainder being taken from Eltham town supply. This means that the river flow between the Eltham intake at Finnerty Road and the meat plant, a distance of 10 km, has been higher than would have been the case had the Riverlands intake not been operated. The proportion drawn from the river increased to 71% during 2010-2011 from 62% in 2009-2010 as the result of less water use while taking a similar volume directly from the river. The proportion reduced to 55% in 2013-2014, which was ascribed to problems with water treatment plant, and more frequent turbidity in the river during a wetter season.

3.2.2 Discharges to water

Two routine biological surveys of the Waingongoro River were carried out each year during the 2012-2014 review period.

In the October 2012 survey, carried out on the day that discharge to the river ceased and irrigation to land began, the macroinvertebrate richness was slightly below medians found in previous surveys. The macroinvertebrate community index (MCI) scores indicated stream communities were of 'good' to 'very good' health and were typical of mid-reaches of a developed catchment.

In the February 2013 survey, carried out under moderately low flow conditions after a period of four months of no river discharge, no significant changes were found in macroinvertebrate community assemblages and indices below the Riverlands discharge point. Similar proportions of sensitive taxa were found at all sites, with more sensitive than tolerant taxa throughout. Community richness was slightly higher than that found in most previous summer surveys.

In the November 2013 survey, carried out the week after continuous discharge to land commenced, the macroinvertebrate richness was slightly below medians found in previous surveys. The macroinvertebrate community index (MCI) scores indicated stream communities were of 'fair' to 'good' health, and numerical abundances amongst the characteristic taxa were very similar between the control and impact monitoring sites.

In the February 2014 survey, carried out under very low flow conditions after a period of four months of no river discharge, marginally significant changes were found in macroinvertebrate communities at the first site below the Riverlands discharge point, coincident with changes in physical habitat. Similar proportions of sensitive taxa were found at all sites, with more sensitive than tolerant taxa throughout. Community richness was slightly higher, but more variable, than that

found in most previous summer surveys. MCI scores indicated the stream communities were of 'good' generic health.

The variations in MCI scores between sites at the time of the surveys were not considered indicative of any impacts of preceding discharges or land irrigation within the reach of the river adjacent to the meatworks property.

3.2.3 Discharges to land

Comprehensive monitoring for effects of the discharge to land was carried out through testing of soil, herbage, surface waters and groundwaters for the irrigation areas.

The results of soil and herbage testing indicated that the irrigation system is sustainable in the long term, with the application of appropriate corrective fertilisers by topdressing.

The results of surface stream monitoring did not indicate significant leaching or run-off from irrigation areas.

Five dedicated monitoring bores and five existing bores and wells used for water supply continued to be monitored for any effects of wastewater irrigation on groundwater quality. There has been an increase in nitrate concentration at two of the monitoring bores and two disused wells, which is likely to be related to the irrigation. There was no indication from the groundwater monitoring that the irrigation had, or was likely to affect any groundwater used for water supply.

3.2.4 Discharges to air

The main issue in respect of discharges to air is odour, mainly in relation to emissions from the anaerobic ponds in the wastewater treatment system. Particular care is needed when de-sludging of the anaerobic ponds with regard to weather conditions. The irrigation of plant wastewater on land after treatment by aeration has not raised any concerns.

In general, the improvement in quality of air at the plant boundaries noted in the previous eight seasons was found to continue.

A major improvement was brought about in 2002- 2003 by the removal of paunch material from the site at the time of slaughter. Since then, all paunch material has been carted away for use in worm farming. In September 2003, alterations were made so that all yard wastewater screenings can be taken away with the paunch material. No green waste is stored or disposed of at the plant site, thereby completely removing a potential odour source.

A further improvement was the removal of the incinerator in March 2013. Wastes previously incinerated are now recycled.

No complaint was received by the Council about emissions to air.

3.3 Evaluation of performance

A tabular summary of the Company's compliance record for the year under review is set out in Table 12 to Table 21.

Table 12 Summary of performance for Consent 1968-4 Discharge stormwater

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Adopt bpo	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	Chemical sampling	Yes
4. Controls on effect of discharge in receiving water	Inspection, chemical sampling and bio-monitoring	Yes
5. Maintenance of contingency plan	Receipt and certification of Plan. Plan received, approved 11 September 2008.	Yes
6. Maintenance of stormwater management plan	Receipt and certification of Plan. Plan received, approved 11 September 2008	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 2017	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 13 Summary of performance for Consent 2039-4 Discharge treated wastewater to Waingongoro River

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Limits on discharge rates and volumes	Flow measurement by Company	Yes
2. Controls on effect of discharge in receiving water	Inspection, chemical sampling and bio-monitoring	Yes
3. Consultation over significant proposed changes	Liaison during visits. No significant changes undertaken during year	N/A
4. Accurate flow measuring and recording device	Records provided to Council monthly.	Yes
5. Adherence to wastewater disposal management plan	Inspections and review of monitoring data	Yes
6. Plan to be updated by 9 October 2012	Old plan received by Council and approved in 1997. Most recent update January 2008 approved by Council	No
7. Option for review of wastewater plan	No review sought by either Council or Company	N/A
8. Provision of plan to third parties	Communication with Fish & Game and DoC	N/A
9. Designated staff member	Part of Company Technical Manager's job description	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
10. Adopt bpo	Site inspection – checking that standard operating procedures to achieve compliance with conditions are followed	Yes
11. Donation to Taranaki Tree Trust	Confirmation with Council finance dept that donation received	Yes
12. Report on options for reducing DRP	Engagement of consultant by 31 December 2013. No report to date.	Yes
13. Optional review provision re nutrient loadings		N/A
14. Optional review provision re environmental effects	Option not available. Next review date June 2017	N/A
Overall assessment of environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		High Improvement required

Table 14 Summary of performance for Consent 4644-2 Discharge emissions to air

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Discharge to take place as described in application	Inspection by Council	Yes
2. Consultation over significant proposed changes	On-going liaison. No significant changes undertaken during year	Yes
3. Adopt best practicable option (bpo) to prevent or minimise adverse effects	Liaison with Company and inspection by Council	Yes
4. Minimise emissions and effects by most appropriate equipment and operational controls	Inspection by Council	Yes
5. No significant adverse effects upon environment	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. Definition of offensive or objectionable odour		N/A
8. Provision of air quality management plan	Plan received by Council and approved in 1997. Most recent update January 2008 approved by Council	Yes
9. Matters covered by air quality management plan	Plan received by Council and approved in 1997. Most recent update January 2008 approved by Council	Yes
10. Design and operation of incinerator	Inspection by Council. Some repairs required	Yes
11. Maintenance of gas-fired equipment	Inspection	Yes
12. Optional review provision re environmental effects	Option not available. Consent expires June 2016	N/A
Overall assessment of environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		High High

Table 15 Summary of performance for Consent 5437-3 Take from Waingongoro River

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Limit on maximum abstraction rate	Continuous flow metering by consent holder and monthly report to Council	Yes, some reports late
2. Installation of flow meter and provision of records	Inspection, review of data	Yes
3. Certification of flow meter	Receipt of certification. (Provided 18 November 2014).	In progress
4. Reporting of monitoring equipment faults	Inspection, receipt of reports	N/A
5. Access to metering system	Inspection	Yes
6. Formatting of records	Inspection, and review of data received	Yes
7. Adopt bpo 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 report. Reports received 30 June and 24 November 2014	Yes
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
12. Optional review provision re environmental effects	Option not available. Next review date June 2017	N/A
Overall assessment of environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		Good

Table 16 Summary of performance for Consent 5569-1 Discharge to land on Stuart Road

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 January 2008 approved by Council	Yes
3. Plan to be followed	Liaison, inspections and provision of monitoring reports	Yes
4. Optional review of management plan	Neither Company nor Council sought review	N/A
5. Designated staff member	Part of Company Technical Manager's job description	Yes
6. Prohibition of untreated blood	Inspections	Yes

Condition requirement	Means of monitoring during period under review	Compliance achieved?
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 biosolids/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	Monitoring by Company and data review by Council	Yes
14. Provisions for contamination of groundwater or water supply	No significant effect found on local groundwater, or contamination of roof water	N/A
15. Maintenance of monitoring bores	Inspection and sampling	Yes
16. Baseline and operational monitoring	Soil, herbage and water quality sampling by 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	Not sought by Council	N/A
19. Optional review provision re environmental effects	Option not available. Consent expires June 2026	N/A
Overall assessment of environmental performance in respect of this consent		High
Overall assessment of administrative performance in respect of this consent		Good

Table 17 Summary of performance for Consent 5604-1 Structure and erosion control at water intake

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Notification prior to and after works		N/A
2. Construction and maintenance in accordance with documentation	Inspection by Council	Yes
3. Minimum batter slope		N/A
4. Riverbed material not to be removed		N/A
5. Adoption of best practicable option to avoid or minimise adverse effects	Liaison with Company and inspection of structure	Yes
6. No machinery refuelling on riverbed		N/A
7. Riverbed disturbance and reinstatement		N/A

Condition requirement	Means of monitoring during period under review	Compliance achieved?
8. Removal of structure when no longer required		N/A
9. Optional review provision re environmental effects	Option not available. Consent expires June 2017	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 18 Summary of performance for Consent 5736-2 Discharge to land on Eltham Road

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 biosolids produced August 2005	N/A
10. Review of plan for certification	Receipt and review of plan	N/A
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 not installed as consent not exercised, other than biosolids disposal in Sept/Oct 2005	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		N/A
18. Optional review provision re	Option not available. Next review due 2017	N/A

Condition requirement	Means of monitoring during period under review	Compliance achieved?
environmental effects		
Overall assessment of environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		Not exercised

Table 19 Summary of performance for Consent 5739-1 Structure for pipeline crossing

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Notification prior to and after works		N/A
2. Construction and maintenance in accordance with documentation	Inspection by Council	Yes
3. Adoption of best practicable option to avoid or minimise adverse effects	Liaison with Company and inspection of structure	Yes
4. Riverbed disturbance and reinstatement		N/A
5. Removal of structure when no longer required		N/A
6. Optional review provision re environmental effects	Option not available. Consent expires June 2017.	N/A
Overall assessment of environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		High High

Table 20 Summary of performance for Consent 6455-1 Structure for culvert

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 2017	N/A
Overall assessment of environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		High High

Table 21 Summary of performance for Consent 7487-1 Discharge solids to land

Condition requirement	Means of monitoring during period under review	Compliance achieved?
1. Disposal within defined areas	Inspection by Council	N/A
2. Keeping of disposal records	Recording by Company and review by Council	N/A
3. Adopt best practicable option (bpo) to avoid or minimise adverse effects	Liaison with Company and inspection by Council	N/A
4. No discharge to surface water	Inspection by Council	N/A
5. Buffer zones	Inspection by Council	N/A
6. Limit on Nitrogen application rates	Monitoring by Company and data review by Council	N/A
7. No offensive or objectionable odour beyond boundary	Inspections and complaint register	N/A
8. Provision and maintenance of solids disposal management plan	Review by Council, plan yet to be provided, consent not exercised.	N/A
9. Notification and recording of complaints	Reporting by Company and inspection by Council	N/A
10. Lapse of consent if not exercised	Whether exercised by 30 September 2015	N/A
11. Optional review provision re environmental effects	Option not available. Next review date June 2017	N/A
Overall assessment of environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		N/A

Overall, during the 2012-2014 period, Riverlands demonstrated a high level of environmental performance and compliance with the resource consents.

For the take from the Waingongoro River, full compliance with consent conditions was achieved.

For the discharge to the river, full compliance with consent conditions was achieved.

For the discharge to land, the disposal of treated wastewater was well managed.
For the discharge to air, no consent condition was found to be breached.

In regard to administrative performance, improvement is required in one area, in respect of the provision of updated/new plans for wastewater disposal and stormwater management.

3.4 Recommendations from the 2010-2012 Biennial Report

In the 2010-2012 Biennial Report, it was recommended:

1. THAT monitoring of water abstraction and discharges in relation to the meat processing plant of Riverlands Eltham Limited in the 2012-2013 year continue at the same level as in 2011-2012.

2. THAT monitoring of air emissions from the activities of Riverlands Eltham Limited in the 2012-2013 year continue at the same level as in 2011-2012.

3. THAT the option for a review of resource consent **5569-1** (discharge to land on Lower Stuart Road) not be exercised, on the grounds that current conditions are adequate to deal with any potential adverse effects.

These recommendations were fully implemented during the 2012-2013 and 2013-2014 monitoring periods.

3.5 Alterations to monitoring programmes for 2014-2015

In designing and implementing the monitoring programmes for air/water discharges in the region, the Taranaki Regional Council has taken into account the extent of information made available by previous authorities, its relevance under the Resource Management Act, the obligations of the Act in terms of monitoring emissions/discharges and effects, and subsequently reporting to the regional community, 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 emitting to the atmosphere/discharging to the environment.

In the case of Riverlands Eltham Limited, the programme for 2012-2013 and 2013-2014 was unchanged from that for 2011-2012. It is now proposed that for 2014-2015 the monitoring programme remain the same as that for 2013-2014. Recommendations to this effect are attached to this report.

4. Recommendations

1. THAT monitoring of water abstraction and discharges in relation to the meat processing plant of Riverlands Eltham Limited in the 2014-2015 year continue at the same level as in 2013-2014.

2. THAT monitoring of air emissions from the activities of Riverlands Eltham Limited in the 2014-2015 year continue at the same level as in 2013-2014.

Glossary of common terms and abbreviations

The following abbreviations and terms are 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.
Condy	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 20°C and expressed in mS/m
DO	Dissolved oxygen
DRP	Dissolved reactive phosphorus
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
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
g/m^3	Grammes per cubic metre, and equivalent to milligrammes 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
l/s	Litres per second
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)
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)
pH	A numerical system for measuring acidity in solutions, with 7 as neutral. Numbers lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength. For example, a pH of 4 is ten times more acidic than a pH of 5.
Physicochemical	Measurement of both physical properties (e.g. temperature, clarity, density) and chemical determinants (e.g. metals and nutrients) to characterise the state of an environment
resource consent	Refer Section 87 of the RMA. Resource consents include land use consents (refer Sections 9 and 13 of the RMA), coastal permits (Sections 12, 14 and 15), water permits (Section 14) and discharge permits (Section 15)
RMA	Resource Management Act 1991 and subsequent amendments
SS	Suspended solids,
Temp	Temperature, measured in °C (degrees Celsius)
Turb	Turbidity, expressed in NTU
UIR	Unauthorised Incident Register entry- an event recorded by the Council on the basis that it had potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan

For further information on analytical methods, contact the Council's laboratory

Bibliography and references

Ministry for the Environment and Ministry of Health 2003, Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas. June 2003

Ministry of Health 1995, Drinking-Water Standards for New Zealand 1995

Taranaki Regional Council 1990, Huttons Eltham Ltd Monitoring Annual Report 1989/90, Technical Report 90-27

Taranaki Regional Council 1991, Riverlands Eltham Ltd Monitoring Annual Report 1990/91, Technical Report 91-36

Taranaki Regional Council 1992, Riverlands Eltham Limited Monitoring Annual Report 1991/92, Technical Report 92-22

Taranaki Regional Council 1993, Riverlands Eltham Ltd Monitoring Annual Report 1992/93, Technical Report 93-11

Taranaki Regional Council 1994, Riverlands Eltham Ltd Monitoring Annual Report 1993/94, Technical Report 94-12

Taranaki Regional Council 1995, Riverlands Eltham Ltd Consents Monitoring Annual Report 1994-95, Technical Report 95-6

Taranaki Regional Council 1996, Riverlands Eltham Ltd Consents Monitoring Annual Report 1995/96, Technical Report 96-68

Taranaki Regional Council 1997, Riverlands Eltham Ltd Consents Monitoring Annual Report 1996-97, Technical Report 97-104

Taranaki Regional Council 1998, Riverlands Eltham Ltd Consents Monitoring Annual Report 1997-98, Technical Report 98-101

Taranaki Regional Council 1999, Riverlands Eltham Ltd Consents Monitoring Annual Report 1998-99, Technical Report 99-100

Taranaki Regional Council 2000, Riverlands Eltham Ltd Consents Monitoring Annual Report 1999-2000, Technical Report 2000-64

Taranaki Regional Council 2001, Riverlands Eltham Ltd Consents Monitoring Annual Report 2000-2001, Technical Report 2001-72

Taranaki Regional Council 2002, Riverlands Eltham Ltd Consents Monitoring Annual Report 2001-2002, Technical Report 2002-85

Taranaki Regional Council 2003, Riverlands Eltham Ltd Consents Monitoring Annual Report 2002-2003, Technical Report 2003-93

Taranaki Regional Council 2004, Riverlands Eltham Ltd Consents Monitoring Annual Report 2003-2004, Technical Report 2004-106

Taranaki Regional Council 2005, Riverlands Eltham Ltd Consents Monitoring Annual Report 2004-2005, Technical Report 2005-111

Taranaki Regional Council 2007, Riverlands Eltham Ltd Consents Monitoring Biennial Report 2005-2007, Technical Report 2007-116

Taranaki Regional Council 2008, Riverlands Eltham Ltd Consents Monitoring Annual Report 2007-2008, Technical Report 2008-101

Taranaki Regional Council 2009, Riverlands Eltham Ltd Consents Monitoring Annual Report 2008-2009, Technical Report 2009-110

Taranaki Regional Council 2010, Riverlands Eltham Ltd Consents Monitoring Annual Report 2009-2010, Technical Report 2010-113

Taranaki Regional Council 2012, Riverlands Eltham Ltd Consents Monitoring Annual Report 2010-2012, Technical Report 2012-98

Appendix I

Resource consents held by Riverlands Eltham Ltd

Consent 4644-2

TARANAKI REGIONAL COUNCIL

CHIEF EXECUTIVE
PRIVATE BAG 713
47 CLOTEN ROAD
STRATFORD
NEW ZEALAND
PHONE: 06-765 7127
FAX: 06-765 5097
www.trc.govt.nz

Please quote our file number on all correspondence

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
Consent Granted Date:	8 June 2005

Conditions of Consent

Consent Granted:	To discharge emissions into the air arising from meat processing and associated activities at the factory premises at or about GR: Q20:209-961
Expiry Date:	1 June 2016
Review Date(s):	June 2006, June 2010
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

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

General conditions

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

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

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

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

Special conditions

1. The discharges authorised by this consent shall be generally undertaken in accordance with the information submitted in support of application 2728, and to the satisfaction of the Chief Executive, Taranaki Regional Council. In the case of any contradiction between the documentation submitted in support of application 2728 and the conditions of this consent, the conditions of this consent shall prevail.

2. 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 and any amendments.

3. 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.

4. The consent holder shall minimise the emissions and effects of air contaminants discharged from the site, by the selection of the most appropriate process equipment, process control equipment, emission control equipment, methods of control, supervision and operation, and the proper and effective operation, supervision, control and maintenance of all equipment and processes at all times.

5. The discharges authorised by this consent shall not give rise to any significant adverse effect on the environment [as defined in section 2 of the Resource Management Act 1991] in the Taranaki region.

6. The discharges authorised by this consent shall not give rise to any odour at or beyond the boundary of the site that, in the opinion of at least one enforcement officer of the Taranaki Regional Council, is offensive or objectionable.

7. For the purposes of condition 6, without restriction, an odour shall be deemed to be offensive or objectionable if:

a) it is held to be so in the opinion of an enforcement officer of the Taranaki Regional Council, having regard to the duration, frequency, intensity and nature of the odour; and/or

b) an officer of the Taranaki Regional Council observes that an odour is noticeable, and either it lasts longer than three (3) hours continuously, or it occurs frequently during a single period of more than six (6) hours; and/or

c) no less than three individuals from at least two different properties that are affected at the time, each declare in writing that an objectionable or offensive odour was detected beyond the boundary of the site, provided the Council is satisfied that the declarations are not vexatious and that the objectionable or offensive odour was emitted from the site as specified in (b). Each declaration shall include the individuals' names and addresses, the date and time the objectionable or offensive odour was detected, the location of the individual when it was detected and the prevailing weather conditions during the event. The declarations shall be signed and dated.

8. This consent shall be exercised in accordance with an air quality management plan prepared by the consent holder for the purposes of controlling odour from the site, to the satisfaction of the Chief Executive, Taranaki Regional Council. The air quality management plan shall be subject to review upon three months' notice by either the consent holder or the Chief Executive, Taranaki Regional Council.

9. The air quality management plan detailed in special condition 8 shall address, among other matters:
   a) replacement of the fat reclaim units in wastewater pre-treatment with 0.5mm aperture rotary screens by 1 October 2005; and
   b) planting of site boundaries with trees and/or shrubs

10. The incinerator shall be used only to burn dry paper, cardboard or wooden material and shall be adequately designed, maintained and operated to reduce noxious emissions to the satisfaction of the Chief Executive, Taranaki Regional Council.

11. The natural gas-fired process equipment shall be maintained by a trained service person at least every six months to optimise combustion efficiency and to reduce noxious emissions to air. No smoke shall be emitted from such equipment.

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 2006 and/or June 2010, 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 8 June 2005

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Consent 5569-1

TARANAKI REGIONAL COUNCIL

PRIVATE BAG 713
47 CLOTEN ROAD
STRATFORD
NEW ZEALAND
PHONE 0-6-765 7127
FAX 0-6-765 5097

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
Consent Granted Date:	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

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

General conditions

a) That on receipt of a requirement from the General Manager, Taranaki Regional Council (hereinafter the General Manager), 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 within 12 months of the granting of this consent.

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.

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 23 December 1999

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Consent 5604-1

TARANAKI
REGIONAL
COUNCIL

PRIVATE BAG 713
47 CLOTON ROAD
STRATFORD
NEW ZEALAND
PHONE 0-6-765 7127
FAX 0-6-765 5097

Land Use Consent

Structure - Erosion Control
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:	9 March 2000

Conditions of Consent

Consent Granted:	To construct, place, use and maintain an intake structure and associated bank protection works on the true left bank of the Waingongoro River at or about GR: Q20:209-963
Expiry Date:	1 June 2017
Review Date(s):	June 2005, June 2011
Site Location:	75 Lower London Street, Eltham
Legal Description:	Lot 1 DP11593 Blk IX Ngaere SD
Catchment:	Waingongoro

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

General conditions

a) That on receipt of a requirement from the General Manager, Taranaki Regional Council (hereinafter the General Manager), 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

1. THAT the consent holder shall notify the Taranaki Regional Council at least 48 hours prior to the commencement and upon completion of the initial construction and again prior to and upon completion of any subsequent maintenance works which would involve disturbance of or deposition to the riverbed or discharges to water.

2. THAT the structures authorised by this consent shall be constructed generally in accordance with the documentation submitted in support of the application and shall be maintained to ensure the conditions of this consent are met.

3. THAT the consent holder shall install a rock batter with a minimum batter slope of 1:1.5 in front of the bank protection works, to avoid adverse effects on the river bank as a result of the construction of the bank protection works.

4. THAT no material shall be removed from the riverbed for the construction of the rock batter specified in condition 3.

5. THAT the consent holder shall adopt the best practicable option to avoid or minimise the discharge of silt or other contaminants into water or onto the riverbed and to avoid or minimise the disturbance of the riverbed and any adverse effects on water quality.

6. THAT no refuelling of equipment or machinery shall take place on any area of the riverbed.

7. THAT the consent holder shall ensure that the area and volume of riverbed disturbance shall, so far as is practicable, be minimised and any areas which are disturbed shall, so far as is practicable, be reinstated.

8. THAT the structures authorised by this consent shall be removed and the area reinstated, if and when the structures are no longer required. The consent holder shall notify the Taranaki Regional Council at least 48 hours prior to the structure[s] removal and reinstatement.

9. THAT the Taranaki Regional Council shall review any or all of the conditions of this consent by giving notice of review during June 2005 and/or June 2011, 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 March 2000

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Consent 5739-1

TARANAKI REGIONAL COUNCIL

PRIVATE BAG 713
47 CLOTEN ROAD
STRATFORD
NEW ZEALAND
PHONE 0-6-765 7127
FAX 0-6-765 5097

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:	14 December 2000

Conditions of Consent

Consent Granted:	To erect, place and maintain a pipeline under the bed of the Waingongoro River at or about GR: Q20:208-963
Expiry Date:	1 June 2017
Review Date(s):	June 2005, June 2011
Site Location:	Lower London Street, Eltham
Legal Description:	Lot 1 DP 11593 & Sec 101 Eltham Vill Sett Blk IX Ngaere SD [Riverlands property] Pt Sec 39 Blk IX Ngaere SD [Reardon property]
Catchment:	Waingongoro

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

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

1. The consent holder shall notify the Taranaki Regional Council in writing at least 48 hours prior to the commencement and upon completion of the initial construction 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.

2. The structure[s] authorised by this consent shall be constructed generally in accordance with the documentation submitted in support of the application and shall be maintained to ensure the conditions of this consent are met.

3. The consent holder shall adopt the best practicable option to avoid or minimise the discharge of silt or other contaminants into water or onto the riverbed and to avoid or minimise the disturbance of the riverbed and any adverse effects on water quality.

4. The consent holder shall ensure that the area and volume of riverbed disturbance shall, so far as is practicable, be minimised and any areas which are disturbed shall, so far as is practicable, be reinstated.

5. The structure[s] authorised by this consent shall be removed and the area reinstated, if and when the structure[s] are no longer required. The consent holder shall notify the Taranaki Regional Council at least 48 hours prior to structure[s] removal and reinstatement.

6. 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 2005 and/or June 2011, for the purpose of ensuring that the conditions adequately deal with the environmental effects arising from the exercise of this 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 14 December 2000

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Consent 6455-1

TARANAKI REGIONAL COUNCIL

CHIEF EXECUTIVE
PRIVATE BAG 713
47 CLOTEN ROAD
STRATFORD
NEW ZEALAND
PHONE 06-765 7127
FAX 06-765 5097

Please quote our file number on all correspondence

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

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

General conditions

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

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

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

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

Special conditions

1. The 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 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

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:	17 September 2010
Commencement Date:	17 September 2010

Conditions of Consent

Consent Granted:	To discharge anaerobic pond solids and paunch solids onto and into land and contaminants to air in the Waingongoro catchment at or about (NZTM) 1708439E-5635064N, 1710226E-5634406N and 1712433E-5635858N
Expiry Date:	1 June 2029
Review Date(s):	June 2017, June 2023
Site Location:	Lower Stuart Road, Eltham Road & Anderson Road, Eltham
Legal Description:	Lot 1 DP 11593 Lot 3 DP 1622 [Discharge Source] Part of Lots 1 & 3 DP 399595, Lot 1 DP 13131 Pt Sec 21 Blk IX Ngaere SD, Pt Lot 2 DP 13131 Pt Sec 21,22 Block IX Ngaere SD, Pt Sec 38 Blk IX SD, Lot 1 DP 7965 and Part of Sec 38 Blk IX SD, Lot 1 DP 3463 Blk IX Ngaere SD, Lot 2 DP 16398 Blk IX Ngaere SD and Part Sec of DP 3535 Blk IX Ngaere SD, Lot 2 DP 17749 Blk IX Ngaere SD, Pt Sec 39 IX Ngaere SD, Lot 1 DP 5241 Blk IX Ngaere SD, Pt Sec 40 Blk IX Ngaere SD [Discharge Sites]
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

Exercise of Consent

1. The discharge of anaerobic pond solids and paunch solids to land shall only occur within the boundaries of the disposal sites authorised by this consent i.e. within the areas shaded on the plan attached.

2. The consent holder shall keep a record of:

    - The volume of anaerobic pond solids and/or paunch solids discharged to land;
    - The date of disposal;
    - The area of disposal;
    - Nitrogen loading calculations [which demonstrate compliance with special condition 6].

    These records shall be made available to the Chief Executive of Taranaki Regional Council upon request.

3. 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.

4. No anaerobic pond solids, paunch solids, or water which has been in contact with the deposited solids, shall enter surface water.

5. The disposal of anaerobic pond solids and paunch solids to land shall not occur within:

    - 25 metres of a watercourse [whether flowing continuously or intermittently];
    - 20 metres of any property boundary;
    - 50 metres of a water supply well or spring actively used for potable supply;
    - 150 metres of any residential dwelling [unless written approval has been obtained from the owner/occupier to dispose closer].

6. Over any 12 month period the total nitrogen application rate shall not exceed:

    - 300 kg of plant available nitrogen per hectare [of land used for disposal] for grazing areas; and
    - 600 kg plant available nitrogen per hectare [of land used for disposal] for cut-and-carry areas.

7. The discharges authorised by this consent shall not give rise to any odour at or beyond the boundary of the disposal sites that is offensive or objectionable.

8. The consent holder shall prepare and thereafter maintain a management plan that, to the satisfaction of the Chief Executive of the Taranaki Regional Council, details how the disposal of anaerobic pond solids and paunch solids to land will be managed to ensure that the conditions of this consent will be met. The plan shall include but not necessarily be limited to:

   a) A description of disposal areas and buffer zones;
   b) The application rate and method;
   c) The depth and frequency of coverage;
   d) Details of composting management;
   e) Methods for preventing run-off to surface water;
   f) Methods for determining compliance with nitrogen loading conditions;
   g) How leaching to groundwater will be minimised;
   h) Methods for minimisation and control of odour effects offsite;
   i) Contingency procedures; and
   j) Monitoring and reporting methods [undertaken by the consent holder].

9. The consent holder shall maintain a permanent record of any complaints received alleging adverse effects from or related to the exercise of this consent. This record shall include the following, where practicable:

   a) the name and address of the complainant, if supplied;
   b) date, time and details of the alleged event;
   c) weather conditions at the time of the alleged event [as far as practicable];
   d) investigations undertaken by the consent holder in regards to the complaint and any measures adopted to remedy the effects of the incident/complaint; and
   e) measures put in place to prevent occurrence of a similar incident.

   The consent holder shall make the complaints record available to officers of Taranaki Regional Council, on request.

   The consent holder shall notify the Chief Executive, Taranaki Regional Council, or his delegate, of any complaints received, which relate to the exercise of this permit, within 24 hours of being received.

   At the grant date of this consent, the Council's phone number is 0800 736 222 [24 hr service].

Lapse and review dates

10. This consent shall lapse on 30 September 2015, 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.

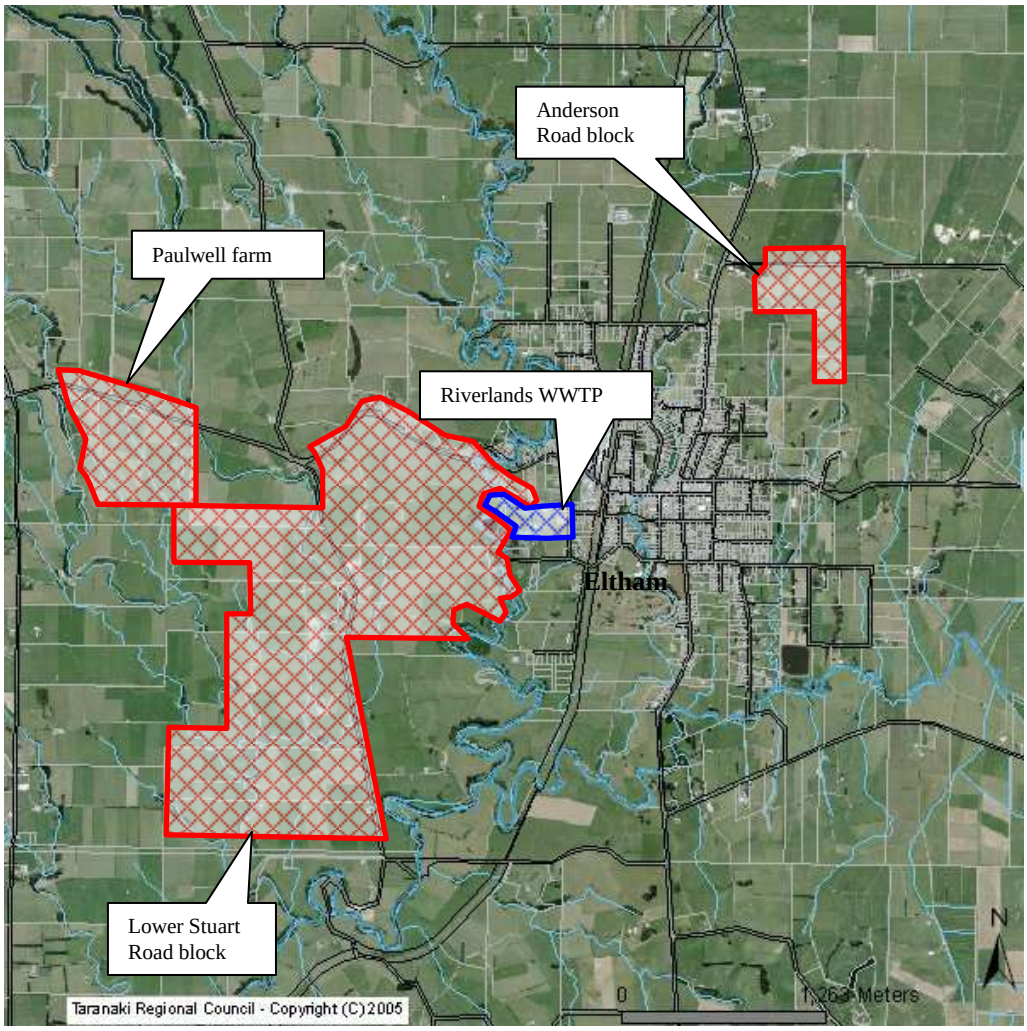
11. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2017 and/or 2023 for the 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 17 September 2010

For and on behalf of
Taranaki Regional Council

_____

Director-Resource Management



Plan attached: Aerial photo illustrating the site areas for land disposal relative to the Wastewater Treatment Plant.

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 P O Box 124 ELTHAM 4353
Decision Date:	9 July 2012
Commencement 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 at or about (NZTM) 1710920E-5634567N
Expiry Date:	1 June 2029
Review Date(s):	June 2017, June 2023
Site Location:	Lower London Street, Eltham
Legal Description:	Lot 1 DP 11593 [Site of take & use]
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 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 ± 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 ± 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; and
   (b) specifically record the water taken as 'zero' when no water is taken.

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 7 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 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 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.

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

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:

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 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 into the Waingongoro River at or about (NZTM) 1710612E-5634427N
Expiry Date:	1 June 2029
Review Date(s):	June 2017, June 2023, June 2026, and/or within 60 days months of receiving notification under special condition 13
Site Location:	London Street, Eltham
Legal Description:	Lot 2 DP 12254 Lot 3 DP 1622 Lots 5-7,14 DP 1623 Lot 1 DP 11593 & Sec 101 Eltham Vill Sett [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 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 ^{o}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. 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.

6. Within three months of the granting of this consent, the consent holder shall update and review the management plan required by condition 5 and resubmit the plan for certification by the Chief Executive, Taranaki Regional Council.

7. Within one months notice given by the Taranaki Regional Council, the consent holder shall review the management plan required by condition 5 and resubmit the plan for certification by the Chief Executive, Taranaki Regional Council.

8. A copy of any reviewed Plan, as per conditions 6 and 7, 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).

9. 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.

10. 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.

11. 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.

12. 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.

13. 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 12 for the purpose of requiring specific conditions to reduce the levels of Dissolved Reactive Phosphorus (DRP) in the discharge.

14. 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.

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

Signed at Stratford on 9 July 2012

For and on behalf of
Taranaki Regional Council

_____

Director-Resource Management

Appendix II

Riverlands discharge monitoring data 2012-2013 and 2013-2014

Appendix II: Riverlands monitoring data on effluent composition, 2012-2013

Date	Time.	Temp-erature	Dissolved oxygen	pH	Suspended solids	COD	Ammonia	Nitrate	Weekly kill
	NZST/DT	°C	g/m³	pH	g/m³	g/m³	g/m³	g/m³	
9.10.12	10:16 AM	11.6	6.88	7.8	140	166	60	15	0
30.10.12	8:45 AM	15.8	10.01	8.5	60	162	49	35	2436
6.11.12	10:43 AM	16.4	7.89	8.2	120	164	49	15	3815
13.11.12	8:23 AM	14.9	7.64	8.0	140	189	108	12	4395
20.11.12	9:35 AM	16.4	11.82	7.9	77	122	162	2.5	4315
27.11.12	11:35 AM	26.0	7.24	7.8	200	228	96	10	4475
4.12.12	10:23 AM	22.0	2.68	7.8	60	284	174	3	4556
11.12.12	10:10 AM	17.1	5.86	7.8	240	322	159	3	4903
18.12.12	11:10 AM	22.9	6.49	7.9	240	201	171	6	4995
									4998
									1980
8.01.13	8:51 AM	16.2	7.09	8.0	120	264	173	12	1966
15.01.13	10:45 AM	20.8	7.45	7.9	40	269	183	5	4712
22.01.13	1:00 PM	25.2	7.53	7.9	600	281	187	6	4979
29.01.13	8:17 AM	18.7	4.8	8.0	200	283	127	1	4951
5.02.13	9:08 AM	17.1	7.43	8.1	180	330	122	5.3	5120
12.02.13	11:10 AM	22.4	3.72	7.9	360	307	110	3	5660
19.02.13	8:13 AM	17.2	5.05	8.0	260	218	125	6	5305
26.02.13	11:05 AM	23.4	5.0	8.0	20	264	128	7	5593
5.03.13	9:25 AM	18.2	6.2	7.9	80	259	121	25	6460
12.03.13	9:52 AM	21.2	3.75	7.9	100	288	156	2	6468
19.03.13	8:15 AM	19.6	6.85	8.1	40	218	105	10	6630
26.03.13	10:20 AM	21.0	6.63	8.0	140	470	176	6	6564
2.04.13	10:18 AM	19.6	3.14	7.8	98	747	185	0	5990
9.04.13	8:50 AM	15.0	6.97	8.0	380	318	143	30	4425
16.04.13	7:22 AM	16.4	6.59	8.0	40	256	98	30	4104
23.04.13	8:45 AM	15.3	6.51	7.9	140	264	79	20	4072
30.04.13	12:05 PM	18.7	7.57	7.7	60	234	66	33.75	4079
8.05.13	10:19 AM	12.7	8.34	7.8	120	373	68	42	5280
14.05.13	11:20 AM	17.3	7.76	7.5	60	605	77	44	5017
21.05.13	9:10 AM	13.9	6.92	7.8	400	398	89	30	4801
28.05.13	9:00 AM	10.4	4.09	7.8	60	340	64	30	5214
5.06.13	9:38 AM	11.7	7.44	7.6	240	187	74	60	5025
11.06.13	10:30 AM	12.3	5.29	7.8	80	186	115	30	4028
18.06.13	9:00 AM	11.8	8.26	7.8	120	283	128	15	3923
26.06.13	1:55 PM	11.3	3.31	7.9	100	228	119	9	3908
4.07.13	10:15 AM	11.2	4.07	7.7	116	455	127	22.5	2540
9.07.13	12:40 PM	10.4	8.34	7.8	60	350	120	22.5	2370
									1986
24.07.13	9:10 AM	10.4	7.61	7.9	140	231	80	18	0
30.07.13	10:30 AM	9.0		7.6	340	243	81	12	*9926*
6.08.13	8:26 AM	10.9	6.89	7.5	60	151	68	40	*15474*
13.08.13	9:30 AM	14.7	7.23	7.4	160	499	63	40	*19940*
20.08.13	9:30 AM	11.9	5.13	7.4	160	96	72	40	*17669*
27.08.13	8:21 AM	11.0	8.86	7.3	80	88	64	40	*15503*
3.09.13	10:03 AM	11.3	13.14	6.8	220	301	76	40	*11899*
10.09.13	8:35 AM	10.6	12.4	7.9	180	174	73	55	*9715*
17.09.13	8:34 AM	11.9	12.07	8.1	100	93	73	50	*10726*
24.09.13	9:25 AM	16.2	11.09	8.0	40	131	55	15	*6664*
1.10.13	11:58 AM	14.9	14.69	7.6	20	172	80	60	*6361*

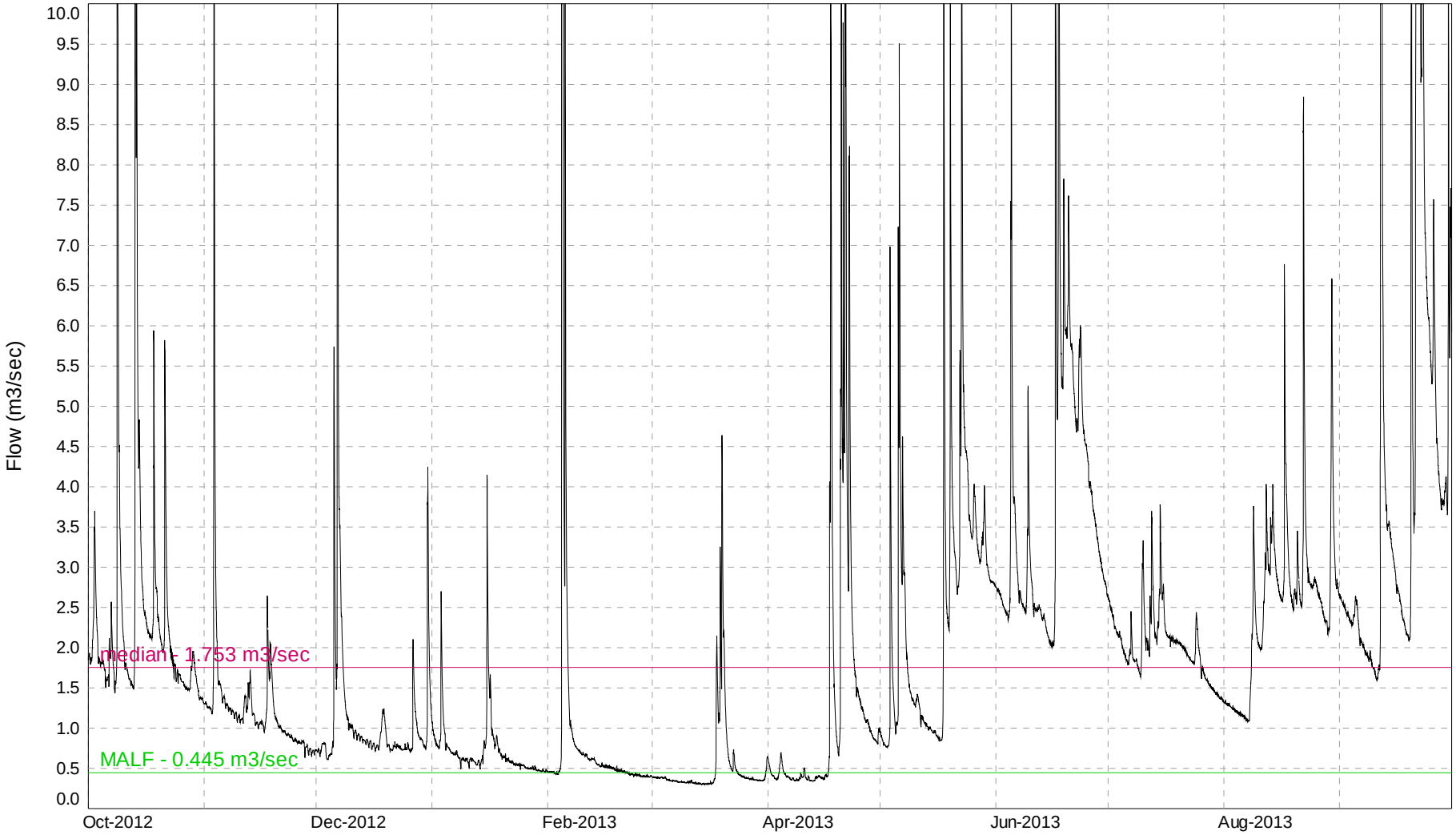
Weekly kill relates to (cattle) kill during the working week prior to sampling (normally Tuesday), *calves* in italics.
Dates in **bold** indicate interlaboratory comparisons.

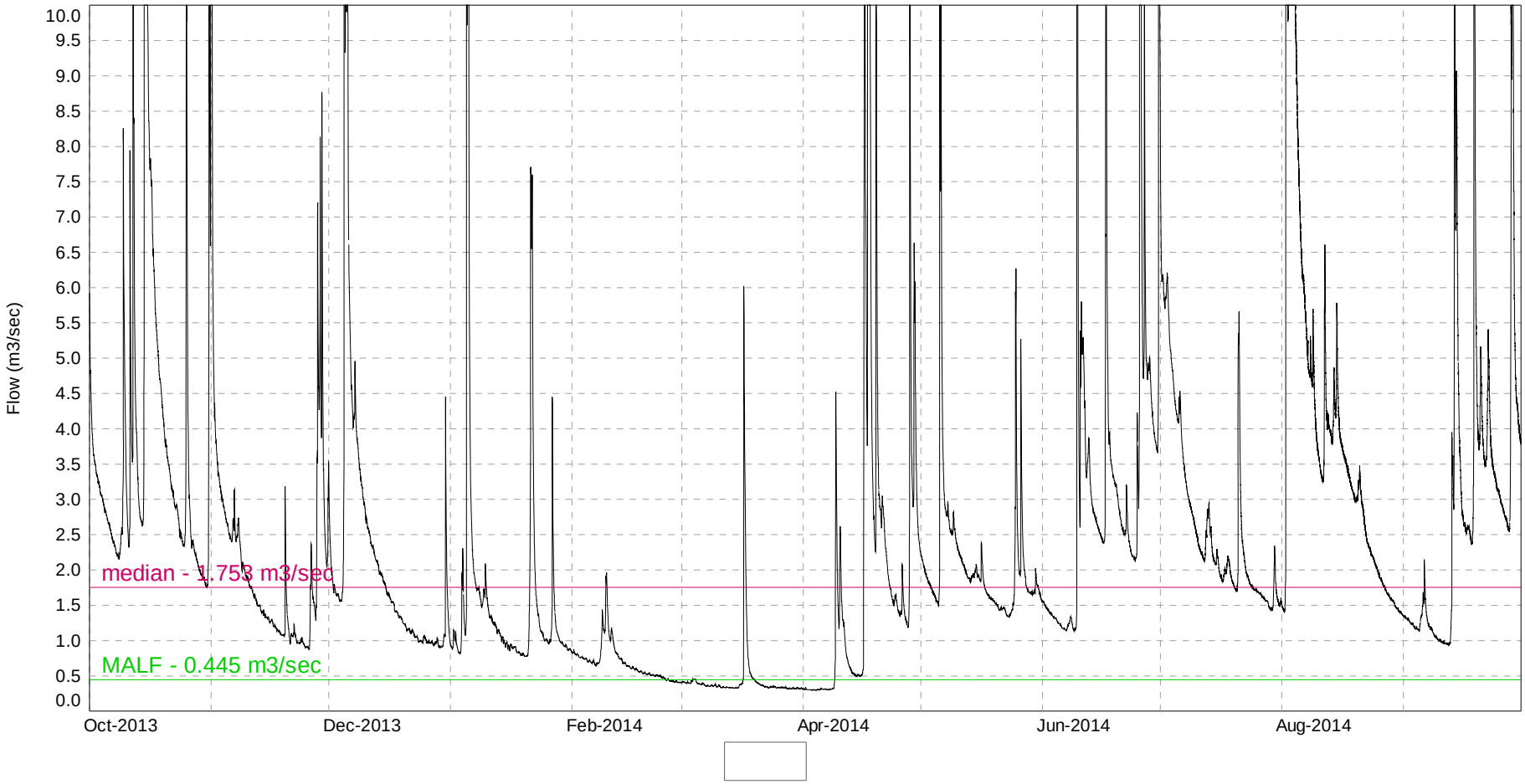
Appendix II: Riverlands monitoring data on effluent composition, 2013-2014

Date	Time.	Temp-erature	Dissolved oxygen	pH	Suspended solids	COD	Ammonia	Nitrate	Weekly kill
	NZST/DT	°C	g/m³	pH	g/m³	g/m³	g/m³	g/m³	
5.11.13	8:47 AM	15.7	1.7	7.3	40	117	49	0.3	2712
12.11.13	12:25 PM	21.2	6.6	7.6	80	255	107	0.125	3624
19.11.13	8:10 AM	18.4	2.1	7.9	176	23	155	0.125	3804
26.11.13	9:40 AM	21.4	5.6	8.0	180	205	152	0.125	4191
3.12.13	9:40 AM	20.3	3.8	7.7	60	239	139	1	4784
10.12.13	8:10 AM	18.6	3.0	7.9	40	225	191	0	4552
17.12.13	9:00 AM	18.5	5.0	7.8	40	249	194	0	3701
									4121
									1500
7.01.14	8:47 AM	19.8	4.7	7.9	40	202	164	30	0
13.01.14	9:00 AM	19.7	4.8	8.1	320	232	185	0.6	4812
21.01.14	8:40 AM	19.3	7.1	8.0	180	304	195	0	4786
28.01.14	10:30 AM	17.7	5.7	8.0	20	283	207	0	4836
4.02.14	10:40 AM	29.3	3.9	7.8	240	450	175	0.25	4746
11.02.14	7:00 AM	15.3	5.3	7.8	157	232	158	2.5	3273
18.02.14	9:55 AM	24.2	10.8	8.0	100	295	168	1.5	5048
25.02.14	9:30 AM	19.6	8.0	7.8	80	457	178	4	4589
4.03.14	10:32 AM	15.0	7.6	7.9	140	236	67	10	5246
12.03.14	11:20 AM	21.8	3.8	7.8	9	338	159	0.7	5957
18.03.14	10:30 AM	18.9	2.5	8.1	360	246	164	0.25	6000
25.03.14	9:30 AM	16.2	6.1	8.0	160	343	198	0.25	6590
4.04.14	10:23 AM	19.3	6.9	8.0	20	273	214	0.75	6519
8.04.14	9:45 AM	18.2	8.1	8.0	160	306	193	0.5	6515
15.04.14	8:15 AM	16.1	7.7	7.9	140	363	85	0.6	6272
22.04.14	11:15 AM	20.4		7.9	240	241	159	2.5	4238
29.04.14	7:32 AM	11.5	9.6	7.6	100	237	50	40	3039
6.05.14	10:10 AM	20.0	10.2	8.1	400	284	115	7.5	4282
13.05.14	9:30 AM	14.2	5.2	7.7	1297	765	173	7.5	4511
20.05.14	1:45 PM	17.3	8.2	7.9	20	348	171	6	5205
27.05.14	10:10 AM	9.1	5.7	7.8		187	141	10	5301
4.06.14	10:29 AM	14.4	6.3	7.8	180	256	138	12.5	5047
11.06.14	9:10 AM	13.8	6.2	7.9	80	159	160	12.5	3777
17.06.14	8:15 AM	13.1	5.5	7.8	120	271	143	1.5	4381
24.06.14	8:48 AM	9.4	7.7	7.8	220	183	120	4	2925
3.07.14	2:08 PM	10.5	7.7	7.8	31	216	92	40	2980
8.07.14	1:10 PM	11.0	7.2	7.9	120	225	135	25	2032
									2062
22.07.14	10:53 AM	11.0	9.0	7.7	1178	1437	229	40	*0*
29.07.14	8:30 AM	8.6	8.4	8.0	180	362	228	25	*9109*
5.08.14	11:43 AM	12.6	8.4	7.9	20	139	137	10	*14966*
13.08.14	7:35 AM	8.4	8.6	7.6	100	135	120	50	*19252*
19.08.14	8:35 AM	11.6	12.9	7.3	80	137	0.17	75	*18862*
26.08.14	11:30 AM	13.7	10.0	7.5	0	172	93	75	*15936*
2.09.14	7:45 AM	10.8	7.7	7.4	32	159	94	65	*13125*
9.09.14	11:10 AM	15.8	9.8	7.9	51	167	94	75	*10449*
16.09.14	10:40 AM	13.5	9.1	7.6	100	137	77	75	*9039*
24.09.14	7:18 AM	10.7	9.5	7.3	100	78	77	30	*7729*
30.09.14	1:05 PM	19.0	9.4	7.0	60	176	71	38	*6306*
7.10.14	8:00 AM	13.5	9.0	8.3	nt	194	128	20	*4285*

Appendix III

Hydrographs for Waingongoro River at Eltham Road


Flow (m3/sec)
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
median - 1.753 m3/sec
MALF - 0.445 m3/sec
Oct-2012
Dec-2012
Feb-2013
Apr-2013
Jun-2013
Aug-2013


Flow (m3/sec)
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
median - 1.753 m3/sec
MALF - 0.445 m3/sec
Oct-2013
Dec-2013
Feb-2014
Apr-2014
Jun-2014
Aug-2014

Appendix IV

Riverlands Eltham Limited
Water Use Annual Reports
for the years 2012-2013 and 2013-2014

To: **General Manager – Taranaki Regional Council**

From: **Rawiri Mako – Riverlands Eltham Ltd**

Date: **30 July 2013**

Subject: **Water Use Report 2012/13 Season**

This report is written to satisfy special condition 3 of Resource Consent 5437 - to take and use water from the Waingongoro River.

Table 1 below compares the 2012/13 beef season for the period from 24 October 2012 to 10 July 2013 with the five previous seasons. A complete record of water use for the 2012/13 season is attached in Appendix 1.

Table 1. Water Use Comparison (Beef Season only)

	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Total Kill	175,940	175,165	166,972	169,195	163,932	172,038
Town Supply Potable (m^3)	208,968	261,762	240,867	135,245	170,530	219,270
River Water Abstracted (m^3)	391,093	380,100	398,424	336,119	297,682	290,272
- River Potable made (m^3)	271,780	255,150	245,281	213,687	194,148	172,818
- River Non-potable (m^3)	119,313	124,950	153,143	122,432	103,534	117,454
Total Potable Water (m^3)	480,748	516,912	486,148	348,932	364,678	392,088
Total Water Use (m^3)	600,061	641,862	639,291	471,364	468,212	509,542
Potable per body (m^3)	2.73	2.95	2.91	2.06	2.22	2.28
Non Potable per body (m^3)	0.68	0.71	0.92	0.72	0.63	0.68
Total Water Use per body (m^3)	**3.41**	**3.66**	**3.83**	**2.79**	**2.85**	**2.96**

Analysis of Water Use figures for 2012/2013

Table 1 above and Graphs 1 & 2 below show the comparative water use figures and trends for the last 6 seasons. A comparison of the water use figures in 2012/13 is detailed below.

- The total beef kill for 2012/13 was 172,038. This was an increase of 8,106 cattle on the previous season.

- This was the third year of the water conservation programme being used within the plant and while not being as successful as the previous 2 years, we are still reasonably happy with this season if we compare it to the amount of water being used before the water conservation was introduced. Please see the note below.

- This year again showed the Water Treatment Plant to be not quite as efficient as it has been in previous years. Part of the reason for this was for a period of time the WTP was non-operational due to problems with the chlorine dosing not meeting the correct levels to be able to be used within the plant.

- The other part of the reason why the WTP was not performing to its optimum was again due to the weather. Once the drought period from early December 2012 through until the end April 2013 ended and the first rains arrived, it bought with it few bugs which managed to enter the WTP that meant we had to shut the plant down for a number of days to completely flush it out. Consequently the Water Treatment Plant was not able to operate at full capacity for large parts of the season.

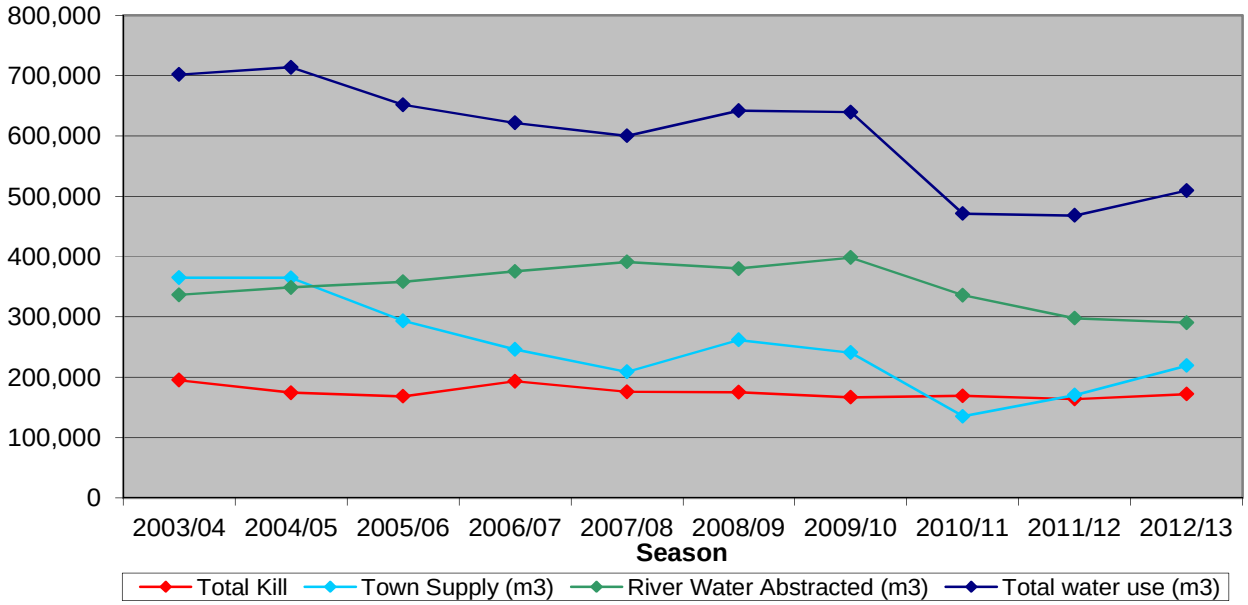
- Overall, total water use for Riverlands has seen an increase compared with the previous season. This has once again been largely due to compliance issues within the plant.

- The total water use per body figure of 2.96m^3 has increased from 2.85m^3 last year.

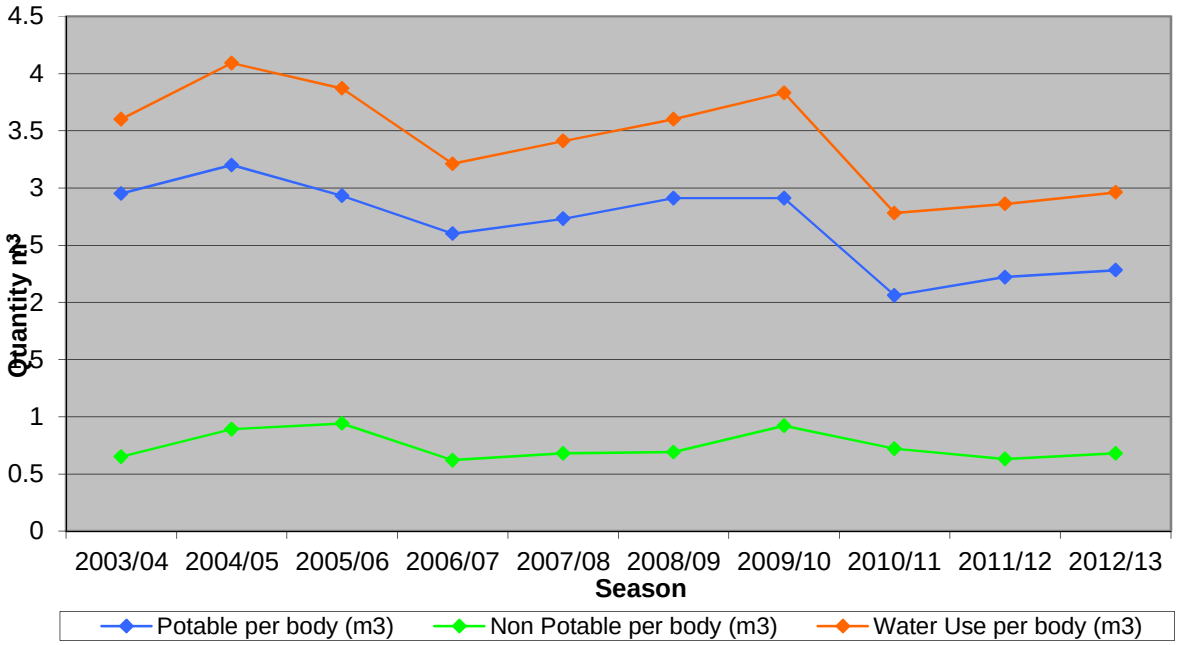
- The total potable water per body figure of 2.22m^3 has increased from 2.06m^3 last year.

- The non-potable water per body figure of 0.68 m^3 has increased from 0.63m^3 last year.

Graph 1. Water Use Trends



Graph 2. Water Use Trends Per Body



Potable Water

- A slight increase in potable water use has been recorded for the 2012/13 season. The water conservation programme introduced into the plant two years ago is still having a major bearing on water use within the plant and is still proving to be very successful.

- Potable water use this season was 392,088m^3 compared to 364,678m^3 used last season. This is a potable water use increase of 27,410m^3 compared with last seasons' potable water use.

- Town potable use was up by 35,285m^3 and potable made was down by 19,539m^3.

- Compliance requirements continue to be ongoing with regards to processing, hygiene and cleanups in and around the plant. With this in mind, there will always be challenges involving the saving of water as opposed to compromising compliance regulations.

Non Potable Water

- The non-potable water use this season was 117,454m^3 compared to 103,534m^3 used last season. This is an increase this season of 13,920m^3 compared to last seasons.

- Non-potable water is used in the yards for washing down the cattle; washing down stock trucks; cleaning up around the by-products and effluent pre-treatment areas; and in the outside rumblers and gut washer.

- An increased amount of customer and compliance requirements are reviewed constantly and the cleaning of stock prior to slaughter is one of these requirements. This is also a

challenge in regard to the saving of water as opposed to meeting customer demand and compliance regulations.

Improvements made / Future Initiatives

- This is the third year of the water conservation programme being used throughout the plant. Once again the positive attitude toward the programme by all concerned was outstanding and has continued to play a major role in the programme being a great success.
- The total water use for the 2012/13 beef season was 509,542m^3 compared to the previous seasons' total water use of 468,212m^3.
- This was an increase of total water 41,330m^3. The beef kill for the season was 172,038, an increase of 8,106 on the previous season. This is an increase of 110lts/body total water used for the season.
- This coming season we intend to make changes to the belly wash in the yards. Currently the water used in the belly wash is potable water. This will be changed to non-potable water. We also intend to shorten the length of the belly wash and nozzle size used in the belly wash which we estimate could save up to 60m^3 of water a day.

Trends in Water Supply and Use

Table 2 below shows comparative percentages on water supply and water use over the past six seasons. Trends in this data are discussed below.

Table 2. Water Supply and Use

	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
% of total water from River	65%	60%	62%	71%	64%	57%
% of total water from Town supply	35%	40%	38%	29%	36%	43%
% of Potable water use	80%	81%	76%	74%	78%	77%
% of Non-Potable water use	20%	19%	24%	26%	22%	23%
% of Potable water from River	57%	51%	51%	61%	53%	44%
% of Potable water from Town Supply	43%	49%	49%	39%	47%	56%

- The proportion of water sourced from the river compared to town supply has shown a 7% decrease in the proportion sourced from the river. The major factor behind this decrease has been due to the Water Treatment Plant not being able to operate at full capacity during the season for the reasons explained above.
- There has been a 1% decrease of potable water use in the plant. This has been countered by a 1% increase of non-potable water compared to the previous season.

- Under our consent, abstraction from the Waingongoro River is limited to 1972 m^3/day. Our water abstraction rates for 2009/10 have all been within this limit.

To: **General Manager – Taranaki Regional Council**

From: **Rawiri Mako – Anzco Foods Limited**

Date: **30 July 2014**

Subject: **Water Use Report 2013/14 Season**

This report is written to satisfy special condition 3 of Resource Consent 5437 - to take and use water from the Waingongoro River.

Table 1 below compares the 2013/14 beef season for the period from 30 October 2013 to 3 July 2014 with the five previous seasons. A complete record of water use for the 2013/14 season is attached in Appendix 1.

Table 1. Water Use Comparison (Beef Season only)

	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
Total Kill	175,165	166,972	169,195	163,932	172,038	157,957
Town Supply Potable (m^3)	261,762	240,867	135,245	170,530	219,270	194,495
River Water Abstracted (m^3)	380,100	398,424	336,119	297,682	290,272	232,170
- River Potable made (m^3)	255,150	245,281	213,687	194,148	172,818	149,034
- River Non-potable (m^3)	124,950	153,143	122,432	103,534	117,454	83,136
Total Potable Water (m^3)	516,912	486,148	348,932	364,678	392,088	343,529
Total Water Use (m^3)	641,862	639,291	471,364	468,212	509,542	426,665
Potable per body (m^3)	2.95	2.91	2.06	2.22	2.28	2.17
Non Potable per body (m^3)	0.71	0.92	0.72	0.63	0.68	0.53
Total Water Use per body (m^3)	**3.66**	**3.83**	**2.79**	**2.85**	**2.96**	**2.70**

Analysis of Water Use figures for 2013/2014

Table 1 above and Graphs 1 & 2 below show the comparative water use figures and trends for the last 6 seasons. A comparison of the water use figures in 2013/14 is detailed below.

- The total beef kill for 2013/14 was 157,957. This was a decrease of 14,081 cattle on the previous season.

- This was the fourth year of the water conservation programme being used within the plant and has been the most successful season to date in terms of water conservation.

- This year again showed the Water Treatment Plant to be not quite as efficient as it has been in previous years. Part of the reason for this was the WTP was non-operational for approximately six weeks due to unexpected maintenance of the plant during March-April 2014.

- The other part of the reason why the WTP was not performing to its optimum was again due to the weather. During heavy rain the plant struggles to cope with the turbidity within the river which in turn means we were unable to operate at capacity.

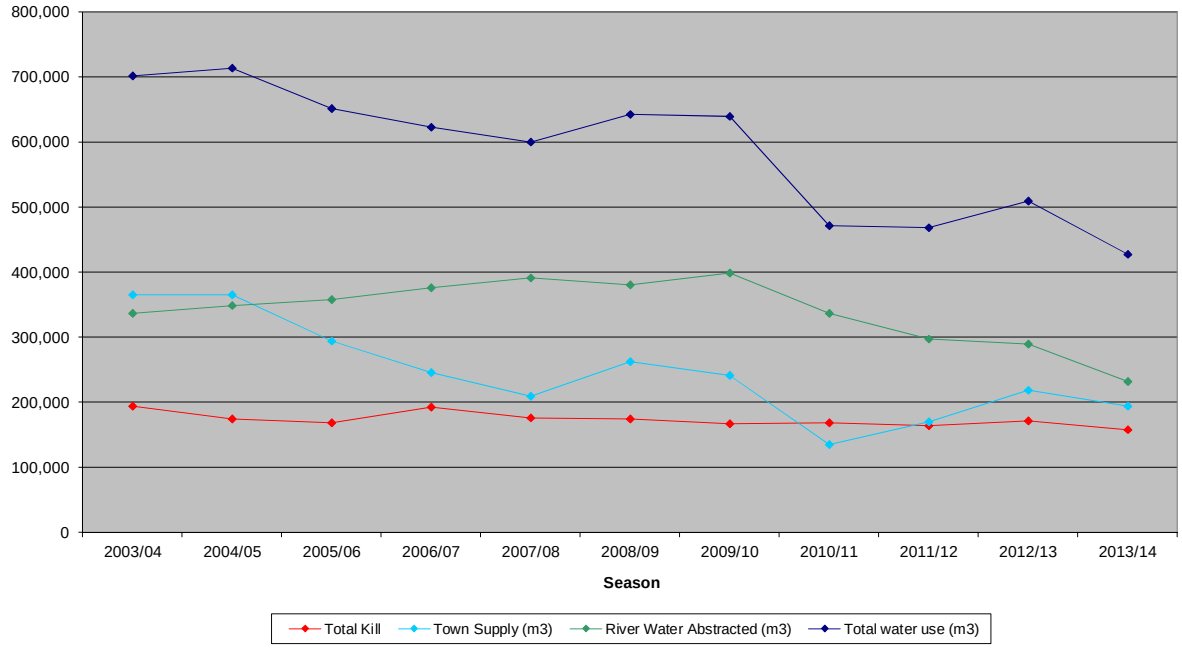
- Overall, total water use for Riverlands has seen a decrease compared with the previous season. This has been an excellent result.

- The total water use per body figure of 2.70m^3 has decreased from 2.96m^3 last year.

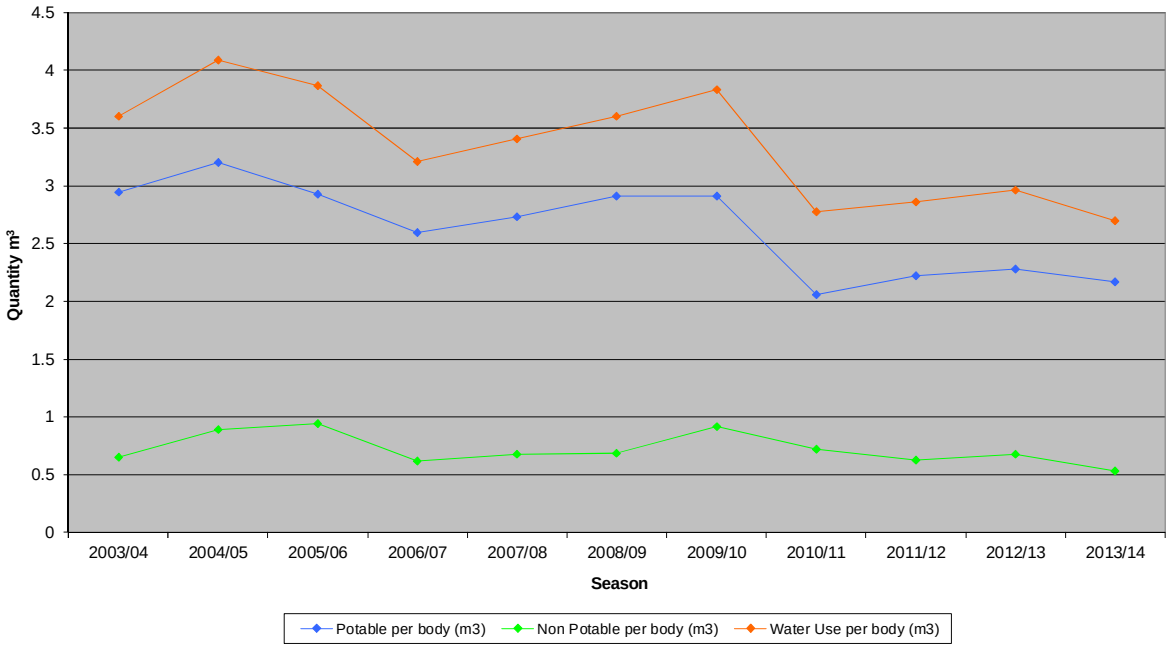
- The total potable water per body figure of 2.17m^3 has decreased from 2.28m^3 last year.

- The non-potable water per body figure of 0.53 m^3 has decreased from 0.68m^3 last year.

Graph 1. Water Use Trends



Graph 2. Water Use Trends Per Body



Potable Water

- A decrease in potable water use has been recorded for the 2013/14 season. This was due to a more vigilant approach toward conserving water than during the previous season.

- Potable water use this season was 343,529m^3 compared to 392,088m^3 used last season. This is a potable water use decrease of 48,559m^3 compared with last seasons' potable water use.

- Town potable use was down by 24,775m^3 and potable made was down by 23,784m^3.

- A lot of the decrease in potable water use during the beef season was due to fact that the plant processed 14,081 less cattle than the previous season. That being said, the total potable water/body this season was 110lts/body less than last season. This is an excellent result for all concerned.

- Compliance requirements continue to be ongoing with regards to processing, hygiene and cleanups in and around the plant. With this in mind, there will always be challenges involving the saving of water as opposed to compromising compliance regulations.

Non Potable Water

- The non-potable water use this season was 83,136m^3 compared to 117,454m^3 used last season. This is a decrease this season of 34,318m^3 compared to last seasons.

- Once again the reduction in the amount of cattle processed this season has had a major bearing on the reduction in the amount of non-potable water used this season compared to last seasons. As with the potable water use we have achieved an excellent result with the non-potable water in terms of water conservation. This season has seen the non-potable

water use/body decrease by 150lts/body compared to last season. Once again an excellent result for all concerned.

- Non-potable water is used in the yards for washing down the cattle; washing down stock trucks; cleaning up around the by-products and effluent pre-treatment areas; and in the outside rumblers and gut washer.

- An increased amount of customer and compliance requirements are reviewed constantly and the cleaning of stock prior to slaughter is one of these requirements. This is also a challenge in regard to the saving of water as opposed to meeting customer demand and compliance regulations.

Improvements made / Future Initiatives

- The total water use for the 2013/14 beef season was 426,665m^3 compared to the previous seasons' total water use 509,542m^3.

- This was a decrease of total water of 82,877m^3. The beef kill for the season was 157,957 a decrease of 14,081 on the previous season.

- The total water use/body has seen a huge decrease by 260lts/body to 2.7m^3/body compared to 2.96m^3/body for the previous season.

- Alterations that were made to the belly wash at the end of last season have had a major impact on reducing our total water use for the 2013/14 season.

- For the 2014/15 season, we are looking to further reduce our water use by constantly trying to find innovative ways to improve our operation within the plant.

Trends in Water Supply and Use

Table 2 below shows comparative percentages on water supply and water use over the past six seasons. Trends in this data are discussed below.

Table 2. Water Supply and Use

	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
% of total water from River	60%	62%	71%	64%	57%	55%
% of total water from Town supply	40%	38%	29%	36%	43%	45%
% of Potable water use	81%	76%	74%	78%	77%	80%
% of Non-Potable water use	19%	24%	26%	22%	23%	20%
% of Potable water from River	51%	51%	61%	53%	44%	43%
% of Potable water from Town Supply	49%	49%	39%	47%	56%	57%

- The proportion of water sourced from the river compared to town supply has shown a 2% decrease in the proportion sourced from the river. The major factor behind this decrease has been due to the Water Treatment Plant not being able to operate at full capacity during the season for the reasons explained above.

- There has been a 3% decrease of potable water use in the plant. This has been countered by a 3% increase of non-potable water compared to the previous season.

- Under our consent, abstraction from the Waingongoro River is limited to 1972 m^3/day. Our water abstraction rates for 2013/14 have all been within this limit.

Appendix V

Biomonitoring reports

To	Job Manager, J Kitto
From	Scientific Officer, C R Fowles
Consent Nos	2039, 1968
Doc No	1123116
Report No.	CF562
Date	20 November 2012

Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, surveyed in October 2012

Introduction

Two biological surveys (spring and summer) are scheduled annually for the assessment of effects of treated meatworks wastes discharges on the biological communities of the Waingongoro River. These surveys in the 2011-2012 monitoring year were performed in November 2011 and February 2012. An assessment of TRC biomonitoring data [1995 to 2010] was undertaken as a component of the consent renewal process (Stark, 2010) which concluded that overall, monitoring data collected by Taranaki Regional Council over the previous 15 years indicated some improvement in river health downstream of the discharge since discharge to the river was reduced by adoption of land disposal in 2001. Macroinvertebrate communities indicated that the river downstream of the discharge has improved from 'fair' to 'good' condition over the previous 15 years and that the impact of the discharge had been no more than minor given the ability of the river to assimilate the wastewater and to cleanse itself frequently during floods. Almost all MCI values recorded from sites downstream of the Riverlands discharge exceeded 80 units and have been within the 95% confidence limits of the predictive relationships between MCI and site altitude or distance from source that Stark & Fowles (2009) developed based on data from 'control' sites (i.e., upstream of consented discharges) in the Waingongoro catchment (Stark, 2010).

This current survey, the first of the scheduled surveys for the 2012–2013 monitoring period, was performed in spring under a period of moderate, recession flow conditions and on the day that the consented discharge of treated wastewater was diverted to land irrigation after a period of 5 continuous days of river discharge. The survey followed a wet spring period with four significant freshes during the previous three weeks.

Methods

The standard '400 ml kick sampling' technique was used to collect streambed (benthic) macroinvertebrates from three established sampling sites (1, 3, and 3a, illustrated in Figure 1) on 31 October 2012.

Site 3a replaced site 2a about fifteen years earlier, due to changes in the river channel following flood events and the subsequent unsuitability of the previously surveyed site (2a) which had been located at the periphery of the 50 m mixing zone.

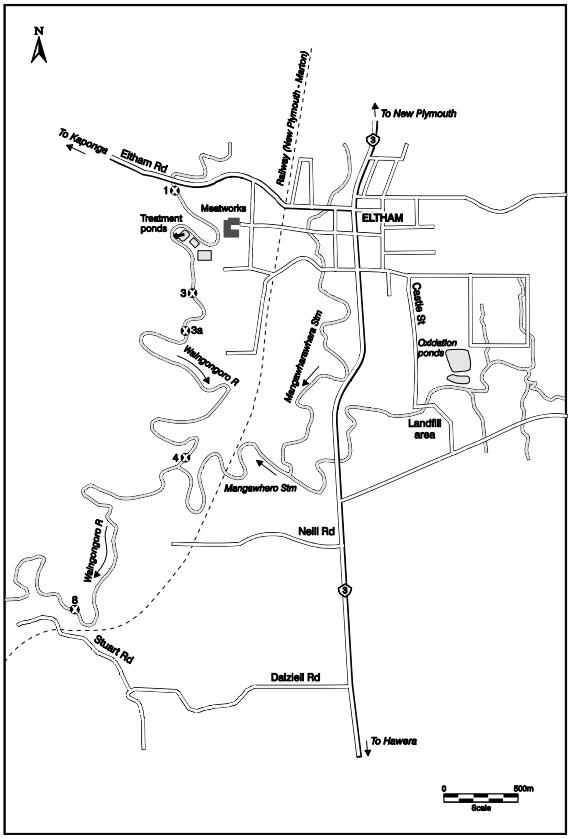


Figure 1 Biomonitoring sampling site locations in the Waingongoro River in relation to Riverlands meatworks discharges

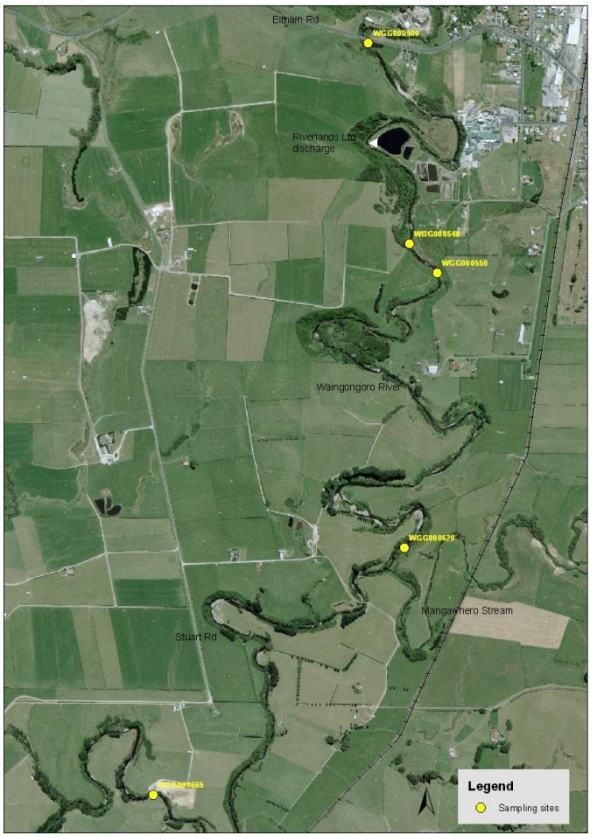


Figure 2 Location of biomonitoring sites in relation to the Eltham WWTP and landfill

These sites were:

Site No	Site Code	Map Reference	Location
1	WGG 000500	Q20:206 966	Eltham road bridge (upstream of discharge)
3	WGG 000540	Q20:208 958	approximately 400m downstream of discharge
3a	WGG 000550	Q20:207 956	approximately 600m downstream of discharge

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

Samples were preserved with Kahle's Fluid for later stereomicroscopic sorting and identification according to documented Taranaki Regional Council methodology. Macroinvertebrate taxa found in each sample were recorded as:

R (rare)	= less than 5 individuals;
C (common)	= 5-19 individuals;
A (abundant)	= 20-99 individuals;
VA (very abundant)	= 100-499 individuals;
XA (extremely abundant)	= 500 or more individuals.

Macroinvertebrate Community Index (MCI) values were calculated for taxa present at each site (Stark 1985) with certain taxa scores modified in accordance with Taranaki experience.

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

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

Results and discussion

This spring survey was performed under moderate recession flow conditions (1.26 m^3/sec at site 1) on 31 October 2012, 10 days after a fresh in excess of 3 times median flow and 18 days after a fresh in excess of 7 times median flow in the river. This flow was below the minimum mean monthly flow (1.53 m^3/sec) for October and the average October mean monthly flow (4.48 m^3/sec) for the period 1992 to 2011. Only thin periphyton mats were present with no filamentous algae visible on the substrate at any sites. Moss was patchy at site 3a but absent from sites 1 and 3. River water temperatures had a narrow range from 11.8°C to 12.3°C at the three sites during this mid morning survey. The discharge of treated wastewater to the river had been operative for five days prior to the day of the survey.

Macroinvertebrate communities

A summary of data obtained from previous surveys of the various river sites is presented in Table 1 and illustrated in Figure 2.

Table 1 Summary of macroinvertebrate taxa numbers and MCI values for previous surveys performed between August 1981 and February 2012

Site	Site code	No of surveys	Taxa numbers		MCI values	
			Range	Median	Range	Median
1	WGG000500	55	16-32	24	78-115	100
3	WGG000540	55	14-32	24	71-111	98
3a	WGG000550	34	16-29	23	79-111	99

The macroinvertebrate fauna results for the present survey are listed in Table 2.

Taxa numbers at all three sites were within ranges and from two to five taxa lower than median numbers found by previous surveys (Table 1) with taxa richnesses increasing slightly in mid reach. These numbers generally were indicative of moderate community richness typical of mid-catchment sites in Taranaki rivers and streams as illustrated by comparisons with the results of more than 665 past surveys of 'control' sites in National Park-sourced ringplain rivers and streams situated between 155 and 250 m a.s.l. (median richnesses of 20 to 23 taxa (TRC, 1999 (updated, 2012)).

Dominant taxa characteristic of this reach in the immediate vicinity of the meatworks included up to three 'highly sensitive' taxa (mayflies (*Deleatidium*, which was extremely abundant at all three sites, and *Nesameletus*) and flare-cased caddisfly (*Beraeoptera*)); four 'moderately sensitive' taxa (mayfly (*Coloburiscus*), stonefly (*Zelandobius*), elmid beetles, and stony-cased caddisfly(*Pycnocentrodes*)); and up to two 'tolerant' taxa (oligochaete worms and net-building caddisfly (*Aoteapsyche*)) despite the paucity of periphyton substrate cover due to the frequency of previous floods. These characteristic taxa were slightly fewer in number but in terms of the 'sensitive' taxa, typical of those which have dominated the fauna of this reach of the river at the time of the majority of previous surveys which have been performed mainly in spring and summer months. There were very few significant differences in individual taxon abundances between adjacent sites, which included increases in two 'tolerant' taxa between sites 1 and 3 with a subsequent decrease in numbers of the 'tolerant' oligochaete worms downstream at site 3a (Table 2). There was no evidence of any toxicity effects of preceding discharges as illustrated by no significant downstream reductions in the abundances of the more 'sensitive' taxa at site 3, and further illustrated by small changes in $SQMCI_s$ values which varied only by 0.5 unit through the river reach surveyed.

Numerically by far the most abundant taxon was the mayfly (*Deleatidium*) through this reach which has been the case in many previous surveys. The presence of 'highly sensitive' taxa (e.g. extremely abundant mayfly (*Deleatidium*), another mayfly, one stonefly, two caddisfly taxa, and one beetle taxon), although some of these taxa were recorded as rarities, was a further indication of the preceding relatively high physicochemical quality and good habitat in this reach of the Waingongoro River at the time of this spring survey.

A moderate range of MCI scores (114 to 124) was found, slightly wider in comparison with ranges of scores recorded by a number of previous surveys, but 5 to 12 units higher than found by the previous spring survey (Fowles, 2011 (CF539)). The MCI scores were significantly (Stark, 1998) from 16 (site 3) to 25 units (site 3a) higher than historical median

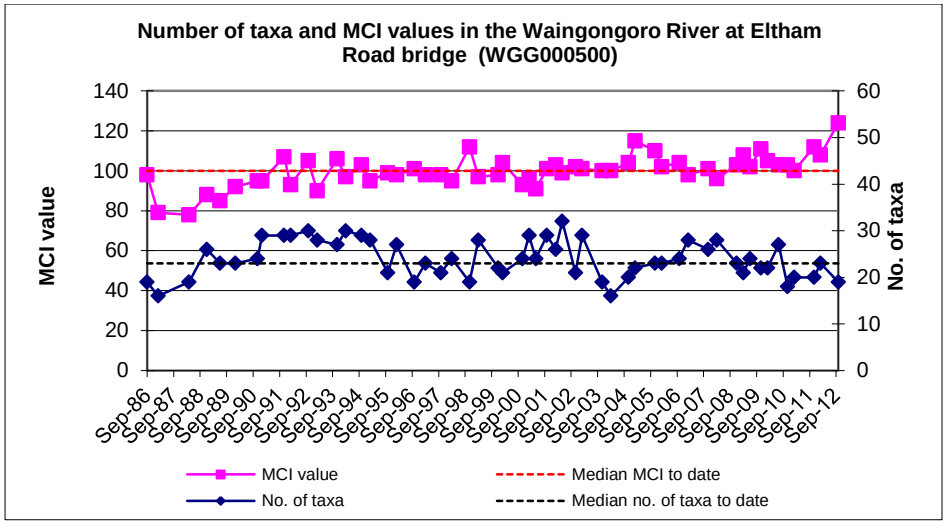
scores at each of the sites (Table 1 and Figure 2), and in all cases above previous maxima (by 3 to 13 units), coincident with minimal periphyton substrate cover through this reach of the river.

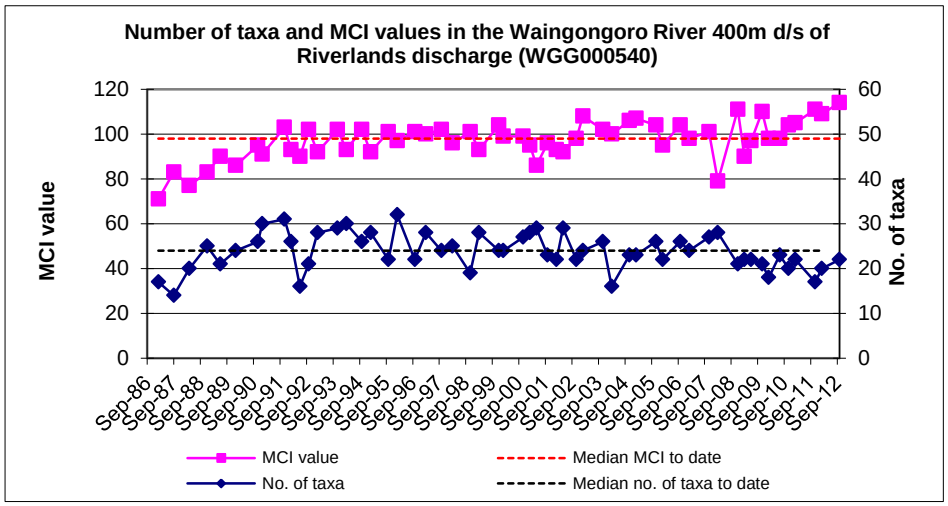
Table 2 Macroinvertebrate fauna of the Waingongoro River in relation to Riverlands Ltd's discharges sampled on 31 October 2012

Taxa List	Site Number	MCI score	1	3	3a
	Site Code		WGG000500	WGG000540	WGG000550
	Sample Number		FWB12394	FWB12395	FWB12396
NEMATOMORPHA	Nematomorpha	3	-	R	-
ANNELIDA (WORMS)	Oligochaeta	1	-	A	-
MOLLUSCA	*Potamopyrgus*	4	-	C	R
EPHEMEROPTERA (MAYFLIES)	*Austroclima*	7	R	-	R
	Coloburiscus	7	VA	VA	VA
	Deleatidium	8	XA	XA	XA
	Nesameletus	9	C	A	A
PLECOPTERA (STONEFLIES)	*Acroperla*	5	R	-	-
	Zelandobius	5	A	A	A
	Zelandoperla	8	C	R	R
COLEOPTERA (BEETLES)	Elmidae	6	A	VA	A
	Hydraenidae	8	R	R	R
MEGALOPTERA (DOBSONFLIES)	*Archichauliodes*	7	C	C	C
TRICHOPTERA (CADDISFLIES)	*Aoteapsyche*	4	C	A	A
	Costachorema	7	C	C	C
	Hydrobiosis	5	C	C	C
	Neurochorema	6	R	R	-
	Psilochorema	6	R	-	-
	Beraeoptera	8	C	A	C
	Olinga	9	-	R	-
	Pycnocentria	7	-	-	R
	Pycnocentrodes	5	A	VA	VA
DIPTERA (TRUE FLIES)	*Aphrophila*	5	C	C	C
	Eriopterini	5	-	R	R
	Orthocladiinae	2	R	R	-
	Polypedilum	3	-	R	R
	No of taxa		19	22	19
	MCI		124	114	124
	SQMCIs		7.5	7.0	7.2
	EPT (taxa)		14	12	12
	%EPT (taxa)		74	55	63

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

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





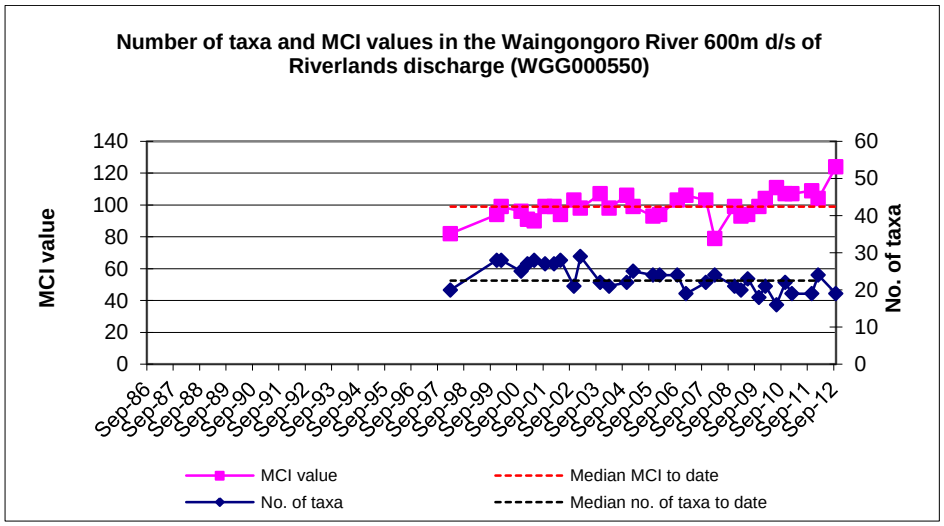


Figure 2 Taxa richness and MCI values for the three sites in the vicinity of Riverlands Eltham Ltd to date

There was no significant difference in scores between the 'control' site and either of the sites (3 and 3a) downstream of the discharge outfall, although the decrease in score between sites 1 and 3 was close to significant (due mainly to the presence of three additional 'tolerant' taxa), but was followed by marked recovery with no overall change in the MCI score between upper and lower sites in the reach of the river surveyed. Variability in scores was due mainly to the presence/absence of a few taxa found only as rarities (less than 5 individuals/site) at the three sites rather than significant changes in community composition between these sites. Some subtle changes in taxa composition were coincident with bank slumping and a less compact substrate at site 3.

The similarity in numerical abundances of the characteristic taxa at each of the three sites resulted in minor variability between $SQMCI_s$ scores which ranged from 7.0 to 7.5 units. This minor variability was due to the extreme abundance of only the one ('highly sensitive') taxon at all three sites.

The MCI scores recorded at these sites were the highest historically at all three sites and categorised this reach of river as having 'good' to 'very good' health (TRC, 2011) at the time of this spring survey. The scores were also from 9 to a significant 19 units higher than predicted MCI scores for a National Park-sourced ringplain river's sites at an altitude of 200m asl and from a significant 17 to 28 units higher than predicted MCI scores for these sites, 23.0 to 24.8 km downstream of the National Park boundary (Stark & Fowles, 2009).

The insignificant difference (Stark, 1998) found between the 'control' site's score and the downstream sites' scores and relative similarity in all sites' community structures were indicative of no recent impacts of discharges from Riverlands' property on the macroinvertebrate fauna of this reach of the river under the current discharge regime prior to wastewater irrigation to land under moderate flow conditions and the several freshes experienced in the receiving waters over the preceding few weeks.

Microscopic heterotrophic assessment

The microscopic heterotrophic assessments of the sites above and below the Riverlands discharges found no trace of undesirable heterotrophic growths on the riverbed at any of the three sites. This was indicative of no recent organic overloading of the assimilative capacity of the receiving waters downstream of the consented discharge's mixing zone following a period of winter–spring wastewater discharge to the river. It was also indicative of the successful remediation work undertaken in recent years to contain all other wastewater on the property of the consent holder.

Conclusions

Typical macroinvertebrate richnesses and MCI values above those typical of the mid-reaches of a developed catchment were found at all sites in the Waingongoro River adjacent to the Riverlands meatworks during this scheduled spring biomonitoring survey performed under moderate flow conditions immediately following a period of treated wastes discharges to the river prior to the commencement of wastewater irrigation onto land. An insignificant decrease in MCI score in a downstream direction below the designated mixing zone of the discharge outfall followed by a recovery in scores and minimal changes in community compositions were indicative of no significant impacts of the wastewater discharge under these moderate receiving water flow conditions following a wet early spring. These

insignificant effects were also indicated by the absence of heterotrophic growths on the river bed habitat at all three sites. These spring MCI scores were higher than historical maxima for all three sites (by 3 to 13 units).

Summary

The Council's standard 'kick-sampling' technique was used at three established sites to collect streambed macroinvertebrates from the Waingongoro River for the scheduled spring survey. Samples were sorted and identified to provide number of taxa (richness) and MCI and $SQMCI_S$ scores for each site.

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

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

This spring macroinvertebrate survey indicated that following a period of wastewater discharge there were no significant effects on the macroinvertebrate communities' compositions downstream of the discharge outfall beyond the designated mixing zone. Few significant changes in individual taxon abundances were recorded in a downstream direction. There were no heterotrophic growths found on the riverbed at any of the three sites which was also indicative of no significant impacts of any preceding authorised wastewater discharge on the biological communities of the Waingongoro River below the discharge and no evidence of any unauthorised spillage(s) to the river, the sources of which had been identified and successfully contained on the property in recent years.

In general, the macroinvertebrate communities of the Waingongoro River contained high proportions of 'sensitive' taxa at all sites and the communities were dominated only by 'sensitive' taxa. Taxonomic richnesses (numbers of taxa) were within ranges and slightly below medians of those found by previous surveys at all sites, whereas MCI scores were higher than historical maxima at each of the three sites.

MCI and $SQMCI_S$ scores indicated that the stream communities were of 'good' to 'very good' health and 'better than' to 'well above expected' predicted conditions recorded for reaches of similar Taranaki rivers. The very few significant differences in the numerical abundances amongst the characteristic taxa accounted for the minor variability in $SQMCI_s$ values through the river reach surveyed.

References

Internal Taranaki Regional Council reports

Fowles, C R, 2005: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, February 2005, CF362.

Fowles, C R, 2005: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, November 2005, CF392.

Fowles, C R, 2006: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, February 2006, CF397.

Fowles, C R, 2006: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, October 2006, CF410.

Fowles, C R, 2007: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, February 2007, CF419.

Fowles, C R, 2007: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, November 2007, CF436.

Fowles, C R, 2008: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, March 2008, CF445.

Fowles, C R, 2008: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, December 2008, CF476.

Fowles, C R, 2009: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, March 2009, CF482.

Fowles, C R, 2009: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, June 2009, CF488.

Fowles, C R, 2009: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, November 2009, CF495.

Fowles, C R, 2010: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, February 2010, CF505.

Fowles, C R, 2010: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, July 2010, CF511.

Fowles, C R, 2010: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, November 2010, CF514.

Fowles, C R, 2011: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, February 2011, CF530.

Fowles, C R, 2011: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, November 2011, CF539.

Fowles, C R, 2012: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, February 2012, CF547.

TRC, 1999: Some statistics from the Taranaki Regional Council database (FWB) of freshwater macroinvertebrate surveys performed during the period from January 1980 to 31 December 1998 (SEM reference report), TRC Technical Report 99-17.

TRC, 2010: Riverlands Eltham Ltd monitoring programme Annual Report 2008-2009, TRC Technical Report 2009-110.

TRC, 2011a: Fresh water macroinvertebrate fauna biological monitoring programme. Annual state of the environment monitoring report 2010-2011. TRC Technical Report 2011-38.

External publications

Stark, JD, 1985: A macroinvertebrate community index of water quality for stony streams. Water and Soil Miscellaneous Publication No. 87.

Stark, JD, 1998: a biotic index for freshwater macroinvertebrate coded abundance data. *New Zealand Journal of Marine and Freshwater Research 32(1): 55-66.*

Stark, JD, 1999: An evaluation of Taranaki Regional Council's SQMCI biomonitoring index. Cawthron Report No 472. 32pp.

Stark, JD, 2010: Assessment of the impact of Riverlands Eltham Ltd discharges on the Waingongoro River. Stark Environmental Report No. 2010-07. 39p.

Stark, JD, Boothroyd IKG, Harding JS, Maxted JR, Scarsbrook MR, 2001: Protocols for sampling macroinvertebrates in wadeable streams. New Zealand Macroinvertebrate Working Group Report No 1. Prepared for the Ministry for the Environment. Sustainable Management Fund Project No. 5130. 57p.

Stark JD, Fowles CR, 2009: Relationships between MCI, site altitude, and distance from source for Taranaki ring plain streams. Stark Environmental Report 2009-01. 47p.

To	Job Manager, J Kitto
From	Scientific Officer, C R Fowles
Consent Nos	2039, 1968
Doc No	1202377
Report No.	CF572
Date	May 2013

Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, February 2013

Introduction

Two biological surveys (spring and summer) are scheduled annually for the assessment of effects of treated meatworks wastes discharges on the biological communities of the Waingongoro River. In the 2012-2013 period, the spring survey was performed in October, 2012 (CF562). An assessment of TRC biomonitoring data [1995 to 2010] undertaken as a component of the consent renewal process (Stark, 2010) concluded that overall, monitoring data collected by Taranaki Regional Council over the past 15 years indicated some improvement in river health downstream of the discharge since discharge to the river was reduced by adoption of land disposal 2001. Macroinvertebrate communities indicated that the river downstream of the discharge has improved from 'fair' to 'good' condition over the last 15 years and that the impact of the discharge had been no more than minor given the ability of the river to assimilate the wastewater and to cleanse itself frequently during floods. Almost all MCI values recorded from sites downstream of the Riverlands discharge exceeded 80 units and have been within the 95% confidence limits of the predictive relationships between MCI and site altitude or distance from source that Stark & Fowles (2009) developed based on data from 'control' sites (i.e., upstream of consented discharges) in the Waingongoro catchment.

This current survey, the second of the scheduled surveys for the 2012–2013 monitoring period, was performed in late summer under a period of moderately low, recession flow conditions and during the consented discharge of treated wastewater to land irrigation which had been occurring continuously for a period since the last day of October 2012. The survey followed a steady recession from the previous fresh nearly three weeks earlier, during a very dry late summer period.

Methods

The standard '400 ml kick sampling' technique was used to collect streambed (benthic) macroinvertebrates from two long-established sampling sites (1 and 3) and a site (3a) established at the time of the spring 1999 survey; one site (4) immediately upstream of the confluence of the Mangawhero Stream, and a site (8) downstream of this confluence in the Waingongoro River (illustrated in Figures 1 and 2) on 25 February 2013. Site 4 was sampled as a component of the Eltham WWTP/landfill survey and was included to provide comparative information associated with the survey performed in conjunction with the South Taranaki District Council Eltham WWTP system where the treated wastewater discharge had been diverted out of the catchment (to Hawera WWTP) since late winter, 2010. Site 8 was sampled as a component of the Council's State of the Environment programme.

These sites were:

Site No	Site code	Map reference	Location
1	WGG 000500	Q20:206 966	Eltham road bridge (upstream of discharge)
3	WGG 000540	Q20:208 958	approximately 400m downstream of discharge
3a	WGG 000550	Q20:208 956	approximately 600m downstream of discharge
4	WGG 000620	Q20:208 947	approximately 100m upstream of Mangawhero Stream confluence
8	WGG 000665	Q20:199 937	approximately 2 km downstream of Mangawhero Stream confluence (off Stuart Road)

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

Samples were preserved with Kahle's Fluid for later stereomicroscopic sorting and identification according to documented Taranaki Regional Council methodology. Macroinvertebrate taxa found in each sample were recorded as:

R (rare)	= less than 5 individuals;
C (common)	= 5-19 individuals;
A (abundant)	= 20-99 individuals;
VA (very abundant)	= 100-499 individuals;
XA (extremely abundant)	= 500 or more individuals.

Macroinvertebrate Community Index (MCI) values were calculated for taxa present at each site (Stark 1985) with certain taxa scores modified in accordance with Taranaki experience.

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

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

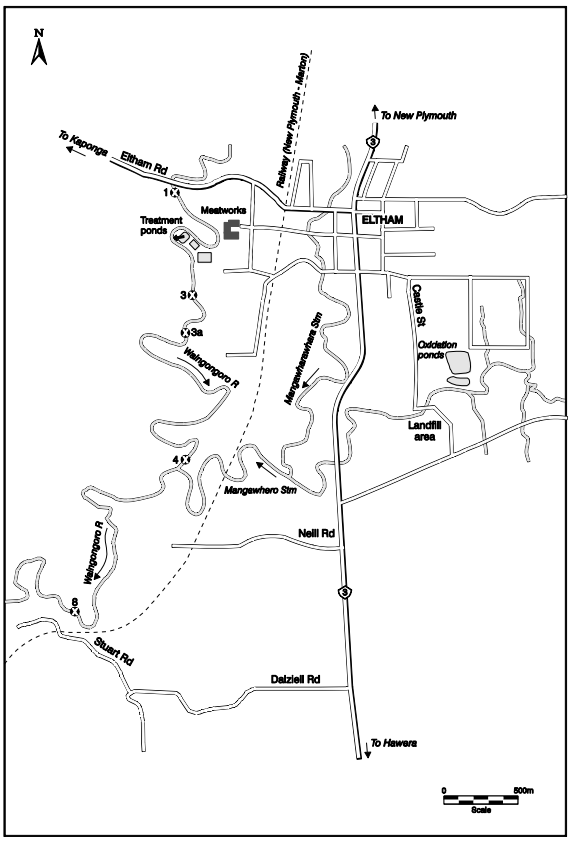


Figure 1 Biomonitoring sampling site locations in the Waingongoro River in relation to Riverlands meatworks discharges

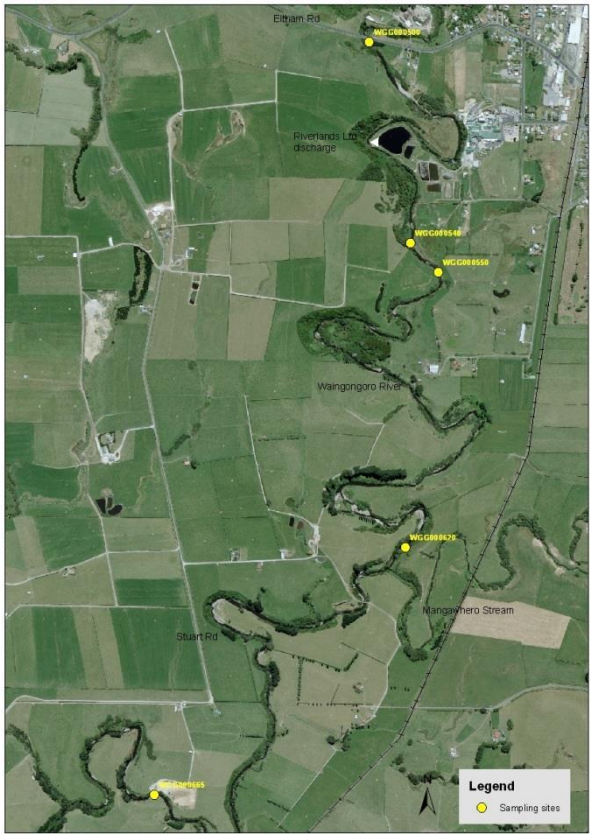


Figure 2 Location of biomonitoring sites in relation to the Eltham WWTP and landfill

Results and discussion

This late summer survey was performed under low flow conditions (0.535 m^3/sec at site 1) on 25 February 2013, 20 days after a fresh in excess of three times and seven times the median flow in the river. This flow was above the minimum mean monthly flow (390 L/sec) previously recorded for February and below the average February mean monthly flow (1.414 m^3/sec) for the period 1975 to 2012. Patchy algal mats were found at four sites (3, 3a , 4, and 8) with thin mats at site 1. No filamentous algal growths were noted on the substrate at any of the sites, with the exception of patchy filamentous algae at site 3a. Water temperatures at sites 1 to 3a ranged from 15.6˚C to 16.4˚C during this mid-morning survey with water temperatures from 17.2˚C to 17.3˚C recorded later in the morning at sites 4 and 8. No discharges from the outfalls were occurring at the time of this survey with all wastes being irrigated onto pasture in an adjacent sub-catchment. No treated wastes had been discharged to the river for a period of nearly four months prior to this survey.

Macroinvertebrate communities

A summary of data obtained from previous surveys of the various river sites is presented in Table 1.

Table 1 Summary of macroinvertebrate taxa numbers and MCI values for previous surveys performed between August 1981 and October 2012

Site	No of surveys	Taxa numbers		MCI values	
		Range	Median	Range	Median
1	56	16-32	24	78-124	101
3	56	14-32	24	71-114	98
3a	35	16-29	23	79-124	99
4	27	16-35	27	77-105	93
8	37	14-30	20	77-111	94

The macroinvertebrate fauna results for the present survey are listed in Table 2 and illustrated in Figure 2 (for sites 1, 3 and 3a) and Figure 3 (sites 4 and 8).

Table 2 Macroinvertebrate fauna of the Waingongoro River in relation to Riverlands Ltd's discharges sampled on 25 February 2013

Taxa List	Site Number	MCI score	1	3	3a	4	8
	Site Code		WGG000500	WGG000540	WGG000550	WGG000620	WGG000665
	Sample Number		FWB13100	FWB13101	FWB13102	FWB13103	FWB13105
PLATYHELMINTHES (FLATWORMS)	*Cura*	3	-	-	-	R	-
NEMERTEA	Nemertea	3	-	C	-	R	-
ANNELIDA (WORMS)	Oligochaeta	1	C	A	-	-	C
MOLLUSCA	*Potamopyrgus*	4	C	C	R	C	C
CRUSTACEA	*Paracalliope*	5	-	-	-	-	R
EPHEMEROPTERA (MAYFLIES)	*Austroclima*	7	A	C	A	A	A
	Coloburiscus	7	VA	A	VA	VA	A
	Deleatidium	8	XA	XA	XA	XA	XA
	Nesameletus	9	C	A	A	R	-
	Zephlebia group	7	R	-	R	R	R
PLECOPTERA (STONEFLIES)	*Stenoperla*	10	-	R	-	-	-
	Zelandobius	5	-	R	-	-	-
	Zelandoperla	8	R	R	C	R	R
COLEOPTERA (BEETLES)	Elmidae	6	VA	XA	VA	VA	VA
	Hydraenidae	8	A	R	C	C	R
	Ptilodactylidae	8	-	R	-	-	-
MEGALOPTERA (DOBSONFLIES)	*Archichauliodes*	7	A	A	A	VA	A
TRICHOPTERA (CADDISFLIES)	*Aoteapsyche*	4	XA	VA	VA	XA	VA
	Costachorema	7	R	-	C	R	C
	Hydrobiosis	5	A	A	A	A	A
	Neurochorema	6	R	-	R	-	-
	Beraeoptera	8	R	-	C	C	R
	Confluens	5	-	R	-	-	-
	Olinga	9	-	R	-	-	-
	Oxyethira	2	-	-	-	R	-
	Pycnocentria	7	R	R	C	R	R
	Pycnocentrodes	5	R	C	A	R	C
DIPTERA (TRUE FLIES)	*Aphrophila*	5	A	A	A	A	A
	Eriopterini	5	R	C	R	R	C
	Paralimnophila	6	-	R	-	-	-
	Harrisius	6	R	-	-	-	-
	Maoridiamesa	3	R	-	C	R	A
	Orthocladiinae	2	C	C	C	R	A
	Polypedilum	3	-	-	R	C	R
	Tanytarsini	3	C	R	C	R	A
	Empididae	3	-	-	R	-	-
	Ephydridae	4	-	-	R	-	-
	Austrosimulium	3	C	R	C	R	R
	Tabanidae	3	-	-	-	-	R
	Tanyderidae	4	R	R	R	R	-
	No of taxa		26	27	27	27	25
	MCI		112	114	110	106	105
	SQMCIs		6.1	6.6	6.9	6.1	6.6
	EPT (taxa)		13	13	13	12	11
	%EPT (taxa)		50	48	48	44	44

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

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

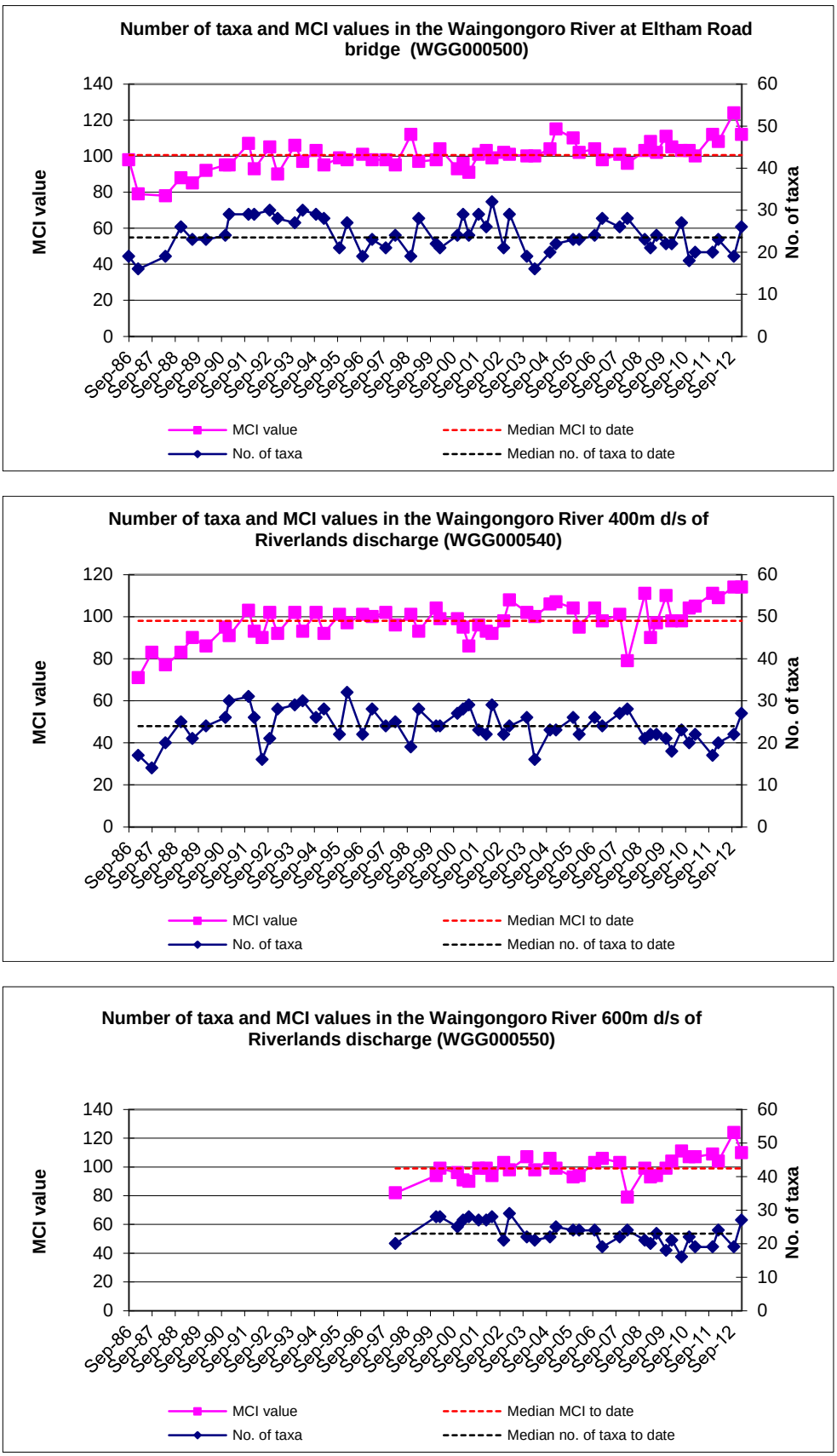


Figure 2 Taxa richness and MCI values for the three sites in the vicinity of Riverlands Eltham Ltd to date

Sites in the immediate vicinity of the meatworks (sites 1, 3 and 3a)

Taxa richnesses at these sites (Table 2) were slightly above median numbers found in previous surveys by 2 to 4 taxa (Figure 2 and Table 1). These numbers were indicative of relatively typical community richnesses for the mid-catchment of Taranaki ringplain rivers/streams as illustrated by comparisons with the results of more than 669 past surveys of 'control' sites in National Park-sourced ringplain rivers and streams situated between 155 and 250 m a.s.l. (median richnesses of 20 to 23 taxa (TRC, 1999 (updated 2012))).

Dominant taxa characteristic of the reach in the immediate vicinity of the meatworks, showed only a few minor variations between sites, probably in part due to the relative lack of riparian cover downstream of the meatworks discharge outfall and other more subtle habitat differences. Generally, the macroinvertebrate communities of this three-site reach were characterised by a combination of up to three 'highly sensitive' taxa [extremely abundant mayfly (*Deleatidium*); another mayfly (*Nesameletus*); and hydraenid beetles]; up to seven 'moderately sensitive' taxa [mayflies (*Coloburiscus* and *Austroclima*), elmid beetles (very to extremely abundant), dobsonfly (*Archichauliodes*), free-living caddisfly (*Hydrobiosis*), stony-cased caddisfly (*Pycnocentrodes*), and cranefly (*Aphrophila*)]; and up to two 'tolerant' taxa [oligochaete worms and net-building caddisfly (*Aoteapsyche*)]. This was a higher number of characteristic 'sensitive' taxa but fewer 'tolerant' taxa compared with the previous summer's survey results. The very few significant changes in individual taxon abundances which were recorded in a downstream direction through this reach were likely to have coincided with minor habitat variability between sites eg increased abundances of the 'tolerant' midge (*Maoridiamesa*) and two 'sensitive' taxa and a decreased abundance of 'tolerant' oligochaete worms at the furthest downstream site (3a).

Numerically the most abundant taxa were the mayfly (*Deleatidium*), elmid beetles, and net-building caddisfly (*Aoteapsyche*) through this reach which has typically been the case in the majority of previous surveys (i.e. on more than 50% of past survey occasions). The presence of 'highly sensitive' taxa (eg extremely abundant mayfly (*Deleatidium*), one other mayfly taxon, two stonefly taxa, two caddisfly taxa, and two beetle taxa), some of which were recorded as rarities, was a further indication of the preceding relatively high physicochemical quality and good habitat in this reach of the Waingongoro River at the time of this late summer survey.

A narrow range of MCI scores (110 to 114) was found, which was at the upper end of the ranges of scores recorded by past summer surveys. The MCI scores were significantly 11 to 16 units higher than historical median scores at each of the sites (Table 1 and Figure 2). There was no significant difference in scores between the 'control' site and the first site (3) downstream of the discharge outfall, and the MCI score typically decreased overall (but only by two units) through the reach of the river surveyed. This variability in scores was due almost entirely to the presence/absence of a few taxa found only as rarities (less than 5 individuals/site) from sites rather than any significant changes in community composition between these sites.

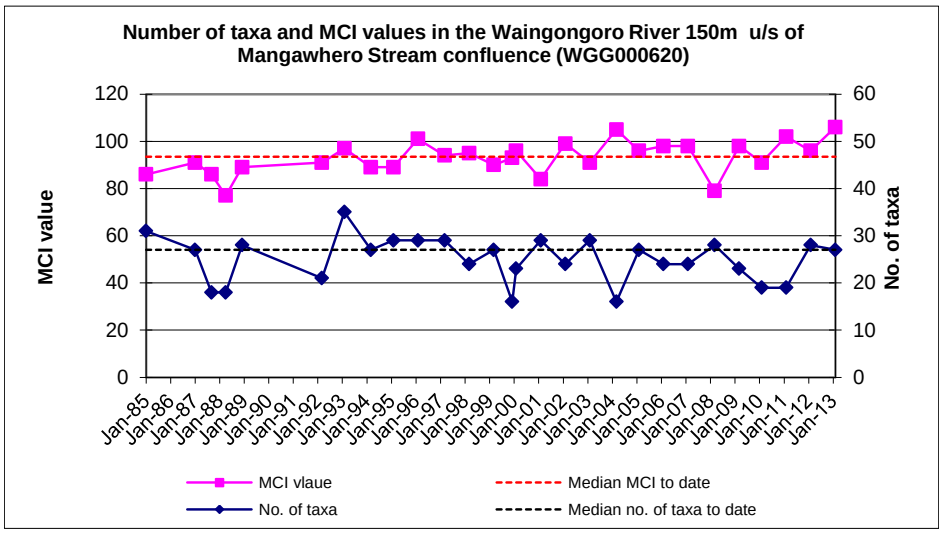
The general similarities in numerical abundances of the characteristic taxa at each of the three sites resulted in relatively small variability between $SQMCI_s$ scores which ranged from 6.1 to 6.9 units. The majority of this variability was due to decreases in the abundance of the 'tolerant' net-building caddisfly taxon in a downstream direction while a decreased abundance of elmid beetles and increase in one mayfly (*Coloburiscus*) taxon, raised $SQMCI_s$ scores by 0.3 unit between sites 3 and 3a. The MCI scores recorded at these sites categorised this reach of river as having 'good' generic health (TRC, 2013) at the time of this summer

survey. The scores were also from five to nine units higher than predicted MCI scores for a National Park-sourced ringplain river's sites at an altitude of 200m asl and from a significant (Stark, 1998) 15 units to 19 units higher than predicted MCI scores for these sites, 23.0 to 24.8 km downstream of the National Park boundary (Stark & Fowles, 2009).

The insignificant difference (Stark, 1998) found between the 'control' site's score and the initial downstream site's score and relative similarity in all sites' community structures were indicative of no recent impacts of discharges from Riverlands' property on the macroinvertebrate fauna of this reach of the river under the existing discharge regime and low flow conditions experienced in the receiving waters over the preceding few weeks.

Sites upstream and downstream of the Mangawhero Stream (sites 4 & 8)

Taxa richnesses found at these sites upstream of the Mangawhero Stream (site 4) and 2 km downstream of the confluence (site 8) were very similar to community richnesses found further upstream in the reach adjacent to the meatworks' discharges (Table 2). Taxa numbers were equal with and five taxa more than medians found by previous surveys (Table 1) at sites 4 and 8 respectively.



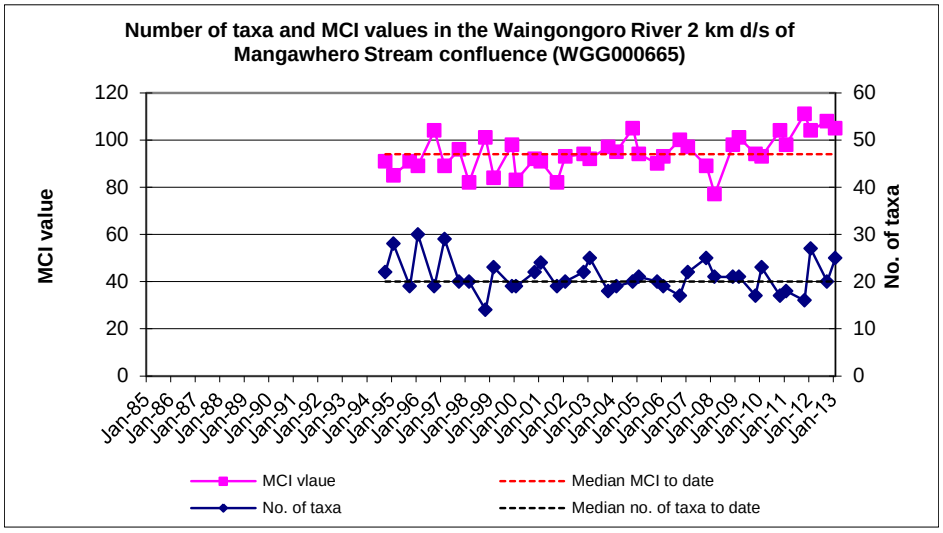


Figure 3 Taxa richness and MCI values for the two sites further downstream near the confluence of the Mangawhero Stream and Waingongoro River

All but three of the taxa which characterised these two sites were also characteristic of sites in the upstream reach, with the addition of three 'tolerant' taxa [midges (orthoclads, tanytarsids, and *Maoridiamesa*)] but a reduction of two 'highly sensitive', one 'moderately sensitive', and one 'tolerant' taxa. There were four significant increases in individual 'tolerant' taxon abundances recorded below the influence of the Mangawhero Stream but only one decrease in a 'moderately sensitive' taxon between sites 3a and 4.

The MCI score (106) at the site upstream of the confluence was 4 to 8 units below scores in the upstream reach of the river, but a significant (Stark, 1998) 13 units above the median score, and one unit above the maximum score, from the surveys previously undertaken at this site (Table 1 and Figure 3). This score represented a more typical decrease of 6 units along the 4km reach of river from Eltham Road to the Mangawhero River confluence, but higher than the predicted decrease of 3 units (Stark & Fowles, 2009) for this reach of a ringplain stream, due mainly to the presence of two additional 'tolerant' taxa found only as rarities or common rather than any significant losses of 'sensitive' taxa.

A very small decrease of one unit in MCI score was recorded 2 km below the Mangawhero Stream confluence at Stuart Road (105 units) in comparison with the MCI score at the nearest site upstream of the confluence. This score was a significant 11 units above the median score from the previous surveys at this site (Figure 3) and there was a relative similarity in community composition at both sites (73% of taxa shared by both sites). The very small decrease in MCI scores was not typical of previous surveys which have shown decreases as high as 13 units downstream of the Mangawhero Stream confluence, coincidental with some deterioration in physicochemical water quality at this site. Also there was an increase of 0.5 unit in $SQMCI_s$ values between these sites. These atypical $SQMCI_s$ and MCI trends reflected the improved physicochemical water quality conditions at the Stuart Rd site as a result of the diversion of Eltham WWTP wastewater out of the Mangawhero Stream (to the Hawera WWTP) since late winter, 2010.

The MCI scores recorded at these two sites categorised this reach of river as having 'good' generic health (TRC, 2013) at the time of this summer survey. The scores were also 3 units higher (site 4) and two units higher (site 8) than predicted MCI scores for a National Park-sourced ringplain river's sites at an altitude of 180m asl and a significant 11 units, and 10 units higher than predicted MCI scores for these sites, 27.2 and 29.6 km respectively downstream of the National Park boundary (Stark & Fowles, 2009).

Comparison with spring (2012) survey

The biomonitoring survey of spring 2012 (CF562) provided Waingongoro River macroinvertebrate community information for the reach adjacent to the meatworks property directly following a period of treated wastes discharge to the river.

Taxa richnesses were higher (by five to eight taxa) at the time of the most recent late summer survey at each of the three sites under lower flow conditions but warmer water temperatures. The 'highly sensitive' taxon (mayfly (*Deleatidium*)), indicative of good preceding physicochemical water quality conditions, was just as abundant in the latest (summer) survey through the reach of the Waingongoro River above the Mangawhero Stream confluence. 'Sensitive' taxa constituted from 63 to 70% of each site's faunal community at the time of the more recent summer survey compared with 73 to 89% in the spring through this reach of the river.

Generally, MCI scores were slightly lower than earlier spring scores (by 0 to 14 units) over the reach at the time of warmer, lower flow summer survey in the absence of wastes discharges to the river for a period of nearly four months preceding the summer survey. The variations in MCI scores between sites at the time of both surveys were not considered indicative of any impacts of preceding discharges within the reach of the river adjacent to the meatworks property.

Streambed microflora

The microscopic heterotrophic assessments at the three sites above and below the Riverlands discharges and the two sites further downstream showed no significant growths of heterotrophic organisms in the Waingongoro River at any sites under low flow conditions during the summer period and meatworks wastes diversion to nearby land irrigation. These heterotrophic growth indicators (protozoan communities) were also not visible at any sites, thereby indicative of the successful remediation work undertaken some four years earlier to contain all other wastewater on the consent holder's property, nor indicative of the effects of the short term unauthorised spillage of irrigated wastewater in the lower section of the river reach surveyed.

Conclusions

Macroinvertebrate richnesses slightly above historical medians and MCI scores above historical median values, and in the upper ranges of typical scores in the mid-reaches of a developed catchment, were found at all sites in the Waingongoro River adjacent to the Riverlands meatworks during this late summer survey performed under low river flow conditions during a lengthy dry period. No significant differences in macroinvertebrate community assemblages and MCI and $SQMCI_s$ scores between the upstream 'control' site and two adjacent downstream sites were recorded, consistent with the absence of discharges from the meatworks to the receiving waters during a four month period of wastes irrigation to land through the summer period while river flows were low. There were no visible or microscopic signs of undesirable biological growths on the riverbed at sites below the outfall at the time of the survey.

A relatively small decrease in the MCI score recorded in the river at the site approximately 2 km upstream of the Mangawhero Stream confluence was consistent with historical trends at this site and gradually decreasing scores in a downstream direction in ringplain rivers. However, there was minimal change in score at the furthest downstream site (downstream of the Mangawhero Stream confluence), where the MCI score was significantly higher than the historical median for this site due to improved physicochemical water quality conditions coincident with the more recent diversion of the Eltham WWTP discharge out of the catchment.

Summary

The Council's standard 'kick-sampling' technique was used at five established sites to collect streambed macroinvertebrates from the Waingongoro River. Samples were sorted and identified to provide number of taxa (richness) and MCI and $SQMCI_S$ scores for each site.

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with

varying degrees of sensitivity to environmental conditions. The $SQMCI_S$ takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities, particularly if non-organic impacts are occurring. Significant differences in either the MCI or $SQMCI_S$ between sites may indicate the degree of adverse effects (if any) of the discharges being monitored.

This late summer macroinvertebrate survey indicated that, coincident with the absence of treated meatworks wastes discharges to the river from the Riverlands site (due to a lengthy period of diversion to land irrigation), no significant changes in the macroinvertebrate communities were found between the upstream 'control' site and either of the two sites downstream of this site discharge.

The macroinvertebrate communities of the Waingongoro River contained relatively similar proportions of 'sensitive' taxa at all sites with the communities dominated by more 'sensitive' than 'tolerant' taxa at all sites. Community richnesses (numbers of taxa), although higher than historical median richnesses, were similar at most sites at the time of this late summer survey but slightly higher in comparison with most previous summer surveys.

MCI scores indicated that the stream communities were all of 'good' generic health, and 'well above expected' predicted conditions recorded for reaches of similar Taranaki rivers and streams. The community at the site downstream of the Mangawhero Stream confluence, normally affected by the Eltham WWTP discharge, showed improvement and was similar to that immediately upstream of the confluence. This improvement was due to the more recent diversion of this discharge out of the catchment (by pipeline to the Hawera WWTP).

References

Internal Taranaki Regional Council reports

Fowles, C R, 2005: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, February 2005, CF362.

Fowles, C R, 2005: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, November 2005, CF392.

Fowles, C R, 2006: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, February 2006, CF397.

Fowles, C R, 2006: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, October 2006, CF410.

Fowles, C R, 2007: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, February 2007, CF419.

Fowles, C R, 2007: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, November 2007, CF436.

Fowles, C R, 2008: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, March 2008, CF445.

Fowles, C R, 2008: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, December 2008, CF476.

Fowles, C R, 2009: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, March 2009, CF482.

Fowles, C R, 2009: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, June 2009, CF488.

Fowles, C R, 2009: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, November 2009, CF495.

Fowles, C R, 2010: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, February 2010, CF505.

Fowles, C R, 2010: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, July 2010, CF511.

Fowles, C R, 2010: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, November 2010, CF514.

Fowles, C R, 2011: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, February 2011, CF530.

Fowles, C R, 2011: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, November 2011, CF539.

Fowles, C R, 2012: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, February 2012, CF547.

Fowles, C R, 2012: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, October 2012, CF562.

TRC, 1999: Some statistics from the Taranaki Regional Council database (FWB) of freshwater macroinvertebrate surveys performed during the period from January 1980 to 31 December 1998 (SEM reference report), TRC Technical Report 99-17.

TRC, 2010: Riverlands Eltham Ltd monitoring programme Annual Report 2008-2009, TRC Technical Report 2009-110.

TRC, 2013: Fresh water macroinvertebrate fauna biological monitoring programme. Annual state of the environment monitoring report 2011-2012. TRC Technical Report 2012-18.

External publications

Stark, JD, 1985: A macroinvertebrate community index of water quality for stony streams. Water and Soil Miscellaneous Publication No. 87.

Stark, JD, 1998: a biotic index for freshwater macroinvertebrate coded abundance data. *New Zealand Journal of Marine and Freshwater Research 32(1): 55-66.*

Stark, JD, 1999: An evaluation of Taranaki Regional Council's SQMCI biomonitoring index. Cawthron Report No 472. 32pp.

Stark, JD, Boothroyd IKG, Harding JS, Maxted JR, Scarsbrook MR, 2001: Protocols for sampling macroinvertebrates in wadeable streams. New Zealand Macroinvertebrate Working Group Report No 1. Prepared for the Ministry for the Environment. Sustainable Management Fund Project No. 5130. 57p.

Stark JD, Fowles CR, 2009: Relationships between MCI, site altitude, and distance from source for Taranaki ring plain streams. Stark Environmental Report 2009-01. 47p.

To Job Manager, J Kitto
From Scientific Officer, C R Fowles
Consent Nos 2039, 1968
Doc No 1310916
Report No CF595
Date 14 February 2014

Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, surveyed in November 2013

Introduction

Two biological surveys (spring and summer) are scheduled annually for the assessment of effects of treated meatworks wastes discharges on the biological communities of the Waingongoro River. An assessment of TRC biomonitoring data [1995 to 2010] was undertaken as a component of the consent renewal process (Stark, 2010) which concluded that overall, monitoring data collected by Taranaki Regional Council over the previous 15 years indicated some improvement in river health downstream of the discharge since discharge to the river was reduced by adoption of land disposal in 2001. Macroinvertebrate communities indicated that the river downstream of the discharge has improved from 'fair' to 'good' condition over the previous 15 years and that the impact of the discharge had been no more than minor given the ability of the river to assimilate the wastewater and to cleanse itself frequently during floods. Almost all MCI values recorded from sites downstream of the Riverlands discharge exceeded 80 units and have been within the 95% confidence limits of the predictive relationships between MCI and site altitude or distance from source that Stark & Fowles (2009) developed based on data from 'control' sites (i.e., upstream of consented discharges) in the Waingongoro catchment (Stark, 2010).

This current survey, the first of the scheduled surveys for the 2013–2014 monitoring period, was performed in spring under a period of moderate, recession flow conditions and about 10 days since the consented discharge of treated wastewater had been predominantly diverted to land irrigation although some discharge to the river (13% by volume) had occurred over the previous week. The survey followed a moderately wet spring period with five significant freshes during the previous four weeks.

Methods

The standard '400 ml kick sampling' technique was used to collect streambed (benthic) macroinvertebrates from three established sampling sites (1, 3, and 3a, illustrated in Figure 1) on 13 November 2013.

Site 3a replaced site 2a about sixteen years earlier, due to changes in the river channel following flood events and the subsequent unsuitability of the previously surveyed site (2a) which had been located at the periphery of the 50 m mixing zone.

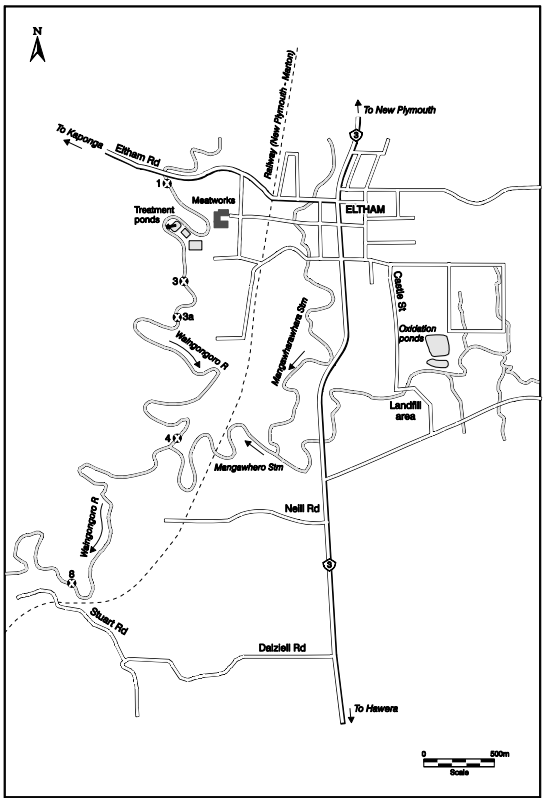


Figure 1 Biomonitoring sampling site locations in the Waingongoro River in relation to Riverlands meatworks discharges

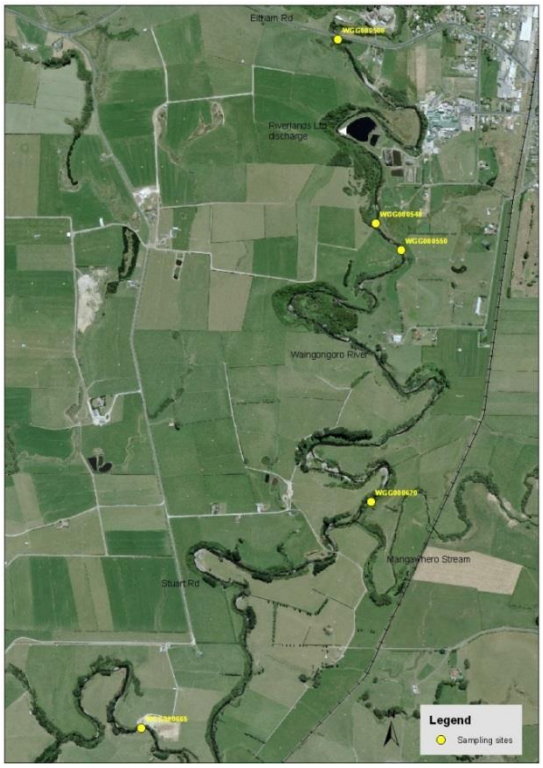


Figure 2 Location of biomonitoring sites in relation to the Eltham WWTP and landfill

These sites were:

Site No	Site Code	GPS Reference	Location
1	WGG 000500	E1710576 N5634824	Eltham road bridge (upstream of discharge)
3	WGG 000540	E1710727 N5634084	approximately 400m downstream of discharge
3a	WGG 000550	E1710830 N5633975	approximately 600m downstream of discharge

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

Samples were preserved with Kahle's Fluid for later stereomicroscopic sorting and identification according to documented Taranaki Regional Council methodology. Macroinvertebrate taxa found in each sample were recorded as:

R (rare) = less than 5 individuals;
C (common) = 5-19 individuals;
A (abundant) = 20-99 individuals;
VA (very abundant) = 100-499 individuals;
XA (extremely abundant) = 500 or more individuals.

Macroinvertebrate Community Index (MCI) values were calculated for taxa present at each site (Stark 1985) with certain taxa scores modified in accordance with Taranaki experience.

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

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

Results and discussion

This spring survey was performed under moderate recession flow conditions (1.43 m^3/sec at site 1) on 13 November 2013, 12 days after a fresh in excess of 3 times median flow and in excess of 7 times median flow in the river. This flow was above the minimum mean monthly flow (0.87 m^3/sec) for November but well below the average November mean monthly flow (2.44 m^3/sec) for the period 1975 to 2012. Only thin periphyton mats were present with no filamentous algae visible on the substrate at each of the sites with the exception of site 3 where some patchy mats were present. Moss was patchy at site 3a but absent from sites 1 and 3. River water temperatures had a narrow range from 11.8°C to 12.1°C at the three sites during this mid morning survey. The partial discharge of treated wastewater to the river had been operative for several days prior to the day of the survey although no river discharge was occurring at the time of the survey.

Macroinvertebrate communities

A summary of data obtained from previous surveys of the various river sites is presented in Table 1 and illustrated in Figure 2.

Table 1 Summary of macroinvertebrate taxa numbers and MCI values for previous surveys performed between August 1981 and February 2013

Site	Site code	No of surveys	Taxa numbers		MCI values	
			Range	Median	Range	Median
1	WGG000500	57	16-32	24	78-124	101
3	WGG000540	57	14-32	24	71-114	98
3a	WGG000550	36	16-29	23	79-124	99

The macroinvertebrate fauna results for the present survey are listed in Table 2.

Table 2 Macroinvertebrate fauna of the Waingongoro River in relation to Riverlands Ltd's discharges sampled on 13 November 2013

Taxa List	Site Number	MCI score	1	3	3a
	Site Code		WGG000500	WGG000540	WGG000550
	Sample Number		FWB13287	FWB13288	FWB13289
ANNELIDA (WORMS)	Oligochaeta	1	-	C	R
MOLLUSCA	*Potamopyrgus*	4	R	R	C
EPHEMEROPTERA (MAYFLIES)	*Austroclima*	7	A	C	A
	Coloburiscus	7	A	A	A
	Deleatidium	8	XA	XA	XA
PLECOPTERA (STONEFLIES)	*Zelandobius*	5	C	C	C
	Zelandoperla	8	R	-	-
COLEOPTERA (BEETLES)	Elmidae	6	VA	VA	VA
	Hydraenidae	8	R	-	R
MEGALOPTERA (DOBSONFLIES)	*Archichauliodes*	7	C	A	C
TRICHOPTERA (CADDISFLIES)	*Aoteapsyche*	4	A	C	A
	Costachorema	7	C	C	C
	Hydrobiosis	5	C	R	C
	Beraeoptera	8	C	C	C
	Olinga	9	-	-	R
	Pycnocentrodes	5	VA	VA	VA
DIPTERA (TRUE FLIES)	*Aphrophila*	5	C	R	R
	Eriopterini	5	R	-	-
	Maoridiamesa	3	R	R	C
	Orthocladiinae	2	C	-	C
	Tanytarsini	3	R	R	R
	Psychodidae	1	-	R	-
	Austrosimulium	3	R	R	R
		No of taxa	20	18	20
		MCI	110	99	107
		SQMCIs	7.1	7.2	7.1
		EPT (taxa)	10	9	10
		%EPT (taxa)	50	50	50

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

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

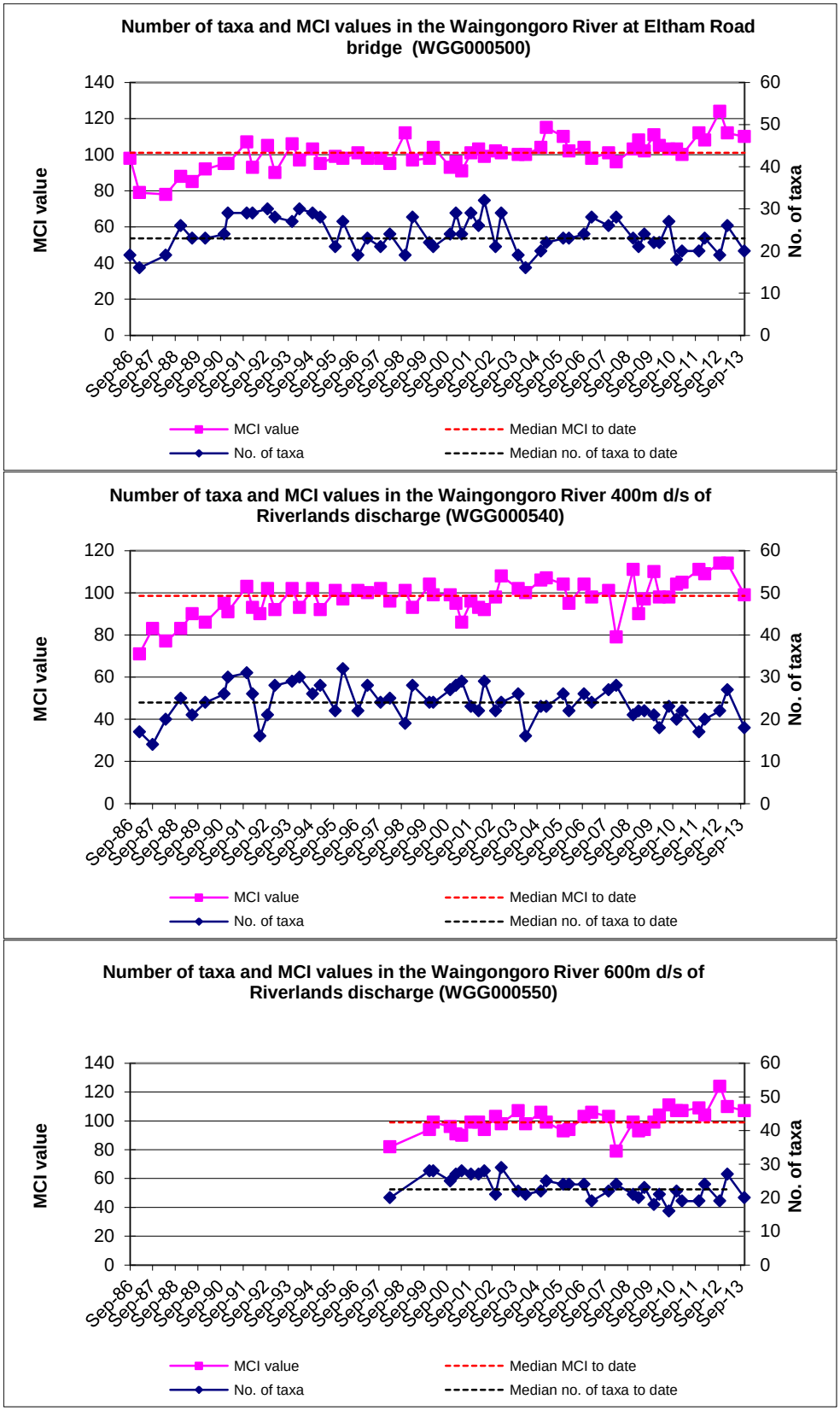


Figure 2 Taxa richness and MCI values for the three sites in the vicinity of Riverlands Eltham Ltd to date

Taxa numbers at all three sites were within ranges but from three to six taxa lower than median numbers found by previous surveys (Table 1) with richnesses within a narrow, two taxa range. These numbers generally were indicative of moderate community richness typical of mid-catchment sites in Taranaki rivers and streams as illustrated by comparisons with the results of more than 698 past surveys of 'control' sites in National Park-sourced ringplain rivers and streams situated between 155 and 250 m a.s.l. (median richnesses of 20 to 23 taxa (TRC, 1999 (updated, 2013)).

Dominant taxa characteristic of this reach in the immediate vicinity of the meatworks included only one 'highly sensitive' taxon [mayfly (*Deleatidium*, which was extremely abundant at all three sites]; up to five 'moderately sensitive' taxa [mayflies (*Coloburiscus* and *Austroclima*), elmid beetles, dobsonfly (*Archichauliodes*), and stony-cased caddisfly (*Pycnocentrodes*)]; and only one 'tolerant' taxon [net-building caddisfly (*Aoteapsyche*)] coincident with the paucity of periphyton substrate cover due to the frequency of previous floods. These characteristic taxa were slightly fewer in number but in terms of the 'sensitive' taxa, typical of those which have dominated the fauna of this reach of the river at the time of the majority of previous surveys which have been performed mainly in spring and summer months. There were very few significant differences in individual taxon abundances between adjacent sites, which included an increase in one 'tolerant' taxon (oligochaete worms) between sites 1 and 3 with a decrease in numbers of 'tolerant' orthoclad midges downstream at site 3 (Table 2). There was no evidence of any toxicity effects of preceding discharges as illustrated by no significant downstream reductions in the abundances of the more 'sensitive' taxa at site 3, and further illustrated by minimal changes in $SQMCI_s$ values which varied only by 0.1 unit through the river reach surveyed.

Numerically by far the most abundant taxon was the mayfly (*Deleatidium*) through this reach which has been the case in many previous surveys. The presence of 'highly sensitive' taxa [e.g. extremely abundant mayfly (*Deleatidium*), one stonefly, two caddisfly taxa, and one beetle taxon], although some of these taxa were recorded as rarities, was a further indication of the preceding relatively high physicochemical quality and good habitat in this reach of the Waingongoro River at the time of this spring survey.

A moderate range of MCI scores (99 to 110) was found, slightly wider in comparison with ranges of scores recorded by a number of previous surveys, but 14 to 17 units lower than found by the previous spring survey (Fowles, 2012 (CF562)). The MCI scores were insignificantly (Stark, 1998) from 1 (site 3) to 9 units (site 1) higher than historical median scores at each of the sites (Table 1 and Figure 2), and in all cases below previous maxima (by 14 to 17 units), coincident with minimal periphyton substrate cover through this reach of the river.

There was no significant difference in scores between the 'control' site and the site (3a) furthest downstream of the discharge outfall, although the decrease in score (of 11 units) between sites 1 and 3 was marginally significant (Stark, 1998) due mainly to the absence of two 'highly sensitive' taxa (present only as rarities at the upstream 'control' site) but was followed by marked recovery with only a small decrease (3 units) in the MCI score between upper and lower sites in the reach of the river surveyed. Variability in scores was due mainly to the presence/absence of a few taxa found only as rarities (less than 5 individuals/site) at the three sites rather than significant changes in community composition between these sites. Some subtle changes in taxa composition were also coincident with bank slumping and a much looser substrate at site 3.

The similarity in numerical abundances of the characteristic taxa at each of the three sites resulted in minimal variability between $SQMCI_s$ scores which ranged from 7.1 to 7.2 units. This minimal variability was due to the extreme abundance of the one ('highly sensitive') taxon and two very abundant 'moderately sensitive' taxa at all of the three sites.

The MCI scores recorded at these sites were above historical medians at all three sites and categorised this reach of river as having 'fair' to 'good' health (TRC, 2014) at the time of this spring survey. The scores were also from 5 units lower to 5 units higher than predicted MCI scores for a National Park-sourced ringplain river's sites at an altitude of 200m asl and from 2 units to a significant 13 units higher than predicted MCI scores for these sites, 23.0 km to 24.8 km downstream of the National Park boundary (Stark & Fowles, 2009).

The insignificant difference (Stark, 1998) found between the 'control' site's score and the furthest downstream site's score and relative similarity in all sites' community structures were indicative of minimal recent impacts of discharges from Riverlands' property on the macroinvertebrate fauna of this reach of the river under the current discharge regime (prior to full wastewater irrigation to land) under moderate flow conditions and the several freshes experienced in the receiving waters over the preceding few weeks.

Heterotrophic assessment

The heterotrophic assessments of the sites above and below the Riverlands discharges found no trace of undesirable heterotrophic growths on the riverbed at any of the three sites. This was indicative of no recent organic overloading of the assimilative capacity of the receiving waters downstream of the consented discharge's mixing zone following a period of winter–spring wastewater discharge to the river. It was also indicative of the successful remediation work undertaken in recent years to contain all other wastewater on the property of the consent holder.

Conclusions

Relatively typical macroinvertebrate richnesses and MCI values typical of the mid-reaches of a developed catchment were found at all sites in the Waingongoro River adjacent to the Riverlands meatworks during this scheduled spring biomonitoring survey performed under moderate flow conditions immediately following a period of treated wastes discharges to the river prior to the commencement of full wastewater irrigation onto land. A marginally significant decrease in MCI score in a downstream direction below the designated mixing zone of the discharge outfall followed by a recovery in scores and minimal changes in community compositions were indicative of limited impacts of the wastewater discharge under these moderate receiving water flow conditions following a wet early spring. These limited effects were also indicated by the absence of heterotrophic growths on the river bed habitat at all three sites. These spring MCI scores were higher than historical medians for all three sites (by 1 to 9 units).

Summary

The Council's standard 'kick-sampling' technique was used at three established sites to collect streambed macroinvertebrates from the Waingongoro River for the scheduled spring survey. Samples were sorted and identified to provide number of taxa (richness) and MCI and $SQMCI_S$ scores for each site.
The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The $SQMCI_S$ takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities, particularly if non-organic impacts are occurring.

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

This spring macroinvertebrate survey indicated that following a period of partial wastewater discharge to the river there were limited, relatively insignificant effects on the macroinvertebrate communities' compositions downstream of the discharge outfall beyond the designated mixing zone. Very few significant changes in individual taxon abundances were recorded in a downstream direction. There were no heterotrophic growths found on the riverbed at any of the three sites which was also indicative of limited impacts of any preceding authorised wastewater discharge on the biological communities of the Waingongoro River below the discharge and no evidence of any unauthorised spillage(s) to the river, the sources of which had been identified and successfully contained on the property in recent years.

In general, the macroinvertebrate communities of the Waingongoro River contained high proportions of 'sensitive' taxa at all sites and the communities were dominated almost entirely by 'sensitive' taxa. Taxonomic richnesses (numbers of taxa) were within ranges and slightly below medians of those found by previous surveys at all sites, whereas MCI scores were above medians but lower than historical maxima at each of the three sites.

MCI and $SQMCI_S$ scores indicated that the stream communities were of 'fair' to 'good' generic health and ' expected' predicted health conditions recorded for reaches of similar Taranaki rivers. The very few significant differences in the numerical abundances amongst the characteristic taxa accounted for the very similar in $SQMCI_s$ values through the river reach surveyed.

References

Internal Taranaki Regional Council reports

Fowles, C R, 2005: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, February 2005, CF362.

Fowles, C R, 2005: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, November 2005, CF392.

Fowles, C R, 2006: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, February 2006, CF397.

Fowles, C R, 2006: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, October 2006, CF410.

Fowles, C R, 2007: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, February 2007, CF419.

Fowles, C R, 2007: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, November 2007, CF436.

Fowles, C R, 2008: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, March 2008, CF445.

Fowles, C R, 2008: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, December 2008, CF476.

Fowles, C R, 2009: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, March 2009, CF482.

Fowles, C R, 2009: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, June 2009, CF488.

Fowles, C R, 2009: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, November 2009, CF495.

Fowles, C R, 2010: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, February 2010, CF505.

Fowles, C R, 2010: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, July 2010, CF511.

Fowles, C R, 2010: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, November 2010, CF514.

Fowles, C R, 2011: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, February 2011, CF530.

Fowles, C R, 2011: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, November 2011, CF539.

Fowles, C R, 2012: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, February 2012, CF547.

Fowles, C R, 2012: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, October 2012, CF562.

TRC, 1999: Some statistics from the Taranaki Regional Council database (FWB) of freshwater macroinvertebrate surveys performed during the period from January 1980 to 31 December 1998 (SEM reference report), TRC Technical Report 99-17.

TRC, 2013: Riverlands Eltham Ltd monitoring programme Biennial Report 2010-2012, TRC Technical Report 2012-98.

TRC, 2014: Fresh water macroinvertebrate fauna biological monitoring programme. Annual state of the environment monitoring report 2012-2013. TRC Technical Report 2013-48.

External publications

Stark, JD, 1985: A macroinvertebrate community index of water quality for stony streams. Water and Soil Miscellaneous Publication No. 87.

Stark, JD, 1998: a biotic index for freshwater macroinvertebrate coded abundance data. *New Zealand Journal of Marine and Freshwater Research 32(1): 55-66.*

Stark, JD, 1999: An evaluation of Taranaki Regional Council's SQMCI biomonitoring index. Cawthron Report No 472. 32pp.

Stark, JD, 2010: Assessment of the impact of Riverlands Eltham Ltd discharges on the Waingongoro River. Stark Environmental Report No. 2010-07. 39p.

Stark, JD, Boothroyd IKG, Harding JS, Maxted JR, Scarsbrook MR, 2001: Protocols for sampling macroinvertebrates in wadeable streams. New Zealand Macroinvertebrate Working Group Report No 1. Prepared for the Ministry for the Environment. Sustainable Management Fund Project No. 5130. 57p.

Stark JD, Fowles CR, 2009: Relationships between MCI, site altitude, and distance from source for Taranaki ring plain streams. Stark Environmental Report 2009-01. 47p.

To	Job Manager, J Kitto
From	Scientific Officer, C R Fowles
Consent Nos	2039, 1968
Doc No	1324763
Report No.	CF606
Date	March 2014

Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, February 2014

Introduction

Two biological surveys (spring and summer) are scheduled annually for the assessment of effects of treated meatworks wastes discharges on the biological communities of the Waingongoro River. In the 2013-2014 period, the spring survey was performed in October, 2013 (CF595). An assessment of TRC biomonitoring data [1995 to 2010] undertaken as a component of the consent renewal process (Stark, 2010) concluded that overall, monitoring data collected by Taranaki Regional Council over the previous 15 years indicated some improvement in river health downstream of the discharge since discharge to the river was reduced by adoption of land disposal 2001. Macroinvertebrate communities indicated that the river downstream of the discharge has improved from 'fair' to 'good' condition over the 15 years and that the impact of the discharge had been no more than minor given the ability of the river to assimilate the wastewater and to cleanse itself frequently during floods. Almost all MCI values recorded from sites downstream of the Riverlands discharge exceeded 80 units and had been within the 95% confidence limits of the predictive relationships between MCI and site altitude or distance from source that Stark & Fowles (2009) developed based on data from 'control' sites (i.e., upstream of consented discharges) in the Waingongoro catchment.

This current survey, the second of the scheduled surveys for the 2013–2014 monitoring period, was performed in late summer under a period of low, recession flow conditions and during the consented discharge of treated wastewater to land irrigation which had been occurring continuously for a period since mid November 2013. The survey followed a steady recession from the previous small fresh nearly two weeks earlier and most recent significant fresh over a month previously, during a very dry late summer period.

Methods

The standard '400 ml kick sampling' technique was used to collect streambed (benthic) macroinvertebrates from two long-established sampling sites (1 and 3) and a site (3a) established at the time of the spring 1999 survey; one site (4) immediately upstream of the confluence of the Mangawhero Stream, and a site (8) downstream of this confluence in the Waingongoro River (illustrated in Figures 1 and 2) on 25 February 2014. Site 4 was sampled as a component of the Eltham WWTP/landfill survey and was included to provide comparative information associated with the survey performed in conjunction with the South Taranaki District Council Eltham WWTP system where the treated wastewater discharge had been diverted out of the catchment (to Hawera WWTP) since late winter, 2010. Site 8 was sampled as a component of the Council's State of the Environment programme.

These sites were:

Site No	Site code	GPS reference	Location
1	WGG 000500	E1710576 N5634824	Eltham road bridge (upstream of discharge)
3	WGG 000540	E1710727 N5634084	approximately 400m downstream of discharge
3a	WGG 000550	E1710830 N5633975	approximately 600m downstream of discharge
4	WGG 000620	E1710708 N5632961	approximately 100m upstream of Mangawhero Stream confluence
8	WGG 000665	E1709784 N5632049	approximately 2 km downstream of Mangawhero Stream confluence (off Stuart Road)

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

Samples were preserved with Kahle's Fluid for later stereomicroscopic sorting and identification according to documented Taranaki Regional Council methodology. Macroinvertebrate taxa found in each sample were recorded as:

R (rare)	= less than 5 individuals;
C (common)	= 5-19 individuals;
A (abundant)	= 20-99 individuals;
VA (very abundant)	= 100-499 individuals;
XA (extremely abundant)	= 500 or more individuals.

Macroinvertebrate Community Index (MCI) values were calculated for taxa present at each site (Stark 1985) with certain taxa scores modified in accordance with Taranaki experience.

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

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

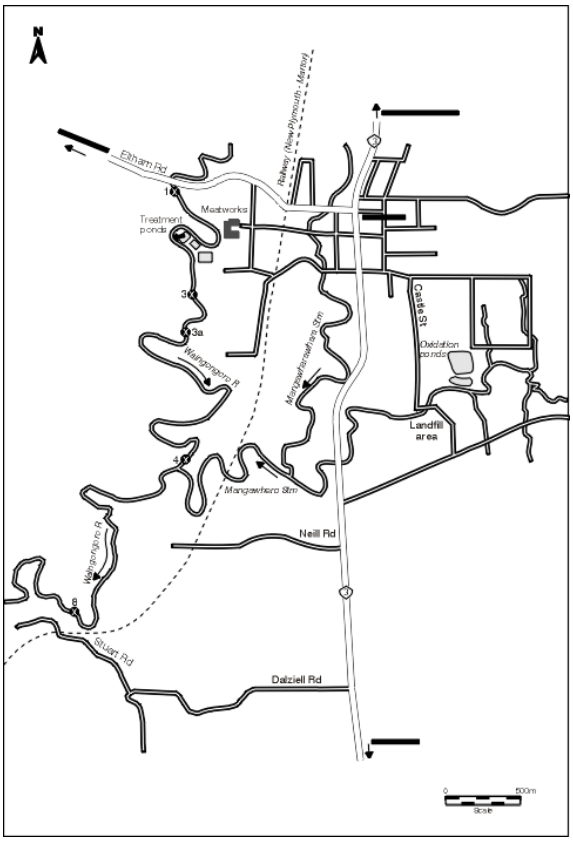


Figure 1 Biomonitoring sampling site locations in the Waingongoro River in relation to Riverlands meatworks discharges

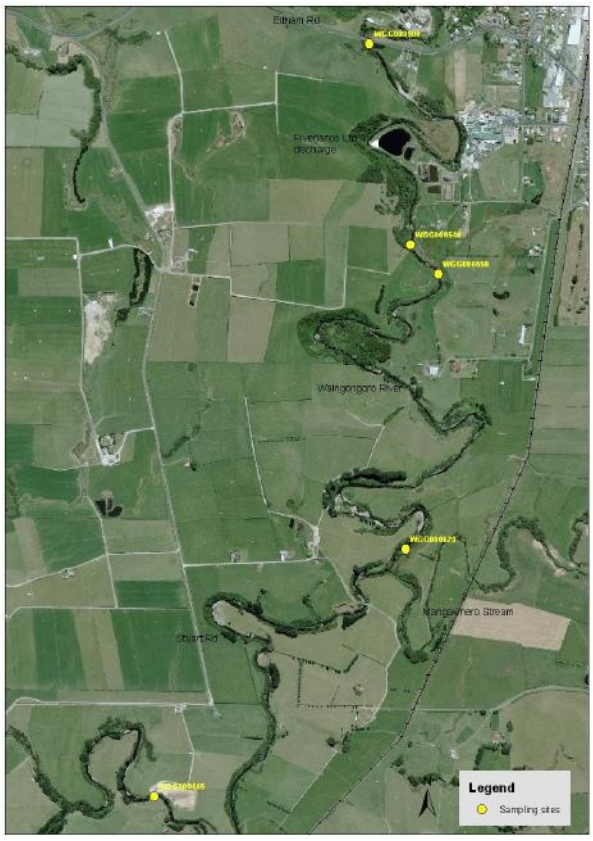


Figure 2 Location of biomonitoring sites in relation to the Eltham WWTP and landfill

Results and discussion

This late summer survey was performed under very low flow conditions (0.45 m^3/sec at site 1) on 25 February 2014, 34 days after a fresh in excess of three times and 51 days after a fresh in excess of seven times the median flow in the river. This flow was above the minimum mean monthly flow (0.390 m^3/sec) previously recorded for February and below the average February mean monthly flow (1.40 m^3/sec) for the period 1975 to 2013. Patchy algal mats were found at two sites (3 and 3a) with thin mats at sites 1, 4, and 8. No filamentous algal growths were noted on the substrate at any of the sites, with the exception of patchy filamentous algae at sites 4 and 8. Moss was patchy at sites 3, 3a, and 8. Water temperatures at sites 1 to 3a ranged from 14.9˚C to 15.6˚C during this early-morning survey with water temperatures from 16.7˚C to 17.1˚C recorded in mid-morning at sites 4 and 8. No discharges from the outfalls were occurring at the time of this survey with all wastes being irrigated onto pasture in an adjacent sub-catchment. No treated wastes had been discharged to the river for a period of about four months prior to this survey.

Macroinvertebrate communities

A summary of data obtained from previous surveys of the various river sites is presented in Table 1.

Table 1 Summary of macroinvertebrate taxa numbers and MCI values for previous surveys performed between August 1981 and November 2013

Site	No of surveys	Taxa numbers		MCI values	
		Range	Median	Range	Median
1	58	16-32	24	78-124	101
3	58	14-32	24	71-114	99
3a	37	16-29	23	79-124	99
4	28	16-35	27	77-106	94
8	39	14-30	20	77-111	94

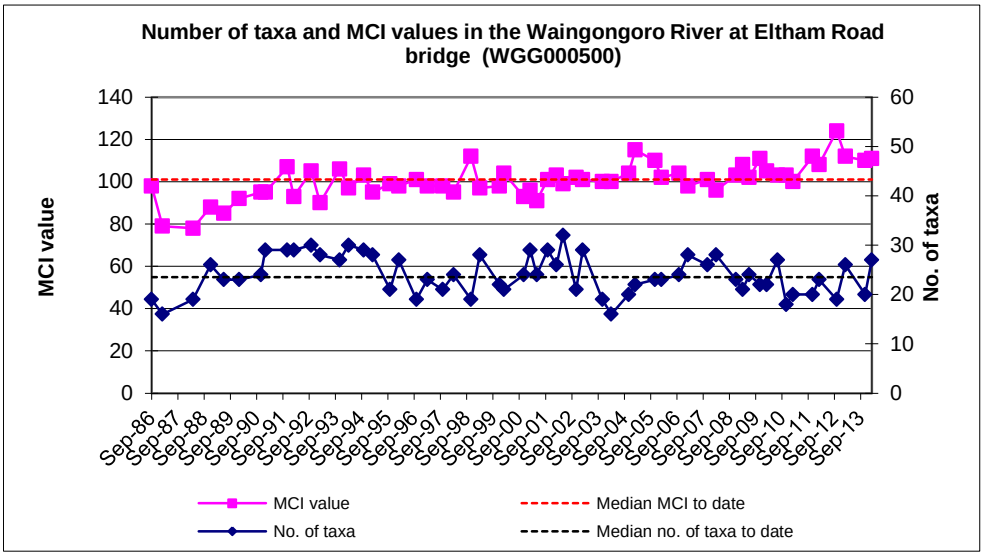
The macroinvertebrate fauna results for the present survey are listed in Table 2 and illustrated in Figure 2 (for sites 1, 3 and 3a) and Figure 3 (sites 4 and 8).

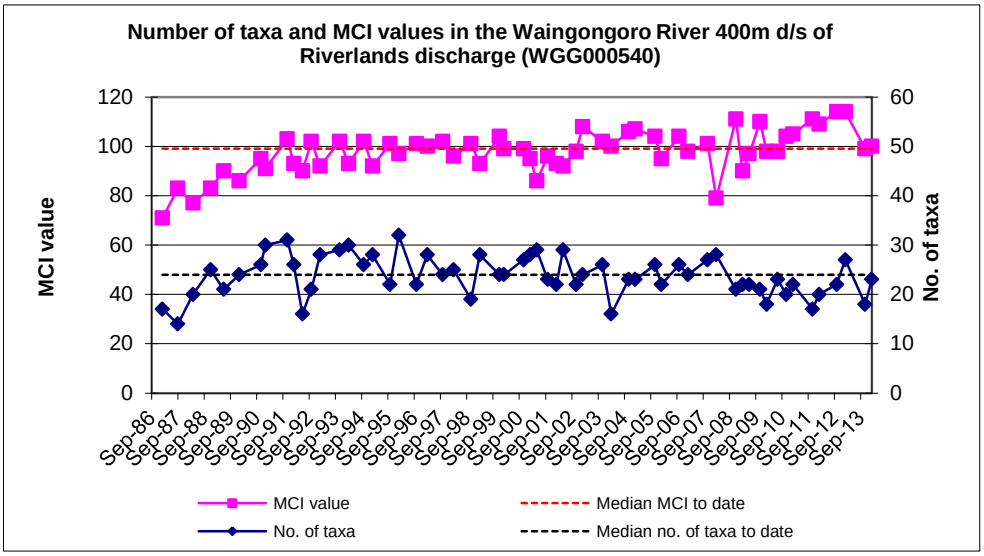
Table 2 Macroinvertebrate fauna of the Waingongoro River in relation to Riverlands Ltd's discharges sampled on 25 February 2014

Taxa List	Site Number	MCI score	1	3	3a	4	8
	Site Code		WGG000500	WGG000540	WGG000550	WGG000620	WGG000665
	Sample Number		FWB14154	FWB14155	FWB14156	FWB14157	FWB14159
NEMERTEA	Nemertea	3	R	-	-	-	-
ANNELIDA (WORMS)	Oligochaeta	1	R	R	R	-	C
MOLLUSCA	*Potamopyrgus*	4	R	-	R	R	R
EPHEMEROPTERA (MAYFLIES)	*Ameletopsis*	10	-	-	-	R	-
	Austroclima	7	A	C	A	C	A
	Coloburiscus	7	VA	A	VA	A	C
	Deleatidium	8	XA	XA	XA	XA	XA
	Nesameletus	9	A	R	C	C	-
	Zephlebia group	7	R	-	R	R	R
PLECOPTERA (STONEFLIES)	*Zelandobius*	5	-	-	R	-	R
	Zelandoperla	8	R	-	-	R	-
COLEOPTERA (BEETLES)	Elmidae	6	VA	VA	VA	VA	A
	Hydraenidae	8	C	R	C	-	-
	Ptilodactylidae	8	R	-	-	-	-
	Staphylinidae	5	-	-	-	-	R
MEGALOPTERA (DOBSONFLIES)	*Archichauliodes*	7	VA	A	A	A	A
TRICHOPTERA (CADDISFLIES)	*Aoteapsyche*	4	XA	XA	XA	XA	VA
	Costachorema	7	C	C	A	C	A
	Hydrobiosis	5	A	A	A	A	A
	Neurochorema	6	R	-	R	-	R
	Beraeoptera	8	R	-	R	-	-
	Confluens	5	R	R	R	-	-
	Oxyethira	2	R	-	R	-	-
	Pycnocentria	7	-	-	-	C	C
	Pycnocentrodes	5	R	R	R	R	R
DIPTERA (TRUE FLIES)	*Aphrophila*	5	C	C	A	C	A
	Eriopterini	5	A	R	C	R	R
	Hexatomini	5	-	R	-	-	-
	Harrisius	6	R	-	-	-	-
	Maoridiamesa	3	-	A	A	C	A
	Orthocladiinae	2	R	C	C	R	A
	Polypedilum	3	-	-	-	R	-
	Tanytarsini	3	-	R	C	-	A
	Empididae	3	-	R	-	-	R
	Ephydridae	4	-	-	R	-	R
	Muscidae	3	-	R	R	-	R
	Austrosimulium	3	C	C	C	C	C
	Tabanidae	3	-	-	-	-	C
	Tanyderidae	4	R	R	R	-	R
		No of taxa	27	23	28	21	27
		MCI	111	100	102	116	96
		SQMCIs	6.2	5.9	6.0	6.0	6.7
		EPT (taxa)	13	9	13	12	11
		%EPT (taxa)	48	39	46	57	41

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

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





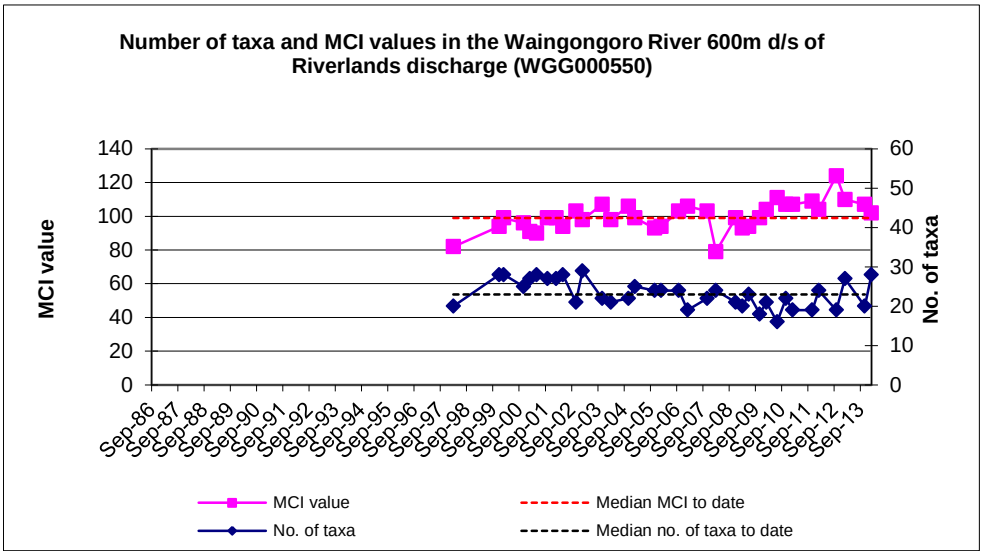


Figure 2 Taxa richness and MCI values for the three sites in the vicinity of Riverlands Eltham Ltd to date

Sites in the immediate vicinity of the meatworks (sites 1, 3 and 3a)

Taxa richnesses at these sites (Table 2) were generally higher and within 5 taxa of median numbers found in previous surveys (Figure 2 and Table 1). These numbers were indicative of relatively typical community richnesses for the mid-catchment of Taranaki ringplain rivers/streams as illustrated by comparisons with the results of more than 698 past surveys of 'control' sites in National Park-sourced ringplain rivers and streams situated between 155 and 250 m a.s.l. (median richnesses of 20 to 23 taxa (TRC, 1999 (updated 2013))).

Dominant taxa characteristic of the reach in the immediate vicinity of the meatworks, showed only a few variations between sites, probably in part due to the relative lack of riparian cover downstream of the meatworks discharge outfall and other more subtle habitat differences. Generally, the macroinvertebrate communities of this three-site reach were characterised by a combination of up to two 'highly sensitive' taxa [extremely abundant mayfly (*Deleatidium*); and another mayfly (*Nesameletus*)]; up to eight 'moderately sensitive' taxa [mayflies (*Coloburiscus* and *Austroclima*), elmid beetles (very abundant), dobsonfly (*Archichauliodes*), free-living caddisflies (*Hydrobiosis* and *Costachorema*), and craneflies (*Aphrophila* and eriopters)]; and up to two 'tolerant' taxa [net-building caddisfly (*Aoteapsyche*) and midge (*Maoridiamesa*)]. This was almost identical with the number and composition of characteristic taxa found by the previous summer's survey. The few significant changes in individual taxon abundances which were recorded in a downstream direction through this reach were likely to have coincided with minor habitat variability between sites eg increased abundances of the 'tolerant' midge (*Maoridiamesa*) and decreased abundances of 'sensitive' mayfly and eriopter craneflies at the closest downstream site (3) where coincidentally, the substrate was looser and there was some evidence of bank erosion at this more open site.

Numerically the most abundant taxa were the mayfly (*Deleatidium*), elmid beetles, and net-building caddisfly (*Aoteapsyche*) through this reach which has typically been the case in the majority of previous surveys (i.e. on more than 70% of past survey occasions at site 3 (TRC, 2014)). The presence of 'highly sensitive' taxa (eg extremely abundant mayfly (*Deleatidium*), one other mayfly, one stonefly, one caddisfly, and two beetle taxa), some of which were recorded as rarities, was a further indication of the preceding relatively high physicochemical quality and good habitat in this reach of the Waingongoro River at the time of this late summer survey.

A moderate range of MCI scores (100 to 111) was found, which was slightly above the medians and within ranges of scores recorded by past summer surveys. The MCI scores were insignificantly 1 to 10 units higher than historical median scores at each of the sites (Table 1 and Figure 2). There was a marginally significant difference in scores between the 'control' site and the first site (3), but not site 3a, downstream of the discharge outfall, and the MCI score typically decreased overall (by nine units) through the reach of the river surveyed. This variability in scores was due almost entirely to the presence/absence of a few taxa found only as rarities (less than 5 individuals/site) from sites rather than many significant changes in community composition between these sites.

The general similarities in the most numerically abundant of the characteristic taxa at each of the three sites resulted in relatively small variability between $SQMCI_s$ scores which ranged from 5.9 to 6.2 units. The MCI scores recorded at each of these sites categorised this reach of river as having 'good' generic health (TRC, 2014) at the time of this late summer survey. The scores were also from five units lower to six units higher than predicted MCI scores for a National Park-sourced ringplain river's sites at an altitude of 200m asl and from five units to a

significant (Stark, 1998) 14 units higher than predicted MCI scores for these sites, 23.0 to 24.8 km downstream of the National Park boundary (Stark & Fowles, 2009).

The marginally significant difference (Stark, 1998) found between the 'control' site's score and the initial downstream site's score, taking into account the relative similarity in all sites' community structures and habitat variability between adjacent sites, was indicative of no recent impacts of discharges from Riverlands' property on the macroinvertebrate fauna of this reach of the river under the existing discharge regime and very low flow conditions experienced in the receiving waters over the preceding few weeks.

Sites upstream and downstream of the Mangawhero Stream (sites 4 & 8)

The moderately wide range of taxa richnesses found at these sites upstream of the Mangawhero Stream (site 4) and 2 km downstream of the confluence (site 8) was similar to the range of community richnesses found further upstream in the reach adjacent to the meatworks' discharges (Table 2). Taxa numbers were six lower and seven higher than medians found by previous surveys (Table 1) at sites 4 and 8 respectively, but the variability principally was due to the presence/absence of rarities (less than five individuals per taxon) rather than significant changes in dominant (characteristic) taxa.

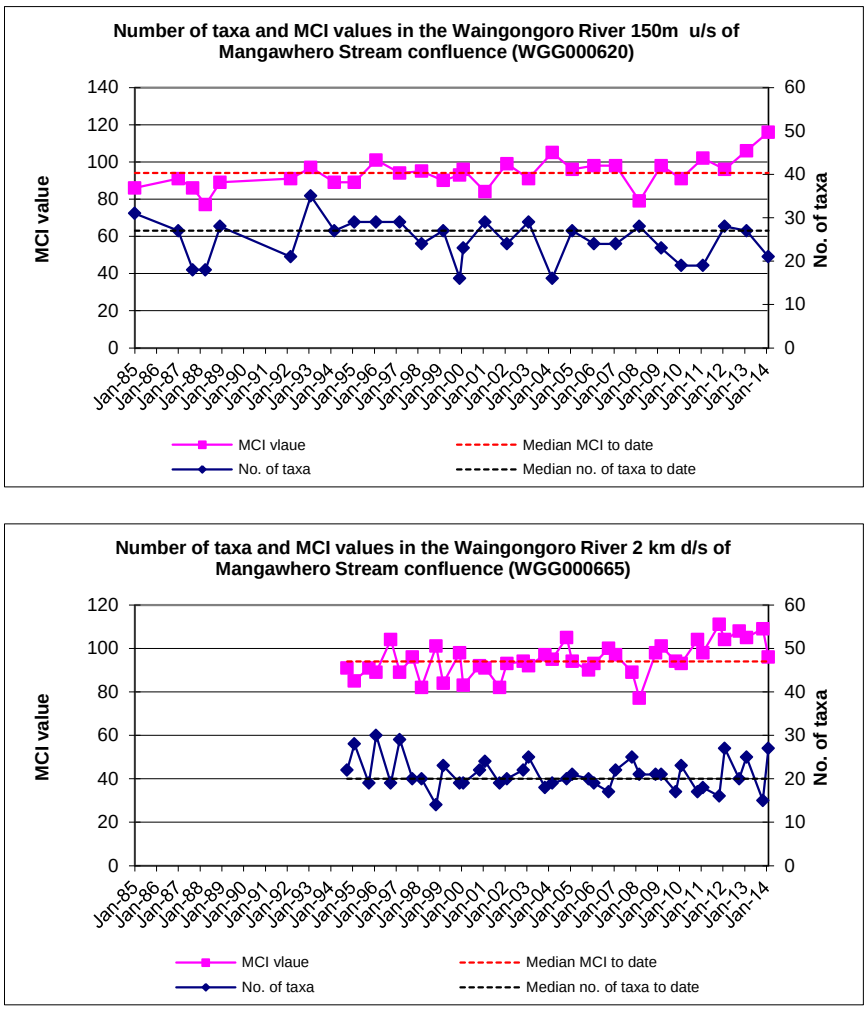


Figure 3 Taxa richness and MCI values for the two sites further downstream near the confluence of the Mangawhero Stream and Waingongoro River

All but two of the taxa which characterised these two sites were also characteristic of sites in the upstream reach, with the addition of two 'tolerant' taxa [midges (orthoclads and *Maoridiamesa*)] but a reduction of one 'highly sensitive' and one 'moderately sensitive' taxa. There were four significant increases in individual 'tolerant' taxon abundances recorded below the influence of the Mangawhero Stream but only one decrease in a 'highly sensitive' taxon between sites 3a and 4.

The MCI score (116) at the site upstream of the confluence atypically was 5 to a significant 16 units above scores in the upstream reach of the river, and a significant (Stark, 1998) 22 units above the median score, and ten units above the maximum score, from the surveys previously undertaken at this site (Table 1 and Figure 3). This score represented an atypical increase of 5 units along the 4km reach of river from Eltham Road to the Mangawhero River confluence and therefore quite different to the predicted decrease of 3 units (Stark & Fowles, 2009) for this reach of a ringplain stream. This was due mainly to the presence of one additional 'highly sensitive' taxon and five fewer 'tolerant' taxa found only as rarities or common rather than any significant losses of 'sensitive' taxa.

A significant decrease of 20 units in MCI score was recorded 2 km below the Mangawhero Stream confluence at Stuart Road (96 units) in comparison with the MCI score at the nearest site upstream of the confluence. However, this score was two units above the median score from the previous surveys at this site (Figure 3) and although there was a relative dissimilarity in community compositions at these sites (44% of taxa shared by both sites) there were fewer differences in the most dominant taxa (as indicated by a downstream increase in $SQMCI_s$ score of 0.7 unit). The decrease in MCI scores was more typical of previous surveys which have shown decreases as high as 13 units downstream of the Mangawhero Stream confluence, coincidental with some deterioration in physicochemical water quality at this site. This atypical MCI trend did not reflect the improved physicochemical water quality conditions at the Stuart Rd site which have been documented subsequent to the diversion of Eltham WWTP wastewater out of the Mangawhero Stream (to the Hawera WWTP) since late winter, 2010. However, in comparison with more typical MCI scores (100 to 102 units) recorded in the reach below the meatworks outfall, the relatively small downstream decrease of four to six units was more typical of recent trends in improved physicochemical water quality conditions at Stuart Road.

The MCI scores recorded at these two sites categorised this reach of river as having 'good' to 'fair' generic health (TRC, 2014) at the time of this late summer survey. The scores were also 13 units higher (site 4) and seven units lower (site 8) than predicted MCI scores for a National Park-sourced ringplain river's sites at an altitude of 180m asl and a significant 21 units, and one unit higher than predicted MCI scores for these sites, 27.2 and 29.6 km respectively downstream of the National Park boundary (Stark & Fowles, 2009).

Comparison with spring (2013) survey

The biomonitoring survey of spring 2013 (CF595) provided Waingongoro River macroinvertebrate community information for the reach adjacent to the meatworks property directly following a period of treated wastes partial discharge to the river and to land irrigation.

Taxa richnesses were higher (by five to eight taxa) at the time of the most recent late summer survey at each of the three sites under lower flow conditions but warmer water temperatures. The 'highly sensitive' taxon (mayfly (*Deleatidium*)), indicative of good preceding

physicochemical water quality conditions, was just as abundant in the latest (summer) survey through the reach of the Waingongoro River above the Mangawhero Stream confluence. 'Sensitive' taxa constituted from 61 to 67% of each site's faunal community at the time of the more recent summer survey compared with 61 to 70% in the spring through this reach of the river.

Generally, MCI scores were very similar to slightly lower than earlier spring scores (by 0 to 5 units) over the reach at the time of warmer, lower flow summer survey in the absence of wastes discharges to the river for a period of nearly four months preceding the summer survey. The variations in MCI scores between sites at the time of both surveys were not considered indicative of any impacts of preceding discharges or land irrigation within the reach of the river adjacent to the meatworks property.

Streambed microflora

The microscopic heterotrophic assessments at the three sites above and below the Riverlands discharges and the two sites further downstream showed no significant growths of heterotrophic organisms in the Waingongoro River at any sites under low flow conditions during the summer period and meatworks wastes diversion to nearby land irrigation. These heterotrophic growth indicators (protozoan communities) were also not visible at any sites, thereby indicative of the successful remediation work undertaken some five years earlier to contain all other wastewater on the consent holder's property.

Conclusions

Macroinvertebrate richnesses slightly above historical medians and MCI scores above historical median values, and typical of scores in the mid-reaches of a developed catchment, were found at all sites in the Waingongoro River adjacent to the Riverlands meatworks during this late summer survey performed under very low river flow conditions during a lengthy dry period. Few significant differences in macroinvertebrate community assemblages and a marginally significant decrease in MCI scores but not in $SQMCI_s$ scores between the upstream 'control' site and two downstream sites were recorded, consistent with the absence of discharges from the meatworks to the receiving waters during a four month period of wastes irrigation to land through the summer period while river flows were low. There were no visible or microscopic signs of undesirable biological growths on the riverbed at sites below the outfall at the time of the survey.

A relatively significant increase in the MCI score recorded in the river at the site approximately 2 km upstream of the Mangawhero Stream confluence was inconsistent with historical trends at this site and gradually decreasing scores in a downstream direction in ringplain rivers. This was due to subtle changes in community composition rather than major changes in numerically dominant taxa composition at this site where the score was the highest recorded to date. However, there was significant change in score at the furthest downstream site (downstream of the Mangawhero Stream confluence), although the MCI score was slightly higher than the historical median for this site due to improved physicochemical water quality conditions coincident with the more recent diversion of the Eltham WWTP discharge out of the catchment.

Summary

The Council's standard 'kick-sampling' technique was used at five established sites to collect streambed macroinvertebrates from the Waingongoro River. Samples were sorted and identified to provide number of taxa (richness) and MCI and $SQMCI_S$ scores for each site.

The MCI is a measure of the overall sensitivity of the macroinvertebrate community to the effects of organic pollution in stony streams. It is based on the presence/absence of taxa with varying degrees of sensitivity to environmental conditions. The $SQMCI_S$ takes into account taxa abundance as well as sensitivity to pollution, and may reveal more subtle changes in communities, particularly if non-organic impacts are occurring. Significant differences in either the MCI or $SQMCI_S$ between sites may indicate the degree of adverse effects (if any) of the discharges being monitored.

This late summer macroinvertebrate survey indicated that, coincident with the absence of treated meatworks wastes discharges to the river from the Riverlands site (due to a lengthy period of diversion to land irrigation), marginally significant changes in the macroinvertebrate communities were found between the upstream 'control' site and the first of the two sites downstream of this site discharge coincident with poorer habitat at this downstream site.

The macroinvertebrate communities of the Waingongoro River contained relatively similar proportions of 'sensitive' taxa at all sites with the communities dominated by more 'sensitive' than 'tolerant' taxa at all sites. Community richnesses (numbers of taxa), although generally higher than, or similar to, historical median richnesses, had a moderate range of seven taxa at the time of this late summer survey but were slightly more variable in comparison with most previous summer surveys, although not significantly poorer in richness.

MCI scores indicated that the stream communities were all of 'good' generic health with the exception of 'fair' generic health at the furthest downstream site (Stuart Road), and generally of 'expected' predicted conditions recorded for reaches of similar Taranaki rivers and streams. The community at the site downstream of the Mangawhero Stream confluence, previously affected by the Eltham WWTP discharge, maintained improvement and was similar to those in the reach downstream of the meatworks outfall. This improvement, in the absence of the meatworks discharge, primarily was due to the more recent diversion of this discharge out of the catchment (by pipeline to the Hawera WWTP).

References

Internal Taranaki Regional Council reports

Fowles, C R, 2005: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, February 2005, CF362.

Fowles, C R, 2005: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, November 2005, CF392.

Fowles, C R, 2006: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, February 2006, CF397.

Fowles, C R, 2006: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, October 2006, CF410.

Fowles, C R, 2007: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, February 2007, CF419.

Fowles, C R, 2007: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, November 2007, CF436.

Fowles, C R, 2008: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, March 2008, CF445.

Fowles, C R, 2008: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, December 2008, CF476.

Fowles, C R, 2009: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, March 2009, CF482.

Fowles, C R, 2009: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, June 2009, CF488.

Fowles, C R, 2009: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, November 2009, CF495.

Fowles, C R, 2010: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, February 2010, CF505.

Fowles, C R, 2010: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, July 2010, CF511.

Fowles, C R, 2010: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, November 2010, CF514.

Fowles, C R, 2011: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, February 2011, CF530.

Fowles, C R, 2011: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, November 2011, CF539.

Fowles, C R, 2012: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, February 2012, CF547.

Fowles, C R, 2012: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, October 2012, CF562.

Fowles, C R, 2013: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, February 2013, CF572.

Fowles, C R, 2013: Biomonitoring of the Waingongoro River in relation to Riverlands Eltham Ltd wastes discharges, November 2013, CF595.

TRC, 1999: Some statistics from the Taranaki Regional Council database (FWB) of freshwater macroinvertebrate surveys performed during the period from January 1980 to 31 December 1998 (SEM reference report), TRC Technical Report 99-17.

TRC, 2010: Riverlands Eltham Ltd monitoring programme Annual Report 2008-2009, TRC Technical Report 2009-110.

TRC, 2014: Fresh water macroinvertebrate fauna biological monitoring programme. Annual state of the environment monitoring report 2012-2013. TRC Technical Report 2013-48.

External publications

Stark, JD, 1985: A macroinvertebrate community index of water quality for stony streams. Water and Soil Miscellaneous Publication No. 87.

Stark, JD, 1998: a biotic index for freshwater macroinvertebrate coded abundance data. *New Zealand Journal of Marine and Freshwater Research 32(1): 55-66.*

Stark, JD, 1999: An evaluation of Taranaki Regional Council's SQMCI biomonitoring index. Cawthron Report No 472. 32pp.

Stark, JD, Boothroyd IKG, Harding JS, Maxted JR, Scarsbrook MR, 2001: Protocols for sampling macroinvertebrates in wadeable streams. New Zealand Macroinvertebrate Working Group Report No 1. Prepared for the Ministry for the Environment. Sustainable Management Fund Project No. 5130. 57p.

Stark JD, Fowles CR, 2009: Relationships between MCI, site altitude, and distance from source for Taranaki ring plain streams. Stark Environmental Report 2009-01. 47p.

Appendix VI

Riverlands Eltham Limited
Waste Disposal System Annual Reports
for the years ending 30 September 2013 and 2014

To: **Chief Executive – Taranaki Regional Council**

From: **Rawiri Mako – Riverlands Eltham Ltd**

Date: **10 August 2014**

Subject: **Annual Environmental Management Report**

RIVERLANDS ELTHAM LIMITED – ANNUAL ENVIRONMENTAL MANAGEMENT REPORT 2012-2013 SEASON

(October 2012 – end of September 2013)

1 Introduction

Riverlands Eltham Ltd are required to submit an annual report detailing monitoring results, incidents, system changes, and significant events from all areas of the waste treatment and disposal systems. Relevant figures such as kill numbers, water use, and effluent discharges are included and shown in a weekly format. This information is displayed in Appendix 1.

2 Processing Activity

The beef season ran from 24 October 2012 to 10 July 2013. During this period a total of 172,032 cattle were processed. This is an increase on the total of 163,932 processed in 20011/12. Appendix 1 shows the weekly kill numbers for beef for 2012/13.

Bobby calves were processed from 22 July to 3 October 2013. A total of 128,116 calves were processed over this 11 week period.

Total treated effluent produced for 2012/13 was 585,610m^3. This was an increase of 65,874m^3 of treated effluent compared to the previous year of 519,736m^3.

From this total of treated effluent, 205,181 m^3 was discharged into the Waingonogoro River, which equates to 35% of the total effluent. And 380,429m^3 of treated effluent was irrigated to Joblin's farm, which equates to 65% of the total effluent.

3 Ponds/Treatment System Changes

We continued to have regular weed spraying undertaken on the grass around the ponds and on the covers of ponds 1 and 2.

Long term plans are being investigated as to how Riverlands can recover or remove solids from the ponds system which will help the longevity of the system and also enhance our discharge from the ponds system.

The stirrers that were added last season to ponds 6 and 7 have been reasonably successful in regard to moving solids out of the ponds during the irrigation season. This has been adopted as major part of our solids removal strategy. During the 2012/13 season Riverlands constructed a new holding pond on the Riverlands Farm. The new pond gives us the ability if the needs arises to

cleanout ponds 6 or 7 during the shutdown periods of either June or October and not have to irrigate this effluent until conditions suit.

Also during the 2012/13 season we separated the red and green waste streams before entering the ponds system. This has given the effluent system more time to recover solids from the fat reclaim squares. To date this innovation has been reasonably successful.

In the past the green and red waste streams have combined at the end of the fat reclaim squares. Once the green waste enters the red waste stream the combined discharge became to large for the pipe to the ponds to cope with. This caused the combined discharge to flood back up into the fat reclaim squares which in turn caused the fat reclaim to become ineffective because the volume of effluent within the system did not allow the solids to be adequately removed which meant more solids entering the ponds.

During the 2013/14 season Riverlands will continue to make improvements in reducing our water use which in turn will reduce our effluent output. Major work on reducing the yard water use for the upcoming season will involve reducing the belly wash water by reducing the nozzle size used in the belly wash and changing the potable wash which is mounted at the end of the belly wash to spray sheen instead of a nozzle wash. In theory this should reduce the water use by up to 200lts/body.

4 Site Management

Site inspections continue to be undertaken weekly. These inspections involve a walk around the plant and the effluent treatment area, while inspecting and reporting on any problem areas. Any problems/faults are reported to the appropriate personnel to repair/re-work the area.

Weekly air quality checks are carried out around the plant boundary. The results are included under Section 8.

5 Effluent Quality

The effluent quality throughout 2012/13 was again similar to levels from the previous season.

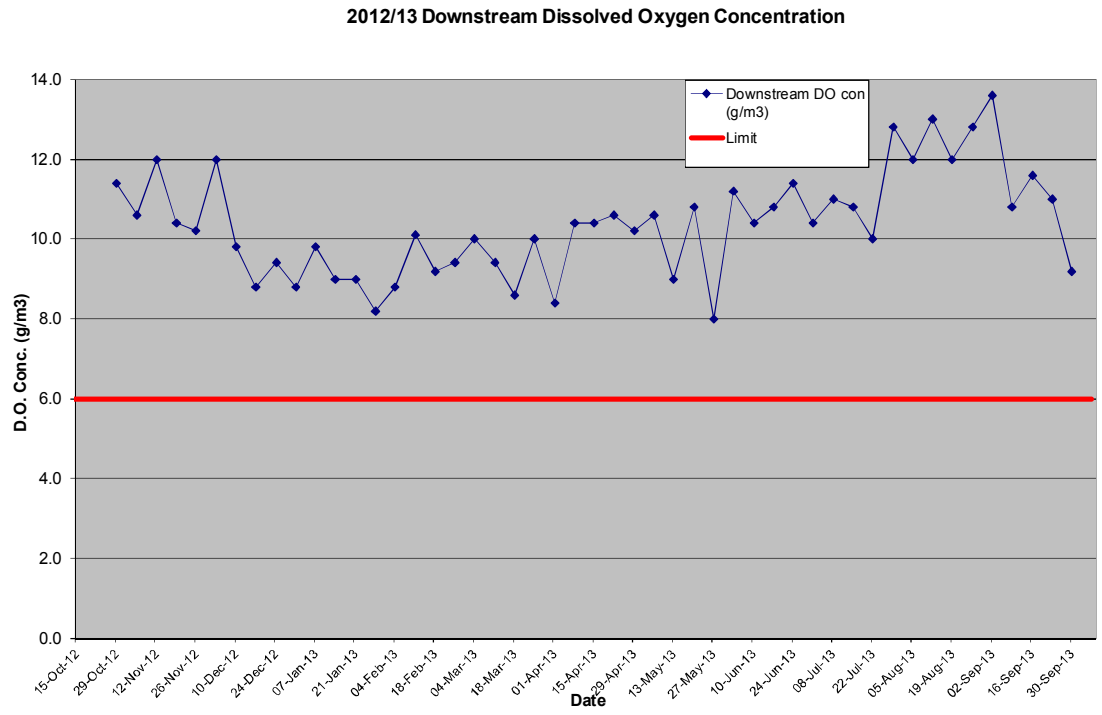
Testing of effluent continues to be done once a week by our laboratory, and usually takes place on Tuesday. ICS laboratory also monitor the effluent quality of pond 7 on a monthly basis.

With regards to our discharge to water consent (2039), the conditions regarding Dissolved Oxygen and Ammoniacal Nitrogen are detailed below.

5.1 Dissolved Oxygen

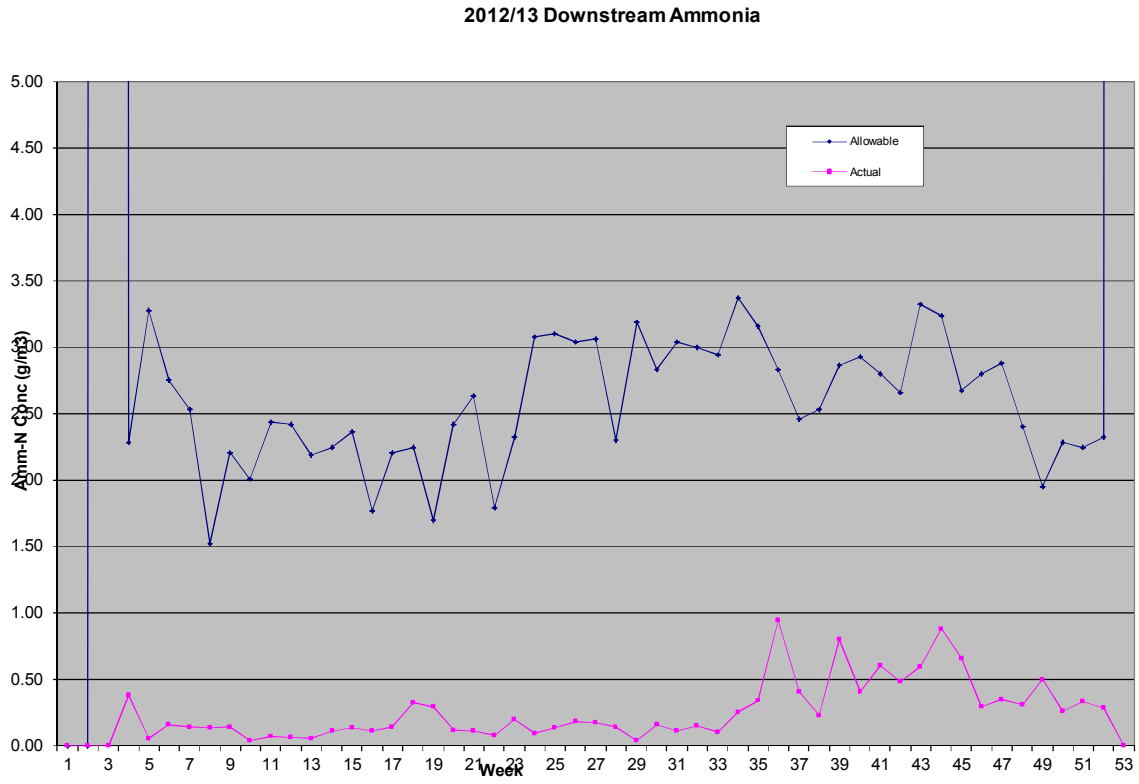
The dissolved oxygen concentration of the downstream point in the Waingongoro River never fell below the consent limit of 6 gm3. The lowest recorded dissolved oxygen concentration was 8 g/m3, which occurred once during May 2013.

Graph 5.1 below shows the downstream dissolved oxygen concentrations.



5.2 Ammoniacal Nitrogen

The downstream Ammoniacal Nitrogen levels versus the allowable in stream levels for 2012/13 is shown in Graph 5.2 below. Allowable levels were not exceeded at any time during the season.



6 Irrigation

This section firstly relates to irrigation on Joblin's farm under consent 5569. Our other irrigation consent 5736 is covered further in section 6.8 below.

6.1 System Performance

Irrigation on Joblin's farm ran for 30 weeks. Included in the 30 weeks was a part week at the start of the irrigation season and a part week at the end of the season when Riverlands discharged to the river as well as irrigating. The percentage of treated effluent irrigated decreased by 6%. Riverlands irrigated 23,334m^3 more of treated effluent compared to the previous year. This was largely due to a longer irrigation season.

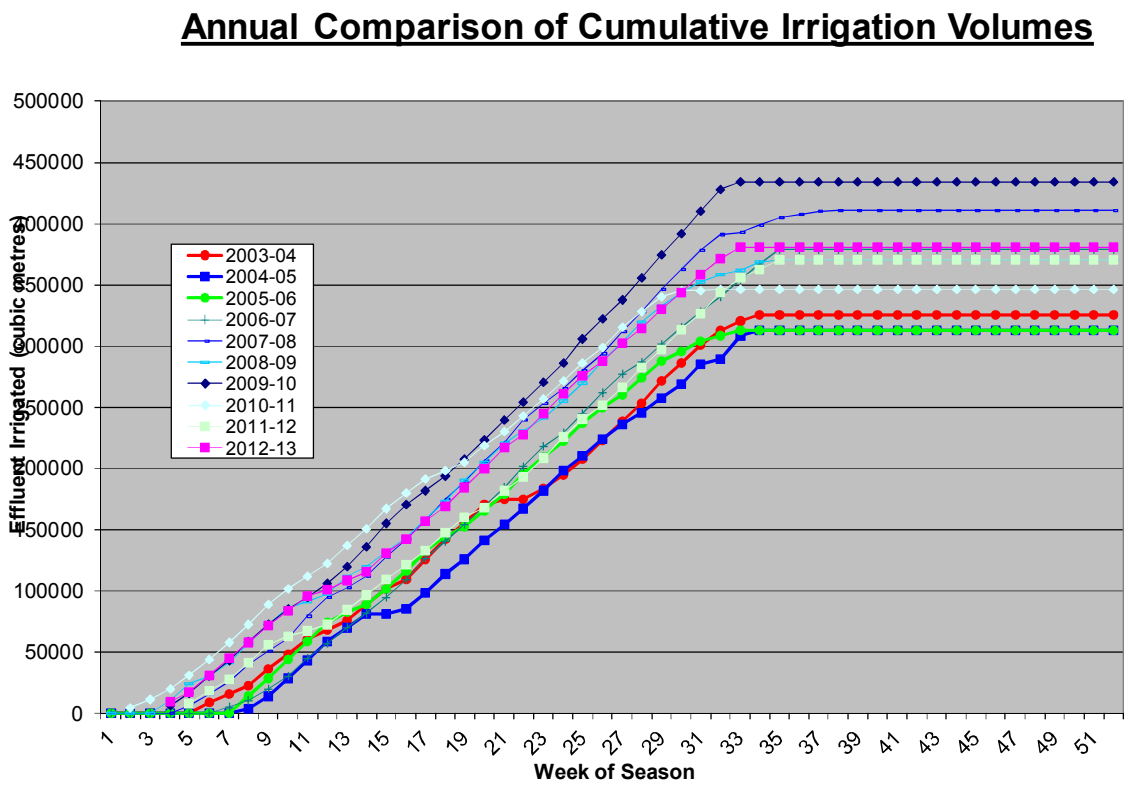
Irrigation commenced on 1 November 2012 and finished on 26 May 2013. A total of 380,429 m^3 of effluent was irrigated to land, which accounted for 65% of the total effluent produced. Table 6.1 below compares the 2012/13 season with the previous six seasons.

Table 6.1 – Seasonal Comparison of Irrigation Volumes

	2006/07	**2007/08**	**2008/09**	**2009/10**	**2010/11**	**2011/12**	**2012/13**
No. Of Weeks	31	34	33	30	30	32	30
Total Vol. (m^3)	379,360	411,287	370,404	433,879	346,774	370,108	380,429
Weekly Max. (m^3)	17,057	18,077	17,942	19,006	16,442	17,059	17,867
Weekly Ave. (m^3)	12,237	12,097	11,224	14,463	11,185	11,939	12,681
% of annual	59%	67%	63%	72%	69%	71%	65%
Nitrogen Applied (kg)	37,653	56,270	55,541	59,408	47,877	55,484	59,071

From Table 6.1, it can be seen that the irrigation period decreased by two weeks compared to the previous season, with the total volume of effluent irrigated increasing by 1% out of the total volume of effluent produced by the plant. The increase was basically due to the extra cattle being processed compared to the previous year.

Graph 6.2 below shows the annual comparison of cumulative irrigation volumes for the past ten years.



6.2 Operational Delays

There were no operational delays with the irrigation system to report on during the irrigation season.

6.3 Irrigation Non-compliances

There were no non-compliance issues during the 2012/13 season.

6.4 Nitrogen Loading per Hectare

Table 6.3 below shows the nitrogen application loading rate on each paddock on Joblin's farm during 2011/12. The method used to calculate this Nitrogen Loading, was by using the application depth (standard 45mm is used), times the size of each paddock and the weekly Total Nitrogen value, gives a Nitrogen loading on each paddock. A copy of the irrigation map which shows the Paddock numbers is included in Appendix 4.

Table 6.3 - Nitrogen Application							
Paddock	**Kg/ha**	**Paddock**	**Kg/ha**	**Paddock**	**Kg/ha**	**Paddock**	**Kg/ha**
B1	201.6	Y6	62.6	P8	124.2	G6	238.1
B2	210.2	Y7	169.7	P9	204.3	G7	232.7
B3	164.3	Y8	231.8	P10	119.7	G8	149.0
B4	172.8	Y9	218.3			G9	128.7
B5	249.3	Y10	167.4	O1	0.0	G10	115.7
B6	153.9	Y11	218.7	O2	86.4	G11	123.8
B7	106.2	Y12	58.5	O3	124.7	G12	207.9
B8	207.9	Y13	118.8	O4	149.9	G13	239.4
B9	153.5	Y14	113.9	O5	88.7	G14	206.1
B10	128.3	Y15	242.6	O6	77.9	G15	180.9
B11	175.1	Y16	121.5	O7	77.9	G16	201.2
B12	152.1	Y17	168.3	O8	58.5	G17	119.3
B13	0.0	Y18	144.9	O9	196.7	G18	203.4
B14	69.8	Y19	169.7	O10	199.4	G19	203.4
B15	211.5	Y20	149.9	O11	286.2	G20	272.7
B16	105.8	Y21	0.0	O12	247.5	G21	0.0
B17	81.0	Y22	0.0	O13	244.4	G22	147.2
B18	149.9			O14	133.7	G23	147.2
B19	147.6	P1	86.4	O15	347.0	G24	158.9
		P2	161.1			G25	158.9
Y1	0.0	P3	251.6	G1	201.2	G26	142.2
Y2	0.0	P4	289.4	G2	212.0	G27	191.3
Y3	143.1	P5	351.9	G3	175.1	G28	230.0
Y4	239.9	P6	315.0	G4	261.0	G29	296.1
Y5	240.8	P7	204.3	G5	264.6		
Total N Applied **59,071 kg**				**Average N Applied** (on irrigated paddocks) **164.8 kg/ha**			

There is a total irrigable land area of 264.71ha (after taking off the exclusion zones). Of this total area, there were 257.5ha which was actually utilised for irrigation. Almost all of the reticulated buried pipe work has been completed which has given the Joblins the ability to basically utilise the entire farm for irrigation. Most of the paddocks had 2 or 3 separate applications throughout the season; however 8 paddocks had 4 applications and of those 8 paddocks, 1 had a total of 5 applications. As can be seen in the table above, there were 3 paddocks which exceeded the 300 kg/ha limit.

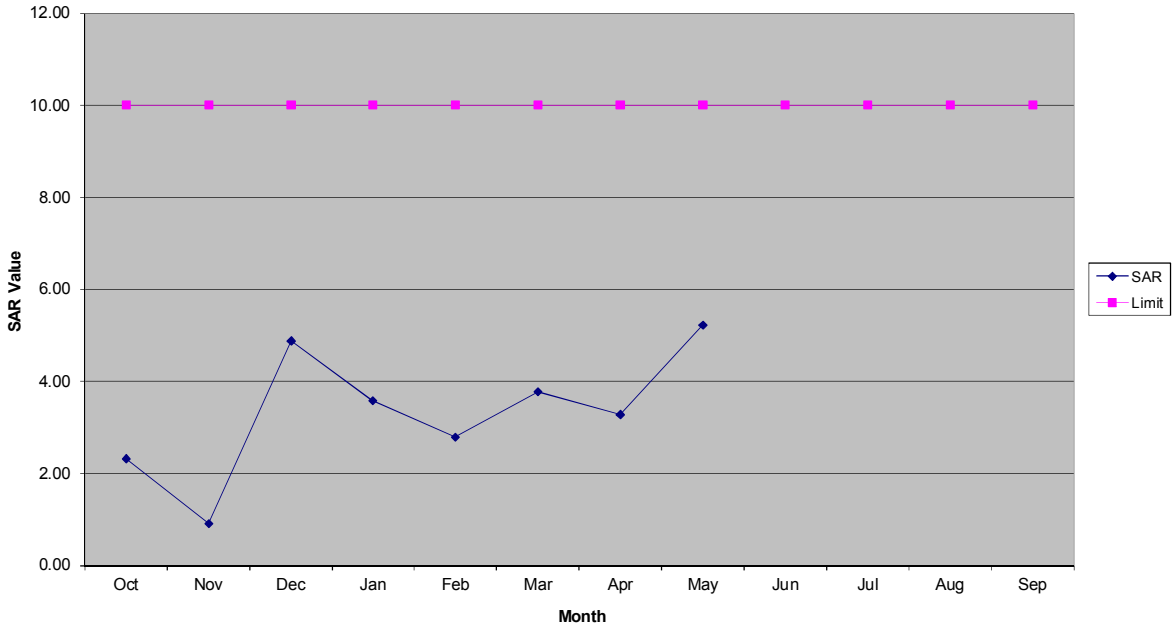
6.5 Soil Nitrogen Loading

The average nitrogen application on the irrigated paddocks (as seen in Table 6.3 above) was 164.8 kg/ha and the total Nitrogen applied 59,071 kg, which was an increase to previous season due to a larger volume being irrigated this year compared to the previous season.
Soil Nitrogen Loadings are also measured at five sites on Joblin's dairy farm, once a month by Industrial Chemistry Services (ICS). A copy of the Reardon Block soil Nitrogen loadings are attached as Appendix 5. It can be seen that Nitrate levels have remained similar to previous years. Total Nitrogen levels have shown a slight decrease to previous years.

Effluent Sodium Absorption Ratio

Graph 6.4 below shows the Sodium Absorption Ratio did not exceed 10 at any stage throughout the season, as required by condition 10 of irrigation consent 5569. The Sodium Absorption Ratio was not tested by ICS in June, July, August and September of 2013. There was no irrigation to land from the end of May 2013 through until the end of September 2013.

Graph 6.4 2012/13 Effluent Sodium Absorption Ratio



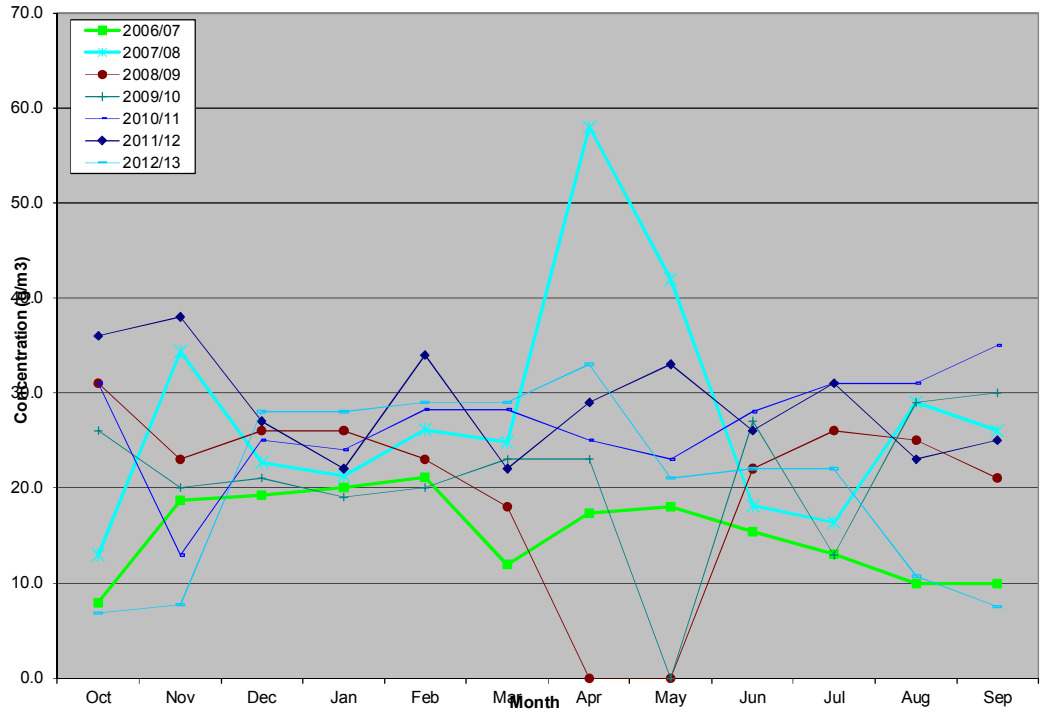
7 Paunch Material Disposal

This was the tenth season that paunch content material was taken off site by Remediation Ltd. This method of off site disposal has proved successful for Riverlands, with no paunch grass odours detected around the plant, and no public complaints being received for paunch grass odour. The improvements that have been put in place to remove excess water from the paunch have shown a huge reduction in the quantity of paunch leaving the site.

8 Phosphorus

The Phosphorus concentration in the effluent is monitored on a monthly basis by Industrial Chemistry Services. The average Phosphorus concentration in the effluent for the 2012/13 season was 20.39g/m^3 which is a decrease of 8.44g/m^3 on the previous season. Graph 7.1 below shows the phosphorus concentration of the effluent for the past seven seasons. It can be seen that there has been a moderate decrease in concentration levels compared to previous seasons.

Graph 7.1 - Total Phosphorus Concentration in Effluent



9 Odour

Air quality monitoring was conducted by Riverlands staff on a weekly basis, and it usually occurred every Monday morning. These results were then reported monthly to TRC. The monitoring involved checking for any odours at the four sites around the plant; which were at the end of Conway Rd, North Street, the main gate, and Eltham Road.

Table 8.1 below shows the weekly monitoring results for the 2012/13 season.

Table 8.1 - Air Quality Monitoring Results 2010/11

Monitoring Point	**Frequency**						
	Strength of Odour						
	0	**1**	**2**	**3**	**4**	**5**	**Total**
Conway Road	50	15	0	0	0	0	52
North Street	50	2	0	0	0	0	52
Main Gate	50	25	0	0	0	0	52
Eltham Road	50	8	0	0	0	0	52
Total	**200**	**50**	**0**	**0**	**0**	**0**	**208**
Percentage	**96.0%**	**25.0%**	**0%**	**0%**	**0%**	**0%**	

Scale

0 = no noticeable odours
1 = slight occasional wafts
2 = slight but constant odour
3 = very noticeable odour
4 = unpleasant odours
5 = putrid

In the 2012/13 season, the major source of odour was from the yards. At Conway Road, the only odours detected were from the anaerobic ponds, whereas the yards odour was detectable from the main gate and North Street. Pond odours were also detected at Eltham Road. There were no odours detected above the scale of 2.
During the 2012/13 season, there were no complaints received by Riverlands or the TRC about Riverlands concerning odour coming from the site.

10 Water Use

Riverlands water use report for the 2012/13 season was submitted to TRC on the 19 August 2013. A summary of the season is as follows:
Total water use at the plant has increased by 4% on the previous season, with an increase in the total beef kill by 8,106.
Total potable water use has again increased on the previous season. The potable per body figure is 2.28m^3 compared to 2.22m^3 for the previous season.
The total non-potable water use has also increased by 0.05m^3/body compared to the previous season, with the non-potable per body figure of 0.68 m^3 for the 2012/13 season compared to 0.63m^3 last season.

11 Stormwater

Stormwater discharge samples were collected by TRC on 4 December 2012, the 4 July 2013 and the 10 September 2013. Samples were taken from the cooling water/stormwater drain immediately above the weir on the Waingongoro River. As can be seen in table 10.1 below, all results were well within consent limits.

Table 10.1 - Stormwater Discharges

Date Sampled	**Suspended Solids (g/m3)**	**pH**
Limits	**100**	**6.0-10.0**
04 Dec 12	3	7.7
04 Jul 13	8	7.1
10 Sep 13	4	7.7

12 Inter Laboratory Comparisons

Three inter laboratory comparisons were conducted during the 2012/13 season; the samples were collected on 4 December 12, 4 July 13, and the 10 September 13. The results are shown in Table 11.1 below.

Parameter		Discharge		Upstream		Downstream	
2012-2013		Riverlands	TRC	Riverlands	TRC	Riverlands	TRC
4 December 2012							
Temperature	**°C**	22.0	22.0	14.7	14.9	14.8	15.9
Dissolved oxygen	**g/m³**	2.7	4.6	9.1	10.2	9.2	10.0
pH		7.8	7.6	7.5	7.8	7.6	7.8
Ammonia	**g/m³N**	174	162	0.19	0.045	0.14	0.078
Nitrate + nitrite	**g/m³N**	3	8.3				
Chemical oxygen demand	**g/m³**	284	290				
Suspended solids	**g/m³**	**60**	**110**				
4 July 2013							
Temperature	**°C**	11.2	11.0	10.7	10.7	11.2	10.8
Dissolved oxygen	**g/m³**	4.1	2.9	10.8	11.0	10.8	10.9
pH		7.7	7.7	**7.3**	**7.7**	**7.3**	**7.7**
Ammonia	**g/m³N**	127	116	0.24	0.028	0.80	0.74
Nitrate + nitrite	**g/m³N**	23	18.2				
Chemical oxygen demand	**g/m³**	455	210				
Suspended solids	**g/m³**	116	77				
10 September 2013							
Temperature	**°C**	10.6	10.5	9.7	9.6	9.9	9.8
Dissolved oxygen	**g/m³**	12.4	-	11.0	-	10.8	-
pH		7.86	7.8	7.72	7.5	7.71	7.6
Ammonia	**g/m³N**	73	64	0.030	0.034	0.50	0.41
Nitrate + nitrite	**g/m³N**	55	60				
Chemical oxygen demand	**g/m³**	174	180				
Suspended solids	**g/m³**	180	100				

The comparison of results has been acceptable for all parameters.

13 Summary

The Irrigation season for 2012/13 saw a 6% decrease on the previous season from 71% to 65% of the waste water going to land. In terms of actual cubic metres of treated effluent to land is concerned, there was approximately 10,364m^3 more of treated effluent irrigated this season. This was largely due to an increase in the total water used for processing compared to the previous year.

As has been for previous seasons, accurate monitoring of air quality, effluent, site inspections at Riverlands, and monitoring on the Joblin farm will continue to be carried out to a high standard in order to achieve an excellent standard of compliance with consent conditions.

Overall, we consider that we have achieved an excellent level of environmental performance for the 2012/13 year.

In the 2013/14 season, Riverlands are planning to have another successful year where we achieve compliance with all our consents and will continue to make innovative changes within the plant to improve our environmental outcomes.

To: **Chief Executive – Taranaki Regional Council**

From: **Rawiri Mako – Anzco Foods Eltham Limited**

Date: **17 November 2014**

Subject: **Annual Environmental Management Report**

RIVERLANDS ELTHAM LIMITED – ANNUAL ENVIRONMENTAL MANAGEMENT REPORT 2013-2014 SEASON

(October 2013 – end of September 2014)

1 Introduction

Anzco Foods Eltham Limited are required to submit an annual report detailing monitoring results, incidents, system changes, and significant events from all areas of the waste treatment and disposal systems. Relevant figures such as kill numbers, water use, and effluent discharges are included and shown in a weekly format. This information is displayed in Appendix 1.

2 Processing Activity

The beef season ran from 30 October 2014 to 8 July 2014. During this period a total of 157,958 cattle were processed. This is a decrease on the total of 172,038 processed in 20012/13. Appendix 1 shows the weekly kill numbers for beef for 2013/14.

Bobby calves were processed from 21 July to 2 October 2014. A total of 129,058 calves were processed over this 11 week period.

Total treated effluent produced for 2013/14 was 467,619m^3. This was a decrease of 117,991m^3 of treated effluent compared to the previous year of 585,610m^3.

From this total of treated effluent, 141,967m^3 was discharged into the Waingongoro River, which equates to 30% of the total effluent. And 325,652m^3 of treated effluent was irrigated to Joblin's farm, which equates to 70% of the total effluent.

3 Ponds/Treatment System Changes

We continued to have regular weed spraying undertaken on the grass around the ponds and on the covers of ponds 1 and 2.

Long term plans are still being considered as to how we can recover or remove solids from the ponds system which will help the longevity of the system and also enhance our discharge from the ponds system.

The stirrers that were added in 2012 to ponds 6 and 7 have remained reasonably successful in regard to moving solids out of the ponds during the irrigation season.

During the 2012/13 season we separated the red and green waste streams before entering the ponds system. This has given the effluent system more time to recover solids from the fat reclaim

squares. To date this innovation has proved to be very successful with a lot less fat being transferred through to the ponds system.

During the 2013/14 season major work on reducing the yard water use involving reducing the belly wash water by reducing the nozzle size used in the belly wash and changing the potable wash which is mounted at the end of the belly wash to spray sheen instead of a nozzle wash. This has had a dramatic impact on reducing the amount of yard water used daily. Initial results have shown the reduction to be in the vicinity of approximately 130-150lts/body.

4 Site Management

Site inspections continue to be undertaken weekly. These inspections involve a walk around the plant and the effluent treatment area, while inspecting and reporting on any problem areas. Any problems/faults are reported to the appropriate personnel to repair/re-work the area.

Weekly air quality checks are carried out around the plant boundary. The results are included under Section 8.

5 Effluent Quality

The effluent quality throughout 2013/14 was again similar to levels from the previous season.

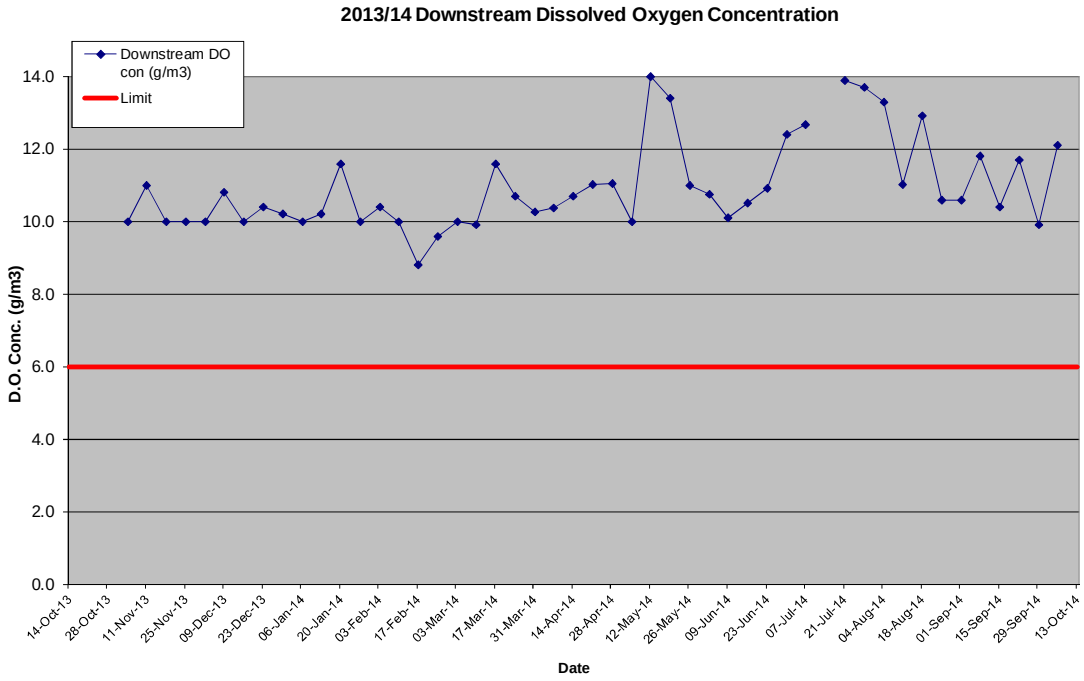
Testing of effluent continues to be done once a week by our laboratory, and usually takes place on Tuesday. ICS laboratory also monitor the effluent quality of pond 7 on a monthly basis.

With regards to our discharge to water consent (2039), the conditions regarding Dissolved Oxygen and Ammoniacal Nitrogen are detailed below.

5.1 Dissolved Oxygen

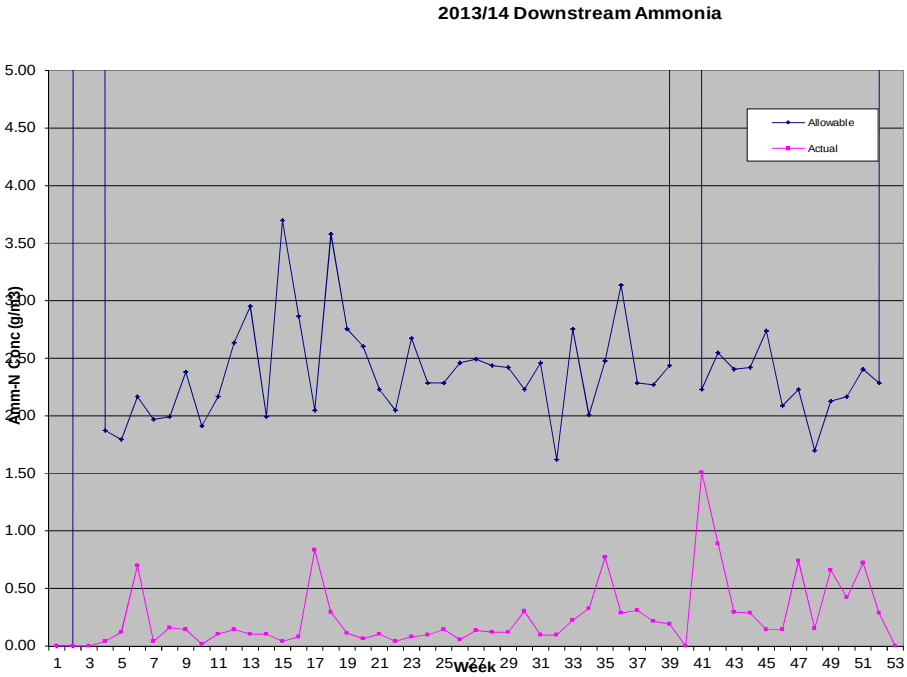
The dissolved oxygen concentration of the downstream point in the Waingongoro River never fell below the consent limit of 6 gm3. The lowest recorded dissolved oxygen concentration was 8.8 g/m3, which occurred once during February 2014.

Graph 5.1 below shows the downstream dissolved oxygen concentrations.



5.2 Ammoniacal Nitrogen

The downstream Ammoniacal Nitrogen levels versus the allowable in stream levels for 2013/14 is shown in Graph 5.2 below. Allowable levels were not exceeded at any time during the season.



6 Irrigation

This section firstly relates to irrigation on Joblin's farm under consent 5569. Our other irrigation consent 5736 is covered further in section 6.8 below.

6.1 System Performance

Irrigation on Joblin's farm ran for 34 weeks. Included in the 34 weeks were 5 part weeks at the start of the irrigation season and 5 part weeks at the end of the season when Anzco Foods Limited discharged to the river as well as irrigating.

Irrigation commenced on 29 October 2013 and finished on 22 June 2014. A total of 325,625m^3 of effluent was irrigated to land, which accounted for 70% of the total effluent produced. Table 6.1 below compares the 2013/14 season with the previous six seasons.

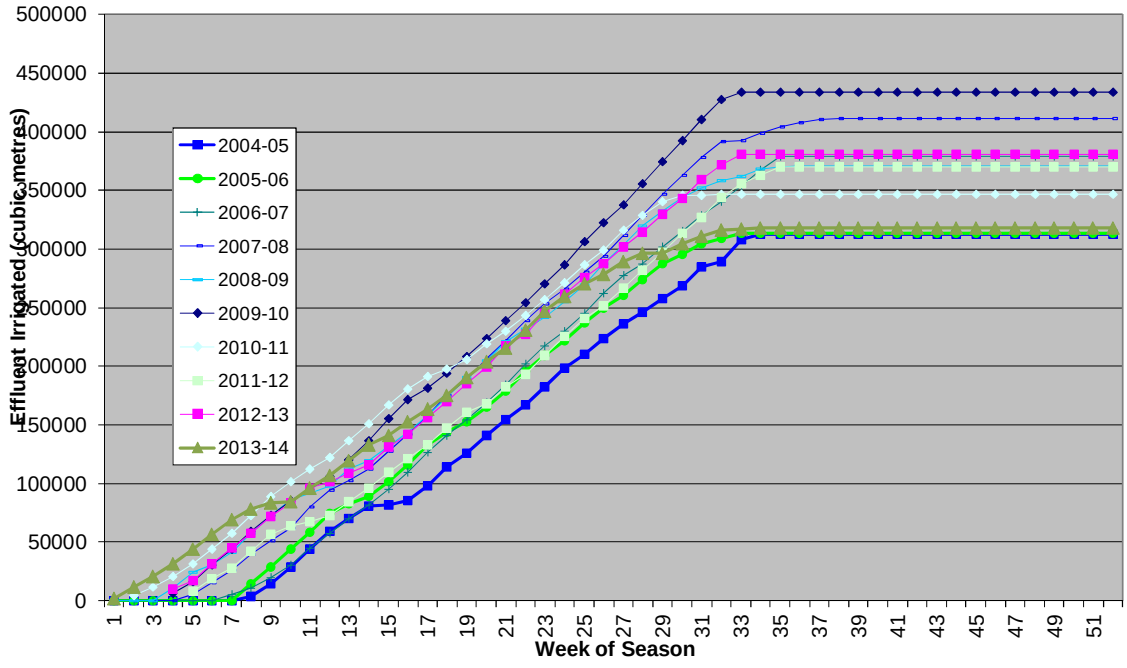
Table 6.1 – Seasonal Comparison of Irrigation Volumes

	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14
No. Of Weeks	34	33	30	30	32	30	34
Total Vol. (m^3)	411,287	370,404	433,879	346,774	370,108	380,429	325,652
Weekly Max. (m^3)	18,077	17,942	19,006	16,442	17,059	17,867	15,870
Weekly Ave. (m^3)	12,097	11,224	14,463	11,185	11,939	12,681	9,578
% of annual	67%	63%	72%	69%	71%	65%	70%
Nitrogen Applied (kg)	56,270	55,541	59,408	47,877	55,484	59,071	50,258

From Table 6.1, it can be seen that the irrigation period increased by four weeks compared to the previous season, with the total volume of effluent irrigated increasing by 5% out of the total volume of effluent produced by the plant.

Graph 6.2 below shows the annual comparison of cumulative irrigation volumes for the past ten years.

Annual Comparison of Cumulative Irrigation Volumes



6.2 Operational Delays

There were no operational delays with the irrigation system to report on during the irrigation season.

6.3 Irrigation Non-compliances

There were no non-compliance issues during the 2013/14 season.

6.4 Nitrogen Loading per Hectare

Table 6.3 below shows the nitrogen application loading rate on each paddock on Joblin's farm during 2013/14. The method used to calculate this Nitrogen Loading, was by using the application depth (standard 45mm is used), times the size of each paddock and the weekly Total Nitrogen value, gives a Nitrogen loading on each paddock. A copy of the irrigation map which shows the Paddock numbers is included in Appendix 4.

Table 6.3 - Nitrogen Application

Paddock	Kg/ha	Paddock	Kg/ha	Paddock	Kg/ha	Paddock	Kg/ha
B1	168.4	Y6	0.0	P8	356.6	G6	195.3
B2	270.4	Y7	252.9	P9	197.8	G7	281.9
B3	150.9	Y8	149.9	P10	272.7	G8	181.8
B4	259.2	Y9	88.0			G9	226.4
B5	178.9	Y10	74.7	O1	0.0	G10	260.3
B6	135.9	Y11	86.4	O2	248.2	G11	0.0
B7	94.1	Y12	155.5	O3	222.5	G12	135.9
B8	94.1	Y13	235.6	O4	228.2	G13	158.2
B9	83.0	Y14	69.8	O5	74.7	G14	154.9
B10	190.0	Y15	194.9	O6	0.0	G15	171.2
B11	90.5	Y16	191.3	O7	0.0	G16	178.7
B12	103.5	Y17	239.2	O8	74.5	G17	173.3
B13	94.1	Y18	227.1	O9	255.2	G18	0.0
B14	175.1	Y19	197.6	O10	235.6	G19	0.0
B15	179.6	Y20	319.0	O11	256.4	G20	94.1
B16	148.7	Y21	0.0	O12	319.4	G21	0.0
B17	227.9	Y22	85.7	O13	206.8	G22	85.7
B18	283.6			O14	78.3	G23	85.7
B19	247.5	P1	274.7	O15	244.4	G24	100.4
		P2	232.2			G25	100.4
Y1	0.0	P3	357.1	G1	172.1	G26	169.7
Y2	0.0	P4	296.7	G2	141.3	G27	134.4
Y3	349.7	P5	252.4	G3	141.3	G28	157.4
Y4	249.1	P6	282.0	G4	154.6	G29	201.7
Y5	123.4	P7	233.8	G5	201.4		
Total N Applied **50,248 kg**				**Average N Applied** (on irrigated paddocks) **186.4 kg/ha**			

There is a total irrigable land area of 264.71ha (after taking off the exclusion zones). Of this total area, there were 238.8ha which was actually utilised for irrigation. All of the reticulated buried pipe work has been completed which has given the Joblins the ability to basically utilise the entire farm for irrigation. Most of the paddocks had 2 or 3 separate applications throughout the season; however 10 paddocks had 4 applications. As can be seen in the table above, there were 5 paddocks which exceeded the 300 kg/ha limit.

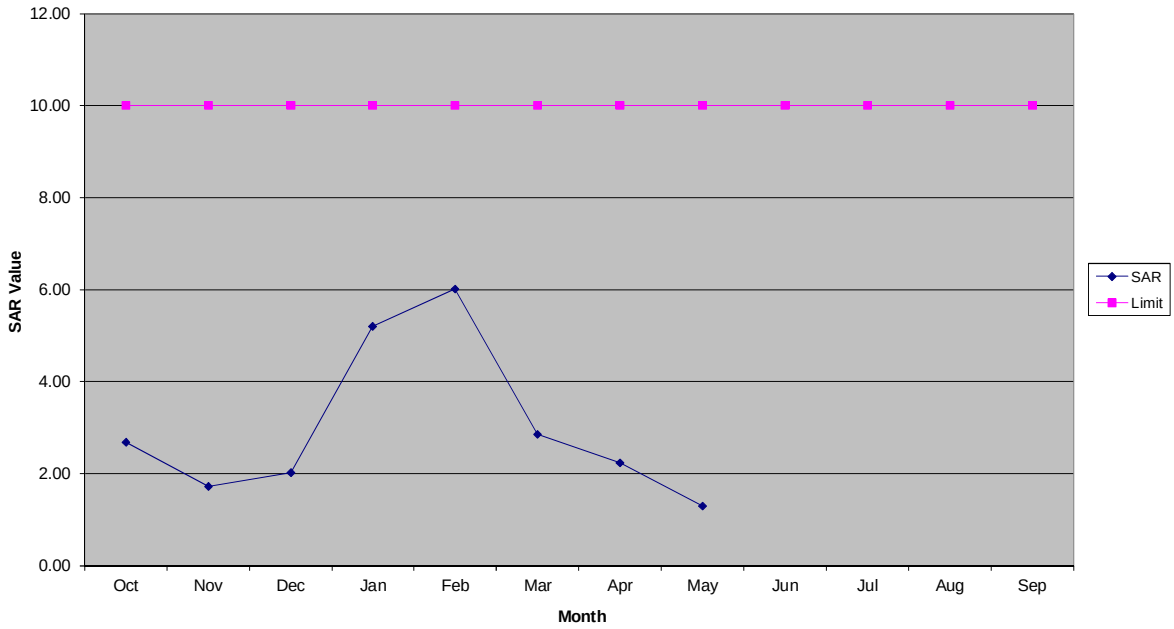
6.5 Soil Nitrogen Loading

The average nitrogen application on the irrigated paddocks (as seen in Table 6.3 above) was 186.4 kg/ha and the total Nitrogen applied 50,248 kg, which was a decrease compared to the previous season due to less cattle being processed this season and a more vigilant approach to the water conservation programme.
Soil Nitrogen Loadings are also measured at five sites on Joblin's dairy farm, once a month by Industrial Chemistry Services (ICS). A copy of the Reardon Block soil Nitrogen loadings are attached as Appendix 5. It can be seen that Nitrate levels have remained similar to previous years. Total Nitrogen levels have shown a slight decrease to previous years.

Effluent Sodium Absorption Ratio

Graph 6.4 below shows the Sodium Absorption Ratio did not exceed 10 at any stage throughout the season, as required by condition 10 of irrigation consent 5569. The Sodium Absorption Ratio was not tested by ICS in June, July, August and September of 2013. There was no irrigation to land from approximately 20 June 2014 through until the end of October 2014.

Graph 6.4 2013/14 Effluent Sodium Absorption Ratio



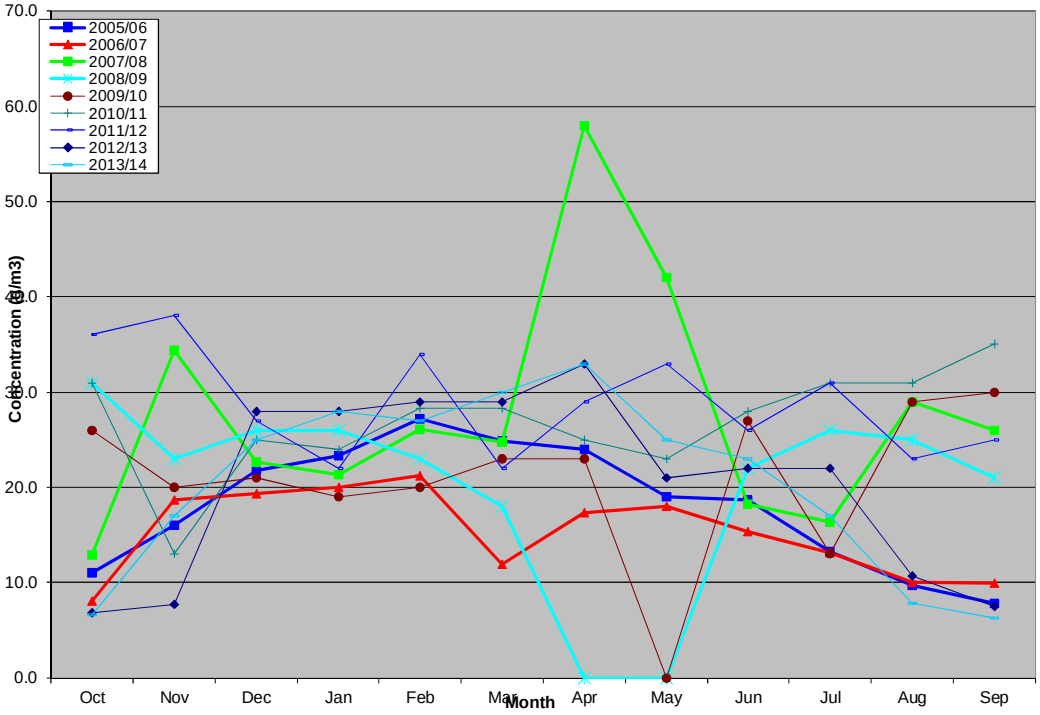
7 Paunch Material Disposal

This paunch content material was taken off site by Remediation Ltd. This method of off site disposal has proved successful for Anzco Foods Eltham Limited, with no paunch grass odours detected around the plant, and no public complaints being received for paunch grass odour. The improvements that have been put in place to remove excess water from the paunch have shown a huge reduction in the quantity of paunch leaving the site.

8 Phosphorus

The Phosphorus concentration in the effluent is monitored on a monthly basis by Industrial Chemistry Services. The average Phosphorus concentration in the effluent for the 2013/14 season was 20.47g/m^3 which were basically the same as the previous season. Graph 7.1 below shows the phosphorus concentration of the effluent for the past seven seasons.

Graph 7.1 - Total Phosphorus Concentration in Effluent



9 Odour

Air quality monitoring was conducted by Riverlands staff on a weekly basis, and it usually occurred every Monday morning. These results were then reported monthly to TRC. The monitoring involved checking for any odours at the four sites around the plant; which were at the end of Conway Rd, North Street, the main gate, and Eltham Road.

Table 8.1 below shows the weekly monitoring results for the 2013/14 season.

Table 8.1 - Air Quality Monitoring Results 2013/14

Monitoring Point	**Frequency**						
	Strength of Odour						
	0	**1**	**2**	**3**	**4**	**5**	**Total**
Conway Road	50	14	0	0	0	0	52
North Street	50	8	0	0	0	0	52
Main Gate	50	19	6	0	0	0	52
Eltham Road	50	10	2	0	0	0	52
Total	**200**	**51**	**0**	**0**	**0**	**0**	**208**
Percentage	**96.0%**	**25.5%**	**4%**	**0%**	**0%**	**0%**	

Scale

0 = no noticeable odours
1 = slight occasional wafts
2 = slight but constant odour
3 = very noticeable odour
4 = unpleasant odours
5 = putrid

In the 2013/14 season, the major source of odour was from the yards. At Conway Road, the only odours detected were from the anaerobic ponds, whereas the yards odour was detectable from the main gate and North Street. Pond odours were also detected at Eltham Road.
During the 2013/14 season, there were no complaints received by Anzco Foods Eltham Limited or the TRC concerning odour coming from the site.

10 Water Use

Riverlands water use report for the 2013/14 season was submitted to TRC on the 24 November 2014. A summary of the season is as follows:
Total water use at the plant has decreased by 16% on the previous season, with a decrease in the total beef kill by 14,075.
Total potable water use has decreased on the previous season. The potable water/body figure is 2.17m^3 compared to 2.28m^3 for the previous season.
The total non-potable water use has also decreased by 0.15m^3/body compared to the previous season, with the non-potable water/body figure of 0.53 m^3 for the 2013/14 season compared to 0.68m^3 last season.

11 Stormwater

Stormwater discharge samples were collected by TRC on 18 February 2014 and the 2 September 2014. Samples were taken from the cooling water/stormwater drain immediately above the weir on the Waingongoro River. As can be seen in table 10.1 below, all results were well within consent limits.

Table 10.1 - Stormwater Discharges

Date Sampled	**Suspended Solids (g/m3)**	**pH**
Limits	**100**	**6.0-10.0**
18 Feb 14	5	8.0
02 Sep 14	4	7.1

12 Inter Laboratory Comparisons

Two inter laboratory comparisons were conducted during the 2013/14 season; the samples were collected on 18 February 2014, and the 2 September 2014. The results are shown in Table 11.1 below.

Parameter		Discharge		Upstream		Downstream	
2013-2014		Riverlands	TRC	Riverlands	TRC	Riverlands	TRC
18 February 2014							
Temperature	°C	24.2	23.0	18.0	17.7	18.0	18.3
Dissolved oxygen	g/m³	10.8	10.0	9.9	9.8	9.4	9.5
pH		8.0	8.1	7.3	8.0	7.3	8.1
Ammonia	g/m³N	168	153	0.09	0.032	0.11	0.076
Nitrate + nitrite	g/m³N	1.5	0.86				
Chemical oxygen demand	g/m³	295	270				
Suspended solids	g/m³	100	86				
2 September 2014							
Temperature	°C	10.8	9.8	10.3	9.3	10.4	9.3
Dissolved oxygen	g/m³	7.7	7.8	10.9	11.3	10.6	11.2
pH		7.4	7.6	7.6	7.6	7.6	7.6
Ammonia	g/m³N	94	?	0.22	?	0.74	?
Nitrate + nitrite	g/m³N	65.0	?				
Chemical oxygen demand	g/m³	159	?				
Suspended solids	g/m³	32	35				

The comparison of results has been acceptable for all parameters.

13 Summary

The Irrigation season for 2013/14 saw a major decrease in the volume of the waste water going to land. In terms of actual cubic metres of treated effluent to land is concerned, there was approximately 55,000m^3 less of treated effluent irrigated this season. Part of the reason for this was due to less cattle being processed this season. The other part was that we took a more vigilant approach to our water conservation programme which had a massive impact on the decrease in the total water used for processing compared to the previous year.

As has been for previous seasons, accurate monitoring of air quality, effluent, site inspections at Anzco Foods Eltham Limited, and monitoring on the Joblin farm will continue to be carried out to a high standard in order to achieve an excellent standard of compliance with consent conditions.

Overall, we consider that we have achieved an excellent level of environmental performance for the 2013/14 year.

In the 2013/14 season, Anzco Foods Eltham Limited is planning to have another successful year where we achieve compliance with all our consents and will continue to make innovative changes within the plant to improve our environmental outcomes.