Ballance Agri-Nutrients (Kapuni) Ltd
Monitoring Programme
Annual Report
2016-2017

Technical Report 2017–83

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Executive summary

Ballance Agri-Nutrients (Kapuni) Ltd (the Company) operates an ammonia urea manufacturing plant located near Kapuni, in the Kapuni Stream catchment. This report for the period July 2016-June 2017 describes the monitoring programmes implemented by the Taranaki Regional Council (the Council) to assess the Company's environmental performance during the period under review. The report also details the results of the monitoring undertaken and assesses the environmental effects of the Company's activities.

The Company holds a total of seven resource consents, which include a total of 74 conditions setting out the requirements that the Company must satisfy. The Company holds resource consents to allow it to take water from the Waingongoro River, the Kapuni Stream and from groundwater; to discharge to land and to the Kapuni Stream; and to discharge emissions into the air.

During the monitoring period, Ballance Agri-Nutrients demonstrated an overall high level of environmental performance.

The Company and the Council monitor the exercise of the resource consents. The monitoring programme includes site inspections, sampling of effluent, discharge and receiving waters (both ground and surface) for physicochemical analysis, and biological surveys of affected streams. Particular attention is paid to the management of the irrigation disposal system, and its effects on groundwater quality.

The Council's monitoring programme included four inspections, four water samples collected for physicochemical analysis, two composite samples supplied by the Company for an interlaboratory comparison, two bore samples, and three air quality surveys.

Abstraction volumes from Waingongoro River complied with the consent limit. An investigation into effects of the take on juvenile fish entrainment was completed. A contribution of $30,000 towards riparian planting and management in Waingongoro catchment was made, the fifth of ten annual payments.

The groundwater monitoring indicates the presence of elevated nitrate concentrations in shallow groundwater. This is in part a result of heavy applications of nitrogen (effluent) early in the life of the plant. Current effluent application is considerably lower than previous application rates. However, nitrate concentrations in the soil profile underneath the irrigation areas and in the tributaries flowing through or adjacent to the site remain elevated.

A narrow but concentrated plume of ammonia is present in the groundwater and extends from a previous leak in an effluent storage basin. This basin has since been repaired. A second more recent and more concentrated ammonia plume extends from the plant area. Both plumes have pump and treatment systems operating, with the contaminated groundwater pumped back through the plant and waste treatment system. Both plumes currently do not extend beyond the Company boundary site and are monitored.

Monitoring of the Kapuni Stream and its tributaries around the plant, through testing for nitrogen, as well as biomonitoring involving macroinvertebrate and fish surveys, has not detected any detrimental impact on the stream health caused by discharges from the Company site.

Air monitoring of the site and the neighbourhood shows no significant impact on the surrounding environment in relation to the operation of the ammonia urea plant.

During the monitoring period, no unauthorised incidents were identified, or reported to the Council.

Overall, during the period under review, the Company demonstrated a high level of environmental performance and a high level of administrative performance with its resource consents.

For reference, in the 2016-2017 year, consent holders were found to achieve a high level of environmental performance and compliance for 74% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 21% of the consents, a good level of environmental performance and compliance was achieved.

In terms of overall environmental and compliance performance by the consent holder over the last several years, this report shows that the consent holder's performance remains at a high level.

This report includes recommendations for the 2017-2018 year.

Table of contents

List of tables

List of figures

List of photos

1. Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report is for the period July 2016 to June 2017 by the Taranaki Regional Council (the Council) on the monitoring programme associated with the resource consents held by Ballance Agri-Nutrients (Kapuni) Ltd (the Company). The Company operates an ammonia urea plant (the AUP) situated on Palmer Road, Kapuni, in the Kapuni catchment.

This report covers the results and findings of the monitoring programme implemented by the Council in respect of the consents held by the Company that relate to abstractions of water in the Waingongoro and Kapuni catchments and discharges of water and effluent within the Kapuni catchment, and the air discharge permit held by the Company 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 Council generally implements integrated environmental monitoring programmes and reports the results of the programmes jointly. This report discusses the environmental effects of the Company's use of water, land, and air, and is the 24th combined annual report by the Council for the Company, and includes the 29th report on the effects to water.

1.1.2 Structure of this report

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

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

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

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

Section 4 presents recommendations to be implemented in the 2017-2018 monitoring year.

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

1.1.3 The Resource Management Act 1991 and monitoring

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

a. the neighbourhood or the wider community around an activity, and may include cultural and 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 (for example recreational, cultural, or aesthetic); and

e. risks to the neighbourhood or environment.

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

1.1.4 Evaluation of environmental performance

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

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

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

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

Environmental Performance

High: No or inconsequential (short-term duration, less than minor in severity) breaches of consent or regional plan parameters resulting from the activity; no adverse effects of significance noted or likely in the receiving environment. The Council did not record any verified unauthorised incidents involving 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 performance

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

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

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

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

For reference, in the 2016-2017 year, consent holders were found to achieve a high level of environmental performance and compliance for 74% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 21% of the consents, a good level of environmental performance and compliance was achieved.

1.2 Process description

The ammonia-urea plant was commissioned in November 1982. The plant utilises specification gas from the Taranaki Fields. This gas is supplied for both fuel and process.

The feed gas is treated in a de-sulphuriser and then mixed with superheated steam for reaction in the steam methane reformer. The synthesis gas mixture consists of hydrogen, carbon dioxide, and carbon monoxide. The reformer is heated by burning fuel gas. The waste gases from combustion are used to generate steam, before discharging to the atmosphere, to increase efficiency and reduce fuel consumption. The synthesis gas mixture is reacted with air in a secondary reformer, a process that releases heat and requires no fuel. The heat is recovered for steam generation. A shift converter adjusts the synthesis gas mixture, before carbon dioxide is removed by absorption into an amine solution. This solution is regenerated by heating, which drives off the dissolved carbon dioxide. The carbon dioxide is sent to the urea plant for utilisation in the urea manufacturing process. Meanwhile, the synthesis gas is reacted to form ammonia. Non-utilisable by-product gases are burnt as fuel.

The ammonia and the carbon dioxide are combined in the urea formulation process. Off-gases are absorbed in scrubbers. The urea is formed into granules utilising air fluidised-bed granulation. Following this the product is screened and air-cooled.

The normal discharges and emissions from the AUP are listed in Table 1.

In the 2016-2017 monitoring year, Ballance produced approximately 277,933 tonnes of urea at the Kapuni site. This was an increase of 44% from production in the 2015-2016 year (192,478 tonnes).

Photo 1 Ballance Agri-Nutrients ammonia urea plant (viewed looking towards the north-west)

Table 1 Discharges and emissions from the ammonia urea plant

Discharge	Resource consent	Source	Constituents	Rate
Discharges to land	0597-3	Discharge of plant production effluent and contaminated stormwater by way of spray irrigation to pasture	Primarily ammonia, urea and nitrate. Also contains cooling water blow down	Up to 1,470 m^3/day
	7751-0 (Certificate of compliance)	Domestic sewage via soakage trenches	Treated sewage effluent	Up to 28 m^3/day
Discharges to water	0598-3	Uncontaminated stormwater, and raw water treatment effluent, to the Kapuni Stream and an unnamed tributary of the Kapuni Stream	Major cations (particularly sodium) and accumulated particulate material	Up to 1,920 m^3/day to the Kapuni Stream. Up to 4,080 m^3/day to an unnamed tributary of the Kapuni Stream
	1766-3	Contingency discharge of treated plant effluent and contaminated stormwater	Primarily ammonia, urea and nitrate. Also contains cooling water blow down	Up to 1,000 m^3/day to the Kapuni Stream when conditions do not allow spray irrigation
Emissions to air	4046-3	Reformers and de-sulphuriser heater	Carbon dioxide, nitrogen oxides, water vapour	Nitrogen oxides about 300 kg/hr
		Alkanolamine stripper	Carbon dioxide	16,000 kg/hr for short periods
		Cooling tower	Water vapour and droplets, traces of water treatment chemicals	
		Urea granulation process	Urea dust, ammonia	Less than 5 kg/hr
		Ammonia recovery process vent	Ammonia	Less than 3 kg/hr
		Ammonia finishing absorber	Ammonia	Less than 3 kg/hr
		Pressure relief valves	Ammonia	Infrequent (abnormal process event)

1.3 Resource consents

The Company holds seven resource consents for the operation of the AUP. The purposes of the resource consents are summarised in Table 2. Further detail is provided in Sections 1.3.1 to 1.3.3. Copies of the resource consents are included in Appendix I.

Table 2 Resource consents for operation of ammonia urea plant

Resource consent	Purpose	Volume (m^3/day)	Next review date	Expiry date
0596-3	Abstract water from Waingongoro River	4,000	2023	2035
1213-3	Abstract water from Kapuni Stream during emergencies	950	2023	2035
0597-3	Discharge plant production effluent and contaminated stormwater by way of irrigation onto pastureland	1,470	2023	2035
0598-3	Discharge uncontaminated stormwater and raw water treatment plant wastewater to Kapuni Stream	1,920	2023	2035
	or tributary of Kapuni Stream during high flows	4,080		
1766-3	Discharge treated effluent and stormwater to Kapuni Stream when conditions do not allow irrigation onto land	1,000	2023	2035
4719-2	Take groundwater for site remediation purposes	200	2023	2035
4046-3	Discharge of emissions to air from the manufacturing of ammonia and urea	N/A	2023	2035
Certificate of compliance				
7751-0 (formerly consent 3967-1)	Discharge treated domestic wastewater to groundwater via soakage trenches	-	Not applicable	Not applicable

The resource consents are subject to conditions on abstraction and discharge rates, effluent compositions and receiving water effects, and implementation of management plans. There is provision of six-yearly reviews of resource consent conditions from 1 June 2023.

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.

The Company holds three permits to abstract water.

1.3.1.1 Waingongoro River

The Company holds water permit **0596-3** to take water from the Waingongoro River for operation of an ammonia/urea plant. This consent was issued by the Council on 31 August 2012 under Section 87 (d) of the RMA. It is due to expire on 1 June 2035.

There are fifteen special conditions attached to this permit.

Condition 1 limits the volume of water taken to 4,000 cubic metres/day.

Conditions 2 to 6 address the measurement and recording of abstraction.

Condition 7 requires the adoption of the best practicable option to prevent or minimise adverse effects on the environment, including the efficient and conservative use of water.

Condition 8 controls any modifications to the intake.

Condition 9 requires a report on the costs and benefits of altering the intake to minimise the entrainment of juvenile fish.

Conditions 10 to 12 address monitoring of environmental effects and consultation with interested parties.

Condition 13 requires financial contribution towards riparian planting and management in Waingongoro catchment.

Conditions 14 and 15 are review provisions.

1.3.1.2 Kapuni Stream

The Company holds water permit **1213-3** to take and use water from the Kapuni Stream (at times when the normal water supply has failed) for operation of an ammonia/urea plant. This consent was issued by the Council on 31 August 2012 under Section 87 (d) of the RMA. It is due to expire on 1 June 2035.

There are six special conditions attached to this permit.

Condition 1 limits the volume of water taken to 33 l/s.

Condition 2 authorises taking only at times when the supply under consent 0596-3 has failed.

Condition 3 addresses measurement, recording and reporting of abstraction.

Condition 4 requires the adoption of the best practicable option to prevent or minimise adverse effects on the environment, including the efficient and conservative use of water.

Condition 5 deals with notification of and reporting on exercise of consent.

Condition 6 is a review provision.

1.3.1.3 Groundwater

The Company holds water permit **4719-2** to take and use groundwater from the Kapuni Stream (catchment) for industrial site remediation and process use purposes. This consent was issued by the Council on 31 August 2012 under Section 87 (d) of the RMA. It is due to expire on 1 June 2035.

There are four special conditions attached to this permit.

Condition 1 limits the volume of water taken to 200 cubic metres/day.

Condition 2 addresses measurement, recording and reporting of abstraction.

Condition 3 requires the adoption of the best practicable option to prevent or minimise adverse effects on the environment, including the efficient and conservative use of water.

Condition 4 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.

The Company holds two permits to discharge to water.

1.3.2.1 Stormwater

The Company holds water discharge permit **0598-3**, which allows for the discharge of stormwater from non-process areas, and raw water treatment plant wastewater, from an ammonia/urea plant to the Kapuni Stream and into an unnamed tributary of the Kapuni Stream. This consent was issued by the Council on 31 August 2012 under Section 87 (e) of the RMA. It is due to expire on 1 June 2035.

Discharge permit 0598-3 has a total of twelve special conditions which relate to the discharge of stormwater and wastewater.

Condition 1 limits discharge volumes.

Condition 2 requires the adoption of the best practicable option to prevent or minimise adverse effects on the environment.

Conditions 3 and 4 set limits on constituents in the discharge and beyond a defined mixing zone downstream, while condition 5 describes effects which must not arise beyond the mixing zone.

Condition 6 addresses monitoring for compliance with condition 4 on constituents in Kapuni Stream.

Condition 7 requires the Company to minimise the discharge of free phosphate.

Conditions 8 to 10 require the discharge to be undertaken in accordance with an effluent management plan, and the production and review of the plan.

Conditions 11 and 12 are review provisions.

1.3.2.2 Contingency discharges

The Company holds water discharge permit **1766-3** to discharge treated plant production effluent and contaminated stormwater from an ammonia/urea plant to the Kapuni Stream when wet ground conditions do not allow spray irrigation onto and into land. This consent was issued by the Council on 31 August 2012 under Section 87 (e) of the RMA. It is due to expire on 1 June 2035.

There are ten conditions associated with this consent which set out how the consent shall be operated and managed.

Condition 1 places restrictions on when consent can be exercised.

Condition 2 limits discharge volume.

Condition 3 requires the adoption of the best practicable option to prevent or minimise adverse effects on the environment.

Conditions 4 and 5 set limits on constituents in the discharge and beyond a defined mixing zone downstream, while condition 6 describes effects which must not arise beyond the mixing zone.

Conditions 7 to 9 require the discharge to be undertaken in accordance with an effluent management plan, and the production and review of the plan.

Condition 10 is a review provision.

1.1.5 Discharge to land permits

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.

The Company holds one resource consent for discharge to land.

1.3.2.3 Process wastewater

The Company holds discharge permit **0597-3,** which allows for the discharge of treated plant production effluent and contaminated stormwater from an ammonia/urea plant by spray irrigation onto and into land. This consent was issued by the Council on 31 August 2012 under Section 87 (e) of the RMA. It is due to expire on 1 June 2035.

Consent 0597-3 has a total of fourteen special conditions which relate to the method and management of disposal of wastewater to minimise effects on the surrounding environment.

Condition 1 defines the area of land where discharge is authorised.

Condition 2 limits the volume discharged.

Condition 3 requires the adoption of the best practicable option.

Condition 4 requires maximisation of discharge to land rather than to Kapuni Stream under consent 1766-3.

Conditions 5 to 7 require the discharge to be undertaken in accordance with an effluent management plan, and the production and review of the plan.

Conditions 8 and 9 require that the discharge not result in offensive odour or spray drift beyond the boundary of the property, while condition 10 specifies spray zones.

Condition 11 sets limits on nitrogen loading rate.

Conditions 12 and 13 deal with water treatment and cleaning chemicals.

Condition 14 is a review provision.

1.3.2.4 Domestic wastewater

The Company held water discharge permit **3967-1** to discharge up to 28 cubic metres/day of treated domestic wastewater from an ammonia/urea plant via soakage trenches to groundwater in the Kapuni Catchment. This permit was issued by the Council on 23 September 1991 under Section 21 (c) of the Water and Soil Conservation Act, 1967 and is deemed to be an existing right under section 386 (1) (e) (ii) of the RMA. It expired on 1 June 2011.

From 6 December 2010 this discharge has been covered by Certificate of Compliance **7751-0**, as a permitted activity pursuant to Rule 22 of the Regional Freshwater Plan for Taranaki [2001].

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.

The Company holds one permit to discharge emissions to air.

The Company holds discharge permit **4046-3** for the discharge of emissions into the air from the manufacture of ammonia and urea and associated activities. This permit was issued by the Council under Section 87 (e) of the RMA on 10 February 2012. It expires on 1 June 2035.

There are 13 special conditions attached to permit 4046-3.

Condition 1 requires the adoption of the best practicable option for controlling effects of discharges on the environment.

Condition 2 requires notification to Council prior to significant alterations to the plant.

Conditions 3 and 4 impose limits on ammonia emissions, while condition 5 requires monitoring of these discharges.

Conditions 6 to 8 impose limits on the emission of urea, carbon monoxide, nitrogen dioxide, and other contaminants.

Condition 9 requires odour generated at the site not to be objectionable beyond the plant boundary.

Condition 10 requires the provision of a report every three years addressing technological advances in ways to minimise emission, an evaluation and review of ammonia pressure safety valve systems, details of complaints received, and monitoring records required by condition 5.

Condition 11 requires the consent holder to convene meetings with Council and neighbours to discuss information relating to the consent.

Condition 12 requires the production of a site contingency plan in case of accidental discharge or spillage.

Condition 13 is a review provision.

This summary of consent conditions may not reflect the full requirements of each condition. The consent conditions in full can be found in the resource consent(s) which is/are appended to this report.

1.4 Monitoring programme: water

1.4.1 Introduction

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

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

Monitoring at the AUP is carried out by both Ballance and the Council. The monitoring programme for the AUP site consisted of three primary components:

- to determine compliance with conditions on resource consents;
- to determine the effects on surface waters and groundwater from the exercise of the resource consents; and
- to provide information for management of the wastewater disposal system.

1.4.2 Monitoring by the Company

Monitoring undertaken by the Company covers four main areas as described below.

1.4.2.1 Compliance

Compliance with resource consent conditions on abstraction and discharge rates and on discharge and receiving water compositions is determined on a regular basis.

1.4.2.2 Irrigation system management

The irrigation system is managed through monitoring of inputs from effluent, and outputs through grass removal and drainage to groundwater. Soil and herbage analyses are performed.

1.4.2.3 Groundwater

A series of monitoring bores within and around the irrigation areas is used to monitor the effects of the irrigation system on groundwater quality. A total of 42 monitoring bores have been installed at the AUP since 1981. An electromagnetic induction survey has been conducted annually since 2002.

1.4.2.4 Biological monitoring

Since 1981, biological monitoring of the Kapuni Stream and its tributaries has been carried out regularly by a consultant for the Company as part of a combined monitoring programme for the AUP and the Vector gas treatment plant on an adjacent site. The Kapuni Stream, in the vicinity of the AUP, is monitored approximately quarterly to detect any changes, over time, in the abundance or diversity of bottom dwelling organisms, and biannually for fish. This biological monitoring programme is jointly administered with the Vector gas treatment plant, which also discharges effluent into the Kapuni Stream. During the monitoring period, Stark Environmental Ltd was engaged to perform the quarterly sampling and to provide an interpretation of the resultant monitoring conducted. The results are forwarded to the Council for review.

1.4.3 Monitoring by Taranaki Regional Council

The water quality monitoring programme for the AUP site undertaken by the Council consists of four primary components as described below.

1.4.3.1 Programme liaison and management

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

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

1.4.3.2 Review of the Company's monitoring data

Monitoring data gathered by the Company are reviewed monthly to determine compliance with resource consent conditions and to assess trends in water usage, discharge composition and groundwater quality.

1.4.3.3 Site inspections

An officer of the Council visits the AUP site quarterly. Inspections are made of chemical dosage and storage areas, the stormwater system, the effluent treatment system and the irrigation areas. Monitoring results, irrigation records and activities which may influence plant effluent quality are discussed. The site neighbourhood is surveyed for environmental effects.

1.4.3.4 Chemical sampling

The results of monitoring reported by the Company are checked on two occasions within each year of the monitoring period by splitting samples of wastewater, stormwater and receiving waters (the Kapuni Stream) upstream and downstream of the discharge point and mixing zone concurrently for comparative laboratory analysis. The groundwater monitoring procedure is checked within each year of the monitoring period.

1.5 Monitoring programme: air

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

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

Monitoring of discharges to air at the AUP is carried out by both the Company and the Council. The purposes of monitoring are:

- to determine compliance with conditions on resource consents;
- to determine the effects on the receiving environment from the exercise of the resource consents; and
- to provide information for management of the discharges to the atmosphere.

1.5.1 Monitoring by the Company

The 'dust scrubber' stack was sampled isokinetically and analysed by a consultancy firm, K2 Environmental Ltd, on two occasions during the monitoring year.

Static monitoring stations for measurement of atmospheric ammonia concentration are maintained at two locations on the site boundary, in accordance with special condition 5 on consent 4046-3.

1.5.2 Monitoring by Taranaki Regional Council

The air quality monitoring programme for the AUP site consists of three primary components.

1.5.2.1 Programme liaison and management

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

1.5.2.2 Site inspections

The AUP is visited quarterly for routine monitoring purposes. The main points of interest during routine monitoring are plant processes with associated actual and potential emission sources and characteristics, including potential odour, dust, noxious or offensive emissions, and emissions of greenhouse gases. Sources of data being collected by the resource 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.

Inspections in relation to emissions to air are integrated with inspections undertaken for other purposes (e.g. effluent discharges).

1.5.2.3 Chemical sampling

The Council undertakes sampling of ambient air quality at the plant site on at least four occasions each year.

Particulate deposition is monitored annually using gauges placed at five selected sites in the plant vicinity for a single continuous period of approximately three weeks. The collected samples are analysed for ammonia, urea, conductivity, pH and airborne particulate concentrations.

Ambient gas levels are measured at or beyond downwind site boundaries on three occasions each year. Monitoring covers ammonia, carbon monoxide, volatile organic compounds (VOC), and combustible gases.

In addition, the data from emission testing by the Company's consultant are audited by the Council.

2 Results

2.1 Water

2.1.1 Inspections

The Company site was inspected on four occasions during the monitoring year under review. On all occasions, site management was found to be good and the effluent management system, irrigation areas, and stormwater systems found to be working well. All bunded areas were found to be secure.

2.1.2 Water abstractions

2.1.2.1 Waingongoro River abstraction

Process and operation water for the site is pumped from the Waingongoro River, which is located 7.2 km east from the Company site (Figure 1). Water is pumped at a rate of approximately 140 m^3/h (3,360 m^3/d or 39 l/s). The consented daily volume limit, of 3,456 m^3 at a maximum rate of 100 l/s, was increased by 15% to 4,000 m^3, without an instantaneous limit, under replacement consent 0596-3 in August 2012.

Figure 1 Map showing water intake structure adjacent to the Waingongoro River

Under the Resource Management (Measurement and Reporting of Water Takes) Regulations 2010, the Company 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 meters were already in place, and appropriate records kept, at the time the regulations came into force.

The daily abstraction record for 2016-2017 is presented in Figure 2.

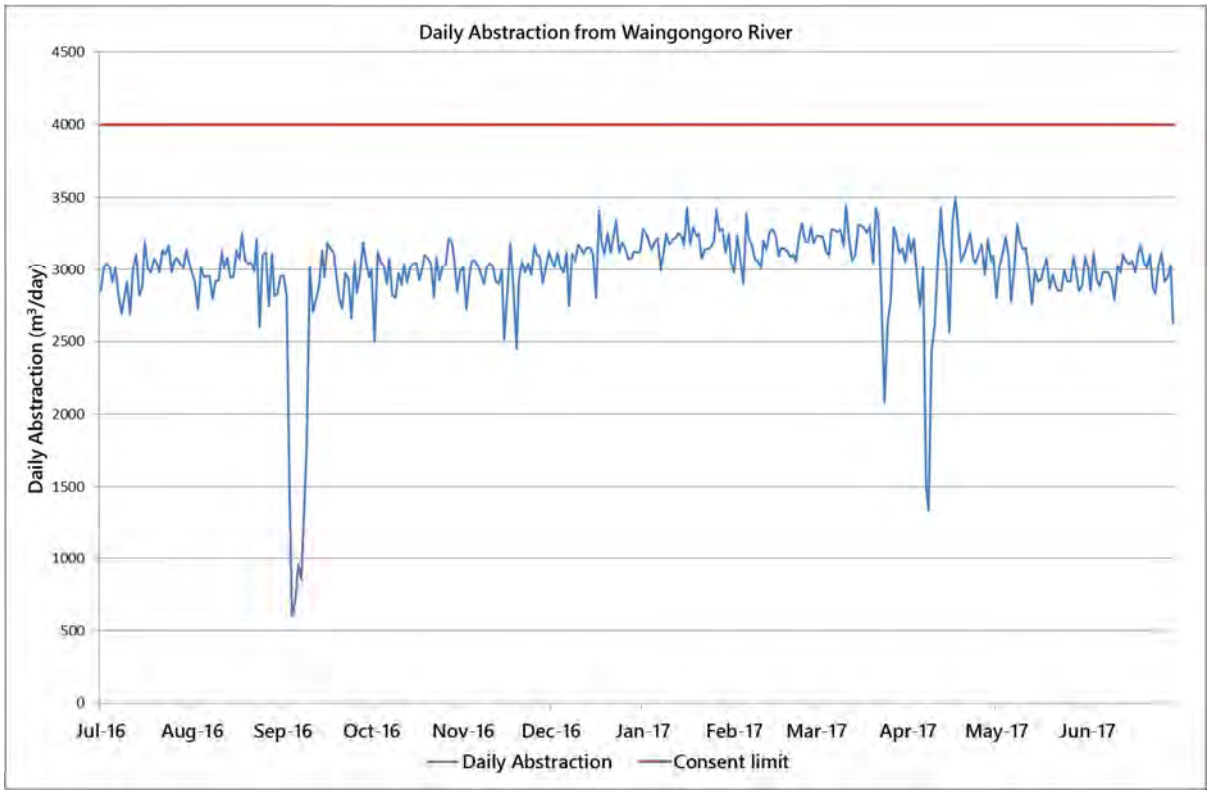

Figure 2 Daily water abstraction by the Company, July 2016 – June 2017

The record shows that the consent limit of 4,000 m^3/day on maximum abstraction volume was complied with throughout the 2016-2017 review period. The minimum daily recorded volume was 594 m^3/day and the maximum recorded daily volume was 3,504 m^3, or 88% of the limit. The median volume was 3056 m^3/day. The recorded total volume abstracted in the 2016-2017 reporting period was 1,094,167 m^3, an increase from the previous year (885,876 m^3) of 21%.

Verification of the accuracy of the measurement system was carried out by an authorised independent agent on 9 October 2014. The equipment was found to meet the required accuracy levels (+/- 5%).

2.1.2.2 Kapuni Stream abstraction

Water permit 1213-3, to abstract water from the Kapuni Stream at times when the normal water supply has failed, was not exercised during the 2016-2017 review period.

2.1.2.3 Intake options report and monitoring programme

Special conditions on consent 0596-3 require the Company to produce a report on options to minimise entrainment of juvenile fish through the water intake, and to develop a monitoring programme in consultation with Iwi:

9. By 31 January 2013 the consent holder shall provide the Chief Executive, Taranaki Regional Council with a report, including recommendations, on an investigation of the costs and benefits of altering the intake to meet design guidelines for minimising the entrainment of juvenile fish.

10. The consent holder shall ensure that a monitoring programme is developed and undertaken that determines compliance with the conditions of this consent and identifies, as far as practicable, the environmental effects resulting from its exercise. The monitoring programme shall be reviewed annually.

11. In developing the monitoring programme referred to in condition 10 the consent holder shall carry out reasonable consultation with Ngati Ruanui and Ngaruahine that includes submitting the monitoring programme relating to the operation, monitoring and environmental effects of the consented activity.

These new conditions were imposed to meet concerns raised by submitters to the consent application.

On 31 January 2013, the Company provided a report by consultant Tonkin & Taylor which set out a two-stage process for assessing the costs and benefits of altering the intake to minimise entrainment of juvenile fish. The preparation of a monitoring programme to determine compliance with consent conditions also was addressed.

Stage 1 was a review of certain assumptions made in the desk-top study that had been undertaken in the Assessment of Environmental Effects for the consent application. This involved physical survey of the intake site, and review of fish database records against a predictive model for native fish presence. An engineer and an ecologist visited the site on 5 March 2013 to view and assess the existing intake structure, and local river morphology and habitat types. Known barriers to fish passage (weirs) on the river were also visited. Cross sections along a 400 metre length of river around the intake were surveyed on 11 February 2013 under extreme low flow conditions. A hydraulic model was then developed to estimate sweep velocities at the intake site to allow assessment of the potential for entrainment of fish under a range of river flows and different intake structure designs.

Stage 2 involved a conceptual design and cost/benefit analysis for three alternative intake options to reduce fish entrainment risk, and a do nothing (monitoring only) option. The information gathered in Stage 1, on physical intake site conditions and species of fish likely to be present, would be used in setting design criteria for the intake options.

The Stage 1 report, dated 15 May 2013, was received by Council on 6 June 2013. Essentially, the assumptions made in the initial desk-stop study were confirmed.

A draft Stage 2 report, dated October 2013, was received by Council on 18 December 2013, and the final Stage 2 report, dated February 2014, was received by Council on 28 March 2014. The following is taken from the report summary and conclusions:

In order to undertake a cost/benefit assessment for intake upgrades it was necessary to develop two conceptual retrofit options that would achieve identified good practice criteria and reduce the risk of fish entrainment. A third off the shelf option was also considered. Costs for manual and automatic screen cleaning systems have been considered and costed.

The three options were designed such that intake velocities complied with NIWA guidelines for the species identified to potentially be at risk and for the Mean Annual Low Flow case. A fourth option to not upgrade the intake and undertake site specific monitoring to confirm if entrainment is occurring was also included in the cost benefit assessment. The four options are summarised as follows:

Option 1 involves providing new fish screens to the existing intake. This will be achieved by constructing metal frames fitted with a fine mesh screen that would be placed within the existing bulkhead guides. The screen mesh would meet the criteria for the protection of trout fry and would result in approach and sweep velocities that meet criteria (<0.1 m/s approach velocity and a sweep velocity higher than the approach velocity). The cost to design and install Option 1 with an automated cleaning system is estimated to be between $201,000 and $242,000.

Option 2 involves constructing a concrete channel on the face of the existing bulkhead and intake structure. The concrete channel would house an angled mesh screen and adjacent fish bypass. The screen mesh would meet the criteria for the protection of trout fry and would result in approach and sweep velocities that meet design criteria (<0.1 m/s approach velocity and sweep velocity higher than the approach velocity). The cost to design and install Option 2 with an automated cleaning system is estimated to be between $264,000 and $370,000.

Option 3 involves the installation of two Johnson Screens and an associated air burst cleaning system. This is an "off the shelf" product and is widely installed at intakes throughout New Zealand. The screen mesh would

meet the criteria for the protection of trout fry and would result in approach and sweep velocities that meet design criteria (<0.1 m/s approach velocity and a sweep velocity higher than the approach velocity). The cost to design and install Option 3 is estimated to be between $153,000 and $196,000.

Option 4 is the 'monitoring only' option with no upgrades to the intake. This would see approach velocity remain at 0.34 m/s with negligible sweep velocity and screens that don't meet good practice criteria in terms of mesh size. Monitoring is recommended to confirm the effect of the intake on native fish and trout. The estimated cost to undertake two years of monitoring is $70,000 to $80,000.

Overall, our desktop assessment has shown that the risk of entrainment is low. However site specific monitoring would be required to confirm an actual entrainment issue. Two years of monitoring is likely to be sufficient to establish this. If entrainment is confirmed to be occurring, or if the decision is made to implement upgrade measures anyway, the Option 3 (Johnson Screens) is the best value for money.

The preparation of a new monitoring programme to determine compliance with conditions on consent 0596-3 was deferred until the outcome of stage 2 of the intake investigation was completed, as this would affect the design of any fish surveys. In the interim, the existing programme of measuring, recording and reporting of abstraction volumes continued.

Consultation on intake options and monitoring

Condition 12 on consent 0596-3 requires liaison with interested parties on exercise of the consent:

12. At least once every year, the consent holder shall convene a meeting with representatives of the Taranaki Regional Council, Fish and Game, Department of Conservation, Ngati Ruanui and Ngaruahine. The meeting shall be for the purpose of discussing and generally informing the parties about the consent holder's monitoring data and the monitoring programme relating to the operation, monitoring and environmental effects of the consented activities.

A meeting for the Company to consult with and inform interested parties about the options and monitoring of its water intake on the Waingongoro River was held at the offices of Te Korowai o Ngaruahine Trust, Hawera on 7 October 2014. The meeting was attended by representatives of Ngaruahine Iwi, Taranaki Fish and Game, Department of Conservation, the Company and the Council. Apologies were received from representatives of Ngati Ruanui Iwi and of interested hapu of Ngaruahine. The Tonkin & Taylor report was circulated before the meeting.

It was agreed that the Company, with assistance from Council, would design and implement a monitoring programme to assess actual entrainment of juvenile fish though the intake structure, to determine whether any change to the structure was needed. A visit to view the intake was arranged for interested parties.

Issues unrelated to consent 0596-3, such as weirs on the river that form barriers to fish passage, and the general health of the river, were also discussed.

A visit to the Company intake by representatives of the parties present at the meeting was made on 4 December 2014.

2.1.2.4 Intake fish entrainment trial

Following the October 2014 consultation, a procedure was developed for the monitoring of any fish entrainment at the Company intake. The procedure involves the placement of a trap on the flow that is returned to the river via the "spillback" pipe (Photo 2). The trap comprises a fine mesh (2 mm by 1.5 mm) net in a perforated industrial bulk container (IBC). A large proportion of the water that is abstracted from the river under normal plant operation is diverted through the trap. Any animals caught are identified, counted and recorded. The trap can be operated at any time, to monitor for diurnal or seasonal variation in fish entrainment.

Photo 2 Intake fish entrainment trial, 27 November 2014

The first sampling run was conducted successfully on 27 November 2014 between 1120 and 1300 NZDT during a recession in river flow (1.2 m^3/s at Eltham Road hydrometric station, 13 km upstream, exceeded 66% of the time). Flow through the trap was raised gradually to 78 m^3/h, or 22 L/s, and held for over an hour, with a total volume sampled of about 97 m^3. The animals and detritus that were trapped are shown in Photo 3. No fish were caught. Eleven invertebrates were caught, including a stonefly, an adult dipteran and nine caddisfly, of which three were alive. Obtaining such small whole live specimens demonstrated that fish are not likely to be mashed by the pumps, and that fish larvae are not likely to escape through the net.

Photo 3 Detritus and invertebrates trapped in intake fish entrainment trial, 27 November 2014

The results of the initial trial were presented during the tour of the intake by interested parties. To address questions raised then about appropriate sampling to cover fish migrations and diurnal variation in fish movement, a fish migration calendar was drawn up with assistance from Fish and Game and the Department of Conservation. Two more day surveys were planned, and three night surveys to be carried out in February/March.

A second daytime survey was conducted on 5 February 2015, after delays caused by operational problems at the plant. The river was at approximately mean annual low flow (0.47 m^3/s at Eltham Road). No fish were caught in a run of about 77 minutes from 1300 NZDT. Three invertebrates were caught: two species of caddisfly and parts of one chironomid.

A night survey was conducted on 24 February 2015 between 2004 and 2130 NZDT. Sunset was at 2012 NZDT. The river was at approximately five-year return period low flow (0.33 m^3/s at Eltham Road). No fish were caught. Two invertebrates were captured.

No further testing was undertaken during the 2014-2015 review period, owing to delays caused by the plant control room being upgraded in March, at the end of the fish migration period. More testing was planned for October/November 2015, the next migration period, to be followed by a report on the trial.

Preparations were made for further night surveys in October 2015 and in January and March 2016. However, operational difficulties with the plant which reduced abstraction rate significantly, followed by a major plant turnaround in February/March 2016 with a prolonged start-up into April 2016, prevented the surveys from being carried out within the fish migration periods. During the turnaround, the control scheme for operation of the water intake pumps was upgraded to enable easier adjustment of rate of return to the river.

The interested parties were informed of the delay, and in June 2016 agreed to a postponement of the annual meeting until further night surveys could be completed and a report on the outcome of the fish entrainment trial produced.

Two further night surveys were carried out in October and November 2016.

A second night survey was conducted on 20 October 2016 between 1950 and 2100 NZDT. Sunset was at 1947 NZDT. The river was at approximately median flow (1.75 m^3/s at Eltham Road). No fish were caught. Six invertebrates were captured.

A third night survey was conducted on 23 November 2016 between 2020 and 2130 NZDT. Sunset was at 2025 NZDT. The river was above median flow (2.42 m^3/s at Eltham Road). No fish were caught. Eight invertebrates were captured.

After reviewing the data it was decided it was unnecessary for any additional surveys to be carried out and a report was written in April 2017 detailing the results and conclusions from the work (Appendix II). The main finding from the report was that no fish were caught in the five surveys and therefore the water intake is not likely to have a significant effect on fish populations in the Waingongoro River. This is assuming that if fish had been entrained they would have been detected using the described sampling methodology, that fish at risk of being entrained were in the river and that abstraction was representative of normal operations. The sampling generally targeted optimal times for fish entrainment but the absence of fish does not preclude fish being entrained in the water take. However, the results indicate that levels of fish mortality as a result of entrainment are not likely to have any meaningful effect on fish populations.

2.1.3 Discharge monitoring

2.1.3.1 Stormwater and raw water treatment discharges

Resource consent 0598-3 allows for the discharge of up to 6,000 m^3 of uncontaminated stormwater and raw water treatment effluent to the Kapuni Stream and its tributary daily. Stormwater is discharged to the Kapuni Stream from a holding pond. At times of extreme high rainfall, the stormwater is also discharged to an unnamed tributary of the Kapuni Stream which runs through the plant site.

Normally these discharges are in batches with a frequency ranging from daily to weekly, dependent on rainfall. During and after exceptionally heavy rainfall, the discharge may occur for continuous periods of up to 24 hours.

In 2016-2017, the average daily volume of stormwater discharged from the site to the Kapuni Stream and its tributary was 630 m^3, whilst a total of 46,639 m^3 of stormwater was discharged on 76 days during the monitoring period. The volume of material discharged is in compliance with the resource consent.

A standard stormwater discharge procedure has been developed by the Company for plant operators and has been approved by the Council. The procedure involves chemical analysis and visual inspection of the collected stormwater before each discharge. The flow of the Kapuni Stream is measured by a Flo-Dar

radar/ultrasonic flow measurement device installed beside the Vector gas treatment plant, and is checked against readings from the Council's hydrometric station downstream at Normanby Road. The stream pH and temperature are measured to allow the estimation of unionised ammonia concentrations. A suitably trained Company staff member must authorise each discharge.

About one hour after commencement of each discharge of the basin contents, chemical analysis of the Kapuni Stream at Skeet Road, 600 metres below the discharge point, is carried out to monitor effects on water quality.

Monitoring of the discharge was undertaken by the Company, and on two occasions during the monitoring year by the Council. The results of testing the samples taken by the Company and the Council are compared as a quality control measure. The results of the compliance monitoring and inter-laboratory comparison between the Council and the Company are shown in Table 3.

The resource consent requires that the discharge shall maintain a pH range of 6.5 - 9.0. Monitoring by the Company in 2016-2017 showed a range of 7.10 – 8.92, with a mean pH of 8.14, and that the resource consent limits were complied with throughout the review period.

The resource consent also requires the zinc concentration in the discharge to be below 0.5 g/m^3. The Company does not routinely test for zinc. Monitoring by the Council on 16 March 2017 showed zinc levels of 0.06 g/m^3 therefore complying with the resource consent.

The resource consent places maximum limits on unionised ammonia (0.025 g/m^3) and sodium (40 g/m^3) concentrations in the receiving water.

Compliance with the limit on unionised ammonia concentration was achieved throughout the monitoring year, the maximum recorded concentration downstream at Skeet Road attributed to the Company being 0.012 g/m^3 on 4th April 2017 (pH 7.73, total ammonia 0.96 g/m^3).

The limit on sodium concentration of 40 g/m^3 was complied with throughout the monitoring year, the maximum recorded sodium concentration downstream at Skeet Road being 24.0 g/m^3 on 13 June 2017 (10.09 g/m^3 upstream).

The monitoring results above demonstrate compliance with the conditions of resource consent 0598-3 in the Kapuni Stream and its tributary during the July 2016-June 2017 review period.

The comparisons of laboratory results showed generally good agreement, and compliance with consent conditions. Where differences did occur, the concentrations reported were generally so low as not to be of concern.

Table 3 Results of compliance monitoring and inter-laboratory comparison between Council and Ballance, 2016-2017 (note no grab sample was analysed by the Company on 3/8/16)

		Spray Irrigated Effluent IND002006								D-Min Waste and Stormwater IND002007				Kapuni u/s of AUP KPN000293				Kapuni d/s of AUP KPN000300			
		3 Aug 16		1 Aug 16		16 Mar 17		16 Mar 17		3 Aug 16		16 Mar 17		3 Aug 16		16 Mar 17		3 Aug 16		16 Mar 17	
		Grab		Composite		Grab		Composite													
		TRC	AUP	TRC	AUP	TRC	AUP	TRC	AUP	TRC	AUP	TRC	AUP	TRC	AUP	TRC	AUP	TRC	AUP	TRC	AUP
Time	NZST	1040	-	-	-	0855	0955	-	-	1027	-	-	-	1101	-	0943	-	1113	-	0955	-
Temperature	˚C	25.8	-	-	-	23.3	-	-	-	10.9	-	-	-	10.7	10.0	12.0	11.7	11.0	10.2	12.2	12.0
Conductivity, 20˚C	mS/m	283	-	242	-	162	-	180	-	45	47	22	22	10	10	8	8	10	10	8	9
pH	pH	8.3	-	7.7	-	7.9	-	7.9	-	8.4	8.5	8.3	8.4	7.4	7.6	7.6	7.7	7.6	7.7	7.6	7.7
Suspended solids	g/m^3	71	-	-	-	37	-	-	-	34	-	23	-	-	-	-	-	-	-	-	-
Turbidity	NTU	-	-	-	-	-	-	-	-	21	-	13	-	5.0	-	2.2	-	6.0	-	2.4	-
Ammonia (free)	g/m^3 NH_3	-	-	-	-	-	-	-	-		-	-	-	0.00004	<0.0001	0.0003	<0.0001	0.0010	<0.0001	0.0015	0.0032
Ammonia (total)	g/m^3 N	-	-	8.24	8.47	-	10.88	5.79	6.11	10.80	10.28	10.10	10.90	0.01	0.02	0.03	<0.01	0.11	0.04	0.23	0.26
Nitrate	g/m^3 N	-	-	22.6	23.0	-	42.0	19.0	23.0	-	-	2.1	-	1.3	-	0.5	-	1.3	-	0.5	-
Nitrite	g/m^3 N	-	-	0.43	0.42	-	12.10	6.61	6.84	0.49	0.50	0.60	0.60	<0.01	<0.01	<0.01	<0.01	0.01	0.01	0.02	0.06
Nitrate and Nitrite	g/m^3 N	-	-	23.0	23.42	-	-	25.6	29.8	4.61	-	2.68	-	1.35	-	0.54	-	1.36	-	0.51	-
Urea	g/m^3 N	-	-	2.52	3.54	-	-	1.70	3.02	7.71	7.99	5.76	3.16	-	-	-	-	-	-	-	-
Nitrogen (total)	g/m^3 N	59.0	-	35.6	-	63.1	-	-	-	-	-	15.1	-	-	-	-	-	-	-	-	-

		Spray Irrigated Effluent IND002006								D-Min Waste and Stormwater IND002007				Kapuni u/s of AUP KPN000293				Kapuni d/s of AUP KPN000300			
		3 Aug 16		1 Aug 16		16 Mar 17		16 Mar 17		3 Aug 16		16 Mar 17		3 Aug 16		16 Mar 17		3 Aug 16		16 Mar 17	
		Grab		Composite		Grab		Composite		TRC	AUP	TRC	AUP	TRC	AUP	TRC	AUP	TRC	AUP	TRC	AUP
		TRC	AUP	TRC	AUP	TRC	AUP	TRC	AUP												
Potassium	g/m³	-	-	149	-	-	-	125	122	3.8	-	-	-	-	-	2.7	-	3.6	-	2.8	-
Sodium	g/m³	-	-	403	-	-	-	230	225	68	70	-	19	-	9	7	7	9	10	8	8
Calcium	g/m³	-	-	63.4	-	-	-	71.5	70.4	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	g/m³	-	-	21.7	-	-	-	27.6	27.0	-	-	-	-	-	-	-	-	-	-	-	-
Chloride	g/m³	-	-	179	-	-	-	285	-	-	-	-	-	-	-	-	-	-	-	-	-
Phosphorus, diss. reactive	g/m³P	-	-	3.23	-	-	-	2.49	-	0.09	-	0.01	-	-	-	-	-	0.02	-	-	-
Copper (acid soluble)	g/m³	0.06	-	-	-	0.03	-	-	-	0.02	-	0.01	-	-	-	-	-	-	-	-	-
Chromium (acid soluble)	g/m³	0.03	-	-	-	<0.03	-	-	-	<0.03	-	<0.03	-	-	-	-	-	-	-	-	-
Mercury (total)	g/m³	0.0015	-	-	-	0.0010	-	-	-	<0.0002	-	<0.0002	-	-	-	-	-	-	-	-	-
Nickel (acid soluble)	g/m³	0.02	-	-	-	<0.02	-	-	-	<0.02	-	<0.02	-	-	-	-	-	-	-	-	-
Zinc (acid soluble)	g/m³	1.49	-	-	-	1.56	-	-	-	0.10	0.04	0.06	0.05	-	-	-	-	-	-	-	-
Hydrocarbons	g/m³	-	-	-	-	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-	-	-	-

2.1.3.2 Contingency discharges

When heavy or prolonged rainfall prevents irrigation of wastewater and results in the filling of the wastewater storage basins, treated wastewater is discharged to the Kapuni Stream via the stormwater outfall, as allowed for under resource consent 1766-3. The Environmental Management System Operating Manual for the plant (which includes the Effluent Disposal Management Plan required under condition 7 of the consent) sets out a procedure for discharge in Production Effluent Contingency events. The Plan requires the Council to be notified before each discharge period.

This resource consent was not exercised during the 2016-2017 review period.

2.1.3.3 Domestic sewage

Domestic sewage generated at the AUP is treated in a submerged aerated filter (SAF) plant of 22.5 m^3/d capacity which features anaerobic/anoxic primary treatment and two-stage aeration secondary treatment. The treated waste is discharged to land via a soak-away system. There are also two septic tanks. The discharges complied with the conditions of Rule 22 of the Regional Freshwater Plan, under which this activity is permitted, throughout the 2016-2017 review period.

Rule 22 provides for the large number of on-site domestic wastewater discharges that have no or only minor adverse effects on the environment. In accordance with Rule 22, the owner of the on-site domestic wastewater treatment system is not required to obtain a resource consent from the Council so long as the activity can comply with the conditions of the rule. The Council is satisfied that on-site domestic wastewater treatment systems that comply with the conditions of this rule will generally avoid contamination of soils, groundwater and waterways.

The conditions of Rule 22 primarily relate to the siting and proper operation of on-site domestic wastewater treatment systems. The first and second conditions preclude discharges being permitted if surface ponding, runoff or direct discharge of any contaminants to surface water occurs. The third and fourth conditions set the distance for a system to be sited from surface water and groundwater in order to avoid contaminants discharging into water and affecting water quality. The final condition precludes discharges being permitted if that discharge is noxious, offensive or objectionable to such an extent that it has or is likely to have a significant adverse effect on the environment. In such circumstances, the system is quite clearly not operating effectively and measures must be undertaken to address any problems before the discharge can once again qualify as a permitted activity. The Council considers that if the wastewater treatment system is designed, constructed, operated and maintained in accordance with the New Zealand manual of alternative wastewater treatment and disposal systems, referred to in the note at the foot of the rule table, then that system will meet the conditions of Rule 22. This advisory note is included to promote integrated management with the functions of 158 territorial authorities under the Building Act 1991 when granting building consent for on-site domestic wastewater treatment systems.

2.1.4 Receiving environment monitoring

Biomonitoring of the Kapuni Stream and its tributaries was carried out by the Company as required by the conditions of the resource consents. The Company monitored the ecological effects of wastewater and stormwater discharges from their operations on natural waters in the vicinity of the plant. Since 1981, biological monitoring of the Kapuni Stream and its tributaries have been carried out regularly by a consultant (Cawthron Institute until April 2007, Stark Environmental Ltd from August 2007) for the Company as part of a combined monitoring programme for the AUP and the nearby gas treatment plant operated by Vector Limited. The last biological survey (June 2017) was undertaken by the Council on behalf of Stark Environmental Ltd. It is anticipated that future fieldwork will be undertaken by the Council with the report prepared by Stark Environmental Ltd.

The programme involved assessment of changes in the abundance and diversity of the macroinvertebrates and fish communities. Up to nine sites in the Kapuni catchment, seven on the main stream and two in gullies that run through the irrigation area (Figure 3), were monitored quarterly for benthic macroinvertebrates and biannually for fish by electric fishing. Monitoring results and their interpretation are forwarded to the Council quarterly.

Figure 3 Biomonitoring sites in the Kapuni Catchment

The recommendation made from the preceding monitoring period that the two upper gully sites (2 and 3) be discontinued and a new site (13) established at the lower end of a separate gully that drains the western part of the AUP site was implemented for the current monitoring period. This adjustment to the monitoring programme was in response to sampling becoming increasingly difficult at the upper gully sites due to dense vegetation within the stream.

Streambed macroinvertebrate communities were sampled on 17 August 2016, 23 November 2016, 18 January 2017 and 1 June 2017 and electric fishing surveys were conducted on 23 November 2016 and 1 June 2017.

All the survey reports were reviewed by a Council freshwater biologist and a separate report prepared which summarises the findings of the individual reports which is attached as Appendix III. The general conclusions were that the macroinvertebrate communities in the Kapuni Stream were in good health and were not significantly affected by the Company's operations. The macroinvertebrate communities in the two gully tributaries were in fair health and had communities typical of small streams in catchments where

agriculture land use was predominate. Furthermore, there were no significant adverse impacts caused by activities associated with the Company on fish communities in the Kapuni Stream.

2.1.4.1 Tributary monitoring for total nitrogen

The surface tributaries of the Kapuni Stream which pass alongside, or under, the plant and irrigation areas have also been monitored regularly for nitrogen, which is found almost entirely as nitrate-nitrogen. Results for East Gully have remained generally below 10 g/m^{3}N, whilst the water in West Gully is generally in the range 15-25 g/m^{3}N (Figure 4). The concentrations of total nitrogen recorded in Buckthought Gully have shown a decrease from the peaks of the late1980s and since the late 1990s total N has fluctuated in the range 18-26 g/m^{3}N. The value of 28.1 g/m^{3}N recorded during the current monitoring period in August 2016 represents the highest value recorded since December 1995.

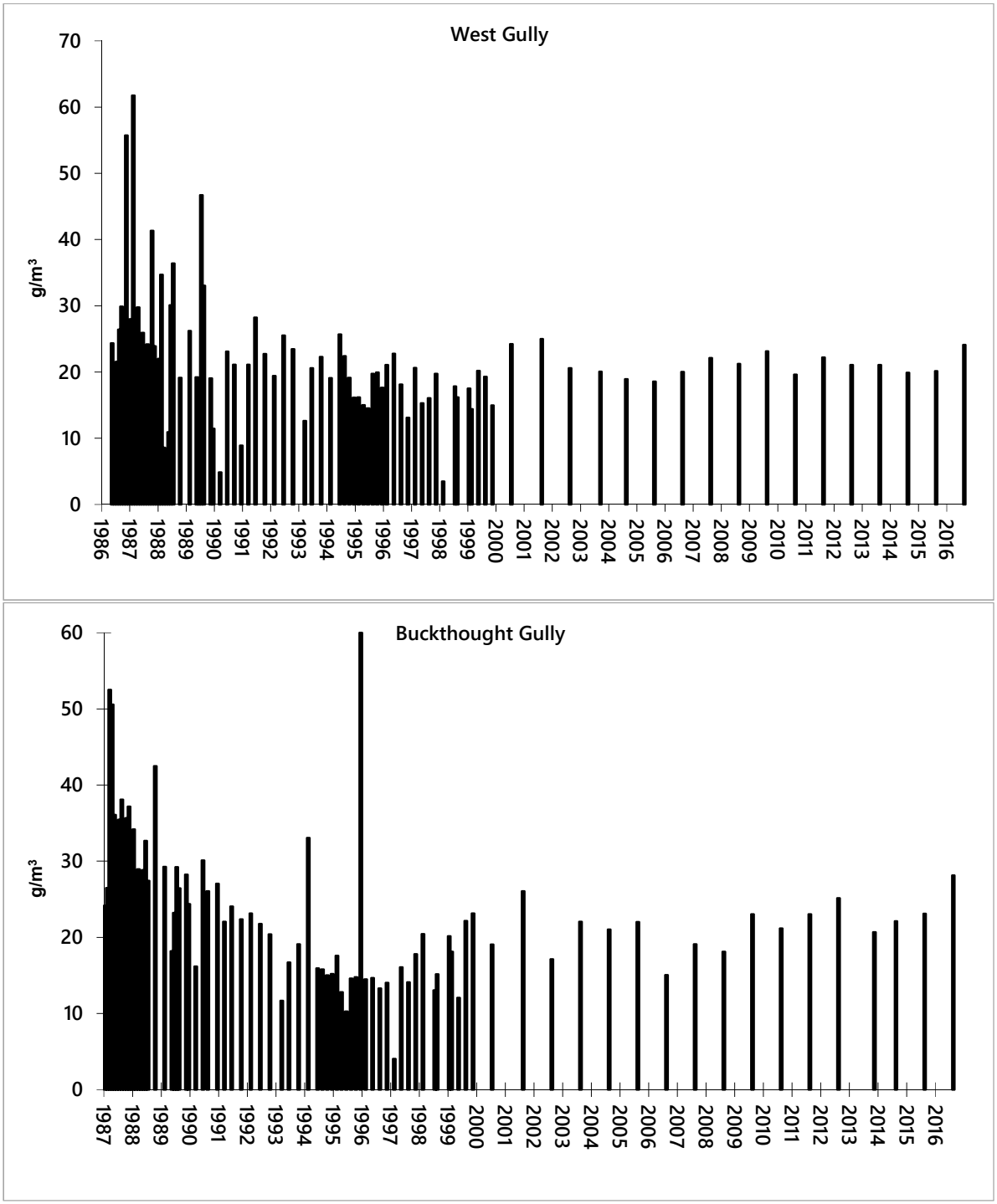

Figure 4 Total nitrogen concentration for West and Buckthought Gully (unnamed tributaries of the Kapuni Stream)

2.2 Land

Wastewater generated from the site, in the form of process effluent and contaminated stormwater, is disposed of, after treatment, by spray irrigation onto pastureland adjacent to the plant (Figure 5) under consent 0597-3. The irrigation system comprises 12.8 ha operated as a "cut-and-carry" area (Areas 1-6, blue shading), from which the grass is removed and supplied to a local farm. Until June 2004, an additional area of up to 30.3 ha on a neighboring farm to the west (Buckthoughts, Areas 7 -10, red shading) was operated as a "grazed" area.

A new grazed area was established on another neighboring farm, to the south (Luscombes, Area 11, green shading) in December 2004, which was increased in stages to 15.2 ha by January 2008. Use of the Buckthought grazed area recommenced in February 2009, 18.7 ha being irrigated (Area 7 and Area 8 adjacent to the cut-and-carry area), but ceased again in February 2011. The Luscombe grazed area was increased by 11.2 ha (Area 12) to 26.4 ha in October 2013. Effluent is applied by travelling irrigators.

Due to the nature of activities at the the Company site, wastewater generated from the site contains nitrogen, therefore, there is potential for nitrate contamination of groundwater beneath the irrigated areas as a result of discharging the wastewater. A formal plan for the management of the waste disposal system was compiled in 1990 from procedures developed during eight years of operational experience and from advice provided by the Department of Scientific and Industrial Research, Grasslands Division (DSIR), now AgResearch Limited, Grasslands Division (AgResearch). The success of the system relies on the minimisation of nitrogen output and on good soil and pasture management of the irrigation areas.

The rate of nitrogen removal by pasture uptake and through microbial transformations is governed by many factors, including the infiltration capacity of the soil, soil temperature, mineral content of the waste (particularly the cation balance), hydraulic loading (rainfall is the major factor), application method, grass removal method, and livestock management.

Plant effluent is monitored for nitrogen species, and for cations, which affect soil stability. A certain amount of nitrogen is required for the health of pasture and the cut-and-carry area may not be receiving adequate nitrogen for optimal growth at certain times of the year.

Alkali metal ions (sodium and potassium) will deflocculate the soil when present at elevated concentrations. The concentrations of these ions are reduced through the discharge of their main source, ion exchanger regenerant, to the Kapuni Stream with stormwater under consent 0598-3.

Soil and herbage testing of the irrigation areas has been undertaken bi-annually, in spring and autumn, to determine the requirements for soil stability and grass health. Applications of gypsum and Epsom salts (soil conditioners) are delivered routinely according to the results of the analyses. Other nutrients, such as superphosphate, are applied as required.

Care is taken to ensure that effluent run-off does not occur and that pasture damage from water logging, vehicle traffic or pugging by livestock is minimised. At times of intense or prolonged rainfall, the effluent may be discharged under consent 1766-3 to the Kapuni Stream, provided there is sufficient flow in the stream, to avoid irrigation of flooded areas.

2.2.1 Inspections

The Company site was inspected on four occasions in the year under review. On each occasion site management was found to be good and the effluent management system, irrigation areas, and stormwater systems found to be working well.

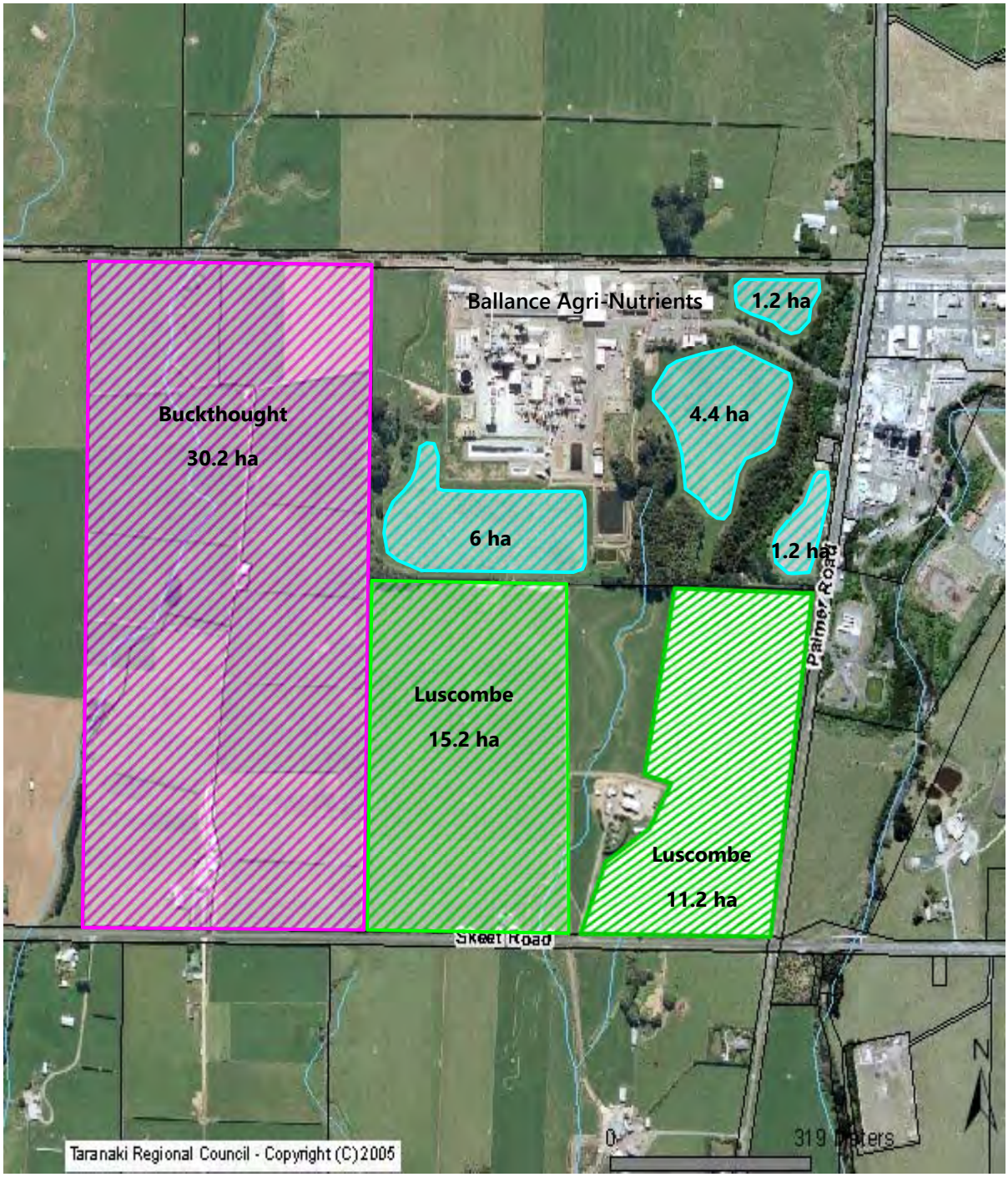

Figure 5 Irrigation areas

2.2.2 Discharge monitoring

2.2.2.1 Effluent volume

Special Condition 2 of consent 0597-3 limits the volume discharged to 1,470 m^3/d.The Company measures and records daily the effluent volume sprayed on each irrigation plot and produces the data in monthly reports which are forwarded to Council. By summing the daily plot volumes, compliance with the consent limit can be determined. The data in the monthly reports demonstrate that the daily volume limit was complied with throughout the 2016-2017 review period.

In 2016-2017, the total volume of effluent irrigated was 198,997 m^3, of which 121,684 m^3 was applied to cut-and-carry areas, and 77,313 m^3 to grazed areas. This was an increase of 56,253 m^3, or 39%, from the previous year but was very similar to the 2014-2015 year of 203,394 m^3. The 2015-2016 year had a shutdown period and therefore production and associated discharges were lower than normal.

2.2.2.2 Effluent nitrogen

In 2016-2017, the total mass of nitrogen disposed of was 8,145 kg, comprising 2035 kg ammonia, 5,588 kg nitrite/nitrate and 522 kg urea, an increase of 2,242 kg, or 38%, from the previous year.

2.2.2.3 Nitrogen application rates

Special Condition 11 of consent 0597-3 limits the application rate of total nitrogen onto the irrigation areas. The limits on cut-and-carry and grazed pasture areas are given in the table below (Table 4), together with the average application rates for the last seven years.

Table 4 Average nitrogen application rates for cut and carry and grazed pasture areas for 2016-2017

Area	Consent limit	Average nitrogen application rate kg/ha/y							
		2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017
Cut and carry area	1,000	613	495	294	397	472	542	387	434
Grazed pasture	300	230	177	53	146	177	287	63	204

The nitrogen application rates for each operational area are presented in Figure 6.

2.2.2.3.1 Cut and carry areas

The Company complied with the maximum application rate of 1,000 kgN/ha/y specified in the resource consent for the cut-and-carry areas at all times during the 2016-2017 monitoring period. The Company also has an internal target for cut and carry pasture of 600 kgN/ha to promote good pasture health and they also met this target.

In the 2016-2017 period, the average nitrogen loading across the cut-and-carry area was 434 kgN/ha. The nitrogen application rates for each operational area are presented in Figure 6.

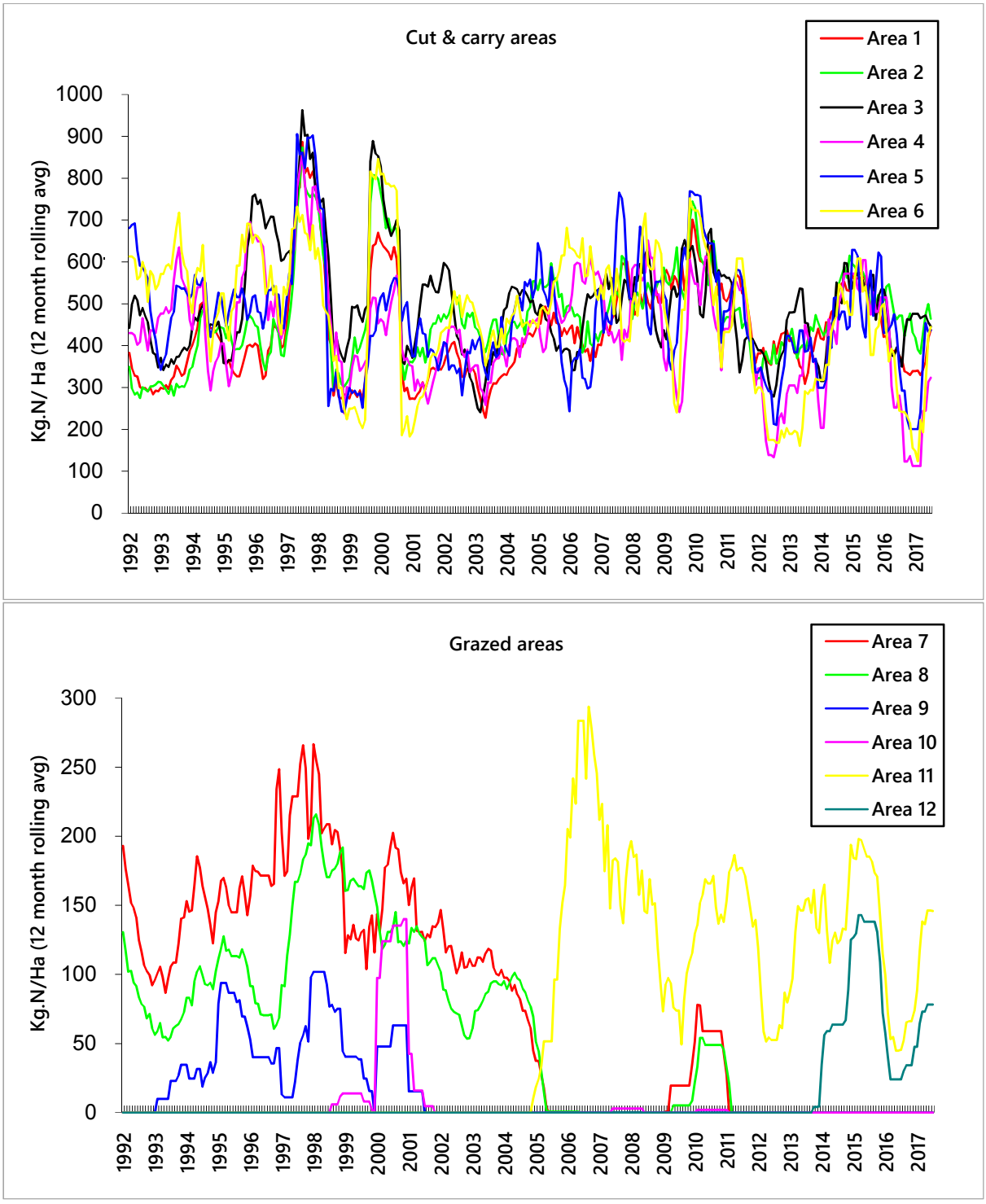

Figure 6 Nitrogen application rates on spray irrigation areas, January 1992 to June 2017

2.2.2.3.2 Grazed areas

The Company complied with the maximum application rate of 300 kgN/ha/y as specified in the resource consent conditions for the grazed areas at all times during the 2016-2017 monitoring period. The average application on the grazed areas amounted to 204 kgN/ha/y.

2.2.3 Soil and herbage monitoring

The Company employs AgResearch to carry out monitoring of plants and soils of the irrigation areas. This was the 30th year that the monitoring was undertaken.

The primary objective of the programme is to provide a management plan for the effluent disposal areas. In the case of the cut-and-carry area this is aimed at maintaining conditions which maximise the uptake of nitrogen, potassium and sodium from the effluent while preventing accumulation of leachable nitrate in the soil.

This includes managing the balance of cations in the surface soil to prevent deflocculation of soil colloids and the consequent loss of its ability to infiltrate water (hydraulic conductivity).

The grazed area is managed with similar objectives. However, the total amount of nitrogen applied is limited by the capacity of the system to absorb and redistribute nitrogen rather than its removal.

A secondary objective is the monitoring of the effluent disposal areas to assess the performance and to allow modifications of the management plan.

The monitoring has two components:

1. Spring sampling which is centred on nutritional status of the areas and balance of cations in the surface soil; and
2. Autumn sampling which details the movement of nitrate through the soil profile to the saturated zone.

In July 2001, the Council agreed that assessment of the sodium and potassium adsorption ratios (SAR and KAR respectively) during the autumn sampling round could be discontinued, as the ratios had been consistently within acceptable limits in recent years. This was based on AgResearch's opinion that the more detailed sampling undertaken each spring is a better indication of changes to cation ratios in the receiving environment. However, should subsequent sampling indicate any significant change in the cation adsorption ratios, then the autumn sampling should be re-established to ensure no adverse effects on the receiving environment.

AgResearch undertook sampling at the Company site on 28 November 2016 and 11 May 2017. The results of the AgResearch sampling undertaken in the 2016-2017 monitoring period are summarised below.

2.2.3.1 Spring 2016 soil and herbage survey

Surface soil and plant samples were taken in 28 November 2016 from the cut-and-carry area and Luscombes' original and new grazed areas, and soil only from a control area on the Luscombe farm not receiving any effluent.

It was difficult to get an estimate of the bare areas due to the long and stalky growth at the time of the sampling.

Surface soil SAR in the cut areas had increased above last year's highs (maximum 4.07 and 8.19 for 2015 and 2016 respectively). Sodium levels within the 30 cm soil profile are the highest since measurements began in 1986. The sum of the SAR and KAR exceeded the upper safe threshold of 3.0, increasing the risk of soil deflocculation which would have several undesirable effects including restricting the downward movement of irrigation and rainfall through the soil profile and promoting an undesirable anaerobic environment. It was suggested by AgResearch that Epsom salts be applied to cut and carry areas to reduce SAR ratios and this is being done by the Company. The grazed areas within the Luscombe property had increased but satisfactory SARs.

Herbage was analysed for titanium as a measure of soil contamination. For all the cut and carry plots, levels were below the minimum analyser level, while grazed plots had slightly higher levels but were still satisfactory. Herbage cobalt levels in all areas were below the minimum recommended value for animal health requirements.

2.2.3.2 Autumn 2017 deep soil leaching profiles

The May 2017 deep soil sampling survey report found that annual nitrogen application to the sampled cut areas had decreased by 15% (for the May to April year), and winter application by 34% over values recorded last year. The profile nitrogen mass to 3 m depth of the cut areas was 25% lower than the last year's high. To reduce the potential for excess leaching, the measured profile mass needs to be lowered further with a an aim to have a profile mass below 0.5 m.

As usual in the grazed areas, there was large variation between and within the profiles as a result of the uneven distribution of nitrogen from livestock urine, making trend analysis difficult. Again, a control plot adjacent to the cut area showed elevated nitrate concentration at the bottom of the profile, which was attributed to underground flow from the cut area.

2.2.4 Groundwater and related tributary monitoring

There are 42 groundwater monitoring bores established at the Company site. The monitoring bores at the plant are monitored by the Company for different purposes. The original sites were established to monitor the effects on groundwater of the application of effluent onto land under Consent 0597-3.

More recently, sites have been introduced for general site assessment and in response to specific problems. These include the monitoring of a contaminant plume resulting from leaks in the finished effluent catch basin (FECB) and from contamination detected around the urea process area. The functions of each of the monitoring bores are summarised in Table 5, and their locations are given in Figure 7.

Table 5 Groundwater monitoring bore functions

Site	Monitoring bore	Approximate Total N Concentrations (g/m^3)
Control site	22	
Irrigation areas	3, 4, 5, 7, 10-1, 10-2, 10-3, 10-4, 10-5, W, W1, W2	100 (Bore 10-5 unaffected)
Skeet Road	1, 2, 8, 12-1, 12-2, 12-3	<3 - 30
FECB plume	East and West bores, 4, 13 to 21, 30	60-100
Plant site	23 to 29, 31 to 40	300 – 15,100

Figure 7 Locations of groundwater monitoring bores

2.2.4.1 Electromagnetic induction survey

In June 2002, the groundwater monitoring programme was altered to include an electromagnetic induction (EMI) survey to be conducted annually which would help in identifying any contaminated groundwater and the extent of the contamination by measuring the electrical properties of the soil.

The EMI surveys cover the large paddocks on the south and west side of the main production plant as well as the adjoining paddock on the neighbouring farm. Also included are roads inside the plant and the large paddock immediately south of the administration offices.

The preceding EMI survey was conducted in February 2016. Roadways inside the plant operational area were not included, due to the amount of activity during a plant maintenance shutdown. The survey indicated generally similar soil conductivity levels in the main paddock to the south of the plant site (cut-and-carry). In the paddock south of the administration offices, soil conductivity levels were also generally similar to those from the February 2015 survey, a reduction in elevated soil conductivity. Additionally there was a small area of slightly elevated coil conductivity around one effluent hydrant. No new soil conductivity plumes were found, and there was no significant change from the previous survey results that would require further investigation.

An EMI survey was conducted during the period under review, in March 2017. As in previous years, the soil conductivity contour plan for the paddock south of the administration offices (Main South Paddock) showed evidence of a plume which had accumulated, and was currently centred around the southwest section of this paddock. However, the survey indicated a general increase in the area associated with the high soil conductivity plume. Furthermore, the area of elevated soil conductivity which was seen in the 2016 survey had also increased in size.

There was no change in conductivity in the neighbouring South-side Luscombe farm.

The Administration Block Paddock showed an increase in the extent of the plume of elevated soil conductivity around effluent hydrant in the Southern section of this paddock.

2.2.4.2 Groundwater monitoring in relation to effluent irrigation

The ‘irrigation’ monitoring sites are sampled regularly, at frequencies ranging from monthly to annual, depending on groundwater composition. Groundwater levels were measured and the samples analysed for conductivity, pH, ammonia, nitrate, nitrite, urea, sodium and chloride.

Three of the monitoring bores (Bore 10, Bore W and Bore 12) are multi-piezometric (that is, a cluster of standpipes screened to allow the monitoring and collection of groundwater samples at various depths). These monitoring bores provide the most valuable information as they generate data on the depth of the effects of the irrigated effluent. Bore 10 was drilled at the downslope boundary of the cut-and-carry irrigation area in January 1987; Bore 12 was sunk 500 m further downslope, at Skeet Road, in July 1989. The three shallower piezometers in Bore 10 (10-2, 10-2 and 10-3) were replaced with three piezometers (W, W1 and W2) set at slightly different depth intervals in November 2005, as the seals between some sampling intervals appeared to be failing.

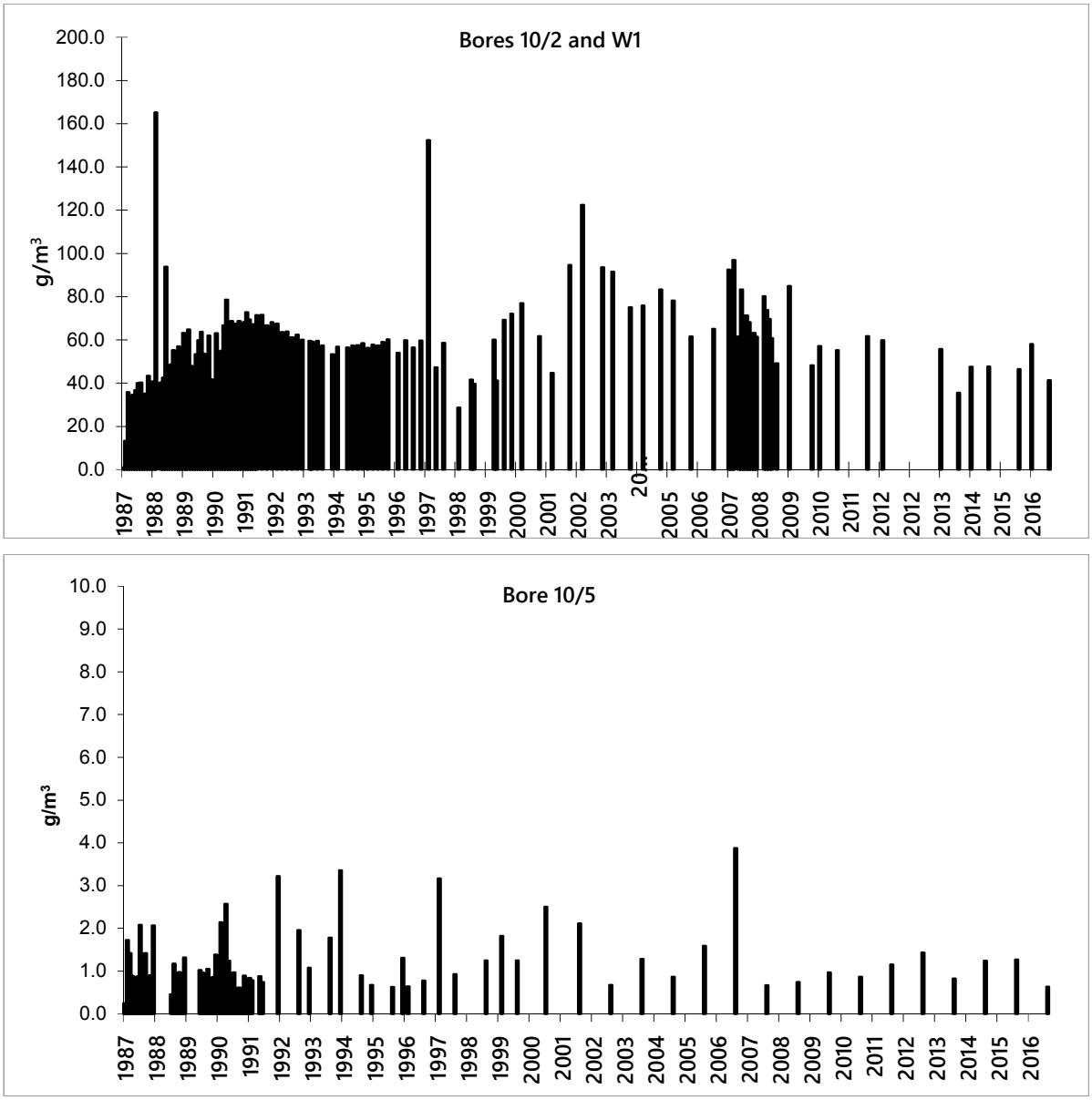

Figure 8 Total nitrogen concentrations in groundwater beneath spray irrigation areas (bores 10-2 and W1, and bore 10/5)

Monitoring results for Bore 10 over the past 30 years have indicated that groundwater is affected by effluent irrigation at a depth of 6.0 to 7.0 m (Bore 10-2), but not at 11.0 to 13.0 m depth (Bore 10-4). Total nitrogen concentrations for Bore 10-2 and Bore W1 are presented in Figure 8, together with values for Bore 10-5 (18.0 to 19.5 m) for comparison.

During the early and mid-1990s total nitrogen concentrations at Bore 10-2 fell slowly from about 70 to 60 g/m^3, (with an unexplained peak in February 1997), and have since gone through fluctuations over periods of about three years which have ranged from about 30 to 120 g/m^3. Monitoring ceased at bore 10-2 in October 2005 due to bore seal failure, though sampling at bores 10-4 and 10-5 has continued. Bore W1, at a depth of 5.5 to 7.5 m is comparable in depth with Bore 10-2. Results in 2016 were similar to those of the previous five years, from 41 to 58 g/m^3. Bore 10-5 is unaffected by the discharge of effluent to the land, with total nitrogen concentrations of about 1 g/m^3.

The peaks recorded for Bore 10-2 may be due to high nitrogen irrigation loadings. However, seasonal and several-year variations in nitrogen concentrations of similar scale occur in wells which are not affected by effluent irrigation. Therefore, peaks may not be irrigation related, but due to variations in rainfall recharge,

which affect the concentration of the nitrogen plume derived from the production area (discussed further below).

Until the source of these fluctuations can be confirmed, attention needs to be paid to the timing and magnitude of effluent nitrogen loadings to avoid additional losses to groundwater which may be unsustainable.

Bore 12 is situated beside Skeet Road and approximately 500 m downslope of the cut-and-carry area. At Bore 12-1 (screened at 3 to 4.1 m below ground level) monitoring shows total nitrogen concentrations since early 1990s have fluctuated between 8.4 and 31 g/m^{3}N, with a general downward trend. Bores 1 and 8, east and west of Bore 12 on Skeet Road show a similar trend.

At Bore 12-2 (screened at 6 to 7.1 m below ground level) the nitrogen concentrations since 2000 have fluctuated over the range 9.0 to 22 g/m^{3}N. Groundwater at Bore 12-3 (screened at 8 to 9.1 m below ground level) has typically shown low total nitrogen concentrations of less than 6.0 g/m^{3}N.

2.2.4.3 Groundwater monitoring in relation to the FECB plume

A leak from the finished effluent catch basin (FECB) occurred during the 1980s which subsequently was repaired. A second leak occurred during the 1990s. Following the second leakage the Company stopped using the basin altogether. During the 1996-1997 monitoring period the basin was relined with a double skin liner and a leak detection system was installed. However, during the basin re-commissioning, it leaked again and had to be repaired. A third layer was introduced to ensure the soundness of the system.

Groundwater is sampled at 14 monitoring bores established down slope of the FECB and on the spray irrigation area. These monitoring bores have been installed to determine the rate of movement and dispersion of ammonia that has leaked from the FECB over the past 33 years.

Monitoring by the Company in the way of a geophysical survey conducted by GPR Geophysical Services indicates that ammonia from the historical leakage is moving slowly in a narrow plume towards a tributary of the Kapuni Stream. There will be some degradation of the ammonia to other nitrogen species occurring in the subsurface. Due to dilution from the effects of dispersion and natural attenuation of the plume the total nitrogen concentrations reaching the tributary are expected to be low. There will be further dilution with the surface water in the tributary should the plume reach the tributary. Current monitoring shows the plume is yet to extend to this tributary.

Monitoring of the down gradient bores shows the plume is presently relatively stable as a result of the removal of the source (that is, repairing the FECB) and the continued abstraction and treatment of groundwater from three of the down gradient monitoring bores (East Bore, West Bore and Bore 30) under consent 4719-2. The East and West Bores have been pumped since 1992 and Bore 30 since late 1994.

At West Bore, which is pumped at a location immediately downslope of the FECB, nitrogen levels were relatively stable after the last liner was installed, fluctuating between 44 and 198 g/m^3 since 1999, with a spike in winter 2013, when a value of 444 g/m^3 was measured (Figure 9).

Bore 14 is situated near the centre of the plume about 50 m downslope of the FECB. The results of monitoring show a reduction in total nitrogen concentration from 800 g/m^3 in 1994 to less than 150 g/m^3 since 2000, and with results of 114 and 124 g/m^3 in December 2016 and February 2017 respectively.

Bore 30 is one of the down-gradient pumping bores, downslope and west of Bore 14. Nitrogen levels there are affected potentially both by the ammonia plume and by irrigation of effluent. Overall, total nitrogen concentrations have decreased from 300 g/m^3 in 1995 to 72 g/m^3 in September 2016, with fluctuations that may reflect effluent irrigation or recharge variation.

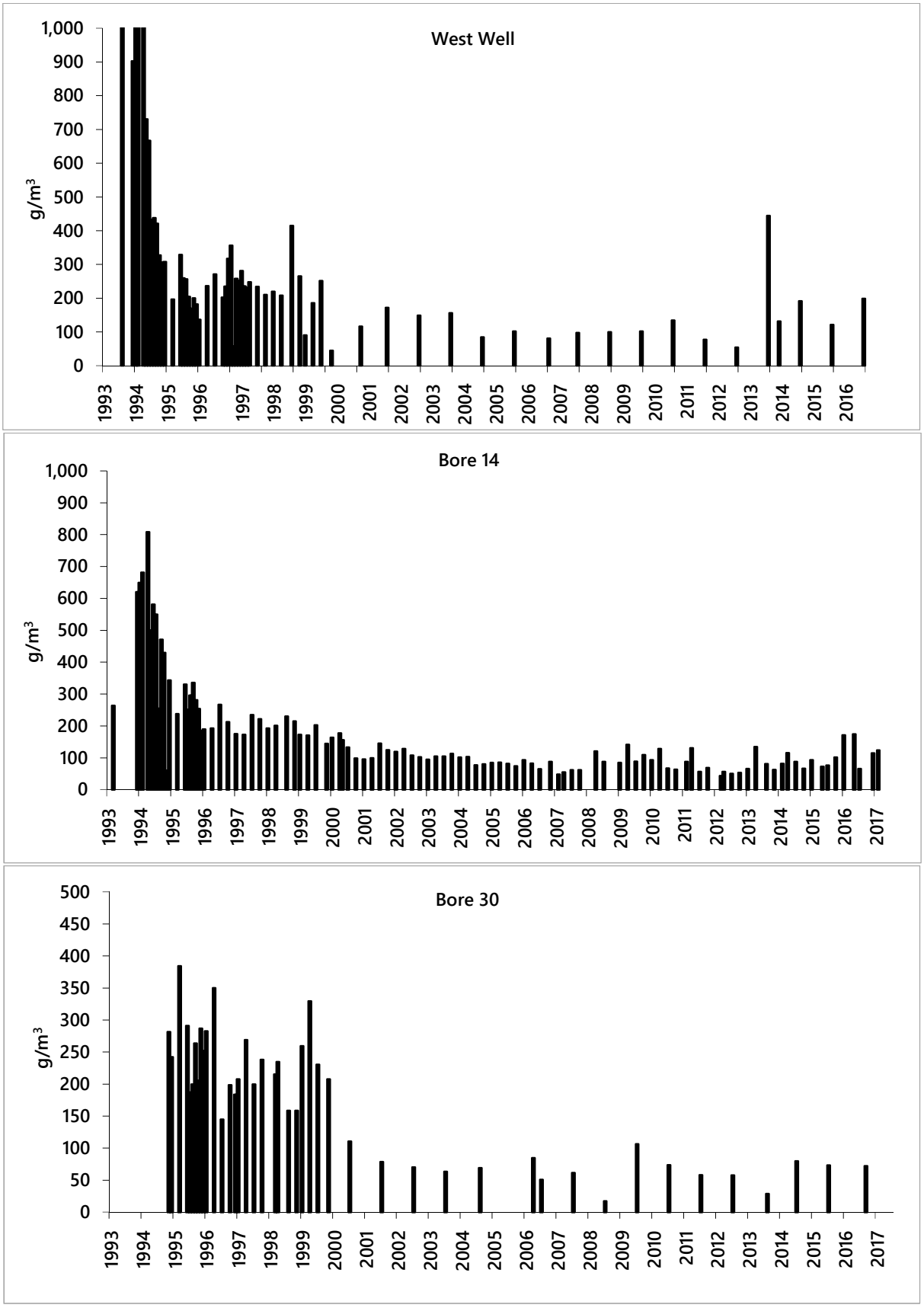

Figure 9 Total nitrogen concentration in groundwater associated with the FECB plume monitoring

The total nitrogen concentrations in Bore 4 and Bore 17 (50 and 65 g/m^3, respectively), located further down gradient, whilst being elevated have remained relatively stable with a slight downward trend evident. Pumping from East Bore, West Bore and Bore 30 should continue along with monitoring of the other bores.

2.2.4.4 Groundwater monitoring in relation to the granulator plume

The Company has extended its groundwater monitoring programme to other areas of the plant. High total nitrogen concentrations, predominantly in the form of ammonia, had been detected in the vicinity of the granulator area of the plant. The high level of 11,500 g/m^{3}N was recorded for Bore 32 in 1998. In response to these elevated nitrogen concentrations, the Company has undertaken remedial pumping at Bore 25 and Bore 32 since late 1994 (Figure 10) under consents 4719-1 and 4719-2. Pumping from, and monitoring of, these bores has continued through to the monitoring period under review.

Total nitrogen concentration in the pumped groundwater varies according to rate of pumping, increasing when abstraction ceases. Since 2000, total nitrogen concentration has ranged from about 300 to 15,000 g/m^3, mainly in the form of ammonia. In July 2005, the nitrogen in Bore 25 increased sharply, possibly as a result of not pumping during a plant shut-down the previous month, and remained elevated for eight years. Another peak occurred in mid-2013, again possibly as a result of not pumping for a period, with further peaks in March 2014 (13,500 g/m^3), March 2015 (15,121 g/m^3) and April 2016 (12,200 g/m^3). During the period under review nitrogen levels were still high with a median amount of 3,695 g/m^3 but no exceptionally high spikes were recorded with a maximum level of 5,215 g/m^3 recorded in November 2016.

In 2008-2009, there was a 'spike' in total nitrogen at Bore 32, to 11,000 g/m^3, as the result of there being no pumping and treatment during a plant maintenance shutdown. Bore 38, closest to and down-gradient of the pumped bores, showed an increase in total nitrogen concentration early in 2006, for a period of about two years, which then reduced to 1,000 to 2,500 g/m^3. For the current period there was a spike detected in a March sample (sampled for the February period) of 4,467 g/m^3 which was possibly a product of the nitrogen spikes that were recorded in bore 25 in 2015 or 2016.

Further down-gradient at Bores 39 and 40, total nitrogen concentrations have been much lower with Bore 39 ranging from 247-398 g/m^3 and Bore 40 from 89-100 g/m^3 over the last five years with a larger proportion recorded as nitrate. Continued annual monitoring is recommended to identify significant trends (if any) in this area. The granulator plume is situated in the middle of the plant site and poses no short-term threat to freshwater ecosystems.

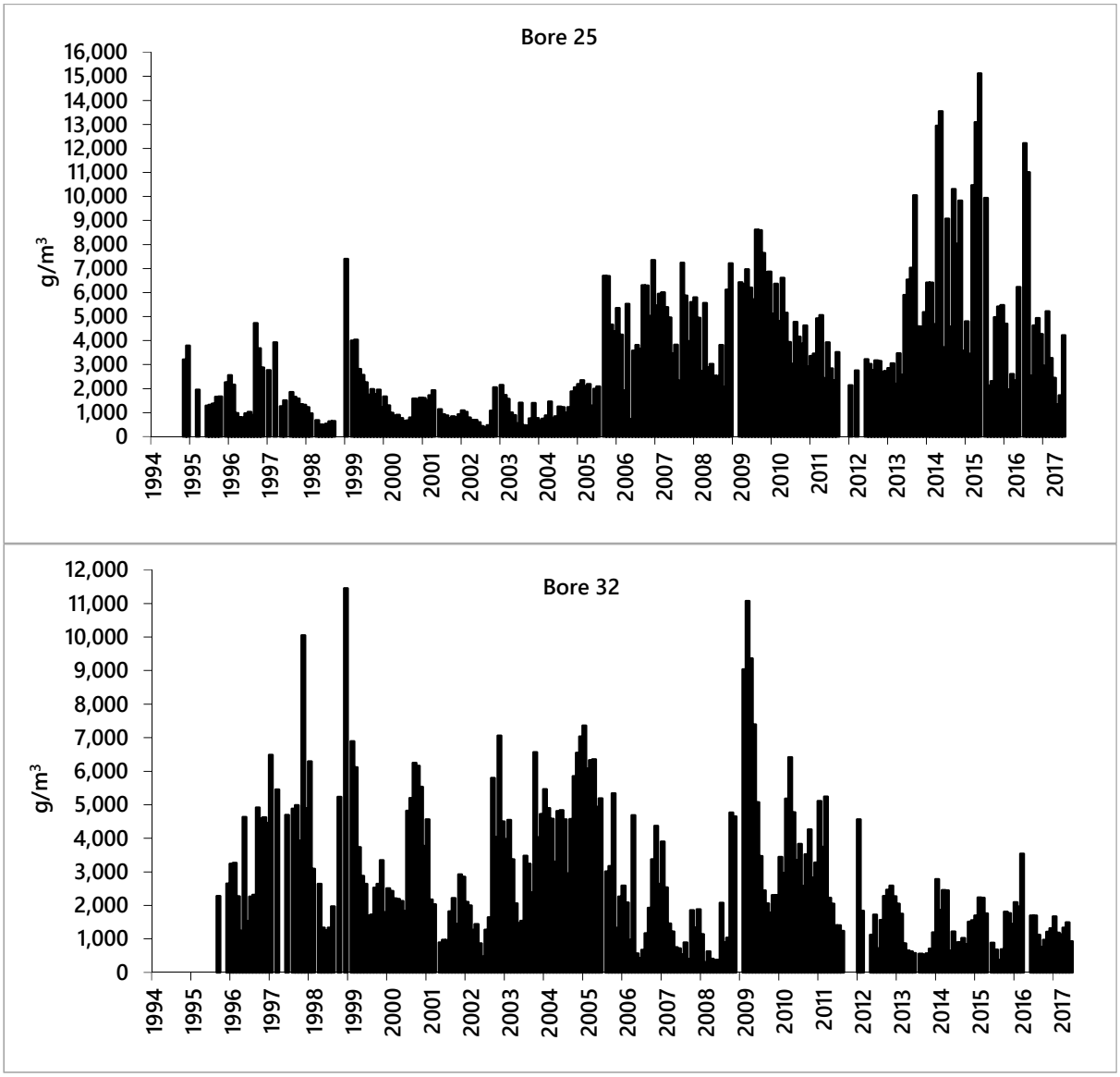

Figure 10 Total nitrogen concentration in groundwater in the vicinity of urea processing (bores 25 and 32) areas

2.2.4.5 Groundwater monitoring in relation to the bulk urea storage and load-out area

Monitoring of groundwater in the vicinity of the bulk urea load out area at Bore 24 has been undertaken since November 1994 (Figure 11). Total nitrogen concentrations increased steadily from a median value of 50 g/m^3 for the 1994-1996 period to 87 g/m^3 for the 1996-1998 period to 202 g/m^3 for the 1998-2000 period indicating that activities at the bulk store area were raising nitrogen levels in groundwater.

Nitrogen levels have since fluctuated between about 87-300 g/m^3 with occasional spikes of up to 678 g/m^3. A relatively high result of 401 g/m^3 was recorded in July 2016 which was the highest result recorded since July 2009 but the following result in October 2016 was 147 g/m^3 which was a more typical value for the site. No data has been provided by the Company since October 2016 due to equipment needing to be replaced. This needs to be done as soon as practicable. Monitoring at Bore 23 down-gradient of the bulk storage area shows no trend but data has not been collected since October 2014 due to water leaking into bore casing.

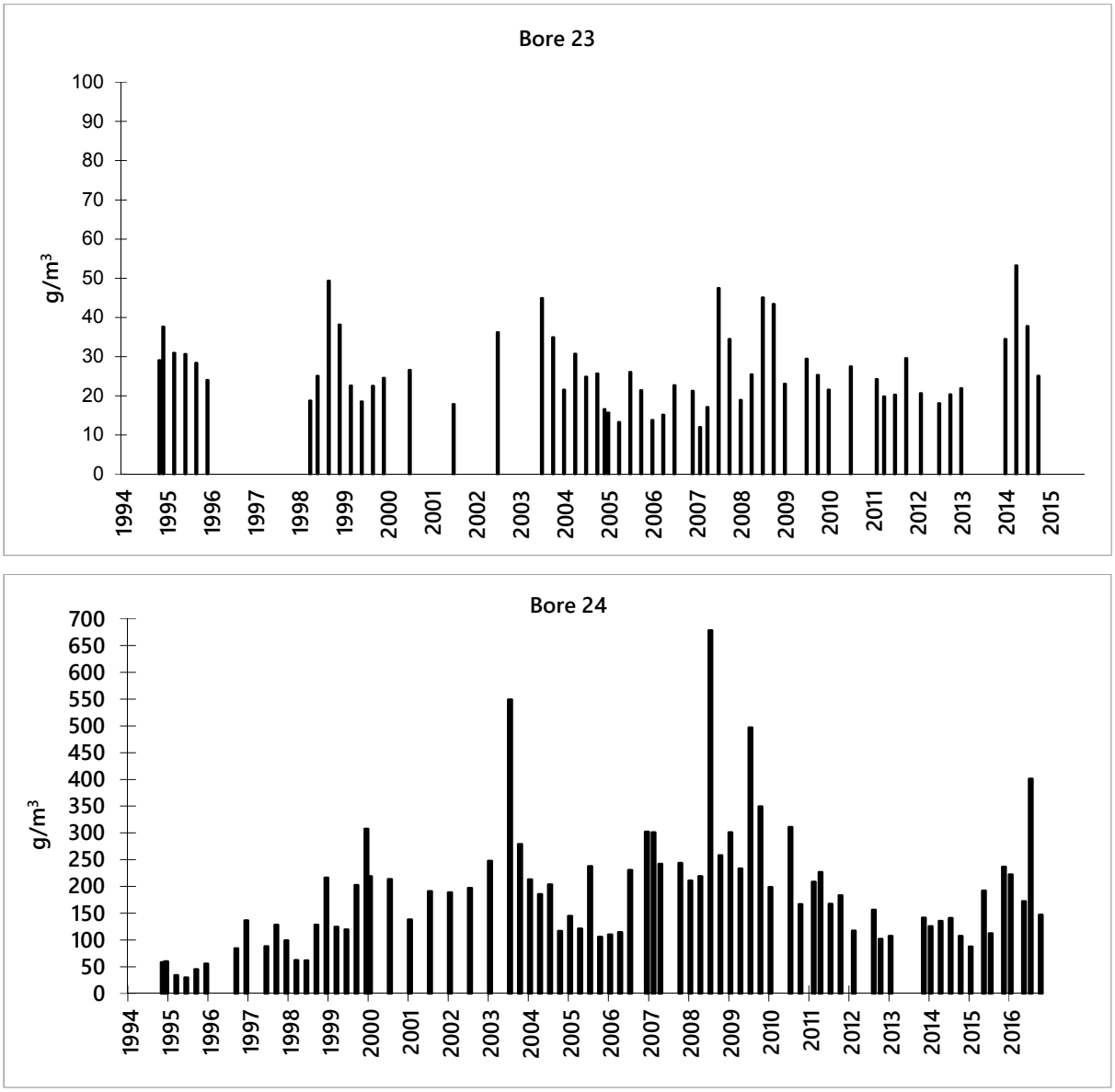

Figure 11 Total nitrogen concentration in groundwater in the vicinity of bulk storage (bores 23 and 24) areas

2.3 Air

2.3.1 Inspections

The Company site was inspected on four occasions during the monitoring year under review. On each occasion site management was found to be good. On three occasions no odours were detected off-site at the time of inspections. On one occasion odour was detected downwind of the site but at a sufficiently low level to not be deemed objectionable.

During each scheduled inspection the dust scrubber, the plant perimeter, the cooling towers, formaldehyde storage area, and the bulk storage area were checked for emissions to air including odour, ammonia and particulate deposition and dispersion. No effects on the receiving environment beyond the plant perimeter could be determined during any of the inspections from discharges to air or plant operation.

Ambient gas monitoring was also undertaken at the site on three occasions during the 2016-2017 monitoring period, on 6/8 July 2016, 10/10 November 2017, and 18/20 April 2017, while deposition gauges were deployed at the site during the period from 11 to 25 July 2017.

2.3.2 Results of discharge monitoring

2.3.2.1 Emissions testing

To assess compliance with special conditions on consent 4046-3, the Company undertook monitoring of air emissions from the site. The discharge of air emissions from the dust scrubber was monitored on two occasions during the monitoring period by K2 Environmental Ltd.

Emissions from the dust scrubber fan at the urea plant were sampled isokinetically and analysed by K2 Environmental Ltd. In previous monitoring periods, emissions from the main blow-down vent for the urea plant were also sampled. This ceased upon redirection of the continual purge to the main vent to the primary reformer for use as a fuel gas in February 2003. Routine sampling of the dust scrubber was undertaken on 13th December 2016 and 17th May 2017.

The results are presented in Table 6. The tests were the average of three samples, each collected from 20 points across the vent.

Table 6 Dust scrubber emission testing results

Date		13 Dec 2016	17 May 2017	Consent limit
Ammonia	kg/h	290	120	295
Urea	kg/h	3	1	12
Urea	mg/m^3	14	6	125

Special Condition 3 on Resource Consent 4046-3 limits the ammonia emission from the dust scrubber fan and the blow down tank vent as a combined mass discharge of 295 kg/hour.

The concentration limit for urea emissions from the dust scrubber fan (or any other source) is 125 mg/m^3, and the mass discharge rate limit is 12 kg/hour, as set by Special Condition 6.

The level of ammonia discharged from the dust scrubber was recorded as being below the consent limit on both monitoring occasions though the level on 13 December 2016 came close to the consent limit.

The urea mass discharge rate was recorded as being below the consent limit on both monitoring occasions.

2.3.3 Results of receiving environment monitoring

2.3.3.1 Particulate deposition gauging

Initially the particulate deposition gauges survey was conducted in February 2017, but on retrieval day some gauges were found to be dry. The particulate deposition gauges survey was repeated by the Council between 11 and 25 July 2017, at five locations around the Company site as shown in Figure 12.

There was a moderate level of rainfall over the 14-day winter 2017 monitoring period, with 34 mm of rain falling at the Council's station on Lower Glenn Road. Winds (at Hawera AWS) blew from the N and NE for 100% of the deployment (Figure 13). There was a significant component (82%) from the N.

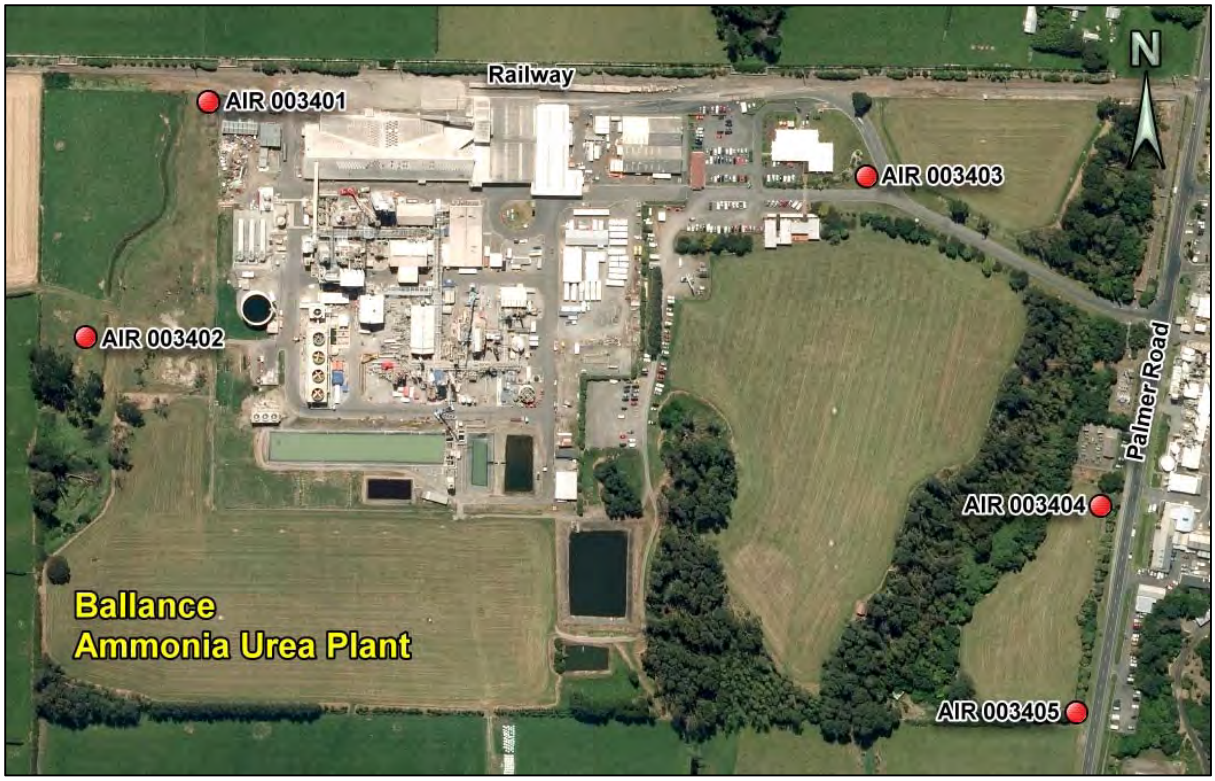

Figure 12 Location of deposition gauge sites 2016-2017

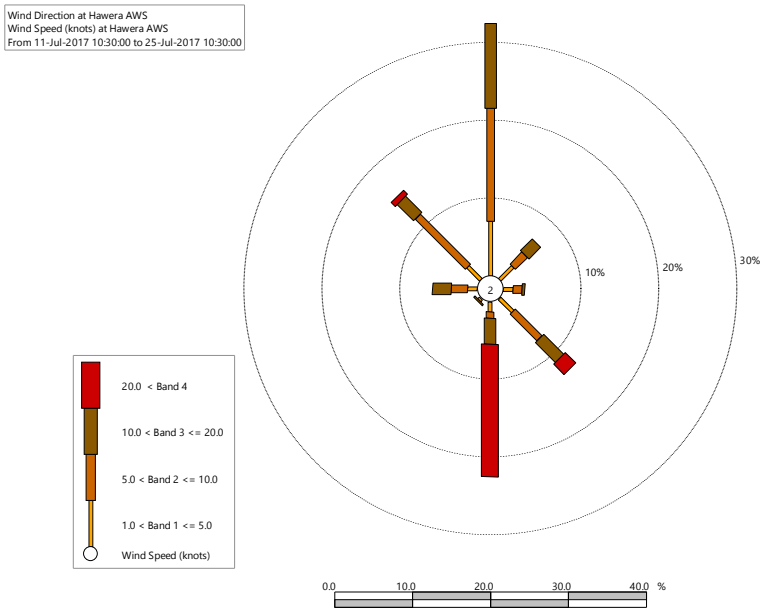

Figure 13 Wind-rose for Hawera weather station during deployment of deposition gauges, 11 July to 25 July 2017

The results (year 2016-2017) are presented in Table 7, together with data ranges from 1996-2016 for comparison. Winds (at Hawera AWS) blew from the N and NW for about 38% of the deployment in July (Figure 13), and from the S and SE for 35%. Strong winds of more than 20 knots blew from the S and SE for 18% of the time, bringing salt from the sea that resulted in the high, even conductivity values recorded at all five monitoring stations.

Table 7 Results of particulate deposition monitoring for 11 July to 25 July 2017 with 1996-2016 data for comparison

Parameter	Site				
	AIR003401	AIR003402	AIR003403	AIR003404	AIR003405
	North west of the plant on the northern boundary	West of the plant (north of irrigation area)	On site north of roadway	On the eastern boundary	Close to the eastern boundary south of the plant
pH	7.4 (5.6 – 8.2)	7.4 (4.7 – 8.4)	7.2 (6.9 – 7.8)	6.7 (5.5 – 7.7)	6.9 (5.8 – 7.9)
Conductivity mS/m/day	3.1 (0.11 – 3.7)	2.4 (0.12 – 1.7)	2.6 (0.11 - 1.95)	2.8 (0.15 – 32.5)	2.8 (0.11 – 6.1)
Ammonia mgN/m2/day	35.6 (0.028 – 145.5)	26.7 (0.21 – 53.2)	15.3 (0.87 – 23)	4.2 (0.58 – 557)	12.1 (0.32 – 94)
Urea mgN/m2/day	6.6 (0.43 – 28.2)	0.9 (0.13 – 4.4)	1.3 (0.50 – 3.6)	0.3 (0.06 – 20)	0.5 (0.10 – 6.7)
Particulate mg/m2/day	50 (<10 – 110)	70 (10 – 120)	50 (10 – 110)	50 (10 – 460)	40 (10 – 150)

Material from the gauges was analysed both for solid particulates and for various chemicals associated with the discharge from the site.

The guideline value for nuisance levels for total particulate deposition used by the Council is 130 $mg/m^2/day$. Consideration is given to the location of the industry and the nuisance the community is likely to suffer, when assessing results against this value.

The results of the total particulate deposition measurements at and around the AUP site, during the monitoring period, ranged from 40 to 70 $mg/m^3/day$. These results are well below the guideline set by Council.

The measured ammonia deposition rates at all five sites exceeded the typical background rate of 0.4 $mgN/m^2/day$ found in the Taranaki region. The recommended maximum rate for the agricultural application of nitrogenous fertiliser is 200 kg/ha/y, which is equivalent to 55 $mg/m^2/day$. In the 2016-2017 monitoring period, the measured rates at the five sites ranged from 4.2 to 35.6 $mgN/m^2/day$, with none exceeding the recommended maximum value.

The 2016-2017 urea results were similar to those of deposition surveys done in previous monitoring periods. The results are all below the recommended maximum rate for the agricultural application of nitrogenous fertiliser.

The results of ongoing deposition monitoring show that to date only minor amounts of deposition have been recorded in close proximity to the main processing facility, with little or no adverse effects on the surrounding environment. The main issue is that of potential effects from the irrigation system upon groundwater, which is being monitored as described in section 2.2.4.2.

2.3.3.2 Ambient gas monitoring by Regional Council

During the monitoring period, a multiple gas detector was deployed on three occasions in the vicinity of the plant. Each survey lasted approximately 48 hours, with the instrument placed in a down-wind position at the start of each deployment. Monitoring consisted of continual measurements of gas concentrations for

the gases of interest (ammonia, carbon monoxide, and combustible gases). The location of the multi-gas meter for each sampling run is shown in Figure 14.

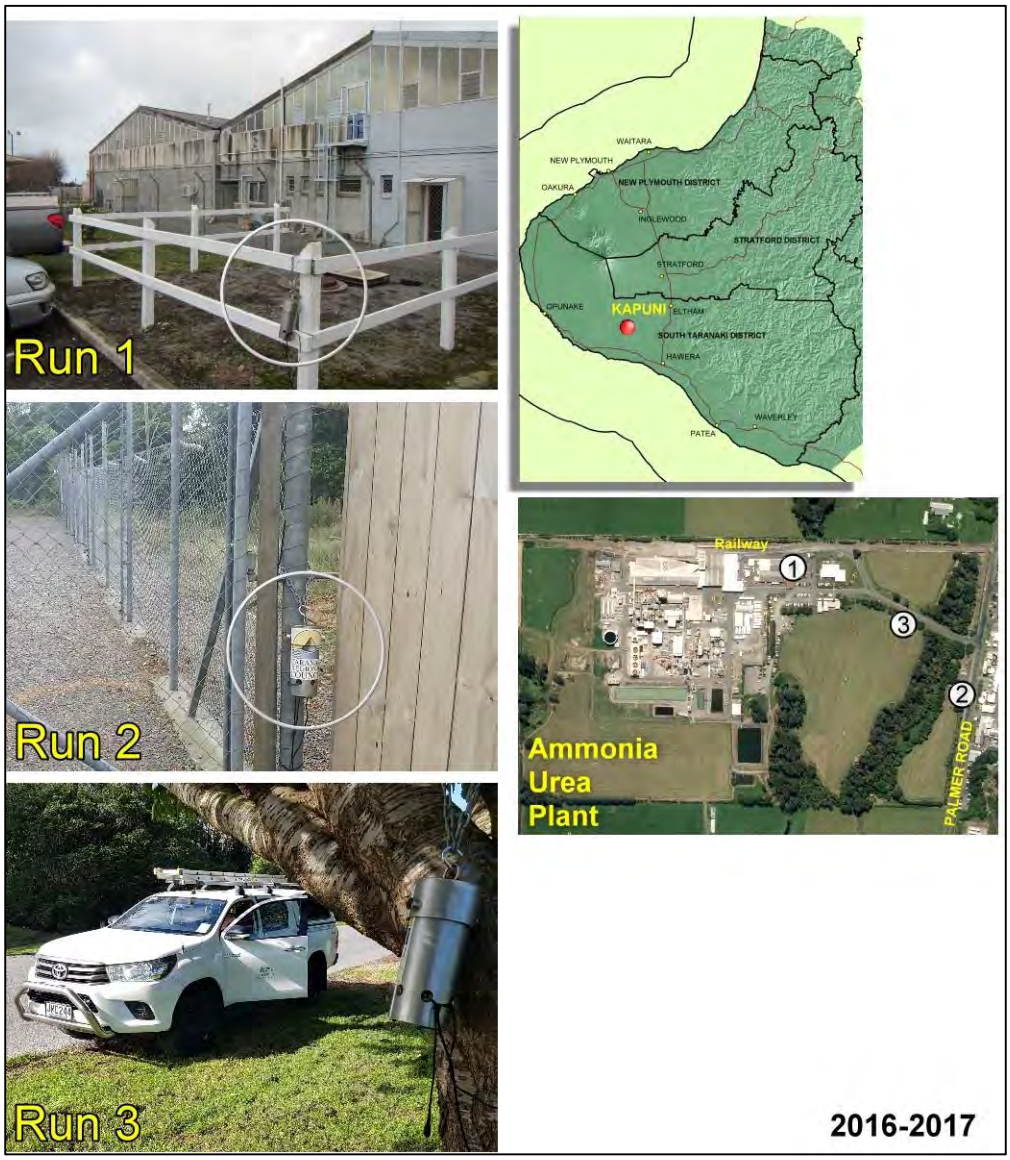

Figure 14 Sampling sites for ambient gas monitoring at ammonia urea plant, 2016-2017

Because of the nature of the activities on the site, it was considered that the primary information of interest in respect of gases potentially emitted from the site was the average downwind concentration, rather than any instantaneous peak value. That is, the long-term exposure levels, rather than short-term maxima, are of most interest. The gas meter was therefore set up to create a data-set based on recording the average concentration measured during each minute as raw data.

The meter is equipped with detectors intended to respond to ammonia, carbon monoxide, and the presence of combustible gases, recorded as the equivalent percentage of the lower explosive limit (LEL) of methane.

Because the lower explosive limit of methane in air is about 5%, then a reading of 1% LEL is equivalent to an actual concentration of 1% of 5% that is, an actual concentration of 0.05%.

The meter is used for screening purposes, to determine whether further investigations are warranted. It is known that gases other than the nominated target gas can interfere with results. In particular, the Council has found during use that the Multi-Rae meter will sometimes register the presence of ammonia when

none is present, and also that ammonia, carbon monoxide, and volatile organic gases will give spurious LEL results. The carbon monoxide detector will react to some volatile organic gases. The exact numbers shown in the attached graphs and tables should therefore be interpreted with caution.

2.3.3.3 2016-2017 monitoring results

The results of monitoring undertaken for in the 2016-2017 year are summarised in Table 8. The data for ammonia and carbon monoxide from each run are presented graphically in Figure 15 and Figure 16 (No combustible gas was detected during any of the three runs).

Table 8 Summary of ambient gas monitoring results - Ballance Agri-Nutrients 2016-2017

Run		1	2	3	Average
Period (from/to)		06/09/2016 09:53 08/09/2016 09:14	10/02/2017 14:33 10/02/2017 21:41	18:04:2017 14:55 20/04/2017 10:14	
Max	NH_3 (ppm)	3.60	0.10	5.40	3.03
	CO (ppm)	11.90	0.90	2.50	5.10
	LEL (%)	0.00	0.00	0.00	0.00
Mean	NH_3	0.10	0.00	0.40	0.17
	CO (ppm)	0.20	0.10	0.40	0.23
	LEL (%)	0.00	0.00	0.00	0.00
Min	NH_3	0.00	0.00	0.00	0.00
	CO (ppm)	0.00	0.00	0.00	0.00
	LEL (%)	0.00	0.00	0.00	0.00

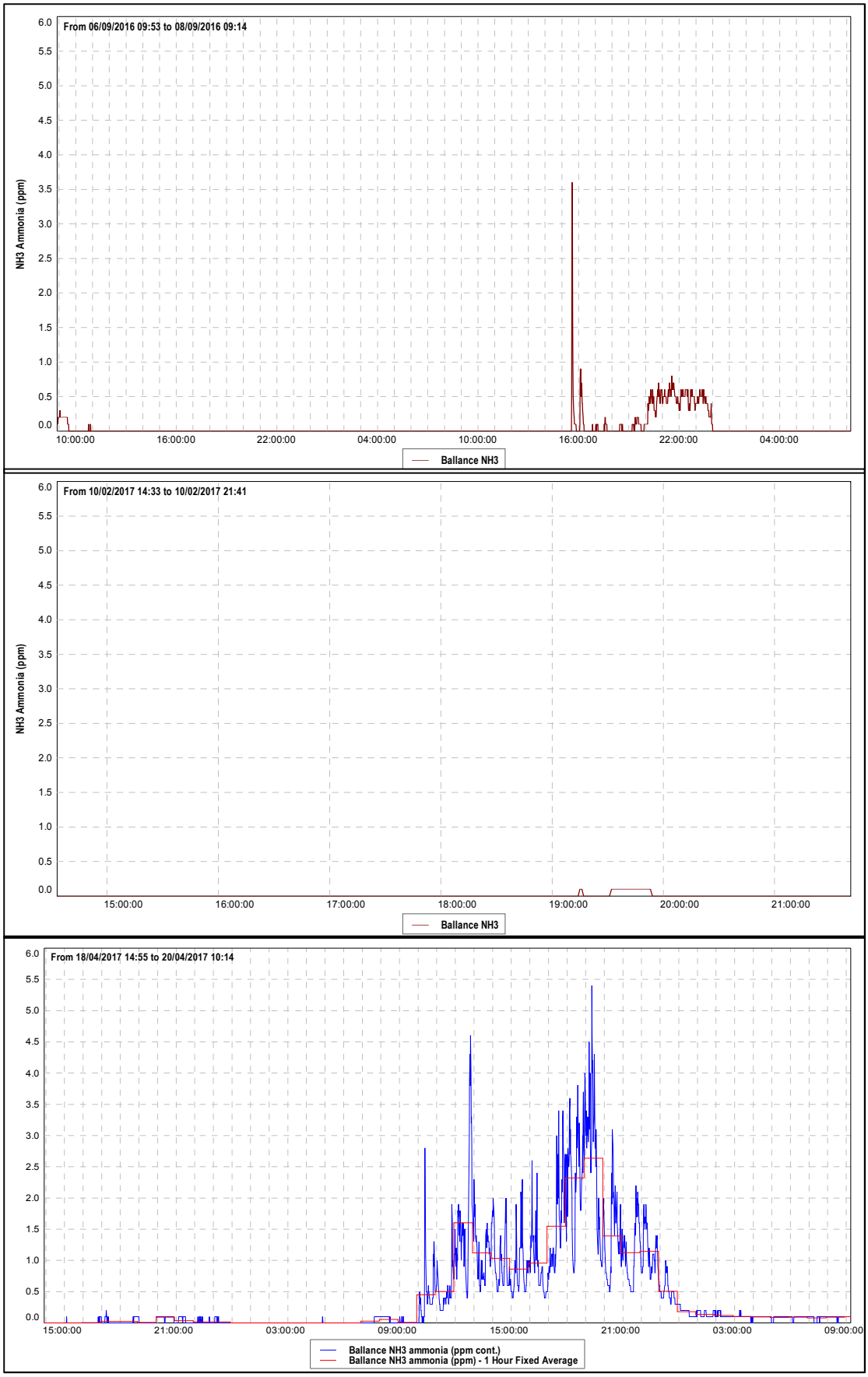

Figure 15 Graphs of ambient ammonia gas levels in the vicinity of ammonia urea plant (2016-2017)

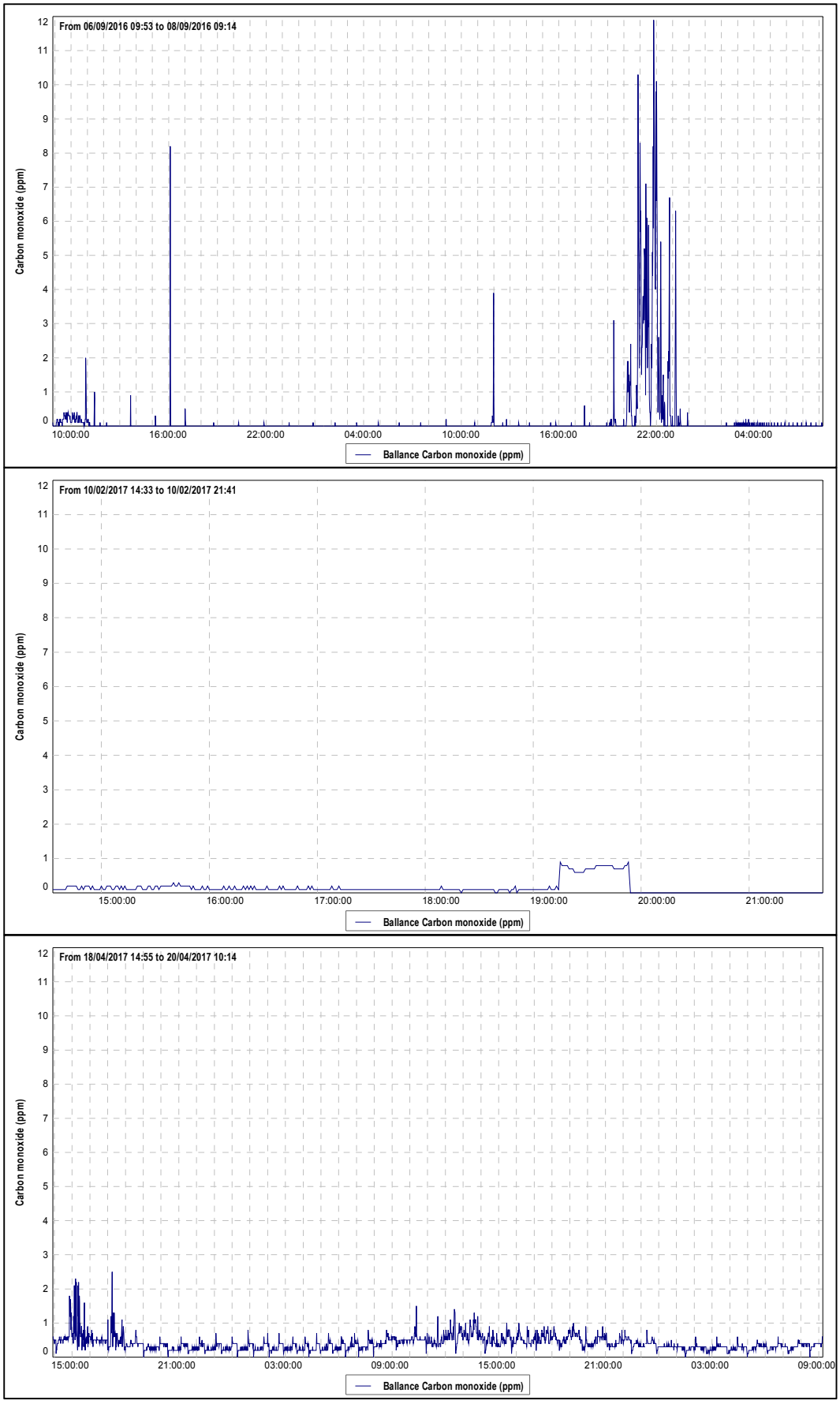

Figure 16 Graphs of ambient carbon monoxide levels in the vicinity of the ammonia urea plant (2016-2017)

The consent covering air discharges from the Ammonia Urea Plant has specific limits related to particular gases. Special condition 4 of consent 4046-3 sets a limit on the ammonia concentration beyond the boundary of the site.

"The emission of ammonia to the atmosphere under normal operation, start-up and shut-down shall be so controlled to ensure that the maximum ground level concentrations [one-hour average] do not exceed 4.27ppm (v/v) beyond the boundary of the site."

The mean of maximum concentrations of ammonia found during all three monitoring runs was 3.03 ppm which wholly complies with the consent condition.

Special condition 7 of consent 4046-3 sets a limit on the carbon monoxide concentration at or beyond the site boundary.

"The consent holder shall control all emissions of carbon monoxide and nitrogen dioxide to air so that the maximum ground level concentration of any of these contaminants, arising from the exercise of this consent, measured under ambient conditions does not exceed the relevant ambient air quality standard as set out in the Resource Management [National Environmental Standards for Air Quality Regulations, 2004] at or beyond the site boundary."

The National Environmental Standard (NES) for carbon monoxide is 10 mg/m^3 expressed as a running 8-hour mean. The measured carbon monoxide concentrations were well within this limit, with the mean result found for the entire three runs at 0.23 ppm or 0.30 mg/m^3.

The results show that there is generally little of concern in terms of the ambient atmosphere around the ammonia-urea plant. There are occasional ammonia peaks, but these tend to be short-term events only and would represent odour episodes only, in terms of their scale of significance. Carbon monoxide results were low on average, though with some spikes recorded during all three runs, with maximum concentration of 11.9 ppm or 13.6 mg/m^3, and were mainly close to background levels.

2.3.3.4 Ambient ammonia monitoring by the Company

Condition 4 on consent 4046-3 stipulates that:

The emission of ammonia to the atmosphere under normal operation start-up and shut-down shall be so controlled to ensure that the maximum ground level concentrations [one-hour average] do not exceed 4.27 ppm (v/v) beyond the boundary of the site.

Condition 5 on consent 4046-3, granted in February 2012, requires that:

Within 12 months of the issue of this consent, the consent holder shall to the satisfaction of the Chief Executive, Taranaki Regional Council, establish two static monitoring locations beyond the boundary of the site for the purpose of monitoring atmospheric ammonia on adjacent property and to check compliance with condition 4. The consent holder shall record the ground level concentration of ammonia at the static monitoring locations, every Wednesday morning between 7.00am and 10.00am, or at an alternative time as agreed to by the Chief Executive, Taranaki Regional Council.

In September 2012, two static monitoring stations for measurement of atmospheric ammonia concentration were established on the western and southern boundaries of the cut-and-carry irrigation area, in consultation with the owners of the adjacent properties, who had requested such monitoring at pre-hearing meetings on the consent application, to determine any long-term trends. The start of the weekly three-hour sampling window was changed from 7.00 am to 1.00 pm, with the approval of Council, to fit better with the Company laboratory workload. Ammonia concentration was measured using a Draegar CMS instrument. Usually, one measurement is taken, over a period of about 10 minutes. The results of ambient ammonia monitoring for the period 1 July 2016 to 30 June 2017 are presented in Figure 17.

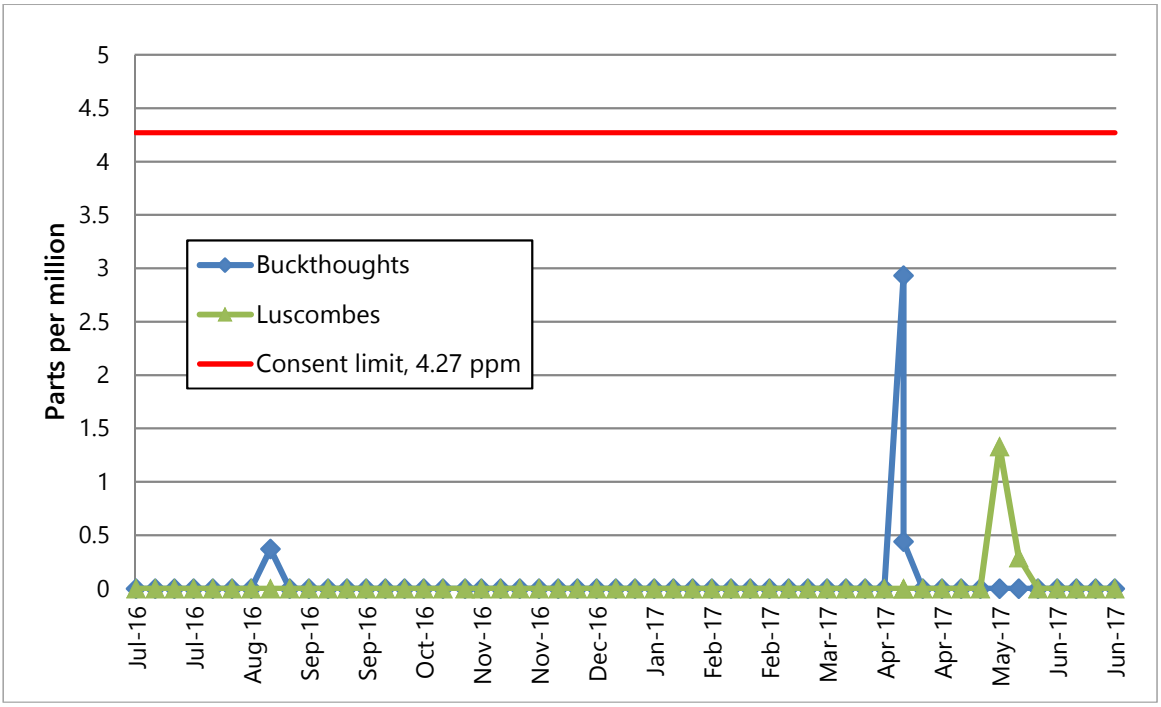

Figure 17 Atmospheric ammonia concentration at ground level on site boundary, ppm (v/v)

Ammonia concentration was recorded above the detection limit of 0.2 ppm on three days at the western boundary (Buckthoughts), and on two occasions at the southern boundary (Luscombes). All recorded values were well within the consent limit of 4.27 ppm. The maximum recorded value was 2.97 ppm, at the western boundary on 12 April 2017. At the southern monitoring station, the maximum recorded value was 1.33 ppm on 17 May 2017.

2.3.3.5 Other ambient monitoring

Carbon Dioxide Emissions

Special Condition 5 of the now expired Resource Consent 4046-2 for the discharge to air required that Ballance provide the Council with its annual gross carbon dioxide emission data. The Company calculated gross carbon dioxide emissions for the 1 July to 30 June period in 2012-2013 was 170,650 tonnes. The current Resource Consent 4046-3 no longer requires monitoring of carbon dioxide emissions.

Nitrogen Oxide Emissions

From 2014 onwards, the Council has implemented a coordinated region-wide compliance monitoring programme to measure NOx (TRC, 2017). The programme involves deploying all measuring devices at 24 NOx monitoring sites (including two sites in the vicinity of the Company ammonia urea plant) on the same day, with retrieval three weeks later. This approach assists the Council in further evaluating the effects of local and regional emission sources and ambient air quality in the region.

The consents covering air discharges from the Company ammonia urea plant have specific limits related to particular gases. Special condition 7 of consent 4046-3 sets a limit on the nitrogen dioxide concentration at or beyond the plant boundary. The limit is expressed as 200 µg/m^3 for a one hour average exposure.

NOx passive adsorption discs were placed at two locations in the vicinity of the ammonia urea plant on one occasion during the year under review. The discs were left in place for a period of 21 days between 13 January and 3 February 2017.

The calculated 1-hour theoretical maximum NOx concentration found at the ammonia urea plant during the year under review equates to 9.1µg/m^3. The results show that the ambient ground level concentration of NO_x is well below the limits set out by consent 4046-3.

2.3.3.6 Vegetation survey

In December 2009, the condition of vegetation in the vicinity of the AUP was assessed. Foliar condition measurements of four native species were used to assess tree and shrub health, and foliage samples were taken for nitrogen analysis. Baseline surveys were undertaken in December 1993 and December 1994.

Four sites were monitored, two impact and two control. The potential impact sites were located among mature landscape plantings around the main entrance to the plant, and in the stream margin along the Kapuni Stream off Palmer Road. The control sites were located away from the prevailing wind, 4 km to the west at Kapuni School, and 6 km to the north on the banks of the Kapuni Stream by Eltham Road.

The results of the survey are available from the Council. The results provide no evidence that emissions from the AUP were having negative effects on vegetation surrounding the plant.

The Council has not required a more recent survey of vegetation, given the lack of evidence of effects in the baseline surveys and the on-going inspections of the site and its surrounds by Council officers.

2.3.4 Technical review reports

Special condition 10 on consent 4046-3, which was issued on 12 February 2012, requires the Company to provide to Council by 1 June 2012 and every three years thereafter a written report which includes:

a. a review of any technological advances in the reduction or mitigation of discharges to air from the site, and the costs and benefits of these advances; and

b. an evaluation and review of ammonia pressure safety valve [PSV] systems, operating parameters, and vent heights to ensure that the probability of PSV discharges have been reduced as far as

practicable, and to determine whether flaring or other control rather than vent height is practicable as a means to reduce ground level concentration of ammonia; and

c. details of any complaints received [external to the operation of the plant] to include date, time operating conditions, weather conditions and measures taken in response; and

d. monitoring records required by condition 5.

(Special condition 5 on consent 4046-3 requires the Company to establish two stations for monitoring ground level concentration of ammonia beyond the boundary of the site within 12 months of the issue of this consent. Two stations were established in September 2012, one to the west on the boundary with Buckthoughts, and one to the south on the boundary with Luscombes - refer section 2.3.3.4).

The second report required under consent 4046-3, which covers the period June 2012 to May 2015, was received in June 2015. The report is attached as Appendix IV. The summary states:

Operation of the plant has been breach-free for over twenty-six months.

Ballance-Kapuni is currently evaluating a major upgrade of the plant. Should this go ahead, it would bring significant improvements in environmental performance, and in particular air emissions, that are constrained by the current technology and inherent design.

In the event that an uprate of the plant does not go ahead, Ballance-Kapuni will develop further the work it has already carried out on the feasibility of a flare system to address ammonia plant emission.

Other technological and procedural improvements have, and will be, instigated to achieve continuous improvement of our air emissions performance.

Recent improvements are described which, while aimed primarily at increasing the protection and the production capability of plant, also have reduced ammonia emissions to air. These measures, which cost about $1,000,000, relate largely to the reduction of inerts in process streams and the ability of plant to accept them, and hence the amounts that need to be removed, along with attendant ammonia.

A modification was made to the dust scrubber which improved the accuracy of emission testing for ammonia and urea. This showed that the emissions from the scrubber were compliant with consent limits, contrary to some previous test results.

Ongoing work evaluating and reviewing pressure safety valves is described. A cost-benefit study on alternatives to direct venting to atmosphere, such as flaring, was placed on hold while the plant upgrade feasibility study is carried out.

Twenty-one external complaints received by the Company in the period May 2012 to May 2015 are detailed, two of which involved breach of consent, in February/March 2013. In terms of Council's July to June reporting year, a reducing trend is apparent, ten complaints being made in 2012-2013, six in 2013-2014, one in 2014-2015, none in 2015-2016, and none in 2016-2017.

The Company is required by Condition 10 (c) of the consent to record details of any complaints received, including date, time, operating conditions, weather conditions, and measures taken in response. However, it should be noted that the investigation of complaints by the Company does not extend (and is not required to extend) to any determination of the severity and spatial and temporal extent of any odour episodes, nor was there any notification at the time to the Council that would have allowed independent investigation. Thus, in strict terms it cannot be determined whether there was or was not a breach of conditions 8 and 9 of the consent, which in simple terms prohibit any offensive or objectionable releases of odorous emissions or other discharges.

The establishment of the external ammonia monitoring stations required under special condition 5 is reported, and test results are attached.

2.4 Riparian management

Condition 13 on water permit 0596-3, issued in August 2012 to take from Waingongoro River, states:

The consent holder shall make ten annual payments of $30,000 (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. The first payment shall be made within 60 days of the commencement of this consent, and subsequent payments shall be made by 1 September each year.

The first annual payment of $30,000 was made in September 2012.

The Company had already, since 1999, been donating voluntarily to Taranaki Tree Trust $3,000 per year for the specific purpose of riparian planting and management both upstream and downstream of the intake location.

During 2016-2017, a total of 25 holders of Riparian Management Plans (RMPs) received funding from the Company. The funding criteria for the Company riparian contribution was 50% of the cost of riparian plants ($23,604.57) and a contribution of $0.50 per plant ($7,072.50).

The recommended riparian planting for the 25 RMPs that have received Company funding covers a stream bank distance of 185 km, up from the 142 km indicated in the previous report, of which 110 km, or 60%, had been completed at the end of June 2017. In comparison, of the recommended 282 km for the other RMPs, only 116 km, or 41%, of stream bank planting had been completed.

Note that the percentage completed has decreased from the 65% stated in the 2015-2016 report to 60% for the current report. This is due to an increase in the RMPs from 23 to 25 which has resulted in a revised target and percentage remaining.

The locations in Waingongoro catchment of the RMP properties which have received funding from the Company are given in Figure 18. The proportion of recommended planting that has been implemented is indicated for each property.

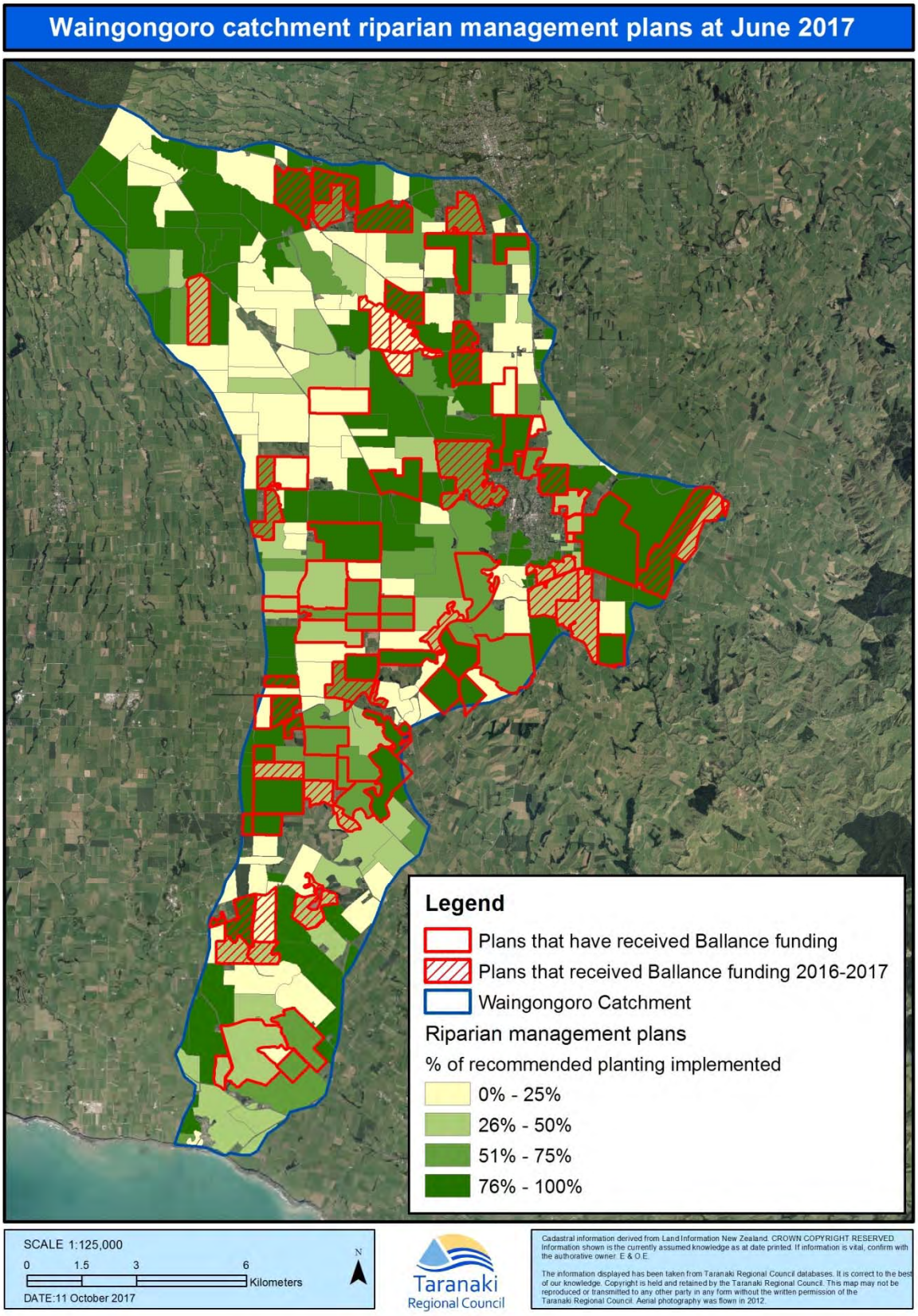

Figure 18 Riparian management plans in Waingongoro catchment with Ballance funding

2.4.1 Investigations, interventions, and incidents

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

The Council operates and maintains a register of all complaints or reported and discovered excursions from acceptable limits and practices, including non-compliance with consents, which may damage the environment. The Incident Register (IR) 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 2016-2017 period, the Council was not required to undertake significant additional investigations and interventions, or record incidents, in association with the Company's conditions in resource consents or provisions in Regional Plans.

3 Discussion

3.1 Discussion of plant performance

On-site maintenance and management at Ballance Agri-Nutrients Ltd was well operated. On-going liaison between Ballance staff and the Council has been indicative of the Company's commitment to development of environmental performance.

In the 2016-2017 review period, plant production increased by about 44% compared to 2015-2016, largely due to a long plant turnaround in the previous year decreasing production volumes but volumes were also higher than the 2014-15 year indicating better operational performance. Water abstraction volume compared with the previous year was also correspondingly higher, by 21%. Effluent nitrogen mass was higher, by 39%, as a result of higher plant production. For water abstraction, no compliance issues arose with abstraction from the Waingongoro River. The consent to take from the Kapuni Stream in emergency was not exercised.

For discharges to the Kapuni Stream, the procedures of the environmental management plan were followed. Control, monitoring and reporting of discharges was good throughout the period. Results from inter-laboratory comparisons generally correlated well. Biomonitoring indicated that discharges from the site were not having an adverse effect on the Kapuni Stream.

For discharges to land, the irrigation system for treatment and disposal of plant effluent was well managed. Effluent monitoring, surface and groundwater monitoring, and soil and herbage analysis were carried out in accordance with the environmental management system manual.

Groundwater monitoring indicated nitrogen levels associated with irrigation were similar to those in the previous monitoring period.

For emissions to air, in general, plant processes were operated and controlled so that the emissions authorised by consent were maintained at a practicable minimum. There were no occasions when concentrations approached or exceeded the consent limit of 4.27ppm. The ongoing review of the best practicable option to prevent adverse effects on the environment continued.

Overall the plant has been operating in an environmentally sound manner.

3.2 Environment effects of exercise of water consents

Spray irrigation of effluent to land, the contingency discharge of effluent and the discharge of stormwater and water treatment effluent to the Kapuni Stream are the activities that have greatest potential to adversely affect the aquatic receiving environment.

The results of biomonitoring in the Kapuni catchment indicate that there is no significant impact in the stream or its tributaries as a result of plant operations. In relation to discharges to land the high levels of nitrate in shallow groundwater are partly due to the heavy effluent application that occurred early in the life of the plant. Current application rates are considerably lower. However, nitrate and sodium concentrations in the soil profile underneath the irrigation areas remain elevated.

Two concentrated ammonia plumes due to historical leaks from the effluent storage basin and from the urea plant are managed with pump recovery and treatment systems. The contaminated groundwater is pumped back through the plant and waste treatment systems. Both plumes currently do not extend beyond the Ballance site and are monitored. They posed no short term threat to freshwater ecosystems but monitoring and active management are needed for the foreseeable future to ensure that there is no harm to freshwater ecosystems.

Concentrations of nitrates in the two tributaries (West Gully and Buckthoughts Gully) were high, coincident with macroinvertebrate community health in the two tributaries being significantly lower than those within the Kapuni Stream itself, which typically had 'very good' health. However, the tributaries had macroinvertebrate communities that were typical of those found in small streams running through farmland. The concentrations of nitrate in the Kapuni Stream remained low.

3.3 Environmental effects of exercise of air discharge permit

During the monitoring period, the results of monitoring from site inspections, and the measurement of dust deposition and of ambient gas levels, indicated no significant adverse effect on the neighbourhood as a result of activities at the ammonia urea plant.

Over the reporting period, no air discharge incidents were reported to the Council. Ammonia levels were recorded by the Company at the boundary were consistently less than 3 ppm which was below the consent limit of 4.27 ppm.

The results from the gaugings indicate only minor amounts of deposition have been recorded close to the main plant, with no effect on the surrounding environment. Monitoring of gas concentration indicated that there is little of concern in the ambient atmosphere around the plant.

3.4 Evaluation of performance

A tabular summary of the Company's compliance record for the year under review is set out in Table 9 to Table 15.

Table 9 Summary of performance for Consent 0596-3

Purpose: *To take water from the Waingongoro River for operation of an ammonia/urea plant*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Limit on maximum abstraction rate	Metering by consent holder and review of records by Council	Yes
2. Installation and operation of monitoring equipment	Site inspection and receipt of abstraction records	Yes
3. Certification of monitoring equipment	Receipt of certificate. Installation details of existing meters/ dataloggers received 20 April 2012. Verification performed 9 October 2014.	Yes
4. Actions upon breakdown of monitoring equipment	Receipt of notification, and inspection. Check water take records.	N/A
5. Access to monitoring equipment	Site inspection	Yes
6. Format of monitoring records	Examination of records	Yes
7. Best practicable option and efficient use	Site inspections and liaison with consent holder	Yes
8. Restrictions on intake modification	Site inspection. Report on consultants inspection of 5 March 2013.	Yes
9. Report on altering intake to minimise entrainment of juvenile fish by 31 January 2013	Receipt of report. Scoping report received 31 January 2013; final costs/benefits report received 28 March 2014.	Yes
10. Development of a monitoring programme and annual review	Receipt of monitoring programme. Monitoring programme under development at during review period, including intake fish entrainment surveys.	Yes
11. Consultation on monitoring programme to include iwi	Liaison with consent holder. Monitoring programme under development at end of review period.	Yes
12. Annual meeting about monitoring programme	Meeting occurs as required. First meeting 7 October 2014.	No. Meeting in 2015-2016 period postponed by agreement in June 2016 until fish entrainment trial completed.

Purpose: *To take water from the Waingongoro River for operation of an ammonia/urea plant*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
13. Financial contribution to riparian planting and management	Receipt of contribution	Yes
14. Review of consent in respect of intake structure	N/A	N/A
15. Optional review provision	Next review option available June 2023	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

N/A = not applicable

Table 10 Summary of performance for Consent 1213-3

Purpose:*To take and use water from the Kapuni Stream (at times when the normal water supply has failed) for operation of an ammonia/urea plant*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Limit on maximum abstraction rate	Metering by consent holder	Yes
2. Take only when main supply fails	Site inspection.	Yes
3. Keep and provide record of take	Inspection and receipt of record	Yes
4. Best practicable optiion	Site inspection and liaison with consent holder	Yes
5. Notify Council and report on exercise of consent	Receipt of notification/reports	Yes
6. Optional review provision	Next review option available June 2017	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

N/A = not applicable

Table 11 Summary of performance for Consent 4719-2

Purpose: *To take and use groundwater for industrial site remediation and process use purposes*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Limit on maximum abstraction rate	Metering by consent holder.	Yes

2. Keep and provide record of take	Inspection and receipt of record	Yes
3. Best practicable option	Site inspection and liaison with consent holder	Yes
4. Optional review provision	Next option available June 2023	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

N/A = not applicable

Table 12 Summary of performance for Consent 0598-3

Purpose: ***To discharge stormwater from non-process areas; and raw water treatment plant wastewater, from an ammonia/urea plant to the Kapuni Stream and into an unnamed tributary of the Kapuni Stream***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Limit on discharge volume	Metering by consent holder	Yes
2. Best practicable option	Inspection and liaison with consent holder	Yes
3. Discharge concentration limits	Inspection and chemical sampling	Yes
4. Receiving water concentration limits	Inspection and chemical sampling	Yes
5. Control on effect of discharge in receiving water	Inspection, chemical sampling and bio-monitoring	Yes
6. Company shall monitor the stream	Review of Company records	Yes
7. Company shall minimise discharge of phosphate	Inspections and monitoring results	Yes
8. Discharge to be in accordance with an Effluent Disposal Management Plan	Inspections and liaison with consent holder	Yes
9. Provision of Management Plan for certification	Receipt of Management Plan. Reviewed Plan received 18 Dec 2012. Updated Plan received 4 May 2015.	Yes
10. Review of Management Plan by DoC and Fish & Game NZ	Plan forwarded 21 May 2013	N/A
11. Company to provide water treatment programme to Council for review when changes to process or chemicals proposed	Notifications from Company when changes to chemicals proposed.	Yes
12. Optional review provision	Next option available June 2023	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

N/A = not applicable

Table 13 Summary of performance for Consent 1766-3

Purpose: *To discharge treated plant production effluent and contaminated stormwater from an ammonia/urea plant into the Kapuni Stream when wet ground conditions do not allow spray irrigation onto and into land*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Constraint on when discharge occurs	Liaison with Company and monitoring results. Consent not exercised	N/A
2. Limit on discharge rate	Metering by Company	N/A
3. Best practicable option	Inspection and liaison with Company	N/A
4. Discharge concentration limits	Inspection and chemical sampling	N/A
5. Receiving water concentration limits	Inspection and chemical sampling	N/A
6. Control on effect of discharge in receiving water	Inspection and bio-monitoring results	N/A
7. Discharge to be in accordance with an Effluent Disposal Management Plan	Inspections and liaison with consent holder	N/A
8. Provision of Management Plan for certification	Receipt of Management Plan. Plan received 18 Dec 2012. Updated Plan received 4 May 2015	Yes
9. Review of Management Plan by DOC and Fish & Game NZ	Plan forwarded 21 May 2013	N/A
10. Optional review provision	Next optional review June 2023	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**N/A** **N/A**

N/A = not applicable

Table 14 Summary of performance for Consent 0597-3

Purpose: *To discharge treated plant production effluent and contaminated stormwater from an ammonia/urea plant by spray irrigation onto and into land*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Disposal within defined area	Inspection	Yes
2. Limit on discharge rate	Metering by consent holder	Yes
3. Best practicable option	Inspection and liaison with consent holder	Yes

Purpose: *To discharge treated plant production effluent and contaminated stormwater from an ammonia/urea plant by spray irrigation onto and into land*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
4. Maximisation of discharge to land, and minimisation of discharge to stream	Inspection and metering by consent holder	Yes
5. Discharge to be in accordance with an Effluent Disposal Management Plan	Inspections and liaison with consent holder	Yes
6. Provision of Management Plan for certification	Receipt of Plan. Plan received 18 Dec 2012	Yes
7. Review of Management Plan by DoC and Fish & Game NZ	Plan forwarded 21 May 2013	N/A
8. No odour beyond boundary of the site	Site inspections and complaints register	Yes
9. No spray drift beyond boundary of the site	Site inspections and complaints register	Yes
10. Defines the edge of the spray zone	Site inspections	Yes
11. Limit on the application of total nitrogen	Site inspections and liaison with consent holder, sampling results	Yes
12. Consent holder shall provide details of water treatment programme and any proposed changes to the Council for review	Liaison with the consent holder, and information supplied to the Council by Ballance	Yes
13. Consent holder shall provide details of chemical cleaning programmes and any proposed changes to the Council for review	Liaison with the consent holder, and information supplied to the Council by Ballance	Yes
14. Optional review provision	Option next available June 2023	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

N/A = not applicable

Table 15 Summary of performance for Consent 4046-3

Purpose: *To discharge emissions into the air from the manufacture of ammonia and urea and associated activities at an ammonia-urea manufacturing complex*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Best practicable option	Site inspections and liaison with consent holder	Yes
2. Prior to changing plant processes or operations that may change nature of discharge the Company shall consult with the TRC	Liaison with consent holder	Yes
1. Limits the mass emission of ammonia from the dust scrubber and blow down tank vent	Liaison with the consent holder and monitoring of discharges by K2 Environmental for Ballance	Yes
2. Limits the concentration of ammonia beyond the site boundary	Liaison with consent holder and monitoring at boundary by Ballance and Council	Yes
3. Consent holder to establish monitoring sites for ammonia	Due by 12 February 2013. Sites established in September 2012.	Yes
4. Limits the concentration and mass of urea emissions	Liaison with consent holder and monitoring of discharges by K2 Environmental for Ballance	Yes
5. Limits the concentration of carbon monoxide and nitrogen dioxide beyond the plant boundary	Liaison with consent holder. Monitoring of carbon monoxide by Council. NOx not monitored as previous results indicate compliance.	Yes
6. Limits the concentration of other contaminants beyond the plant boundary	Liaison with consent holder and inspection	Yes
7. Discharge not to give rise to offensive or objectionable odour beyond the plant boundary	Inspections and Company records.	Not determined- no complaints to the Council
8. Written report required every three years detailing emissions and measure undertaken to reduce them	Received 10 June 2015	Yes
9. Consent holder to convene meeting three-yearly	Annual meetings with neighbours held, not attended by Council	Yes
10. Shall maintain and operate a site contingency plan and review it annually	Site inspections and correspondence from the Company	Yes
11. Optional review provision	Next scheduled in June 2023, if required	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**High** **High**

N/A = not applicable

During the 2016-2017 period under review, the Company demonstrated a high level of environmental performance and compliance with the resource consents as defined in Section 1.1.4.

3.5 Recommendations from the 2015-2016 Annual Report

In the 2015-2016 Annual Report, it was recommended:

1. THAT monitoring of air emissions from the Ammonia Urea Plant of Ballance Agri-Nutrients Limited in the 2016-2017 year continue at the same level as in 2015-2016.
2. THAT monitoring of abstractions for and discharges from the Ammonia Urea Plant of Ballance Agri-Nutrients Limited in the 2016-2017 year continue at the same level as in 2015-2016.
3. THAT monitoring of the effects of abstraction from Waingongoro River for the Ammonia Urea Plant of Ballance Agri-Nutrients Limited be reviewed upon provision of the report on the intake fish entrainment trial being undertaken in 2016-2017.
4. THAT the option for a review of resource consent 0596-3 (surface take) in June 2017, as set out in condition 14 on consent 0596-3 not be exercised, on the ground that the current conditions are adequate to deal with any potential adverse effects.
5. THAT the option for a review of resource consent 0597-3 (discharge to land) in June 2017, as set out in condition 14 on consent 0597-3 not be exercised, on the ground that the current conditions are adequate to deal with any potential adverse effects.
6. THAT the option for a review of resource consent 0598-3 (discharge to water) in June 2017, as set out in condition 12 on consent 0598-3 not be exercised, on the ground that the current conditions are adequate to deal with any potential adverse effects.
7. THAT the option for a review of resource consent 1213-3 (emergency take) in June 2017, as set out in condition 6 on consent 1213-3 not be exercised, on the ground that the current conditions are adequate to deal with any potential adverse effects.
8. THAT the option for a review of resource consent 1766-3 (contingency discharge) in June 2017, as set out in condition 10 on consent 1766-3 not be exercised, on the ground that the current conditions are adequate to deal with any potential adverse effects.
9. THAT the option for a review of resource consent 4046-3 (air discharge) in June 2017, as set out in condition 13 on consent 4046-3 not be exercised, on the ground that the current conditions are adequate to deal with any potential adverse effects.
10. THAT the option for a review of resource consent 4719-3 (groundwater take) in June 2017, as set out in condition 4 on consent 4719-3 not be exercised, on the ground that the current conditions are adequate to deal with any potential adverse effects.

All the recommendations were followed. A fish entrainment trial was completed at the Waingongoro River water intake. The monitoring programme on the abstraction will still need to be reviewed, as a meeting with interested parties regarding the results of the trial has not yet occurred.

3.6 Alterations to monitoring programmes for 2017-2018

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 already made available through monitoring or other means to date;
- its relevance under the RMA;
- the Council's obligations to monitor consented activities and their effects under the RMA;

- the record of administrative and environmental performances of the consent holder; and
- reporting to the regional community.

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

It is proposed that for 2017-2018, the monitoring remain the same as for 2016-2017 except that the monitoring programme on the abstraction will need to be reviewed in consultation with interested parties now the fish entrainment trail has been completed. A recommendation to this effect is attached.

It should be noted that the proposed programme represents a reasonable and risk-based level of monitoring for the site(s) in question. The Council reserves the right to subsequently adjust the programme from that initially prepared, should the need arise if potential or actual non-compliance is determined at any time during 2017-2018.

3.7 Exercise of optional review of consent

All seven of the consents held by the Company provided for an optional review in June 2017.

Resource consents 0596-4 (surface take), 0597-3 (discharge to land), 0598-3 (discharge to water), 1213-3 (emergency take), 1766-3 (contingency discharge to water), 4046-3 (air discharge) and 4719-3 (groundwater take) provide for an optional review of the consent in June 2017. Condition 14 on consent 0596-3, condition 14 on consent 0597-3, condition 12 on consent 0598-3, condition 6 on consent 1213-3, condition 10 on consent 1766-3, condition 13 on consent 4046-3, and condition 4 on consent 4719-2 allow the Council to review the consents for the purpose of ensuring that the conditions are adequate to deal with any adverse effects of the respective activities on the environment.

Based on the results of monitoring in the year under review, and in previous years as set out in earlier annual compliance monitoring reports, and after careful review of the current it was decided that a formal review of the consent conditions was not required.

4 Recommendations

1. THAT in the first instance monitoring of air emissions from the Ammonia Urea Plant of Ballance Agri-Nutrients Limited in the 2017-2018 year continue at the same level as in 2016-2017.
2. THAT should there be issues with environmental or administrative performance in 2017-2018, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.
3. THAT monitoring of abstractions for and discharges from the Ammonia Urea Plant of Ballance Agri-Nutrients Limited in the 2017-2018 year continue at the same level as in 2016-2017.
4. THAT monitoring of the effects of abstraction from the Waingongoro River be reviewed in consultation with interested parties, as provided in condition 10 and 11on consent 0596-3.

Glossary of common terms and abbreviations

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

Approach velocity	The speed at which water moves towards an intake structure, expressed in m/s.
AUP	Ammonia urea plant.
Ballance	Ballance Agri-Nutrients Limited.
Biomonitoring	Assessing the health of the environment using aquatic organisms.
Bund	A wall around a tank to contain its contents in the case of a leak.
Condy	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 20˚C and expressed in MS/m.
Cu*	Copper.
DRP	Dissolved reactive phosphorus.
EPT	Ephemeroptera, Plecoptera and Trichoptera; species of mayflies, stoneflies and caddisflies sensitive to organic pollution.
Fresh	Elevated flow in a stream, such as after heavy rainfall.
g/m^3	Grams per cubic metre, and equivalent to milligrams per litre (mg/L). In water, this is also equivalent to parts per million (ppm), but the same does not apply to gaseous mixtures.
Hg	Mercury.
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	Un-ionised ammonia, normally expressed in terms of the mass of ammonia (NH_3).
Ni	Nickel.

NIWA	National Institute of Water and Atmospheric Research
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 the 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.
RMP	Riparian management plan.
SS	Suspended solids.
Sweep velocity	The speed at which water moves past an intake structure, expressed in m/s.
Temp	Temperature, measured in ˚C (degrees Celsius).
TRC	Taranaki Regional Council.
Turb	Turbidity, expressed in NTU.
UI	Unauthorised Incident.
UIR	Unauthorised Incident Register – contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan.
Zn*	Zinc

* an abbreviation for a metal or other analyte may be followed by the letter ‘As’, to denote the amount of metal recoverable in acidic conditions. This is taken as indicating the total amount of metal that might be solubilised under extreme environmental conditions. The abbreviation may alternatively be followed by the letter ‘D’, denoting the amount of the metal present in dissolved form rather than in particulate or solid form.

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

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Appendix I

Resource consents held by Ballance Agri-Nutrients (Kapuni) Ltd

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

Water Permit

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

Name of Consent Holder:	Ballance Agri-Nutrients (Kapuni) Limited P O Box 439 HAWERA 4640
Decision Date:	31 August 2012
Commencement Date:	31 August 2012

Conditions of Consent

Consent Granted:	To take water from the Waingongoro River for operation of an ammonia/urea plant at or about (NZTM) 1707784E-5628870N
Expiry Date:	1 June 2035
Review Date(s):	June 2013, June 2017, June 2023, June 2029
Site Location:	309 Palmer Road, Hawera
Legal Description:	Lot 1 DP 14159 Blk XIII Ngaere SD (Site of take)
Catchment:	Waingongoro

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

General condition

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

Special conditions

1. The volume of water taken shall not exceed 4,000 cubic metres per day.

2. Before exercising this consent the consent holder shall install, and thereafter maintain a water meter and a datalogger at a location that measures all water taken. The water meter and datalogger shall be tamper-proof and shall measure and record the rate (in litres per second) and volume of water (in cubic metres per day) taken to an accuracy of ± 5percent. 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 ± 5percent.

   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 abstraction of water, including, but not limited to, the efficient and conservative use of water.

8. The consent holder shall ensure that no modification is made to the intake that:

   (a) increases the aperture size of any intake screen; or

   (b) increases velocity of water toward any screen (approach velocity) or across any screen (sweep velocity); or

   (c) in any other way that could increase the likelihood of juvenile fish entering the intake or being trapped against the screen.

9. By 31 January 2013 the consent holder shall provide the Chief Executive, Taranaki Regional Council with a report, including recommendations, on an investigation of the costs and benefits of altering the intake to meet design guidelines for minimising the entrainment of juvenile fish.

10. The consent holder shall ensure that a monitoring programme is developed and undertaken that determines compliance with the conditions of this consent and identifies, as far as practicable, the environmental effects resulting from its exercise. The monitoring programme shall be reviewed annually.

11. In developing the monitoring programme referred to in condition 10 the consent holder shall carry out reasonable consultation with Ngati Ruanui and Ngaruahine that includes submitting the monitoring programme to both Iwi for comment and allowing one month for a response. The consent holder shall ensure any comments received are provided to the Chief Executive, Taranaki Regional Council.

12. At least once every year, the consent holder shall convene a meeting with representatives of the Taranaki Regional Council, Fish and Game, Department of Conservation, Ngati Ruanui and Ngaruahine. The meeting shall be for the purpose of discussing and generally informing the parties about the consent holder's monitoring data and the monitoring programme relating to the operation, monitoring and environmental effects of the consented activity.

13. The consent holder shall make ten annual payments of $30,000 (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. The first payment shall be made within 60 days of the commencement of this consent, and subsequent payments shall be made by 1 September each year.

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 special condition 8 (re changes to the intake) of this resource consent during the month of June 2013, for the purpose of requiring the modification of the intake to reduce the risk of fish entrainment.

15. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2017 and/or June 2023 and/or June 2029 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 31 August 2012

For and on behalf of
Taranaki Regional Council

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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:	Ballance Agri-Nutrients (Kapuni) Limited P O Box 439 HAWERA 4640
Decision Date:	31 August 2012
Commencement Date:	31 August 2012

Conditions of Consent

Consent Granted:	To discharge treated plant production effluent and contaminated stormwater from an ammonia/urea plant by spray irrigation onto and into land at or about (NZTM) 1699807E-5629386N, 1700174E-5629156N, 1700195E-5629448N, 1700572E-5629619N, 1700685E-5629761N, 1700700E-5629443N
Expiry Date:	1 June 2035
Review Date(s):	June 2017, June 2023, June 2029
Site Location:	309 Palmer Road, Kapuni
Legal Description:	Pt Lot 1 DP 13121 (Discharge source & site) Lots 1 & 2 DP 15057 Sec 21 Blk XV Kaupokonui SD (Discharge site)
Catchment:	Kapuni

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

General condition

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

Special conditions

1. This consent authorises discharges to the areas of land shown in Appendix 1 attached to this document.

2. The discharge shall not exceed 1,470 cubic metres per day.

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. The consent holder shall ensure that the discharge of contaminants to land in accordance with this consent is maximised and, conversely, the discharge of contaminants to the Kapuni Stream in accordance with consent 1766-3 is minimised.

5. Subject to the other conditions this consent, this consent shall be exercised in accordance with an 'Effluent 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 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, including but not necessarily be limited to details of:

   (a) effluent application rate (volume and components);
   (b) application method;
   (c) pasture and soil husbandry;
   (d) run-off prevention;
   (e) effluent monitoring;
   (f) soil and herbage monitoring;
   (g) groundwater monitoring;
   (h) how the discharge of contaminants to land is maximised;
   (i) surface water monitoring (chemical and biological);
   (j) management of contingency events;
   (k) reporting on the exercise of consent; and
   (l) the size and adequacy of the irrigation area.

   Note: The Management Plan required by this condition may be combined with Management Plans required by the conditions of other consents held by the consent holder for the site.

6. Within 3 months of this consent being issued, the Management Plan required by condition 5 shall be submitted by the consent holder to the Taranaki Regional Council for certification by the Chief Executive.

7. A copy of any reviewed Management Plan, in accordance with conditions 5 and 6, 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).

8. The discharge authorised by this consent shall not give rise to an odour that is offensive or objectionable, at or beyond the boundary of the property or properties on which spray irrigation is occurring.

9. The exercise of this consent shall not result in any spray drift beyond the boundary of the property or properties on which this consent is being exercised.

10. The discharge shall not occur within:

    (a) 25 metres from the banks of any watercourse;
    (b) 50 metres from any bore, well or spring used for water supply purposes;
    (c) 20 metres from any public road;
    (d) 20 metres from any property boundary; or
    (e) 150 metres from any dwellinghouse unless the written approval of the occupier has been obtained to allow the discharge at a lesser distance.

11. The Total Nitrogen applied to any hectare of land shall not exceed:

    (a) 1000 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.

12. The consent holder shall provide to the Chief Executive, Taranaki Regional Council for review, programmes of water treatment used at the Ammonia Urea Plant, including raw water, boiler water and cooling water. Further, the consent holder shall notify the Chief Executive, Taranaki Regional Council, of any change in water treatment chemical, or increase in maximum concentration of any water treatment chemical used, at least one month prior to change of a water treatment programme.

13. The consent holder shall provide to the Chief Executive, Taranaki Regional Council, for review, programmes of chemical cleaning used at the Ammonia Urea Plant. Further, the consent holder shall notify the Chief Executive, Taranaki Regional Council, of any change in chemical cleaning agent, or increase in maximum concentration of any chemical cleaning agent used, at least one month prior to change of a chemical cleaning programme.

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 2029 for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 31 August 2012

For and on behalf of
Taranaki Regional Council

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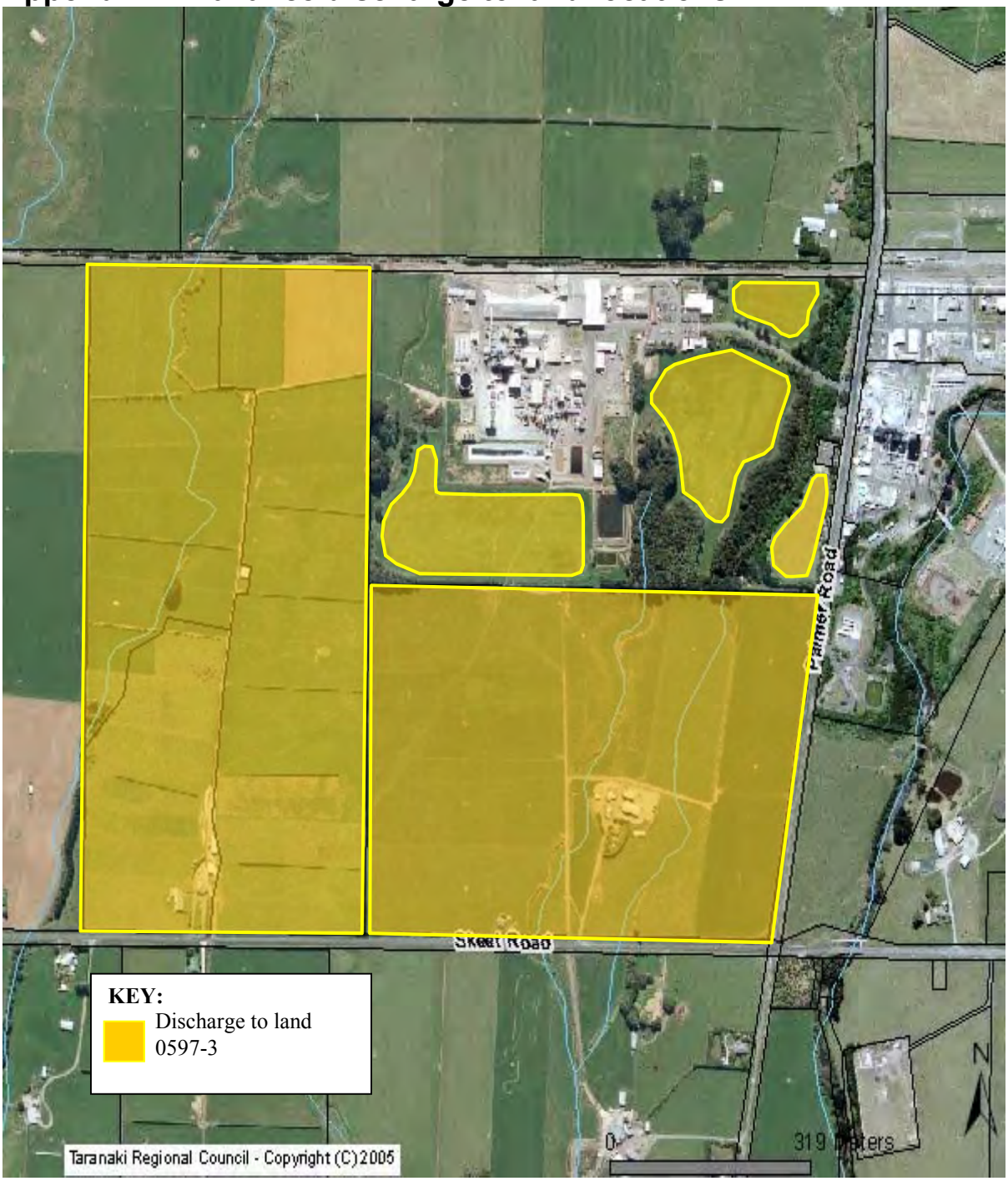
Director-Resource Management

Appendix 1- Ballance discharge to land locations



Discharge Permit

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

Name of Consent Holder:	Ballance Agri-Nutrients (Kapuni) Limited P O Box 439 HAWERA 4640
Decision Date:	31 August 2012
Commencement Date:	31 August 2012

Conditions of Consent

Consent Granted:	To discharge: • stormwater from non-process areas; and • raw water treatment plant wastewater, from an ammonia/urea plant to the Kapuni Stream and into an unnamed tributary of the Kapuni Stream at or about (NZTM) 1700851E-5629366N and 1700454E-5629380N
Expiry Date:	1 June 2035
Review Date(s):	June 2017, June 2023, June 2029
Site Location:	309 Palmer Road, Kapuni
Legal Description:	Pt Lot 1 DP 13121 & Lot 1 DP 15254 (Discharge sites)
Catchment:	Kapuni

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

General condition

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

Special conditions

1. The discharge shall not exceed 1,920 m^3 per day to the Kapuni Stream, or 4,080 m^3 per day to an unnamed tributary of the Kapuni Stream.

2. 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.

3. Constituents of the discharge shall meet the standards shown in the following table.

Constituent	Standard
pH	Within the range 6.5 to 9.0
Zinc	Concentration not greater than 0.5 gm^{-3}

4. Beyond a mixing zone of 200 metres downstream from the discharge point, the discharge shall not cause constituents in the Kapuni Stream to exceed the maximum concentrations shown in the table below.

Constituent	Maximum concentration
Un-ionised ammonia	0.025 gm^{-3}
Sodium	40 gm^{-3}

5. After allowing for reasonable mixing, within a mixing zone extending 200 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.

6. The consent holder shall monitor the Kapuni Stream for pH, unionised ammonia, and sodium, at locations and at a frequency that enables compliance with condition 4 to be determined.

7. The consent holder shall manage its stormwater disposal system in such a manner as to minimise the discharge of dissolved reactive phosphorus to the Kapuni catchment.

8. Subject to the other conditions this consent, this consent shall be exercised in accordance with an 'Effluent 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 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, including but necessarily limited to details of:

   (a) exclusion of contaminated stormwater;
   (b) minimisation of dissolved reactive phosphorus in the discharge;
   (c) monitoring of the discharge;
   (d) monitoring of the Kapuni Stream;
   (e) discharge to the Kapuni tributary in times of extreme rainfall; and
   (f) reporting on exercise of consent.

   Note: The Management Plan required by this condition may be combined with Management Plans required by the conditions of other consents held by the consent holder for the site.

9. Within 3 months of this consent being issued, the Management Plan required by condition 8 shall be submitted by the consent holder to the Taranaki Regional Council for certification by the Chief Executive.

10. A copy of any reviewed Management Plan, in accordance with conditions 8 and 9, 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).

11. The consent holder shall provide to the Chief Executive, Taranaki Regional Council for review programmes of raw water treatment used at the Ammonia Urea Plant. Further, the consent holder shall notify the Chief Executive, Taranaki Regional Council, of any change in water treatment chemical, or increase in maximum concentration of any water treatment chemical used, at least one month prior to change of a water treatment programme.

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 and/or June 2029, for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 31 August 2012

For and on behalf of
Taranaki Regional Council

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Director-Resource Management

Water Permit

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

Name of Consent Holder:	Ballance Agri-Nutrients (Kapuni) Limited P O Box 439 HAWERA 4640
Decision Date:	31 August 2012
Commencement Date:	31 August 2012

Conditions of Consent

Consent Granted:	To take and use water from the Kapuni Stream (at times when the normal water supply has failed) for operation of an ammonia/urea plant at or about (NZTM) 1701490E-5630833N
Expiry Date:	1 June 2035
Review Date(s):	June 2017, June 2023, June 2029
Site Location:	309 Palmer Road, Kapuni
Legal Description:	Lot 2 DP 10570 Blk XVI Kaupokonui SD (Site of take) Pt Lot 1 DP 13121 (Site of use)
Catchment:	Kapuni

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

General condition

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

Special conditions

1. The rate of water taken shall not exceed 33 litres per second.

2. This consent authorises taking only at times when the consent holder's water supply from the Waingongoro River (under consent 0596-3) has failed.

3. The consent holder shall maintain a record of taking to an accuracy of ±5%, including date and daily volume taken. The record shall be provided to the Chief Executive, Taranaki Regional Council, no later than 31 July each year, or earlier upon request.

4. 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 abstraction of water, including, but not limited to, the efficient and conservative use of water.

5. Each time the consent is exercised the consent holder shall immediately advise the Chief Executive, Taranaki Regional Council, and within five days provide a written report. The report shall detail how the normal supply failed and the work programme proposed to reinstate it as soon as practicably achievable. If the time taken to reinstate the normal supply is longer than five days the consent holder shall provide progress reports in a form and at a frequency as may be directed by the Chief Executive, Taranaki Regional Council.

6. 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 2029, for the purposes 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 31 August 2012

For and on behalf of
Taranaki Regional Council

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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:	Ballance Agri-Nutrients (Kapuni) Limited P O Box 439 HAWERA 4640
Decision Date:	31 August 2012
Commencement Date:	31 August 2012

Conditions of Consent

Consent Granted:	To discharge treated plant production effluent and contaminated stormwater from an Ammonia/Urea plant into the Kapuni Stream when wet ground conditions do not allow spray irrigation onto and into land at or about (NZTM) 1700851E-5629366N
Expiry Date:	1 June 2035
Review Date(s):	June 2017, June 2023, June 2029
Site Location:	309 Palmer Road, Kapuni
Legal Description:	Lot 1 DP 15254 (Discharge site)
Catchment:	Kapuni

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

General condition

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

Special conditions

1. The consent may be exercised only when the effluent cannot be immediately assimilated into the soil and on-site effluent storage is nearing full capacity.

2. The discharge shall not exceed 1000 cubic metres per day.

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. Constituents of the discharge shall meet the standards shown in the following table.

Constituent	Standard
pH	Within the range 6.5 to 9.0
Zinc	Concentration not greater than 1.5 gm^{-3}

5. Beyond a mixing zone of 200 metres downstream from the discharge point, the discharge shall not cause constituents in the Kapuni Stream to exceed the maximum concentrations shown in the table below.

Constituent	Maximum concentration
Un-ionised ammonia	0.025 gm^{-3}
Nitrite	0.2 gm^{-3}

6. After allowing for reasonable mixing, within a mixing zone extending 200 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.

7. Subject to the other conditions this consent, this consent shall be exercised in accordance with an 'Effluent 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 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, including but necessarily limited to details of:

   (a) conditions under which this consent may be exercised;
   (b) how compliance with condition 2 is determined;
   (c) notification to the Taranaki Regional Council about the exercising of this consent;
   (d) monitoring of the discharge;
   (e) monitoring of the Kapuni Stream; and
   (f) reporting on exercise of consent.

   Note: The Management Plan required by this condition may be combined with Management Plans required by the conditions of other consents held by the consent holder for the site.

8. Within 3 months of this consent being issued, the Management Plan required by condition 7 shall be submitted by the consent holder to the Taranaki Regional Council for certification by the Chief Executive.

9. A copy of any reviewed Management Plan, in accordance with conditions 7 and 8, shall be provided to the Department of Conservation and Fish and Game New Zealand (Taranaki Region), for the Taranaki Regional Council to take into account any comments received (within a two week timeframe from when the Plan was provided).

10. 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 2029 for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 31 August 2012

For and on behalf of
Taranaki Regional Council

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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:	Ballance Agri-Nutrients [Kapuni] Limited P O Box 439 HAWERA 4640
Decision Date:	10 February 2012
Commencement Date:	10 February 2012

Conditions of Consent

Consent Granted:	To discharge emissions into the air from the manufacture of ammonia and urea and associated activities at an ammonia-urea manufacturing complex at or about (NZTM) 1700202E-5629703N
Expiry Date:	1 June 2035
Review Date(s):	June 2017, June 2022, June 2027, June 2032
Site Location:	309 Palmer Road, Kapuni
Legal Description:	Lot 20 Blk XV Kaupokonui SD (Discharge source & site)

General condition

a. The consent holder shall pay to the Taranaki Regional Council all the administration, monitoring and supervision costs of this consent, fixed in accordance 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 actual or likely adverse effects on the environment arising from discharges to air from the site. The best practicable option includes, but is not limited to:

   - the consent holder at all times operating, maintaining, supervising, monitoring and controlling all processes so that emissions authorised by this consent are maintained at a practicable minimum;
   - urea being handled in such a manner and process and conveying equipment so contained to minimise spillages outside processing, storage and packaging/dispatch buildings or areas, and to prevent transport of dust beyond the boundary of the site;
   - the storage of anhydrous ammonia being undertaken in such a manner that maximum protection is afforded to valves, pipes and other fittings to minimise risk of accidental damage; and
   - the probability of ammonia pressure safety valve [PSV] system discharges being reduced as far as practicable, to ensure that any discharge does not pose a significant risk to people living or working in the area nor to farm livestock.

2. Prior to undertaking any alterations to the plant, processes or operations which may significantly change the nature or quantity of contaminants discharged to air from the site, the consent holder shall consult with the Chief Executive, Taranaki Regional Council, and shall obtain any necessary approvals required under the Resource Management Act 1991.

3. The combined emission of ammonia [as NH3] from the following sources shall not exceed 295 kg/hour:

   a) dust scrubber fan D4-GB-1505; and
   b) blow down tank vent D5-FA-403.

4. The emission of ammonia to the atmosphere under normal operation, start-up and shut-down shall be so controlled to ensure that the maximum ground level concentrations [one-hour average] do not exceed 4.27ppm (v/v) beyond the boundary of the site.

5. Within 12 months of the issue of this consent, the consent holder shall to the satisfaction of the Chief Executive, Taranaki Regional Council, establish two static monitoring locations beyond the boundary of the site for the purpose of monitoring atmospheric ammonia on adjacent property, and to check compliance with condition 4. The consent holder shall record the ground level concentration of ammonia at the static monitoring locations, every Wednesday morning between 7.00 am and 10.00 am, or at an alternative time as agreed to by the Chief Executive, Taranaki Regional Council.

6. The emission of urea shall not exceed:

   a) 125 $mgNm^{-3}$ [as urea] or 12 kg/hour [mass emission] from the dust scrubber fan D4-GB-1505; or

   b) 125 $mgNm^{-3}$ [as urea] from any other source.

7. The consent holder shall control all emissions of carbon monoxide and nitrogen dioxide to air so that the maximum ground level concentration of any of these contaminants, arising from the exercise of this consent, measured under ambient conditions does not exceed the relevant ambient air quality standard as set out in the Resource Management [National Environmental Standards for Air Quality Regulations, 2004] at or beyond the site boundary.

8. The consent holder shall control emissions of all contaminants to air, other than those expressly provided for in other special conditions of consent, so that they do not individually or in combination with other contaminants cause a hazardous, noxious, dangerous, offensive or objectionable effect at or beyond the boundary of the property.

9. The discharges authorised by this consent shall not give rise to an odour at or beyond the boundary of the site that is offensive or objectionable.

   Note: For the purposes of this condition:

   - The boundary of the site is as illustrated on the map attached; and
   - Assessment under this condition shall be in accordance with the Good Practice Guide for Assessing and Managing Odour in New Zealand, Air Quality Report 36, Ministry for the Environment, 2003.

10. The consent holder shall provide to the Chief Executive, Taranaki Regional Council by 1 June 2012 and every three years thereafter, a written report which includes:

    a) a review of any technological advances in the reduction or mitigation of discharges to air from the site, and the costs and benefits of these advances; and
    b) an evaluation and review of ammonia pressure safety valve [PSV] systems, operating parameters, and vent heights to ensure that the probability of PSV discharges have been reduced as far as practicable, and to determine whether flaring or other control rather than vent height is practicable as a means to reduce ground level concentrations of ammonia; and
    c) details of any complaints received [external to the operation of the plant], to include date, time, operating conditions, weather conditions and measures taken in response; and
    d) monitoring records required by condition 5.

11. At least once every three years the consent holder shall convene a meeting with representatives of the Taranaki Regional Council and adjacent residential and industrial neighbours, to enable the dissemination and discussion of information relating to this consent.

12. The consent holder shall maintain a contingency plan for the site. The contingency plan shall be adhered to in the event of a spill or emergency and shall, to the satisfaction of the Chief Executive, Taranaki Regional Council, detail measures and procedures to be undertaken to prevent spillage or accidental discharge of contaminants not authorised by this consent and measures to avoid, remedy or mitigate the environmental effects of such a spillage or discharge.

13. 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 2022 and/or June 2027 and/or June 2032 for the purpose of ensuring that the ammonia standard specified in condition 4 is appropriate, and 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 10 February 2012

For and on behalf of
Taranaki Regional Council

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Director-Resource Management

Appendix 1

Map showing site boundary

Water Permit

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

Name of Consent Holder:	Ballance Agri-Nutrients (Kapuni) Limited P O Box 439 HAWERA 4640
Decision Date:	31 August 2012
Commencement Date:	31 August 2012

Conditions of Consent

Consent Granted:	To take and use groundwater from the Kapuni Stream for industrial site remediation and process use purposes at or about (NZTM) 1700277E-5629526N
Expiry Date:	1 June 2035
Review Date(s):	June 2017, June 2023, June 2029
Site Location:	309 Palmer Road, Kapuni
Legal Description:	Lot 1 DP 13121 (Site of take & use)
Catchment:	Kapuni

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

General condition

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

Special conditions

1. The volume of water taken shall not exceed 200 m^3 per day.

2. The consent holder shall maintain a record of the abstraction including date, rate, pumping hours and daily volume abstracted and supply these records to the Chief Executive, Taranaki Regional Council, no later than 31 July of each year, or earlier upon request.

3. 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 abstraction of groundwater, including, but not limited to, the efficient and conservative use of water.

4. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2017 and/or June 2023 and/or June 2029 for the purpose of ensuring that the conditions are adequate to deal with any adverse effects on the environment arising from the exercise of this resource consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Signed at Stratford on 31 August 2012

For and on behalf of
Taranaki Regional Council

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Director-Resource Management

Appendix II

Fish entrainment survey at the Ballance water intake site on the Waingongoro River

Fish entrainment survey at the Ballance water intake site on the Waingongoro River

Document No: 1796132

Date: 19 May 2017

Dr Darin Sutherland, Scientific Officer (Taranaki Regional Council)

Introduction

In August 2012, Ballance Agri-Nutrients (Kapuni) Limited (Ballance) was granted consent 0596-3 (Appendix 1) to take up to 4,000 m^3/d of water from Waingongoro River (Figure 1). This consent represented an additional 15% take of water from the Waingongoro River compared with the previous consent. The increased water take allowed Ballance to install an auxiliary water cooling tower to improve production efficiency during summer and allowed increased production of certain products. A number of special conditions were imposed to meet concerns raised by submitters (Ngati Ruanui, Ngaruahine, Fish & Game, and the Department of Conservation) regarding the increased water take. Special condition 10 and 11 requires Ballance to develop a monitoring programme in consultation with Iwi that identifies environmental effects and determines compliance with the consent conditions.

The current water intake structure has a screen that would prevent the entrainment of adult fish but could allow larval and juvenile fish to be entrained. A report produced by consultant Tonkin and Taylor (Tonkin and Taylor, 2014) identified fish species present at the water intake site as well as fish present further upstream and at the Waingongoro River mouth. It should be noted that downstream of the Ballance intake is the Normanby Weir. This structure currently severely restricts the upstream passage of fish.

To provide information in relation to the formulation of the monitoring programme the Taranaki Regional Council (TRC) in conjunction with Ballance have undertaken fish surveys to help determine the effect of the water intake on fish populations in the Waingongoro River by examining the amount of fish entrained by the water take.

The first component of this work used the fish data contained within Tonkin and Taylor (2014) in conjunction with work identifying fish migrations and spawning times (EW, 2007) to quantify the risk of fish entrainment. The second component was conducting fish surveys at potentially high risk times to determine actual fish entrainment. This report presents the findings of the fish entrainment investigation undertaken by TRC and Ballance to determine whether any change to the Company's water intake structure on Waingongoro River is necessary to protect fish populations.

Figure 1. Map showing water intake structure adjacent to the Waingongoro River

Methods

A fish calendar adapted from an existing Environment Waikato calendar (EW, 2007) was created identifying times when peak fish migrations were likely to occur (Table 1). This shows that the period of greatest risk for fish entrainment is between October to February for most fish species that could be affected by the water intake (Table 1).

Five surveys, the first two during daylight hours and the last three during the evening were completed in spring and summer months (Table 2). A recent study indicated that larval fish migration occurs mainly at night and therefore evening surveying was implemented from the third survey onwards (Jarvis, 2015). Larval fish would be particularly susceptible to entrainment due to their poor swimming ability.

Table 1. Fish calendar indicating times of peak fish migrations (mainly spring and summer)

Species	Direction	Life stage	Summer		Autumn			Winter			Spring			Summer
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Longfin eel	Upstream	Juvenile												
Shortfin eel	Upstream	Juvenile												
Redfinned bully	Downstream	Larvae												
Redfinned bully	Upstream	Juvenile												
Common bully	Downstream	Larvae												
Common bully	Upstream	Juvenile												
Upland bully	None	Larvae												
Crans bully	None	Larvae												
Giant Kokopu	Downstream	Larvae												
Giant Kokopu	Upstream	Juvenile												
Koaro	Downstream	Larvae												
Koaro	Upstream	Juvenile												
Brown mudfish	None	Larvae												
Lamprey	Downstream	Larvae												
Torrentfish	Upstream	Juvenile												
Common smelt	Downstream	Larvae												
Common smelt	Upstream	Juvenile												
Rainbow trout	Downstream	Larvae												
Brown trout	Downstream	Larvae												

Dark blue = peak migration, light blue = total migration range

Table 2. Summary of survey dates and flow data

Survey No.	Date	Survey duration (minutes)	River flow* (m^3/s)	Approximate volume sampled (m^3)
1	27/11/14	100	1.2	100
2	5/02/15	77	0.47	85
3	24/02/15	86	0.33	91
4	20/10/16	70	1.87	82
5	23/11/16	70	2.42	82

* At Eltham Road hydrometric station 13 km upstream of the water intake

The sampling procedure required diverting a proportion of the abstraction to a net suspended in a large plastic container via a large flexible hose (Figure 2-5). The net used had an aperture size of 1.5 mm by 2 mm. River flow at the time of the survey and the volume sampled are presented in Table 2. Approximately 80-100 cubic metres of water was sampled each time for the five surveys over approximately 1.2-1.5 hrs with a minimum of one hour of peak pump velocity (75 m^3/h). This equates to approximately 55% of the total pump flow.

Figure 2. Sampling in operation at full velocity (75 m^3/h)

The material collected on each occasion was breifly checked on site for fish before being stored at 4°C overnight for closer examination the following morning. A dissecting microscope was used to help identifiy macroinvertebrates. Any animals, or parts of animals, found were placed in a petri dish to be photographed and identified. Macroinvertebrates were identified down to a broad taxonomic level (generally at the Order level) and any fish found were to have been individually photographed, identified down to species level if practical using McCarteer (1994) and McDowall (1990) reference material, and their lengths recorded. A photograph of the general detritus collected was also taken.

Figure 3. Hose leading from the outlet pipe to the container holding the net

Figure 4. Water emptying from top of container onto sheeting used to prevent scouring

Figure 5. Overview of sampling operation with the pumps and other infrastructure to the left hand side of the picture

Results

The most significant result was that there was no fish caught in any of the five surveys. A number of different macroinvertebrate taxa were collected (mostly cased caddisflies and chironomid midges), along with detritus consisting of plant matter and some metal flakes, presumably from the intake pipe. The results are presented in more detail below.

Survey 1 on 27/11/14

Riverflow at the Eltham Road hydrometric station (TIDEDA site 35004), situated 13 km upstream, was 1.2 m^3 which was slightly below the median flow of 1.75 m^3. Sampling was carried out 1120-1300 NZDT.

- No fish were caught
- Animals found
    - 1 stonefly
    - 1 adult Diptera (true fly)
    - 9 caddisfly, of which 3 were alive

Figure 6. Tray showing the contents collected from sampling on 27/11/14

Figure 7. Petri dish showing invertebrates collected from the sampling on 27/11/14

Survey 2 on 5/02/15

Riverflow at the Eltham Road hydrometric station was 0.47 m^3 which was significantly below the median flow of 1.75 m^3 and was just above the mean annual low flow (MALF) of 0.443 m^3. Sampling was carried out from 1300-1417 NZDT.

- No fish were caught
- Animals found
    - 2 caddisfly and one chironomid (parts)

Figure 8. Tray showing the contents collected from sampling on 5/02/15

Figure 9. Dish showing parts of two caddisfly and one chironomid found in the 5/02/15 sample

Survey 3 on 24/02/15

Riverflow at the Eltham Road hydrometric station was 0.33 m^3 which was significantly below the median flow of 1.75 m^3 and was below both the mean annual low flow (MALF) of 0.443 m^3 and the five year low flow (0.346 m^3) Sampling was carried out from 2004-2130 NZDT.

- No fish were caught
- Animals found
    - 2 chironomids. One chironomid was still alive

Figure 10. Tray showing the contents collected from sampling on 24/02/15

Figure 11. Dish showing two chironomids found on the 24/02/15 sample

Survey 4 on 20/10/16

Riverflow at the Eltham Road hydrometric station was 1.87 m^3 which was slightly above the median flow of 1.75 m^3 and 18 days after a significant fresh greater than 7x median flow. Sampling was carried out from 1950-2100 NZDT.

- No fish were caught
- Animals found
    - 2 cased caddisfly one alive
    - 2 empty cased caddisfly cases
    - 1 live caseless caddisfly
    - 2 terrestrial spiders, one dead one alive
    - 1 terrestrial fly
    - A few body parts including 2 wings, 1 abdomen, 1 mouthpart, 1 leg

Figure 12. Tray showing the contents collected from sampling on 20/10/16

Figure 13. Dish showing animals found on the 20/10/16 sample

Survey 5 on 23/11/16

Riverflow at the Eltham Road hydrometric station was 2.42 m^3 which was above the median flow of 1.75 m^3 and 7 days after a significant fresh greater than 7x median flow. Sampling was carried out from 2020-2130 NZDT.

- No fish were caught
- Animals found
    - 7 empty cases from cased caddisfly
    - 3 caddisfly (2 might be from the empty cases)
    - 2 sandfly larvae
    - 1 snail
    - 1 chironomid midge
    - 1 cranefly larvae
    - Assorted insect parts

Figure 14. Tray showing the contents collected from sampling on 23/11/16

Figure 15. Dish showing animals found on the 23/11/16 sample

Discussion

No fish were caught in the five surveys. There are a number of potential factors that may have contributed to this result. Firstly, no fish were present of a size that could not overcome the flow velocity of the intake at the time of the surveys. Secondly, flow in the river may have taken neutrally buoyant fish downstream or encouraged swimming fish away from the intake. Thirdly, the sampling method was somehow biased so that no fish entering the pipe were collected in the net. Fourthly, fish captured were pulverised and therefore not identified. Fifthly, fish were not being retained in the net.

The third, fourth and fifth reasons can probably be discounted by the presence of small, intact macroinvertebrates found in all of the samples collected. If the methodology used was unable to catch fish, destroyed the fish captured within the intake structure, or could not retain fish in the net, then macroinvertebrates would also be subjected to the same processes and therefore these should be absent from the samples collected as well. It can therefore be confirmed that the methodology employed successfully sampled intake river water for aquatic animals with relatively weak swimming ability.

A lack of fish present of a size that could not escape the flow velocity of the intake could be due to a combination of factors. The presence of the Normanby Weir downstream of the Ballance intake structure is likely to be a significant barrier to some fish species as the fish pass is broken. This would limit upstream migrations of some species and potentially reduce the abundances of species that were present above the Normanby Weir as recruitment is reduced. Furthermore, another large weir exits 13 km upstream of the intake at Eltham which would also be a barrier to upstream fish passage and may further reduce fish populations in the upper Waingongoro River, limiting downstream migrations.

A report (Tonkin and Taylor, 2014) addressing the costs and benefits of upgrading the intake structure to meet design guidelines for minimising the entrainment of juvenile fish was produced by consultant Tonkin & Taylor in February 2014. The report suggested the current location of the intake pipe above a small rock weir was likely to help minimise approach velocities by ensuring the intake pipe was always submerged which may have helped reduce fish entrainment.

There is currently no empirical evidence that fish are being entrained by the water intake. Concerns surrounding the water intake were largely based on the grill size of the current water take which was larger than best practice guidelines (Bejakovich, 2005 and Charteris, 2006).

There were five surveys conducted and given the sporadic nature of fish migrations there may not have been any fish migrations occurring during the time of the surveys. The species and abundance of larval and juvenile fish in a river is not constant. Different species have different spawning times and most native New Zealand freshwater fish species undertake migrations to and from the sea (McDowall, 1990) and these migration times vary seasonally. The fish calendar constructed for the Taranaki Region indicated that the majority of migrations occur between October and February for fish species possibly present at the intake site and all five surveys were in this period. Furthermore, some fish species are known to have larval drift migration peaks immediately after sunset lasting less than two hours (Jarvis, 2015) and this was the period targeted by the three night surveys to help

maximise the chance of capturing fish. Pump velocities were also at their highest rate for the majority of the sampling to maximise fish entrainment.

There was a broad range of flow conditions among the different sampling dates. Both high and low flows could potentially affect the fish migration. High flows are thought to trigger hatching in some galaxiid species (Allibone and Caskey, 2000) but could also temporarily inhibit upstream migration. Low flows would potentially make it easier for juvenile fish to migrate upstream but could also inhibit movement (e.g. a slightly perched culvert might be passable at higher flows but not low flows). Conducting the surveys over a range of flow conditions ensured flow did not unduly affect the results.

Conclusions

No fish were caught in the five surveys and therefore the water intake is not likely to be having a significant effect on fish populations in the Waingongoro River. This is assuming that if fish had been entrained they would have been detected using the described sampling methodology, that fish at risk of being entrained were in the river and that abstraction was representative of normal operations. The sampling generally targeted optimal times for fish entrainment but the absence of fish does not preclude fish being entrained in the water take. However, the results indicate that levels of fish mortality as a result of entrainment are not likely to have any meaningful effect on fish populations.

Recommendations

1) That sufficient sampling has occurred to determine that fish entrainment is of less than minor significance at the Ballance water intake.

2) That further monitoring may need to occur if upstream passage improves and/or there is an increase in fish diversity/abundance.

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Jarvis, M. 2015. Larval drift and development of amphidromous fishes, particularly the bluegill bully (*Gobiomorphus hubbsi*). MSc thesis. University of Otago. Pp 41.

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Tonkin and Taylor Ltd. 2014. Kapuni water intake cost benefit assessment of intake options to minimise fish entrainment. Consultancy Report prepared for Ballance Agri-Nutrients Ltd. T&T Ref:23997.005.

TRC, 2014. Outline of fish monitoring equipment at Ballance site. DOC No. 1427627.

Appendix 1

Resource consent conditions for consent 0596-3

Number	Condition	Type	From
1	The volume of water taken shall not exceed 4,000 cubic metres per day.	Provision of data, monitoring requirement	31/08/2012
2	Before exercising this consent the consent holder shall install, and thereafter maintain a water meter and a datalogger at a location that measures all water taken. The water meter and datalogger shall be tamper-proof and shall measure and record the rate (in litres per second) and volume of water (in cubic metres per day) taken to an accuracy of ± 5percent. 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.	Provision of data, monitoring requirement	31/08/2012
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'): has been installed and/or maintained in accordance with the manufacturer's specifications; and/or has been tested and shown to be operating to an accuracy of ± 5percent. The documentation shall be provided: within 30 days of the installation of a water meter or datalogger; 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 no less frequently than once every five years.	Provision of data, monitoring requirement	31/08/2012
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.	Provision of data, monitoring requirement	31/08/2012

5	The water meter and datalogger shall be accessible to Taranaki Regional Council officers at all reasonable times for inspection and/or data retrieval.	Provision of data, monitoring requirement	31/08/2012
6	The records of water taken shall: be in a format that, in the opinion of the Chief Executive, Taranaki Regional Council, is suitable for auditing; and specifically record the water taken as 'zero' when no water is taken.	Provision of data, monitoring requirement	31/08/2012
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 abstraction of water, including, but not limited to, the efficient and conservative use of water.	Provision of data, monitoring requirement	31/08/2012
8	The consent holder shall ensure that no modification is made to the intake that: increases the aperture size of any intake screen; or increases velocity of water toward any screen (approach velocity) or across any screen (sweep velocity); or in any other way that could increase the likelihood of juvenile fish entering the intake or being trapped against the screen.	Provision of data, monitoring requirement	31/08/2012
9	By 31 January 2013 the consent holder shall provide the Chief Executive, Taranaki Regional Council with a report, including recommendations, on an investigation of the costs and benefits of altering the intake to meet design guidelines for minimising the entrainment of juvenile fish.	Provision of data, monitoring requirement	31/08/2012
10	The consent holder shall ensure that a monitoring programme is developed and undertaken that determines compliance with the conditions of this consent and identifies, as far as practicable, the environmental effects resulting from its exercise. The monitoring programme shall be reviewed annually.	Provision of data, monitoring requirement	31/08/2012
11	In developing the monitoring programme referred to in condition 10 the consent holder shall carry out reasonable consultation with Ngati Ruanui and Ngaruahine that includes submitting the monitoring programme to both Iwi for comment and allowing one month for a response. The consent holder shall ensure any comments received are provided to the Chief Executive, Taranaki Regional Council.	Provision of data, monitoring requirement	31/08/2012

12	At least once every year, the consent holder shall convene a meeting with representatives of the Taranaki Regional Council, Fish and Game, Department of Conservation, Ngati Ruanui and Ngaruahine. The meeting shall be for the purpose of discussing and generally informing the parties about the consent holder's monitoring data and the monitoring programme relating to the operation, monitoring and environmental effects of the consented activity.	Provision of data, monitoring requirement	31/08/2012
13	The consent holder shall make ten annual payments of $30,000 (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. The first payment shall be made within 60 days of the commencement of this consent, and subsequent payments shall be made by 1 September each year.	Provision of data, monitoring requirement	31/08/2012
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 special condition 8 (re changes to the intake) of this resource consent during the month of June 2013, for the purpose of requiring the modification of the intake to reduce the risk of fish entrainment.	Provision of data, monitoring requirement	31/08/2012
15	In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2017 and/or June 2023 and/or June 2029 for the purposes 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; and/or 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 31 August 2012 For and on behalf of Taranaki Regional Council	Provision of data, monitoring requirement	31/08/2012

Appendix III

Review of Stark Environmental Reports: Kapuni macroinvertebrate biomonitoring and electric fishing in relation to Ballance Agri-Nutrients Kapuni Ltd and Vector Ltd – July 2016 – June 2017

Memorandum

To N Crook, Scientific Officer

From D Sutherland, Scientific Officer

Document 1927178

Date 07 Sep 2017

Review of Stark Environmental Reports: Kapuni macroinvertebrate biomonitoring and electric fishing in relation to Ballance Agri-Nutrients Kapuni Ltd and Vector Ltd – July 2016 – June 2017

Introduction

Four macroinvertebrate surveys and two fish surveys were scheduled for the Kapuni Catchment for the 2016-2017 monitoring period (Table 1). In this memo, the reports are reviewed which detail the macroinvertebrate and fish monitoring. Refer to the specific reports for further details.

Table 1 Overview of the monitoring programme for the Kapuni Catchment

Survey dates	Report number	Taxa	Number of sites	
			Kapuni Stream	Tributaries
17/08/16	2016-08	Fish	7	
17/08/16	2016-09	Macroinvertebrate	7	2
23/11/16	2016-10	Macroinvertebrate	9	2
18/01/17	2017-02	Macroinvertebrate	7	2
1/06/17	2017-03	Fish	7	
1/06/17	2017-04	Macroinvertebrate	7	2

Figure 1 Biomonitoring sites in the Kapuni Catchment

Macroinvertebrate monitoring

Biomonitoring in both August and November 2016 survey were undertaken when the river level was slightly above median flow at 1.56 m^3/s after a series of significant freshes. The January 2017 survey was conducted after a period of stable flows with a low flow of 0.40 m^3/s. The June 2017 survey was conducted at higher flows of 1.97 m^3/s (median flow 1.29 m^3/s). Periphyton growth was largely related to flow levels with only the survey in January 2017 having periphyton noted in the report.

Targets for MCI values have been set for the Kapuni main stem and gully system. For the Kapuni Stream a MCI target of 100 has been obtained from historical data and the expected mild enrichment in the mid-catchment. The gully system (site 5) previously had a MCI target of 72 using the hard bottomed score but this has been revised to a soft bottomed index score (MCI-sb) of 73 units based on the 25th percentile of historical data. Site 13 does not have enough data to set a target score based on historic data.

The soft bottom MCI is generally not used by the Taranaki Regional Council due to staff finding it to be unreliable when detecting known, severe pollution incidences. For instance, there have been several examples of sites discovered containing large amounts of sewage fungus and very high BODs that had 'very poor' hard bottomed MCI scores but with 'fair' soft bottomed scores (e.g. MCI-hb of 40 vs MCI-sb 95). The MCI-sb was

developed primarily in the Auckland Region and may not be appropriate for the Taranaki Region and its continued use may need to be reviewed.

Based on a sample size of one for a kick-net sample an error of 10.8 MCI units was used for the four reports. However, this error was based on comparisons between two kicknet samples and as the target value arguably does not contain any sampling error, an error of half 10.8, 5.4 MCI units, is considered more appropriate. The reports suggest this means only scores of less than 62 (73-10.8) require explanation but in fact scores less than 62.2, i.e. 62 and less, should require explanation based on the Stark Environment Ltd target and error rate applied. Having MCI-sb scores of 62 and less in the Taranaki Region, even in streams with known water quality issues, is exceedingly rare.

The gully site 5 is approximately 2,200 m downstream from the boundary with Ballance Kapuni and gully site 13 is approximately 2,000 m downstream of the boundary. The relatively large distance from the site boundary produces two problems. Firstly, effects of any nutrient enrichment will be less apparent the further downstream samples are collected. Weedy streams would be expected to take up significant amounts of nitrogen and therefore the ability to detect effects of nutrient enrichment from the Ballance site at the point where samples were collected is limited. Secondly, the two streams run through a dairy farm and if any degradation were detected it would be difficult to disentangle potential enrichment from the dairy farm (e.g. inappropriate irrigating of dairy shed effluent) from enrichment from Ballance Kapuni.

Based on the large distance from the site, use of the MCI-sb score, error rate, conservative target of 25th percentile, having a target for the two gully sites is in itself of little value and relevance. Macroinvertebrate sampling does still have limited value in the context that if a spill or discharge were to occur that was acutely toxic to macroinvertebrates and would effectively eliminate populations from the monitoring sites, then this would still be detectable. Stark Environment Ltd also concluded that the gully sites were of little practical use and macroinvertebrate communities at the sites were relatively insensitive to nutrient enrichment.

During all four surveys, the Kapuni Stream and its tributary sites generally had scores indicating 'good' or 'very good' macroinvertebrate health. In the November 2016 survey both gully sites had MCI-sb scores of 93 indicating fair health which was quite typical for small, weedy, farm stream. The Kokiri Rd site did have a score of 99, indicative of 'fair' health but this was only one unit below target. There was an expected trend of decreasing score in a downstream direction but the Kokiri Rd site was a highly significant 30 units lower than the control site at site 9 (129 units).

Linear trends in MCI values at the sites are also reported, by plotting MCI and taxa richness versus time using the LOWESS (Locally Weighted Scatterplot Smoothing) method (used with Tension = 0.4). The statistical significance of the trends was assessed using Mann-Kendall tests in STATISTICA 8. The Benjamini-Hochberg false discovery rate (FDR) was also used, to control the overall Type-I error rate in time series analyses. All sites, apart from site 13 that did not have sufficient data collected for trend analysis, exhibited a statistically significant positive trend in all surveys, with such significantly positive trends being strong enough to avoid elimination by the FDR. The last 5-10 years show a levelling off or decrease in scores but as this effects the control site (site 9), it appears to be due to factors unrelated to activities associated with Ballance Kapuni.

Some additional analysis was done, where recorded MCI scores were compared with that predicted using relationships developed between MCI scores and altitude for ringplain streams. There were three predicted values provided, the first based on a relationship developed using all generic ringplain data, the second using Kapuni Stream data collected since 1981 only and the third using Kapuni Stream data collected since 2000. The latter predicts the highest MCI scores, and this is the relationship against which the reported results were compared. Across all reviewed reports the majority of sites recorded an MCI scores relatively close to predicted scores. For the January 2017 survey two sites, sites 7 and Kokiri Rd, had scores 12 and 23 units lower than predicted values. This was attributed to the stable flows preceding the survey which resulted in higher periphyton biomass which favours tolerant taxa. However, It should be noted that upstream sites also experienced the same long period of stable flow and another key element in excessive periphyton growth is

availability of nutrients. Therefore, poorer macroinvertebrate health, caused by higher periphyton biomass, cannot be solely attributed to a lack of freshes.

For the four surveys taxa numbers were variable between sites and surveys but no sites had taxa richnesses that were indicative of preceding water quality that was toxic to macroinvertebrates (minimum taxa richness recorded of eight). Long term trends in taxa richness are also evident at some sites in the Kapuni Stream. This trending, undertaken for the July and October 2014 surveys, showed a statistically significant ($P<0.05$) negative trend in taxa richness at all sites except for site 3. After the October 2014 survey, the need for this trending was reconsidered. As the relationship between taxon richness and stream health is not linear, as both highly polluted and pristine waters can produce low taxa richness, it was decided to discontinue the trending of taxon richness.

Overall, the MCI scores for nearly all sites were similar to their respective means. The Kapuni Stream was generally in 'good' to 'very good' health and the impact (if any) of the industrial activity at Kapuni was not discernible.

Electric Fishing

The two reports that detail the monitoring of fish communities undertaken in the Kapuni Stream in November 2016 (nine sites) and June 2017 (seven sites). It should be noted that normally eleven sites are fished in the spring survey (November 2016) but sites 11 and 12 were not fished due to equipment failure. The area of streambed fished at each site in the Kapuni Stream was approximately 45 m^2, while the tributaries were not fished in either survey.

Table 2 Results of fish survey in the Kapuni Stream conducted on 23 November 2016

Site	Brown trout	Redfin bully	Koaro	Torrentfish	Eels	Koura	Total number of species
O	1		1				2
P			3			1	4
E					2	2	4
9					9	1	10
11	NA	NA	NA	NA	NA	NA	NA
12	NA	NA	NA	NA	NA	NA	NA
10	2	2			2		6
6		1			6		7
7		2			2	2	6
8/K					11		11
N							0
Total	3	5	4	0	32	6	

Table 3 Results of fish survey in the Kapuni Stream conducted on 1 June 2017

Site	Brown trout	Redfin bully	Koaro	Torrentfish	Eels	Koura	Total number of species
O	NA	NA	NA	NA	NA	NA	NA
P	NA	NA	NA	NA	NA	NA	NA
E	NA	NA	NA	NA	NA	NA	NA
9		1				1	2
11							
12		1					1
10							
6		1					1
7							
8/K		2			4	1	7
N	NA	NA	NA	NA	NA	NA	NA
Total	0	5	0	0	4	2	

All sites were surveyed for fish using the single pass electric fishing technique. The results of these surveys are given in Table 2 and Table 3.

A total of 50 animals, comprising five taxa, were caught at nine sites during the November 2016 survey. During the June 2017 survey, eleven animals comprising three taxa were caught. Both survey results were within the range (8-221) of total numbers and variety (2-8 taxa) recorded in previous years with the autumn survey having lower numbers and taxa recorded than the spring survey, in keeping with what was found in the previous monitoring year.

In November 2016, eels were the most abundant taxa comprising 58% of the total number of animals recorded. Koura (14%), koaro (9%), redfin bully (12%) and trout (7%) were also present. Eels are normally the dominant fish recorded from the Kapuni Stream.

In June 2017, redfin bully was the most abundant taxa comprising 55% of the total number of animals recorded. Eels (36%) and koura (18%) were also present. The poor results were likely caused by fine sand deposition and significant freshes.

It has been noted in previous reports that fine sand has been a dominant feature on the streambed, due in part to the erosion on the mountain. This has continued in both reports reviewed and it is likely to have reduced the suitability of habitat for some taxa, such as koura. It is thought that this reduction in available habitat is also responsible for a reduction in the numbers of brown trout recorded per site. The catch per unit effort has dropped from a high of 4.27 brown trout per site in 1982 – 1983 to less than 0.5 from late 2008 to mid 2012. An improvement was recorded in the October 2015 survey, however none were recorded during the April 2016 survey, only three for the November 2016 survey and none for the June 2017 survey. It was suggested that trout records may increase in the near future as Fish and Game is now more actively stocking this river than has happened in the recent past but so far trout numbers to not appear to be improving.

One additional point worth noting is the fact that the v-notch weir at the Vector site has been removed. The weir's removal will have improved fish passage in this reach of the Kapuni Stream, and this may result in improved fish communities. Furthermore, New Zealand Railways Corporation has undertaken works to improve fish passage at the railway bridge, which also may lead to improved fish communities.

Overall, these electric fishing results from the Kapuni catchment do not provide any conclusive indication that the petrochemical industries are having any significant adverse effects on fish communities in the Kapuni catchment with results being affected by sedimentation and significant number of preceding freshes.

Appendix IV

Technical review report prepared by Ballance Agri-Nutrients under special condition 10 of air discharge permit 4046-3

Ref: **TM15-082**

Ballance Agri-Nutrients [Kapuni] Limited

A Report Prepared for Special Conditions 5 and 10 of

Air Discharge Permit 4046-3

June 2012 – May 2015

Contents Page

1.0 INTRODUCTION

Ballance Agri-Nutrients [Kapuni] Limited (*Ballance-Kapuni*) holds Discharge Permit 4046-3, issued by the Taranaki Regional Council for the following purpose:

> *To discharge emissions into the air from the manufacture of ammonia and urea and associated activities at an ammonia-urea manufacturing complex at or about GR: Q20: 104-918.*

There are 13 special conditions associated with the discharge permit detailing various limits and/or management practices to be adhered to.

This report is specifically prepared to meet the requirements of special condition 10, including records for special condition 5, with the key measure of operational compliance being special condition 4, as described below.

Special Condition 10

> *The consent holder shall provide to the Chief Executive, Taranaki Regional Council, by 1 June 2012 and every three years thereafter a written report which includes:*
> *a) A review of any technological advances in the reduction or mitigation of discharges to air from the site, and the costs and benefits of these advances; and*
> *b) An evaluation and review of ammonia pressure safety valve [PSV] systems, operating parameters, and vent heights to ensure that the probability of PSV discharges have been reduced as far as practicable, and to determine whether flaring or other control rather than vent height is practicable as a means to reduce ground level concentrations of ammonia; and*
> *c) Details of any complaints received [external to the operation of the plant], to include date, time, operating conditions, weather conditions and measures taken in response; and*
> d) *Monitoring records required by condition 5.*

Special Condition 5

> *e) Within 12 months of the issue of this consent, the consent holder shall to the satisfaction of the Chief Executive, Taranaki Regional Council, establish two static monitoring locations beyond the boundary of the site for the purpose of monitoring atmospheric ammonia on adjacent property, and to check compliance with condition 4. The consent holder shall record the ground level concentration of ammonia at the static monitoring locations, every Wednesday morning between 7.00 am and 10.00 am, or at an alternative time as agreed by the Chief Executive, Taranaki Regional Council*

Special Condition 4

> *The emission of ammonia to atmosphere under normal operation, start up and shut down shall be so controlled to ensure that the maximum ground level concentrations [one-hour average] do not exceed 4.27 ppm (v/v) beyond the boundary of the site.*

This is the second review and is for the period June 2012 to May 2015.

2.0 OVERVIEW

The Ballance-Kapuni ammonia-urea plant is owned and operated by Ballance Agri-Nutrients Limited. An overview of the process is provided in Appendix 1, but essentially gas, water (steam) and electricity are used in the production of ammonia and then urea with products sold for further industrial or agricultural use domestically.

3.0 CONDITION 10(a): TECHNOLOGICAL ADVANCES TO REDUCE EMISSIONS

3.1 Recent improvements

The two major sources of ammonia air emissions are from the dust scrubber and from the main vent. The ammonia in the dust scrubber is mainly comprised of residual un-reacted ammonia from the urea process and is present during normal operation. Ammonia generally enters the main vent during plant start up and shut down. Many of the urea plant safety valves discharge into the main vent also. In addition, the inherent design of both the ammonia and urea plants requires venting of ammonia-containing liquids and vapours to atmosphere on a continuous and/or semi-continuous basis.

A new oil coalescer was installed in the ammonia refrigeration loop within the compression section of the ammonia plant during the Turnaround in 2013. Although designed to minimise damage to a heat exchanger, the unit has reduced significantly the amount of ammonia discharged to atmosphere when removing non-condensable vapours from the loop. The cost of the unit was approximately $850k.

During normal operation, non-condensable vapours build up in the ammonia storage bullets. Modifications have been made to the process used to remove these inerts, resulting in much lower concentrations of ammonia in the vicinity of the bullets. This has been achieved at zero cost. In addition, minor pipe work modifications have been made to the ammonia recovery section of the urea plant. This will make it easier for the plant to accept and process ammonia with higher levels of inerts in it, reducing the requirement to vent the bullets to atmosphere. The cost of these modifications was approximately $10k.

The levels of ammonia and urea exiting the dust scrubber are measured every 6 months by K2 Environmental Ltd. Over the years, these measurements have suffered from wide variations, not only day-to-day, but hour to hour and sample to sample. Such variations when measuring urea levels resulted in an Abatement notice being served on the site in June 2013 when testing showed urea levels exceeding the consent limit. In response, a new dust scrubber stack extension was added. This allowed the sampling location to be relocated away from silencer baffles believed to be saturated with weak urea solution. As a result, testing results were much more consistent and demonstrated that the plant was in compliance with the consent limit. The Abatement Notice was lifted as a result. The cost of the extension, and associated platform, was approximately $150k.

3.2 Technology advances

As described above, losses of ammonia to atmosphere are an inherent part of the 1950's/1960's design of the ammonia plant and the 1970's design of the urea plant.

A project is currently underway looking at the feasibility of a major upgrade to the plant. Should the project go ahead, it would require a new ammonia plant and major modifications to the urea plant. The latest technologies will be used, including a flare, resulting in a significant

reduction in fugitive and design losses of ammonia to atmosphere from both plants, possibly by as much as 90% relative to current performance. A decision on whether to proceed with the project is expected to be made in 2016.

4.0 CONDITION 10(b): PRESSURE SAFETY VALVES AND VENT HEIGHTS

4.1 Ammonia pressure safety valves

There are 252 pressure safety valves on the ammonia plant and 118 pressure safety valves on the urea plant, giving a total of 370.

A programme of work was initiated in 2010 to evaluate and review all of the pressure safety valves on site, but with particular emphasis on the safety valves in the (high pressure) ammonia loop area of the plant. This work is still ongoing and will take some years to complete. The outline program is described below, with parts a) to c) completed and aspects of parts d) and e) completed also.

a) Developing a single master list of all pressure safety valves on the plant
b) Matching the details on this list to actual valves on plant, engineering drawings and plant operating parameters
c) Prioritising the criticality of these safety valves, based on service conditions
d) Carrying out relief case calculations to confirm that sizing of the valves and associated pipe work complied with current codes.
e) Carrying out valve and/or pipe work modifications, as required.

During the turnaround in 2013, two safety valves were replaced on the recycle solution service within the urea plant. The set pressure for these valves was reduced from 312 barg to 180 barg for technical reasons. Normal operating pressure in this service is 140-150 barg. Recycle solution has a high ammonia content to it. During routine swap over of the recycle solution pumps in March 2013, a month after the plant re-started, one of these valves lifted early, releasing recycle solution into the scrubber system. When the system was swapped back to the original pump, its safety valve lifted early also. The outcome was a significant release of ammonia to atmosphere and a breach of our consent limit. A full investigation was carried out and submitted to TRC (see TM13-056, dated 28th March 2013). Changes to operating procedures, and raising the set pressure to 209 barg, has prevented a repeat occurrence.

4.2 Vent heights, flaring or other options

There are almost 100 vent points on the plant, many involving the release of small amounts of ammonia as part of normal day-to-day operation. As described above, many of the urea plant safety valves discharge into the main vent, which is the highest vent point on the plant (36m high). Many of the ammonia plant pressure safety valves discharge directly to atmosphere, local to the safety valve and relatively close to grade.

The costs and benefits of installing a flare system on site have been worked up in sufficient detail to allow both technical and commercial proposals to be made. The proposal was limited to the main actual, or potential, sources of ammonia release from the ammonia plant only. The estimated cost was $6m (TM15-020). The project is con hold, pending a decision on the plant upgrade, which would supersede this project should it go ahead.

5.0 CONDITION 10(c): EXTERNAL COMPLAINTS

The table below summarises the details of all external complaints received during the period. Two of these external complaints were consent breaches.

Date	Time	Operating conditions	Weather conditions	Response measures	Comments
25th May 2012 - STOS	1322	Normal operation	South west - 5 knots	Drained and refilled blowdown tank	Boundary measurement was 0.52 ppm
11th June 2012 - STOS	0950	Plant shut down	Westerly - 10/20 knots	All venting and draining stopped. Demister flush on.	Boundary measurement was 0.81 ppm
26th June 2012 - STOS	1410	Normal Operation	Westerly - 10 knots	Dust scrubber drained and demister flush initiated	Boundary measurement was 0.77 ppm
29th June 2012 - STOS	0024	Normal operation	South/west - 10 knots	Vector venting ammonia!	Boundary measurement was 0.34 ppm
21st August 2012 - STOS	0946	Normal operation	South westerly - 2 knots	Routine PFP ammonia levels reported daily	Boundary measurement was 2.4 ppm
5th September 2012 - STOS	1126	Normal operation	Westerly - 20/40 knots	Standard checks - No issues found	Boundary measurement was 0.6 ppm
19th Sept 2012 - STOS	1238	Normal operation	Westerly - 12 knots	Standard checks - No issues found	Boundary measurement was 0.23 ppm
2nd October 2012 - Vector	01:30	Normal operation	South Easterly - 17 knots	Reduced ammonia strength in dust scrubber	Boundary measurement was 0.84 ppm
22nd October 2012 - STOS	1725	Venting	Westerly	Venting had finished. Standard checks found no issues	Boundary measurement was 0.49 ppm
9th February 2013 - Vector	1752	Shutting down	West - 18 knots	Draining stopped. All vents closed	Boundary measurement was 5.2 ppm
18th March 2013 - Vector	1202	Normal operation	Westerly - 15/30 knots	Procedures amended. Set pressure raised on PSVs	Boundary measurement was 4.9 ppm
29th April 2013 - Vector	0912	Normal operation	SSW - 10 knots	High NH3 in ECB	Boundary measurement was 0.45 ppm
20th May 2013 - STOS	1520	Normal operation	West - 5 knots	Standard checks - No issues found	Boundary measurement was <0.2 ppm
2nd June 2013 - Vector	0837	Shutting down	North West - 2 knots	Procedure modified to prevent Batching back tanks	Boundary measurement was 1.96 ppm
28th July 2013 - Vector	1541	Normal operation	West - 17 knots	Stopped processing tanks	Boundary measurement was 1.03 ppm
1st October 2013 - STOS	0950	Urea plant shut down	South west - 5/10 knots	Stopped processing tanks. Restarted D/S fan	Boundary measurement was 3.78 ppm
17th December 2013 - Vector	1005	Shutting down	West - 5 knots	Blowdown tank refreshed, sparge in main vent	Boundary measurement was 1.91 ppm
27th February 2014 - Neigbour	0804	Start up	North to South - 1 knot	Vents closed. Procedures modified	Boundary measurement was 3.87 ppm
6th May 2014 -	1327	Normal	West - 15	Stopped bullet	Boundary measurement

Vector		operation	knots	venting	was <0.2 ppm
19th June 2014 - STOS	1150	Normal operation	West - 5 knots	Stopped processing tanks	Boundary measurement was 0.42 ppm
1st February - 2015 neighbour	0800	Normal operation	North West - speed uncertain	Recycle PSV on A Cooper replaced	Reported on 3rd Feb as "slight smell" but not enough to report on the day

6.0 CONDITION 10(d): Monitoring records required by Condition 5

Discussions with our residential neighbours were initiated with the aim of identifying suitable locations for the static monitoring sites. These were confirmed and the monitoring programme was initiated in September 2012. A minor modification to the requirements of Special Condition 5 was to change the timeframe for sampling from 7am-10am to 1pm-4pm on a Wednesday. This was done in agreement with TRC to suit the workload of the laboratory technicians, who are generally very busy during the morning on routine plant support work. The cumulative results of this testing is attached with the report. No trends or ammonia levels of any significance have been found to date.

7.0 NEIGHBOURS

Ballance-Kapuni continues to operate the Mutual Aid Agreement, which provides assistance to all three plants at Kapuni. The nearest neighbours are contacted frequently to discuss any concerns, particularly if we are starting up/shutting down or performing a non-routine activity. On an annual basis all residential neighbours are invited to site to receive an update on Ballance-Kapuni activities from the previous year and plans for the next year. This is also an opportunity to discuss any issues collectively that they wish to raise.

8.0 SUMMARY

Operation of the plant has been breach-free for over twenty-six months.

Ballance-Kapuni is currently evaluating a major uprate of the plant. Should this go ahead, it would bring significant improvements in environmental performance, and in particular air emissions, that are constrained by the current technology and inherent design.

In the event that an uprate of the plant does not go ahead, Ballance-Kapuni will develop further the work it has already carried out on the feasibility of a flare system to address ammonia plant emissions.

Other technological and procedural improvements have, and will be, instigated to achieve continuous improvement of our air emissions performance.

Appendix 1

Ammonia production

Pre-heated and desulphurised natural gas is reacted with steam in the primary reformer. This is a gas-fired furnace containing vertical, catalyst-filled tubes through which the reacting mixture passes to produce carbon monoxide, carbon dioxide and hydrogen. A controlled quantity of air is then added to this mixture in the secondary reformer to produce synthesis gas containing the correct hydrogen to nitrogen ratio. The gas then passes to the shift converters, where carbon monoxide is converted to carbon dioxide. This is subsequently removed in an absorber-stripper unit to provide one of the feedstocks of the urea plant.

After removal of the last traces of carbon oxides in the methanator, this synthesis gas is compressed by two 3700kW- and one 4800kW- Cooper Bessemer Compressors, operating in parallel (which also provide compressed air and ammonia refrigeration compression for the plant). The compressed process gases, consisting mainly of nitrogen and hydrogen, are fed into the ammonia loop and pass through the ammonia synthesis converter. The gases are then refrigerated and ammonia condensed to be drawn off from the circulation synthesis gas as a liquid. This product is over 99.5% pure and is stored as a liquid in three tanks with a combined capacity of 450 tonnes.

Urea production

Anhydrous liquid ammonia from storage is combined with carbon dioxide (separated from the ammonia synthesis gas) in the urea synthesis reactor.

The resulting product is a mixture of urea, water and an intermediate by-product, ammonium carbamate, which is separated from the aqueous urea in a three-stage decomposition and absorption process. This purification section produces a liquid stream which is recycled to a second urea reactor. Aqueous urea is concentrated by evaporating water from the molten solution, which is then granulated in a mixed fluid-spouting bed granulator.

The granular urea is then conveyed to the bulk store ready for distribution to users. The bulk storage facility at Kapuni is capable of holding 10,000 tonnes of product.

Ballance's **n-rich** urea contains:

- 46% nitrogen
- 20% carbon
- 27% oxygen
- 7% hydrogen

Using urea

Urea is used extensively throughout the New Zealand agricultural sector. With a nitrogen concentration of 46%, and hard, free-flowing qualities, urea is the most cost-efficient source of nitrogen available to farmers.

Urea can be purchased in bagged or bulk form, and spread by hand, tractor- or bike-mounted spreaders, or by commercial spreaders. Used strategically, it offers enormous benefit to farmers, helping to promote plant growth to provide feed for animals or higher crop yields.

Urea is also used by New Zealand's industrial sector, particularly in the manufacture of urea formaldehyde resin (adhesive). This is then used for making plywood, particle board, abrasive papers and fibreboards, many of which are exported. Other industrial uses for urea include the manufacture of fibreglass, yeast making, in livestock feeds, in the pharmaceutical industry, and in the manufacture of cosmetics, cleaners and paint.

Ammonia

A small percentage of ammonia manufactured is sold annually on the domestic market to meet New Zealand's requirements for anhydrous ammonia. This is used primarily in refrigeration systems, with smaller amounts required for the manufacture of detergents and the treatment of industrial effluent.

The environment

The ammonia and urea complex is operated in accordance with stringent safety and environmental standards. The urea manufacturing process uses and produces water. Much of this effluent is recycled with the balance stored, treated and spray irrigated onto pastures surrounding the complex.

Continuous review and analysis is done to determine the optimum use of waste streams, thus trying to minimise the impact on the environment. This is verified with in-house and independent third party review.