

Ballance Agri-Nutrients (Kapuni) Ltd
Monitoring Programme
Annual Report
2018-2019

Technical Report 2019-25

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Taranaki Regional Council
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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 2018 to June 2019 describes the monitoring programmes implemented by the Taranaki Regional Council (the Council) to assess the Company's environmental and consent compliance 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 Ltd 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 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 stream samples, two stormwater/discharge samples, two effluent grab samples, two composite effluent samples supplied by the Company, two bore samples, three air quality surveys and one depositional gauging.

Abstraction volumes from Waingongoro River complied with the consent limit. A contribution of \$30,000 towards riparian planting and management in Waingongoro catchment was made, the seventh 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 boundary of the Company's 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's 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 2018-2019 year, consent holders were found to achieve a high level of environmental performance and compliance for 83% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 13% 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 2019-2020 year.

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1 Introduction

1.1 Compliance monitoring programme reports and the Resource Management Act 1991

1.1.1 Introduction

This report is for the period July 2018 to June 2019 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 25th combined annual report by the Council for the Company, and includes the 30th 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 through 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 2019-2020 monitoring year.

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

1.1.3 The Resource Management Act 1991 and monitoring

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

- a. the neighbourhood or the wider community around an activity, and may include cultural and social-economic effects;
- b. physical effects on the locality, including landscape, amenity and visual effects;

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

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

1.1.4 Evaluation of environmental and administrative performance

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

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

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

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

Environmental Performance

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

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

For example:

- High suspended solid values recorded in discharge samples, however the discharge was to land or to receiving waters that were in high flow at the time;

- Strong odour beyond boundary but no residential properties or other recipient nearby.

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

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

Administrative performance

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

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

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

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

For reference, in the 2018-2019 year, consent holders were found to achieve a high level of environmental performance and compliance for 83% of the consents monitored through the Taranaki tailored monitoring programmes, while for another 13% of the consents, a good level of environmental performance and compliance was achieved.¹

1.2 Process description

The AUP 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 (mainly dinitrogen gas) 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

¹ The Council has used these compliance grading criteria for 15 years. They align closely with the 4 compliance grades in the MfE Best Practice Guidelines for Compliance, Monitoring and Enforcement, 2018

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.



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 the details of which are summarised in Table 2. Summaries of the conditions attached to each permit are set out in Section 3 of this report.

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

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	2,851	2023	2035
0597-3	Discharge plant production effluent and contaminated stormwater by way of irrigation onto land	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	-	N/A	N/A

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.

1.4 Monitoring programme

1.4.1 Introduction

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

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

Monitoring at the AUP is carried out by both the Company 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;
- 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 and odour.

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 effluent, 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 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 of 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, as described below.

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, including potential odour, dust, noxious or offensive emissions. 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 two occasions each year. Monitoring covers ammonia, carbon monoxide, volatile organic compounds (VOC), and combustible gases.

Nitrogen oxides (NO_x) are measured at two sites on one occasion each year.

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's 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 m³/h (3,360 m³/d or 39 L/s). The consented daily volume limit, of 3,456 m³ at a maximum rate of 100 L/s, was increased by 15% to 4,000 m³, 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 2018-2019 is presented in Figure 2.

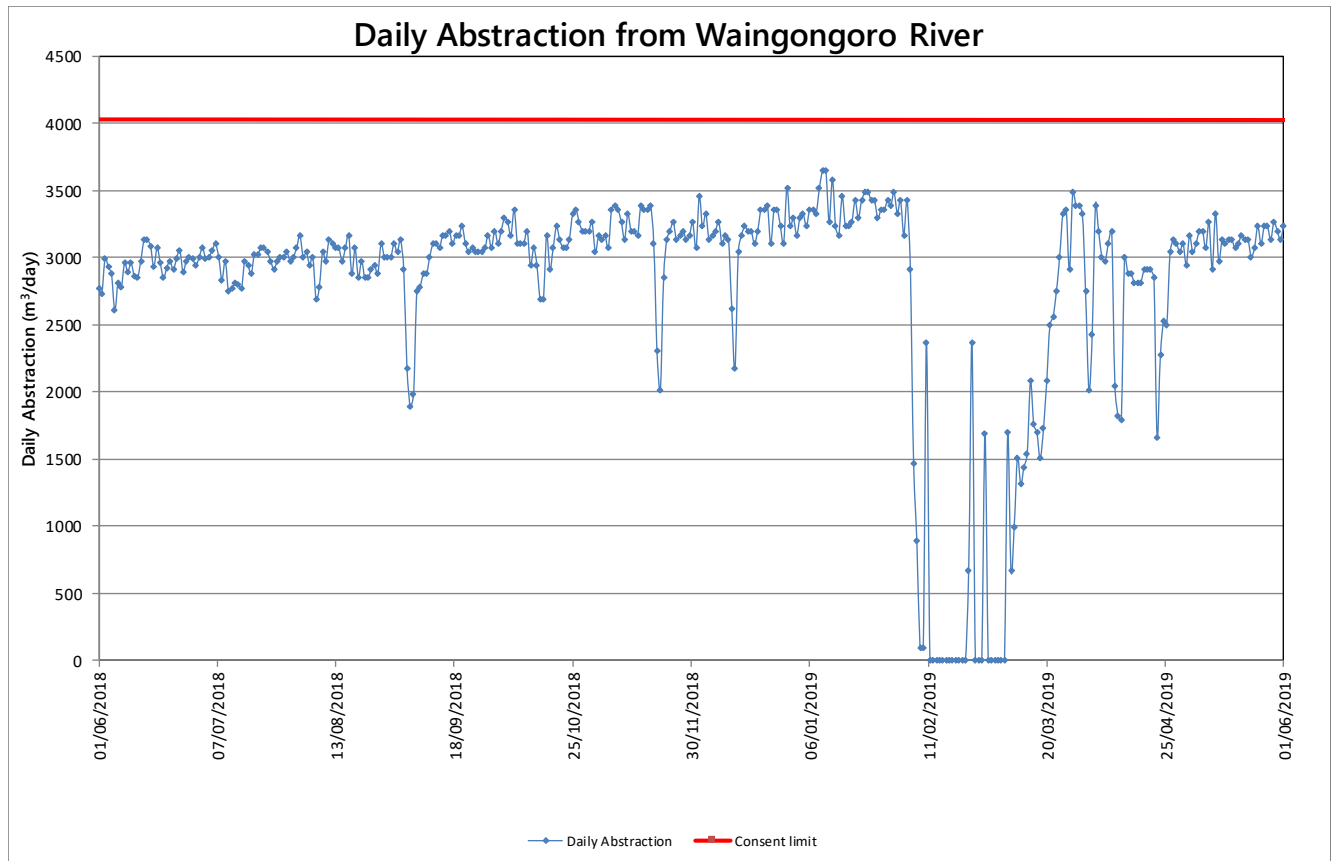


Figure 2 Daily water abstraction by the Company, July 2018 – June 2019

The record shows that the consent limit of 4,000 m³/d on maximum abstraction volume was complied with throughout the 2018-2019 review period. The minimum daily recorded volume was 0 m³/d and the maximum recorded daily volume was 3,648 m³, or 91% of the limit.

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 exercised during the 2018-2019 review period. The consent was exercised on two occasions. The first instance was due to a power outage cutting power to the pumps at the normal intake on the Waingongoro River. This was for 51 minutes on 2 December 2018. The second instance was due to a scheduled major plant shutdown for necessary maintenance work. Kapuni Stream water was abstracted over an 11 day period from 11 to 21 February 2019. Because the second instance was a planned take as opposed to an unforeseen failure this was considered a misinterpretation of what the consent conditions allow by the Company. However, it should be noted the water take during this period was extremely low with the maximum average daily take of only 3.2 L/s. Water takes on both occasions were within the consented limit of 33 L/s. There is no residual flow requirement. The Company was instructed not to take Kapuni Stream water in future for scheduled works.

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. Work has been completed regarding this programme and the monitoring results indicate that levels of fish mortality as a result of entrainment are not likely to have any meaningful effect on

fish populations. Further details of the monitoring carried out is included in the preceding compliance monitoring report published by the Council (see bibliography).

2.1.2.4 Annual meeting regarding the Waingongoro River intake and environmental performance

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 its offices at the Kapuni site on 27 August 2019. The meeting was attended by representatives of Taranaki Fish and Game, Ngati Ruanui, Ngaruahine, the Company and the Council. Apologies were received from the DOC representative.

Issues unrelated to consent 0596-3, such as the Kapuni Stream water takes, potential use of groundwater and nitrogen loadings were also discussed.

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 4,080 m³/d of uncontaminated stormwater to the unnamed tributary or 1,920 m³/d to the Kapuni Stream. 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 2018-2019, the average daily volume of stormwater discharged from the site to the Kapuni Stream and its tributary was 610 m³, whilst a total of 34,790 m³ of stormwater was discharged on 57 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 m 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 of 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 stormwater discharge shall maintain a pH range of 6.5-9.0 and a maximum zinc concentration below 0.5 g/m³. Monitoring by the Company in 2018-2019 showed a pH range of 7.3-8.9 which complied with the consent condition. Zinc in the stormwater discharge was tested on two occasions in conjunction with the inter-laboratory comparisons (0.02 g/m³ and 0.03 g/m³) and were well below the maximum limit.

The resource consent also has maximum limits on unionised (free) ammonia (0.025 g/m³) and sodium (40 g/m³) concentrations in the receiving waters. Compliance with the limit on unionised ammonia concentration was achieved throughout the monitoring year, the maximum recorded concentration downstream at Skeet Road being 0.009 g/m³. The sodium concentration limit (40 g/m³) was also complied with, the maximum recorded sodium concentration was 19.2 g/m³.

The monitoring results above demonstrate compliance with the conditions of resource consent 0598-3 during the 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, 2018-2019

		Spray Irrigated Effluent IND002006								D-Min Waste and Stormwater IND002007				Kapuni u/s of AUP KPN000293				Kapuni d/s of AUP KPN000300					
		29 Nov 18		29 Nov 18		21 Jun 19		21 Jun 19		29 Nov 18		21 Jun 19		29 Nov 18		21 Jun 19		29 Nov 18		21 Jun 19			
		Grab		Composite		Grab		Composite		TRC	AUP	TRC	AUP	TRC	AUP	TRC	AUP	TRC	AUP	TRC	AUP	TRC	AUP
		TRC	AUP	TRC	AUP	TRC	AUP	TRC	AUP														
Temperature	°C	30.2	-	-	-	24.0	-	-	-	21.3	-	10.6	-	13.5	13.4	9.6	9.6	14.0	14.1	9.8	16.2		
Conductivity, 20°C	mS/m	148	-	159	-	158	-	148	-	109	94	155	144	11	9	8	9	13	11	9	9		
pH	pH	7.4	-	8.0	-	7.5	-	8.0	-	8.9	8.7	7.7	7.8	7.6	7.6	7.4	7.6	7.5	7.9	7.5	7.7		
Suspended solids	g/m ³	22	-	-	-	22	-	-	-	19	-	9	-	-	-	-	-	-	-	-	-		
Turbidity	NTU	-	-	-	-	-	-	-	-	23	-	3	-	1	-	22	-	2	-	22	-		
Ammonia (free)	g/m ³ NH ³	-	-	-	-	-	-	-	-	4.3	-	0.149	-	<0.001	<0.001	<0.001	0.001	0.001	0.009	<0.001	0.002		
Ammonia (total)	g/m ³ N	-	-	3.7	4.61	-	11.8	-	4.62	17.2	16.0	8.0	12.25	0.027	0.6	0.018	0.15	0.320	0.395	0.116	0.156		
Nitrate	g/m ³ N	-	-	12.3	13.1	-	12.7	15.3	13.5	3.3	-	13.3	-	0.88	-	0.61	-	0.94	-	0.70	-		
Nitrite	g/m ³ N	-	-	4.9	5.77	-	1.57	6.0	2.87	1.4	1.41	1.34	1.14	0.008	0.009	0.003	0.003	0.028	0.04	0.012	0.009		
Urea	g/m ³ N	-	-	0.97	1.14	-	1.96	0.85	2.39	10.5	6.86	3.35	5.23	-	-	-	-	-	-	-	-		
Potassium	g/m ³	-	-	131	125	-	171	117	115	9	-	-	-	4	-	3	-	4	-	3	-		
Sodium	g/m ³	-	-	188	178	-	124	156	151	179	173	-	909	8	8	7	9	11	11	9	9		
Calcium	g/m ³	-	-	45	48.0	-	40.0	44	45.0	-	-	-	-	-	-	-	-	-	-	-	-		
Magnesium	g/m ³	-	-	16.1	17.6	-	12.7	12.7	13.8	-	-	-	-	-	-	-	-	-	-	-	-		
Chloride	g/m ³	-	-	195	-	-	-	220	-	-	-	-	-	-	-	-	-	-	-	-	-		
Phosphorus, diss. reactive	g/m ³ P	-	-	1.26	-	-	-	1.32	-	<0.004	-	0.01	-	0.022	-	0.012	-	0.010	-	0.015	-		
Copper (acid soluble)	g/m ³	0.023	-	-	-	0.018	-	-	-	<0.01	-	<0.01	-	-	-	-	-	-	-	-	-		
Chromium (acid soluble)	g/m ³	<0.01	-	-	-	0.024	-	-	-	<0.01	-	<0.01	-	-	-	-	-	-	-	-	-		

		Spray Irrigated Effluent IND002006								D-Min Waste and Stormwater IND002007				Kapuni u/s of AUP KPN000293				Kapuni d/s of AUP KPN000300			
		29 Nov 18		29 Nov 18		21 Jun 19		21 Jun 19		29 Nov 18		21 Jun 19		29 Nov 18		21 Jun 19		29 Nov 18		21 Jun 19	
		Grab		Composite		Grab		Composite		TRC	AUP	TRC	AUP	TRC	AUP	TRC	AUP	TRC	AUP	TRC	AUP
		TRC	AUP	TRC	AUP	TRC	AUP	TRC	AUP												
Mercury (total)	mg/m ³	0.19	-	-	-	0.69	-	-	-	<0.08	-	<0.08	-	-	-	-	-	-	-	-	-
Nickel (acid soluble)	g/m ³	<0.01	-	-	-	<0.01	-	-	-	<0.02	-	<0.01	-	-	-	-	-	-	-	-	-
Zinc (acid soluble)	g/m ³	0.67	-	-	-	0.39	-	-	-	<0.02	0.02	0.03	0.03	-	-	-	-	-	-	-	-
Hydrocarbons (total)	g/m ³	-	-	-	-	-	-	-	-	<4	-	<4	-	-	-	-	-	-	-	-	-

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. All six biological surveys were undertaken by the Council on behalf of Stark Environmental Ltd for the monitoring period under review. It is anticipated that future fieldwork will continue to be undertaken by the Council with the data interpretation and reporting undertaken by Stark Environmental Ltd.

The programme involved assessment of changes in the abundance and diversity of the macroinvertebrates and fish communities. Seven sites in the Kapuni catchment, five on the main stream and two in gullies that run through the irrigation area were monitored quarterly for benthic macroinvertebrates and biannually for fish by electric fishing (Figure 3). A further four sites on the main stream are sampled once a year in spring in conjunction with the other monitoring for both macroinvertebrates and fish. Monitoring results and their interpretation are forwarded to the Council quarterly.

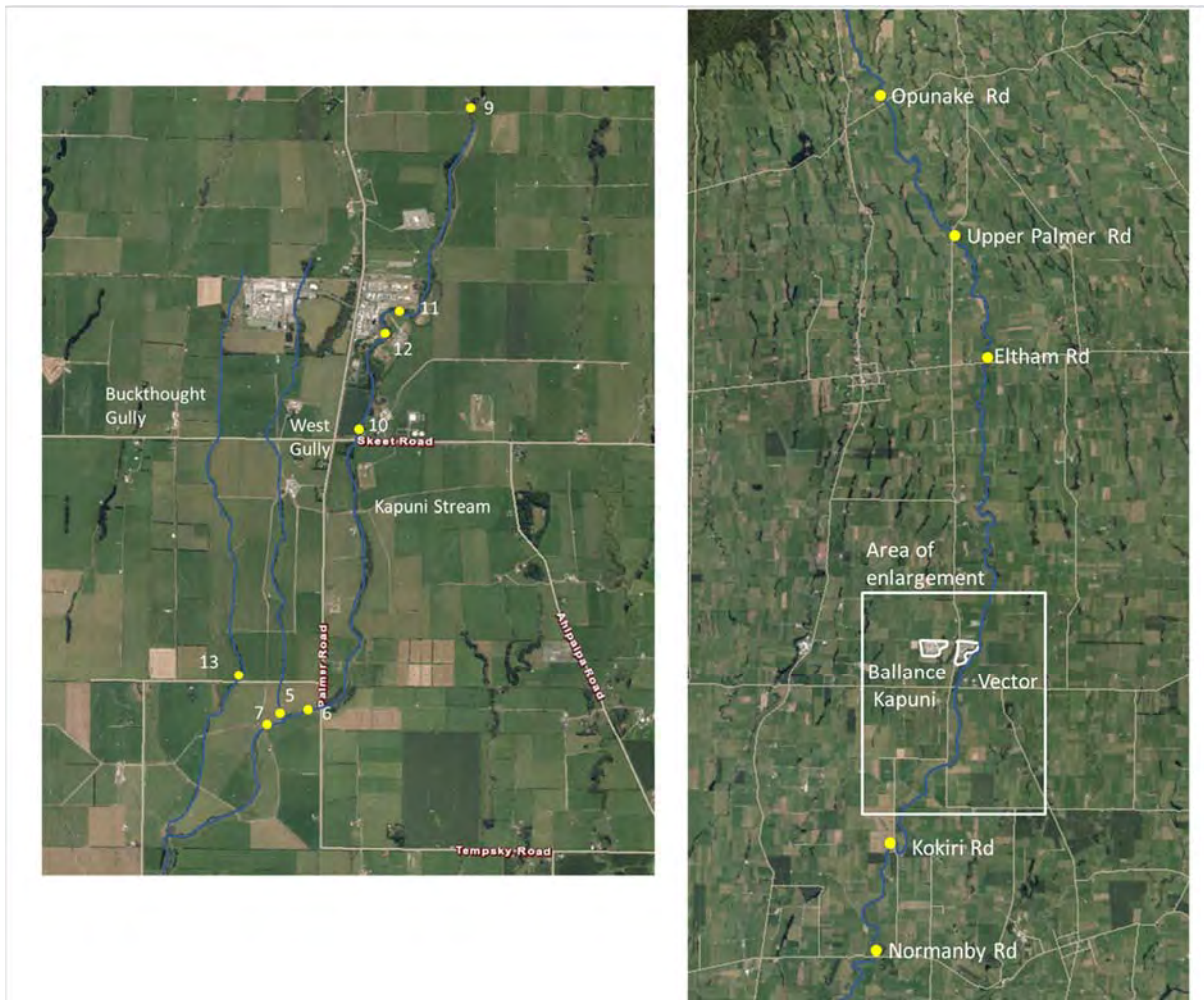


Figure 3 Biomonitoring sites in the Kapuni Catchment

Streambed macroinvertebrate communities were sampled on 18 July 2018, 9 October 2018, 22 January 2019 and 15 April 2019 and electric fishing surveys were conducted on 9 October 2018 and 15 April 2019.

A separate report prepared by a Council freshwater biologist summarises the findings of the individual reports is attached as Appendix II. 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 predominant. Furthermore, there were no significant adverse impacts caused by activities associated with the Company on fish communities in 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 land adjacent to the plant (Figure 4) 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's site, wastewater generated from it 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. 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. 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 under saturated conditions.

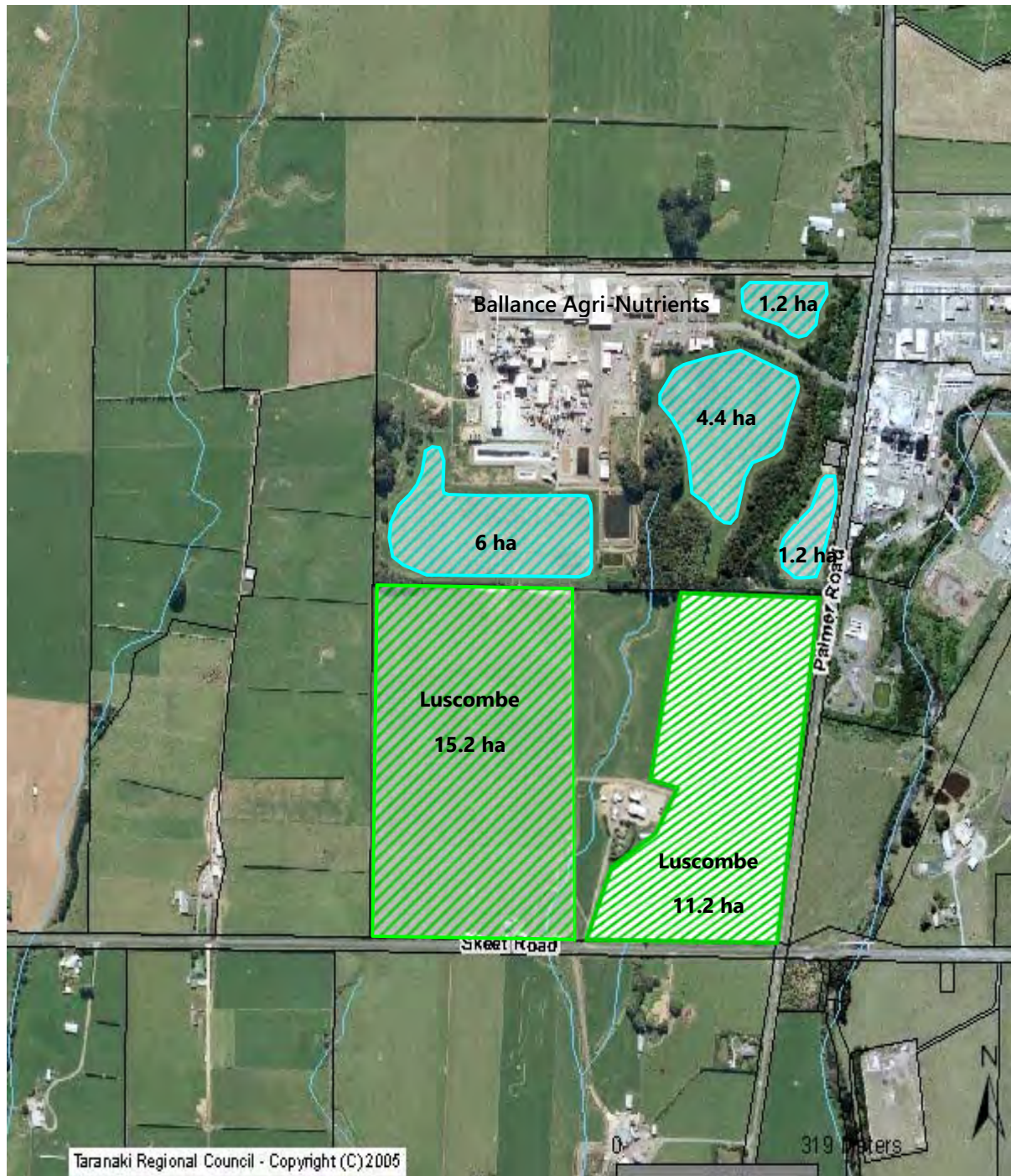


Figure 4 Irrigation areas for the 2018-2019 year

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.

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 m³/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 the 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 2018-2019 review period.

2.2.2.2 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 2018-2019

Area	Consent limit	Average nitrogen application rate kg/ha/y								
		2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019
Cut-and carry-area	1,000	495	294	397	472	542	387	434	457	377
Grazed pasture	300	177	53	146	177	287	63	117	192	69

2.2.2.2.1 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 2018-2019 monitoring period. The Company also has an internal target for cut-and-carry pasture of 600 kgN/ha to promote good pasture health.

In the 2018-2019 period, the average nitrogen loading across the cut-and-carry area was 377 kgN/ha.

2.2.2.2.2 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 2018-2019 monitoring period. The average application on the grazed areas amounted to 69 kgN/ha/y.

The nitrogen application rates for each operational area are presented in Figure 5.

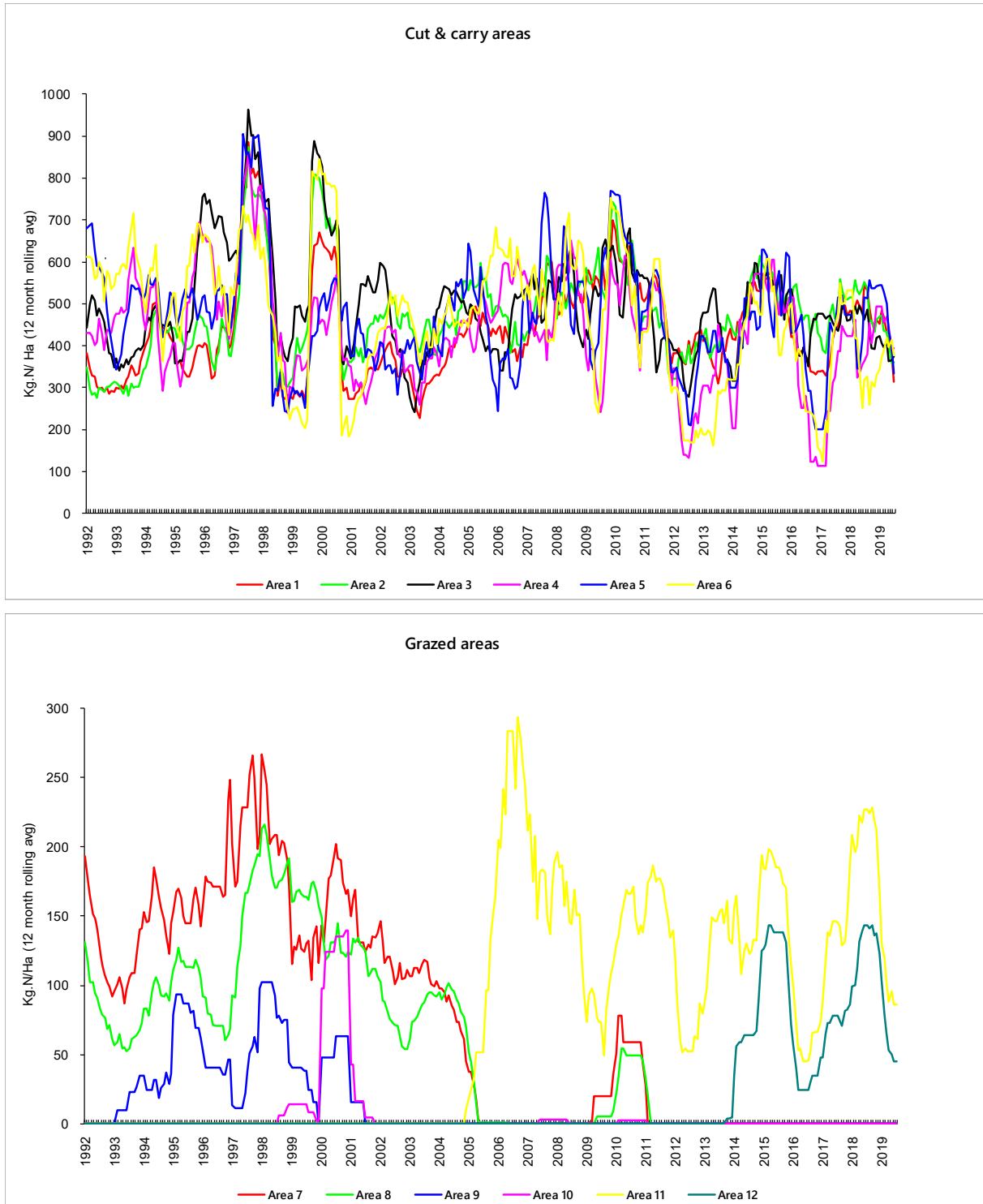


Figure 5 Nitrogen application rates on spray irrigation areas, January 1992 to June 2019

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 31st 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.

AgResearch undertook sampling at the Company site on 8 November 2018 and May 2019. The results are summarised below.

2.2.3.1 Spring 2019 soil and herbage survey

Surface soil and plant samples were taken in 8 November 2018 from the cut-and-carry area and grazed areas from Luscombes' farm. The maximum sodium absorption ratio's (SAR) ratios increased slightly from last year (maximum 5.25) with a maximum ratio of 5.35. However, surface cations in the cut areas have recorded their highest mean concentrations since 1987. A reduction in the rate of sodium applied to irrigated areas needs to occur and would reduce the need to apply further fertilizer to reduce the soil ion imbalance.

The sum of the SAR and potassium absorption ration (KAR) still exceeded the upper safe threshold of 3.0, increasing the risk of soil deflocculation. This would have several undesirable effects including restricting the downward movement of irrigation and rainfall through the soil profile and promoting an undesirable anaerobic environment. The application of Epsom salts is ongoing to improve the soil condition and prevent deflocculation.

2.2.3.2 Autumn 2019 deep soil leaching profiles

The May 2019 deep soil sampling survey report found that annual nitrogen application to the sampled cut areas had decreased by 10% (for the May to April year), and winter application had increased by 9% over values recorded last year. The profile nitrogen mass to 3 m depth of the cut areas was 93% higher than last year. This suggests the potential for nitrate leaching during the winter of 2019 as the lower the profile mass the lower the chance of nitrogen leaching.

2.2.4 Groundwater monitoring

There are 42 groundwater monitoring bores established at the Company's 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 areas that each monitoring bore corresponds with are summarised in Table 5, and their locations are given in Figure 6.

Table 5 Site areas in relation to groundwater monitoring bores and nitrogen concentrations

Site	Monitoring bore	Approximate Total N Concentrations (g/m ³)
Control site	22	3-13
Irrigation areas	3, 4, 5, 7, 10-1, 10-2, 10-3, 10-4, 10-5, W, W1, W2	<1-100
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

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.

An EMI survey was undertaken in June 2019. The conductivity in the area north of Luscombe's paddock showed an increase of 9% compared with the 2018 survey. The soil conductivity for the paddock south of the administration offices (Main South Paddock) had a 10% increase from the 2018 survey. Overall, conductivity levels have increased over the last several years which is of concern. Soil conductivity needs to be managed so that conductivity levels do not continue to increase.

2.2.4.2 Groundwater monitoring in relation to effluent irrigation

The 'irrigation' monitoring sites are sampled regularly, at frequencies ranging from monthly to annually, depending on groundwater composition. Groundwater levels were measured and the samples analysed for conductivity, pH, ammonia, nitrate, nitrite, urea, sodium and chloride. These monitoring bores provide the most valuable information as they generate data on the depth of the effects of the irrigated effluent.

Three bores (Bores W, 10 and 12) are multi-piezometric (that is, a cluster of standpipes screened to allow the monitoring and collection of groundwater samples at various depths). 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 (10-1, 10-2 and 10-3) were replaced with three piezometers at Bore W (W at a depth of 10 m, W1 at depth of 7.5 m, and W2 at depth 5 m) set at slightly different depth intervals in November 2005, as the seals between some sampling intervals appeared to be failing but 10-4 and 10-5 are still operational.



Figure 6 Locations of groundwater monitoring bores

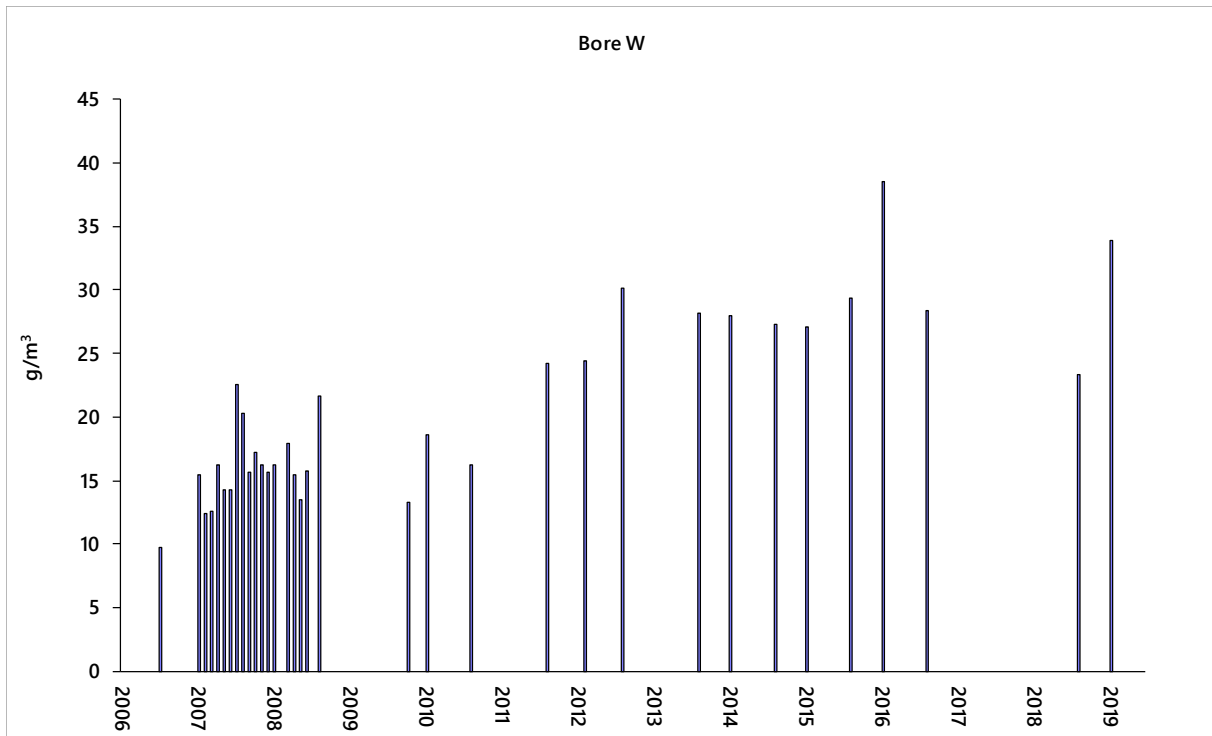


Figure 7 Total nitrogen concentrations in groundwater beneath spray irrigation area (Bore W)

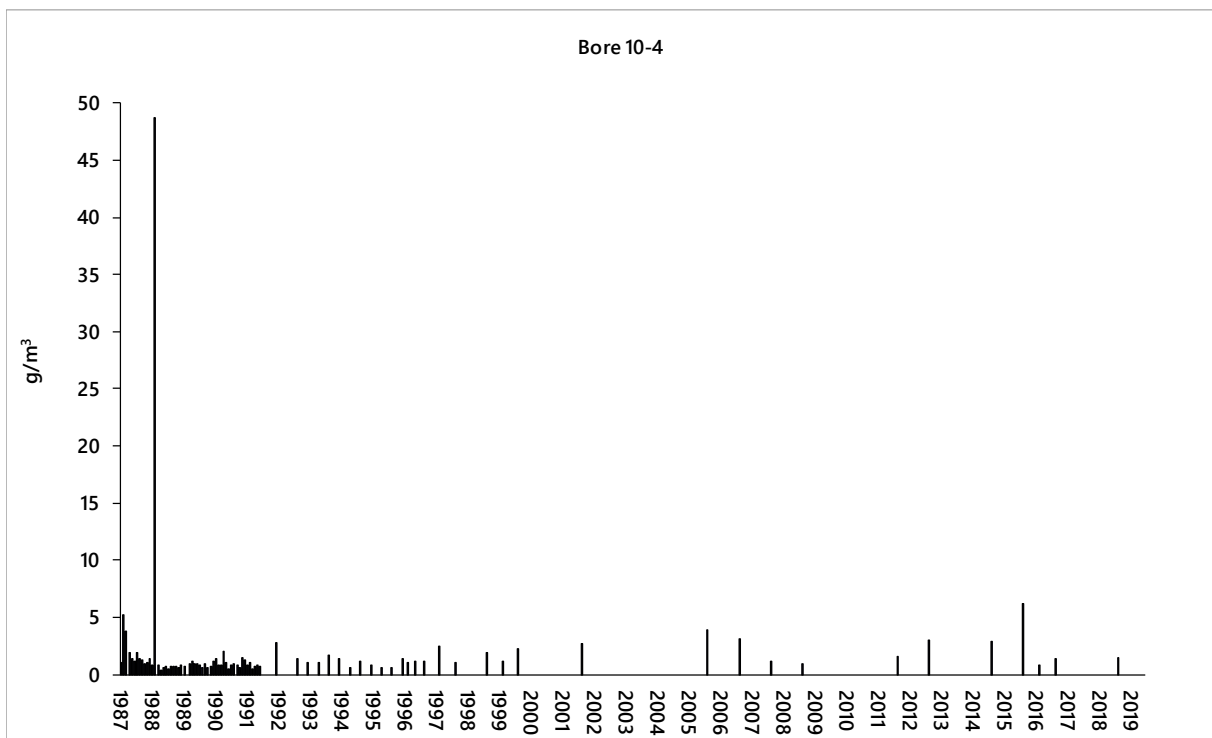


Figure 8 Total nitrogen concentrations in groundwater beneath spray irrigation area (Bore 10-4)

Monitoring results have indicated that groundwater is affected by effluent irrigation at a depth 8-10 m (Bore W) (Figure 7), but not at 11-13 m depth (Bore 10-4) (Figure 8) and deeper (Bore 10-5) where total nitrogen levels have always remained low.

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/m³N. The result for the current monitoring years was

24.06 g/m³N on August 2018 which represents the highest result since 1997. Bore 1 and 8 still had relatively high concentrations (21.3 g/m³N and 14.0 g/m³N), which was a similar result to the preceding year. 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/m³N. 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/m³N (less than 1 g/m³N for the current monitoring year).

Seasonal and multi-year variations in nitrogen concentrations 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. Attention needs to be paid to the timing and magnitude of effluent nitrogen loadings to avoid additional losses to groundwater which may be unsustainable.

2.2.4.3 Groundwater monitoring in relation to the FECB plume

A leak from the 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 35 years.

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/m³ since 1999, with a spike in winter 2013, when a value of 444 g/m³ was measured (Figure 9).

Bore 30 is one of the down gradient pumping bores (Figure 10). 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/m³ in 1995 to 74 g/m³ in July 2018, with fluctuations that may reflect effluent irrigation or recharge variation.

The total nitrogen concentrations in Bore 4 and Bore 17, located further down gradient, whilst being elevated have remained relatively stable. Pumping from East Bore, West Bore and Bore 30 should continue along with monitoring of the other bores.

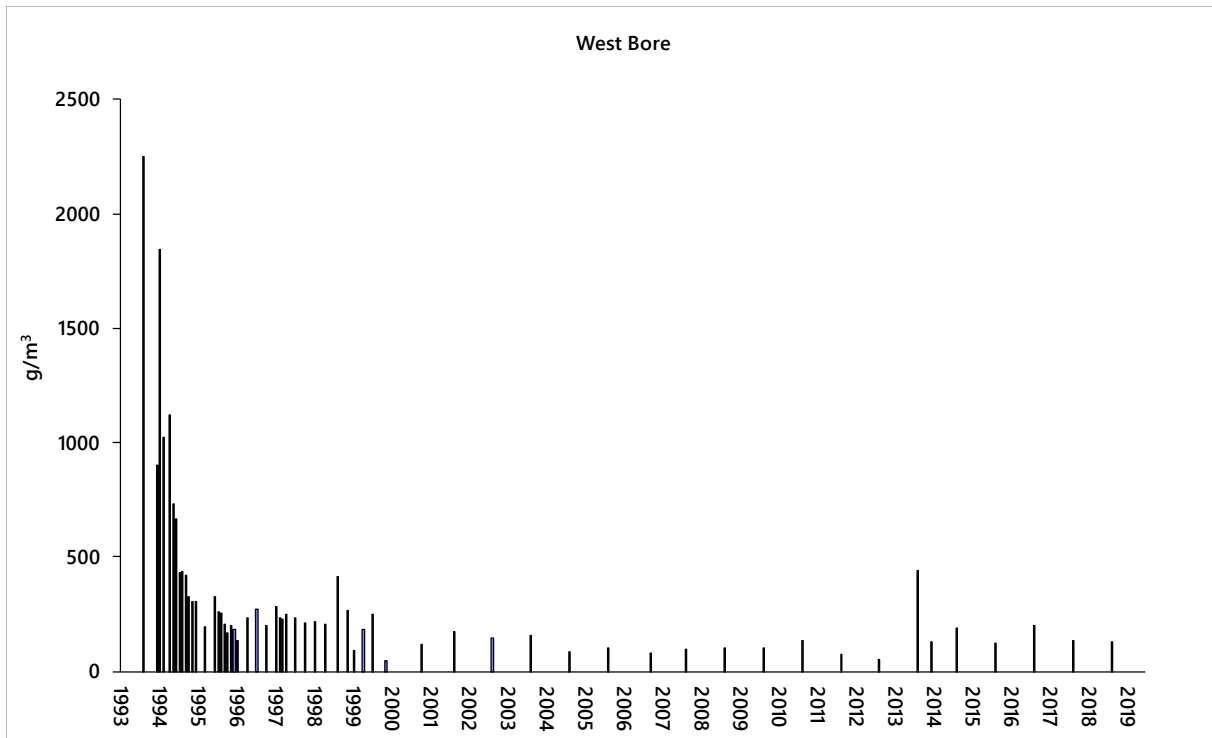


Figure 9 Total nitrogen concentration in groundwater associated with the FECB plume monitoring from West Well

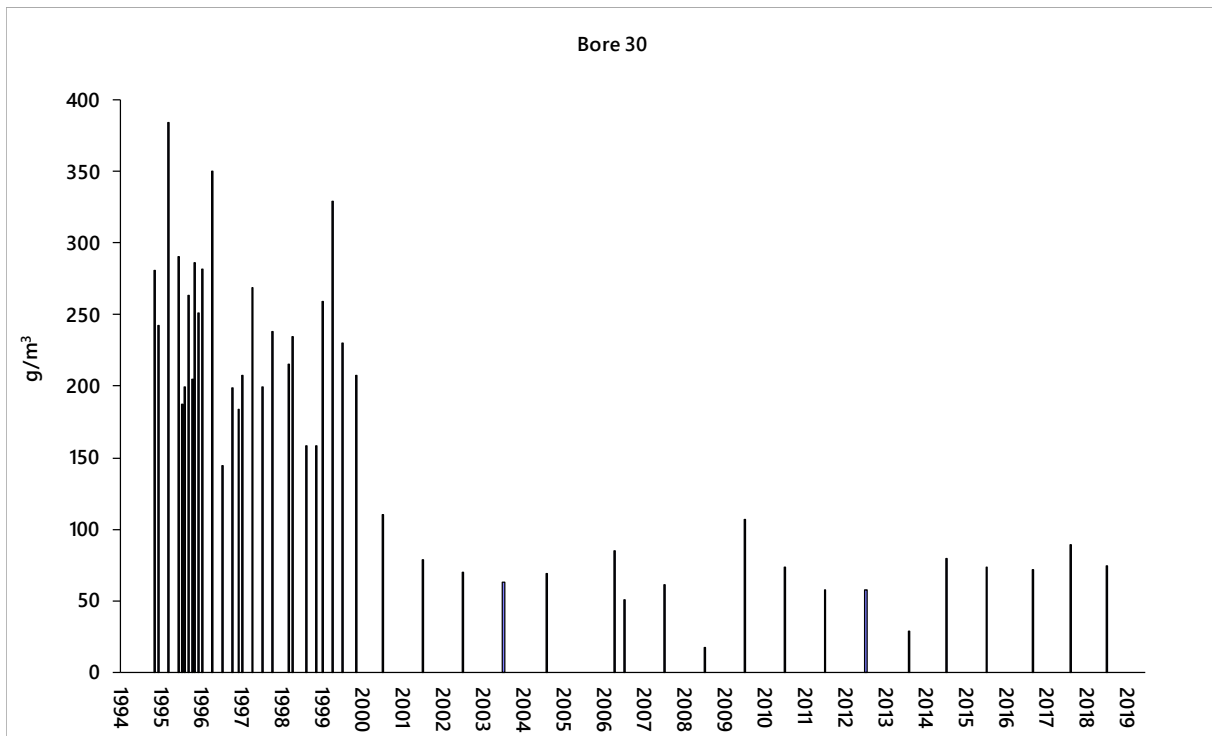


Figure 10 Total nitrogen concentration in groundwater associated with the FECB plume monitoring from Bore 30

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. In response to these elevated nitrogen concentrations, the Company has

undertaken remedial pumping at Bore 25 (Figure 11) and Bore 32 (Figure 12) since late 1994 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 relatively low compared with previous years with no exceptionally high spikes recorded.

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. For the current period nitrogen levels were relatively low compared with previous years. Further down gradient at Bores 39 and 40, total nitrogen concentrations have been much lower with Bore 39 ranging from 247-410 g/m^3 and Bore 40 from 86-100 g/m^3 over the last seven years with a larger proportion of nitrogen recorded as nitrate. Continued annual monitoring is recommended to identify significant trends in this area. The granulator plume is situated in the middle of the plant site and poses no short-term threat to freshwater ecosystems.

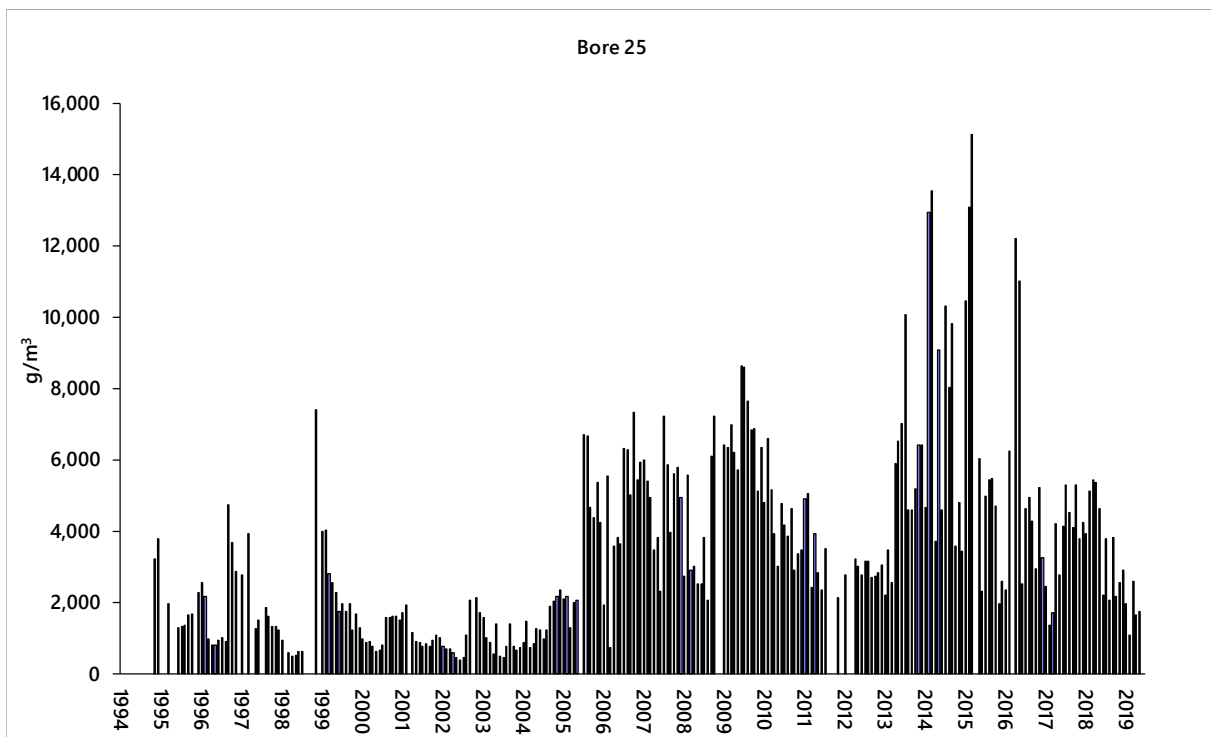


Figure 11 Total nitrogen concentration in groundwater in the vicinity of urea processing (Bores 25) areas

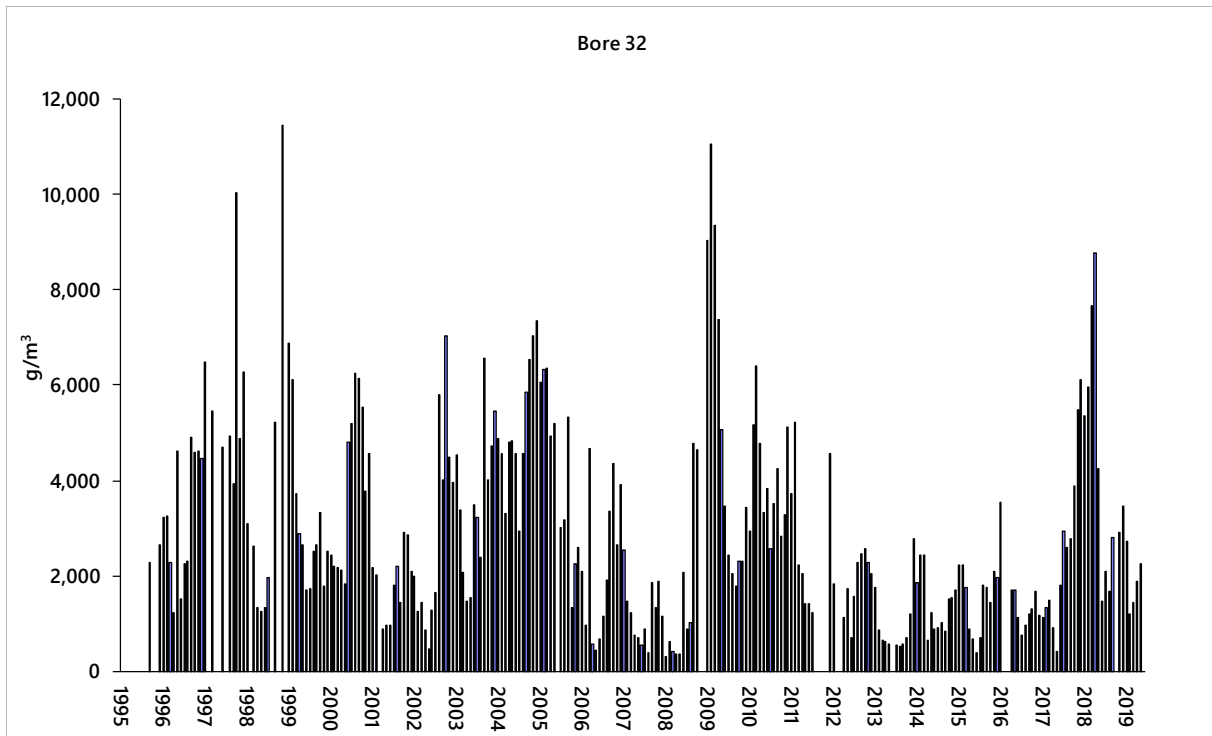


Figure 12 Total nitrogen concentration in groundwater in the vicinity of urea processing (Bore 32) areas

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 13). Nitrogen levels have fluctuated between approximately 87-300 g/m³, with occasional spikes of up to 678 g/m³. A relatively high result of 401 g/m³ was recorded in July 2016, the highest result recorded since July 2009. However, the following result in October 2016 was only 147 g/m³, which was a more typical value for the site. Recent results were between consistent with previous years (191-292 g/m³). Monitoring at Bore 23 down gradient of the bulk storage area has shown no clear trend in nitrogen concentrations but data has not been collected since 2014 due to water leaking into the bore casing.

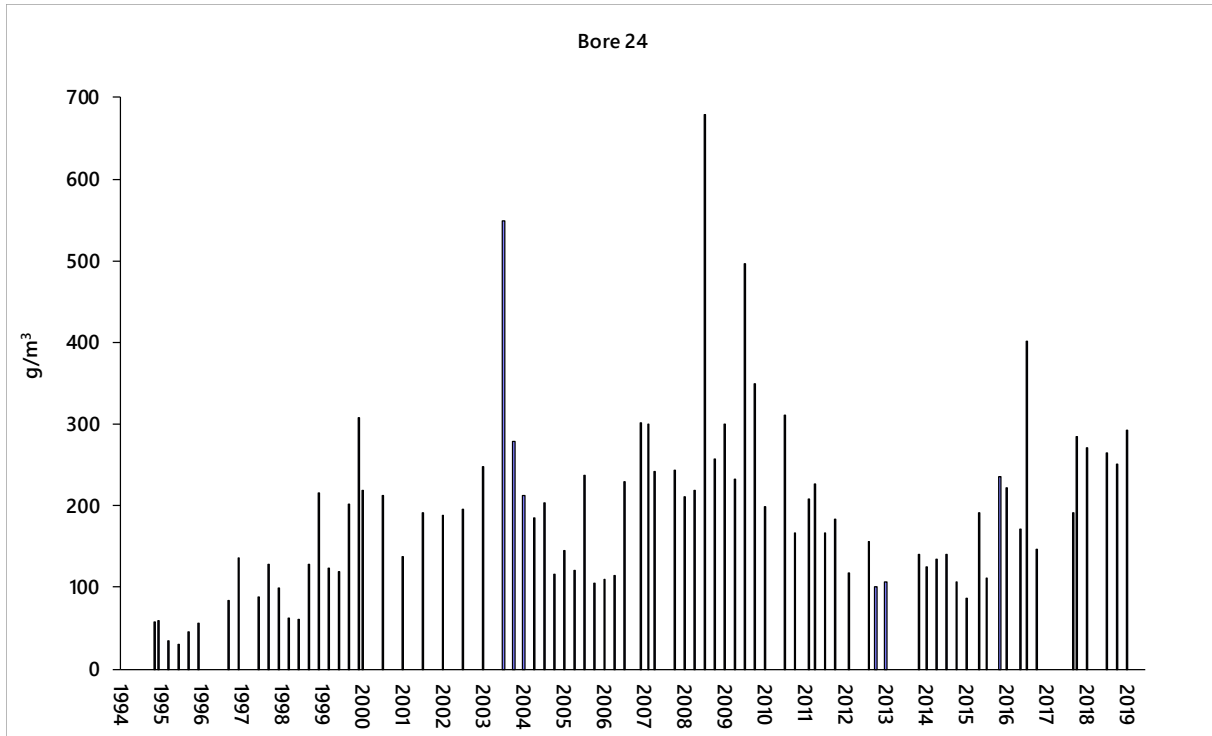


Figure 13 Total nitrogen concentration in groundwater in the vicinity of bulk storage (bore 24) area

2.3 Air

2.3.1 Inspections

The Company's 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 two occasions during the 2018-2019 monitoring period, while deposition gauges were also deployed at the site.

2.3.2 Results of abstraction and 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 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 from 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 17 January 2019 and 15 May 2019. 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 (2018-2019)

Date	17 January 2019	15 May 2019	Consent limit
Ammonia (kg/hr)	84	200	295
Urea (kg/hr)	1.2	3.3	12
Urea (mg/m ³)	12	12	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/hr.

The concentration limit for urea emissions from the dust scrubber fan (or any other source) is 125 mg/m³, and the mass discharge rate limit is 12 kg/hr, 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, as was the urea mass discharge rate.

2.3.3 Results of receiving environment monitoring

2.3.3.1 Particulate deposition gauging

The particulate deposition survey was undertaken by the Council between 15 October and 5 November 2018, at five locations around the Company's site as shown in Figure 14.

There was significant wind (at Hawera AWS) from the west for the deployment. The wind rose for the monitoring period is presented Figure 15. The results are presented in Table 7.

Material from the gauges was analysed both for solid particulate 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/m²/d. 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 10 to 80 mg/m²/d. These results are well below the guidelines set by the Council.



Figure 14 Location of deposition gauge sites

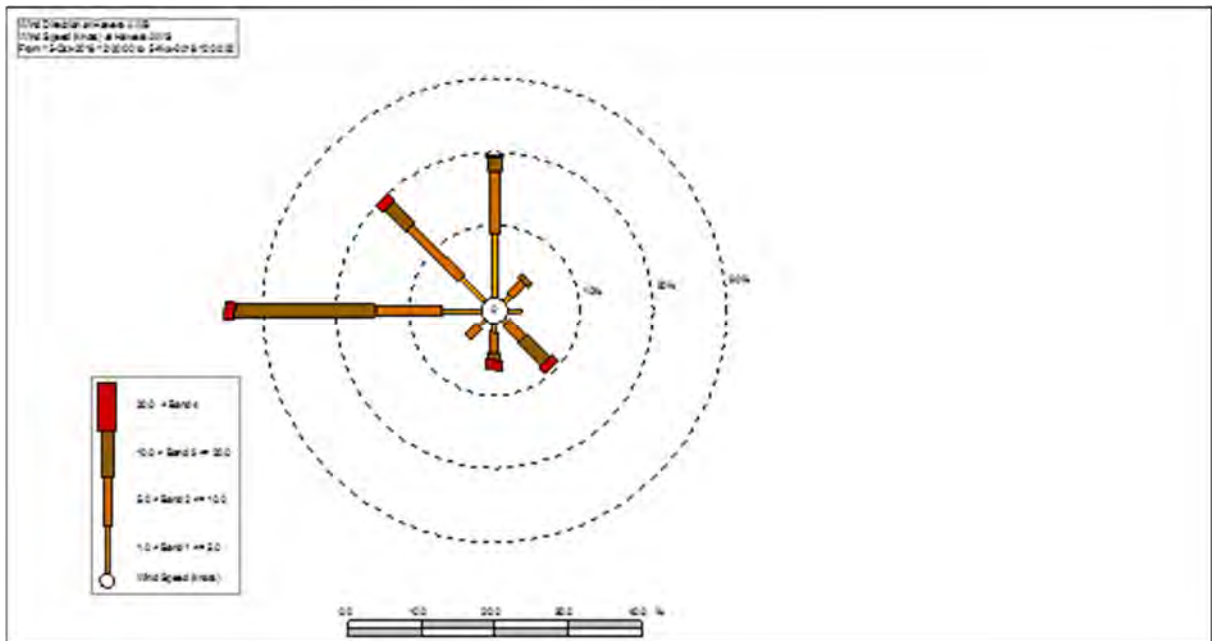


Figure 15 Wind-rose for Hawera weather station during deployment of deposition gauges, 15 October to 5 November 2018

Table 7 Results of particulate deposition monitoring for 15 October to 5 November 2018

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	7.5	7.3	7.8	7.2	7.7
Conductivity mS/m/d	0.72	0.50	0.91	0.67	0.87
Ammonia mgN/m ² /d	12.37	7.49	22.75	10.62	13.41
Urea mgN/m ² /d	29.36	1.52	2.59	1.40	3.64
Particulate mg/m ² /d	10	10	40	30	80

The measured ammonia deposition rates at all five sites exceeded the typical background rate of 0.4 mgN/m²/d 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 mgN/m²/d. In the 2018-2019 monitoring period, the measured rates at the five sites ranged from 7.49 to 22.75 mgN/m²/d, with none exceeding the recommended maximum value (55 mgN/m²/d).

The 2018-2019 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.

2.3.3.2 Ambient gas monitoring by Regional Council

During the monitoring period, a multi-gas detector was deployed on two 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 16.

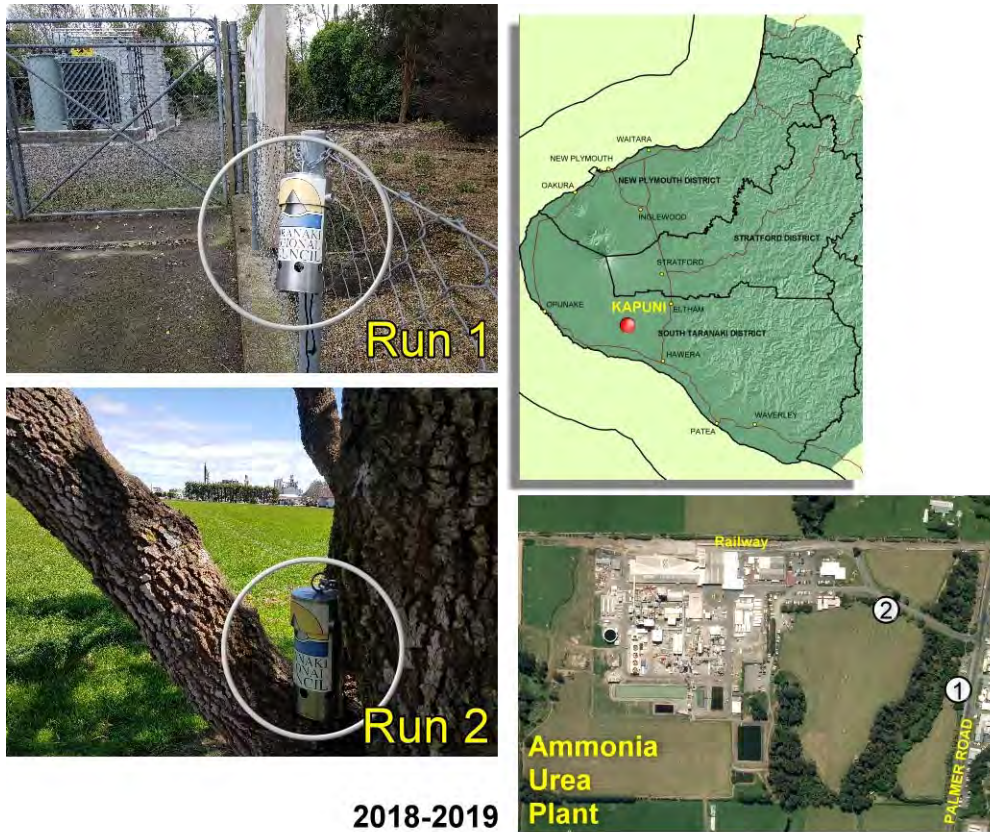


Figure 16 Sampling sites for ambient gas monitoring at ammonia urea plant (2018-2019)

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 summarised in Table 8.

Table 8 Summary of ambient gas monitoring results (2018-2019)

Run		1	2
Period (from/to)		03/09/2018 16:47 06/09/2018 08:44	05/10/2018 16:20 07/10/2018 13:48
Max	NH ₃ (ppm)	6.10	6.00
	CO (ppm)	7.30	2.50
	LEL (%)	0.00	0.00
Mean	NH ₃	0.29	0.41
	CO (ppm)	0.05	0.32
	LEL (%)	0.00	0.00
Min	NH ₃	0.00	0.00
	CO (ppm)	0.00	0.00
	LEL (%)	0.00	0.00

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 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. The data for ammonia and carbon monoxide from each run are presented graphically in Figure 17 and Figure 18 (no combustible gas was detected during any of the two runs).

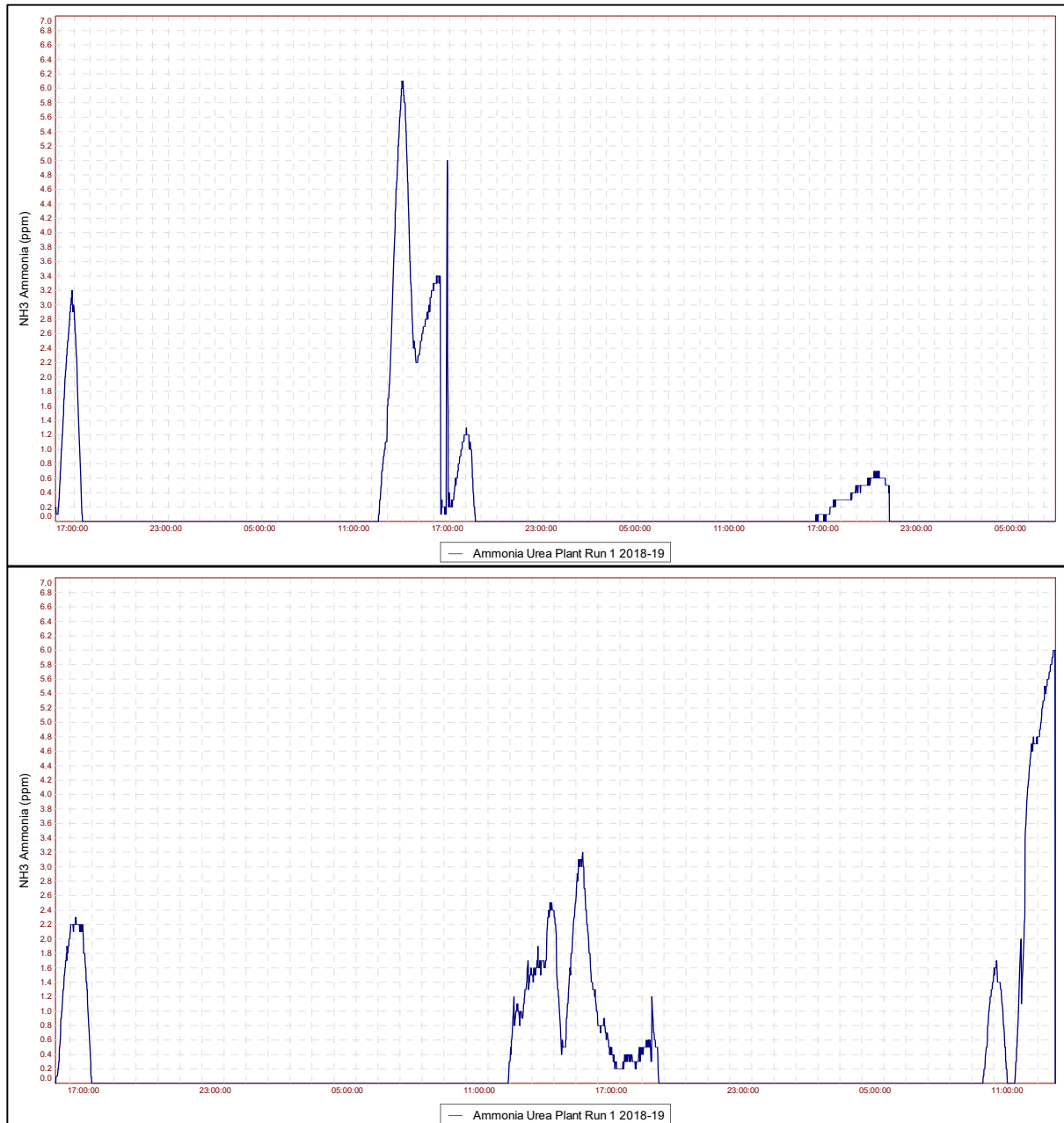


Figure 17 Graphs of ambient ammonia gas levels in the vicinity of ammonia urea plant (2018-2019)

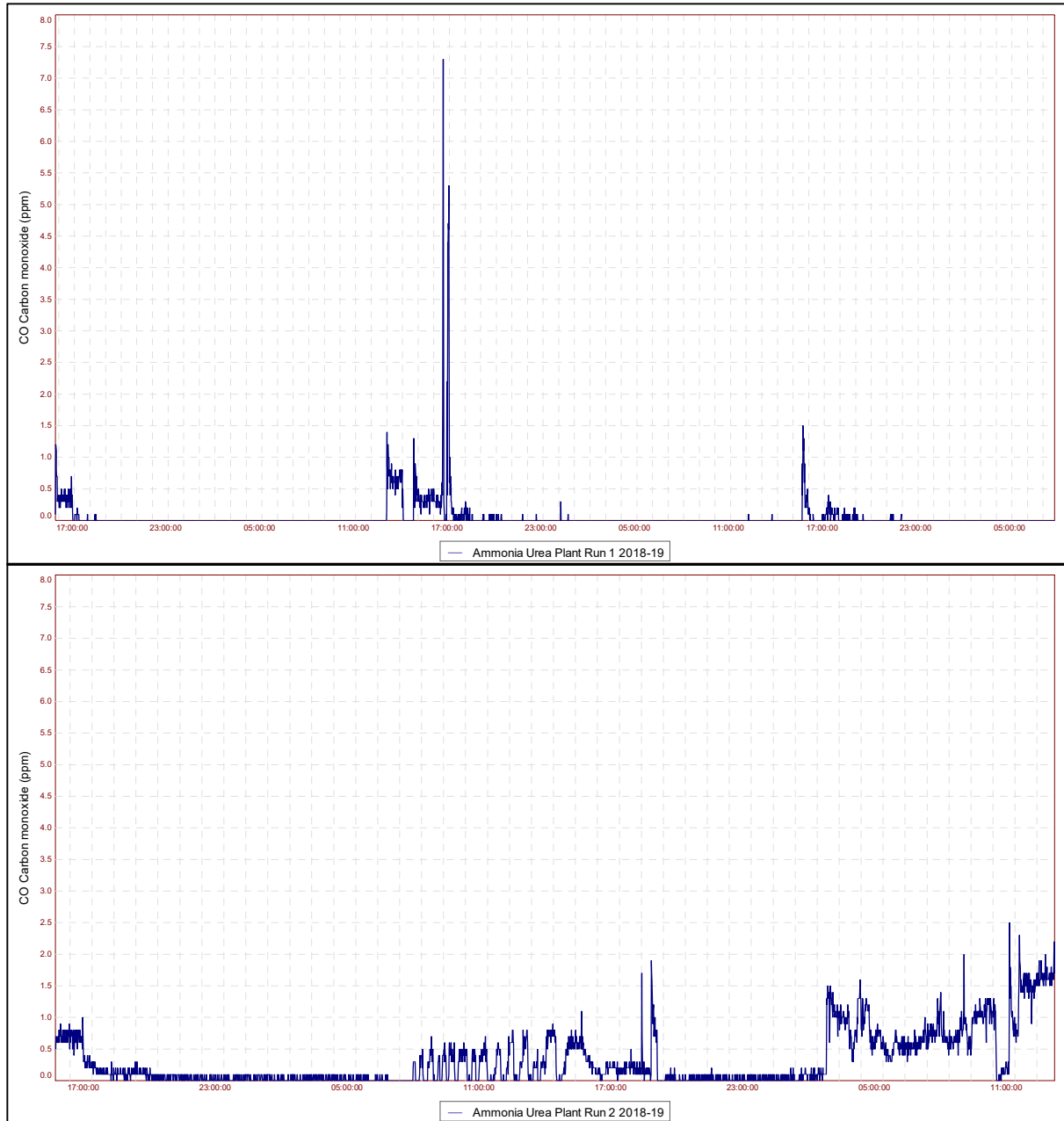


Figure 18 Graphs of ambient carbon monoxide levels in the vicinity of the ammonia urea plant (2018-2019)

The consent covering air discharges from the AUP 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 as 4.27 ppm as a one hour average.

The measured ammonia concentrations had a mean result for the two runs of 0.29 ppm and 0.41 ppm.

Special condition 7 of consent 4046-3 sets a limit on the carbon monoxide concentration at or beyond the site boundary as 10 mg/m³ expressed as a running eight hour mean. The measured carbon monoxide concentrations had a mean result for the two runs of 0.05 and 0.32 mg/m³.

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 one of the runs.

2.3.3.3 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 Draeger CMS instrument. Usually, one measurement is taken, over a period of about 10 minutes. The results of ambient ammonia monitoring for the period are presented in Figure 19 and Figure 20.

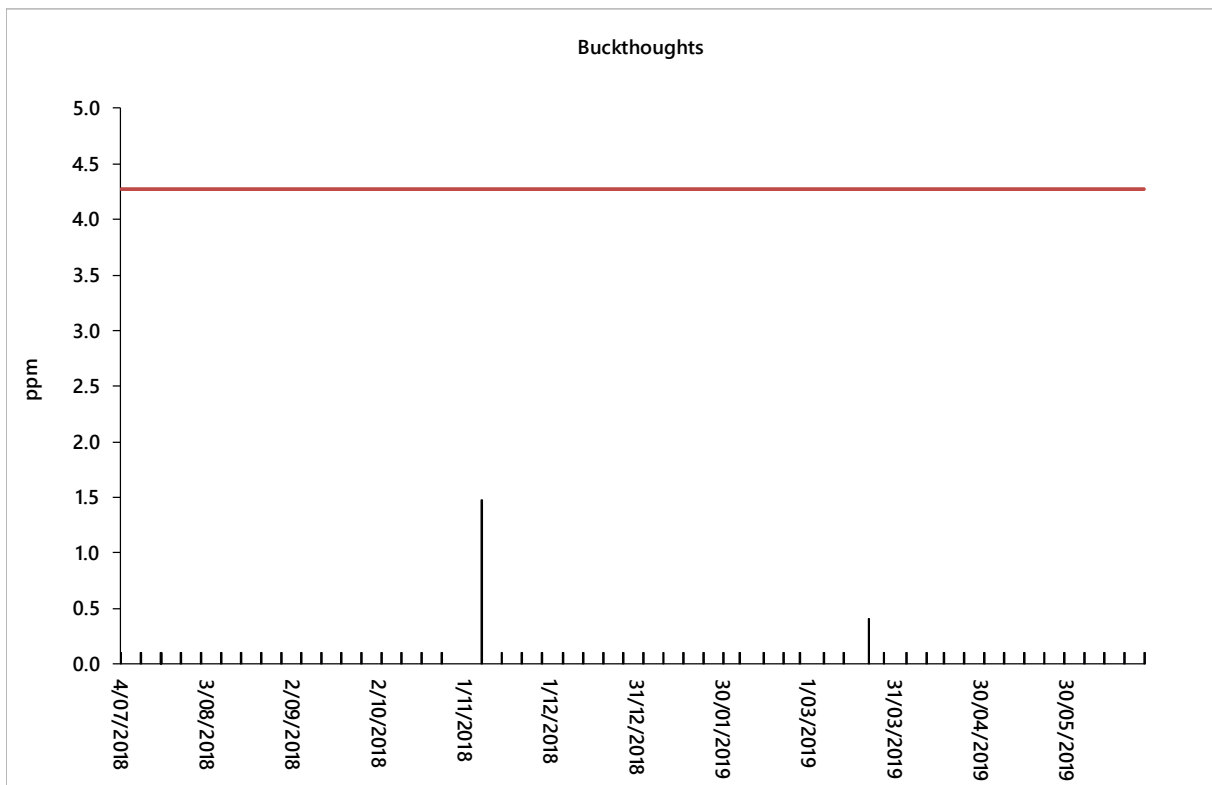


Figure 19 Atmospheric ammonia concentration at ground level on site boundary (consent limit 4.27 ppm one hour average)

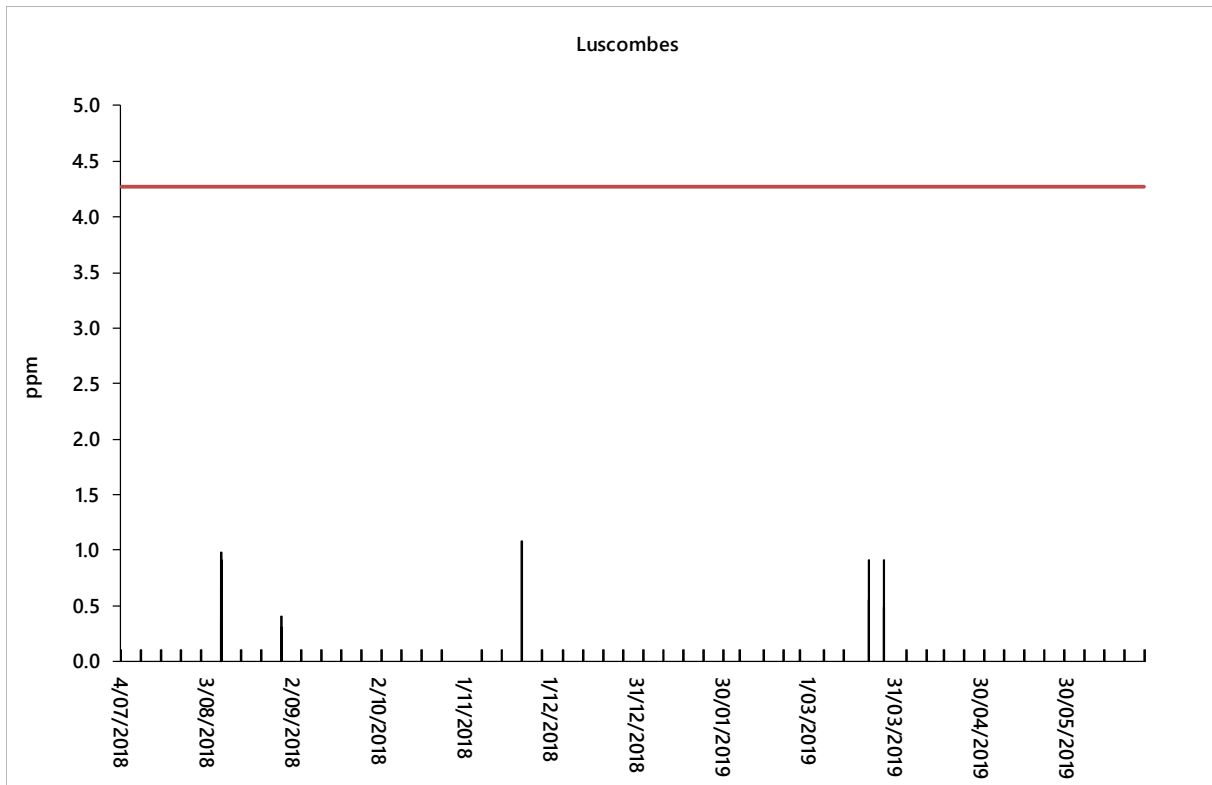


Figure 20 Atmospheric ammonia concentration at ground level on site boundary (consent limit 4.27 ppm one hour average)

Ammonia concentration was recorded above the detection limit of 0.2 ppm on two days at the western boundary (Buckthoughts), and on five days at the southern boundary (Luscombes) and all one hour average values were within the consent limit of 4.27 ppm.

2.3.3.4 Other ambient monitoring

Nitrogen Oxide Emissions

From 2014 onwards, the Council has implemented a coordinated region-wide compliance monitoring programme to measure NO_x (TRC, 2018). The programme involves deploying all measuring devices at 24 NO_x monitoring sites (including two sites in the vicinity of the AUP) 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 AUP 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/m³ for a one hour average exposure.

NO_x passive adsorption discs were placed at two locations in the vicinity of the AUP on one occasion during the year under review. The discs were left in place for a period of 21 days.

The calculated 1-hour theoretical maximum NO_x concentration found at the AUP during the year under review equates to 7.2 and 27.0 µg/m³ (Table 9). The results show that the ambient ground level concentration of NO_x is well below the limits set out by consent 4046-3.

Table 9 Summary of ambient gas monitoring results (2018-2019)

Site	NOx($\mu\text{g}/\text{m}^3$)	NOx 1/hr ($\mu\text{g}/\text{m}^3$) Theoretical max.	NOx 24/hr ($\mu\text{g}/\text{m}^3$) Theoretical max.
AIR003401	3.9	13.5	7.2
AIR003404	14.7	51.0	27.0

2.3.3.5 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 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
- 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
- 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
- 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 2.3.3.3).

The third report required under consent 4046-3, which covers the period June 2015 to May 2018, was received in August 2018. The report is attached as Appendix III. The summary states:

Operation of the plant has been breach-free for over five years.

Ballance-Kapuni is an upper tier major hazard facility. A comprehensive study has identified and risk assessed all credible scenarios leading to major incidents, including those resulting in significant ammonia release. A project has been initiated to scope an ammonia emissions management system as part of a continuing programme of process safety improvement. The new system is slated to be operational by 2021. In addition, a

major programme of capital investment is scheduled over the next 10 years, with a significant proportion of that related to minimising the risk of major incidents involving ammonia release.

In terms of recent improvements, improved sampling methodology, costing over \$100,000, has provided more consistent monitoring results. This improved monitoring has found that ammonia and urea emissions were at lower average levels than previously reported.

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.

During the draining of the urea reactors, typically as part of a plant shutdown, ammonia is vented to the atmosphere. Control systems have been modified to ensure the rate of ammonia release is tightly controlled. The cost of the change was relatively small but there was an operational cost in terms of adding several hours to the draining procedure.

The plant upgrade feasibility study was carried out and a decision by the Board to not proceed was made. As a result, a significant programme of capital investment was identified for the current asset amounting to over \$250m. This will include turnarounds, replacement of end of life equipment, further investment in process safety risk reduction and asset integrity.

Also, further work to verify the design of critical safety valves on the ammonia plant, to confirm that they are correctly sized and configured, is currently underway.

Seventeen external complaints received by the Company in the period May 2015 to May 2018 are detailed, none of which involved breach of consent. In terms of Council's July to June reporting year, there were six complaints in 2015-2016, three in 2016-2017 and eight in 2017-2018.

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. There has been no notification during the current monitoring year to the Council about any odour complaints. Thus, there can be no determination as to 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.

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 \$30,000 per year for the specific purpose of riparian planting and management both upstream and downstream of the intake location. During 2018-2019, a total of 22 landowners received funding from the Company for the amount \$27,377.01. Landowners were rebated 50% of the cost of the plants and some 11 landowners also received a rebate for planting. A total of 15,999 plants were planted. The locations in Waingongoro catchment of the properties which have received funding from the Company are given in Figure 21. The proportion of recommended planting that has been implemented is indicated for each property.

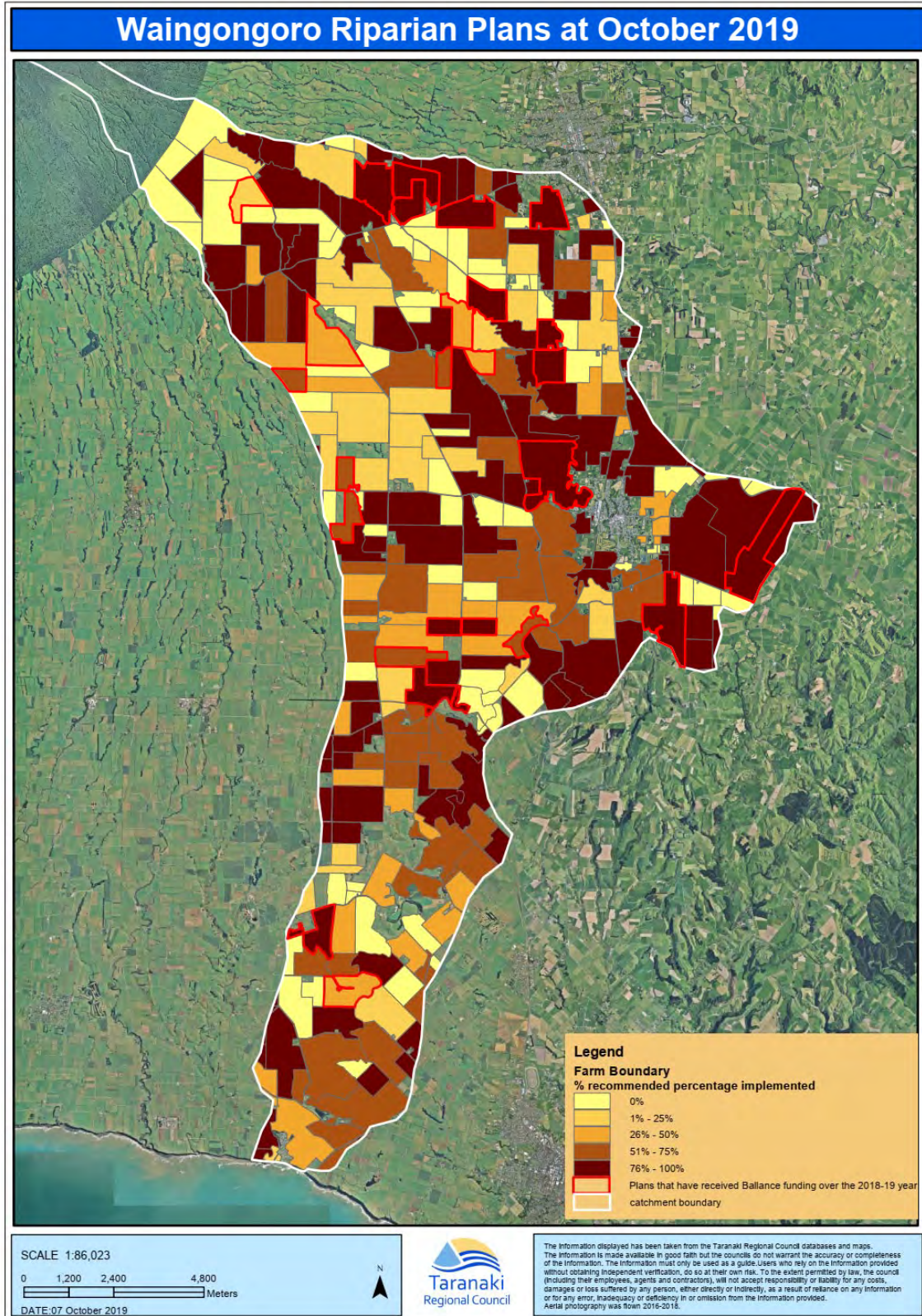


Figure 21 Riparian management plans in Waingongoro catchment with Company funding

2.5 Incidents, investigations, and interventions

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 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 2018-2019 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 site performance

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

The consent to take from the Kapuni Stream was exercised twice during the current monitoring year, the first instance due to issues with electricity supply and the second due to the planned shutdown.

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 analyses were carried out in accordance with the environmental management system manual.

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. 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 Environmental effects of exercise of 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 Company's site and are monitored. They pose 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.

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. Average one-hour ammonia levels recorded by the Company at the boundary were less than 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.

3.3 Evaluation of performance

A tabular summary of the Company's compliance record for the year under review is set out in Table 10 to Table 16.

Table 10 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 consultant's 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	Yes
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		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 11 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 option	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		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 12 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		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 13 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

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?
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		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 14 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

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?
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		N/A
Overall assessment of administrative performance in respect of this consent		N/A

N/A = not applicable

Table 15 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
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

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?
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		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 16 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
3. 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
4. Limits the concentration of ammonia beyond the site boundary	Liaison with consent holder and monitoring at boundary by Ballance and Council	Yes
5. Consent holder to establish monitoring sites for ammonia	Due by 12 February 2013. Sites established in September 2012	Yes

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?
6. Limits the concentration and mass of urea emissions	Liaison with consent holder and monitoring of discharges by K2 Environmental for Ballance	Yes
7. 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
8. Limits the concentration of other contaminants beyond the plant boundary	Liaison with consent holder and inspection	Yes
9. Discharge not to give rise to offensive or objectionable odour beyond the plant boundary	Inspections and Company records.	Yes
10. Written report required every three years detailing emissions and measure undertaken to reduce them	Received 10 June 2015	Yes
11. Consent holder to convene meeting three-yearly	Annual meetings with neighbours held, not attended by Council	Yes
12. Shall maintain and operate a site contingency plan and review it annually	Site inspections and correspondence from the Company	Yes
13. 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		High
Overall assessment of administrative performance in respect of this consent		High

N/A = not applicable

Table 17 Evaluation of environmental performance over time

Year	Consent no	High	Good	Improvement required	Poor	Not exercised
2010	0596-2	1	-	-	-	-
	1213-2	1	-	-	-	-
	4719-1	1	-	-	-	-
	0598-2	1	-	-	-	-
	1766-2	-	-	-	-	1
	0597-2	1	-	-	-	-
	3967-1	1	-	-	-	-
	4046-2	-	-	1	-	-
2011-2012	0596-2	1	-	-	-	-
	1213-2	1	-	-	-	-
	4719-1	1	-	-	-	-

Year	Consent no	High	Good	Improvement required	Poor	Not exercised
	0598-2	1	-	-	-	-
	1766-2	-	1	-	-	-
	0597-2	1	-	-	-	-
	4046-2	-	-	1	-	-
	4046-3	1	-	-	-	-
2013	0596-2	1	-	-	-	-
	0596-3	1	-	-	-	-
	1213-2	-	-	-	-	1
	1213-3	-	-	-	-	1
	4719-1	1	-	-	-	-
	4719-2	1	-	-	-	-
	0598-2	1	-	-	-	-
	0598-3	1	-	-	-	-
	1766-2	-	-	-	-	1
	1766-3	1	-	-	-	-
	0597-2	1	-	-	-	-
	0597-3	1	-	-	-	-
4046-3	-	-	1	-	-	
2014-2015	0596-3	1	-	-	-	-
	1213-3	1	-	-	-	-
	4719-2	1	-	-	-	-
	0598-3	1	-	-	-	-
	1766-3	-	-	-	-	1
	0597-3	1	-	-	-	-
	4046-3	1	-	-	-	-
2016	0596-3	1	-	-	-	-
	1213-3	1	-	-	-	-
	4719-2	1	-	-	-	-
	0598-3	1	-	-	-	-
	1766-3	1	-	-	-	-
	0597-3	1	-	-	-	-
	4046-3	1	-	-	-	-
2017	0596-3	1	-	-	-	-
	1213-3	1	-	-	-	-
	4719-2	1	-	-	-	-
	0598-3	1	-	-	-	-

Year	Consent no	High	Good	Improvement required	Poor	Not exercised
	1766-3	1	-	-	-	-
	0597-3	1	-	-	-	-
	4046-3	1	-	-	-	-
2018	0596-3	1	-	-	-	-
	1213-3	1	-	-	-	-
	4719-2	1	-	-	-	-
	0598-3	1	-	-	-	-
	1766-3	1	-	-	-	-
	0597-3	1	-	-	-	-
	4046-3	1	-	-	-	-
Totals		42	1	3	-	4

During the 2018-2019 period under review, the Company demonstrated a high level of environmental and administrative performance and compliance with the resource consents as defined in Section 1.1.4.

3.4 Recommendations from the 2017-2018 Annual Report

1. THAT in the first instance monitoring of air emissions from the Company's AUP in the 2017-2018 year continue at the same level as in 2016-2017 except for a reduction in multigas monitoring from three instances to two instances.
2. THAT should there be issues with environmental or administrative performance in 2018-2019, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.
3. THAT monitoring of abstractions and discharges from the Company's AUP in the 2018-2019 year continue at the same level as in 2017-2018.
4. THAT monitoring of the effects of abstraction from the Waingongoro River be discussed in consultation with interested parties, as provided in condition 10 and 11 on consent 0596-3.

These recommendations were implemented during the 2017-2018 monitoring year and a high level of compliance was achieved.

3.5 Alterations to monitoring programmes for 2019-2020

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 2019-2020, the monitoring remain the same as for 2018-2019 monitoring. 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 2019-2020.

3.6 Exercise of optional review of consent

None of the seven consents held by the Company provided for an optional review in June 2020.

4 Recommendations

1. THAT monitoring from the Company's AUP in the 2019-2020 year continue at the same level as in 2018-2019 and that should there be issues with environmental or administrative performance in 2019-2020, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.
2. THAT monitoring of the effects of abstraction from the Waingongoro River be discussed in consultation with interested parties, as provided in condition 10 and 11 on consent 0596-3.

Glossary of common terms and abbreviations

Approach velocity	The speed at which water moves towards an intake structure, expressed in m/s.
AUP	Ammonia urea plant.
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 25°C and expressed in $\mu\text{S}/\text{cm}$.
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.
$\mu\text{S}/\text{cm}$	Microsiemens per centimetre.
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 letters '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 a Science Services Manager.

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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)

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	2,851	2023	2035
0597-3	Discharge plant production effluent and contaminated stormwater by way of irrigation onto land	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

Water abstraction permits

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

Water discharge permits

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

Air discharge permits

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

Discharges of wastes to land

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

Land use permits

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

Coastal permits

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

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 ± 5 percent. Records of the date, the time and the rate and volume of water taken at intervals not exceeding 15 minutes, shall be made available to the Chief Executive, Taranaki Regional Council at all reasonable times.

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

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

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.

Consent 0596-3

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.

Consent 0596-3

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

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.

Consent 0597-3

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.

Consent 0597-3

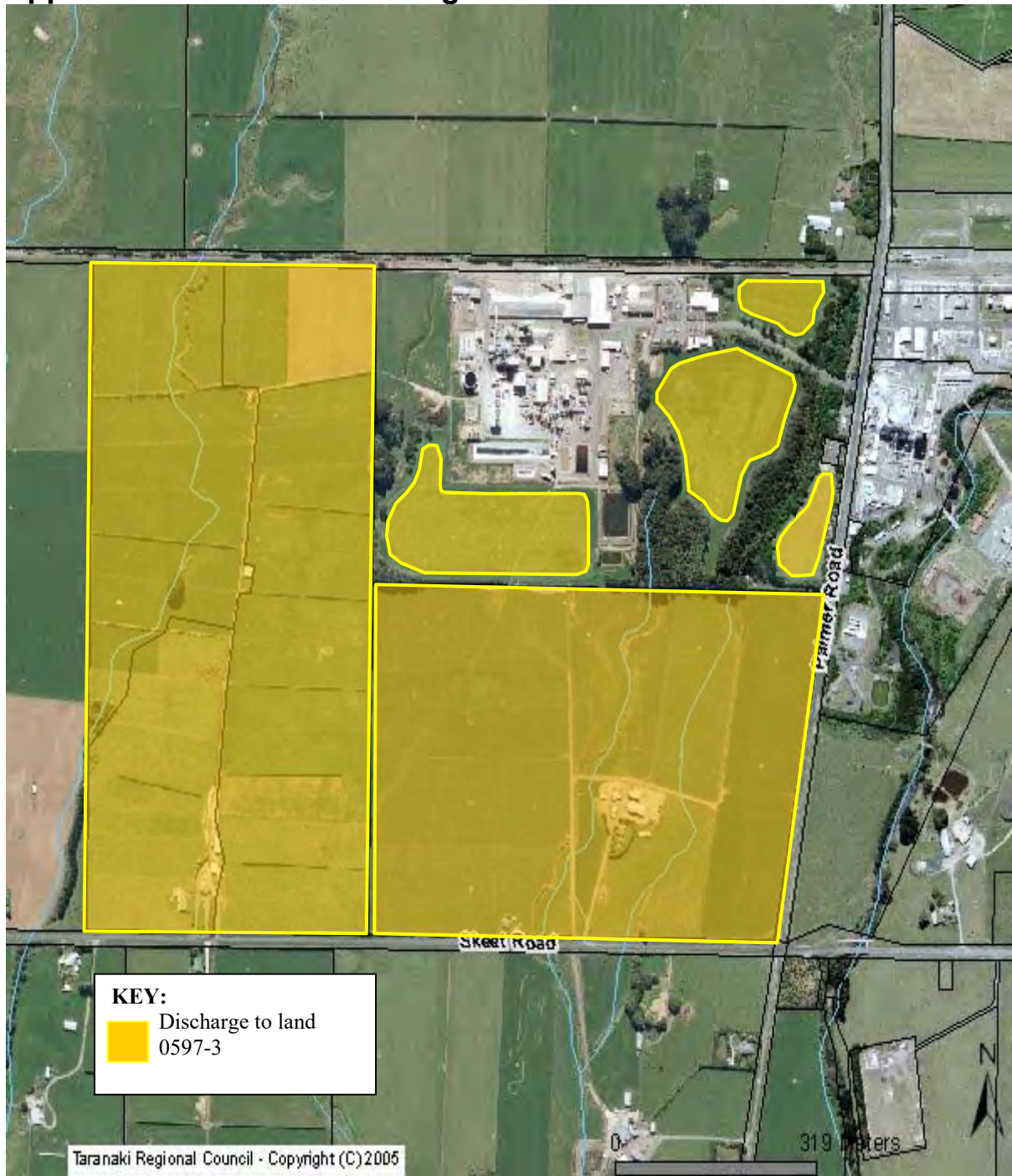
14. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2017 and/or June 2023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

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 m³ per day to the Kapuni Stream, or 4,080 m³ 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.

Consent 0598-3

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 not 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

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 $\pm 5\%$, 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

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.

<u>Constituent</u>	<u>Standard</u>
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.

<u>Constituent</u>	<u>Maximum concentration</u>
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.

Consent 1766-3

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

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)

*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 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.

Consent 4046-3

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.

Consent 4046-3

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

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 m³ 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

Director-Resource Management

Certificate of Compliance

**Pursuant to section 139 of the Resource Management Act 1991
a certificate of compliance is hereby issued by the
Taranaki Regional Council**

Name of certificate holder	Ballance Agri-Nutrients (Kapuni) Limited P O Box 439 HAWERA 4640
Site location	309 Palmer Road at or about GR: 1700250E-5629534N [legal description: Pt Lot 1 DP 13121 [Discharge source & site]]
Proposal/Activity	To discharge treated domestic wastewater into land via soakage trenches in the Kapuni catchment
Certification	<p>The Taranaki Regional Council hereby certifies that:</p> <p>the discharge of treated domestic wastewater into land via soakage trenches in the Kapuni catchment as outlined in the documentation supplied in support of the application is a permitted activity pursuant to Rule 22 of the Regional Freshwater Plan for Taranaki [2001] at the date of receipt of the application for this certificate, provided that it complies with and continues to comply with the following conditions:</p> <ul style="list-style-type: none">• <i>The discharge shall not result in surface ponding or runoff of any contaminant into a surface water body;</i>• <i>There shall be no direct discharge of any contaminant into a surface water body;</i>• <i>The discharge shall not be within 25 metres of a surface water body;</i>• <i>The discharge shall not be within 50 metres of any bore, well or spring used for water supply purposes;</i>

- *The discharge shall not be noxious, dangerous, offensive or objectionable to such an extent that it has or is likely to have a significant adverse effect on the environment.*

Any discharge which causes any of the above conditions to be breached is not permitted and may be the subject of enforcement action.

Signed at Stratford on 6 December 2010

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Appendix II

Review of Stark Environmental Reports: Kapuni
macroinvertebrate biomonitoring and electric
fishing in relation to Ballance Agri-Nutrients Kapuni
Ltd and Vector Ltd – July 2017 – June 2018

Memorandum

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Review of Stark Environmental Reports: Kapuni macroinvertebrate biomonitoring and electric fishing in relation to Ballance Agri-Nutrients Kapuni Ltd and Vector Ltd – July 2018 – June 2019

Introduction

Four macroinvertebrate surveys and two fish surveys were scheduled for the Kapuni Catchment for the 2018-2019 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
18/07/18	2018-07	Macroinvertebrate	7	2
9/10/18	2018-10	Fish	11	
9/10/18	2018-11	Macroinvertebrate	11	2
22/01/19	2019-02	Macroinvertebrate	7	2
15/04/19	2019-04	Fish	7	
15/04/19	2019-05	Macroinvertebrate	7	2



Figure 1 Biomonitoring sites in the Kapuni Catchment

Macroinvertebrate monitoring

Targets for MCI values have been set for the Kapuni main stem and gully system. For the Kapuni Stream a hard bottom MCI (MCI-hb) 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 MCI (MCI-sb) of 73 units based on the 25th percentile of historical data. Site 13 has a tentative target of MCI-sb 90.

The MCI-sb is generally not used by Taranaki Regional Council due to staff finding it to be unreliable when detecting pollution incidences. For instance, during a recent pollution incident where a stream was found to contain large amounts of sewage fungus and had very high BODs, a MCI-hb of 40, indicating 'very poor' health was found. This was a true reflection of macroinvertebrate health. However, the MCI-sb score was 95, indicating 'fair' health and only five units off 'good' health, which was clearly inappropriate considering the situation. The MCI-sb was developed primarily in the Auckland Region and may not be appropriate for the Taranaki Region.

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. This error was based on comparisons between two kicknet samples but as the target value arguably does not contain any sampling error, the detectable difference should be half of 10.8 (5.4 MCI units).

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 had scores above 100 MCI-hb indicating 'excellent' to 'good' macroinvertebrate health while the two tributary sites had MCI-sb scores between 88 to 105 indicating 'good' to 'fair' health. No sites recorded a taxa richness below 10 indicating that sites had not been exposed to any toxic discharges.

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. All trends remained significantly positive after FDR. The last 5-10 years show a levelling off or decrease in scores, but as the control site was also levelled off, it appears to be due to factors unrelated to activities associated with Ballance Kapuni, probably sand inundation from slips within Egmont National Park.

Some additional analyses were 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. Observed results were generally lower than expected for the January and April survey results and higher than expected for the July and October surveys, reflecting typical seasonal variation.

Overall, the Kapuni Stream was generally in 'good' to 'excellent' 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 9 October 2018 (11 sites) and 15 April 2019 (seven sites). The total area of streambed fished in the Kapuni Stream was approximately 357 m² in October and 230 m² in April. The tributaries were not fished in either survey. Appendix 2 for report 2018-10 regarding brown trout is incorrect. It states four brown trout were caught for site N on 9 October 2018, when in fact five fish were caught. However, the conclusions regarding the number of trout caught (17), and total fish were correct.

Table 2 Results of spring fish survey in the Kapuni Stream conducted on 9 October 2018

Site	Brown trout	Redfin bully	Koaro	Torrentfish	Eels	Koura	Total number of species
O			2				1
P							0
E					1	2	2
9	3				1	1	3
11	5						1
12	2				1		2
10	2						1
6					1		1
7					1		1
8/K					2		1
N	5					1	2
Total	17		2		7	4	4

Table 3 Results of fish survey in the Kapuni Stream conducted on 15 April 2019

Site	Brown trout	Redfin bully	Koaro	Torrentfish	Eels	Koura	Total number of species
9							0
11							0
12						1	1
10							0
6							0
7							0
8/K		1			1		2
Total	0	1	0	0	1	1	3

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 30 animals, comprising four taxa, were caught at 10 sites during the October 2018 survey. During the April 2019 survey, only three separate taxa were caught. The October survey result was within the range (8-221) of total numbers and variety (2-8 taxa) recorded in previous years; the April survey had the lowest recorded numbers to date but was within the range of taxa caught. Typically, the autumn survey has lower numbers and taxa recorded than the spring survey, but the very low numbers recorded was unusual.

In October 2018, brown trout were the most abundant taxa comprising 57% of the total number of animals recorded. Eels are normally the dominant fish recorded from the Kapuni Stream.

In April 2019, redfin bully, eel and koura were equally the most abundant taxa comprising 33% of the total number of animals recorded. 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 2018 survey. However, none were recorded during the April 2019 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 do 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 III

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

Ballance Agri-Nutrients [Kapuni] Limited

A Report Prepared for Special Conditions 5 and 10 of

Air Discharge Permit 4046-3

June 2015 – May 2018

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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 third review and is for the period June 2015 to May 2018.

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.

The levels of ammonia and urea exiting the dust scrubber are measured every 6 months by K2 Environmental Ltd. Following changes made to the sampling methodology in 2013, costing over \$100k, the monitoring results have been much more consistent, indicating lower average levels for ammonia and urea emissions than previously reported.

During the draining of the Urea reactors, typically as part of a plant shutdown, ammonia is vented to atmosphere. Control systems have been modified to ensure the rate of ammonia release is tightly controlled. The cost of the change was relatively small although the operational impact was to add several hours onto the draining period. This is an example where care for the environment was placed above production.

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 looking at the feasibility of a major upgrade to the plant was finalised in 2017, with a decision taken by the Board of Directors not to proceed with the upgrade. As a result, a significant programme of capital investment was identified for the current asset, extending over the next 10 years, and amounting to over \$250m. This will include turnarounds, replacement of end of life equipment, further investment in process safety risk reduction and asset integrity. In addition, the 10 year plan includes collaboration with technology providers who will assist and advise on technological improvement opportunities going forward.

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.

Ballance-Kapuni was designated an upper tier major hazard facility in 2016, with a requirement to submit a safety case to Worksafe. To meet this requirement, a detailed analysis of plant operation was carried out and potential major incident hazards were identified. Many of these involved large releases of ammonia to atmosphere. For each major incident hazard, the existing controls were identified and a level of risk determined. As part of this risk assessment process, further potential controls were identified that could reduce risk further, and assessed for future implementation. This has generated a substantial programme of work over the next 7 years, with some of these additional controls being implemented either prior to, or during, the 2019 Turnaround.

In addition to the capital investment programme, another tranche of work is now underway to verify the design of critical safety valves on the ammonia plant, to confirm that they are correctly sized and configured. This work is being conducted by an independent company and is due for completion before the end of 2018.

4.2 Vent heights, flaring or other options

One of the most significant outcomes from the safety case hazard identification and risk assessment process was the reinforcement of the need for an ammonia emissions management system i.e. a system that can safely manage releases from safety valves and process vents within the ammonia plant.

Initial work has begun, aimed at firming up the scope and capacity requirements for such a system, building on the design work carried out previously on a flare system. The expectation is that the new system will be larger in scope than the original flare study and be operational by 2021.

5.0 CONDITION 10(c): EXTERNAL COMPLAINTS

The table below summarises the details of all external complaints received during the period. None of these external complaints were consent breaches.

Date	Time	Operating conditions	Weather conditions	Response measures	Comments
6 th August 2015 -	1100	Normal Operation		Changed out faulty suction safety (SV-105B) on GA-101B	Ammonia Uraca suction safety lift, leak on PC system. Boundary test: TWA = 1.05ppm v/v NH3. No breach.
20 th August 2015 - STOS	0750	Urea Plant SD	West – 2-10 knots	Plant shut down for mixing tee clearance	The Urea Plant was shutdown & Reactors being drained to storage tanks due to high Mixing Tee dp. 0.82ppm
15 th December 2015 – Vector	1530	Normal Operation	West 10-15 knots	High ammonia results, above nominated levels, and effluent return was immediately stopped and the dust scrubbers diluted	There were no plant issues other than high dust scrubber and PFP NH3 which were diluted. 0.48ppm
7 th April 2016 – Vector					
9 th May 2016 – Vector	51192 0720	Normal Operation	Westerly – 8 knots	Isolated the off-line Ammonia Uraca, Vent down Uraca to vacuum system. Flushed PSV tail pipe to Dust scrubber and main vent. Steam on main vent.	<0.2ppm - Ammonia Uraca suction PSV passing.
24 th May 2016 – Vector	51399 0545	Plant Trip	Westerly – 10 knots	Stopped venting, stopped draining and vacuum re-established	Max was <2 ppm. Reactor draining from DCS fault plant trip
5 th October 2016 – Vector	53554 0730	Normal Operation	West	Monitoring carried out.	<0.2ppm Plant running normally. Strong westerly wind. No issues found
1 st December 2016 - STOS	54296 1135	Normal Operation	West	Monitoring carried out	0.4ppm - Plant running normally - strong westerly wind. Nothing found
16 th December 2016 – STOS	54488 1019				Nothing venting, no obvious plant excursions, no readings on STOS ammonia detectors. The TWA for the testing was 0.82ppm NH3
11 th July 2017 – Vector	57771 0745	Plant Start up			Plant in abnormal state due to power outage. Peak was 2.11 ppm

1 st August 2017 – Vector	58327 1230	Plant Trip	Westerly – 18 knots		Plant in abnormal condition following restart and processing tanks. Peak 2.48 ppm
7 th December 2017 – TODD	60689 1547	Urea Plant Shut Down	Westerly – 10 knots	Transfer off HPAC to A tank changed to 406 Tank	Urea plant shutting down. Fluid sent to A tank instead of 406 tank, venting to D/S. Peak was 5 ppm.
13 th December 2017 – TODD	60824 1115	Urea Plant Start Up	South West 5 knots	Both leaks isolated & repaired immediately	HPAC drain line leak and PT-124 leak, followed by HPD reboiler lid leak
19 th December 2017 – TODD	60934 1115	Normal Operation – Post Granulator Wash	North West – 10 knots		Plant running well with pfp and D/s slightly high. Strong westerly. Peak was 2.31 ppm
21 st February 2018 - Vector	61951 1030	Normal Operation	North West – 20 knots	Closed reactor and drained all venting.	Reactors draining after power trip, three valves wrongly aligned. Peak was 2.49 ppm
13 th March 2018 – TODD	62350 0903	Normal Operation	Westerly – 7 knots		Plant running normally. Nothing unusual found.
17 th May 2018 -	63698 0820	Plant Start Up	Westerly – 3 knots	Stopped draining HPAC	During plant S/U after an outage for electrical supply loss. Peak reading >5

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 five years.

Ballance-Kapuni is an upper tier major hazard facility. A comprehensive study has identified and risk assessed all credible scenarios leading to major incidents, including those resulting in significant ammonia release. A project has been initiated to scope an ammonia emissions management system as part of a continuing programme of process safety improvement. The new system is slated to be operational by 2021. In addition, a major programme of capital investment is scheduled over the next 10 years, with a significant proportion of that related to minimising the risk of major incidents involving ammonia release.

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.

