

Ballance Agri-Nutrients (Kapuni) Ltd
Monitoring Programme
Annual Report
2020-2021

Technical Report 2021-58



Working with people | caring for Taranaki

Taranaki Regional Council
Private Bag 713
Stratford

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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 2020 to June 2021 describes the monitoring programme 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.

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

The Company hold 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, to the Kapuni Stream and an unnamed tributary of the Kapuni Stream; and to discharge emissions into the air.

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, physicochemical analysis of four stream samples, two stormwater/discharge samples, two effluent grab samples, two composite effluent samples, and two groundwater samples, two 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 ninth of ten annual payments required by consent conditions.

The groundwater monitoring indicates the presence of elevated total nitrogen 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 historic 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 resulting from previous leaks in a finished effluent catch 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 are closely monitored and neither plume extends beyond the boundary of the Company's site. However, current results indicate that one monitoring bore, but not other down gradient bores in close proximity, showed a large increase in total nitrogen. This suggests that the plume had moved a short distance. Monitoring of the bore has been increased but further action may need to be taken.

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

In terms of overall environmental and compliance performance by the 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 2021-2022 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 2020 to June 2021 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.

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 2021-2022 monitoring year.

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

1.1.3 The Resource Management Act 1991 and monitoring

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

- a. the neighbourhood or the wider community around an activity, and may include cultural and social-economic effects;
- b. physical effects on the locality, including landscape, amenity and visual effects;
- c. ecosystems, including effects on plants, animals, or habitats, whether aquatic or terrestrial;

- d. natural and physical resources having special significance (for example recreational, cultural, or aesthetic); and
- e. risks to the neighbourhood or environment.

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

1.1.4 Evaluation of environmental and administrative performance

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

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

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

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

Environmental Performance

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

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

For example:

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

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

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

Administrative performance

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

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

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

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

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

1.2 Process description

The 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 more than 17 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

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 components of monitoring carried out by each entity is described in further detail below.

1.4.2 Monitoring by the Company

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 to map the migration of contaminated plumes beneath the site.

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 Todd Energy (formerly Vector) gas treatment plant on an adjacent site. Monitoring is carried out quarterly to detect any changes, over time, in the abundance, diversity and health of benthic macroinvertebrate communities, and biannually for fish and freshwater crayfish. During the monitoring period, Stark Environmental Ltd was engaged to perform the quarterly sampling and to report on the resultant monitoring conducted. The reports are forwarded to the Council for review.

1.4.3 Monitoring by Taranaki Regional Council

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 annually.

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 no significant issues were noted. The effluent management system and irrigation areas were found to be working well and all bunded areas were 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.

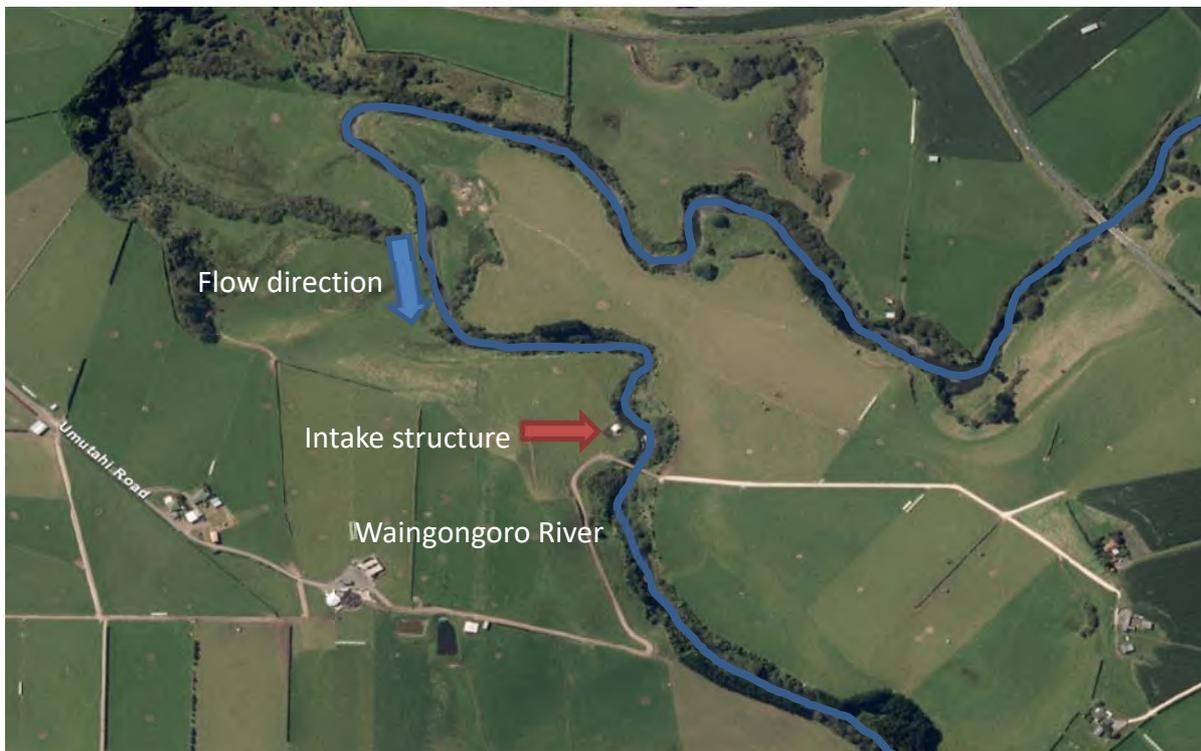


Figure 1 Map showing water intake structure adjacent to the Waingongoro River

Under the Resource Management (Measurement and Reporting of Water Takes) Regulations 2010, the Company was required to take continuous measurements and keep daily records of volume taken from 10 November 2012, 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 2020-2021 is presented in Figure 2.

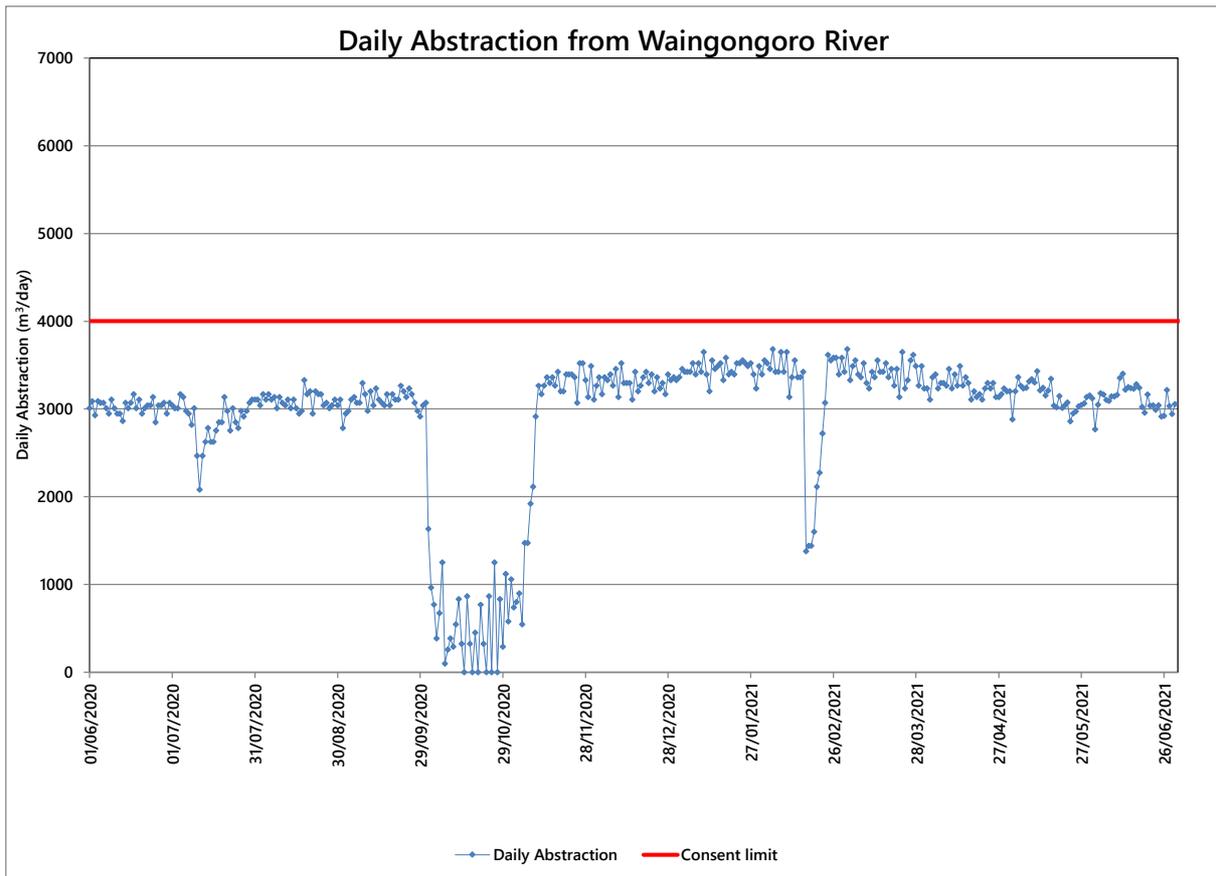


Figure 2 Daily water abstraction by the Company, July 2020 – June 2021

The record shows that the consent limit of 4,000 m³/d on maximum abstraction volume was complied with throughout the 2020-2021 review period. The minimum daily recorded volume was 0 m³/d and the maximum recorded daily volume was 3,680 m³, or 92% of the limit.

Verification of the accuracy of the measurement system was carried out by an authorised independent agent on 5 September 2019. 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 on 6th July 2020. The reason for this was a disruption to the grid electricity supply power. Electrical power to the river water pumps was lost at 0122 hrs and reinstated 91 minutes later. In total 135 m³ of water was abstracted with an average rate of 25 L/s. The consent limit is 33 L/s.

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 2017-2018 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 May 2021. The meeting was attended by representatives of Taranaki Fish and Game, Ngaruahine, the Company and the Council. Apologies were received from the DOC representative and Ngati Ruanui.

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

2.1.3 Discharge monitoring

2.1.3.1 Stormwater and raw water treatment discharges

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. Resource consent 0598-3 allows for to 1,920 m³/d of uncontaminated stormwater to be discharged to the Kapuni Stream and up to 4,080 m³/d to the unnamed tributary.

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 2020-2021, the maximum daily volume of stormwater discharged from the site to the Kapuni Stream was 647 m³, though on one occasion over a three day period there was a combined discharge of 2,814 m³ to the Kapuni Stream. In total there was 41,665 m³ of stormwater discharged over 64 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, which is validated 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 2020-2021 showed a pH range

of 7.0-8.9 which complied with the consent condition. Zinc in the stormwater discharge was tested on two occasions by the Council in conjunction with the inter-laboratory comparisons (0.05 g/m^3 on 31/03/21 and $<0.02 \text{ g/m}^3$ on 27/05/21) and were well below the maximum limit.

The resource consent also has maximum limits on unionised (free) ammonia (0.025 g/m^3) and sodium (40 g/m^3) 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 0.0155 g/m^3 . The sodium concentration limit (40 g/m^3) was also complied with, the maximum recorded sodium concentration was 22.8 g/m^3 .

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 low so as not to be of concern.

Table 3 Results of compliance monitoring and inter-laboratory comparison between Council and the Company, 2020-2021

	Spray Irrigated Effluent IND002006								D-Min Waste and Stormwater IND002007				Kapuni u/s of AUP KPN000293				Kapuni d/s of AUP KPN000300			
	31 Mar 21				27 May 21				31 Mar 21		27 May 21		31 Mar 21		27 May 21		31 Mar 21		27 May 21	
	Grab		Composite		Grab		Composite		TRC	AUP	TRC	AUP	TRC	AUP	TRC	AUP	TRC	AUP	TRC	AUP
	TRC	AUP	TRC	AUP	TRC	AUP	TRC	AUP												
Temperature °C	24.1	-	-	-	22.3	-	-	-	19.8	-	11.0	-	13.9	14.0	7.3	7.3	14.2	14.3	7.7	7.5
Conductivity @ 25°C mS/m	171	-	151	-	190	-	164	-	21	21	166	169	5	15	11	10	5	5	14	14
pH	7.1	-	8.1	-	7.7	-	7.9	-	7.8	7.4	8.2	8.3	7.0	7.4	7.5	7.7	7.1	7.4	7.5	7.8
Suspended solids g/m ³	16	-	-	-	19	-	-	-	19	-	31	-	-	-	-	-	-	-	-	-
Turbidity NTU	-	-	-	-	-	-	-	-	21	-	24	-	-	-	-	-	-	-	-	-
Turbidity FNU	-	-	-	-	-	-	-	-	-	-	-	-	9.3	-	0.94	-	7.8	-	1.71	-
Ammonia (free) g/m ³ NH ₃	-	-	-	-	-	-	-	-	0.18	-	1.12	-	<0.001	0.001	<0.001	<0.001	0.001	0.002	<0.001	0.006
Ammonia (total) g/m ³ -N	-	5.88	6.9	8.14	-	14.5	9.9	10.40	7.3	7.4	33	32	0.035	0.18	0.015	<0.01	0.061	0.23	0.57	0.74
Nitrate g/m ³ -N	-	8.14	14.4	14.5	-	16.5	16.6	16.0	2.7	-	12.8	-	0.22	-	1.10	-	0.23	-	1.31	-
Nitrite g/m ³ -N	-	40.2	16.5	16.3	-	4.3	7.8	9.92	0.28	0.30	0.90	0.92	0.003	0.003	<0.002	<0.01	0.005	0.003	0.018	0.020
Total Nitrogen g/m ³	-	-	39	-	-	-	35	-	23	-	52	-	-	-	-	-	-	-	-	-
Urea g/m ³ -N	-	2.64	1.43	2.36	-	5.35	1.11	1.25	14	11.6	5.6	3.9	-	-	-	-	-	-	-	-
Potassium g/m ³	-	242	115	113	-	168	114	111	3	-	13	-	2	-	3	-	2	-	4	-
Sodium g/m ³	-	125	155	161	-	187	173	170	15	15	280	261	4	-	8	8	4	5	14	13
Calcium g/m ³	-	38	42	44	-	51	45	47	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium g/m ³	-	15.9	16.4	17.8	-	18.0	15.8	17.2	-	-	-	-	-	-	-	-	-	-	-	-
Chloride g/m ³	-	-	193	-	-	-	240	-	-	-	-	-	-	-	-	-	-	-	-	-
Phosphorus, (dissolved reactive) g/m ³	-	-	1.11	-	-	-	1.28	-	<0.004	-	0.090	-	0.017	-	0.014	-	0.015	-	0.013	-
Copper (acid soluble) g/m ³	0.029	-	-	-	0.027	-	-	-	<0.010	-	<0.010	-	-	-	-	-	-	-	-	-

	Spray Irrigated Effluent IND002006								D-Min Waste and Stormwater IND002007				Kapuni u/s of AUP KPN000293				Kapuni d/s of AUP KPN000300			
	31 Mar 21				27 May 21				31 Mar 21		27 May 21		31 Mar 21		27 May 21		31 Mar 21		27 May 21	
	Grab		Composite		Grab		Composite		TRC	AUP	TRC	AUP	TRC	AUP	TRC	AUP	TRC	AUP	TRC	AUP
	TRC	AUP	TRC	AUP	TRC	AUP	TRC	AUP												
Chromium (acid soluble) g/m ³	<0.010	-	-	-	<0.010	-	-	-	<0.010	-	<0.010	-	-	-	-	-	-	-	-	-
Mercury (total) mg/m ³	<0.001	-	-	-	0.001	-	-	-	<0.080	-	<0.080	-	-	-	-	-	-	-	-	-
Nickel (acid soluble) g/m ³	<0.010	-	-	-	<0.010	-	-	-	<0.010	-	<0.010	-	-	-	-	-	-	-	-	-
Zinc (acid soluble) g/m ³	0.59	-	-	-	0.69	-	-	-	0.05	0.03	<0.02	0.04	-	-	-	-	-	-	-	-
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. All six biological surveys were undertaken by the Council, with Stark Environmental Ltd. carrying out the data interpretation and reporting on behalf of the Company.

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 28 July 2020, 6-7 October 2020, 27 January 2021 and 28 April 2021. Electric fishing surveys were conducted on 6-7 October 2020 and 28 April 2021.

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 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 to the Kapuni Stream under consent 1766-3, provided there is sufficient flow in the stream, to avoid irrigation under saturated conditions.

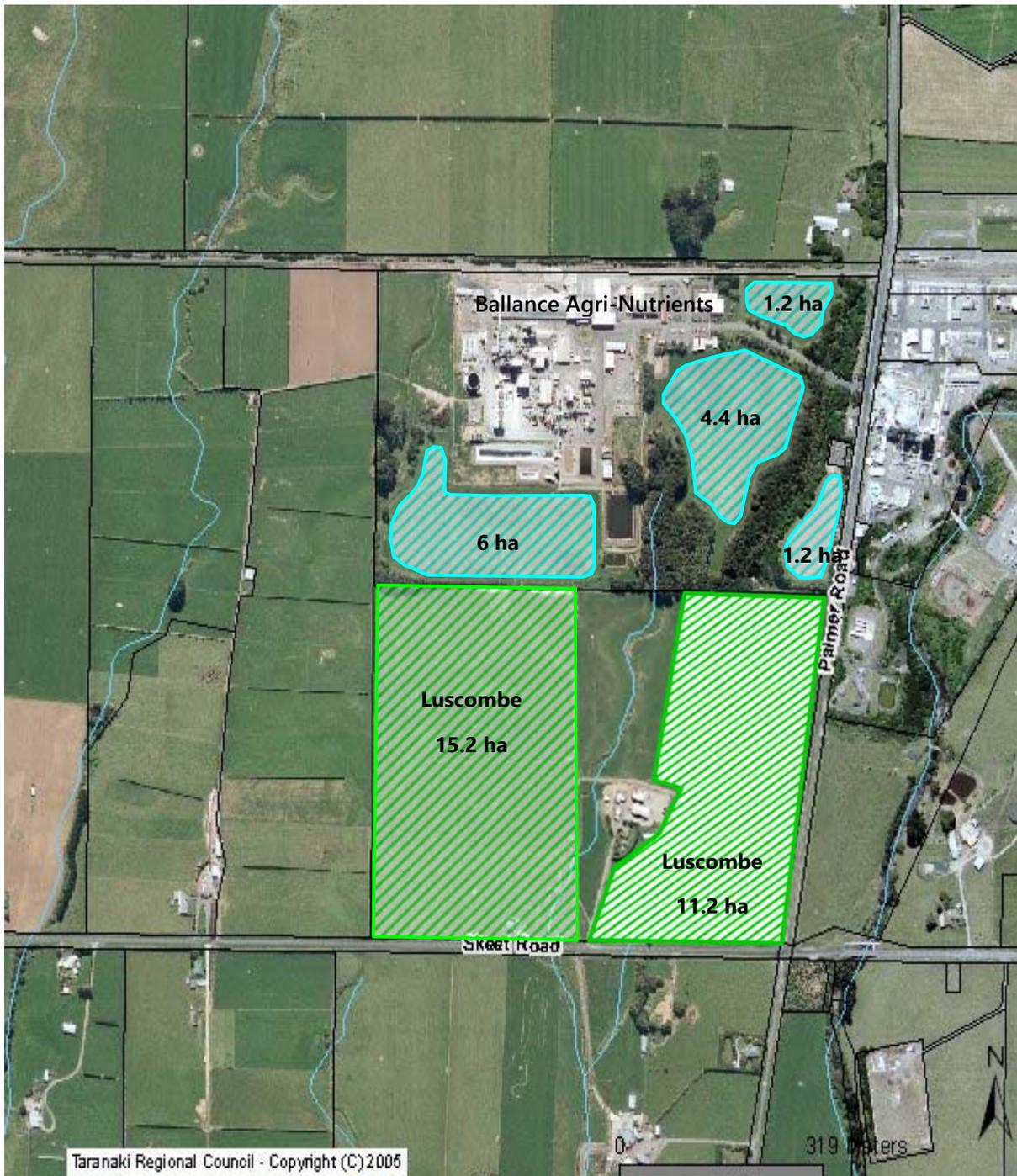


Figure 4 Irrigation areas for the 2020-2021 year

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 and irrigation areas were 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 2020-2021 review period with a peak daily volume of 1,313 m³ recorded on the 4 March 2021.

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 total nitrogen loadings for cut and carry and grazed pastures for each operational area are provided in Table 4. This shows compliance with the consent condition of 1,000 kgN/ha/y for cut and carry areas and 300 kgN/ha/y for grazed areas during the 2020-2021 monitoring period.

Area	Cut and Carry kgN/ha/y						Grazed kgN/ha/y	
	1	2	3	4	5	6	11	12
Total	464	471	439	480	487	503	183	161

Table 4 Nitrogen application rates (kg/ha/y) for cut-and-carry areas and grazed areas for 2020-2021

The Company also has an internal target for cut and carry areas of 600 kgN/ha to promote good pasture health which was also achieved. Long term compliance with the nitrogen loadings have always been observed though there have been periods where the internal goal has not been achieved Figure 5.

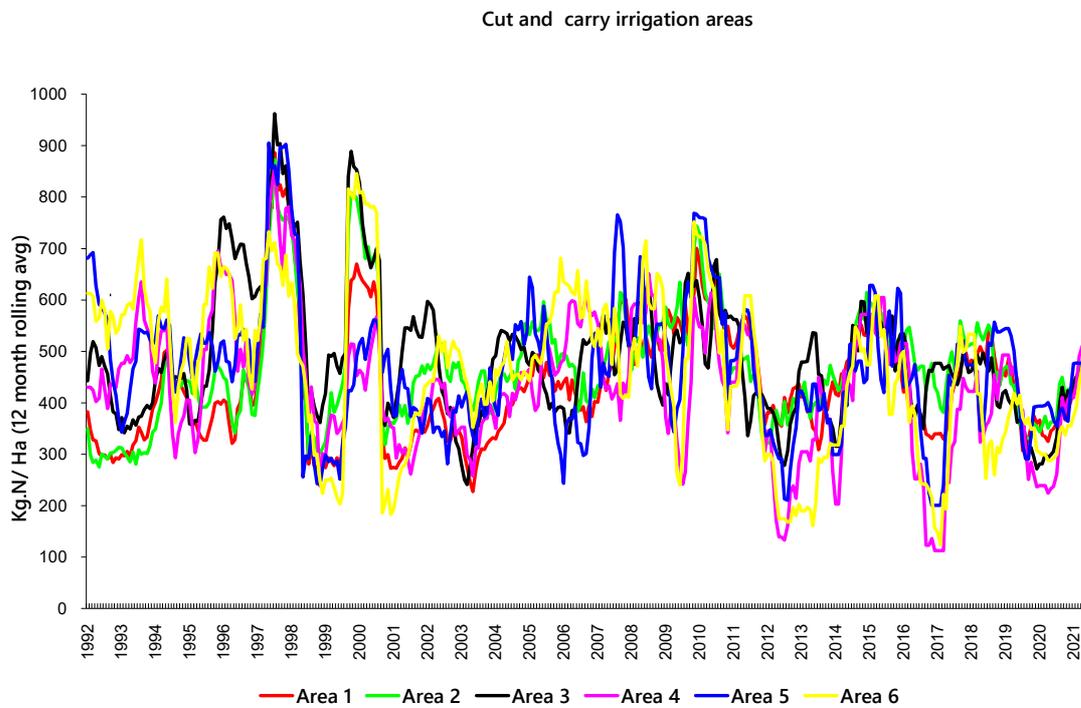


Figure 5 Nitrogen applications rates on cut and carry spray irrigation areas

Long term compliance with the nitrogen loadings have always been observed for grazed areas (Figure 6). It should be noted that the areas referred to as Area 7 and Area 8 have not been used since the 2010-2011 monitoring year, Area 9 since 2001-2002 monitoring year and Area 10 since the 2007-2008 monitoring year.

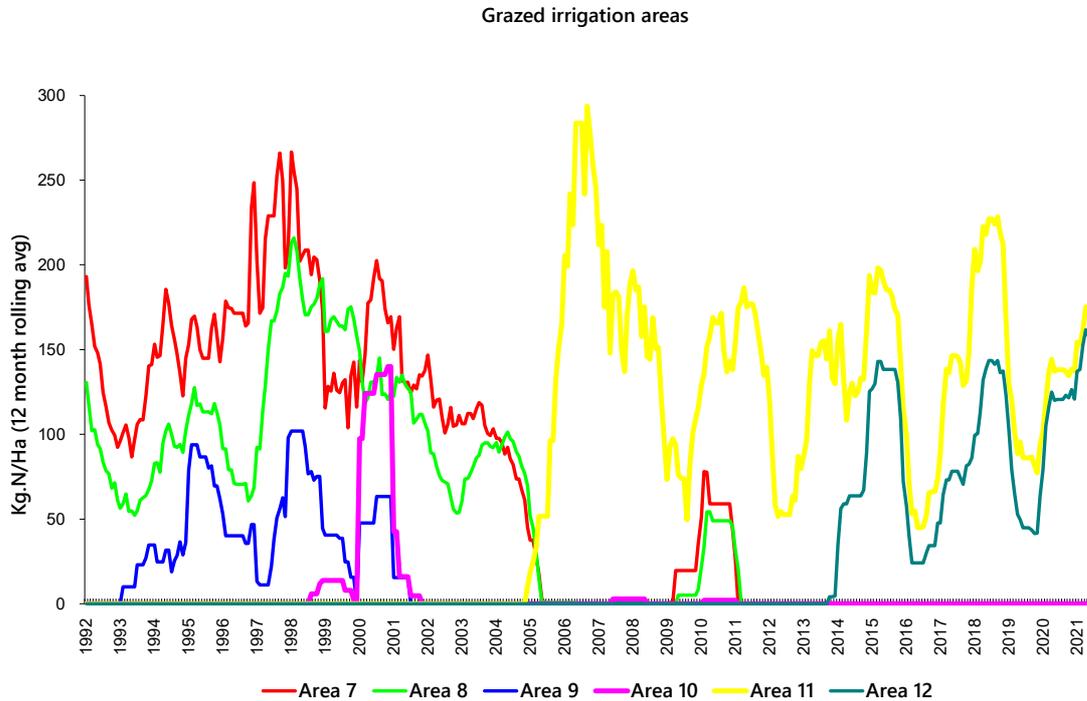


Figure 6 Nitrogen applications rates on grazed spray irrigation areas

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 with the results summarised below.

2.2.3.1 Spring 2020 soil and herbage survey

Surface soil and plant samples were taken in 28 October 2020 from the cut and carry area and grazed areas from Luscombes farm. There was evidence that the grass sward was allowed to grow longer than was desirable and effort needs to be made to cut the sward before it grows longer than 300 mm. With the exception of potassium (which increased significantly) in the cut areas, all surface (0-75mm) cations in both the cut and carry and grazed areas have decreased compared to last year. The maximum sodium absorption ratio's (SAR) ratios decreased from last year (maximum 5.15) with a maximum ratio of 3.68 in the surface layer. The sum of the SAR and potassium absorption ration (KAR) still significantly exceeded the upper safe threshold of 3 in the cut and carry areas (average above 5), increasing the risk of soil deflocculation. In the grazed areas, SAR's were generally below 2.0 and the combined SAR and KAR values were below 3.0. The application of Epsom salts is ongoing to improve the soil condition and prevent deflocculation.

2.2.3.2 Autumn 2020 deep soil leaching profiles

The 24 March 2021 deep soil sampling survey report found that annual nitrogen application to the sampled cut areas had increased by 40% (for the March to February year), and winter application had substantially increased by 59% over values recorded last year. The profile nitrogen mass to 3 m depth of the cut areas was 11% higher than last year. The higher nitrate mass in the 3 m profile will have resulted in more potential nitrate leaching. It should be noted that last year's sampling was in mid-June and lower soil temperatures would likely have affected soil N mineralisation and nitrification rates. The lower irrigation rate (5% less) and rainfall (5% less) from the previous year will also have positively influenced solute movement within the soil profile.

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 7.

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 (EM31) 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 EM31 is a near-surface electromagnetic survey system with a peak response in the 1 to 1.5 m depth range and a maximum depth range of 5 to 6 m in the vertical dipole mode. It is a high sensitivity system, capable of measuring and

recording very small changes, milli-siemens per metre (mS/m); in soil electrical conductivity (i.e. inverse of resistivity). It is often used to detect and delineate subtle changes in the subsurface conditions caused by contamination, underground waterways, fault lines, change in soil type, subsidence, etc.

An EM31 survey was undertaken on 20 April 2021. The EM31 surveys cover the large paddocks on the south (Site A) and west side (Site B) of the main production plant as well as the adjoining paddock on the neighbouring farm.

The conductivity at the northern edge of Site A (nearest the facility) showed a similar result to the 2020 survey and is no longer increasing. The southern edge of Site A, in the southern paddocks also had a similar conductivity to the previous 2020 survey. The conductivity across Site B was also very similar to the 2020 survey, though there was a small, general decrease in conductivity at the northern end of the survey area. This continues the trend found in the 2020 survey.

Conductivity within areas was variable and appears to shift annually. The conductivity changes appear to be within the normal variability of the site, with factors such as groundwater conditions, grass growth, wastewater application all affecting conductivity.

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

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.



Figure 7 Locations of groundwater monitoring bores

2.2.4.3 Groundwater monitoring in relation to the FECB ammonia plume

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. Three of the down gradient monitoring bores (West Bore, East Bore and Bore 30) have had abstraction and treatment of groundwater under consent 4719-2.

Monitoring of the down gradient bores shows the plume has migrated. At West Bore (WFECB), which is located immediately downslope of the FECB, nitrogen levels have been relatively stable after the last liner was installed. Nitrogen levels have fluctuated between 44 and 198 g/m³ since 1999, with a spike in 2013, when a value of 444 g/m³ was measured. However, for the current monitoring year it recorded its second highest result ever of 8,075 g/m³ on August 2020 (Figure 8). This suggests either another leak or inadequate abstraction of the groundwater at the bore. This issue was identified in the previous monitoring year when 2,038 g/m³ was detected on May 2020. The Company has increased sampling of the bore and the latest result recorded a decline to 3,493 g/m³. Further monitoring will assess whether the decline continues to previous levels.

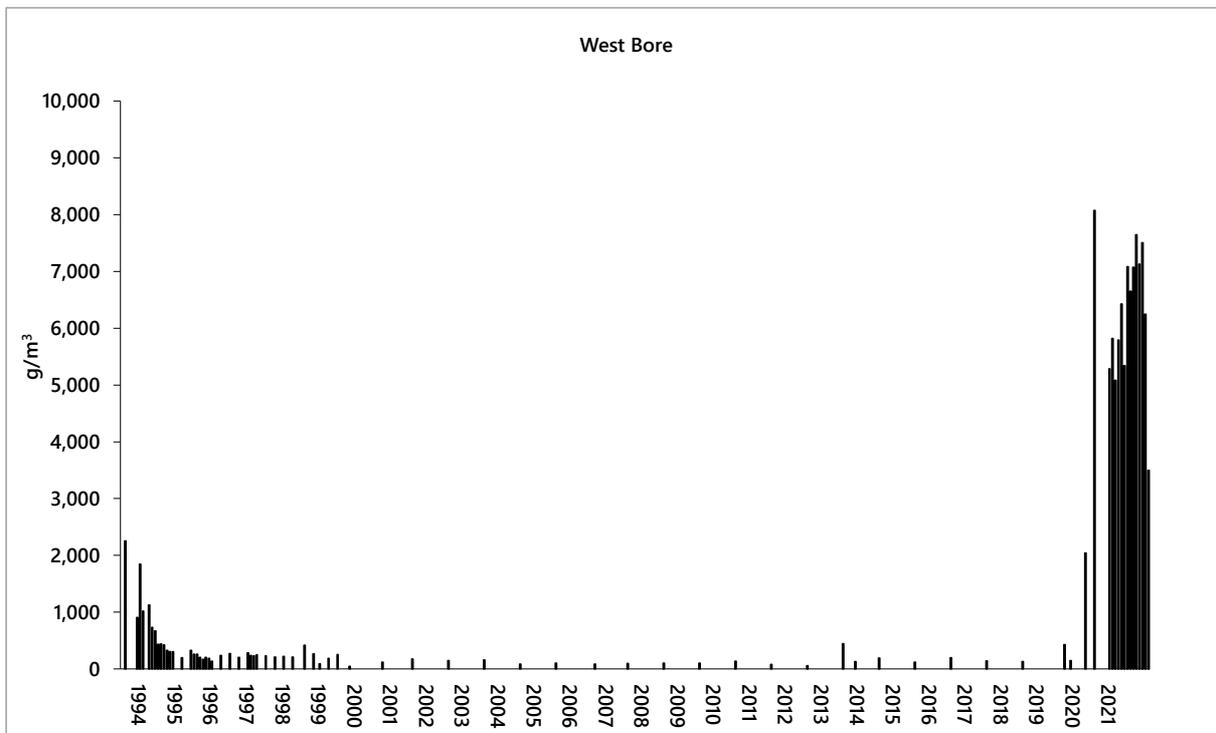


Figure 8 Total nitrogen concentration in groundwater associated with the FECB plume from West Bore

At East Bore (EFECB), which is located immediately downslope of the FECB and slightly to the east of West Bore, nitrogen levels have been relatively stable after the last liner was installed (Figure 9). For the current monitoring year it recorded its highest result since 1999 of 183 g/m³. However, this increase was relatively minor compared with that at West Bore. This indicates that the plume migration was largely localised but there was some suggestion that the East Bore was becoming affected as well.

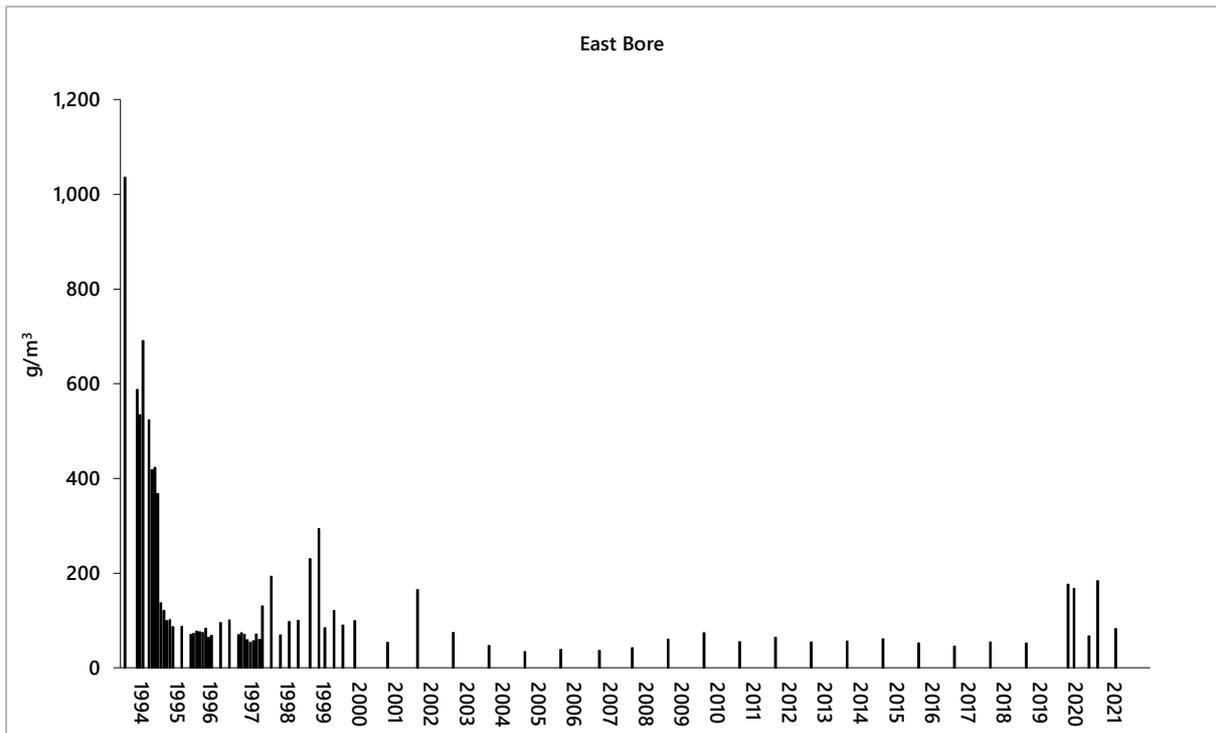


Figure 9 Total nitrogen concentration in groundwater associated with the FECB plume from East Bore

Bore 30 is the other down gradient pumping bore. Nitrogen levels at this bore are potentially affected by both the ammonia plume and by irrigation of wastewater. Overall, total nitrogen concentrations have remained stable since 1999 when the last FECB leak occurred.

The total nitrogen concentrations in other bores located down gradient of the FECB (Bores 13, 14 and 15) were slightly elevated compared with results recorded over the last ten years, similar to that shown in East Bore, though it's unclear whether this was due to plume movement or just effluent irrigation.

Pumping from East Bore, West Bore and Bore 30 should continue along with monitoring of the other bores. If further plume movement is observed further action may need to be taken to contain the plume onsite such as increased pumping of groundwater.

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 and Bore 32 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 over 15,000 g/m³, mainly in the form of ammonia. During the period under review nitrogen levels were similar to previous years, though a slightly elevated level of 6,706 g/m³ was recorded on February 2021.

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. Nitrogen levels have fluctuated between approximately 87-401 g/m³, with occasional spikes of up to 678 g/m³. Recent results were between consistent with previous years (162 and 431 g/m³).

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. No odours were detected off-site during inspections.

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 and particulate deposition. 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 2020-2021 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.

Routine sampling of the dust scrubber was undertaken on 28 July 2020 and 21 January 2021. The results of the stack emission assessment 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 for the monitoring period 2020-2021

Date	28 July 2020	21 January 2021	Consent limit
Ammonia (kg/hr)	100	260	295
Urea (kg/hr)	3.9	1.3	12
Urea (mg/m ³)	1.1	4.8	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 12 January and 2 February 2021, at five locations around the Company's site as shown in Figure 10.

There was stable wind (at Hawera AWS) from the west to the north-west for the entire 21 day deployment. The wind rose for the monitoring period is presented Figure 11. The results of the deposition gauges survey 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 30 mg/m²/d. These results are well below 130 mg/m²/d or 0.13 g/m²/day guideline set by the Council.

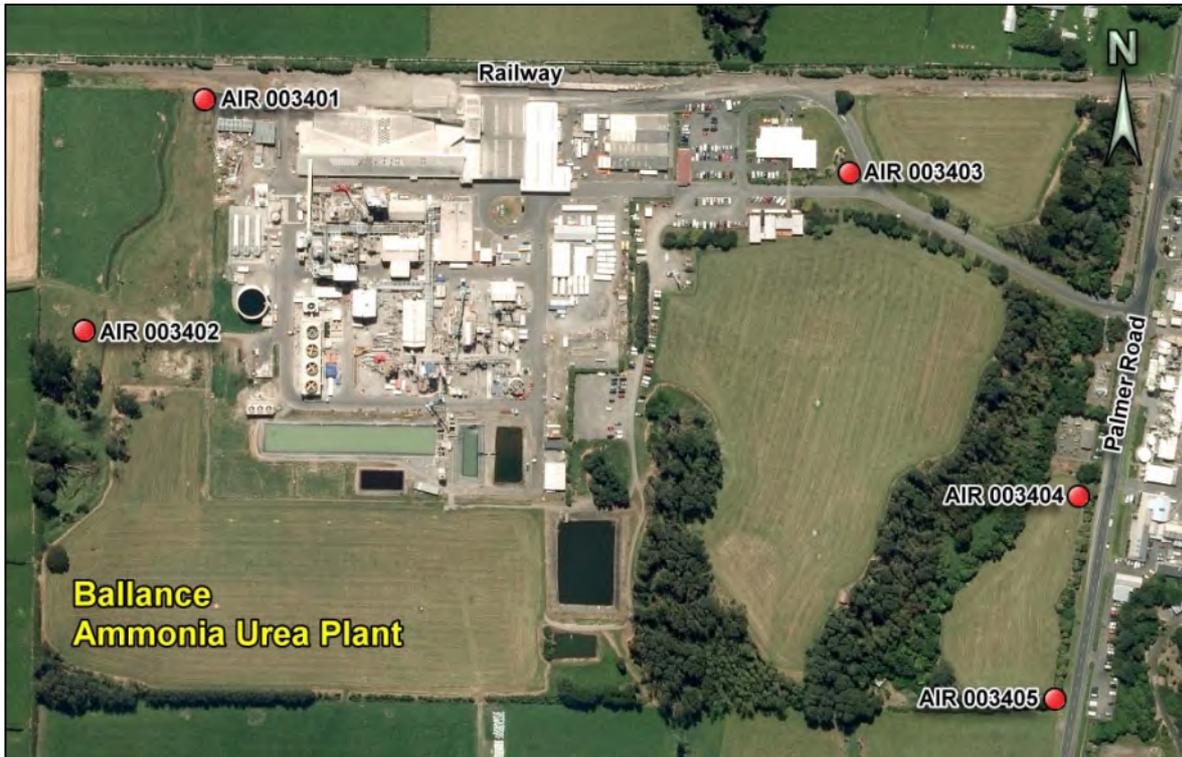


Figure 10 Location of deposition gauge sites

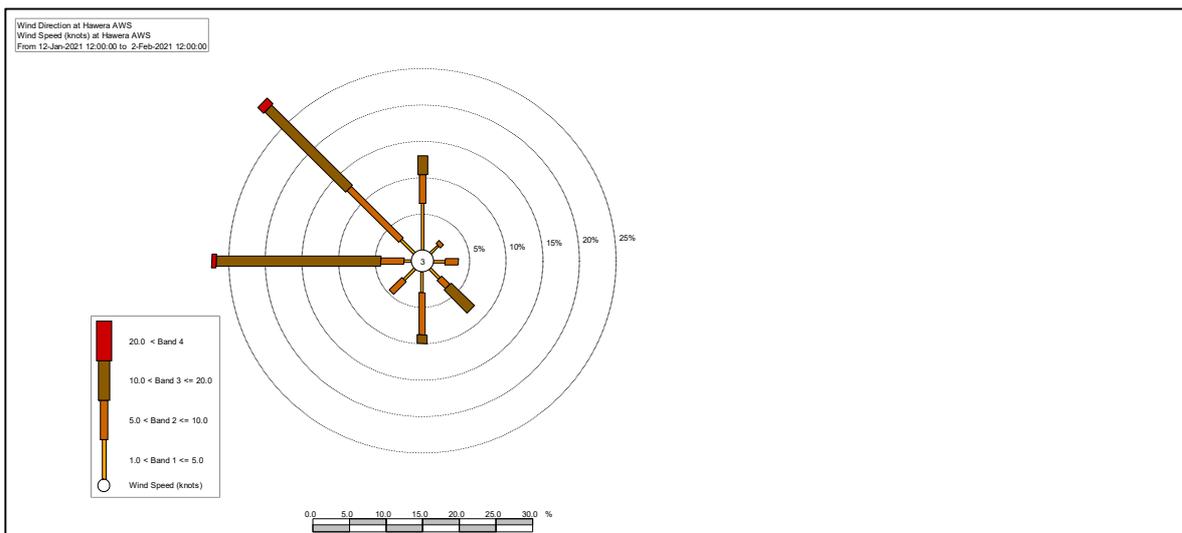


Figure 11 Wind-rose for Hawera weather station during deployment of deposition gauges, 12 January to 2 February 2021

Table 7 Results of particulate deposition monitoring for 12 January to 2 February 2021

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	7.2	6.9	7.3	7.4	7.2
Conductivity mS/m/d	0.39	0.26	0.31	0.38	0.37
Ammonia mgN/m ² /d	5.51	2.18	4.85	7.76	5.46
Urea mgN/m ² /d	8.01	0.52	1.03	0.32	0.61
Particulate mg/m ² /d	30	10	30	30	10

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 2020-2021 monitoring period, the measured rates at the five sites ranged from 2.18 to 7.76 mgN/m²/d, with none exceeding the recommended maximum value (55 mgN/m²/d).

The 2020-2021 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 the Council

During the monitoring period, a multi-gas detector was deployed on one occasion in the vicinity of the plant. This survey lasted approximately 48 hours, with the instrument placed in a down-wind position at the start of 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 the sampling run is shown in Figure 12.

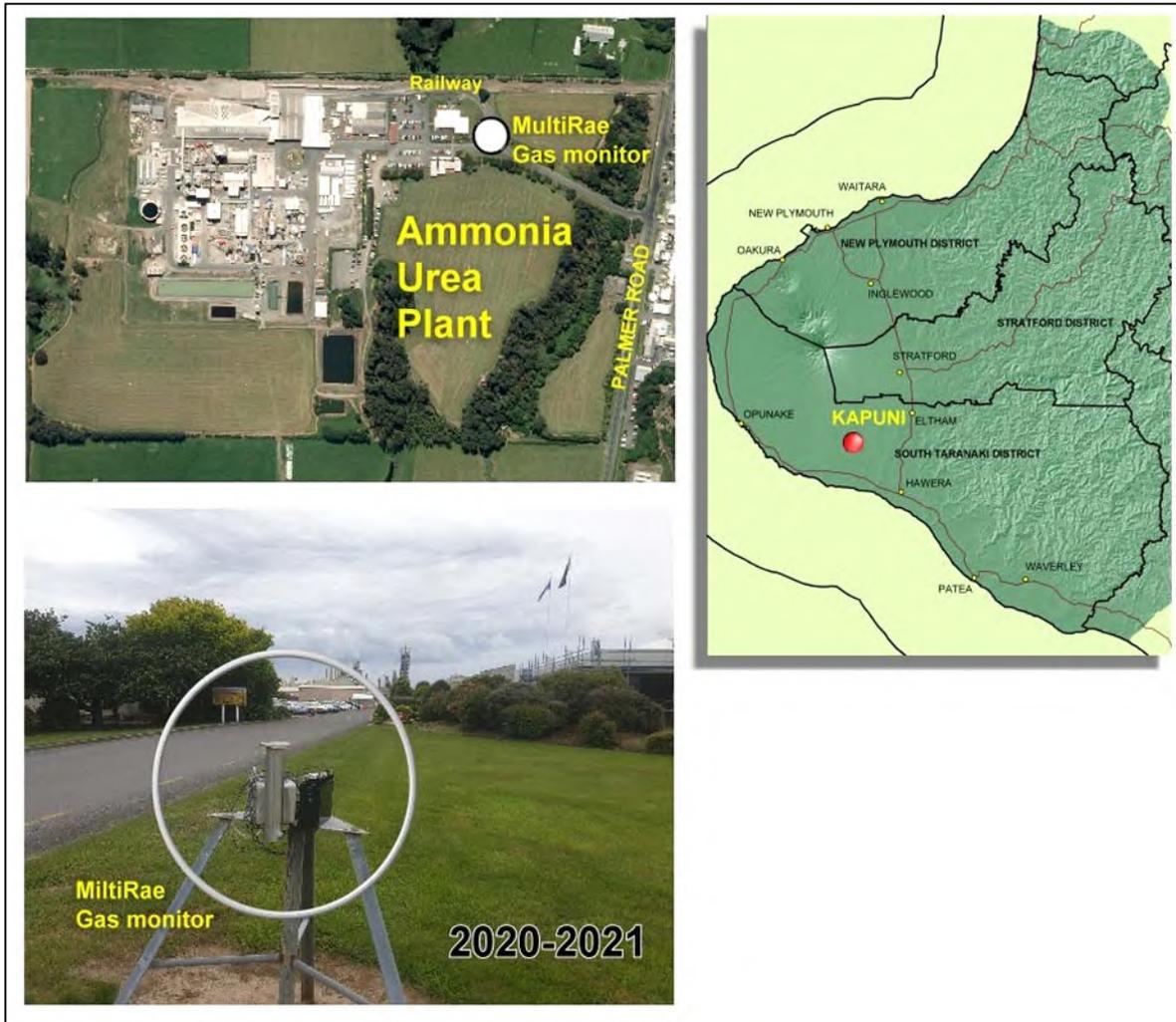


Figure 12 Sampling site for ambient gas monitoring at ammonia urea plant (2020-2021)

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 capture a database on 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 (2020-2021)

Period (from/to)		24/11/2020 14:00 26/11/2020 14:43
Max	NH ₃ (ppm)	0.30
	CO (ppm)	2.00
	LEL (%)	0.00
Mean	NH ₃	0.04
	CO (ppm)	0.02
	LEL (%)	0.00
Min	NH ₃	0.00
	CO (ppm)	0.00
	LEL (%)	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 for the monitoring run are presented graphically in Figure 13 and Figure 14 (no combustible gas was detected).

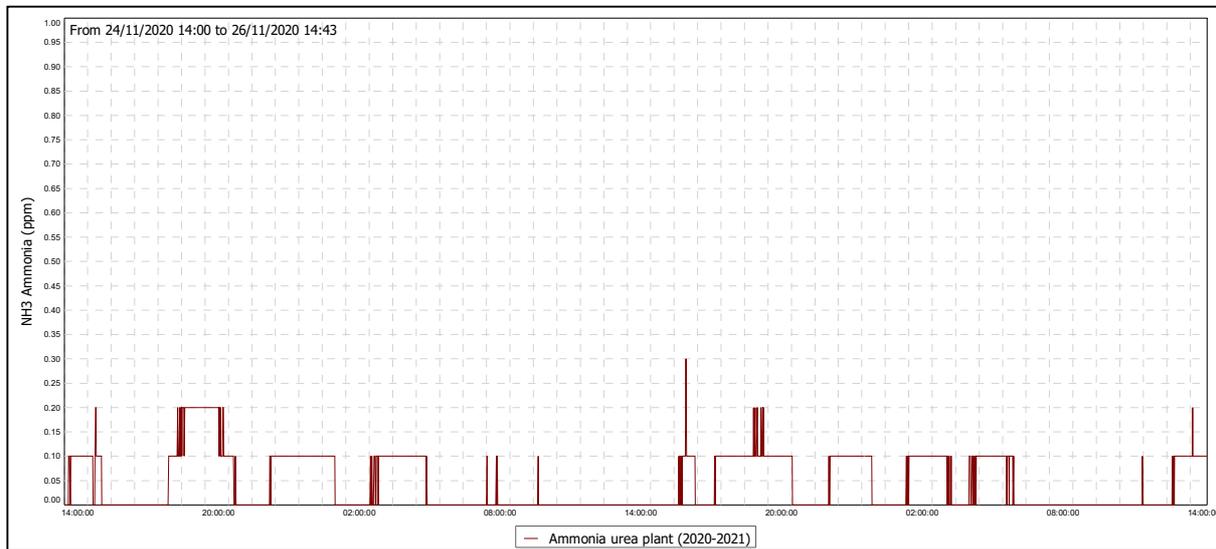


Figure 13 Graph of ambient ammonia gas levels in the vicinity of ammonia urea plant (2020-2021)

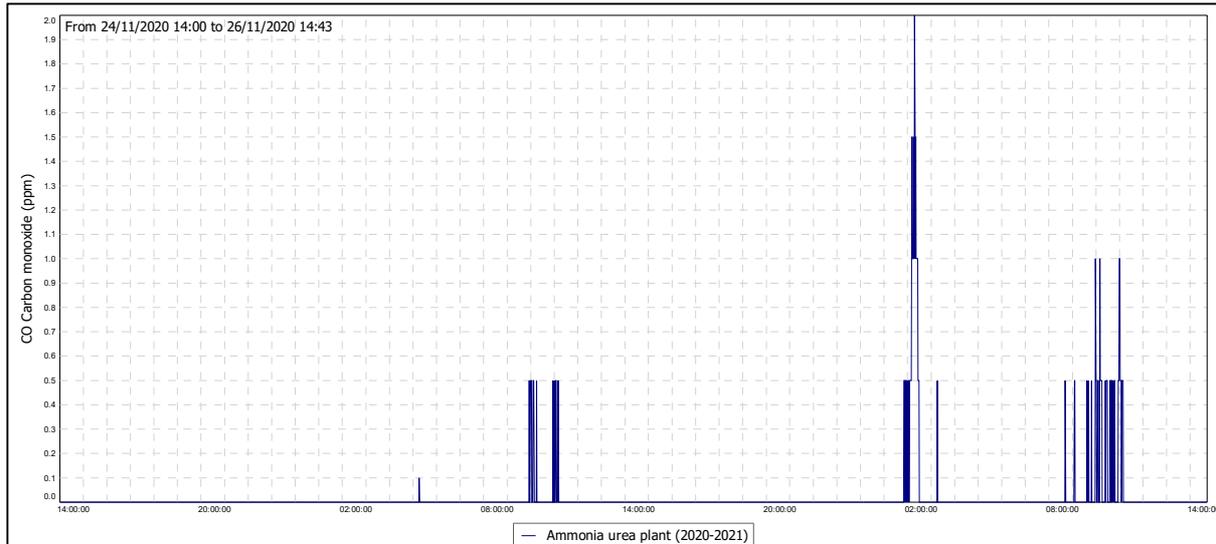


Figure 14 Graph of ambient carbon monoxide levels in the vicinity of the ammonia urea plant (2020-2021)

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 concentration had a mean result for the run of 0.04 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 concentration had a mean result for the run of 0.023 mg/m³ (the instrument records in units of ppm at 25°C, 1 atm. 1ppm CO = 1.145 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 the run.

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 (Buckthoughts) and southern (Luscombes) boundaries of the cut-and-carry irrigation area. This was done 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, but when results above the detection limit of 0.20 ppm are recorded multiple measurements may be taken to ensure compliance with the consent limit (one hour average). The results of ambient ammonia monitoring for the period under review are presented in Figure 15 and Figure 16.

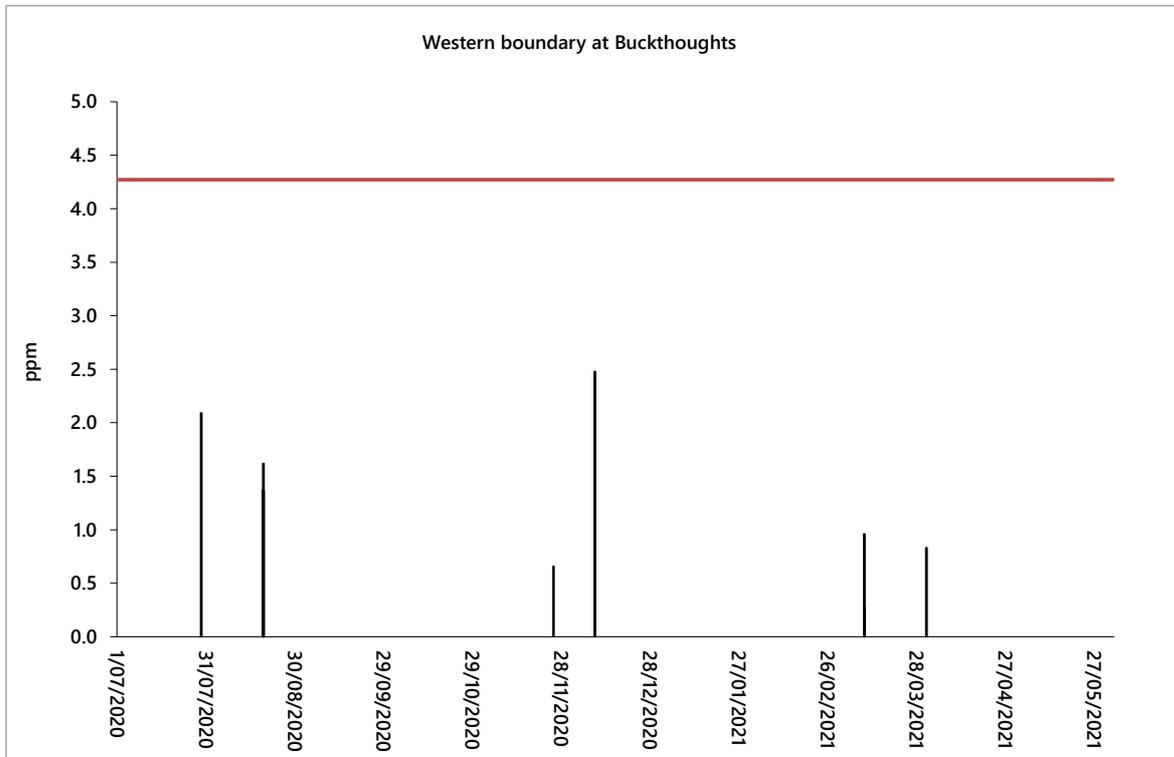


Figure 15 Atmospheric ammonia concentration at ground level on the site boundary (consent limit 4.27 ppm one hour average)

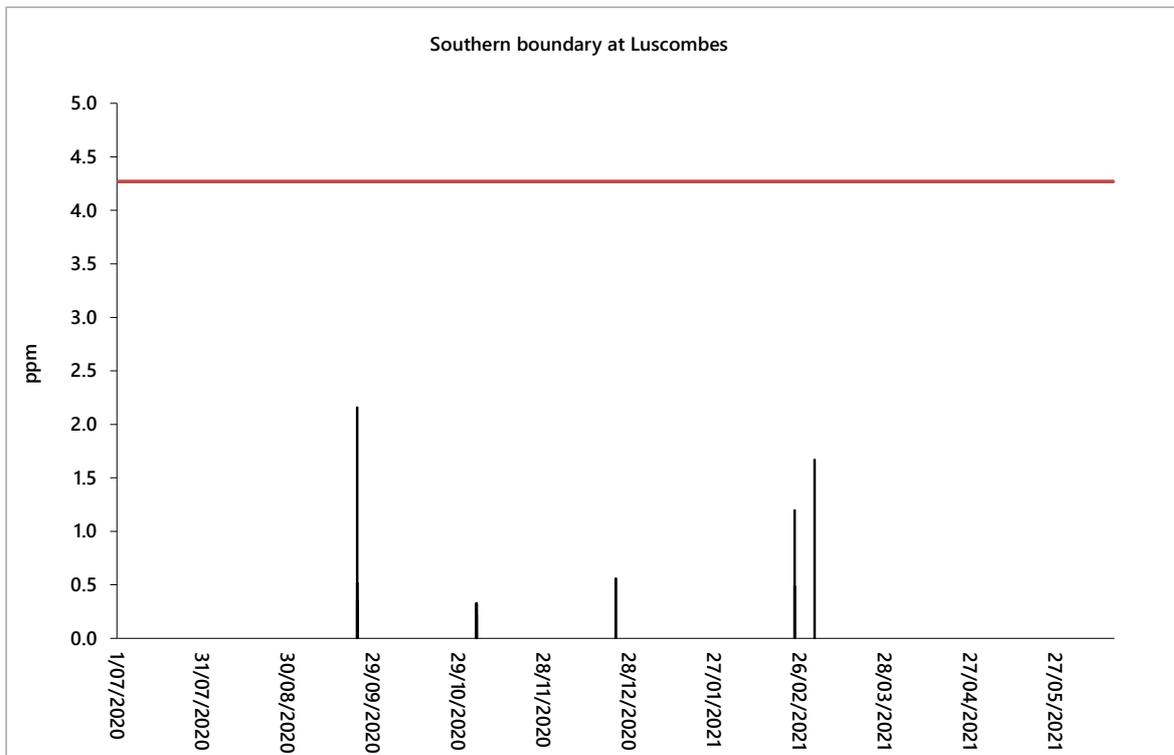


Figure 16 Atmospheric ammonia concentration at ground level on the site boundary (consent limit 4.27 ppm one hour average)

The ammonia concentration based on a one hour average was below the consent limit of 4.27 ppm for both site boundaries.

2.3.3.4 Other ambient monitoring

Nitrogen Oxide Emissions

Nitrogen oxide (NO_x) are any mixture of nitrous oxide (N₂O), nitric oxide (NO) and nitrogen dioxide (NO₂) gases, and are produced from soil, motor vehicles and industrial fuel combustion processes. From 2014 onwards, the Council has implemented a coordinated region-wide compliance monitoring programme to measure NO_x (TRC, 2020). The programme involves deploying all measuring devices at 24 NO_x monitoring sites (including two sites in the vicinity of the AUP, AIR003401 and AIR003404) 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 are shown in Table 9. The results show that the ambient ground level concentration of NO_x is well below the limit set out by consent 4046-3.

Table 9 Actual (laboratory) and recalculated ambient gas monitoring (NO_x results) for 2020-2021

Site	NO _x (µg/m ³)	NO _x 1/hr (µg/m ³) Theoretical max.	NO _x 24/hr (µg/ m ³) Theoretical max.
AIR003401	25.7	89.2	47.2
AIR003404	10.0	34.7	18.4
Consent Limit		200	

2.3.4 Technical review reports

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

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

(Special condition 5 on consent 4046-3 requires the Company to establish two stations for monitoring ground level concentration of ammonia beyond the boundary of the site within 12 months of the issue of

this consent. Two stations were established in September 2012, one to the west on the boundary with Buckthoughts, and one to the south on the boundary with Luscombes.

The third report required under consent 4046-3, which covers the period June 2018 to May 2021 is attached as Appendix III.

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 2020-2021, a total of 11 landowners received funding from the Company for the amount \$23,378.77. Landowners were rebated 50% of the cost of the plants. A total of 12,280 plants were planted. Costs were divided between \$20,763.77 the cost of plants (\$20,763.77) and planting costs (\$6,615.00) at \$0.50 a plant. The remaining balance will be used in the 2021-2022 monitoring year. The locations of the properties which have received funding from the Company are given in Figure 17. The proportion of recommended planting that has been implemented is indicated for each property.

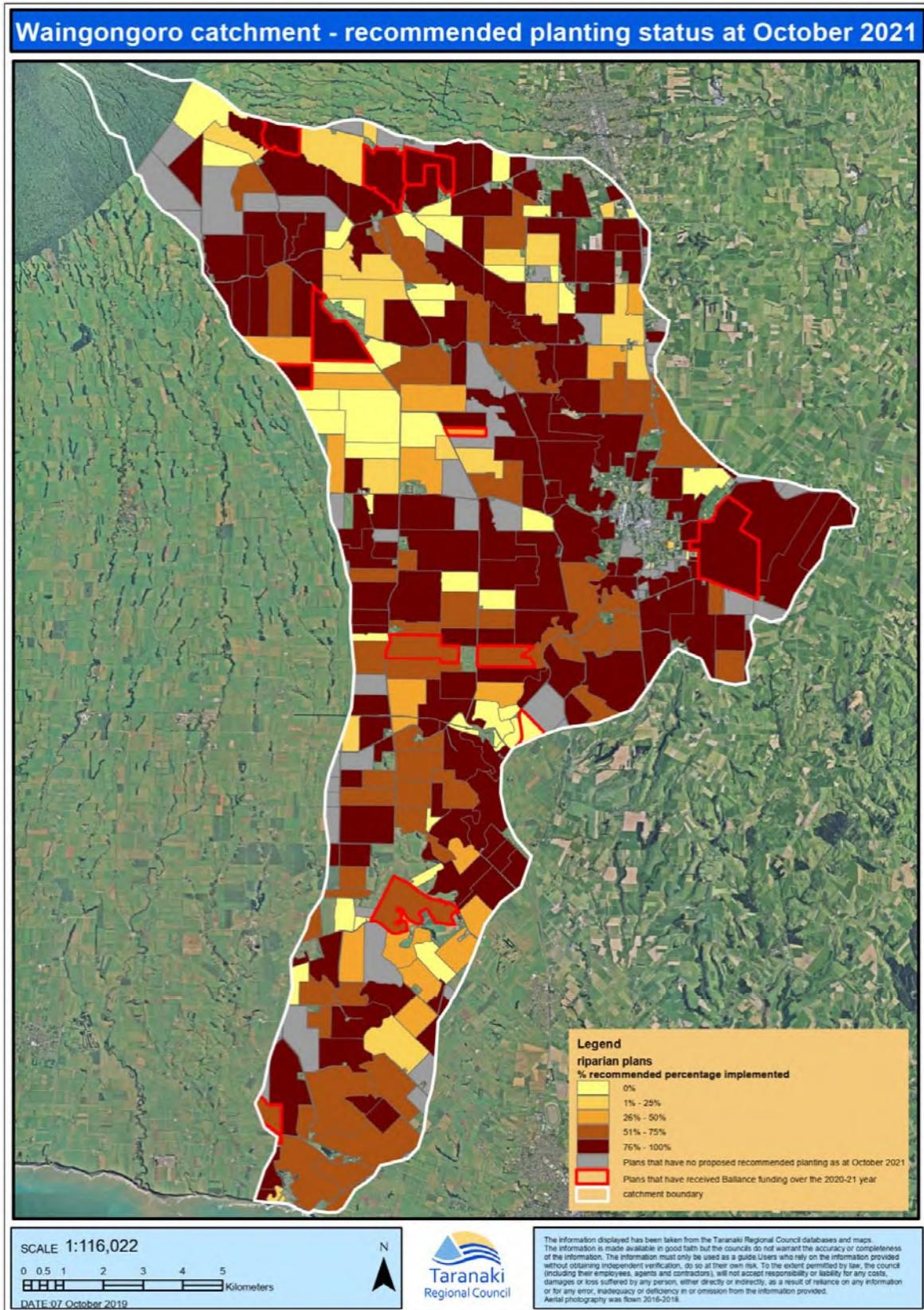


Figure 17 Riparian management plans in Waingongoro catchment with Company funding

2.5 Incidents, investigations, and interventions

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

For all significant compliance issues, as well as complaints from the public, the Council maintains a database record. The record includes events where the individual/organisation concerned has itself notified the Council. Details of any investigation and corrective action taken are recorded for non-compliant events.

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 individual/organisation is indeed the source of the incident (or that the allegation cannot be proven).

In the 2020-2021 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 water from the Kapuni Stream was not exercised during the current monitoring year.

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.

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. One groundwater bore (West Bore) that was situated close to the FECB plume showed a large increase in total nitrogen potentially indicating plume movement. The Company has increased monitoring at the bore as a result of the increased nitrogen levels. This may have been due to a lack of active pumping.

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 remained low.

The results from the deposition 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 September 2019	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

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?
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	Liaison with consent holder	Yes
3. Keep and provide record of take	Inspection and receipt of record	Yes
4. Best practicable option	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 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 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	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
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

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?
3. Best practicable option	Inspection and liaison with Company	N/A
4. Discharge concentration limits	Inspection and chemical sampling	N/A
5. Receiving water concentration limits	Inspection and chemical sampling	N/A
6. Control on effect of discharge in receiving water	Inspection and bio-monitoring results	N/A
7. Discharge to be in accordance with an Effluent Disposal Management Plan	Inspections and liaison with consent holder	N/A
8. Provision of Management Plan for certification	Receipt of Management Plan. Plan received 18 Dec 2012. Updated Plan received 4 May 2015	Yes
9. Review of Management Plan by DOC and Fish & Game NZ	Plan forwarded 21 May 2013	N/A
10. Optional review provision	Next optional review June 2023	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent		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

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?
7. Review of Management Plan by DOC and Fish & Game NZ	Plan forwarded 21 May 2013	N/A
8. No odour beyond boundary of the site	Site inspections and complaints register	Yes
9. No spray drift beyond boundary of the site	Site inspections and complaints register	Yes
10. Defines the edge of the spray zone	Site inspections	Yes
11. Limit on the application of total nitrogen	Site inspections and liaison with consent holder, sampling results	Yes
12. Consent holder shall provide details of water treatment programme and any proposed changes to the Council for review	Liaison with the consent holder, and information supplied to the Council by the Company	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 the Company	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 the Company	Yes
4. Limits the concentration of ammonia beyond the site boundary	Liaison with consent holder and monitoring at boundary by the Company and Council	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?
5. Consent holder to establish monitoring sites for ammonia	Due by 12 February 2013. Sites established in September 2012	Yes
6. Limits the concentration and mass of urea emissions	Liaison with consent holder and monitoring of discharges by K2 Environmental for the Company	Yes
7. Limits the concentration of carbon monoxide and nitrogen dioxide beyond the plant boundary	Liaison with consent holder. Monitoring by Council.	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	-	-
	0596-2	1	-	-	-	-

Year	Consent no	High	Good	Improvement required	Poor	Not exercised
2011-2012	1213-2	1	-	-	-	-
	4719-1	1	-	-	-	-
	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	-	-
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	-	-	-	-

Year	Consent no	High	Good	Improvement required	Poor	Not exercised
	4719-2	1	-	-	-	-
	0598-3	1	-	-	-	-
	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	-	-	-	-
2019	0596-3	1	-	-	-	-
	1213-3	1	-	-	-	-
	4719-2	1	-	-	-	-
	0598-3	1	-	-	-	-
	1766-3	-	-	-	-	1
	0597-3	1	-	-	-	-
	4046-3	1	-	-	-	-
2020	0596-3	1	-	-	-	-
	1213-3	-	-	-	-	1
	4719-2	1	-	-	-	-
	0598-3	1	-	-	-	-
	1766-3	-	-	-	-	1
	0597-3	1	-	-	-	-
	4046-3	1	-	-	-	-
2021	0596-3	1	-	-	-	-
	1213-3	1	-	-	-	-
	4719-2	1	-	-	-	-
	0598-3	1	-	-	-	-
	1766-3	-	-	-	-	1
	0597-3	1	-	-	-	-
	4046-3	1	-	-	-	-
Totals		62	2	3	-	11

During the 2020-2021 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 2019-2020 Annual Report

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

1. THAT in the first instance, monitoring of consented activities at the Company's AUP in the 2020-2021 year continue at the same level as in 2019-2020.
2. THAT should there be issues with environmental or administrative performance in 2020-2021, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.
3. 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 2019-2020 monitoring year and a high level of compliance was achieved.

3.5 Alterations to monitoring programmes for 2021-2022

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 2021-2022, the monitoring remain the same as for 2020-2021 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 2021-2022.

3.6 Exercise of optional review of consent

None of the seven consents held by the Company provided for an optional review in June 2021.

4 Recommendations

1. THAT in the first instance, monitoring of consented activities at the Company's AUP in the 2021-2022 year continue at the same level as in 2020-2021.
2. THAT should there be issues with environmental or administrative performance in 2021-2022, monitoring may be adjusted to reflect any additional investigation or intervention as found necessary.
3. 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).

NO _x	Any mixture of nitrous oxide (N ₂ O), nitric oxide (NO) and nitrogen dioxide (NO ₂) gases
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)

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 PO Box 439 Hawera 4640	
Decision Date (Change):	15 January 2021	
Commencement Date (Change):	15 January 2021	(Granted Date: 31 August 2012)

Conditions of Consent

Consent Granted:	To take water from the Waingongoro River for operation of an ammonia/urea plant, and a hydrogen plant	
Expiry Date:	1 June 2035	
Review Date(s):	June 2023, June 2029	
Site Location:	309 Palmer Road, Hawera	
Grid Reference (NZTM)	1707780E-5628870N	
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 0596-3.1

7. At all times the consent holder shall adopt the best practicable option to prevent or minimise any actual or likely adverse effect on the environment associated with the 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 0596-3.1

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 15 January 2021

For and on behalf of
Taranaki Regional Council



A D McLay

Director - Resource Management

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

Name of
Consent Holder: 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

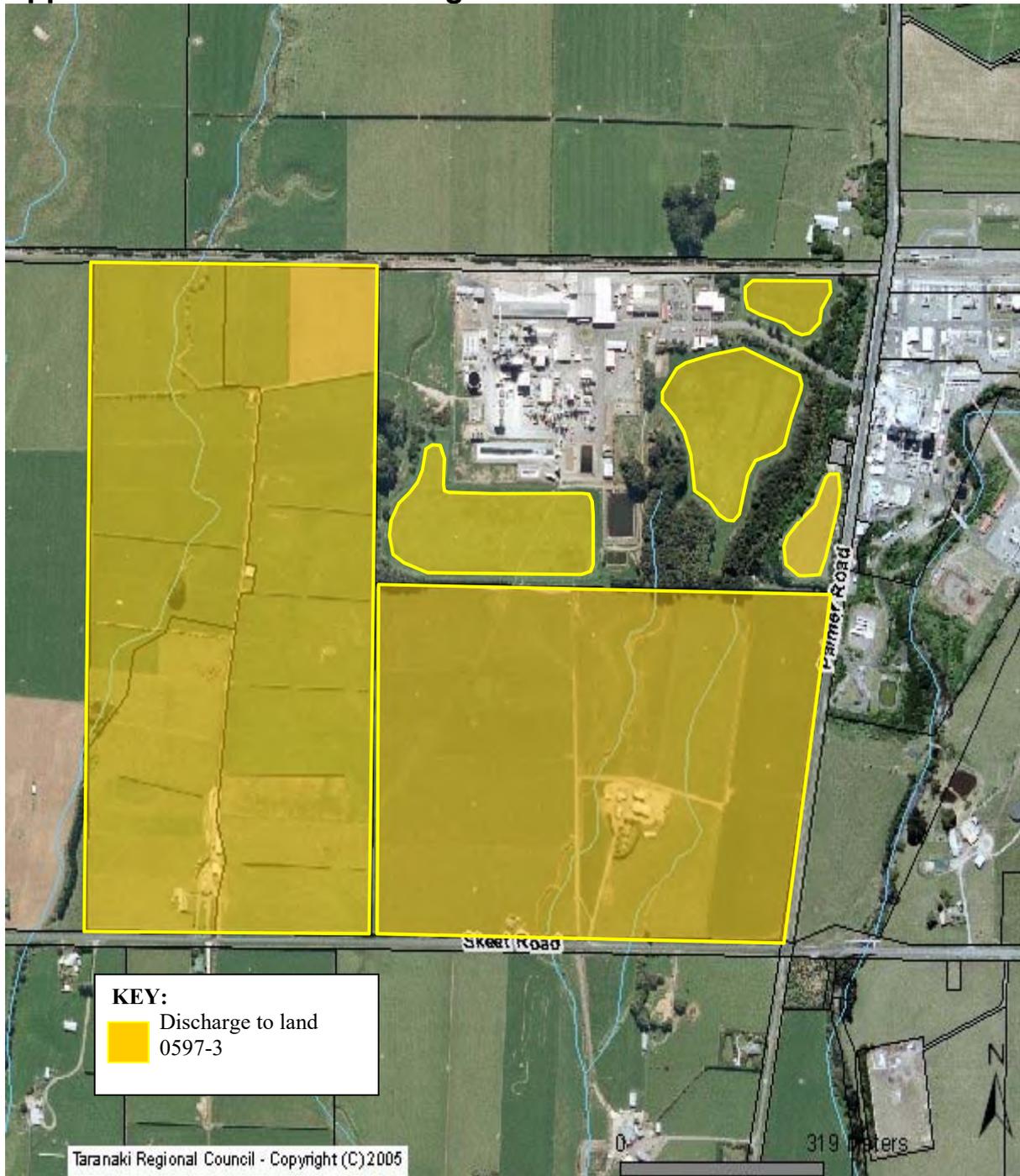
14. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2017 and/or June 2023 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 PO Box 439 Hawera 4640	
Decision Date (Change):	15 January 2021	
Commencement Date (Change):	15 January 2021	(Granted 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 the operation of an ammonia/ urea plant, and a hydrogen plant	
Expiry Date:	1 June 2035	
Review Date(s):	June 2023, June 2029	
Site Location:	309 Palmer Road, Hawera	
Grid Reference (NZTM)	1701490E-5630830N	
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 15 January 2021

For and on behalf of
Taranaki Regional Council



A D McLay
Director - Resource Management

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

Name of Consent Holder: 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.

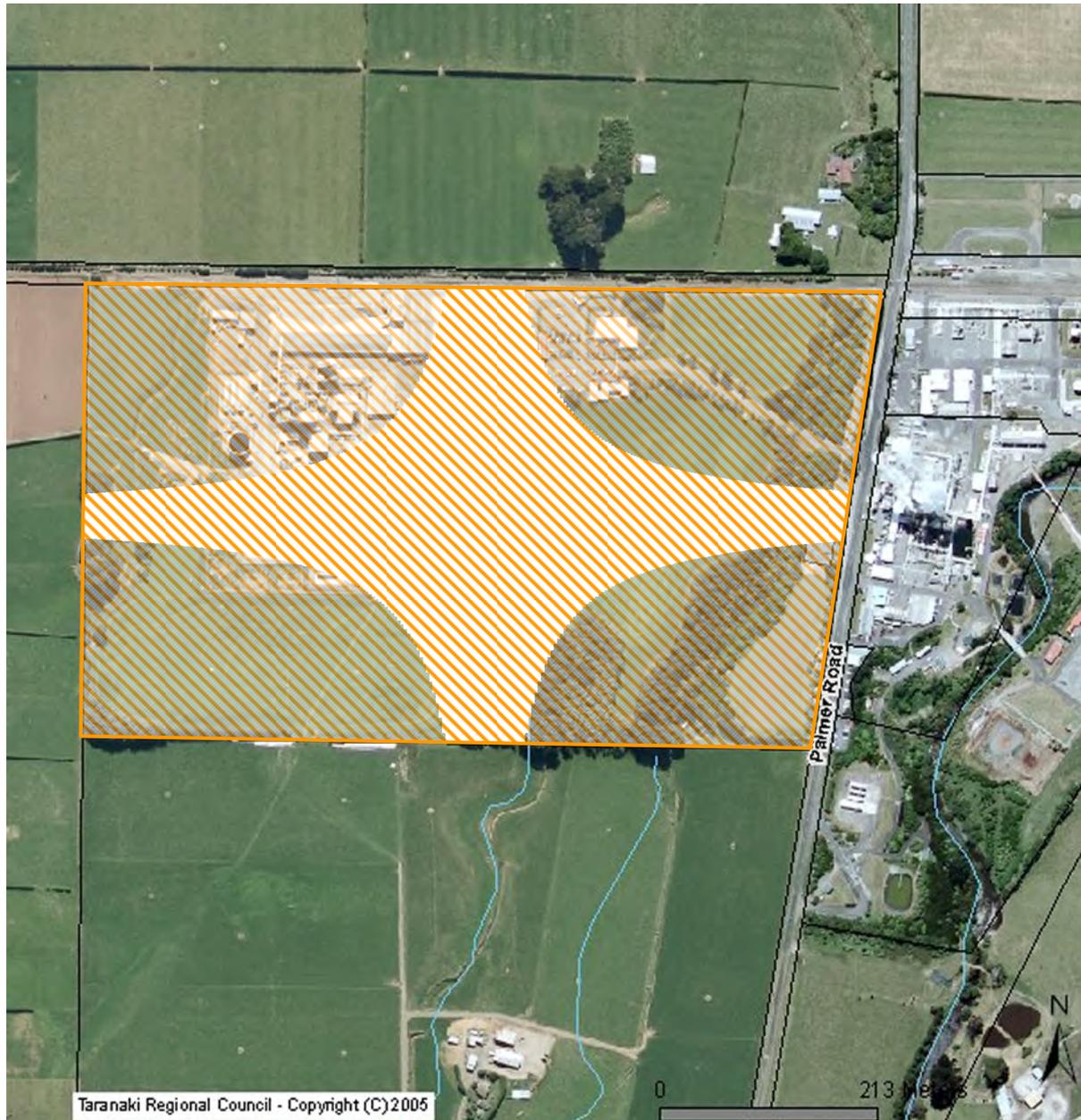
Signed at Stratford on 10 February 2012

For and on behalf of
Taranaki Regional Council

Director-Resource Management

Appendix 1

Map showing site boundary



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

Name of
Consent Holder: Todd Energy Limited
P O Box 802
NEW PLYMOUTH

Decision Date: 27 October 2000

Commencement Date: 27 October 2000

Conditions of Consent

Consent Granted: To discharge treated stormwater from hydrocarbon exploration and production operations at the Mangahewa-A wellsite onto and into land and into an unnamed tributary of the Waitara River at or about GR: Q19:243-360

Expiry Date: 1 June 2021

Review Date(s): June 2003, June 2009, June 2015

Site Location: Mangahewa-A wellsite, Otaraoa Road, Tikorangi
[Property owner: P & S Cole]

Legal Description: Pt Lot 1 DP 658 Pt Otaraoa Block Blk X Waitara SD

Catchment: Waitara

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

General conditions

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

Special conditions

1. The consent holder shall at all times adopt the best practicable option to prevent or minimise any adverse effects of the discharge on any water body.
2. The Chief Executive, Taranaki Regional Council, shall be advised in writing at least 7 days prior to commencing site works, and again in writing at least 7 days prior to any well drilling operation commencing.
3. The consent holder shall provide and maintain, for the written approval of the Chief Executive, Taranaki Regional Council, site specific details relating to contingency planning for the wellsite.
4. The design, management and maintenance of the stormwater system shall be generally undertaken in accordance with the information submitted in support of the application.
5. Any above ground hazardous substances storage areas shall be bunded with drainage to drilling sumps, or other appropriate recovery systems, and not to the stormwater catchment.
6. The following concentrations shall not be exceeded in the discharge effluent:

Component	Concentration
pH (range)	6.5-8.5
suspended solids	100 gm ⁻³
total recoverable hydrocarbons [infrared spectroscopic technique]	15 gm ⁻³

Consent 4919-2

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

7. After allowing for reasonable mixing, within a mixing zone extending 25 metres downstream of the discharge point, the discharge shall not give rise to any of the following effects in the receiving waters of the unnamed tributary:
 - a) an increase in temperature of more than 2 degrees Celsius;
 - b) an increase in biochemical oxygen demand of more than 2.00 gm⁻³.

8. After allowing for reasonable mixing, within a mixing zone extending 25 metres downstream of the discharge point, the discharge shall not give rise to any of the following effects in the receiving waters of the unnamed tributary:
 - 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.

9. The Chief Executive, Taranaki Regional Council, shall be advised in writing at least 48 hours prior to the reinstatement of the site and the reinstatement shall be carried out so as to minimise effects on stormwater quality.

10. The Taranaki Regional Council may review any or all of the conditions of this consent by giving notice of review during the month of June 2003 and/or June 2009 and/or June 2013, for the purpose of ensuring that the conditions are adequate to deal with any significant adverse effects of the discharge on the environment arising from the exercise of this consent, which were either not foreseen at the time the application was considered or which it was not appropriate to deal with at the time.

Transferred at Stratford on 15 November 2013

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 2020 – June 2021

Memorandum

To Nathan Crook and Darin Sutherland, Job Managers
From Darin Sutherland, Environmental Scientist
Document 2943958
Date 14 December 2021

Review of Stark Environmental Reports: Kapuni macroinvertebrate biomonitoring and electric fishing in relation to Ballance Agri-Nutrients Kapuni Ltd and Todd Energy Ltd – July 2020 – June 2021

Introduction

Four macroinvertebrate surveys and two fish surveys were scheduled for the Kapuni Catchment for the 2020-2021 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
28/07/20	2020-07	Macroinvertebrate	7	2
6-7/10/20	2020-08	Fish	11	
6-7/10/20	2020-09	Macroinvertebrate	11	2
27/01/21	2021-01	Macroinvertebrate	7	2
28/04/21	2021-04	Fish	7	
28/04/21	2021-05	Macroinvertebrate	7	2

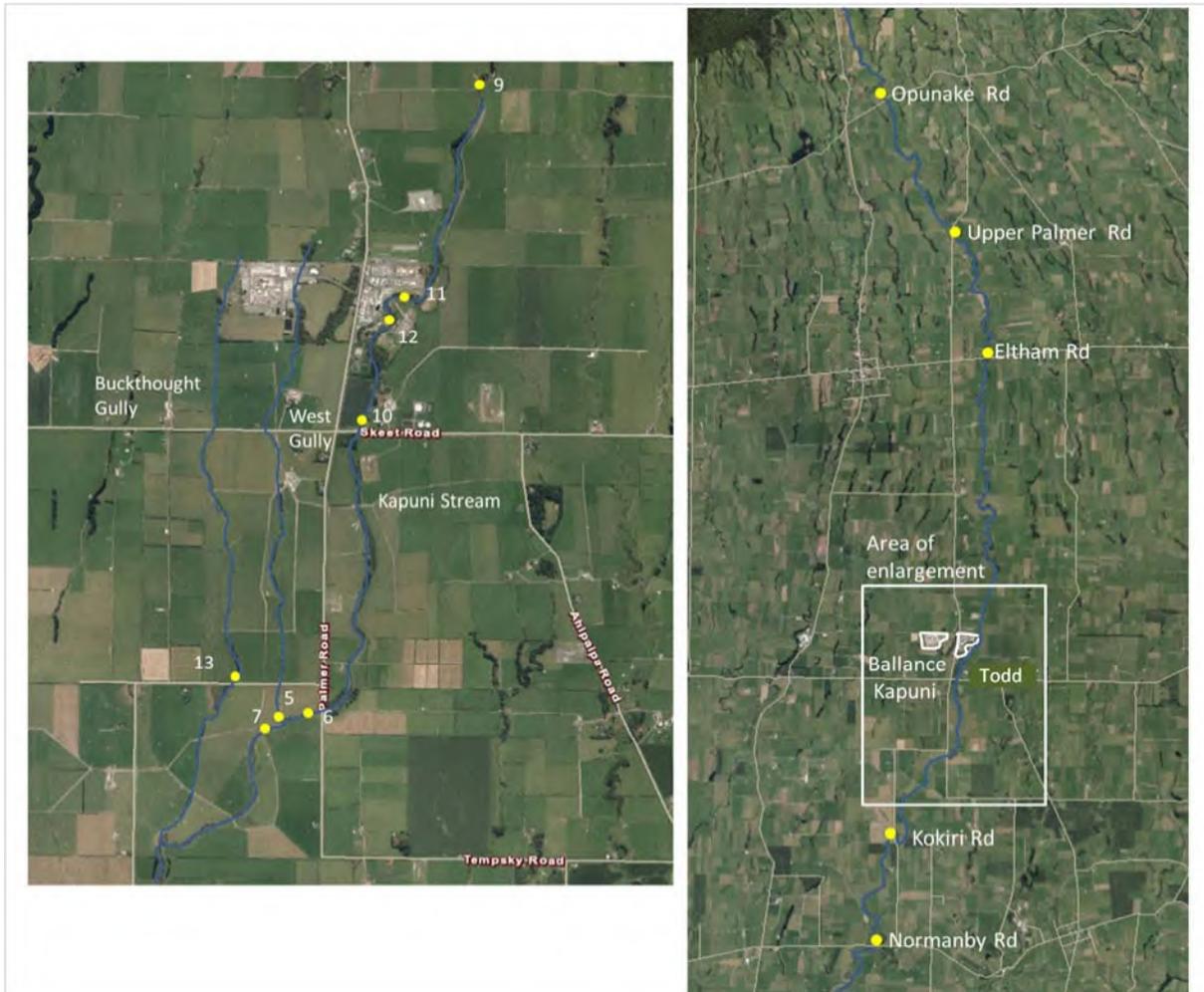


Figure 1 Biomonitoring sites in the Kapuni Catchment

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 bottom 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.

Taranaki Regional Council generally does not use the MCI-sb due to staff finding it unreliable in a Taranaki context though the NPS-FM 2020 does proscribe the use of the MCI-sb for soft bottom streams. However, the two streams in question may be naturally hard bottom and the current NPS-FM criteria would categorise both tributaries as hard bottom both based on their REC categories (WW/L/VA). Both have been observed to have significant gravel substrate, especially during periods after significant freshes.

It should also be noted that from April 2021 onwards Stark Environmental Ltd are processing samples using the fixed 200 count as per the NPS-FM 2020. This should not have a significant effect on results.

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 84 to 98 indicating 'fair' health.

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 Opunake Road and site 13, exhibited a statistically significant positive trend over the entire date range (e.g. since 1982). The Opunake Road and site 13 sites had positive, non-significant trends. The last 5-10 years show a levelling off or decrease in scores, but as some of the control sites were also plateauing or decreasing, it appears to be due to factors unrelated to activities associated with Ballance Kapuni.

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 all surveys though there were some sites that exceeded the predicted value for a particular survey.

Overall, the Kapuni Stream was in 'good' to 'excellent' health and there was no discernible impact from any industrial activity at Kapuni.

Electric fishing surveys

The two reports that detail the monitoring of fish communities undertaken in the Kapuni Stream in 6-7 October 2020 (11 sites) and 28 April 2021 (7 sites). The total area of streambed fished in the Kapuni Stream was approximately 384 m² in October and 245 m² in May. The tributaries were not fished in either survey.

Table 2 Results of spring fish survey in the Kapuni Stream conducted on 6-7 October 2020

Site	Brown trout	Redfin bully	Koaro	Bully	Eels	Koura	Total number of species
O			3				3
P						3	3
E	1						1
9	5	1				2	8
11	5						5
12	1	1		1			3
10	1	1					2
6							0
7	2	1					3
8/K					2		2
N	1	1					2
Total	16	5	3	1	2	5	32

Table 3 Results of fish survey in the Kapuni Stream conducted on 28 May 2021

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

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 27 fish, in five taxa, and 5 koura, were caught during the October 2020 survey. During the May 2021 survey, only five fish in three taxa were caught. The October survey result was within the range (3-221) of total numbers and variety (2-8 taxa) recorded in previous years; the May survey had the third 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.

In October 2020, brown trout were the most abundant taxa comprising 50% of the total number of animals recorded. Eels are normally the dominant fish recorded from the Kapuni Stream.

In May 2021, redfin bully, eels and koaro were present. The poor results were likely caused by fine sand deposition and significant freshes and were very similar to the May 2020 results.

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 0.54 trout per site from late 2008 to mid 2012. An improvement was recorded in the October 2020 survey. However, none were recorded during the May 2021 survey.

Overall, these electric fishing results from the Kapuni catchment do not provide any 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 2018 – May 2021

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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 fourth review and is for the period June 2018 to May 2021.

2.0 OVERVIEW

The Ballance-Kapuni ammonia-urea plant is owned and operated by Ballance Agri-Nutrients (Kapuni) 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

There have been no substantive changes in the basic technology of either the ammonia plant or urea plant over the past 3 years. However, a number of smaller equipment changes were implemented during this period to minimise the risk of fugitive ammonia losses to atmosphere, with others planned for execution in the upcoming Turnaround (August/September 2021). These include:

Replacement of a weathering pot within the ammonia synthesis loop with a larger vessel. The inherent design of the new vessel significantly reduces the likelihood of a substantive liquid ammonia discharge to atmosphere in upset conditions. The cost of this project was approximately \$220k.

Replacement of two liquid ammonia pumps with single mechanical seals to magnetic drive pumps (no seals required). This will eliminate the potential for harm to both people and environment from liquid ammonia release due to seal failure. The cost of this project was approximately \$600k.

Addition of a flow restriction to the carbamate recovery tank ensuring that liquid, containing significant amounts of ammonia, flowing to the tank do not result in the safety valve on this vessel lifting. The cost of this project was approximately \$9k.

The suction bottles for our high pressure liquid ammonia pumps were replaced with similar vessels with a significantly higher design pressure. This has minimised the risk of lifting the safety valves on these vessels during normal operation, which would result in a discharge of ammonia to atmosphere (via the main vent). The cost of this project was approximately \$150k.

3.2 Technology advances

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

Over the next 5-10 years an accelerated equipment replacement program will address "end-of-life" concerns for many pieces of equipment in both plants as well as a strategic goal of increasing production and product quality. The replacement program will enhance asset integrity and reduce the risks of fugitive losses to atmosphere. The content of the program is well developed, has been shared with Ballance senior management and is awaiting final approval from the Ballance Board of Directors.

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. The safety case was submitted in March 2018 and accepted in April 2020. The safety case includes a detailed analysis of plant operation and identification of potential major incident hazards. 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 having been implemented in the 2019 Turnaround and others planned for the Turnaround in August/September 2021.

In addition, another tranche of work to independently verify that critical safety valves on the ammonia plant are correctly sized and configured, was completed during this review period. This highlighted minor corrective works that have either been implemented or are to be carried out in the 2021 Turnaround.

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.

As a result of this, a new flare system is being installed on the site to safely manage these releases. There are approximately 90 different point sources that feed into the flare, most containing ammonia and/or flammable gases and comprising safety valves, rupture disks and some plant vents. In the event of a major incident, releases from safety devices will be directed to the flare for incineration, rather than to atmosphere. Although, primarily, an emergency flare rather than an operational flare, there is one operational vent connected to the flare system to eliminate process gas emissions to atmosphere during the start-up of the ammonia plant.

The flare will be operational after the Turnaround in 2021. The cost of the flare is commercially sensitive but runs into multiple millions of dollars.

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 and all were received from the Todd complex on the opposite side of Palmer Road to the Ballance site.

Date	Time	Operating conditions	Weather conditions	Response measures	Comments
2 nd July 2018 Todd - 765	1105	Normal Operation	Westerly – 20 knots	Normal processes followed. Dust scrubber liquor drained and refreshed with water.	Boundary test: TWA = 0.57ppm v/v NH3. No breach.
9 th August 2018 Todd - 1720	1130	Normal operation	Westerly 2-3 knots	Normal processes followed. Demister pad flush, vent testing.	Boundary test: TWA = 0.69ppm v/v NH3. No breach.
31 st October 2018 Todd – 3891	1527	Normal Operation	West 15 knots	Normal processes followed. Demister pad flush, vent testing.	Boundary test: TWA = 1.16ppm v/v NH3. No breach.
21 st August 2019 Todd – 13649	1415	Plant start up	Westerly 20 knots	Depressurised leaking equipment to stop ammonia leak.	Boundary test: TWA = 0.51ppm v/v NH3. No breach.
24 th November 2019 Todd – 16289	1235	Ammonia recovery unit upset	Westerly – 8 knots	Urea plant rate reduced. Steam and water sparge on main vent. Back filled recovery unit with water.	Boundary test: TWA = 1.15ppm v/v NH3. No breach.
7 th May 2020 Todd – 22616	1015	Plant start up	Westerly – 10 knots	Urea plant rate reduced. Steam and water sparge on main vent. Back filled recovery unit with water. Ammonia pump operation modified.	Boundary test: TWA = 0.75ppm v/v NH3. No breach.
10 th July 2020 Todd – 26786	1345	Urea plant start up	Not recorded	Normal protocols initiated. Urea recovery vent closed.	Boundary test: TWA = 1.01ppm v/v NH3. No breach.
9 th September 2020 Todd 2016 - 30309	1050	Normal Operation	North-Westerly 15 knots	Normal processes followed.	Boundary test: TWA = 0.55ppm v/v NH3. No breach.
16 th December 2020 Todd – 34822	1517	Normal Operation	Westerly 10-20 knots	Normal processes followed. Stopped ECB pump.	Boundary test: TWA = 0.83ppm v/v NH3. No breach.
10 th January 2021 Todd – 35376	2000	Normal Operation	North-Westerly 12 knots	Normal processes followed.	Boundary test: TWA = 0.94ppm v/v NH3. No breach.

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.

A more formal meeting was convened on site in April 2021, compliant with special condition 11 of our consent, where adjacent residential and industrial neighbours met with site personnel to discuss current plant operation, future plans and compliance against our consent. A representative of Taranaki regional Council was present also.

8.0 SUMMARY

Operation of the plant has been consent breach-free for over eight 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. Many of these will be mitigated by the installation of a new flare system in late 2021.

In addition, a major 10 year programme of capital investment is already underway, 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.

