Stanley Bros Trust (Piggery)

Monitoring Programme

Annual Report

2020-2021

Technical Report 2021-89

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Taranaki Regional Council

Taranaki Regional Council
Private Bag 713
Stratford

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Executive summary

The Stanley Bros Trust (the Company) operates a piggery located on the corner of 4833 South Road and 24 Arawhata Road, Opunake in the Arawhata catchment. The piggery is a breeder, grower, and finishing operation with the capacity of up to 5,381 pigs and piglets at any one time. The Company holds resource consents which allow the Company to discharge effluent to land via spray irrigation, and the discharging of effluent emissions to air from related practices.

During the monitoring period, the Company demonstrated an overall level of environmental performance that required improvement.

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.

The Company holds two resource consents, which include a total of 21 conditions setting out the requirements that the Company must satisfy. The Company holds one consent to discharge piggery effluent to land and one consent to discharge emissions into the air at this site.

The Council's monitoring programme for the year under review included three inspections, five water samples collected for physicochemical analysis. Odour surveys were also undertaken during inspections. Data were supplied by the Company and reviewed by the Council.

The Company was unable to discharge effluent to the consented 100 ha of cut and carry pasture this monitoring period, with just 81.5 ha utilised for cut and carry operations. A variation of consent may be sought by the Company in the upcoming monitoring period.

The Company are currently carrying less pigs than their consented allowance and have no plans to increase stock numbers, citing instability within the pork industry.

Piezometers installation had been delayed. The Company has provided the Council with a proposal to negate their requirement for groundwater monitoring. This proposal is currently being reviewed by the Council.

The monitoring showed that a minor increase of nitrate was recorded down the length of the Arawhata Stream. Some slight ponding was noted during an inspection.

There were four unauthorised incidents recording non-compliance in respect of this consent holder during the period under review.

Two incidents were addressed with enforcement action. On one occasion an irrigator was observed discharging into the marine environment, while on another occasion effluent was piped directly to the Arawhata Stream.

Following these two incidents, the operations have come under new management from within the Company structure. This represents a step-change with the Company operations, with greater control now being exercised in the field of irrigation management. This is in part due to the significant investment in new technologies for use across the Company site. The utilisation of these technological advances has the potential to achieve greater transparency in regard to effluent management and improve productivity for both current and future cut and carry operations on site.

During the year, the Company demonstrated a level of environmental performance that required improvement and good administrative performance with the resource consents.

The rationale for this grading was due to the issuance of five abatement notices, three 14 day letters and two infringement notices for the two incidents.

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 at a level that requires improvement.

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 resource consents held by Stanley Bros Trust Piggery (the Company). The Company operates a piggery situated on the corner of 24 Arawhata Road, and 4833 South Road (State Highway 45), Opunake, in the Arawhata catchment.

The report includes the results and findings of the monitoring programme implemented by the Council in respect of the consents held by the Company that relate to discharge of water within the Arawhata catchment, and the air discharge permit to cover emissions to air from the site.

One of the intents of the *Resource Management Act 1991* (RMA) is that environmental management should be integrated across all media, so that a consent holder's use of water, air, and land should be considered from a single comprehensive environmental perspective. Accordingly, the Council generally implements integrated environmental monitoring programmes and reports the results of the programmes jointly. This report discusses the environmental effects of the Company's use of water, land and air, and is the 2nd combined annual report by the Council for the Company.

1.1.2 Structure of this report

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

- consent compliance monitoring under the and the Council's obligations;
- the Council's approach to monitoring sites though annual programmes;
- the resource consents held by the Company in the Arawhata catchment;
- 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

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1.1.5 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 Company own and operate a piggery located on the corner of 24 Arawhata Road and 4833 South Road (State Highway 45), Opunake. The piggery and surrounding land owned by the Company covers 133 ha, of which 105 ha is available for effluent irrigation.

The piggery is a breeder, grower and finishing operation capable holding up to a maximum of 5,381 kg pig equivalents onsite at any one time (Table 1). The discharge is made up of effluent and wash water from the piggery operation.

Up until early October 2018 the site operated as a piggery and dairy farm with 270 dairy cows. In October 2018 the dairy herd was sold and only a small amount of grazing stock remain on the farm.

The existing piggery is made up of seven purpose-built piggery sheds which are ventilated with roof fans and side vents. The sheds are in good condition, with impervious wall cladding. The floor is impervious with concrete, wooden slats, and plastic flooring panels. The layout of the sheds is generally across the prevailing winds and there are side ventilation exhausts with automatic control. The configuration and locality of the sheds (along with the exhaust stacks) generally enhance dispersion of odours and dust from the sheds.

Pens are flushed daily with water and the effluent is pumped to a series of storage ponds before land application. The pond is stirred as effluent is applied to land, where it is applied through numerous methods which are described later in this report.

There are two storage ponds on the property, pond 1 has a storage capacity of 24,500 m^3, and pond 2 has a storage capacity of 19,320 m^3.

The existing piggery, ponds, and irrigation areas in relation to the property are shown in Figure 1, and Figure 2.

[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

Figure 1 Location of Stanley Bros Trust Piggeries current buildings and effluent ponds

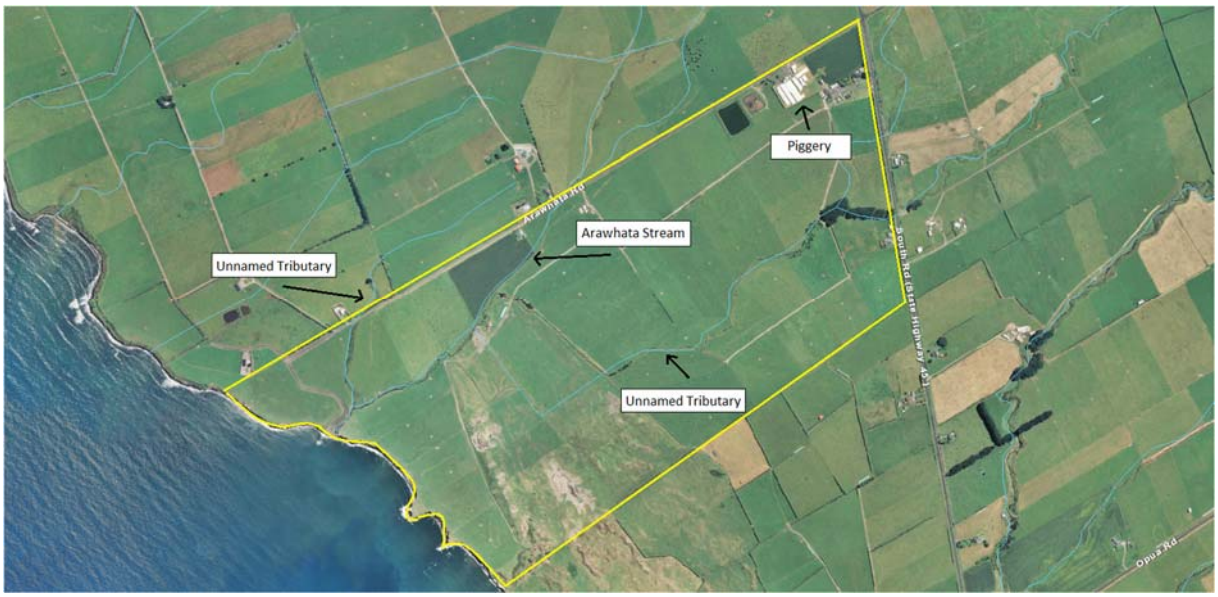

Figure 2 Stanley piggeries in relation to the Arawhata Stream and Unnamed Tributaries

Initially the Company proposed an expansion for the existing piggery operation from 4,000 to 5,000 pigs (or 5,381, 50 kg pig equivalents, the consented limit under 10671-1.1). The number and approximate weights of the maximum pigs proposed is provided in Table 1.

Table 1 Proposed maximum piggery composition

Type of pigs	No. of pigs	Average weight (kg)	Total weight (kg)	50 kg equivalent pigs
Sows	500	162	81,000	1,620
Growers	1,525	65	99,125	1,982
Store pigs	1,487	44	65,428	1,309
Weaners	1,470	18	23,520	470
Total	**4,982**			**5,381**

This expansion included an extension for an additional five pig housing sheds and effluent ponds. The extended piggery operation and ponds were proposed to occupy approximately 3.5 ha of the site.

The new sheds will be a continuation of the buildings already on site. They will be constructed with freezer panel and concrete. The new sheds required are:

- 3 x 24 crate sow farrowing rooms;
- 1 x 100 sow shed[2]; and
- 1 x 400 pig grower shed.

The addition of these sheds were proposed to allow for re-organisation of the farm's younger pigs, generally to the north and older pigs to the south (further from the closest dwelling). The shed expansion and proposed area for effluent discharge are displayed in Figure 3 and Figure 4.

[2] The Company have since communicated by annual report that their plan to increase the number of sows to 500 has been abandoned. The farrowing sheds (three) will be completed.

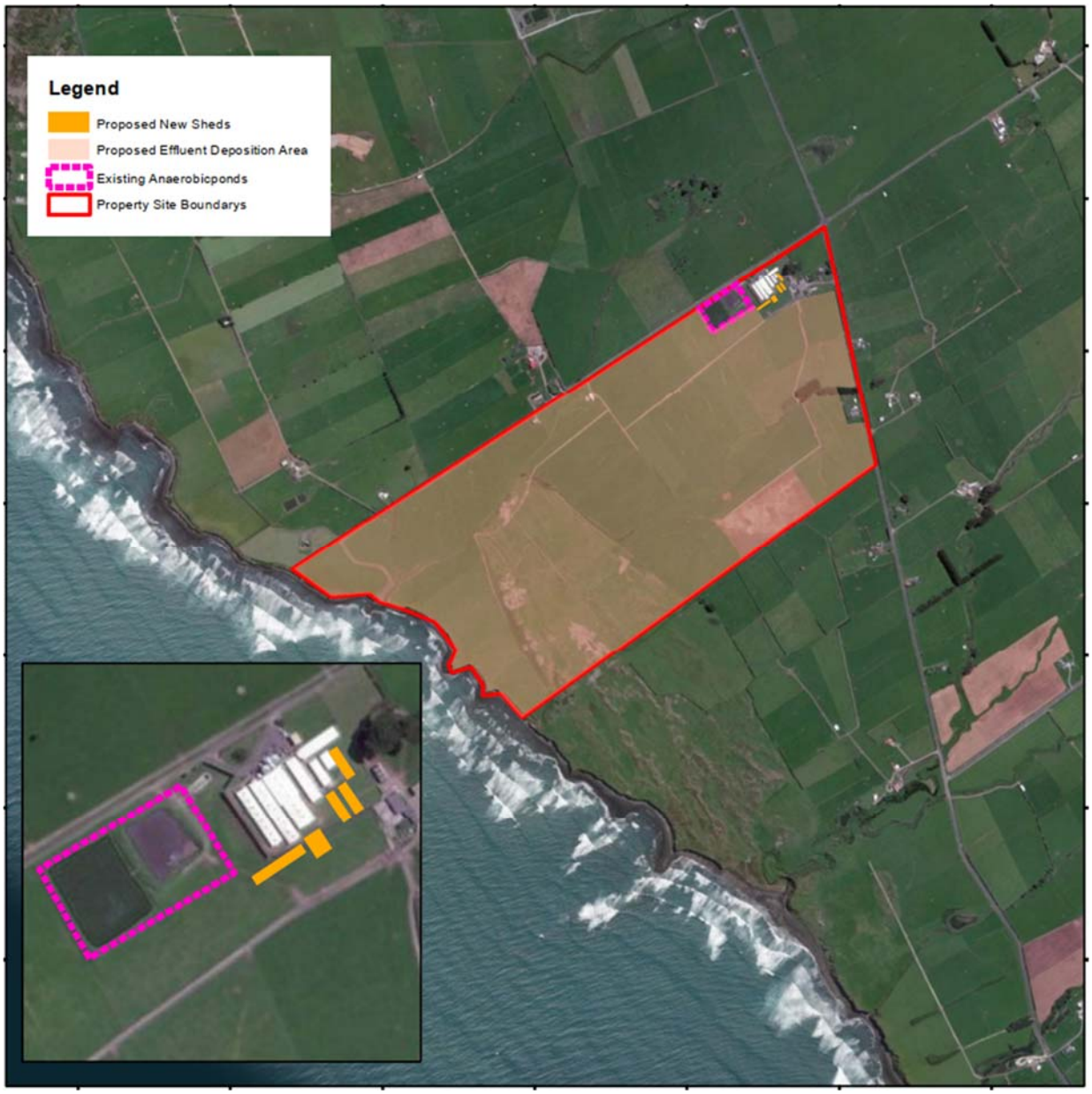

Figure 3 Existing and proposed piggery buildings and effluent storage ponds

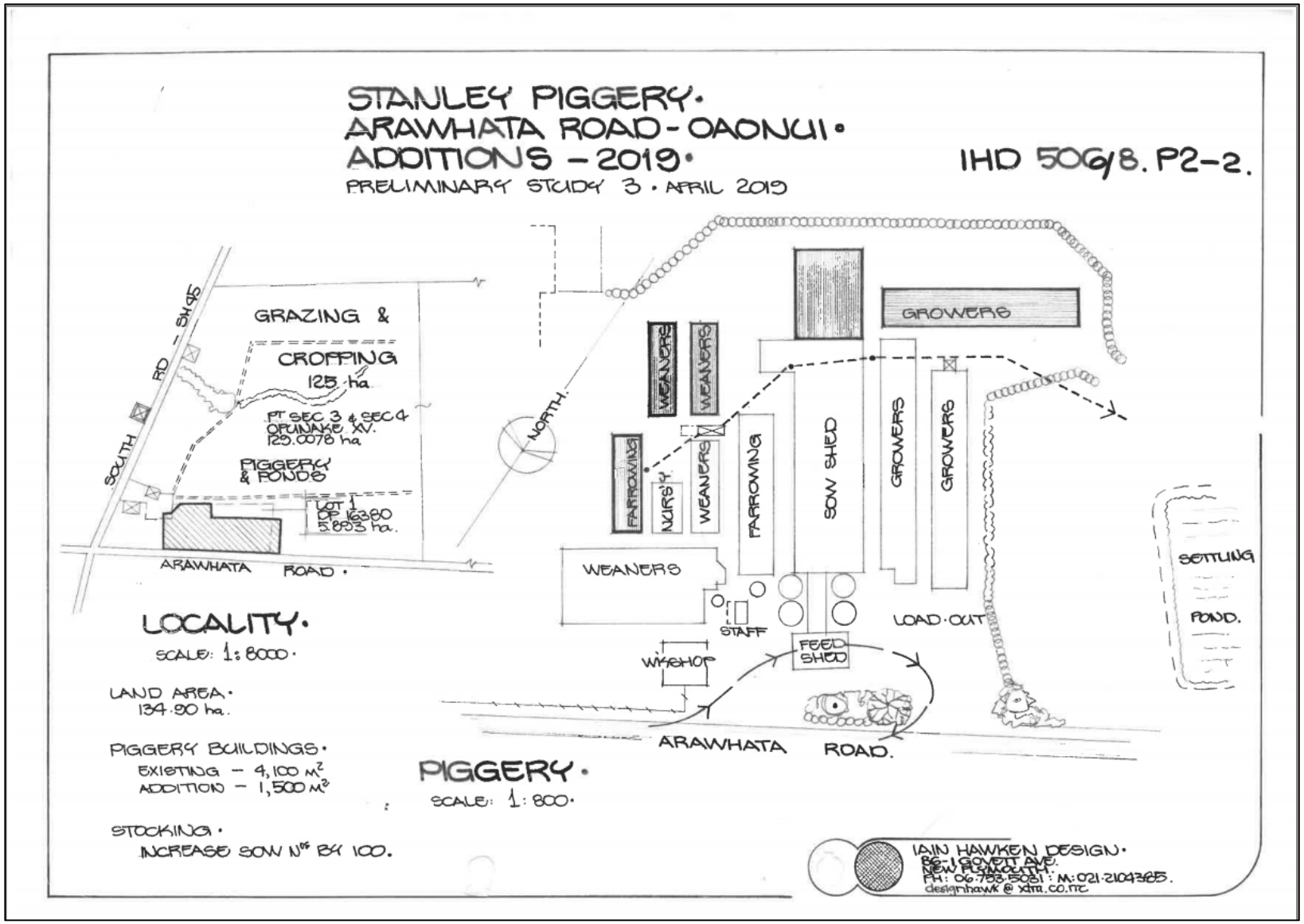

Figure 4 Proposed piggery buildings in relation to the existing sheds

This expansion was accepted by the Council and a change of conditions to consent 5251 was made, allowing for a maximum increase from 4,000 to 5,000 pigs at any one time. This change was made on the 6th August 2019, along with a subsequent change to consent 10671, permitting effluent discharges from pigs only following the removal of dairy stock.

The allowed stock density in sheds has been significantly reduced by revisions to animal welfare regulation changes. The new sheds will have a lower stock density than the previous existing sheds.

The number of approximate weights and stock number for the 2020-2021 period (Table 2) were less than the proposed number and weights set out in Table 1. The total number of pigs decreased by 1,160 and the amount of 50 kg equivalent pigs decreased by 720 SPU.

Table 2 Piggery stock inventory 2020-2021

Type of pigs	No. of pigs	Average weight (kg)	Total weight (kg)	50 kg equivalent pigs (SPU)
Sows	354	162	57,348	1,147
Boars	4	162	648	13
Gilts	80	150	12,000	240
Light pork	1,368	70	95,760	1,915
Store pigs	840	44	36,960	739
Weaners	1,214	25	30,350	607
Total	**3,840**		**233,066**	**4,661**

Approximately 18 m^3 of effluent and wastewater is discharged onto land on a daily basis. The proposed increase of pigs would have brought this to 22 m^3 per day. Pens are flushed daily and the effluent is pumped into the storage ponds where it is stirred before and during land application. Approximately 105 ha is used for irrigation on the property. Since the closure of the dairy shed, effluent volume has reduced by 60%, increasing available storage to up to three months.

The Company undertook 'cut and carry' operations during this monitoring period. Approximately 43.5 ha of pasture as bailage and 38 ha of maize silage was grown and sold off-farm. The Company has also expressed interest in other 'cut and carry' operations for future years. Effluent will be applied after harvesting to maintain soil fertility for future crops.

Key determinants with effluent irrigation are potassium and nitrogen levels. The report produced by agKnowledge (in the consent application) estimated typical values for freshly voided manure characteristics based on 3.25 kg of manure per standard pig equivalent, and predicted nutrient loading rates based on these estimates with the inclusion of irrigation to 105 ha of land, and 30% of nitrogen gaseous loses. The report concluded that the nutrient input from the piggery and the 'cut and carry' operation is not excessive as harvested crops counter the high nutrient inputs from the piggery.

1.3 Resource consents

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

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

Table 3 Summary of resource consents held by Stanley Bros piggery

Consent number	Purpose	Granted	Review	Expires
Air discharge permit				
5251-2.2	To discharge emissions into the air from pig farming operations and associated effluent treatment and waste management activities	2019	2024	2030
Discharges to land permit				
10671-1	To discharge piggery effluent onto land by spray irrigation	2019	2024	2030

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.

The monitoring programme for the Company site consisted of three primary components.

1.4.2 Programme liaison and management

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

- ongoing liaison with resource consent holders over 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 Programme liaison and management

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

1.4.4 Site inspections

The Company's site was visited on three occasions during the monitoring period. With regard to consents for the discharge of piggery effluent to land, the main points of interest were plant processes with potential or actual discharges to land, including contaminated stormwater and process wastewaters.

Sources of data being collected by the Company were identified and accessed, so that performance in respect of operation, internal monitoring, and supervision could be reviewed by the Council. The neighbourhood was surveyed for environmental effects.

As far as practical, inspections related to air emissions were integrated with inspections undertaken for other purposes for example inspection of the oxidation ponds. The air monitoring component focused on processes with associated actual and potential emission sources and characteristics, including potential odour.

1.4.5 Chemical sampling

The Council undertook sampling of effluent collection and irrigation pond. In addition, surface water samples were collected from the Arawhata Stream and associated unnamed tributary on one occasion. The analytes tested for in the effluent pond and surface water samples include the following:

- Effluent pond (PGP001003) analytes
- Temperature, pH, electrical conductivity (EC), chloride, nitrate + nitrite nitrogen, total nitrogen, total kjeldahl nitrogen (TKN), total sodium, total phosphorus, total potassium, sodium absorption ratio (SAR), total calcium and total magnesium
- Arawhata Stream analytes
- Temperature, pH, electrical conductivity (EC), chloride, nitrate + nitrite nitrogen, chloride, total potassium, dissolved reactive phosphorus (DRP), free ammonia, total ammoniacal nitrogen and total biochemical oxygen demand (TBOD5)

The Council also undertook odour surveys to assess ambient air quality in the neighbourhood during inspections.

2 Results

2.1 Inspections

25 August 2020

An inspection was undertaken to assess compliance with the air and land discharge consents held by the Company. The irrigation pond was observed to contain ample freeboard. The second of the two ponds contained stormwater only. A sample was collected from within the irrigation pond.

The irrigator was operating at the time of inspection. Some ponding was noted, however, this was likely to absorb within the time frame. It was conveyed that there shall be no effluent discharged within 25 m of a surface water body.

A leak was noted at one of the joins to the irrigator, however a staff member was about to commence repairs at the time. In terms of site odour, a normal piggery odour was detected along the state highway, but was not considered offensive or objectionable. The air discharge was found to be compliant at the time of inspection.

31 August 2020

A file note was taken. It stated that abatement Notice EAC-23255 and EAC-23272 (requiring the installation of piezometers) had been extended until 31 August 2021.

04 February 2021

A routine compliance monitoring inspection was undertaken for the air discharge and land discharge consents held by the Company. The irrigator was operational at the time of inspection and the application rate looked reasonable. The irrigator was located away from water bodies, and no ponding or pooling was evident.

An odour survey was conducted, this found no offensive or objectionable odours beyond the boundary of the property. An inspection was undertaken of the storage pond area. This found Pond One to be of a low level. In comparison, Pond Two contained some water.

The discharge pipe into the stream had been removed[3]. Pond One was no longer able to discharge into Pond Two. Pond Two will be allowed to evaporate. The piggery was inspected. No evidence of overflows were noted. It was observed that the sand trap was in need of a clean out.

Upgrades are likely to take place to direct clean water from the road away to the sand trap. The monitoring bores had yet to be installed. It was communicated to ensure that this is completed prior to 31 August 2021, as required by abatement notice EAC-23255 and EAC-23272.

09 April 2021

A routine compliance monitoring inspection was undertaken for the air discharge and land discharge consents held by the Company. The irrigator was operational at the time of inspection and the application rate looked reasonable.

The irrigator was located away from water bodies, and no ponding or pooling was evident. An odour survey was conducted which found no offensive or objectionable odours beyond the boundary of the property. An inspection was undertaken of the ponds which found pond one to be low, pond two still contained some water. The piggery was inspected. No evidence of overflows were noted.

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[3] Please see Section 2.3

Upgrades to direct clean water from the road away to the sand trap had yet to occur. The monitoring bores had not been installed. A consultant had been engaged to investigate this, with discussion to take place to determine if they are required. This discussion will be held with the Council and if the Company are successful with their proposal, the consent may be varied to remove the requirement for bore installation from the consent.

A new dribble bar for the tractor had been purchased, and a computer system will be installed to record discharges to land. This will mean that the discharge information can be easily assessed. No issues were noted during the inspection. A sample of the irrigation pond was collected, along with Arawhata Stream samples by a technical officer of the Council.

2.2 Results of discharge monitoring

2.2.1 Effluent monitoring

Piggery effluent is pumped to the irrigation pond (Figure 1). The pond holds the effluent when conditions are not correct for irrigation to land to occur. A secondary pond is also available for additional storage if required.

The Council sampled the irrigation pond (PGP001003) on three occasions[4] this monitoring period. The analysis of the three rounds is provided in the following Table 4. This year marks the inaugural year of monitoring at this industrial discharge.

Table 4 PGP001003 2020-2021 analysis

PGP001003	Collected	05 Mar 2020	05 Mar 2020	25 Aug 2020	09 Apr 2021
Parameter	Time	08:50	08:50	10:45	10:05
Temperature	°C	23.4	23.4	-	-
pH	pH Units	6.6	6.6	7.4	7.3
Electrical Conductivity (EC)	mS/m	468	494	635	491
Chloride	g/m^3	144	156	195	178
Nitrate-N + Nitrite-N	g/m^3	< 0.10	< 0.10	0.15	< 0.10
Total Nitrogen	g/m^3	690	710	730	1,030
Total Kjeldahl Nitrogen (TKN)	g/m^3	690	710	730	1,030
Total Sodium	g/m^3	102	100	84	113
Total Phosphorus	g/m^3	200	230	132	410
Total Potassium	g/m^3	280	280	300	320
Sodium Absorption Ratio (Total)		-	-	-	0.5
Total Calcium	g/m^3	-	-	-	4,000
Total Magnesium	g/m^3	-	-	-	280

The monitoring of the effluent indicated the following:

[4] Please note the initial sampling round (05 March 2020) was undertaken in duplicate.

- One temperature result was collected, recorded at 23.4°C on the duplicate samples, 05 March 2020.
- Irrigation fluid pH ranged 6.6-7.4 pH.
- Electrical conductivity ranged 491-635 mS/m.
- Chloride ranged 144-195 g/m^3.
- Nitrate nitrite nitrogen (NNN) ranged from below the laboratory limit of detection (LOD) on two occasions of three, ranging <0.10-0.15 g/m^3.
- Total nitrogen (TN) and total kjeldahl nitrogen (TKN) ranged 690-1,030 g/m^3.
- Total sodium ranged relatively steady, 84-113 g/m^3.
- Total phosphorous also remained relatively stable, ranging 280-320 g/m^3.
- Total potassium ranged 280-320 g/m^3.
- A singular sodium absorption ratio result was collected, 0.5 SAR, which was within consent conditions (<15 SAR).
- Total calcium was recorded at 4,000 g/m^3.
- Total magnesium was recorded at 280 g/m^3.

2.2.2 Surface water monitoring

Initiated this monitoring period, in lieu of a decision with regard to the installation of groundwater monitoring wells, was the surface water monitoring of the Arawhata Stream. Four surface water monitoring locations have been established on the Stream and associated unnamed tributary.

The four sites are provided in the following Figure 5:

- ARW000070 is located slightly offsite, to the northwest of the Company site. The stream is full of macrophyte vegetation with minimal to no shading. This is monitored to assess pre-irrigation area surface water quality (control site).
- ARW000954 is located on the eastern side of the Company site, up gradient of site irrigation areas. This stream is an unnamed tributary of the Arawhata Stream. It is assessed to provide pre-irrigation area surface water conditions (control site).
- ARW000984 is located in the central area of the site, within the irrigation areas, just prior to the confluence with the main stem of the Arawhata Stream. The aim of this site is to assess for any effect associated with the irrigation areas on the surface water body.
- ARW000999 is located at the mouth of the Arawahata Stream, on the coast. This location seeks to assess the combined effect of the irrigation areas on the unnamed tributary and the main stem of the Arawhata Stream, prior to discharging into the Tasman Sea.

Figure 5 Surface water sampling locations

Surface water monitoring results

One round of surface water monitoring was undertaken by the Council this monitoring period (Table 5).

Table 5 Surface water monitoring Arawahata Stream 2020-2021

	Site	ARW000070	ARW000954	ARW000984	ARW000999
	Collected	09 Apr 2021	09 Apr 2021	09 Apr 2021	09 Apr 2021
Parameter	**Time**	10:15	10:35	10:20	09:50
Sample Temperature	**°C**	15	15.7	15.2	15.8
Electrical Conductivity (EC)	**mS/m**	34.9	31.7	35.8	39.5
pH	**pH Units**	7.2	7.3	7.2	7.7
Chloride	**g/m³**	51	41	46	46
Total Potassium	**g/m³**	8.4	13.1	10.8	10.6
Dissolved Reactive Phosphorus	**g/m³**	0.01	0.021	0.021	0.02
Free Ammonia	**g/m³**	0.00008	0.00009	0.0001	< 0.0002
Nitrate-N	**g/m³**	0.115	0.75	1.15	1.91
Nitrate-N + Nitrite-N	**g/m³**	0.118	0.76	1.16	1.92
Nitrite-N	**g/m³**	0.003	0.007	0.013	0.013
Total Ammoniacal-N	**g/m³**	0.015	0.014	0.018	< 0.010
Total Biochemical Oxygen Demand ($TBOD_5$)	**g O_2/m³**	1	0.8	0.8	1.3

The April 2021 monitoring round indicated the following:

- Surface water temperatures ranged 15-15.8°C.
- Surface water EC ranged 31.7-39.5 mS/m. The unnamed tributary was slightly less mineralized (ARW000954) than compared to the main stem control site (ARW00070). EC increased down the length of the main stem.
- Surface water pH results ranged 7.2-7.7 pH.
- Total potassium ranged 8.4-13.1 g/m³.
- Dissolved reactive phosphorus (DRP) ranged 0.01-0.21 g/m³.
- Free ammonia was recorded at trace concentrations, ranging from below the LOD through to 0.0001 g/m³.
- Nitrate nitrogen was recorded in all samples at low concentrations, ranging 0.115-1.91 g/m³. This analyte increased in concentration down the length of the catchment.
- Nitrite nitrogen was recorded at low concentrations, ranging 0.003-0.013 g/m³.
- Total ammoniacal nitrogen ranged from below the LOD through to 0.018 g/m³.
- Total biochemical oxygen demand was recorded in all samples, however the results were all below 2 g/m³.

In terms of impacts to the Arawahata Stream and associated unnamed tributary. The singular analysis determines a slight increase in nitrate nitrogen down the length of the catchment. However, with the beginning of the surface water monitoring occurring in this monitoring period, caution is urged as to the interpretation with only four data points.

2.3 Provision of consent holder data

Consent required information was provided to the Council by means of an annual report (appendix II). This was produced by the Company's third party consultant agKnowledge[5].

2.3.1 Pig inventory 2020-2021

Special condition 1 of consent 10671-1.1 states the effluent discharged shall be from a piggery of no more than 5,381, 50 kg pig equivalents. Table 6 indicates that the Company were well below the consented allowance, with 4,661 SPU equivalents.

Table 6 Stanley Bros piggery inventory 2020-2021

Pig class	Pig numbers	Average LWT (kg)	Total LWT (kg)	SPU equivalents
Sows	354	162	57,348	1,147
Boars	4	162	648	13
Gilts	80	150	12,000	240
Light Pork	1,368	70	95,760	1,915
Store Pigs	840	44	36,960	739
Weaners	1,214	25	30,350	607
Total	3,860	613	233,066	4,661

2.3.2 Record keeping

The consent holder is required to keep accurate records of effluent application to land, including as a minimum:

a. Volume of effluent applied;
b. Rate and time of application;
c. Area (ha) that the effluent was applied to
d. Method of irrigation; and
e. Type of crop that is grown on that land.

2.3.2.1 Effluent application 2020-2021

The total volume of effluent applied from the piggery in the 2020-2021 monitoring year was 22,334 m^3, Table 8.

Rate and time of application

Table 7 below provides the rate and time of the applications to land in the 2020-2021 monitoring period.

Table 7 Irrigations per month and effluent volumes applied

Month	Irrigation per month (days)	Effluent volumes applied (mm)
July 2020	15	12.0
August	8	12.0
September	0	0

[5] Report of 2020/21 effluent irrigation management plan for Stanley Bros Trust January 2022. agKnowledge

Month	Irrigation per month (days)	Effluent volumes applied (mm)
October	24	12.0
November	25	12.0
December	14	12.0
January 2021	0	0
February	14	8.0
March	29	8.3
April	29	9.5
May	21	7.5
June	23	6.5

2.3.2.2 Area (ha) that effluent is applied

The farm is divided into six blocks, these total 105 ha. The annual effluent volumes applied to these blocks is provided in the following Table 8.

Table 8 Annual effluent volumes by irrigation block in mm and m^3 loading of N per ha

Block	Effective area (ha)	Effluent volume applied (mm)	m^3 of effluent
Main Road	6.5	29.1	1,891.5
Arawhata	21.0	16.3	3,423
Centre	34.0	12.2	4,146
Ron's	14.0	29.8	4,172
Sand dunes	21	31.6	6,636
Cliff tops	8.5	24.3	2,065.5
Total	105	-	22,334

2.3.2.3 Method of irrigation

The effluent from the piggery is pumped to storage pond prior to land application. The Company communicated that three different delivery systems were used during the 2020-2021 monitoring year:

1. 'Weta' travelling rain gun, this was utilised to apply effluent at depths of 8-12 mm each month of the year with the exception of January to mid-February and September, across the bulk of the land (93.5 ha). From May 2021, its use was restricted to the sand dune block.
2. The dribble bar was utilised from May 2021 onwards. This is the new effluent application system attached to the tractor. This allows for significantly lowered applications depths and there is more accurate recording of proof of placement.
3. A slurry tanker is utilised for effluent application at strategic times of the year to minimise odour t the areas besides the South road and close to house. As well as at the back of the farm, along the Arawhata Road, which is also close to neighbours properties. The total area applied was 11.5 ha.

2.3.2.4 Type of crops grown

Two crops were grown under the cut and carry system in 2020-2021: Maize Silage and Permanent Pasture in the sequence outlined in Table 9. The maize silage paddocks (38 ha) were cultivated and planted in October, then harvested in April, yielding around 21 tonnes DM/ha. An annual ryegrass was then planted as a cover

crop, over the cooler/wetter months, and harvested as grass silage in late September/early October yielding 4.3 tonnes DM/ha.

On the permanent pasture areas, 43.5 ha of pasture was mown, with the first crop removed as baleage (65% DM, wrapped silage) yielding 163 tonnes DM total, and the remaining two crops converted into haylage 81% DM) yielding 270 tonnes DM total.

Table 9 Growing sequence of cut and carry crops 2020-2021 (source agKnoweldge report on 2020/21 effluent irrigation management plan)

Cut & Carry (Area)	J	A	S	O	N	D	J	F	M	A	M	J
Maize & Annual (38 ha)	Annual ryegrass			Maize silage							Annual	
Permanent Pasture (43.5 ha)	Baleage (12's)			Haylage (15's)				Haylage (15's)				

2.3.3 Cut and carry operation

Crops/cut and carry operations were undertaken in the 2020-2021 monitoring period. These included maize baleage and hay (Table 9). These accounted for a total of 81.5 ha of land actioned under cut and carry operations.

Special condition 9 of consent 10671-1.1 states:

The consent holder shall ensure that the effluent is discharged to at least 100 hectares of land that is not grazed and that is planted in crops that are removed from the property i.e. a 'cut and carry' operation. It may also be applied and additional areas that are grazed.

Given that the Company only discharged to 81.5 ha during the monitoring year, this is a minor non-compliance with special condition 9 of consent 10671-1.1.

Discussions with the Company have since confirmed they are were below the consented requirement of 100 ha of land for irrigation to cut and carry operations. However, consideration must be given to the Company which is not carrying its maximum piggery capacity (5,381 SPU equivalents consent 10671-1.1) with a reduction of 720 SPU equivalents, below the consented maximum, at 4,661 SPU.

The Company plan to stay at this number of pigs (4,661 SPU) moving forward. As such, a variation to consent 10671-1.1 will be sought by the Company in the upcoming monitoring period. To have the requirement for 100 ha of cut and carry land reduced, on account of the reduced SPU equivalents.

2.3.4 Total nitrogen and potassium in the effluent

Limited data on effluent data was available for the 2020 portion of the 2020-2021 monitoring period. However, from March 2021 onwards samples were collected and analysed by the Company. The results by the Company are provided within the following Table 10.

Table 10 Mean nutrient composition of piggery effluent (n=8) plus 95% confidence interval

Nutrients in piggery effluent	Mean (g/m^3)	95% CI (g/m^3)
Nitrogen	745	110
Phosphorus	186	75
Potassium	280	16
Calcium	781	1,289
Magnesium	96	75
Sodium	84	12

2.3.5 Nutrient management

Consent 10671-1.1, special conditions 10 and 11 require the following:

10. The Total Nitrogen applied to any hectare of land shall not exceed:
    a. 400 kilograms in any 12-month period for 'cut and carry areas'; or
    b. 200 kilograms in any 12-month period for any other land (including grazed pasture).

11. The total Potassium applied to any hectare of land shall not exceed:
    a. 300 kilograms in any 12-month period for 'cut and carry areas'; or
    b. 100 kilograms in any 12-month period for any other land (including grazed pasture).

Utilising the data provided in the following Table 10, which was calculated by the mean concentration for nitrogen provided by the Company (745 g/m^3). It is possible to extrapolate the loading of N per hectare.

2.3.6 Nitrogen loading

Nitrogen loading across all areas is provided in Table 11. All cut and carry areas were estimated to be well below consent 10671-1.1, condition 10, loading allowance for nitrogen, which allows up to 400 kg N /ha.

For the non-cut and carry areas, which have a lower allowance of no more than 200 kg N/ha. The sand dune area was slightly above the consent limit, with an estimated loading of 235.4 kg N/ ha.

Minor non-compliance noted for nitrogen loading in non-cut and carry area of the sand dunes.

Table 11 Estimated N loading by irrigation block 2020-2021

Block	Effective area (ha)	m^3 of effluent	Loading of N kg per ha
Main Road	6.5	1,891.5	216.8
Arawhata	21.0	3,423	121.4
Centre	34.0	4,146	90.8
Ron's	14.0	4,172	222
Sand dunes	21	6,636	235.4
Cliff tops	8.5	2,065.5	181
Total	105	22,334	-
Underlined blocks indicate cut and carry areas. Please note 2.74 ha of the sand dunes is actioned under cut and carry.			

2.3.7 Potassium loading

Estimated potassium loading has been calculated and provided in the following Table 12. The results demonstrated that the Company were in compliance with the potassium loading condition (11) of consent 10671-1.1, across all irrigation blocks, in the 2020-2021 monitoring period. This condition allows up to 300 kg/ K ha for cut and carry areas, while for the non-cut and carry areas, a maximum of 100 kg/ K ha is allowed. All potassium loading was below 100 kg/ K ha for all areas. Compliance was achieved.

Table 12 Estimated potassium loading by irrigation block 2020-2021

Block	Effective area (ha)	m^3 of effluent	Loading of potassium ha/kg
Main Road	6.5	1,891.5	54.1
Arawhata	21.0	3,423	30.3
Centre	34.0	4,146	22.6
Ron's	14.0	4,172	55.4
Sand dunes	21	6,636	58.7
Cliff tops	8.5	2,065.5	45.2
Total	105	22,334	
Underlined blocks indicate cut and carry areas. Please note 2.74 ha of the sand dunes is actioned under cut and carry.			

2.3.8 Cut and carry operation

The Company provided the Council with analysis of composite feed samples[6] of each crop, so that the nutrient uptake and removal off-farm could be calculated.

Table 13 Nitrogen and potassium concentrations and total N and K removed in the cut and carry system

Harvested Feed	N (% in DM)	K (% in DM)	N uptake (kg)	K uptake (kg)
Maize silage	1.20	0.90	9,644	7,233
Grass silage	1.70	2.80	2,785	4,587
Baleage (12's)	1.80	2.50	2,938	4,080
Haylage (15's)	1.60	1.60	4,320	4,320
Total			19,687	20,220

In total the Company removed 19,687 kg nitrogen and 20,220 kg potassium from cut and carry areas this monitoring period.

2.3.9 Future developments

The Company's effluent and irrigation management plan, which was a consented obligation of consent 10671-1.1, condition 13, provides a section on future developments to their irrigation system, for the Company operations. These include the following:

Dribble bar

A "Vogelsang" dribble bar has been purchased and is on-site (Figure 6). This equipment will allow effluent to be applied at ground level across a 9 m spread from the dropper hoses spaced 30 cm apart. Odour from effluent application and lateral movement of effluent are minimised. This will reduce the potential for spray drift during windy effluent irrigation.

[6] Report of 2020/21 effluent irrigation management plan for Stanley Bros Trust January 2022. agKnowledge

Figure 6 Company provided image of the new Vogelsang dribble bar

GPS

A John Deere 4640 GPS unit has been purchased and installed into the tractor (Figure 7). This unit will allow proof of effluent placement on the land and allow buffer zone restrictions to be adhered to.

Figure 7 John Deere 4640 universal display GPS unit (source John Deere)

Flow meter

A Krohne Optiflux 2100 electromagnetic flowmeter has also been purchased and incorporated onto the tractor (Figure 8). This technology will allow the effluent application rate to be regulated via the computer system in the tractor. The effluent passes through an impellor whose rotations (producing pressure) can be regulated by the computer according to tractor speed.

Figure 8 Krohne optiflux 2100 electro magnetic flowmeter (source Krohne NZ)

Once the Dribble Bar, GPS unit and Flowmeter are installed and calibrated to the John Deere software, effluent will be able to be applied with greater precision through the Weta irrigator. A recording system is also being installed at the main office so that effluent placement can be tracked and documented.

In addition, the Company will be proposing the use of a soil sensor in the 2021-2022 monitoring period. This will be discussed in detail in the 2021-2022 monitoring report.

2.4 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).

Table 14 below sets out details of any incidents recorded, additional investigations, or interventions required by the Council in relation to the Company activities during the 2020-2021 period. This table presents details of all events that required further investigation or intervention regardless of whether these were found to be compliant or not.

Table 14 Incidents, investigations, and interventions summary table

Date	Details	Compliant (Y/N)	Enforcement Action Taken?	Outcome
18 March 2020	During the previous monitoring period the Company were opposed to installing ground water piezometers (bores) on their property. This is a consent condition of 10671-1.1 The rationale for this was due to instability in the pork industry at the time.	N	Y	Two abatement notices were issued requiring the Company to install the bores by 31 August 2020. Discussion with the Council extended this abatement notice until 31 August 2021. Since this date, further discussion has been held with the Council in concern to removing the bores from the consent. A proposal has been provided to the Council which offers rationale through additional monitoring means, to negate the bores requirement. The Council is considering the proposal at present.
02 November 2020	During unrelated monitoring it was found that effluent was discharging from an irrigator, over a cliff and into the coastal marine area at a property on Arawhata Road, Opunake. It was evident that the irrigator had been running for some time and a significant amount of effluent had discharged. The consent holder was spoken to and the discharge was immediately ceased and the irrigator shifted. An abatement notice was issued requiring the resource consent conditions to be complied with. Re-inspection found that the abatement notice was being	N	Y	Abatement and infringement notice issued.

Date	Details	Compliant (Y/N)	Enforcement Action Taken?	Outcome
	complied with at the time of inspection.			
08 December 2020	A complaint was received concerning an overflowing effluent pond on Arawhata Road, Opunake. The investigation found that there had been cattle grazing in and around the effluent ponds causing damage to a wall of the second pond. The level of the pond had become high and discharged over the low point of the wall causing untreated effluent to discharge over land and to pond in the adjacent paddock. It was also found that the landowners had cut open and directed the ponded effluent and effluent from the pond via existing underground drainage that had discharged into the Arawhata Stream. Samples, photographs and videos were taken. Abatement notices were issued requiring the discharge to cease and for works to be undertaken to ensure compliance with resource consent conditions. Re-inspection the following day found that the abatement notices were being complied with at the time of inspection. Letters of explanation were received. A meeting was held with the consent holder and charges to the operation agreed.	N	Y	Discharge ceased. Three fourteen day letters. Four abatement notices and 1 infringement notice were issued.

3 Discussion

3.1 Discussion of site performance

2020-2021 marked the end of the second monitoring period for the Company. After the first monitoring period the Company had a few outstanding issues to address.

The Company was required to provide the Council with an Effluent Irrigation Management Plan (EIMP), as well as the concentrations of nitrogen and potassium within the irrigation effluent. The plan, in addition to the effluent monitoring was delivered in this monitoring period, as stated by the Company. The Company commissioned agKnowledge to undertake the works and their assistance has been retained throughout the monitoring period.

The plan fulfilled the consent requirements by providing information on the following:

- Management of the cut and carry operation;
- Evapotranspiration and available water holding capacity of the soil over the irrigated area;
- How irrigation will be scheduled to maximise the benefits of the evapotranspiration and minimise subsurface drainage;
- How effluent is to be applied as uniformly as practicable over the irrigated area, and the uniformity of application demonstrated;
- The designated application area and buffer zones for streams and the property boundary; and
- The determination of the total nitrogen and potassium in the effluent.

From an administrative performance perspective, performance has been satisfactory during the period under review. However, there have been a number of non-compliance incidents throughout the monitoring period, as discussed above in Section 2.4 of this report.

In addition, a minor non-compliance was recorded during a review of the Company records. The Company were unable to irrigate effluent to 100 ha of cut and carry pasture in the monitoring period as required by their consent, achieving 81.5 ha. It is however, noted that the current pig numbers have reduced from the maximum consented allowance (section 2.2.2.1), therefore generating less effluent for irrigation to land.

The Company has been informed that if they wish to vary their consent to reduce the consented maximum irrigation area for cut and carry operations, then a variation of the current consented limit may be possible if the supporting rationale provides confidence that the variation effect will be no more than minor.

Nitrogen loading in the non-cut and carry area of the sand dunes slightly exceeded the consented nitrogen loading limit (>200 kg N/ ha), with an estimated application of 235.4 kg N/ha.

It should be noted that post the November and December 2020 incidents discussed in section 2.3, the operations have come under new management from within the Company structure. The early sign is a step-change in the Company operations, with greater control now being exercised in irrigation management. This is in part due to the significant investment in new technologies for use across the Company site (section 2.2.4). The utilisation of these technological advances on site has the potential to achieve greater transparency in regard to effluent management and improve productivity for both current and future cut and carry operations on site.

3.2 Environmental effects of exercise of consents

Environmental effects were limited in the 2020-2021 monitoring period. The largest potential impact could have been associated with the incident which the Council responded to in early December 2022. It was discovered on site that the second of the two storage ponds on site was piped to the Arawhata Stream.

Due to the significant amount of rainfall occurring at the time of the incident, the actual effect to the surface waters was minimal, with upstream surface water samples containing more elevated contaminants than below the discharge location.

On another occasion an irrigator was observed discharging off the sea cliffs into the marine environment. Both incidents were dealt with by enforcement action.

Some surface ponding was noted during an inspection and this was associated with the use of an irrigator. The Company now have in operation a dribble bar, which is proposed to work in tandem with soil sensors. The soil sensors which are currently being trialled by the Company are telemetered to the GPS within the tractor, as well as hand held phone.

The aim is to provide the Company with up-to-date soil water balance, and available capacity of the soil in real-time. This information can then be used to inform decisions around when and where irrigation application can occur, reducing the risk of excess discharge through ponding, leaching or runoff. It is noted that the Company have engaged expert advice to utilise these technologies.

Riparian planting and fencing has been completed across the site. It is understood from discussions that the Company is undertaking maintenance only (replacing perished plants) at the present time.

The Company records estimated that 19,687 kg nitrogen and 20,220 kg potassium were removed from cut and carry areas during the monitoring period.

The singular Arawhata Stream monitoring round recorded minor increases on nitrate down the length of the site. Further monitoring will assess the practicality of these new technologies over time.

The application of effluent in the 2021-2022 year will be monitored in detail by the Company.

3.3 Evaluation of performance

A tabular summary of the consent holder's compliance record for the year under review is set out in Tables 15-17.

Table 15 Summary of performance for consent 5251-2.2

Purpose: ***To discharge emissions into the air from pig farming operation and associated practices including effluent treatment and other waste management activities***		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Maximum allowable number of pig equivalents	Liaison with Company and review of Company records indicated that the piggery is carry less than consented (5,381 SPU equivalents) Actual 4,661 SPU equivalents	Yes
2. Adoption of best practical option to avoid or minimise adverse effects	Liaison with Company and inspections	Yes
3. Consultation and approval prior to alterations to plant and process	Liaison with Company	N/A
4. Minimisation of impact and emissions through use of equipment and suitable methods	Monitoring Inspections	Yes

Purpose: *To discharge emissions into the air from pig farming operation and associated practices including effluent treatment and other waste management activities*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
5. Operation of piggery in accordance with original application	Monitoring inspections identified that effluent was being discharged to the Arawhata Stream. This was not described in the application. Enforcement undertaken. Abatement and infringement notices issued	No
6. Objectionable odour at site boundary not permitted	Monitoring inspections	Yes
7. Optional review provision	Consent expires June 2030- next review June 2024	N/A
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**Improvement required** **High**

Table 16 Summary of performance for consent 10671-1.1

Purpose: *To discharge piggery effluent onto land by spray irrigation*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
1. Effluent discharge no more than allowable number of pig equivalents	Liaison with Company and review of Company records indicated that the piggery is carry less than consented (5,381 SPU equivalents) Actual 4,661 SPU equivalents	Yes
2. Minimisation of nutrient leaching to groundwater	Liaison with Company and review of records indicated more N and K was removed than discharge to land	Yes
3. No overflow of effluent from disposal system	Liaison with Company and inspection	No, see incidents section
4. Sufficient storage available in effluent storage ponds	Liaison with Company and Inspection	Yes
5. No effluent surface ponding exceeding 30 minutes	Monitoring Inspection	Yes, though some ponding by irrigator on one occasion
6. Sodium adsorption ratio of wastewater shall not exceed 15	Sampling	Yes
7. Effluent applied in consented areas and away from dwellings/rivers	Monitoring Inspection	No, see incidents section
8. No spray drift beyond property boundary	Monitoring Inspection	No, see incidents section

Purpose: *To discharge piggery effluent onto land by spray irrigation*		
Condition requirement	**Means of monitoring during period under review**	**Compliance achieved?**
9. The consent holder shall ensure that the effluent is discharged to at least 100 ha of land that is not grazed and that is planted in crops that are removed from the property	Liaison with Company and Inspection	No, only 81.5 ha utilised this period
10. Total nitrogen applied on land will not exceed 400 kg in 12 month cut and carry areas, or 200 kg in 12 month pasture areas	Liaison with Company and review of records with estimate of loading from duplicate sample from effluent pond	Yes for cut and carry One minor exceedance in non-cut and carry area of the sand dunes
11. Total potassium applied on land will not exceed 300 kg in 12 month cut and carry areas, or 100 kg in 12 month pasture areas	Liaison with Company and review of records with estimate of loading from duplicate sample of effluent pond	Yes
12. Accurate records of applied effluent volume, rate, area, method, and type of crop grown	Liaison with Company	Yes
13. Consent exercised in accordance with Effluent Irrigation Management Plan	Liaison with Company and Inspection	Yes
14. Installation of three piezometers by 31 January 2020 for groundwater quality monitoring	Liaison with Company and Inspection	No, a proposal is currently being reviewed by Council
Overall assessment of consent compliance and environmental performance in respect of this consent Overall assessment of administrative performance in respect of this consent		**Improvement required** **Good**

N/A = not applicable

Table 17 Evaluation of environmental performance over time

Year	Consent no	High	Good	Improvement req	Poor
2019-2020	5251	1	-	-	-
	10671	-	-	1	-
2020-2021	5251	-	-	1	-
	10671	-	-	1	-
Totals	-	1	-	3	-

During the year, the Company demonstrated an improvement required level of environmental and good level of administrative performance 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 Stanley Brothers Trust Piggery in the 2020-2021 year be amended from that undertaken in 2019-2020, by the inclusion of surface water monitoring of the Arawhata Stream.
2. THAT the Company should provide an EIMP and associated testing, as required by consent 10671-1.1.
3. THAT the installation of the groundwater monitoring wells, as required by consent 10671-1.1 be installed by 31 August 2021.
4. 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.
5. THAT the option for a review of resource consent 10671-1.1 in June 2021, as set out in condition 15 of the consent, not be exercised, on the grounds that the conditions are fit for purpose

Recommendation 1 was undertaken.

Recommendation 2 was provided by the Company.

Recommendation 3, the Company have supplied a proposal to the Council to negate the installation of the piezometers. This is currently being reviewed by the Council and a decision will be made during the upcoming monitoring period.

Recommendation 4 was required as defined by section 2.3.

Recommendation 5 was not required.

3.5 Alterations to monitoring programmes for 2021-2022

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

- the extent of information already made available through monitoring or other means to date;
- its relevance under the RMA;
- the Council's obligations to monitor consented activities and their effects under the RMA;
- the record of administrative and environmental performances of the consent holder; and
- reporting to the regional community.

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

Planned changes for 2021-2022 monitoring programme include a review of the proposal submitted by the Company. To assess whether it provides confidence to the Council, that the removal of the piezometers from the consent, will not cause adverse effects to groundwater. That the instruments proposed by the Company will negate there requirement.

The Company shall submit for a variation of consent 10671-1.1. To reduce the number of pigs allowed by the consent, to what is currently held on site. In doing so the Company will also submit, with supporting rationale, for a reduction in the cut and carry irrigation area requirement.

The monitoring programme will remain unchanged from that undertaken in the 2020-2021 monitoring period. Three rounds of surface water monitoring will be completed.

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

4 Recommendations

1. THAT in the first instance, monitoring of consented activities at the Company site will remain unchanged from that undertaken in the 2020-2021 monitoring period. Three rounds of surface water monitoring will be completed.
2. THAT the Council review a proposal submitted by the Company. The result of the review will determine whether or not the original consent requirement; to install piezometers in three locations, be upheld.
3. The Company shall submit for a variation of consent 10671-1.1. To reduce the number of pigs allowed by the consent, to what is currently held on site. In doing so the Company will also submit, with supporting rationale, for a reduction in the cut and carry irrigation area requirement.
4. 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.

Glossary of common terms and abbreviations

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

Al*	Aluminium.
As*	Arsenic.
Biomonitoring	Assessing the health of the environment using aquatic organisms.
BOD	Biochemical oxygen demand. A measure of the presence of degradable organic matter, taking into account the biological conversion of ammonia to nitrate.
BODF	Biochemical oxygen demand of a filtered sample.
Bund	A wall around a tank to contain its contents in the case of a leak.
CBOD	Carbonaceous biochemical oxygen demand. A measure of the presence of degradable organic matter, excluding the biological conversion of ammonia to nitrate.
cfu	Colony forming units. A measure of the concentration of bacteria usually expressed as per 100 millilitre sample.
COD	Chemical oxygen demand. A measure of the oxygen required to oxidise all matter in a sample by chemical reaction.
Conductivity	Conductivity, an indication of the level of dissolved salts in a sample, usually measured at 25°C and expressed in µS/cm.
Cu*	Copper.
Cumec	A volumetric measure of flow- 1 cubic metre per second (1 m^3s^{-1}).
DO	Dissolved oxygen.
DM	Dry matter.
DRP	Dissolved reactive phosphorus.
E.coli	Escherichia coli, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample.
Ent	Enterococci, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre of sample.
F	Fluoride.
FC	Faecal coliforms, an indicator of the possible presence of faecal material and pathological micro-organisms. Usually expressed as colony forming units per 100 millilitre sample.
FNU	Formazin nephelometric units, a measure of the turbidity of water
Fresh	Elevated flow in a stream, such as after heavy rainfall.
$g/m^2/day$	grams/$metre^2$/day.
g/m^3	Grams per cubic metre, and equivalent to milligrams per litre (mg/L). In water, this is also equivalent to parts per million (ppm), but the same does not apply to gaseous mixtures.
Incident	An event that is alleged or is found to have occurred that may have actual or potential environmental consequences or may involve non-compliance with a consent or rule in a regional plan. Registration of an incident by the Council does not automatically mean such an outcome had actually occurred.

Intervention	Action/s taken by Council to instruct or direct actions be taken to avoid or reduce the likelihood of an incident occurring.
Investigation	Action taken by Council to establish what were the circumstances/events surrounding an incident including any allegations of an incident.
Incident register	The incident register contains a list of events recorded by the Council on the basis that they may have the potential or actual environmental consequences that may represent a breach of a consent or provision in a Regional Plan.
L/s	Litres per second.
m^2	Square Metres.
MCI	Macroinvertebrate community index; a numerical indication of the state of biological life in a stream that takes into account the sensitivity of the taxa present to organic pollution in stony habitats.
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.
MPN	Most Probable Number. A method used to estimate the concentration of viable microorganisms in a sample.
µS/cm	Microsiemens per centimetre.
NH_4	Ammonium, normally expressed in terms of the mass of nitrogen (N).
NH_3	Unionised ammonia, normally expressed in terms of the mass of nitrogen (N).
NO_3	Nitrate, normally expressed in terms of the mass of nitrogen (N).
NTU	Nephelometric Turbidity Unit, a measure of the turbidity of water.
O&G	Oil and grease, defined as anything that will dissolve into a particular organic solvent (e.g. hexane). May include both animal material (fats) and mineral matter (hydrocarbons).
Pb*	Lead.
pH	A numerical system for measuring acidity in solutions, with 7 as neutral. Numbers lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength. For example, a pH of 4 is ten times more acidic than a pH of 5.
Physicochemical	Measurement of both physical properties (e.g. temperature, clarity, density) and chemical determinants (e.g. metals and nutrients) to characterise the state of an environment.
PM_{10}, $PM_{2.5}$, $PM_{1.0}$	Relatively fine airborne particles (less than 10 or 2.5 or 1.0 micrometre diameter, respectively).
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 including all subsequent amendments.
SS	Suspended solids.
SQMCI	Semi quantitative macroinvertebrate community index.
Temp	Temperature, measured in °C (degrees Celsius).
Turb	Turbidity, expressed in NTU or FNU.
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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agKnowledge. 2021 Effluent Irrigation Management Plan for Stanley Bros Trust.

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agKnowledge. 2022. Report on 2020-21 Effluent Irrigation Management Plan for Stanley Bros Trust

Ministry for the Environment. 2018. Best Practice Guidelines for Compliance, Monitoring and Enforcement under the Resource Management Act 1991. Wellington: Ministry for the Environment.

Taranaki Regional Council (2020): *Stanley Bros Trust (Piggery) Monitoring Programme Annual Report 2019-2020*. Technical Report 2020-08.

Appendix I

Resource consents held by Stanley Bros Trust Piggery

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

Water abstraction permits

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

Water discharge permits

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

Air discharge permits

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

Discharges of wastes to land

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

Land use permits

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

Coastal permits

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

Discharge Permit

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

Name of Consent Holder:	Stanley Bros Trust (Trustees: Ronald Thomas Stanley & Noel Henry Stanley) 4789A South Road RD 31 Opunake 4681
Decision Date (Change):	6 August 2019
Commencement Date (Change):	6 August 2019 (Granted Date: 12 September 2012)

Conditions of Consent

Consent Granted:	To discharge emissions into the air from a pig farming operation and associated practices including effluent treatment and other waste management activities
Expiry Date:	1 June 2030
Review Date(s):	June 2024
Site Location:	24 Arawhata Road, Opunake
Grid Reference (NZTM)	1670475E-5637131N

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 maximum number of pigs on the property, at any one time, shall not exceed 5,000 pigs (or 5,381, 50 kg pig equivalents).

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 actual or likely adverse effect on the environment associated with the discharge of contaminants into the air from the site.

3. Prior to undertaking any alterations to the pig farming and effluent disposal processes, operations, equipment or layout, as specified in the original application and any subsequent application to change the conditions of this consent, which may significantly change the nature or quantity of contaminants emitted from the site, the consent holder shall consult with the Chief Executive, Taranaki Regional Council, and shall obtain any necessary approvals under the Resource Management Act 1991 and its amendments.

4. The consent holder shall minimise the emissions and impacts of air contaminants discharged into air from the site by:

    a) the selection of the most appropriate process equipment;
    b) process control equipment and emission control equipment;
    c) the methods of control;
    d) the proper and effective operation, supervision, maintenance and control of all equipment and processes; and
    e) the proper care of all pigs on the site.

5. The consent holder shall, at all times, operate the piggery and associated activities in accordance with the information provided in support of the original application and any subsequent application to change the conditions to this consent, except as otherwise required or directed by the conditions set out in this resource consent.

6. 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.

7. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2018 and/or June 2024 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 6 August 2019

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:	Stanley Bros Trust (Trustees: Ronald Thomas Stanley & Noel Henry Stanley) Main Road R D 31 OPUNAKE 4681
Decision Date:	12 September 2012
Commencement Date:	12 September 2012

Conditions of Consent

Consent Granted:	To discharge emissions into the air from a pig farming operation and associated practices including effluent treatment and other waste management activities at or about (NZTM) 1670546E-5637141N
Expiry Date:	1 June 2030
Review Date(s):	June 2018, June 2024
Site Location:	Arawhata Road, Opunake
Legal Description:	Lot 1 DP 16380 Blk XV Opunake 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 with section 36 of the Resource Management Act 1991.

Special conditions

1. The maximum number of pigs on the property, at any one time, shall not exceed 4,000 P value (as defined in Appendix IV of the *Regional Air Quality Plan for Taranaki 2011*.)

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 actual or likely adverse effect on the environment associated with the discharge of contaminants into the air from the site.

3. Prior to undertaking any alterations to the pig farming and effluent disposal processes, operations, equipment or layout, as specified in application 5738 and supporting documentation, which may significantly change the nature or quantity of contaminants emitted from the site, the consent holder shall consult with the Chief Executive, Taranaki Regional Council, and shall obtain any necessary approvals under the Resource Management Act 1991 and its amendments.

4. The consent holder shall minimise the emissions and impacts of air contaminants discharged into air from the site by:

    a) the selection of the most appropriate process equipment;
    b) process control equipment and emission control equipment;
    c) the methods of control;
    d) the proper and effective operation, supervision, maintenance and control of all equipment and processes; and
    e) the proper care of all pigs on the site.

5. The consent holder shall, at all times, operate the piggery and associated activities in accordance with the information provided in support of application 5738, except as otherwise required or directed by the conditions set out in this resource consent.

6. 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.

7. In accordance with section 128 and section 129 of the Resource Management Act 1991, the Taranaki Regional Council may serve notice of its intention to review, amend, delete or add to the conditions of this resource consent by giving notice of review during the month of June 2018 and/or June 2024 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 12 September 2012

For and on behalf of
Taranaki Regional Council

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Director-Resource Management

Discharge Permit

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

Name of Consent Holder:	Stanley Bros Trust (Trustees: Ronald Thomas Stanley & Noel Henry Stanley) 4789A South Road RD 31 Opunake 4681
Decision Date	6 August 2019
Commencement Date	6 August 2019

Conditions of Consent

Consent Granted:	To discharge piggery effluent onto land by spray irrigation
Expiry Date:	1 June 2030
Review Date(s):	June 2021, June 2024, June 2027
Site Location:	24 Arawhata Road, Opunake
Grid Reference (NZTM)	1670475E-5637131N
Catchment:	Arawhata

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 effluent discharged shall be from a piggery of no more than 5,381, 50 kg pig equivalents.

2. Notwithstanding the conditions of this consent, it shall be exercised in a manner that minimises the leaching of nutrients to groundwater.

3. There shall be no overflow of effluent from any part of the effluent disposal system.

4. The consent holder shall ensure that at all times, while complying with the other requirements of this consent, there is sufficient storage available in the effluent storage ponds for any reasonably likely inflow, so that there is no unauthorised discharge to land or water.

5. Discharges to land shall not result in effluent ponding on the surface that remains for more than 30 minutes.

6. The sodium adsorption ratio of the wastewater shall not exceed 15.

7. No effluent shall be applied to land less than:

    a. 25 metres from the water's edge in any watercourse
    b. 50 metres from any bore, well or spring actively used for water supply purposes; or
    c. 150 metres from any dwelling house unless the written approval of the occupier has been obtained to allow discharge at a closer distance.

8. There shall be no spray drift, as a result of the irrigation of treated wastewater, at or beyond the property boundary.

9. The consent holder shall ensure that the effluent is discharged to at least 100 hectares of land that is not grazed and that is planted in crops that are removed from the property i.e. a 'cut and carry' operation. It may also be applied and additional areas that are grazed.

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

    (a) 400 kilograms in any 12-month period for 'cut and carry areas'; or
    (b) 200 kilograms in any 12-month period for any other land (including grazed pasture).

11. The total Potassium applied to any hectare of land shall not exceed:

    (a) 300 kilograms in any 12-month period for 'cut and carry areas'; or
    (b) 100 kilograms in any 12-month period for any other land (including grazed pasture).

12. The consent holder shall keep accurate records of effluent application to land, including as a minimum, the:

    a. volume of effluent applied;
    b. rate and time of application;
    c. area (ha) that the effluent was applied to;
    d. method of irrigation; and
    e. type of crop that is grown on that land.

    This information shall be provided to the Taranaki Regional Council annually during the month of July and at other times when requested.

13. From 1 November 2019, this consent shall be exercised in accordance with an Effluent Irrigation Management Plan ('EIMP') that has been approved by the Chief Executive, Taranaki Regional Council, acting in a certification capacity. The EIMP shall detail how effluent irrigation is managed to minimise nutrient leaching to groundwater. The EIMP shall include as a minimum, details of:

    (a) management of the cut and carry operation
    (b) evapotranspiration and available water holding capacity of the soil(s) over the irrigated area;
    (c) how irrigation will be scheduled to maximise the benefits of evapotranspiration and minimise subsurface drainage;
    (d) how effluent is to be applied as uniformly as practicable over the irrigated area, and the uniformity of application demonstrated;
    (e) the designated application areas and buffer zones for streams and the property boundary; and
    (f) the determination of total Nitrogen and Potassium in effluent.

14. Before 31 January 2020 the consent holder shall after consultation with the Chief Executive, Taranaki Regional Council, install a minimum of three piezometers. The piezometers shall be at locations, and to depths, that enable monitoring to determine any change in groundwater quality resulting from the exercise of this consent. The piezometers shall be installed in accordance with NZS 4411:2001 and all associated costs shall be met by the consent holder.

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 2021 and at 3-yearly intervals thereafter, for the purpose 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
    (b) addressing any significant increases in the concentration of nutrients in the groundwater.

Signed at Stratford on 6 August 2019

For and on behalf of
Taranaki Regional Council

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A D McLay
Director - Resource Management

Appendix II

Company provided annual report

agKnowledge
"The Independent Fertiliser Experts"

Report on 2020/21 Effluent Irrigation Management Plan

For

Stanley Bros Trust

January 2022

agKnowledge
"The Independent Fertiliser Experts"

agKnowledge
"The Independent Fertiliser Experts"

Brief

Stanley Bros Trust have asked agKnowledge Ltd to update the Effluent Irrigation Management Plan (EIMP) for the Taranaki Regional Council (TRC). This EIMP is required to meet the discharge consent conditions set out in Consent 10671-1.1.

Much of the background information concerning the Stanley Bros piggery and its operation was covered in the previous agKnowledge report of April 14, 2021 which covered the calendar year 2020. However, the reporting year should cover from July 1, 2020 to June 30, 2021. Therefore, this report updates the information required for the correct time period.

Discharge Consent Conditions

The specific discharge consent conditions required by the TRC relating to effluent applications to land on this property are as follows:

Clause 12. The consent holder shall keep accurate records of effluent application to land, including as a minimum, the:

a. volume of effluent applied;
b. rate and time of application;
c. area (ha) that the effluent was applied to;
d. method of irrigation; and
e. type of crop that is grown on that land.

In addition, information was also requested on:

f. the determination of total Nitrogen and Potassium in effluent,
g. provide effluent monitoring data to determine the loading of nitrogen and potassium across the irrigation areas?
h. pig numbers for the year.

Each of these points will be addressed but in a different order.

Pig numbers for the year

TRC Special Condition 1 (Consent 5251-2.2) states that the number of pigs on the property, at any one time, shall not exceed 5,000 pigs (or 5,381, 50 kg pig equivalents).

The number of pigs, by class and average liveweight (LWT) is shown below. The Standard Pig Unit (SPU) has been derived from the total LWT (Table 1).

Table 1: Pig inventory for 2020/21.

Pig Class	Pig Numbers	Average LWT (kg)	Total LWT (kg)	SPU equivalents
Sows	354	162	57,348	1,147
Boars	4	162	648	13
Gilts	80	150	12,000	240
Light Pork	1,368	70	95,760	1,915
Store Pigs	840	44	36,960	739
Weaners	1,214	25	30,350	607
Total			**233,066**	**4,661**

The number of SPUs carried by the Stanley Bros Piggery is 13% below the consented number.

Effluent Application

a) Volume of effluent applied

The total volume of effluent applied from the Piggery during 2020/21 was 22,315m^3. Details of application depths, timing of applications and blocks applied will follow.

b) Rate and time of application

Table 2: Irrigations per month and effluent volumes applied.

Month	Irrigations per month (days)	Effluent volumes applied (mm)
July 2020	15	12.0
August	8	12.0
September	0	0
October	24	12.0
November	25	12.0
December	14	12.0
January 2021	0	0 [1]
February	14	8.0
March	29	8.3
April	29	9.5
May	21	7.5 [2]
June	23	6.5 [2]

[1] No irrigations occurred in January to mid-February as the farm was shut up for either maize or pasture crops.

[2] Two irrigators (Dribble Bar & Rain Gun operating), application depths as low as 3.2mm per day.

c) Area (ha) that effluent is applied to

For effluent application purposes, the farm is divided into six blocks, totalling ~105 ha. The annual effluent volumes applied to these blocks is shown in Table 3. During the year, much of the internal fencing has been removed to allow for longer uninterrupted irrigation runs. The average annual application depth for 2020/21 was 21mm.

Table 3: Block areas and annual effluent volumes applied.

Block	Effective Area (ha)	Effluent volume applied (mm)
Main Road	6.5	29.1
Arawhata	21.0	16.3
Centre	34.0	12.2
Ron's	14.0	29.8
Sand Dunes	21.0	31.6
Cliff Tops	8.5	24.3

d) Method of irrigation

The effluent flushed from the Piggery is pumped to a storage pond prior to land application. Three different delivery systems were used during 2020/21:

1) 'Weta' travelling rain gun – this was used to apply effluent at depths of 8-12mm each month of the year with the exception of January to mid-February and September, across the bulk of the land (~93.5 ha). From May 2021, its use was restricted to Sand Dunes block.

2) Dribble bar - from May 2021 this new effluent application system attached to the tractor was employed. The immediate effect of this was that application depths were significantly lowered (3-5mm) and there was now proof of placement (buffer zones from roadways, waterways, etc, were automatically factored in).

3) Slurry tanker – this is used for applying effluent (~8mm) at strategic times of the year to minimise odour to the areas beside the South Road and close to houses, as well as at the back of the farm along Arawhata Road, that is also close to a neighbours' house. The total area applied was ~11.5ha.

e) Total Nitrogen and Potassium in effluent

Limited data is available on the nitrogen and potassium concentrations in the piggery effluent for 2020, however from February 2021 samples were collected on a more regular basis for chemical analysis. These results are summarised below (Table 4). The highest nutrient concentrations were in the April when the pond level was at its lowest.

Table 4: Mean nutrient composition of piggery effluent (n=8) plus 95% Confidence Interval.

Nutrients in Piggery Effluent	Mean (g/m3)	95% C.I. (g/m3)
Nitrogen	745	110
Phosphorus	186	75[1]
Potassium	280	16
Calcium	781	1289[1]
Magnesium	96	75[1]
Sodium	84	12

[1] One sampling (April 2021) had outlier values for P, Ca & Mg; e.g., Ca values normally ranged between 89-124, but were 4000 at the April sampling.

f) Type of crops grown

Two crops were grown under the Cut and Carry system in 2020/21: Maize Silage and Permanent Pasture in the sequence outlined in Table 5.

The Maize Silage paddocks (38 ha) were cultivated and planted in October, then harvested in April, yielding around 21 tonnes DM/ha. An annual ryegrass was then planted as a cover crop, over the cooler/wetter months, and harvested as grass silage in late September/early October yielding ~4.3 tonnes DM/ha.

On the Permanent Pasture areas, 43.5 ha of pasture was mown, with the first crop removed as baleage (65% DM, wrapped silage) yielding ~163 tonnes DM total, and the remaining two crops converted into haylage (81% DM) yielding ~270 tonnes DM total.

Table 5: Growing sequence of Cut and Carry crops.

Cut & Carry (Area)	J	A	S	O	N	D	J	F	M	A	M	J
Maize & Annual (38 ha)	Annual ryegrass			Maize silage							Annual	
Permanent Pasture (43.5 ha)	Baleage (12's)			Haylage (15's)				Haylage (15's)				

g) Management of cut and carry operation

The feed grown on-farm and then sold off-farm, for 2020/21, was as follows (Table 6).

Table 6: Dry matter yields of Cut and Carry crops.

Harvested Feed	Feed Amount	Average DM Yield	Area (ha)	DM removed (tonnes)
Maize silage	38 ha	21,150 kg/ha	38.0	803.7
Grass silage	38 ha	4,310 kg/ha	38.0	163.8
Baleage (12's)	680 bales	240 kg/bale [1]	43.5	163.2
Haylage (15's)	900 bales	300 kg/bale [2]	43.5	270.0

[1 & 2] Feed Supplement data from Beef+LambNZ Factsheet (2017)

Composite feed samples of each crop were collected and analysed by Hill Laboratories so that nutrient uptake removal off-farm could be calculated (Table 7).

Table 7: Nitrogen & potassium concentrations and total N and K removed in the Cut and Carry system.

Harvested Feed	N (% in DM)[1]	K (% in DM)[1]	N uptake (kg)	K uptake (kg)
Maize silage	1.20	0.90	9,644	7,233
Grass silage	1.70	2.80	2,785	4,587
Baleage (12's)	1.80	2.50	2,938	4,080
Haylage (15's)	1.60	1.60	4,320	4,320

In total, 19,687 and 20,220 kg's of N and K respectively were removed off-farm in the harvested feed.

Nutrient Management

The resource consent also includes special conditions for nutrient management viz:

Special condition 10. The Total Nitrogen applied to any hectare of land shall not exceed: (a) 400 kilograms in any 12-month period for 'cut and carry areas'; or (b) 200 kilograms in any 12-month period for any other land (including grazed pasture).

Special Condition 11. The total Potassium applied to any hectare of land shall not exceed: (a) 300 kilograms in any 12-month period for 'cut and carry areas'; or (b) 100 kilograms in any 12-month period for any other land (including grazed pasture).

Maize Silage and Grass Silage

Piggery effluent was applied to the Maize Silage areas supplying 174 kg N/ha and 65 kg K/ha; Fertiliser N was also applied at sowing of the maize and for the annual ryegrass (100 kg N/ha) (Table 8). No potassium fertiliser was applied.

Permanent Pasture

The total nutrients for the Baleage and Haylage Cut and Carry crops were applied solely as piggery effluent and calculated to be 140 kg N/ha and 52 kg K/ha (Table 8).

Nutrient balance

Table 8 summarises the nutrient inputs and outputs for the Cut and Carry operations.

Table 8: Summary of nutrient inputs and outputs (kg/ha).

Cut & Carry Crops	Area (ha)	Inputs		Outputs	
		N	K	N	K
Maize silage & annual grass	38.0	174	65	327	311
Baleage & haylage	43.5	140	52	167	193

The N and K inputs applied were below the consented maximum limits for the Cut and Carry operation, and, furthermore, the outputs of N and K were greater than the inputs.

Soil tests

Soil samples have been collected (0-15cm depth) and analysed for available mineral N and Quick Test K. Results from 2018, 2020 and 2021 (n=5) are presented in Table 9 and show there has been no accumulation of N and K in these soils.

Table 9: Average nitrogen & potassium concentrations in soils since 2018.

Soil analysis (0-15 cm)	2018	2020	2021
Available nitrogen (kg/ha)	206	192	194
Potassium (MAF QT units)	7.8	7.0	8.4

Livestock

A number of dry stock animals are carried on the farm to control pastures both inside and outside the Cut and Carry areas. Note that the Sand Dunes block receives effluent but is solely grazed by livestock. Table 10 summarises the number of animals and their duration on the property during 2020/21.

Table 10: Livestock carried on-farm during 2020-21.

Stock Class	Number carried	Average LWT (kg)	Total LWT (kg)	Time on Farm (months)
R2 steers	11	400	4,400	12
R1 heifers	139	185	25,715	12
Winter grazers	200	425	85,000	3
Total			**115,115**	

During 2020/21, the R1 autumn calves were brought onto the property (100 kg liveweight (LWT)) and it is planned to graze these on the farm and then sell them at around 20 months of age (600 kg LWT).

Bob Longhurst & Dr Doug Edmeades
Monday, 10 January 2022