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Farm Scenario Plan

2015/18 Averaged Nutrient Budget & Report

Prepared by Mark Crawford
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CNMA
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60827342
Piobiare Homestead Ltd (Runoff)
LOCHIEL-BRANXHOLME ROAD RD 4
INVERCARGILL; 9874
10/07/2019

Reviewed by Arron Hutton (Certified Nutrient Management Adviser)

Executive Summary

Nelson, Roseanne and Chris Pyper have requested an OVERSEER® Nutrient Budget on behalf of Piobiare Homestead Ltd to reflect the current and proposed nutrient losses from their runoff property, in preparation for a change in land use consent involving Aerodrome Dairy Farm. The farm is located at 939 Lochiel Branxholme Road RD 4 Invercargill and is approximately 15 km from the South west Coast. The runoff property has a mixture of dry milking cows wintered and replacement heifers reared from Rising 1 year old through to in calf heifers wintered during June to August and September.

- The average N loss from the root zone from the ***current farm system*** was calculated using OVERSEER® (v6.3) to be **4,699 kg N/year or 28 kg N/ha/year**. The N loss from the root zone from the ***proposed farm system*** was calculated using OVERSEER® (v6.3) to be **4,385 kg N/year or 27 kg N/ha/year**
- The averaged P loss from the root zone from the ***current farm system*** was calculated using OVERSEER® (v6.3) to be **121 kg P/year or 0.7 kg P/ha/year**. The P loss from the root zone from the ***proposed farm system*** was calculated using OVERSEER® (v6.3) to be **118 kg N/year or 0.7 kg N/ha/year**

Key Nitrogen nutrient loss pathways are the N loss from winter grazing of crops, the free draining Waikiwi soils, with the Paroa soils providing a degree of buffering from Nitrogen leaching. Key Phosphate nutrient loss pathways are the P losses from effluent applications and cropping of these heavier silt loams (Paroa). Direct losses to water ways from tile drains are also a major risk to this farm.

Current and proposed key mitigations are;

- the wintering barn and its proposed extended use over the shoulder months in autumn and spring,
- the more than adequate effluent area and storage of effluent which is applied at the most appropriate times when pastures are actively growing,
- the slight reduction in stocking with the proposal, given the move to grazing Aerodrome farms diary stock only and extended use of the barn.

The associated input parameter reports (for the nutrient budget) are available in a separate document upon request.

Overseer nutrient budgets Version 6.3.1 have been used to create the nutrient budgets presented in this report.

Overseer modelling of the current and proposed system has been undertaken in accordance with the Overseer 6.3.1 '*Best Practice Data Input Standards*' and has been reviewed by a Certified Nutrient Management Advisor. The following report summarises the respective Overseer 6.3.1nutrient budgets and key assumptions made

Contents

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Mark Crawford

Senior Farm Environment Consultant

Dated: 10th July 2019

General

Aim and Purpose of Farm Scenario Plan

Nelson, Roseanne and Chris Pyper have requested an OVERSEER® Nutrient Budget on behalf of Piobiare Homestead Ltd to reflect the current and proposed nutrient losses from their runoff property, in preparation for a change in land use consent involving Aerodrome Dairy Farm. The farm is located at 939 Lochiel Branxholme Road RD 4 Invercargill and is approximately 15 km from the South west Coast. The total farmed area has been calculated as 165.1 ha, with productive areas forming 156.7 ha. Titled area calculated is 178.26 ha, less 18.51 ha of leased land not farmed, plus 2.6 ha of land is outside of the titled area and has been blocked and identified appropriately as '*FNO*' in OVERSEER® modelling where it is farmed, plus 2.8 ha identified as outside the title area drawn but is owned and farmed. The effective area is of flat topography.

Soil types on the farm are varied and include;

Soil type	Area (ha)	Soil classification	Texture	Drainage status	PAW (0-30 cm)	PAW (0-60 cm)
Paroa_4a.1	96.0	Recent Gley	Silt Loam	Poor draining	99.3	177.7
Waikiwi_30a.1	38.1	Firm Brown	Silt Loam	Well drained	63.8	117.1
Waikiwi_34a.1	29.9	Firm Brown	Silt Loam	Well drained	63.1	112.2
Woodlands_29a.1	1.1	Mottled Brown	Silt Loam	Imperfectly draining	61.1	106.6
Total	165.1					

All soils information taken from Landcare S-Maps.

Property Details

Location/address	939 Lochiel Branxholme Road RD 4 Invercargill 9874
Legal Description	Lot 2 Deposited Plan 429633 and Section 2 Survey Office Plan 385656 and Section 2 Block III New River Hundred and Part Section 3 Block III New River Hundred; Lot 1 Deposited Plan 7084 and Section 30, 39 Block II New River Hundred and Part Section 14-16, 38 Block II New River Hundred
Total area (ha) Titled Area (ha) Leased Area (ha) Non titled farmed (ha)	165.1 (including 2.6 ha on non-titled land) 177.2719 ha titled; 178.26635 ha calculated plus additional 2.8 ha owned 43.27 ha not including 18.51 ha kept by lessor 2.6 ha
Contact details	Nelson & Rosanne & Chris Pyper
Phone	Phone (03) 2217307 Cell (027) 5354005
Farm Type	Dairy Support Runoff

Averaged 2015-18 Farm System Analysis

Description of Current Farm System

The 165.1 ha property is operated as a dairy support runoff, with 654 mixed age cows bought back on farm from the Aerodrome dairy platform from the end of May, with 400 entering the wintering barn and the remainder fed on crop. The cows on crop return back to Aerodrome first, as they transition on crop, whilst the indoor fed cows are sent back as they calve. Cows have been modelled the same as Aerodrome, as Friesian X, with average mob weight of 475 kg. Weaned R1 Replacement dairy heifers (200) are brought from Aerodrome over November and December at 100kg, are wintered twice, with half the in calf heifers going back to Aerodrome in July, the remainder are staggered back from late July. A further mob of replacement heifers (175) are grazed for a dairy farmer for the first winter before being sent back in mid-August. A small mob of dairy cross beef calves are also reared from weaning (100 kg LW) through to slaughter prior to their second winter at between 270 to 300 kg carcass (modelled 285 kg c/c). Notre a small mob of neighbours sheep are used to graze the riparian areas.

Stock Numbers:

Stock class	Start LW	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	End LW
R1 Dairy replacements	100	0	0	0	0	100	151	200	199	199	199	198	198	240
R2 Dairy replacements	240	198	198	197	197	197	197	196	196	196	195	195	195	450
R1 Dairy replacements	100					90	175	175	175	175	175	175	174	240
R2 Dairy replacements	240	174	45											260
Heifers	450	76	10	0	0	0	0	0	0	0	0	0	0	460
Heifers & Cows	455												400	465
Heifers & Cows	465	400	286	17										480
Dairy cows grazing	475	0	0	0	0	0	0	0	0	0	0	0	194	475
Dairy cows grazing	475	176	30	0	0	0	0	0	0	0	0	0	0	475
Weaners	100					12	12	12	12	12	12	12	12	260
Steers	260	12	12	12	12	12	12	12	12	12	12	12		285 c/c
Sheep	60			20	40		40	20		20	40		40	60
Total cows		652	286	17									594	

Climate

Climate data for the property has been sourced from Overseer's Climate Station Tool data and has been entered as annual rainfall: 1110 mm/year, PET: 734 mm/year and average temperature: 10 0^{o}C, based on location at latitude/longitude – 46.2774, 168.3056. Climate data has been modelled as per *Overseer Best Practice Input Data Standards*.

Structures

There is a wintering barn built on the property with a capacity to hold and winter inside 400 animals.

Wintering Barn details

Pad type	Covered animal shelter
Bunker Management	Rubber Mats (modelled no lining material as no other available option)
Bunker Cleaning Management	Scrapping with no water; Solids separated
Concrete feeding Apron present and used	Present and used
Time spent on concrete feed apron	4 hours
Bunker Cleaning Management	Scrapping with no water; Solids separated
Solids separated	Mechanical separation
Average Solid application rate Current system kg N/ha/year	39
Proposed solid application rate kg N/ha/year	38

Feeding Regime: Silage in wintering barn/pad only (% of dry dairy cattle animals per month)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Averaged seasons						55	55	40				
Proposed					30	45	48	75	60			

Effluent management

Effluent management details

Storage type	Holding pond
System	Umbilical cord or Slurry tanker with a dribble bar
Application area, ha	Home block paddocks 1-24 (90 % area applied)
Liquid application depth, mm	Less than 12 mm
Months liquid applied	October through to November after first silage cuts
Solids separated	Mechanical separation
Time in storage	Concrete bunker open, 5 months
Separated solids, months applied	Once a year, October to Effluent block
Pond emptied every year	Every year with liquids
Pond sludge, months applied	October & November
Pond sludge applied on	Effluent Block
Average Liquid application rate Current system kg N/ha/year	41
Proposed liquid application rate kg N/ha/year	39

Irrigation

The property has no irrigation.

Supplements

An estimated 468 Tonnes of silage DM is cut and stored in silage pits (concrete bunkers) and 124 T DM in baleage is cut and used for cattle on crop.

- 468 T DM silage is cut and stored in pits and 411 T DM is fed to cattle from storage on the wintering pad. This was the amount that the model would reported as being fed at very good utilisation, which was used given the concrete indoor feeding bins.
- 100 T DM of baleage is cut and fed from storage to cattle on pastoral blocks, with an added 24 T DM cut, stored and fed to cattle on crop blocks.

Fertiliser

Fertiliser applications have been modelled from Ravensdown sales records and farmer information, and are based on average monthly rates, averaged across the 3 years and the farm blocks. The total fertiliser nitrogen applied is 155 kg N/ha/year and 141 kg N/ha/year for the Non effluent and Effluent farm blocks and 139 kg N/ha/year across all blocks (whole property) on average

Pastoral blocks

Month	Material	NPKS (kg nutrient/ha)
August	Fertiliser product – Urea	12 – 0 – 0 – 0
September	Fertiliser product – Urea	10 - 0 - 0 – 0
October	Fertiliser product – Urea#	5 – 0 – 0 – 0 or 8 – 0 – 0 - 0
October	Fertiliser product – 10 % Potash Superphosphate	0 – 20 – 12 – 25
November	Fertiliser product – Urea#	12 – 0 – 0 – 0 or 20 – 0 – 0 - 0
December	Fertiliser product – Urea	20 – 0 – 0 – 0
December	Fertiliser product – 15 % Potash Superphosphate	0 – 23 – 22 – 28
December	*Fertiliser product – 15 % Sulphur Superphosphate*	*0 – 13– 0 – 22***
January	Fertiliser product – Urea	26 – 0 – 0 – 0
February	Fertiliser product – Urea	15 – 0 – 0 – 0
March	Fertiliser product – Urea	31 – 0 – 0 – 0
April	Fertiliser product – Urea	12 – 0 – 0 – 0
	Total	141-43-35-53 or 155-43-33-53
	Total Effluent Proposal	*141-33-12-47*

Non effluent rates different, tabulated last. ** Proposed rate with added P&K from additional effluent from shed

Soil Test Results

Soil test results presented below are averages of results 2017-2018 between the two blocks, with default values for the riparian edges grazed by sheep.

Blocks	Olsen P	QTK	QT Ca	QT Mg	QT Na	Org S
Effluent Block	37	11	9	16	9	13
Non Effluent & Lease	34	7	10	13	10	12
Riparian block	16	7	7	21	8	7

Pasture Production

The predominant pasture species on the dairy farm is ryegrass/white clover. Annual pasture production has been weighted by relative productivity.

Blocks	Relative productivity	% pasture eaten	Utilisation %	T DM/ha/year
Effluent Non Effluent Home Blocks	1.0	100% dairy grazers	70	12.7
Lease, House Blocks	0.9	100% dairy grazers,	70	11.5
Riparian blocks	0.9	Riparian 100 % sheep only	70	10.8

It should be noted that this estimated pasture production is based on default South Island pasture ME values and may be different to actual ME values and utilisation values on this farm which in turn would influence estimated pasture production.

Crop Rotations

During the 2015-2018 period, 17.6 ha was used for cropping (26.4 ha modelled with rounding error including Young grass crop block) – with fodder beet sown, grazed and cropped twice before being re sown into permanent pasture. The crop blocks modelled were based on the two key soil types pro rata (Paroa_4a.1 and Waikiwi_30a.1 (1st Year crop, 2nd year crop or Fodder beet to Fodder beet and Young grass). Where the block was previously in pasture, conventional cultivation was used in the month of October. Re cropped blocks conventional cultivation occurred in the month of sowing (November). The farm practice in the last three years was to crop the Effluent soils.

Pasture to Fodder Beet: (8.8 ha)

Blocks Paro_4a.1 and Waiki_30a.1 1st Yr FBt were used to model the crop rotation.

- Fodder beet is sown in November after conventional cultivation, grazed in situ in June through to September by the cattle and dairy replacement heifers.
- Sown with a soluble fertiliser mix of NPKS rating (37-28-75-15)as a base and drilled with Crop master DAP (NPKS 30-34-0-2) plus two further applications of Urea at 100 kg/ha are made in December and February.
- Yields are averaged at 26 T DM/ha

Fodder Beet to Fodder Beet: (8.8 ha):

Blocks FB>FB Paro_4a.1, FB>FB Waiki_30a.1, were used to model this crop rotation

- The data entered is the same as for the crop blocks above.

Young Grass: (8.8 ha):

Blocks Waiki_30a.1 YG was used to demonstrate this crop rotation.

Crop blocks were modelled as 6 years in pasture given the 17.6 ha (not counting the Young grass) cropped from the 110.7 ha of home blocks available, with a crop rotation final month being September.

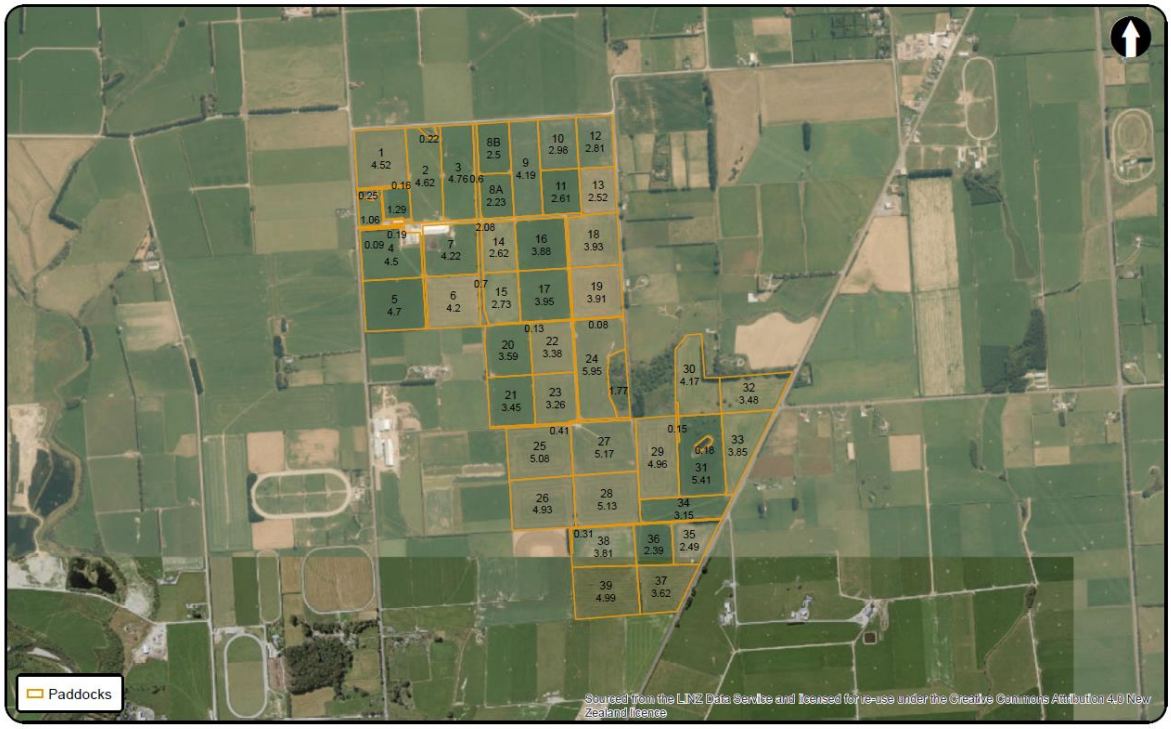
Artificial Drainage

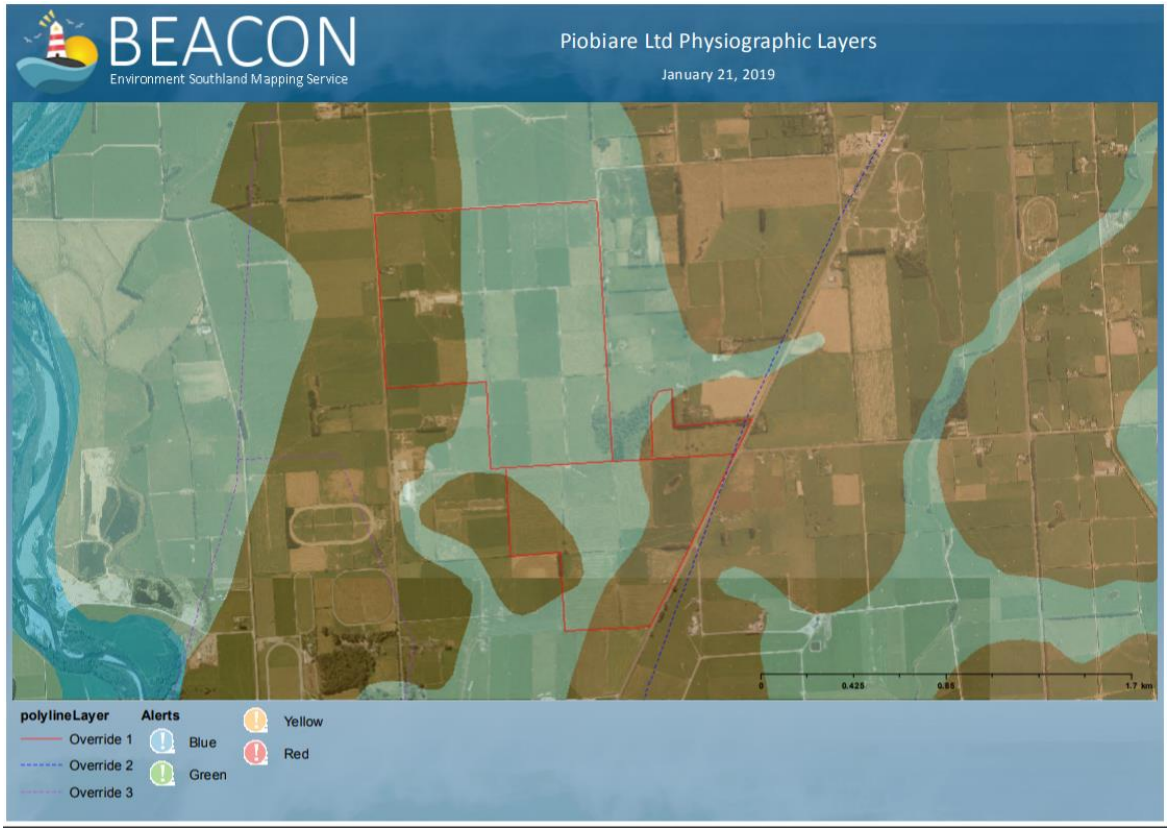
The farm is described by the owner as having tiles throughout the property, with imperfectly and poor draining blocks modelled as mole and tiled for 100 % of block, and the Waikiwi well drained soils at 50 % effectively drained

Management Unit details and Soil Information

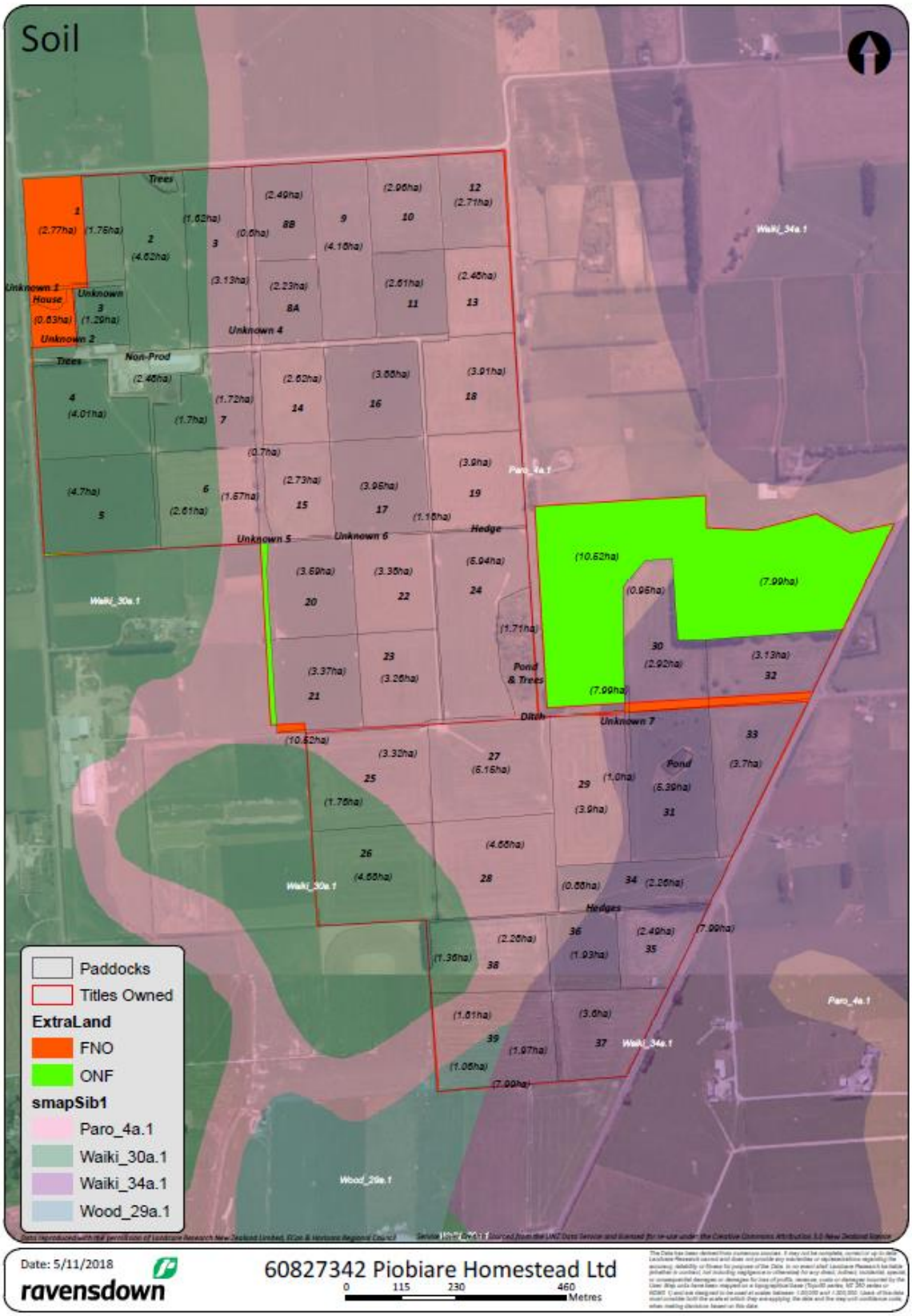
Block Name	Stock	Block Type	Soil Order & Texture	Drainage Class	Effluent	PAW (0-60cm)	Effective Area (ha)
Paro_4a.1 Effluent	Dairy grazers	Pastoral	Recent Gley Silt loam	Poor	Yes	177.7	47.4
Waiki_30a.1 Effluent	Dairy grazers	Pastoral	Firm Brown Silt Loam	Well drained	Yes	117.1	16.8
Paro_4a.1 Non Eff	Dairy grazers	Pastoral	Recent Gley Silt loam	Poor	No	177.7	13.4
Waiki_30a.1 Non Effluent	Dairy grazers	Pastoral	Firm Brown Silt Loam	Well drained	No	117.1	6.9
Paro_4a.1 Non Eff Lease	Dairy grazers	Pastoral	Recent Gley Silt loam	Poor	No	177.7	10.3
Waiki_30a.1 Non Eff Lease	Dairy grazers	Pastoral	Firm Brown Silt Loam	Well drained	No	117.1	1.5
Waiki_34a.1 Non Eff Lease	Dairy grazers	Pastoral	Firm Brown Silt Loam	Well drained	No	112.2	28.6
Wood_29a.1 Non Eff Lease	Dairy grazers	Pastoral	Firm Brown Silt Loam	Imperfect	No	106.6	1.1
Trees and Scrub 1	N/A	Trees and Scrub	Recent Gley Silt loam	Poor	No	177.7	2.5
Riparian 1	N/A	Riparian	Recent Gley Silt loam	Poor	No	177.7	1.1
Waiki_34a.1 Non Eff Lease FNO	Dairy grazers	Pastoral	Firm Brown Silt Loam	Well drained	No	112.2	0.9
Waiki_30a.1 Hse Pdks	Dairy grazers	Pastoral	Firm Brown Silt Loam	Well drained	No	117.7	2.5
Riparain sheep	Sheep	Pastoral	Recent Gley Silt loam	Poor	No	177.7	0.8
Paro_4a.1 FBt>FBt	Dairy grazers	Crop	Recent Gley Silt loam	Poor	No	177.7	6.5
Waiki_30a.1 FBt>FBt	Dairy grazers	Crop	Firm Brown Silt Loam	Well drained	No	117.1	2.3
Paro_4a.1 1st Yr FBt	Dairy grazers	Crop	Recent Gley Silt loam	Poor	No	177.7	6.5
Waiki_30a.1 1st Yr FBt	Dairy grazers	Crop	Firm Brown Silt Loam	Well drained	No	117.1	2.3
Waiki_30a.1 YG	Dairy grazers	Crop	Firm Brown Silt Loam	Well drained	No	117.1	2.3
Paro_4a.1 YG	Dairy grazers	Crop	Recent Gley Silt loam	Poor	No	177.7	6.5
Non-Productive	-	-	-	-	-	-	4.8
Total							**165.1**

Farm Physiographic Land Management Unit Maps

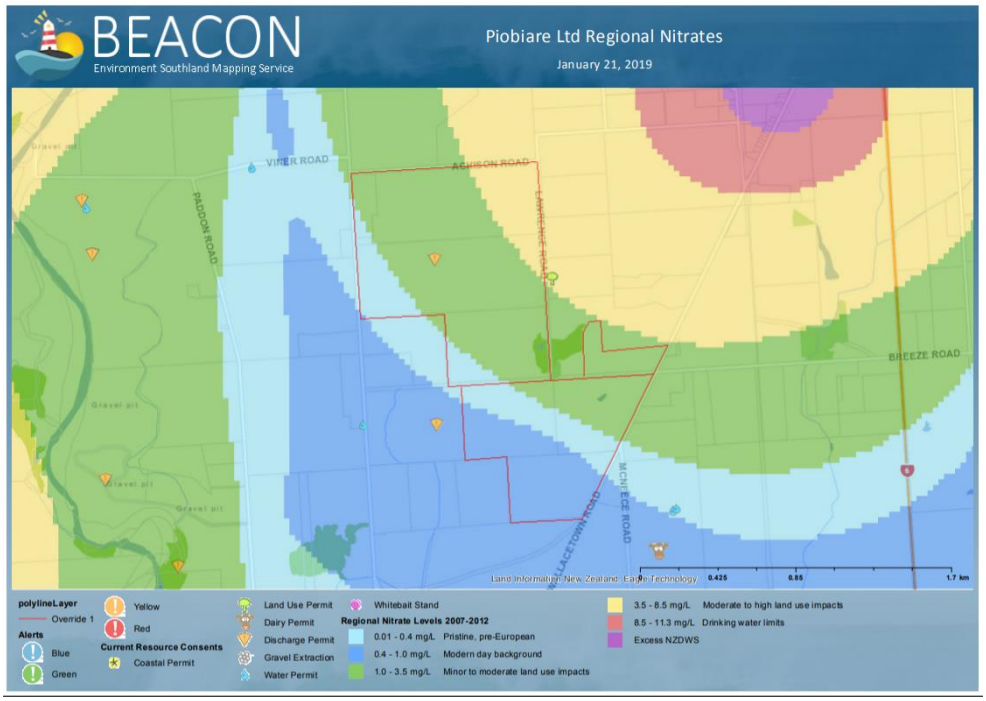




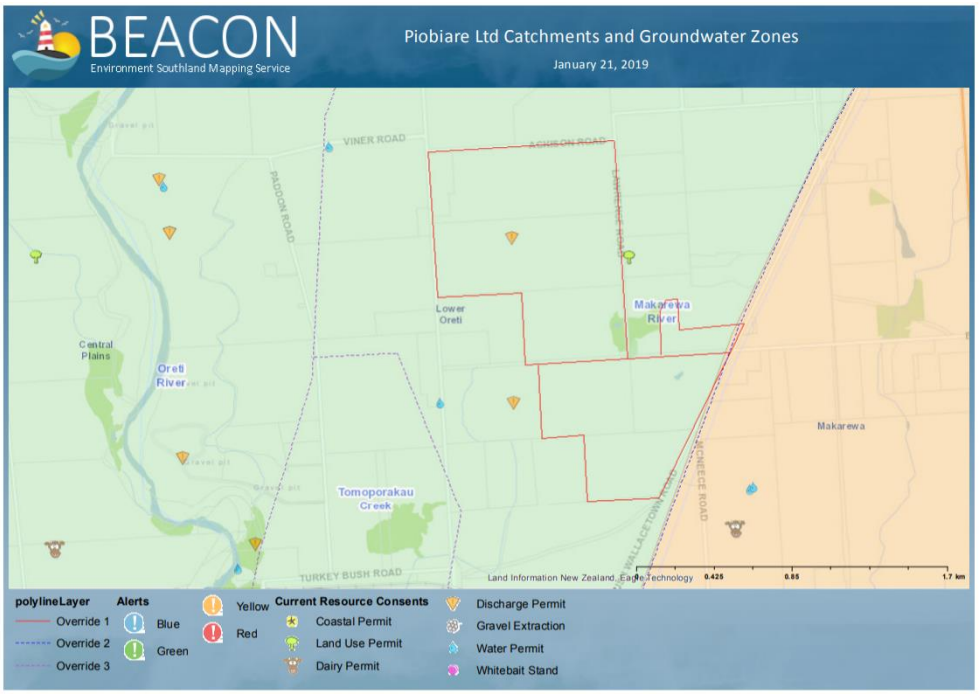
Soil and Slope Maps



Nitrate and Catchment Zone Maps



Farm chiefly lies in nitrate zones which range from pristine pre European to Modern day background to minor to moderate land use impacts.



The farm lies within the Lower Oreti ground water zone, under Alluvial gravels in the Makarewa River sub catchment of the Oreti Catchment

Proposed Farm System Analysis

Description of Proposed Farm System

The farm is proposed to be *used solely for the carrying of the Aerodrome dairy farm increased numbers of wintered dairy cows and young stock*. The effluent area and wintering barn capacity remains the same, with the added ability to use the wintering barn over the May and September periods *for other dry stock*. The cropping area is to remain on the home block still and the effluent block mainly, with the *additional cows and heifers wintered on a slightly increased crop area which is averaged pro rata across the two key soil types*. ***There will be 18 ha of fodder beet grown***.

The 165.1 ha property is operated as a dairy support runoff, with ***670*** mixed age cows bought back on farm from the Aerodrome dairy platform from the end of May, with 400 entering the wintering barn and the remainder ***(270)*** fed on crop. The cows on crop return to Aerodrome firstly as they transition on crop, whilst the indoor fed cows are sent back as they calve. Cows have been modelled to align with the Aerodrome proposal, with higher numbers retained on Piobiare and lower dry cows carried on Aerodrome, as Friesian X with average mob weight of 475 kg. Weaned R1 Replacement dairy heifers ***(225)*** are brought from Aerodrome over November and December at 100kg, are wintered twice with the ***same number*** of in calf heifers going back to Aerodrome in July, the *increased numbers remaining* are staggered back from late July. The same small mob of dairy cross beef calves are also reared from weaning (100 kg LW) through to slaughter prior to their second winter (again modelled 285 kg c/c).

Stock Numbers:

Stock class	Start LW	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	End LW
R1 Dairy replacements	100	0	0	0	0	0	190	225	223	223	223	220	220	240
R2 Dairy replacements	240	220	220	219	219	219	219	218	218	218	215	215	215	450
Heifers	450	93	0	0	0	0	0	0	0	0	0	0	0	460
Heifers & Cows	455												400	465
Heifers & Cows	465	400	315	25										480
Dairy cows grazing	475	0	0	0	0	0	0	0	0	0	0	0	270	475
Dairy cows grazing	475	252	85	0	0	0	0	0	0	0	0	0	0	475
Weaners	100					8	8	8	8	8	8	8	8	260
Steers	260	8	8	8	8	8	8	8	8	8	8	8		285 c/c
Weaner bulls	100						28	28	28	28	28	28	28	250
Bulls R 2 Yr	250	28	28	28	28	28	28	25	25	25	25	25	25	470
Bulls	470	25	25	25	25	25								280
Sheep	60			20	40		40	20		20	40		40	60
Total Cows		745	405	35									670	

Structures

There is a wintering barn built on the property with a capacity to hold and winter inside approximately 400 animals. *There will a change in use of this structure with the aim to further mitigate losses on farm by using this over the shoulders of the season (see table on page 8), with an **average** of 425 cows calculated as wintered over the period June to August, with the rest on crop. The current effluent system is capable of the additional effluent stored.*

In addition the effluent area remains at 90.7 ha, as the cropped area now rotates through some of the non-effluent areas of the home block. (See area differences in Land Management tables)

The management details of the Wintering Barn and Effluent, as well as the feeding regime, remains the same as is as reported in the current farm system table. The changes in the nutrient impacts are also reported in these past sections as well.

Supplements

An estimated 468 Tonnes of silage DM is cut and stored in silage pits (concrete bunkers) and 124 T DM in baleage is cut and used for cattle on crop.

- 468 T DM silage is cut and stored in pits and *468 T DM is fed* to cattle from storage on the wintering pad. This was the amount that the model would report on being fed at very good utilisation, which was used given the concrete indoor feeding bins.
- 100 T DM of baleage is cut and fed to cattle on pastoral blocks, with a further 24 T DM fed to cattle on crop blocks.

Supplementary feed made and fed during the season is similar, given the stocking rates over the total area and time spent on pasture are similar.

Pastoral Stock Unit details:

Stock Class Current System	Revised stock units/ha		Total revised stock units		
	Total farm	Grazed area	Total	Pasture eaten	Time on pasture
Sheep	0.1	0.1	12	12	12
Beef / dairy grazing	15.6	19.7	2,571	1,368	2,571
Total	**15.7**	**19.8**	**2,583**	**1,380**	**2,583**
Stock Class Proposed System	**Revised stock units/ha**		**Total revised stock units**		
	Total farm	**Grazed area**	**Total**	**Pasture eaten**	**Time on pasture**
Sheep	0.1	0.1	12	12	12
Beef / dairy grazing	16.0	20.4	2,651	1,213	2,651
Total	**16.1**	**20.5**	**2,663**	**1,225**	**2,663**

Fertiliser

There are very little change between the two systems modelled. The only modelled change is to reduce the phosphate and potassium on the pastoral effluent blocks by applying 150 kg/ha of 15 % sulphur superphosphate instead of the potassic superphosphate applied previously. The total fertiliser nitrogen applied is 155 and 141 kg N/ha/year for the Non effluent and Effluent farm blocks and 139 kg N/ha across all blocks (whole property) on average

Pasture Production

The predominant pasture species on the dairy farm is ryegrass/white clover. Annual pasture production has been weighted by relative productivity.

Blocks	Relative productivity	% pasture eaten	Utilisation %	T DM/ha/year
Effluent Non Effluent Home Blocks	1.0	100% dairy grazers	70	11.84
Lease, House Blocks	0.9	100% dairy grazers,	70	10.66
Riparian blocks	0.9	Riparian 100 % sheep only	70	10.37

It should be noted that this estimated pasture production is based on default South Island pasture ME values and may be different to actual ME values and utilisation values on this farm which in turn would influence estimated pasture production.

Crop Rotations

For the proposed period, 18.0 ha will be used for cropping – with fodder beet sown, grazed and cropped twice before being re sown into permanent pasture. The crop blocks modelled were based on the two key soil types pro rata (Paroa_4a.1 and Waikiwi_30a.1) on the currently owned farm property (1st Year crop, 2nd year crop or Fodder beet to Fodder beet and Young grass). Where the block was previously in pasture, conventional cultivation was used in the month of October. Re cropped blocks conventional cultivation occurred in the month of sowing (November). The farm practice is still to crop the Effluent soils mostly, ***with some non-effluent area now used but not the leased area***.

Pasture to Fodder Beet: (9.0 ha):

Blocks Paro_4a.1 and Waiki_30a.1 1st Yr FBt were used to model the crop rotation.

- Fodder beet is sown in November after conventional cultivation, grazed in situ in June through to September by the cattle and dairy replacement heifers.
- Sown with a soluble fertiliser mix of NPKS rating (37-28-75-15)as a base and drilled with Crop master DAP (NPKS 30-34-0-2) plus two further applications of Urea at 100 kg/ha are made in December and February.
- Yields are averaged at 26 T DM/ha

Fodder Beet to Fodder Beet: (9.0 ha):

Blocks FB>FB Paro_4a.1, FB>FB Waiki_30a.1, were used to model this crop rotation

- The data entered is the same as for the crop blocks above.

Young Grass: (9.0 ha):

Blocks Waiki_30a.1 YG and Paro_4a.1 were used to demonstrate this crop rotation.

Crop blocks were modelled as 6 years in pasture given the 18.0 ha (not counting the Young grass) cropped from the 101.9 ha modelled from 110.7 ha of home blocks available, with a crop rotation final month being September.

All other factors have remained the same.

Management Unit details and Soil Information: Table 1b

Block Name	Stock	Block Type	Soil Order & Texture	Drainage Class	Effluent	PAW (0-60cm)	Effective Area (ha)
Paro_4a.1 Effluent	Dairy grazers	Pastoral	Recent Gley Silt loam	Poor	Yes	177.7	55.2
Waiki_30a.1 Effluent	Dairy grazers	Pastoral	Firm Brown Silt Loam	Well drained	Yes	117.1	19.7
Paro_4a.1 Non Eff	Dairy grazers	Pastoral	Recent Gley Silt loam	Poor	No	177.7	11.0
Waiki_3oa.1 Non Effluent	Dairy grazers	Pastoral	Firm Brown Silt Loam	Well drained	No	117.1	4.5
Paro_4a.1 Non Eff Lease	Dairy grazers	Pastoral	Recent Gley Silt loam	Poor	No	177.7	8.5
Waiki_30a.1 Non Eff Lease	Dairy grazers	Pastoral	Firm Brown Silt Loam	Well drained	No	117.1	1.5
Waiki_34a.1 Non Eff Lease	Dairy grazers	Pastoral	Firm Brown Silt Loam	Well drained	No	112.2	24.0
Wood_29a.1 Non Eff Lease	Dairy grazers	Pastoral	Firm Brown Silt Loam	Imperfect	No	106.6	1.1
Trees and Scrub 1	N/A	Trees and Scrub	Recent Gley Silt loam	Poor	No	177.7	2.5
Riparian 1	N/A	Riparian	Recent Gley Silt loam	Poor	No	177.7	1.1
Waiki_34a.1 Non Eff Lease FNO	Dairy grazers	Pastoral	Firm Brown Silt Loam	Well drained	No	112.2	0.9
Waiki_30a.1 Hse Pdks	Dairy grazers	Pastoral	Firm Brown Silt Loam	Well drained	No	117.7	2.5
Riparain sheep	Sheep	Pastoral	Recent Gley Silt loam	Poor	No	177.7	0.8
Paro_4a.1 FBt>FBt	Dairy grazers	Crop	Recent Gley Silt loam	Poor	No	177.7	5.3
Waiki_30a.1 FBt>FBt	Dairy grazers	Crop	Firm Brown Silt Loam	Well drained	No	117.1	3.7
Paro_4a.1 1st Yr FBt	Dairy grazers	Crop	Recent Gley Silt loam	Poor	No	177.7	5.3
Waiki_30a.1 1st Yr FBt	Dairy grazers	Crop	Firm Brown Silt Loam	Well drained	No	117.1	3.7
Waiki_30a.1 YG	Dairy grazers	Crop	Firm Brown Silt Loam	Well drained	No	117.1	3.7
Paro_4a.1 YG	Dairy grazers	Crop	Recent Gley Silt loam	Poor	No	177.7	5.3
Non-Productive	-	-	-	-	-	-	4.8
Total							**165.1**

Summary of Current Farm System Scenario: Table 2

	Current scenario	Proposed Scenario
System Type	Dairy support runoff	Dairy support runoff
Total Area (ha)	165.1	165.1
Stocking rate (RSU/ha)*	19.8 /ha grazed 15.7 /ha total farm	20.5 /ha grazed 16.1 /ha total farm
N use (kg N/ha/year)	139 (averaged across the whole farm)	138 (averaged across the whole farm)
Supplements Imported (kg DM/ha/year)	3,585 kg DM/ha/yr. (total farm area), made on and 90 % fed back	3,585 kg DM/ha/yr. (total farm area), made on and all fed back
Pasture production (kg DM/ha/year)**	11,510 to 12,789 (Cattle blocks) 10,829 (Sheep riparian blocks) 8,954 to 9,055 (Young Grass)	10,656 to 11,841 (Cattle blocks) 10,374(Sheep riparian blocks) 8,330 to 8,426 (Young Grass)

*As calculated by OVERSEER and including dairy grazing and replacements**As calculated by OVERSEER with standard default and ME values which are likely to be lower than Southland Otago values.

Summary of Current Whole Farm Nutrient Loss Indicators: Table 3

	Current scenario	Proposed Scenario
Nitrogen leaching loss to water (Total kg N/year)	4,699	4,385
Nitrogen leaching loss to water (kg N/ha/year)	28	27
Phosphorus runoff to water (Total kg P/year)	121	118
Phosphorus runoff to water (kg P/ha/year)	0.7	0.7

Discussion on Whole Farm Nutrient Loss Indicators

From the information provided by Nelson, Roseanne and Chris on behalf of Piobiare Homestead Ltd, information from farm records, and the assumptions listed above, the N loss from the root zone and P loss to second order streams for the current modelled farm system is outlined below.

- The N loss from the root zone from the ***current farm system*** was calculated using OVERSEER® (v6.3) to be **4,699 kg N/year or 28 kg N/ha/year**.
- The N loss from the root zone from the ***proposed farm system*** was calculated using OVERSEER® (v6.3) to be **4,385 kg N/year or 27 kg N/ha/year**
- The P loss from the root zone from the ***current farm system*** was calculated using OVERSEER® (v6.3) to be **121 kg P/year or 0.7 kg P/ha/year**.
- The P loss from the root zone from the ***proposed farm system*** was calculated using OVERSEER® (v6.3) to be **118 kg N/year or 0.7 kg N/ha/year**

The key influences on N loss for the farm systems are discussed below.

- ***Grazing on fodder beet crop***

  The concentrations of urinary N on crops deposited with a moderate stocking rate during winter months may result in a high nitrogen load; thereby increasing the risk of N loss, particularly as this farm has some well-drained soils. This process is exacerbated when the crop is grazed over winter and then left fallow over spring, or on soils with less ability to buffer and are easily leached. The urinary N which has been deposited in the soil is not utilised for crop growth and therefore over the high rainfall period, that N is easily leached. This can be demonstrated by the high N loss value for the Waikiwi crop blocks with the rotation of FB to FB, and Pasture to FB, in comparison to the Paroa blocks of the same rotation, with losses being 110 and 94 kg N/ha/year and 82 and 70 kg N/ha/year respectively. In total, the crop blocks and young grass paddocks contribute 1,707 kg N/year or 36.3 % of the total N loss for the current system. This is very similar to the proposed system (1,773 kg N/year and 40.5 % of total N loss/year.

- ***Soil type and Potential Available Water (PAW)***

  The soil type has a large impact on N leached. The pastoral blocks with the highest N losses were the Waikiwi_30a.1 soil blocks due to the lower Potential Available Water (PAW) compared to the heavier and slower draining Paroa_4a.1 soils. The Potential Available Water is described as “the amount of water potentially available to plant growth that can be stored in the soil to specific soil depths. Soils with lower PAW are less able to buffer against changes in nitrogen losses to the bottom of the root zone and thus will typically have higher N leaching as there will be more frequent drainage from these soil for a given volume of water

applied. In addition these better buffered soils for N leaching are most at risk to sediment loss and overland flow on this farm, as discussed under P losses below.

- ***Pastoral productivity***

The higher the pastoral productivity from pastoral land and the associated higher stocking, the higher the risk of N losses on farms, especially under the climatic, rainfall and evapotranspiration rates for Southland. The current system has a similar stocking per ha on grass (19.8 rsu. /ha grazed) compared to the proposed system (20.5 rsu. /ha grazed) as seen in the table on page 19. This drives the pasture production required at 12,704 kg DM/ha/year and 11,808 kg DM/ha/year respectively as seen in table 2, page 19. This leads to the high amount of urine deposition on pastures from the resulting cattle intakes, resulting in increased risk from N leaching. The results point to a slightly reduced influence from direct losses in the proposal, with the amount of N loss attributed to leaching via tiles decreasing from 19 kg N/ha/year to 17 kg N/ha/year for the proposal, the rest are due to N losses from cropping and effluent applications (other sources) and leaching from urine patches (18 % or 5 kg N/ha/year and 18.5 % or 5 kg N/ha/year respectively for the current and proposed system).

The key influences on P loss for the farm system are discussed below:

The overall P loss risk is low to moderate at 121 kg P/year or 0.7 kg P/ha/year. This is due to the mostly flat topography and soil type. On a kg P/ha/year basis, the majority of the P losses arose from the gleyed soil (Paroa) under cropping or being applied with effluent solids and sludge (9 and 36 kg P/year respectively). These losses can be mitigated with riparian plantings which can remove any sediment before reaching water ways. Reducing stock treading and optimal P levels within these soils are also important factors and are current management practices being used by the current owners. Other sources (19 kg/year) of P loss are lanes and races. Riparian strip planting and vegetation buffer zones again are potential mitigation solutions to reduce this runoff.

The current scenario is rated 7.95, the mid side of category 1 (1 to 12) under the Soil versatility rating system (Landcare Research, 2002), as calculated in the table 4 below. The farm already uses a number of effective Nitrogen mitigation strategies to minimise losses for the proposal culminating in the results above.

Soil Vulnerability Land Management Rating and Physiographic Zones: Table 4

Soil Type (proposal)	Physiographic Zone	Soil Vulnerability	Vulnerability rating	% Farm	Rating score
Paroa_4a.1 aka. Dacre	Gleyed No variant	Moderate	10	58.1	5.81
Waikiwi_30a.1 aka. Edendale	Oxidising No variant	High	1	23.1	0.23
Waikiwi_34a.1	Oxidising Variant artificial drainage	Moderate	10	18.1	1.81
Woodlands_29a.1	Oxidising No variant	Moderate	10	0.7	0.1
Total				**100.0**	**7.95**

The property is situated in the Makarewa River sub catchment, and the Oreti catchment of the proposed Environment Southland Regional Water and Land Plan. It is 58.1% on a Gleyed physiographic zone, with no variants and the remainder is on Oxidising with no variant (23.8 %) and with a variant of artificial drainage (18.1 %). (See map, page 12&13 and table above), meaning the farm must attach significance to these zones in its environmental management. The farm is within zones having influence on nitrate levels within ground water in the range of pristine pre European to moderate to high land use impacts (Environment Southland Beacon map, page 14 of report). Water quality is characterised by alluvial gravels in the Makarewa groundwater management zone and the property is mostly within the Lower Oreti surface water zone. Implications of these environmental characteristics are largely unknown at present but some catchment areas will be required to reduce their impacts. The zonal information would point to the presence of nitrate leaching; and sediment loss as the key risk factors for these zones. An additional key risk factor for all soils is the direct losses of nitrogen through tiles which is the case here.

Mitigations current and modelled:

A summary of current good practice modelled are summarised from the discussions and report;

1. The farm has a wintering barn in which approximately 400 animals are fed in doors and the effluent captured, kept and applied when the pastures are growing (October/November after first cut of silage)
2. There will be additional use of the wintering barn over May and September for the younger stock in the proposal, reducing treading and N leaching losses, as urine is collected and applied at more appropriate times.
3. Given the above, in addition to the change in stock numbers, the stocking intensity is slightly reduced on pasture and there is little need for any additional nitrogen fertiliser from modelling
4. Effluent is stored and able to be applied at appropriate times. As well the area applied is more than adequate, given only 38 ha is required to apply 150 kg of N/ha from all effluent sources, with the current area modelled as 90.7 ha including crops.
5. Effluent applications to the highest risk soil (Paroa) during the highest risk periods could be minimised. This and the created Riparian strips and wetlands would be the activities which would be required to mitigate any overland flows and the direct losses from tile drains.

The associated input parameter reports (for the nutrient budget) are available in a separate document upon request.

Please see information contained in the Appendices for detail relating to nutrient budgets, nitrogen block reports, phosphorus block reports and estimated pasture production for the current situation and scenario modelled.

OVERSEER v6.2.1 onwards has a new irrigation module to better reflect the management practices of irrigators. The Best Practice Data Input Standards give some guidance on what is now required. The model requires more information from users about their irrigation system and how water application decisions are made on farm. The extra data needed includes depth of water per application; return time and depending on how soil water is monitored what are the trigger points and targets (mm deficit). Ideally, this data needs to be actual long-term average data as OVERSEER uses 30-year average climate data. Best estimates of these data will generally generate more drainage, and hence N loss to water, than has been the case with previous OVERSEER versions.

OVERSEER is a continually developing model with several aspects currently being investigated. In particular there are on-going issues in relation to the modelled nitrogen leaching from grazed crop blocks (and possibly forage blocks also) being less than expected. (Please see for more detail).

When future versions of OVERSEER are stipulated for use associated with Regional Council rules, both the current and the proposed farm systems will need to be re-modelled for consistency as the base N lost from the root zone may alter with updated OVERSEER versions.

Appendices

Current Farm System

Whole Farm Nutrient Budget

Farm nutrient budget

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	4,699	28
Phosphorus	121	0.7

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Fertiliser, lime and other	139	47	39	50	87	0	3
Irrigation	0	0	0	0	0	0	0
Supplements	0	0	0	0	0	0	0
Rain/clover fixation	32	0	3	6	4	9	46

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leached from root zone	28	0.7	11	69	54	10	28
As product	11	3	1	1	5	0	0
Transfer	0	0	0	0	0	0	0
Effluent exported	0	0	0	0	0	0	0
To atmosphere	56	0	0	0	0	0	0

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	48	9	5	-16	1	0	0
Inorganic mineral	0	4	-18	0	-2	-3	-3
Inorganic soil pool	5	31	33	0	32	2	25

Current Farm System Nutrient Loss Indicators

P report

Phosphorus summary

	TOTAL LOSS (KG)	LOSS PER HA (KG/HA)
PARO_4A.1 EFFLUENT	36	0.8
PARO_4A.1 NON EFF	10	0.7
PARO_4A.1 NON EFF LSE	8	0.7
RIPARAIN SHEEP	0	0.5
WAIKI_30A.1 EFFLUENT	6	0.4
WAIKI_30A.1 HSE PDKS	1	0.3
WAIKI_30A.1 NON EFF LSE	1	0.3
WAIKI_34A.1 NON EFF LSE	14	0.5
WAIKI_34A.1 NON EFF LSE FNO	0	0.5
WAIKI_30A.1 NON EFF	2	0.3
WOOD_29A.1 NON EFF LSE	1	0.5
PARO_4A.1 1ST YR FBT	8	1.3
PARO_4A.1 FBT>FBT	9	1.3
PARO_4A.1 YG	5	0.7
WAIKI_30A.1 1ST YR FBT	1	0.4
WAIKI_30A.1 FBT>FBT	1	0.4
WAIKI_30A.1 YG	1	0.2

N report

Farm N

Block N

Nitrogen summary

	TOTAL LOSS (KG)	LOSS PER HA (KG/HA)	N IN DRAINAGE (PPM)	N ADDED (KG/HA)	N SURPLUS (KG/HA)
PARO_4A.1 EFFLUENT	1005	21	5	219	139
PARO_4A.1 NON EFF	296	22	5	155	113
PARO_4A.1 NON EFF LSE	204	20	5	155	101
RIPARAIN SHEEP	11	13	3	0	124
WAIKI_30A.1 EFFLUENT	403	24	6	219	141
WAIKI_30A.1 HSE PDKS	52	21	5	141	91
WAIKI_30A.1 NON EFF LSE	32	22	5	155	93
WAIKI_34A.1 NON EFF LSE	649	23	5	155	102
WAIKI_34A.1 NON EFF LSE FNO	19	21	5	155	86
WAIKI_30A.1 NON EFF	171	25	6	155	115
WOOD_29A.1 NON EFF LSE	27	24	6	155	119
PARO_4A.1 1ST YR FBT	457	70	15	159	163
PARO_4A.1 FBT>FBT	532	82	17	159	163
PARO_4A.1 YG	170	26	5	199	66
WAIKI_30A.1 1ST YR FBT	216	94	19	159	163
WAIKI_30A.1 FBT>FBT	253	110	21	159	163
WAIKI_30A.1 YG	79	34	7	199	46

Pasture Production, Effluent and Other Values Reports and Stock number record

Pasture/crops

	PASTURE/CROP	YIELD	GROWTH (KG DM/HA)	INTAKE (KG DM/HA)	REMOVED (KG DM/HA)	UTILISATION (%)	TOTAL RSU
PARO_4A.1 EFFLUENT	Ryegrass/white clover	-	12789	5467	4979	70	9.85
PARO_4A.1 NON EFF	Ryegrass/white clover	-	12789	6393	3657	70	11.51
PARO_4A.1 NON EFF LSE	Ryegrass/white clover	-	11510	5475	3689	70	9.87
RIPARAIN SHEEP	Ryegrass/white clover	-	10829	7580	0	70	13.8
WAIKI_30A.1 EFFLUENT	Ryegrass/white clover	-	12789	5494	4940	70	9.9
WAIKI_30A.1 HSE PDKS	Ryegrass/white clover	-	11475	5233	4000	70	9.44
WAIKI_30A.1 NON EFF LSE	Ryegrass/white clover	-	11510	5257	4000	70	9.47
WAIKI_34A.1 NON EFF LSE	Ryegrass/white clover	-	11510	5463	3706	70	9.84
WAIKI_34A.1 NON EFF LSE FNO	Ryegrass/white clover	-	11510	4946	4444	70	8.92
WAIKI_30A.1 NON EFF	Ryegrass/white clover	-	12789	6416	3623	70	11.58
WOOD_29A.1 NON EFF LSE	Ryegrass/white clover	-	11510	5512	3636	70	9.94
PARO_4A.1 1ST YR FBT	Fodder beets |	25 T DM/Ha	0	0	0	0	0
PARO_4A.1 FBT>FBT	Fodder beets | Fodder beets |	50 T DM/Ha	0	0	0	0	0
PARO_4A.1 YG	Fodder beets | Pasture |	25 T DM/Ha	9055	3970	3385	70	7.17
WAIKI_30A.1 1ST YR FBT	Fodder beets |	25 T DM/Ha	0	0	0	0	0
WAIKI_30A.1 FBT>FBT	Fodder beets | Fodder beets |	50 T DM/Ha	0	0	0	0	0
WAIKI_30A.1 YG	Fodder beets | Pasture |	25 T DM/Ha	8954	3528	3913	70	6.37

Farm details

N: 4699 N/ha: 28 P: 121 P/ha: 0.7 GHG/ha: 9617 NCE: 58%

Total area	165.1 ha
Productive block area	156.60 ha
Nitrogen conversion efficiency (NCE)	58%
N Surplus	72 kg/ha
Region	Southland

GHG: Allocation to wool - breeding mob	0.21	Total liveweight sold (kg/ha grazed)	3551
GHG: Allocation to wool - trading mob	0.01	Percent male beef animals	3
Total liveweight brought (kg/ha grazed)	3237	Beef / dairy grazing stock rate (RSU)	2571
Total liveweight reared (kg/ha grazed)	795	Sheep stock rate (RSU)	12

Effluent report

The report shows rates and target areas for farm liquid effluent only, assuming it is all applied to pastoral blocks. It excludes any farm solid effluent or imported effluent that may be added to effluent blocks. If this occurs, then target areas may need to be increased.

CURRENT AREA RECEIVING LIQUID EFFLUENT	
Total area including crops	67 ha
Pastoral area receiving liquid	58 ha
% of farm pastoral area	44%
Average liquid effluent	38 kg N/ha/yr
Average fertiliser	141 kg N/ha/yr
Average other	38 kg N/ha/yr
AREA OF FARM TO APPLY ALL EFFLUENT TO ACHIEVE RATES OF	
150 kg N/ha/yr - Liquid	20 ha - based on the amount of effluent generated on the the farm and sprayed from sump.
150 kg N/ha/yr - Solid	18 ha
150 kg N/ha/yr - Total	38 ha
Maintenance K	180 ha
100 kg K/ha/yr	81 ha
SOURCE OF N IN EFFLUENT BLOCK(S)	
Effluent from farm dairy	0%
Effluent from Feed pad	0%
Effluent from Standoff pad	0%
Effluent from Uncovered wintering pad/shelter	52%
Solids	48%
Exported	0%

Current		LW	July	August	September	October	Novembe	December	January	February	March	April	May	June	LW
Aerodrome	Milking herd 1	475	0	137	480	577	579	579	578	577	577	557	520	0	475
	Milking herd 2	450	24	180	190	190	190	190	189	189	188	172	164	0	450
	Bulls 1	600	0	0	0	0	6	23	15	0	0	0	0	0	600
	Replacements 1	450	95	0	0	0	0	0	0	0	0	0	0	0	450
	Replacements 2	100	0	0	0	0	0	59	8	8	6	4	4	4	240
	Dairy grazing (milking cows) 1	475	18	146	101	13	0	0	0	0	0	0	0	0	475
	Weaners 1	240	4	4	2	2	2	1	0	0	0	0	0	0	420
	Total Cows		**137**	**463**	**771**	**780**	**769**	**769**	**767**	**766**	**765**	**729**	**684**	**0**	
Piobiare	Dairy grazing (replacements) 1	100	0	0	0	0	100	151	200	199	199	199	198	198	240
	Dairy grazing (replacements) 2	240	198	198	197	197	197	197	196	196	196	195	195	195	450
	Dairy grazing (replacements) 3	100	0	0	0	0	90	175	175	175	175	175	175	174	240
	Dairy grazing (replacements) 4	240	174	45	0	0	0	0	0	0	0	0	0	0	260
	Heifers and cows 1	450	76	10	0	0	0	0	0	0	0	0	0	0	460
	Heifers and cows 2	455	0	0	0	0	0	0	0	0	0	0	0	400	465
	Heifers and cows 3	465	400	286	17	0	0	0	0	0	0	0	0	0	480
	Dairy grazing (milking cows) 1	475	0	0	0	0	0	0	0	0	0	0	0	194	475
	Dairy grazing (milking cows) 2	475	176	30	0	0	0	0	0	0	0	0	0	0	475
	Weaners 1	100						12	12	12	12	12	12	12	260
	Steers	260	12	12	12	12	12	12	12	12	12	12	12		285 c/c
															Average
	Head numbers given		***1032***	***676***	***284***	***251***	***321***	***553***	***553***	***562***	***598***	***550***	***649***	***1088***	***593***
	Total Head		***1036***	***581***	***226***	***209***	***399***	***547***	***595***	***594***	***594***	***593***	***592***	***1173***	***595***
	Total Cows		**652**	**326**	**17**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**594**	
	Total cows incl Aero		**789**	**789**	**788**	**780**									
Proposed		**LW**	**July**	**August**	**September**	**October**	**Novembe**	**December**	**January**	**February**	**March**	**April**	**May**	**June**	**LW**
Aerodrome	Milking herd 1	475	0	201	552	645	645	645	645	645	645	590	480	0	475
	Milking herd 2	450	27	215	210	205	205	205	205	205	205	185	185	0	450
	Bulls 1	600	0	0	0	0	0	25	25	0	0	0	0	0	600
	Replacements 1	450	95	0	0	0	0	0	0	0	0	0	0	0	450
	Replacements 2	100	0	0	0	0	0	59	8	8	6	4	4	4	240
	Dairy grazing (milking cows) 1	475	13	64	83	12	0	0	0	0	0	0	0	0	475
	Weaners 1	240	4	4	2	2	2	1	0	0	0	0	0	0	420
	Total Cows		**135**	**480**	**845**	**862**	**850**	**850**	**850**	**850**	**850**	**775**	**665**	**0**	
Piobiare	Dairy grazing (replacements) 1	100	0	0	0	0	0	190	225	223	223	223	220	220	240
	Dairy grazing (replacements) 2	240	220	220	219	219	219	219	219	219	215	215	215	215	450
	Heifers and cows 1	450	93	0	0	0	0	0	0	0	0	0	0	0	460
	Heifers and cows 2	455	0	0	0	0	0	0	0	0	0	0	0	400	465
	Heifers and cows 3	465	400	315	25	0	0	0	0	0	0	0	0	0	480
	Dairy grazing (milking cows) 1	475	0	0	0	0	0	0	0	0	0	0	0	265	475
	Dairy grazing (milking cows) 2	475	252	85	0	0	0	0	0	0	0	0	0	0	475
	Weaners 1	100						8	8	8	8	8	8	8	260
	Steers	260	8	8	8	8	8	8	8	8	8	8	8		285 c/c
	Bull calves	100						28	28	28	28	28	28	28	250
	R 1 Bulls	250	28	28	28	28	28	28	28	25	25	25	25	25	470
	R 2 Bulls	470	25	25	25	25	25								300 c/c
															Average
	Total Head		***1026***	***681***	***305***	***280***	***280***	***481***	***516***	***511***	***507***	***507***	***504***	***1161***	***563***
	Total Head incl Aero		***1165***	***1165***	***1152***	***1144***	***1132***	***1416***	***1399***	***1369***	***1363***	***1286***	***1173***	***1165***	***1244***
	Total Cows		**745**	**400**	**25**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**665**	
	Total cows incl Aero		**880**	**880**	**870**	**862**	**850**	**850**	**850**	**850**	**850**	**775**	**665**		

Current System Parameter Report

This is available upon request as a separate document.

Proposed Farm System

Whole Farm Nutrient Budget

Farm nutrient budget

LOSSES FROM ROOT ZONE

	TOTAL LOSS (KG/YR)	LOSS PER HA (KG/YR)
Nitrogen	4,385	27
Phosphorus	118	0.7

NUTRIENTS ADDED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Fertiliser, lime and other	138	42	28	46	75	0	3
Irrigation	0	0	0	0	0	0	0
Supplements	0	0	0	0	0	0	0
Rain/clover fixation	27	0	3	6	4	9	46

NUTRIENTS REMOVED (KG/HA/YR)	N	P	K	S	CA	MG	NA
Leached from root zone	27	0.7	11	67	53	10	28
As product	11	3	1	1	5	0	0
Transfer	0	0	0	0	0	0	0
Effluent exported	0	0	0	0	0	0	0
To atmosphere	56	0	0	0	0	0	0

CHANGE IN POOLS (KG/HA/YR)	N	P	K	S	CA	MG	NA
Organic pool	53	9	5	-17	1	0	0
Inorganic mineral	0	4	-21	0	-2	-3	-3
Inorganic soil pool	5	27	33	0	23	3	24

Proposed Farm System Nutrient Loss Indicators

P report

Phosphorus summary

	TOTAL LOSS (KG)	LOSS PER HA (KG/HA)
PARO_4A.1 EFFLUENT	41	0.7
PARO_4A.1 NON EFF	8	0.7
PARO_4A.1 NON EFF LSE	6	0.7
RIPARAIN SHEEP	0	0.5
WAIKI_30A.1 EFFLUENT	7	0.3
WAIKI_30A.1 HSE PDKS	1	0.3
WAIKI_30A.1 NON EFF LSE	1	0.3
WAIKI_34A.1 NON EFF LSE	11	0.5
WAIKI_34A.1 NON EFF LSE FNO	0	0.5
WAIKI_30A.1 NON EFF	2	0.3
WOOD_29A.1 NON EFF LSE	1	0.5
PARO_4A.1 1ST YR FBT	7	1.3
PARO_4A.1 FBT>FBT	7	1.3
PARO_4A.1 YG	4	0.7
WAIKI_30A.1 1ST YR FBT	2	0.4
WAIKI_30A.1 FBT>FBT	2	0.4
WAIKI_30A.1 YG	1	0.2

N report

Farm N

Block N

Nitrogen summary

	TOTAL LOSS (KG)	LOSS PER HA (KG/HA)	N IN DRAINAGE (PPM)	N ADDED (KG/HA)	N SURPLUS (KG/HA)
PARO_4A.1 EFFLUENT	974	18	4	217	123
PARO_4A.1 NON EFF	193	18	4	155	92
PARO_4A.1 NON EFF LSE	133	16	4	155	81
RIPARAIN SHEEP	10	13	3	0	119
WAIKI_30A.1 EFFLUENT	559	28	7	217	215
WAIKI_30A.1 HSE PDKS	44	17	4	141	84
WAIKI_30A.1 NON EFF LSE	27	18	4	155	85
WAIKI_34A.1 NON EFF LSE	425	18	4	155	83
WAIKI_34A.1 NON EFF LSE FNO	16	18	4	155	78
WAIKI_30A.1 NON EFF	78	17	4	155	75
WOOD_29A.1 NON EFF LSE	23	21	5	155	116
PARO_4A.1 1ST YR FBT	363	68	14	159	163
PARO_4A.1 FBT>FBT	423	80	16	159	163
PARO_4A.1 YG	126	24	5	197	50
WAIKI_30A.1 1ST YR FBT	339	92	18	159	163
WAIKI_30A.1 FBT>FBT	397	107	21	159	163
WAIKI_30A.1 YG	126	34	7	197	80

Pasture Production, Effluent and Other Values Reports

Pasture/crops

	PASTURE/CROP	YIELD	GROWTH (KG DM/HA)	INTAKE (KG DM/HA)	REMOVED (KG DM/HA)	UTILISATION (%)	TOTAL RSU
PARO_4A.1 EFFLUENT	Ryegrass/white clover	-	11841	4560	5326	70	8.2
PARO_4A.1 NON EFF	Ryegrass/white clover	-	11840	5170	4455	70	9.31
PARO_4A.1 NON EFF LSE	Ryegrass/white clover	-	10656	4330	4471	70	7.8
RIPARAIN SHEEP	Ryegrass/white clover	-	10374	7262	0	70	13.22
WAIKI_30A.1 EFFLUENT	Ryegrass/white clover	-	11840	7400	1269	70	13.31
WAIKI_30A.1 HSE PDKS	Ryegrass/white clover	-	10634	4643	4000	70	8.36
WAIKI_30A.1 NON EFF LSE	Ryegrass/white clover	-	10656	4659	4000	70	8.38
WAIKI_34A.1 NON EFF LSE	Ryegrass/white clover	-	10656	4368	4417	70	7.86
WAIKI_34A.1 NON EFF LSE FNO	Ryegrass/white clover	-	10656	4348	4444	70	7.82
WAIKI_30A.1 NON EFF	Ryegrass/white clover	-	11841	4400	5556	70	7.91
WOOD_29A.1 NON EFF LSE	Ryegrass/white clover	-	10656	4914	3636	70	8.84
PARO_4A.1 1ST YR FBT	Fodder beets |	25 T DM/Ha	0	0	0	0	0
PARO_4A.1 FBT>FBT	Fodder beets | Fodder beets |	50 T DM/Ha	0	0	0	0	0
PARO_4A.1 YG	Fodder beets | Pasture |	25 T DM/Ha	8426	3256	3774	70	5.85
WAIKI_30A.1 1ST YR FBT	Fodder beets |	25 T DM/Ha	0	0	0	0	0
WAIKI_30A.1 FBT>FBT	Fodder beets | Fodder beets |	50 T DM/Ha	0	0	0	0	0
WAIKI_30A.1 YG	Fodder beets | Pasture |	25 T DM/Ha	8330	3750	2973	70	6.74

Farm details

N: 4385 N/ha: 27 P: 118 P/ha: 0.7 GHG/ha: 9680 NCE: 60%

Total area	165.1 ha
Productive block area	156.70 ha
Nitrogen conversion efficiency (NCE)	60%
N Surplus	67 kg/ha
Region	Southland

GHG: Allocation to wool - breeding mob	0.21	Total liveweight sold (kg/ha grazed)	3944
GHG: Allocation to wool - trading mob	0.01	Percent male beef animals	12
Total liveweight brought (kg/ha grazed)	3652	Beef / dairy grazing stock rate (RSU)	2651
Total liveweight reared (kg/ha grazed)	784	Sheep stock rate (RSU)	12

Effluent report

The report shows rates and target areas for farm liquid effluent only, assuming it is all applied to pastoral blocks. It excludes any farm solid effluent or imported effluent that may be added to effluent blocks. If this occurs, then target areas may need to be increased.

CURRENT AREA RECEIVING LIQUID EFFLUENT	
Total area including crops	76 ha
Pastoral area receiving liquid	67 ha
% of farm pastoral area	52%
Average liquid effluent	38 kg N/ha/yr
Average fertiliser	141 kg N/ha/yr
Average other	37 kg N/ha/yr
AREA OF FARM TO APPLY ALL EFFLUENT TO ACHIEVE RATES OF	
150 kg N/ha/yr - Liquid	22 ha - based on the amount of effluent generated on the the farm and sprayed from sump.
150 kg N/ha/yr - Solid	21 ha
150 kg N/ha/yr - Total	43 ha
Maintenance K	188 ha
100 kg K/ha/yr	92 ha
SOURCE OF N IN EFFLUENT BLOCK(S)	
Effluent from farm dairy	0%
Effluent from Feed pad	0%
Effluent from Standoff pad	0%
Effluent from Uncovered wintering pad/shelter	51%
Solids	49%
Exported	0%

Proposed System Parameter Report

This is available upon request as a separate document

Addendum:

Current Dairy System and Proposed System N & P Block Report comparison

Current	Area	Total N los	N lost to water	N in drainage	Added N **	Total P lost	P lost to water	Proposed		Total N lost	N lost to water	N in drainage	Added N **	Total P lost	P lost to water	N loss diffce	P loss diffce	N loss diffce	P loss diffce	N in Drge diffce
		kg N/yr	kg N/ha/yr	ppm	kg N/ha/yr	kg P/yr	kg P/ha/yr			kg N/yr	kg N/ha/yr	ppm	kg N/ha/yr	kg P/yr	kg P/ha/yr	kg N/yr	kg P/yr	kg N/ha/yr	kg P/ha/yr	ppm
Paro_4a.1 Effluent	47.4	1005	21	4.9	219	36	0.8	Paro_4a.1 Effluent	55.2	974	18	4	217	41	0.7	31	-5	3	0.1	0.9
Waiki_30a.1 Effluent	16.8	403	24	5.5	219	6	0.4	Waiki_30a.1 Effluent	19.7	559	28	6.5	217	7	0.3	-156	-1	-4	0.1	-1
Paro_4a.1 Non Eff	13.4	296	22	5.2	155	10	0.7	Paro_4a.1 Non Eff	11	193	18	4.2	155	8	0.7	103	2	4	0	1
Waiki_3oa.1 Non Eff	6.9	171	25	5.7	155	2	0.3	Waiki_3oa.1 Non Eff	4.5	78	17	4	155	2	0.3	93	0	8	0	1.7
Paro_4a.1 Non Eff Lse	10.3	204	20	4.7	155	8	0.7	Paro_4a.1 Non Eff Lse	8.5	133	16	3.7	155	6	0.7	71	2	4	0	1
Waiki_30a.1 Non Eff Lse	1.5	32	22	5	155	1	0.3	Waiki_30a.1 Non Eff Lse	1.5	27	18	4.2	155	1	0.3	5	0	4	0	0.8
Waiki_34a.1 Non Eff Lse	28.6	648	23	5.2	155	14	0.5	Waiki_34a.1 Non Eff Lse	24	425	18	4	155	11	0.5	223	3	5	0	1.2
Wood_29a.1 Non Eff Lse	1.1	27	24	5.5	155	1	0.5	Wood_29a.1 Non Eff Lse	1.1	23	21	4.7	155	1	0.5	4	0	3	0	0.8
Trees and Scrub 1	2.5	8	3	N/A		0	0.1	Trees and Scrub 1	2.5	8	3	N/A		0	0.1	0	0	0	0	0
Riparian 1	1.1	3	3	N/A		0	0.1	Riparian 1	1.1	3	3	N/A		0	0.1	0	0	0	0	0
Waiki_34a.1 Non Eff Lse FNO	0.9	19	21	4.8	155	0	0.5	Waiki_34a.1 Non Eff Lse FNO	0.9	16	18	4	155	0	0.5	3	0	3	0	0.8
Waiki_30a.1 Hse Pdks	2.5	52	21	4.8	141	1	0.3	Waiki_30a.1 Hse Pdks	2.5	44	17	4	141	1	0.3	8	0	4	0	0.8
Riparain sheep	0.8	11	13	3.2	0	0	0.5	Riparain sheep	0.8	10	13	3.1	0	0	0.5	1	0	0	0	0.1
Paro_4a.1 FBt>FBt	6.5	532	82	16.6	159	9	1.3	Paro_4a.1 FBt>FBt	5.3	423	80	16.1	159	7	1.3	109	2	2	0	0.5
Waiki_30a.1 FBt>FBt	2.3	253	110	21.4	159	1	0.4	Waiki_30a.1 FBt>FBt	3.7	397	107	20.9	159	2	0.4	-144	-1	3	0	0.5
Paro_4a.1 1st Yr FBt	6.5	457	70	14.6	159	8	1.3	Paro_4a.1 1st Yr FBt	5.3	363	68	14.2	159	7	1.3	94	1	2	0	0.4
Waiki_30a.1 1st Yr FBt	2.3	216	94	18.5	159	1	0.4	Waiki_30a.1 1st Yr FBt	3.7	339	91	18	159	2	0.4	-123	-1	3	0	0.5
Waiki_30a.1 YG	2.3	79	34	6.8	199	1	0.2	Waiki_30a.1 YG	3.7	126	34	6.7	197	1	0.2	-47	0	0	0	0.1
Paro_4a.1 YG	6.5	170	26	5.4	199	5	0.7	Paro_4a.1 YG	5.3	125	24	4.8	197	4	0.7	45	1	2	0	0.6
Non prodcutive/Other source	4.9	113				19		Other sources	4.8	118				18		-5	1	0	0	0
Whole farm/Total	165.1	4,698	28			121	0.7	Whole farm/Total	165.1	4,383	27			118	0.7	315	4	1.91	0.02	10.7
		4,699								4,384						315	3	1.00	0.00	

NOTE: The green coloured combined N & P blocks are lower in the proposed when compared to the current. The orange coloured blocks are higher in total N & P loss. White cells are no change. There are rounding differences which mean the sum total of the blocks can differ from Overseer reported values. The 0.1 ha non-productive difference between scenarios has been taken up by averaging areas in the crop blocks, but in no way affects the results at all. Commentary as to why these differences are lower are contained in the report. The Yellow cells totals row shows the overall difference between the sum totals as opposed to the total reported figures in green above, both are showing the overall reduction by these amounts and are as reported and confirmed in the main body of the report.