BALDWIN AGRI SOLUTIONS

OverseerFM farm system modelling to support a consent application for a dairy boundary realignment and expanded dairy

Report prepared for:
Report prepared for:
Paul & Kayleen Turner
Opio Dairy

Property Address:
237 Sinclair Road,
Opio

Overseer File and Report Prepared By:
Lee Baldwin
Baldwin Agri Solutions Limited
CNMA
lee@baldwinagrisolutions.co.nz
0274 199 110

Overseer Files and Report Reviewed By:
Miranda Hunter
Roslin Consultancy Ltd
B.Agr.Sci
CNMA
miranda.hunter@xtra.co.nz
0274 341 140

9 December 2024

Disclaimer

Baldwin Agri Solutions Limited is not liable for any loss, damage or other disadvantage of any form suffered by the client or any third party arising in any way from this document or the services provided by Baldwin Agri Solutions Limited in connection with this document, whether in contract, tort or otherwise.

This document was compiled with information provided by the client. Although this information is checked for sensibility, the customer has reviewed this report and is responsible for quality and accuracy of this information.

Use of this Report

Any use of this document should be authorised by Baldwin Agri Solutions Limited or the client.

This report is designed to be read in its entirety and any excerpts should reference the report for completeness of understanding.

Peer review completed by Miranda Hunter, Roslin Consultancy Limited:

- 30 plus years farm systems expertise
- Certified Nutrient Management Adviser since 2014
- Member of NZIPIM
- Contributing author to recent peer reviewed paper- “Understanding your landscape resilience: Beyond Regulation” Kyte R, Hunter M, Rissman C, Boyce A. April 2024

Contents

1.0 Executive summary:

Opio Dairy is family-owned farming business located at Opio in Western Southland. The farm is a 231.9ha (223ha effective) Dairy milking platform and cut & carry blocks. The opportunity has arisen for Opio Dairy to purchase an adjoining sheep and beef block . To do this Opio Dairy would sell 22ha east of Nightcaps Opio road along with relinquishing the 16ha lease to the East of Nightcaps Opio road. In return Opio dairy would purchase a 32ha sheep and beef block to the south of the existing platform. This piece of land fits the farm and isn't separated via the road like the 22ha and 16ha blocks.

Figure 1 – Current farm boundary

Figure 2– Proposed Farm Boundary

(note: red area is new proposed boundary, yellow is lease relinquishing/land being sold), purple is area being added

To inform the assessment of effects nutrient budgeting has been completed using Overseer version 6.5.8 for the 23/24 season (to reflect status quo farm system) to compare with the proposed land use. Reasons why a 5-year rolling average has not been used is outlined below in section 3.4. These budgets estimate the nitrogen and phosphorus losses from the farm. Three nutrient budgets have been completed:

1) Baseline Opio Dairy Platform update boundary
2) Baseline Sheep & Beef
3) Proposed Dairy System

1.1 Nutrient Loss estimates

The tables below compare the estimated losses of nitrogen and phosphorus from the consented baselines with the estimated losses under the proposed system.

Consented baseline:

	Baseline Opio Dairy	Baseline Sheep & Beef	Total Baseline
Effective Area	223	32	255
Total Farm N Loss (kg)	11 608	603	12 211
N Loss/ha (kgN/ha/yr)	50	19	
Total Farm P Loss (kg)	234	22	256
P loss/ha (kgP/ha/yr)	1	0.7	
Pasture Grown (tDM/ha)	17.1	12.1	
RSU	5170	473	5643

Revised baseline with 22ha and 16ha blocks removed from Dairy Platform.
This has been calculated by removing the nutrient loss from blocks 1 and 5 and a pro rata of other sources relative to the total area.
Note: 22ha + 16ha = 17% of whole block

Nitrogen loss
Total N loss block 1 = 695 kg N / yr
Total N loss block 5 = 1529 kg N / yr
Other sources N loss pro rata = 79 kg N / yr (463 kg N x 17%)

Nitrogen loss no longer attributable to the baseline due to the loss of the 38 ha via giving up lease and selling land = 2303 kg N / yr

Phosphorus loss
Total P loss block 1 = 12 kg P / yr
Total P loss block 5 = 8 kg P / yr
Other sources P loss pro rata = 18 kg P / yr (107 kg P x 17%)

Phosphorus loss no longer attributable to the baseline due to the loss of the 38 ha via giving up lease and selling land = 38 kg P / yr

RSU have been pro rata based on land area:
5643 RSU x 17% = 959 RSU

Revised Consented Baseline compared to Proposed

	Total Baseline	Revised Total baseline	Proposed System	Difference between Baseline and Proposed
Effective Area (ha)	255	217	217	
Total Farm N Loss (kg)	12 211	9908 *(12 211 – 2303)*	7617	23% decrease
N Loss/ha (kgN/ha/yr)				
Total Farm P Loss (kg)	256	218 *(256 – 38)*	208	5% decrease
P loss/ha (kgP/ha/yr)				
Pasture Grown (tDM/ha)			17.1	
RSU	5643	4684 (5643- 959)	6512	39% increase

1.2 Drivers of changes in nutrient losses

1.2.1 Nitrogen loss estimates

Nitrogen losses from a farm system can have negative impacts on water quality downstream. This in turn can have negative implications on aquatic life and human health.

OverseerFM has estimated a 23% decrease in total nitrogen losses between the baseline and proposed scenarios. This is the cumulative result of many changes to the farm system including:

- Cropping
  - Remove winter cropping
- Stock
  - Slight reduction replacement rate
  - Remove sheep and beef cattle
  - Increase number of cows 450 to 550
- Structures
  - Addition of second feed pad
  - Increase of months feed pads used
- Effluent
  - Increase effluent area
- Block Management
  - Management systems rotate through all blocks
- Nitrogen
  - Increase total N use across farm for pasture grazing

1.2.2 Phosphorus loss estimates

Phosphorus losses from the farm can cause algal growth in surface waterways. OverseerFM has estimated a 5% decrease in total phosphorus losses in the proposed system. Key changes include:

- Cropping
  - Remove winter cropping
- Stock
  - Slight reduction replacement rate
  - Remove sheep and beef cattle
  - Increase number of cows 450 to 550
- Structures
  - Addition of second feed pad
  - Increase of months feed pads used
- Effluent
  - Increase effluent area
  - Spread solid effluent in lower risk time of year
- Block Management
  - Management systems rotate through all blocks
- Nitrogen
  - Increase total N use across farm for pasture grazing
- Fertiliser
  - Decrease in Olsen P to 30 to 35, increase Olsen P on 32ha block to 30
  - fertiliser applied to maintenance using low solubility phosphate fertiliser

OverseerFM is not spatially explicit and a phosphorus mitigation plan should be developed as part of the FEMP to reduce phosphorus losses.

2.0 Report purpose

The results of the nutrient budgets will be utilised to support a land use consent application for a dairy boundary realignment.

This report will emphasise the relevant requirements in the proposed Southland Water and Land Plan, and the National Environmental Standards from a nutrient budgeting perspective. The broader range of requirements should be captured in the Farm Environmental Management Plan (FEMP). This report will inform the FEMP which will be completed separately.

Potential environmental risks on the property have been considered and should be included in the FEMP. These include:

- Contamination of ground water
- Contamination of surface water
- Undesired changes in soil nutrient status
- Nutrient application to non-target land
- Accumulation of non-nutrient impurities in the soil profile
- Excess stocking rate
- Pugging and compaction

- Poor cultivation methods

3.0 Farm overview

3.1 Land Area

Opio Dairy		
Blocks	**Effective Area (ha)**	**Total Area (ha)**
1) Platform 22ha	22	
2) Platform 94ha non effluent	54	
3) Platform 94ha Effluent	40	
4) Platform 47ha	39	
6) Runoff 44ha	9	
Crop Blocks		
4) Platform Whole Crop	8	
5) Runoff 16ha	16	
6) Runoff Whole Crop	35	
35ha Sheep & Beef		
7) Sheep & Beef 32ha	32	
	255	**263.9**

3.2 Location of Blocks

Current Platform and runoff marked yellow and red. Yellow block will be given up in proposed system, and purple is included in the proposed system.

3.3 Farm particulars:

Address	237 Sinclair Road, RD1, Otautau
Legal Description	**Opio Dairy** • Fee Simple, 1/1, Section 152 Block V Wairio Survey District, 1,160,259 m2 • Fee Simple, 1/1, Section 153 Block V Wairio Survey District, 1,158,489 m2 **Sheep & Beef 35ha** • Fee Simple, 1/1, Lot 1 Deposited Plan 6203, 319,904 m2
Area	263.9 ha

3.4 Consent Application Modelling Requirements and Method

To inform the assessment of effects, nutrient budgets have been prepared to compare the consented baselines to the proposed land use.

Three nutrient budgets have been completed:

- Baseline Opio Dairy
  - Due to 3 years data available for only 70% of the dairy platform, the most stable system to use is where data is available for the full Dairy Platform = 23/24 year end.
  - 16ha + 44ha blocks only two full seasons where the system hasn't been changed mid season. Have taken the more conservative approach and also the system with the most accurate information available 23/24 yr end.

- Baseline Sheep & Beef
  - 32ha block SU/ha, beef cattle on farm and crop area data for the Sheep & beef block 23/24 season has been supplied by current owner. Due to this block being part of a bigger sheep and beef operation the data given has been used then assumptions have been made to make a viable farming system. Due to all other blocks using the 23/24 year to compare apples with apples the crop from the 23/24 year has also been used, this will be the conservative approach as is 4ha under the maximum in reference period.

- Proposed System
  - A nutrient budget has been modelled to represent the system the farm proposes to do going forward.

The table below data outlines the data available and the most realistic representation of contaminant losses. Where the system has changed numerous times the most conservative approach has been taken. Thus, then assuming the most practical approach to modelling the farm systems in OverseerFM.

Data	Dairy Platform 94ha + 22ha	Dairy Platform 47ha	Runoff Cut & Carry 16ha + 44ha	32ha Block
Stock Numbers	Supplied by Opio Dairy	Supplied Opio Dairy	22/23 SU/ha Supplied current owner 23/24 actual stock Supplied Opio Dairy	SU/ha supplied by owner
MS	Fonterra Records	Fonterra Records		
Crop area	No crop	W/C only Supplied by Opio Dairy	22/23 nothing supplied 23/24 Actuals Supplied Opio Dairy	23/24 Supplied by owner Verified by Opio Dairy – visual over fence check Max crop on this block in the reference period is 12ha supplied by current owner
Supplements	Supplied by Opio Dairy (In shed and supplements cut)	Supplied by Opio Dairy (In shed and supplements cut)	22/23 Nothing Supplied 23/24 Actuals harvested Supplied Opio Dairy	Assumed to make feasible system
Fertiliser Applied	Ballance Annual Summary	Ballance Annual Summary	Ballance Annual Summary + specified by Opio Dairy	Applied at maintenance
Olsen P	Ballance soil test Most recent 21/22	Ballance soil test Most recent 21/22	Ballance soil test Most recent 22/23	OverseerFM industry defaults used
Years data above can be supplied	21/22 22/23 23/24 Note feed pad first use was in June24	30ha leased from April 21 to Dec 22, remaining 17ha leased post Dec22, **First season with full data 23/24**	21 to mid 23 Sheep grazing, Opio Dairy took over July 23 Note: stock numbers supplied for 21-23 seasons but nothing else **First Season with full data 23/24**	**System data limited but can be comfortable the system has been in status quo over last 5years**

3.5 Farm system overview

A detailed description of the modelling methodology and Overseer input data is given in the appendices of this report. This section gives an overview of the farm system modelled in each budget.

3.5.1 Baseline Dairy Platform & runoff

Nutrient budget was completed using the following:

Stock and production:

- 60 beef bulls Sept/Oct
- 450 peak milked dairy cows
- 10 Breeding Bulls Dec/Jan
- 120 replacement heifers until weaning
- 268800 kg milksolids /yr (597kg ms / peak milked cow)

Feed

- From Storage
  - 653t DM Whole Crop Barley (37.5t DM fed to cows, 615.5 t DM exported)
- Imported
  - 264.4 t DM PKE (fed in milking shed)
  - 158.6 t DM DDG (fed in milking shed)
  - 105.8 t DM Barley Grain (fed in milking shed)
- Harvested
  - 287.5 t DM baleage (fed to dairy stock, on the feed pad and to storage)

Fertiliser

- The latest soil tests for blocks were used from Ballance. The tests found an average Olsen P between 30 - 42
- Fertiliser has been entered from the actuals for the 23/24 year from Ballance records – For the 16ha and 44ha blocks this has been split out from Ballance orders.
- Pastoral synthetic nitrogen was on average 183 kg N/ha/yr, applied Sept to March
  - Note: Overseer showing 197kg/ha N, this is because the last 9860kg of Sustain25K in March was applied to roughly 50ha of baleage cut from the platform, meaning this Nitrogen do not fall into the N cap for the grazed pasture blocks.

Structures

- Feed Pad (with rubber matting for resting/sleep) – 200 cows June

Effluent

- Effluent area 40ha
- Effluent for feed pad has been exported as it was not spread in the current year.

3.5.2 Baseline Sheep & Beef

Nutrient budget was completed using the following:

Stock and production:

- 20 Beef calves from weaning, wintered then sold following season.
- 250 Breeding ewes wintered with replacements and lambs
    - Note: Information supplied was 13SU/ha wintered June. Due to the block being run as part of a larger property this has been scaled back to represent a feasible system.

Feed

- Winter Crop
    - 8ha Swedes
- Imported
    - 10 t DM Baleage (fed to beef animals)

Fertiliser

- OverseerFM industry average defaults used Olsen P 16
- Fertiliser has been applied to maintenance
- Pastoral nitrogen assumed at 9 kg N/ha/yr, as per beef and Lamb Economic survey

3.5.3 Proposed Budget

A budget was completed for the proposed long term system taking into account land incorporated and sold.

Stock and production:

- 12 Breeding Bulls Dec/Jan
- 550 peak milked dairy cows
- 138 replacement heifers until weaning
- 330000 kg milksolids /yr (600kg ms / peak milked cow)

Feed

- Imported
    - 210 t DM PKE (fed in milking shed)
    - 165 t DM DDG (fed in milking shed)
    - 175 t DM Barley Grain (fed in milking shed)
- Harvested
    - 530t DM (450 t DM fed on feed pad, 80 t DM fed on pasture)

Fertiliser

- Average Olsen P ranging between 30 - 35
- fertiliser has been entered at maintenance levels using low solubility P fertiliser
- Synthetic nitrogen applied at 190 N/ha/yr applied August to April

Structures

- 2 x Wintering Feed Pads, used for wintering 400 cows, and on the shoulders of the season

Effluent Area

- Total of 217ha

4.0 OverseerFM nutrient loss estimates

4.1 OverseerFM loss estimates

Nutrient budgets have been prepared to support the assessment of effects of the current and proposed dairy systems. The table below shows the OverseerFM version 6.5.6 estimated nutrient losses from the baseline and proposed land use.

The tables below compare the estimated losses of nitrogen and phosphorus from the consented baseline with the estimated losses under the proposed system.

Consented baseline:

	Baseline Opio Dairy	Baseline Sheep & Beef	Total Baseline
Effective Area	223	32	255
Total Farm N Loss (kg)	11 608	603	12 211
N Loss/ha (kgN/ha/yr)	50	19	
Total Farm P Loss (kg)	234	22	256
P loss/ha (kgP/ha/yr)	1	0.7	
Pasture Grown (tDM/ha)	17.1	12.1	
RSU	5170	473	5643

Revised Consented Baseline compared to Proposed

	Total Baseline	Revised Total baseline	Proposed System	Difference between Baseline and Proposed
Effective Area (ha)	255	217	217	
Total Farm N Loss (kg)	12 211	9908 *(12 211 – 2303)*	7617	23% decrease
N Loss/ha (kgN/ha/yr)				
Total Farm P Loss (kg)	256	219 *(257 – 38)*	208	5% decrease
P loss/ha (kgP/ha/yr)				
Pasture Grown (tDM/ha)			17.1	
RSU	5643	4684 (5643- 959)	6512	39% increase

Estimated pasture grown

It should be noted that the estimated pasture grown outputs from Overseer are higher than expected. Overseer uses a default value for ryegrass/white clover pasture quality irrespective of the land use and management. The default Overseer value in Southland ranges from 10.5 to 11.17 MJ ME/ kg DM depending on the month (reference: Characteristics of pasture, June 2018, D M Wheeler AgResearch Ltd). Pasture cuts from a Central Southland monitor farm show MEs of 11.5 to 12.5 (reference: Pasture growth and quality on Southland and Otago dairy farms, D. E. Dalley and T. Geddes, DairyNZ, NZ Grasslands Publication 2012).

The Overseer default values have been used throughout the entirety of this modelling as the Best Practice Data Input Standards state that "there needs to be a very good long-term average evidence of clover content, pasture utilisation, pasture N content and pasture quality to justify changes from the default OVERSEER values. This level of information would be rare."

To ensure that comparisons are valid between the current and proposed the same method has been used to ensure that an "apples with apples" approach is taken.

Bio Fixation

Note bio fixation is increasing in the proposed due to a significant amount of crop area in the baseline budgets, so at overall farm scale bio fixation appears to be increasing however when you break it down at a block level fixation looks similar, this is an apples with apples approach.

5.0 Drivers of changes in nutrient losses

5.1 Nitrogen Loss estimates

5.1.1 Nitrogen loss estimates

Nitrogen losses from a farm system can have negative impacts on water quality downstream. This in turn can have negative implications on aquatic life and human health.

OverseerFM has estimated a 23% decrease in total nitrogen losses between the baseline and proposed scenarios. This is the cumulative result of many changes to the farm system including:

- Cropping
  - Remove winter cropping
- Stock
  - Slight reduction replacement rate
  - Remove sheep and beef cattle
  - Increase number of cows 450 to 550
  - Rotating all systems over the whole block
- Structures
  - Addition of second feed pad
  - Increase of months feed pads used
- Effluent
  - Increase effluent area
- Block Management
  - Management systems rotate through all blocks
- Nitrogen
  - Increase total N use across farm for pasture grazing

5.1.2 Phosphorus loss estimates

Phosphorus losses from the farm can cause algal growth in surface waterways. OverseerFM has estimated a 5% decrease in total phosphorus losses in the proposed system. Key changes include:

- Cropping
  - Remove winter cropping
- Stock
  - Slight reduction replacement rate
  - Remove sheep and beef cattle
  - Increase number of cows 450 to 550
  - Rotating all systems over the whole block
- Structures
  - Addition of second feed pad
  - Increase of months feed pads used
- Effluent
  - Increase effluent area
  - Spread solid effluent in lower risk time of year
- Block Management

    - Management systems rotate through all blocks
- Nitrogen
    - Increase total N use across farm for pasture grazing
- Fertiliser
    - Decrease in Olsen P to 30 to 35, increase Olsen P on 32ha block to 30
    - fertiliser applied to maintenance using low solubility phosphate fertiliser

OverseerFM is not spatially explicit and a phosphorus mitigation plan should be developed as part of the FEMP to reduce phosphorus losses.

6.0 Recommendations from here

OverseerFM can model a specific range of good management practices. Below is a summary of the potential environmental risks on this property and gives recommendations to mitigate these risks.

Good practice for fertiliser use:

- Regular soil testing is used to inform fertiliser recommendations that target agronomic optimum P, K, S, Mg, Na and Ca levels.
- Develop a fertiliser plan with your fertiliser representative. Recommend you make this OverseerFM modelling available to your fertiliser representative to assist them in developing the fertiliser recommendations.
- Apply using a Spreadmark accredited company for fertiliser application – apply at correct rate and with a buffer to waterways.
- Use of Fertmark registered products.
- Record fertiliser applications (location, date of application and amount applied).

Nitrogen:

- Apply nitrogen strategically to meet plant demand.
- Spring nitrogen applications should not be on soil less than 7 degrees Celsius.
- Nitrogen application where possible should be kept out of high drainage months May

Phosphorus:

- OverseerFM is not spatially explicit and a phosphorus mitigation plan should be developed to reduce phosphorus losses.

Critical source areas:

- These include laneways, gateways, swales in paddocks and wallows.
- Review your Farm Environmental Management Plan to update as required and take action on mitigating risk on any new critical source areas identified.

The Proposed Water and Land Plan is currently in the appeals process and is partially operative. It will be important to stay up to date with developments in Environment Southland policy and rules, including the limit setting process which will develop over the next few years.

A National Environmental Standard (NES) has been gazetted. This has implications for the wintering of stock on crop, stock exclusion from waterways, nitrogen fertiliser use, changes in landuse and the use of stockholding areas for cattle.

Both the Proposed Water and Land Plan and the National Environmental Standards require a farm of this size to have a farm environmental management plan. This should be updated to include the recommendations within this report.

Appendices

Appendix 1. Modelling Methodology

Nutrient losses have been estimated using the OverseerFM Version 6.5.8 model. OverseerFM is a software application that models nutrient movements within a farm system. Input data detailing the farm system is entered into the software and interpreted through the use of a series of sub-model that calculate the flow of seven major farm nutrients (Nitrogen, Phosphorus, Potassium, Sulphur, Calcium, Magnesium and Sodium). Output data is reported for interpretation and to inform farm management practices. It currently requires an expert user to describe the physical and management details of a farm.

OverseerFM assumptions

Within the OverseerFM software, assumptions have been made of the farm management:

- Long term annual average model
  The model uses annual average input and produces annual average outputs.
- Near equilibrium conditions
  Model assumes that that the farm is at a state where there is minimal change each year.
- Actual and reasonable inputs
  It is assumed that input data is reasonable and a reflection of the actual farm system. If any parameter changes, it is assumed that all other parameters affected will also be changed.
- Good management practices are followed
  OverseerFM assumes the property is managed at industry agreed good management practice for a specific list of factors including effluent and fertiliser applications. OverseerFM does not assume that all industry agreed good management practices are undertaken on farm.

OverseerFM limitations

Key limitations of the OverseerFM model are:

- OverseerFM does not predict transformations, attenuation or dilution of nutrients between the root zone or farm boundary and the eventual receiving water body. A catchment model is needed to estimate the effects of the nutrient losses from farms on groundwater, river or lake water quality.
- OverseerFM does not calculate outcomes from extreme events (floods and droughts) but provides a typical years result based on a long-term average.
- OverseerFM does not calculate the impacts of a conversion process, rather it predicts the long-term annual average nutrient budgets for changed land use.
- OverseerFM is not spatially explicit beyond the level of defined blocks.
- Not all management practices or activities that have an impact on nutrient losses are captured in the OverseerFM model.
- OverseerFM does not represent all farm systems in New Zealand.
- Components of OverseerFM have not been calibrated against measured data from every combination of farm systems and environment.

Information on OverseerFM can be obtained from the following reports:

- Technical Description of OVERSEER for Regional Councils, September 2015
- Review of the phosphorus loss submodel in OVERSEER®, September 2016

- Using OVERSEER® in Regulation – Technical Resources and Guidance for Regional Councils, August 2016

Data input standards

Nutrient budgets have been constructed using the OverseerFM Version 6.5.8 model.

The nutrient budgets have been developed in accordance with the Overseer data input protocols - "Overseer, Best Practice Data Input Standards, March 2018" and the "OverseerFM User Guide, October 2019." No deviations have been made from these protocols.

Appendix 2. Modelling Inputs

Soil types

Soil type has a large bearing on nutrient loss levels from a property. This is due to different soil types having different water holding capacities, and drainage characteristics. It is therefore important that soil type is inputted correctly.

The table below gives a brief description of the soil types found on the properties.

S-map ref	Group	Soil Order	Drainage class	Description
Apar_6a.1	Sedimentary	Brown	Imperfect	Deep, imperfectly drained, silt
Pukem_6a.1	Recent/YGE/BGE	Pallic	Poor	Moderately deep, poorly drained, silt over clay
Makar_3b.1	Sedimentary	Gley	Poor	Deep, poorly drained, clay

The table below shows the area and the proportion of the block that the soils identified covered:

	Baseline Dairy Platform (ha)	Baseline Sheep& Beef (ha)	Current Total (ha)	Proposed (ha)
Apar_6a.1	129.4	19.2	129.4	127
Pukem_6a.1	80.6	12.8	93.4	84.6
Makar_3b.1	13		13	5.4

Climate Data

The following climate information has been used from the OverseerFM climate station tool:

Annual Rainfall (mm)	1051 - 1075
Mean Annual Temp (°C)	10
Annual PET (mm)	664 - 668

Blocks

The farms have been split into the following pastoral, riparian and fodder crop blocks based on soil type, contour, drainage and land use.

Blocks	Baseline Opio Dairy	Baseline Sheep & Beef	Proposed
1 Platform 22ha	22		
2 Platform 94ha non Effluent	54		54
3 Platform 94ha Effluent	40		40
4 Platform 47ha	39		47
6 Runoff 44ha	9		44
7 Runoff 32ha		**32**	32
Crop Blocks			
4 Platform Whole Crop	8		
5 Runoff 16ha	16		
6 Runoff Whole Crop	35		
Total Effective Area	**223**	**32**	**217**
Non effective area	8.9	0	8.9
Total Area	**231.9**	**32**	**225.9**
Rotation Fodder Crop		**8**	

Farm System Inputs

<table>
<tr><th>Description</th><th>Baseline Dairy Platform</th><th>Baseline Sheep & Beef</th><th>Proposed</th></tr>
<tr><td>Dairy cows (Stock numbers at month end)</td><td>Production: 268800kgMS
(597 kg ms / cow)
Breed – FJx

<table><tr><td>Month</td><td>Cows</td></tr><tr><td>Jul</td><td>100</td></tr><tr><td>Aug</td><td>350</td></tr><tr><td>Sep</td><td>450</td></tr><tr><td>Oct</td><td>450</td></tr><tr><td>Nov</td><td>450</td></tr><tr><td>Dec</td><td>450</td></tr><tr><td>Jan</td><td>450</td></tr><tr><td>Feb</td><td>450</td></tr><tr><td>Mar</td><td>400</td></tr><tr><td>Apr</td><td>346</td></tr><tr><td>May</td><td>346</td></tr><tr><td>Jun</td><td>200</td></tr><tr><td>Mean calving</td><td>14 Aug</td></tr><tr><td>Dry off</td><td>31 May</td></tr></table>
10 breeding Jersey bulls Dec/Jan</td><td>None</td><td>Production: 330000 kgMS
(600 kg ms / cow)
Breed – FJx

<table><tr><td>Month</td><td>Cows</td></tr><tr><td>Jul</td><td>400</td></tr><tr><td>Aug</td><td>580</td></tr><tr><td>Sep</td><td>550</td></tr><tr><td>Oct</td><td>550</td></tr><tr><td>Nov</td><td>550</td></tr><tr><td>Dec</td><td>550</td></tr><tr><td>Jan</td><td>550</td></tr><tr><td>Feb</td><td>550</td></tr><tr><td>Mar</td><td>500</td></tr><tr><td>Apr</td><td>450</td></tr><tr><td>May</td><td>400</td></tr><tr><td>Jun</td><td>400</td></tr><tr><td>Mean calving</td><td>14 Aug</td></tr><tr><td>Dry off</td><td>31 May</td></tr></table>
12 breeding Jersey Dec/Jan</td></tr>
<tr><td>Dairy grazing</td><td>60 Beef Bulls Sept/Oct</td><td></td><td></td></tr>
</table>

Description	Baseline Dairy Platform	Baseline Sheep & Beef	Proposed
Dairy replacements	120 calves to weaning		138 Calves to weaning
Sheep & beef		20 beef calves weaning, wintering then sold the following summer 250 breeding ewes and replacements Sept to May 400 ewes wintered June to August	
In shed feeding	100% of herd fed in shed Aug – May		100% of herd fed in shed Aug – May
Structures	Feed Pad 200 Cows June (effluent exported)		Winter feeding pads x 2 400 cows June 400 cows July 200 cows August 75 cows September
Animal distribution	No difference between blocks Based on Animals present	No difference between blocks	No difference between blocks
Pasture	Ryegrass / clover	Ryegrass / clover	Ryegrass / clover
Crop management	59ha Whole crop Barley Sown Nov – Con cult Yield 10.2 – 11.4 t DM / ha Maint + Captial Nov 500kg/ha Superten 2t/ha Lime At Sowing 346kg/ha Cropzeal16N 86kg/ha MOP Dec 259kg/ha Ammo36N Dec 173kg/ha Sustain25k post harvest Harvested Feb– 653 t DM exported (37.5 t DM imported back in)	8ha Swedes (ex pasture rotation) Sown Dec – Con cult 250kg / ha CZBB at sowing 100kg / ha Urea Jan Yield 12 t DM / ha Resown into Pasture Nov Grazed June - Aug	
Imported Supplements	264.4 t DM PKE (fed in milking shed) 158.6 t DM DDG (fed in milking shed) 105.8 t DM Barley Grain (fed in milking shed)	10 t DM Baleage (fed to beef stock)	210 t DM PKE (fed in milking shed) 165 t DM DDG (fed in milking shed) 175 t DM Barley Grain (fed in milking shed)
Harvested supplements	287.5 t DM Baleage (fed to dairy stock, on fed pad and stored)		530 t DM (450 t DM fed on feed pad rest fed on pastures)

Description	Baseline Dairy Platform	Baseline Sheep & Beef	Proposed
	Cereal silage - 653 t DM exported (37.5 t DM imported back in)		
Soil Fertility	Olsen P of 30 - 42 Balance soil tests 2021	Default Olsen P 16	Olsen P assumed ranging between 30 - 35
Fertiliser	Ex Ballance records 183 kg synthetic N / ha, applied Sept to March + 9860kg Sustain25k applied in March on Silage paddocks (197 kg N / ha) 189 kg N / ha per effective hectare at farm scale	Assumed applied at maintenance 9 kg synthetic N / ha	Assumed applied at maintenance (low solubility P fertiliser) 190 kg synthetic N / ha, applied August to April
Drainage	75% on whole block	75% on whole block	75% on whole block
Effluent system	Holding pond Solids separated Liquid effluent is applied to 40 ha - at less than 12mm Pond solids emptied once a year (applied in Dec) Solids applied to block 2 in sept		Holding pond Solids separated Liquid effluent is applied to 217 ha - at less than 12mm Pond solids emptied once every year applied (applied when conditions appropriate) Solids applied to whole farm