Bronwyn Auckram

From: Christine Stenning
Sent: Tuesday, 9 October 2018 4:30 p.m.
To: Bronwyn Auckram
Subject: FW: Application lodgment - TJ & JA Driscoll
Attachments: Part A Form.pdf; 20181009_17423_AEE Tim Driscoll FINAL relodge.pdf; Attachment A - DESC pond report.pdf; Attachment B - FEMP.pdf; Attachment C - Nutrient budget report.pdf

Hi Bronnie

In the morning could you please print these and scan as one application document and put into our Inwards Mail folder?

Thanks very much, Christine

From: Tanya Copeland [mailto:tanya@landpro.co.nz]
Sent: Tuesday, 9 October 2018 2:38 p.m.
To: Consents Team
Cc: Tim Driscoll
Subject: Application lodgment - TJ & JA Driscoll

Hi Lauren,

Please find attached our application for TJ &JA Driscoll which we are relodging and will replace the application you have at the moment. Please let us know when you are at s88 stage and we will formally withdraw the existing application.

The applicants will deposit $1500 into the ES account as soon as possible.

Regards

Tanya Copeland

Application for Resource Consent (PART A)

This application is made under Section 88 of the Resource Management Act 1991

environment SOUTHLAND REGIONAL COUNCIL
Te Taiao Tonga

The purpose of this Part A form and the relevant Part B form(s) is to provide applications with guidance on information that is required under the Resource Management Act 1991. Please note that these forms are to act as a guide only, and Environment Southland reserves the right to request additional information.

To: Environment Southland
Private Bag 90116
Invercargill 9840

Full name, address and contact details of applicant ***(in whose name consent is to be issued)***

Name: TJ & JA Driscoll, being trustees of T&J Driscoll Family Trust

Address: 266 Thompsons Crossing Rd East
Winton

Email: driscolldairy@gmail.com

Phone: 022 076 9093 (*Preferred*) _____ (*Additional*) Fax: _____

Consultant contact details ***(if different from above)***

Contact name/agent: Tanya Copeland, Landpro

Address: 13 Pinot Noir Drive
Cromwell

Email: tanya@landpro.co.nz

Phone: 027 386 4553 (*Preferred*) _____ (*Additional*) Fax: _____

Please tick the box for the consent(s) you are applying for and complete the relevant Part B form(s) where available:

Land Use

- [ ] Bore/well
- [x] New or expanded dairy farming
- [ ] Effluent storage
- [ ] Cultivation
- [ ] Tree planting
- [ ] Gravel extraction
- [ ] Hill country burning
- [ ] Riverbed activity (incl streams/ creeks and stopbanks)
- [ ] Bridges and culverts

Discharge

- [ ] To air
- [ ] To water
- [x] To land

Water

- [ ] Take and use surface water
- [x] Take and use groundwater
- [ ] Dam water
- [ ] Divert water

Coastal

- [ ] Whitebait stand
- [ ] Structures/occupation of space
- [ ] Removal of natural materials
- [ ] Disturb foreshore/seabed
- [ ] Discharge/deposit substances
- [ ] Commercial surface water activity
- [ ] Reclaim/drain foreshore/seabed
- [ ] Marine farming
- [ ] Other coastal activities

1 Are there any **current or expired** consents relating to this proposal? ☑ Yes ☐ No

If yes, please provide consent number(s) and description:

AUTH 301043
AUTH 301044

2 Are any other consents required from Environment Southland or **other authorities?** ☐ Yes ☑ No

If yes, please state the relevant authority and the type of consent(s) required:

3 For what **purpose** is this consent(s) required: (e.g. discharge of effluent, gravel extraction etc.)

See AEE

4 **Location** of proposed activity

Address: See AEE

Legal Description: _____

Map Reference (NZTM 2000): _____ E _____ N

5 The name and address of the **owner /occupier**: (if other than the applicant)

Name: _____ Phone: _____

Address: _____

6 **Please attach a map or a coloured aerial photograph, showing at a minimum, the location of the proposed activities.**

7 Assessment of effects on the environment (AEE)

Please complete the applicable Part B form(s) for the proposed activities. For those activities where no Part B form is available, please attach a written statement that assesses the effects that your activities may have on the environment. An assessment of effects **must** include the following information:

(a) if it likely that the activity will result in any significant adverse effect on the environment, a description of any possible alternative locations or methods for undertaking the activity;

(b) an assessment of the actual or potential effect on the environment of the activity;

(c) if the activity includes the use of hazardous substances and installations, an assessment of any risks to the environment that are likely to arise from such use;

(d) if the activity includes the discharge of any contaminant, a description of—

(i) the nature of the discharge and the sensitivity of the receiving environment to adverse effects; and

(ii) any possible alternative methods of discharge, including discharge into any other receiving environment;

(e) a description of the mitigation measures (safeguards and contingency plans where relevant) to be undertaken to help or prevent or reduce the actual or potential effect;

(f) identification of the persons affected by the activity, any consultation undertaken, and any response to the views of any persons consulted;

(g) if the scale and significance of the activity's effects are such that monitoring is required, a description of how and by whom the effects will be monitored if the activity is approved;

(h) if the activity will, or is likely to, have adverse effects that are more than minor on the exercise of a protected customary right, a description of possible alternative locations or methods for the exercise of the activity (unless written approval for the activity is given by the protected customary rights group).

You should also include:

(a) an assessment of the activity against any relevant provisions of any relevant objectives, policies, or rules;

(b) any information specified to be included in the application in accordance with the relevant regional plan;

(c) for an application to replace an existing consent, an assessment of the value of the investment of the existing consent holder:

An assessment of effects **must** address the following matters:

(a) any effect on those in the neighbourhood and, where relevant, the wider community, including any social, economic, or cultural effects;

(b) any physical effect on the locality, including any landscape and visual effects;

(c) any effect on ecosystems, including effects on plants or animals and any physical disturbance of habitats in the vicinity;

(d) any effect on natural and physical resources having aesthetic, recreational, scientific, historical, spiritual, or cultural value, or other special value, for present or future generations;

(e) any discharge of contaminants into the environment, including any unreasonable emission of noise, and options for the treatment and disposal of contaminants;

(f) any risk to the neighbourhood, the wider community, or the environment through natural hazards or the use of hazardous substances or hazardous installations.

8 **Affected Parties**

Please attach written approval from parties who may be affected by your activity. *Written Approval of an Affected Party* forms are available on the Environment Southland website. During the processing of your application, Council may determine that additional approvals are required.

9 **Correspondence from Council when using a consultant**

It is standard practice that both you and your consultant are copied into all correspondence relating to the consent process. This is so that you know what is going on with your application. Please let us know below if you would like us to only contact your consultant. This means you will only hear from us when your application is/is not accepted, when a decision is made or if we feel that you need to be contacted.

I want all correspondence about my application to go to my consultant only ☐ Yes ☑ No

10 **Site visit from the Consents Team**

Consents staff are able to meet with you, visit your site and see what you are proposing to do. We find that this is beneficial to everyone involved. The cost of the visit will be included in the total cost of processing your consent. However, we find that applications that have an on-site visit are processed with less congestion and at a similar or lesser overall cost. Please let us know below if you would like us to come and see your site.

Only if not already done previously

I would like a member of the Consents Team to visit my site ☑ Yes ☐ No

11 **How much will it cost to process my application?**

The cost of a consent depends on the complexity of the activities. Staff time is charged out at a rate of $145/hr and vehicle use for site visits is charged at $0.73/km (inclusive of GST).

The fees shown below under section two are **deposits to be paid at the time of application**. Due to the complexity of these activities, this deposit will not usually cover the full cost of processing the application. **Further costs may be incurred** relating to staff time, disbursements, legal charges, consultation fees, and hearing commissioner fees. Environment Southland's User Charges and Fees document is available at:

www.es.govt.nz/fees-and-charges

When the consent has been processed you will receive an invoice for an additional fee, or for a refund.

The Council's user charges are fixed under Section 36 of the Resource Management Act 1991. Our fee schedule is:

1. Fixed fee:	
Bores and wells	**$290**
Whitebait stand	**$220**
2. Deposit:	
All other non-notified applications including: • Certificates of compliance • Changes to consent conditions (variations) • Change of lapse date	**$1,500**
Applications that require notification or limited notification	**$2,000**

How to pay

Environment Southland accepts payment in the forms of cash, Eftpos, cheque, or electronic transfer. All electronic transfers must include the applicant's name and "consent application" as a reference. Please make electronic payments to: Environment Southland, 01-0961-0018998-00.

User Charges

Please note that additional Annual User Charges will apply to all consents. These are payable in advance on the first day of July each year. Tables 4, 5 and 6 of the Environment Southland User Charges and Fees Schedule outlines the fees associated with Annual Administration Charges and Annual Consent Monitoring and Inspection Charges. Table 7: Annual Research and Monitoring Charges applies only to surface and groundwater takes and comprises the following:

- **Surface water takes (per consent, for volumes up to 50,000 m^3/day):**
  - A charge of **$1.89** per year per cubic metre authorised as a maximum daily take.
  - Minimum of **$138**, maximum of **$7,585**.
- **Surface water takes (per consent, for volumes over 50,000 m^3/day):**
  - **$0.0031** per cubic metre authorised as a maximum daily take.
- **Groundwater takes (per consent):**
  - A charge of **$0.89** per year per cubic metre.
  - Minimum of **$162**, maximum of **$1,782**.

Municipal and stock water discount (of 50%) no longer applies.

12 **Checklist: Have you included the following?**

- [x] Payment of the required deposit *(see fee schedule)*
- [x] Written approval from all potentially affected parties *(forms available from the Environment Southland website)*
- [x] Site plan/location map/sketch of the proposed activity
- [ ] A copy of the Certificate of Incorporation (*where applicant is a company*)
- [x] Part B form(s) specific to your activity and/or a separate assessment of environmental effects (AEE)

Note:

(a) If your application does not contain the necessary information and the appropriate fee, Environment Southland must return the application.

Signature of applicant

I hereby certify that to the best of my knowledge and belief, the information given in this application is true and correct.

I undertake to pay all actual and reasonable application processing costs incurred by Environment Southland.

Name (block capitals) TANYA COPELAND

Signed _____ **Date** 9.10.18

(Signature of applicant or person authorised to sign on behalf of applicant)

T J & J A Driscoll being trustees of the T & J Family Trust

Resource Consent Application to
Environment Southland
To Use Land for Dairy Farming
and Associated Permits

Prepared For
T J & J A Driscoll

Prepared By
Landpro Ltd
13 Pinot Noir Drive
PO Box 302
Cromwell

Tel +64 3 445 9905

QUALITY INFORMATION

Reference:	L:\17423 - Tim Driscoll - Discharge Consent Variation\Docs\Drafts\20181008_1
Date:	9 October 2018
Prepared by:	Tanya Copeland
Reviewed by:	Hilary Lennox
Client Review:	Tim Driscoll
Version Number:	FINAL

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LIST OF ATTACHMENTS

1. INTRODUCTION

1.1 Overview of Proposal

T J and J A Driscoll (the applicant) own a 599-cow dairy farm located approximately 5 km south of Winton. Discharge Permit AUTH-301043 authorises the discharge of farm dairy effluent (FDE) and Water Permit AUTH-301044 authorises the taking of groundwater at this farm. These consents do not expire until 2021 but the applicant wishes to expand the dairy platform onto a neighbouring block of land, known as the "East Block", which was purchased in 2016. The applicant would also like to milk up to 700 cows across the extended dairy platform. Consent is hereby sought for the following:

- To use land for dairy farming that did not exist as of May 2016;
- To replace Discharge Consent AUTH-301043 with a new discharge consent to discharge FDE from the seasonal milking of up to 700 cows; and
- To replace Water Permit AUTH-301044 with a new water permit that allows for enough water to be taken to support the proposed farming operation.

1.2 The Applicant

Applicant Address: T J and J A Driscoll
266 Thomsons Crossing Road East
Winton

Address for Service: C/- Landpro Limited
PO Box 302
Cromwell 9342

1.3 Purpose of Documentation

Pursuant to Section 88 of the Resource Management Act 1991 (the RMA), this report provides an assessment of the activities effects on the environment as required by Schedule 4 of the RMA.

2. DETAILS OF PROPOSAL

2.1 Location

The figure below shows the location of the farm in relation to Winton as well as the proposed farm boundary.

Figure 1: Proposed Farm Boundary, with the new East Block shaded

2.2 Details of Dairy Farm

The following provides further details of the farming system proposed.

Table 1: Details of the Dairy Farm

Property Details	
Property address	266 O'Shannessy Road, RD1, Winton
Property owner(s)	T J, J A, J P and C A Driscoll
Legal Description	Pt Sec 30 Blk I Winton Hundred
	Pt Sec 29 Blk I Winton Hundred
	Sec 43 Blk I Winton Hundred
	Sec 44 Blk I Winton Hundred
	Sec 45 Blk I Winton Hundred
	Sec 54 Blk I Winton Hundred
	Lot 1 DP 449518
	Lot 2 DP 449518 (new block)
Property area (ha)	224.5 ha (previously 210.6 ha)
Change in scale/intensity/farm boundary?	Increase in farm area and cow numbers
Discharge Permit Details:	
Replacement of permit no.	AUTH-301043
Number of dairy cows	700
Stocking rate (cows/ha)	3.1
Winter milking?	No milking between 20 June and 20 July other than slipped cows
Wintering barn?	No
Feed pad/standoff pad?	Two impervious pads that don't drain into the effluent pond
Other sources of effluent?	Vat stand, tanker apron
Type of shed	50 bale rotary (only 6 yrs old – recent conversion)
Effluent treatment	Stirrer in the pond (no need for weeping wall)
Storage available (m^3)	3,261 m^3 lined pond
Storage required (m^3)	2,670 m^3 (as per attached dairy effluent storage calculator)
Disposal area (ha)	93.3
Irrigator proposed	RX Plastics Maxi Pods. Slurry tanker may be used rarely, such as when desludging the pond.
Application rate and depth	10 mm/hr rate and 25 mm depth per application 5mm depth for the slurry tanker
Monitoring proposed	None other than that which will be provided for in CAEMP/FEMP
Water Permit Details:	
Replacement of permit no.	AUTH-301044
Freshwater Management Unit	Lower Oreti and Makarewa
Groundwater Zone	Bore is located in the Lower Oreti groundwater management zone
Average rate of take over 24 hrs (L/s)	1
Daily volume (L)	84,000
Allocation per cow (L/cow/day)	120

Location of point of take	Well Number E46/1067, which is located at the house, is currently used for the shed and troughs. There is another well, E46/1089, which is located at the dairy shed but is not currently used.
Freshwater storage onsite?	4 x 30,000 L tanks
Yearly volume (m^3/year)	25,903 (120 L/cow/day for 700 cows over summer, 70 L/cow/day for 86 cows over winter)
Discretionary allocation limit for groundwater zone (m^3/year)	20,700,000
Amount currently allocated from groundwater zone, including current permit (m^3/year)	4,106,038 (20% of allocation limit)
Land Use Consent (use land for dairying)	
Area of new block (ha)	13.9 ha
Use of land pre-May 2016	Sheep grazing
When was it converted to dairying?	Yet to happen – need to wait until consent is granted
Proposed use of land	Incorporation into the dairy platform

Effluent Management

Effluent generated in the dairy shed flows under gravity to the effluent pond via a stone trap. A weeping wall is not necessary at this property because a mechanical stirrer has been fitted on the pond. This is mounted on a concrete pontoon extending into the pond to ensure that the effluent is stirred well. The pond, which was built 6 years ago when the farm was converted, is lined with an HDPE liner and has had no performance issues. All of the farm's effluent infrastructure has been maintained in excellent condition. Given the age, condition and construction of the pond, a pond drop test is superfluous for this consent application. The image below shows that the leak detection system was recently inspected and running clear.

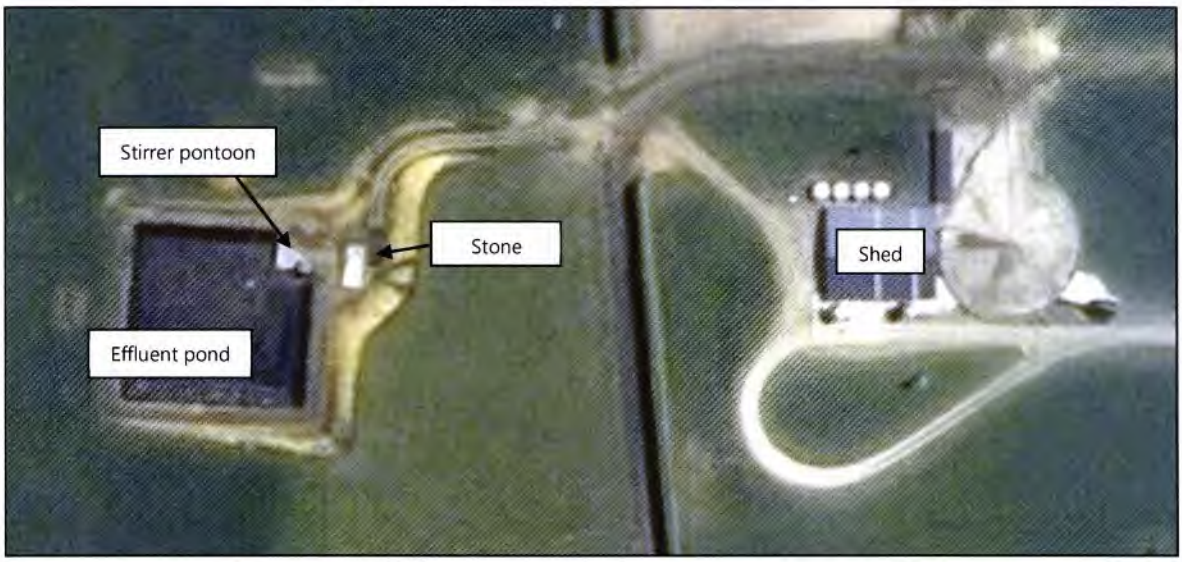

Figure 2: Infrastructure layout

Figure 3: Large stone trap adjacent the effluent pond

Figure 4: Effluent pond

Figure 5: Leak detection port with no trace of effluent

The Dairy Effluent Storage Calculator (DESC) attached shows that the pond is adequately sized to allow for effective deferred irrigation.

This proposal seeks to increase the size of the area to which effluent is actually discharged. Appendix I of Discharge Permit AUTH-301043-01 shows a disposal area of 107.7 ha but this has not been fully utilised and effluent is rarely applied to the east of O'Shannessy Road. Effluent can be applied over a larger area if the effluent disposal field is extended to the south instead. This is an effective way of ensuring that nutrients are distributed over a larger area, thus reducing the intensity of loading in any particular paddock. The current and proposed effluent discharge areas are shown in the figure below, which has been taken from the attached nutrient budget report.

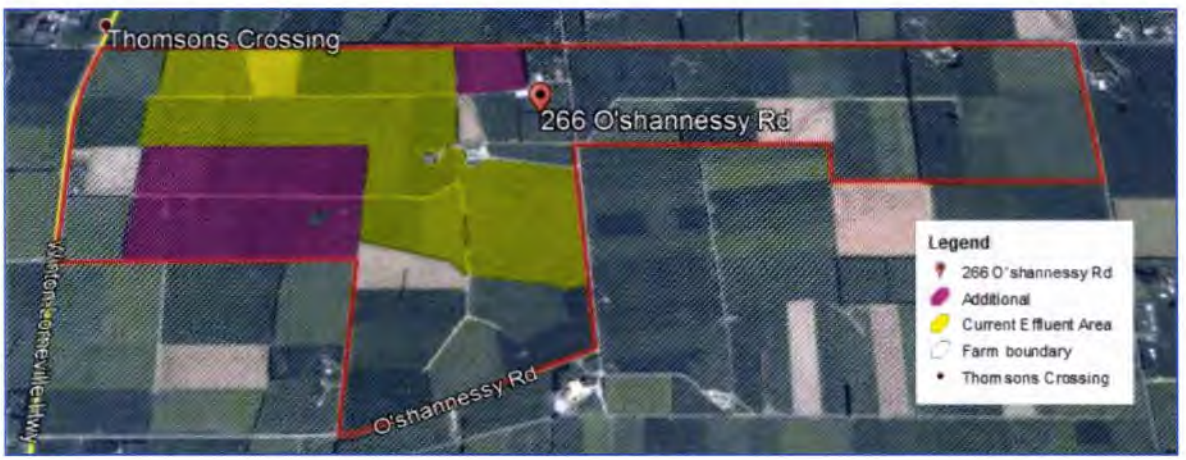

Figure 6: Effluent disposal area

Land Use Consent to Use Land for Dairying

The attached plans from the applicant's Farm Activity Focus Plan confirm what the dairy farm boundary was pre-May 2016. The applicant purchased the East Block in April 2017. This 13.9 ha section has previously been used as a sheep grazing block, but it is proposed that it now be incorporated into the dairy platform.

Inclusion of the new block into the dairy platform will allow for an increase in the number of cows milked at the farm from 599 to 700. To offset the potential increase in N losses from the increased cow numbers, the applicant is proposing to undertake mitigation measures such as:

- reducing the winter crop area on the dairy platform and utilizing 4ha of grass/baleage over winter
- increasing the effluent discharge area so that the concentration is effluent in any one area is reduced; and
- reduced N fertiliser use on the effluent discharge area.
- maintaining the same level of off-platform wintering as the current scenario

These mitigation measures are discussed in further detail in Section 6 of this report. The proposed farming system is essentially one where the majority of the milking herd is wintered offsite, however, the modelling undertaken as part of this application has allowed for some cows of these cows to be on-farm during June and July. This is to allow for delays in removing all of the herd at the start of June, and to allow for early calvers to be brought home early.

Compliance

The compliance history for Discharge Permit AUTH-301043 shows that the consent holder has been fully compliant, with all scores being "1: Fully Compliant". The compliance staff have often commended the consent holder for their performance.

Regarding Water Permit AUTH-301044, this permit requires monthly reporting and the consent holder has sometimes been late in submitting this information. However, there is no record to indicate that there has ever been any over-abstraction.

3. DESCRIPTION OF EXISTING ENVIRONMENT

3.1 Land Use, Topography & Climate

The property, located at approximately 40 m above mean sea level, is an existing dairy farm and conventional farming practices are undertaken. Surrounding land use comprises other dairy farms, sheep and beef farms and some rural dwellings. Based on 30 years of rainfall records of Middle Creek at Otahuti (being the nearest rainfall station to the property) the property is likely to receive an average of 996 mm of rainfall per year.

There are tile drains across the property but most of these were installed before the applicant took possession of the property and so their exact location is not known.

3.2 Water Resources

3.2.1 Surface waterways

According to Beacon, the majority of the property is contained within the Lower Oreti Surface Water Management Zone, and the eastern-most portion is contained within the Tussock Creek catchment/Makarewa Surface Water Management Zone. The Makarewa River is a tributary of the Oreti River.

There are a number of tributaries of the Oreti River on the property, most of which have been modified and all are fenced from stock. The tributaries discharge to the Oreti River approximately 3.6 km downstream of the property boundary. As shown on the plan below (taken from the applicant's Farm Activity Focus Plan), there are no tributaries of Tussock Creek/the Makarewa River on the subject property. Effluent disposal does not occur within 20 m of any surface water body.

Figure 7: Surface waterways (blue lines) and CSAs (dotted orange lines)

Land Air Water Aotearoa (LAWA) is the most up to date national database which connects people with New Zealand's environmental monitoring data, enabling communities to access information relating to the different pressures and conditions on freshwater resources. The state of water quality presented on the LAWA website compares the median of monitoring result for the last five years at a site with other sites around the country. The median for a site can be compared to all other sites with similar land use and altitude. The data used to calculate trends is the same as used for the regional state. LAWA displays regional trends for the last five to ten years which helps to identify whether a site has improved, degraded or stayed the same. The state of water quality is assessed against the objectives within the National Policy Statement for Freshwater Management (NPS-FM; New Zealand Government 2014) and the trigger values for physical and chemical stressors in New Zealand rivers from the ANZECC guidelines (ANZECC 2000).

Table 2: Summary of State and Trend at the Wallacetown Monitoring Site (nearest downstream LAWA monitoring site for the Oreti River)

	State	NOF Band Annual Median	Trend
Oreti River at Wallacetown			
E. Coli	In the best 50% of all lowland rural sites	A – very low risk to waders/boaters	Indeterminate
Clarity	In the best 50% of all lowland rural sites	N/A	Indeterminate
Total Oxidised N	In the worst 25% of all lowland rural sites	A – unlikely to be effects on sensitive species	Indeterminate
Ammoniacal N	In the best 25% of all lowland rural sites	A – 99% species protection level. No observed effect on any species tested.	N/A
Dissolved Reactive P	In the best 25% of all lowland rural sites	N/A	Indeterminate

Table 3: Summary of State and Trend at the Cooper Road Monitoring Site (nearest downstream LAWA monitoring site for Tussock Creek)

	State	NOF Band Annual Median	Trend
Tussock Creek at Cooper Road			
E. Coli	In the worst 25% of all lowland rural sites	D – High risk of infection to waders/boaters	Indeterminate
Clarity	In the worst 50% of all lowland rural sites	N/A	Indeterminate
Total Oxidised N	In the worst 25% of all lowland rural sites	B – Some growth effect on up to 5% of species	Meaningful Improvement
Ammoniacal N	In the worst 25% of all lowland rural sites	A – 99% species protection level. No observed effect on any species tested.	Meaningful Improvement
Dissolved Reactive P	In the worst 25% of all lowland rural sites	N/A	Indeterminate

The results presented above strongly indicate that water quality on the mainstem of the Oreti River is consistent with the regional plan objectives. Despite there being no tributaries of Tussock Creek on the property, water quality information has also been assessed at Tussock Creek at Cooper Road monitoring site for completeness, as this site is within the Makarewa GMZ and provides water quality information within a local tributary. The results presented above for water quality trends on the mainstem of Tussock Creek strongly indicate meaningful improvement in nitrate concentrations.

There is insufficient data over the past 10 years to determine a trend for most key water quality indicators. Environment Southland's monitoring up to 2016 indicated an increase in *E. coli* at the Oreti River at Lumsden Bridge site (upstream of the applicant's property). However, the more recent LAWA data concluded that the data did not indicate a trend. As for Tussock Creek at Cooper Road, trends in some nutrient concentrations have improved over time.

In summary, the surface water quality monitoring data does not indicate a significant deterioration in water quality in Tussock Creek or the Oreti River. However, information from many land use and water quality investigations in Southland highlight the need to minimise contaminant loss from land into water bodies to ensure that the water quality of rivers remains consistent with the relevant objectives in the relevant statutory planning provisions.

3.2.2 Groundwater

The RWPS and pSWLP have delineated groundwater management zones for the Southland Region. Under both Plans, the majority of applicants' property is located in the Lower Oreti groundwater management zone (GMZ), whilst the proposed new block overlies the Makarewa GMZ. The hydrogeological setting of the Lower Oreti GMZ is interpreted to primarily consist of relatively thin (<5 to 40 metres) quaternary gravel deposits overlying Tertiary deposits and Gore lignite measures. This aquifer is recharged mainly by rainfall infiltration with some local surface water/groundwater interaction occurring near the main stem river margins. The Lower Oreti GMZ is a lowland aquifer.

The Makarewa GMZ has similar subsurface geology to the Lower Oreti, in that it consists of relatively thin (<5 meters to 30 metres) Quaternary gravel deposits overlying Tertiary Gore Lignite Measure sediments. The Makarewa GMZ is recharged exclusively by rainfall. Extensive land drainage by mole, tile and artificial drainage channels can also have significant influence on the actual rate of groundwater recharge in this zone. The Makarewa GMZ is also a lowland aquifer.

Information from ES indicates that groundwater quality in the Lower Oreti and Makarewa Groundwater Management Zones are generally good[1]. Regional nitrate levels maps from Beacon indicate that groundwater quality across the site ranges from "pristine, pre-European" to "minor to moderate land use impacts" (0.01 mg/L – 3.5 mg/L).

There are several known bores within 1 km downgradient of the subject property and these range in depth from 6 – 13 m. These bores are listed as being for stock water and dairy supply. The nearest down-gradient registered drinking water site is at Lochiel School (LOC001), located approximately 1.5 km to the southwest

[1] Lower Oreti Groundwater Management Zone ES Factsheet. Retrieved 2 June 2017.

of the subject property. This drinking water site supplies over 25 people (between 25-100 people) and the NZ Register of Drinking Water Supplies indicates that groundwater is sourced from a bore.

3.2.3 Estuary

The Oreti River discharges into the New River Estuary approximately 35 km downstream of the property boundary. This estuary drains several coastal catchments including the Waihopai Catchment.

Section 3.11 in the Regional Coastal Plan describes the key values for the New River Estuary. In summary, the key values application are the exceptional bird and waterfowl habitat, recreational, shellfish gathering and heritage values which can be adversely affected by excessive levels of microbes, sediment and nutrients. The New River Estuary is listed in Appendix Q of the PSWLP as a sensitive waterbody.

A coastal risk assessment undertaken by Wriggle Coastal Management in 2008[2] shows that while eutrophication and sedimentation may be poor in some arms of the estuary, overall vulnerability and susceptibility ranges from low to moderate, as show in the table below, as the estuary is well flushed (low residence time) and is already modified.

Table 4: Risk Assessment for New River Estuary (Source: Wriggle Coastal Management, 2008)

	Existing Condition Rating	*Susceptibility Rating*	*Vulnerability Rating*
Sedimentation	Fair	Low	Moderate
Eutrophication	Fair	Low	Moderate
Disease Risk	Fair	Low	Moderate
Contaminants	Good	Low	Low
Habitat Loss	Fair	Moderate	Moderate
Invaders	Fair	Moderate	Moderate
Shellfish	Good	Low	Low

Estimated nitrogen loadings to the estuary are moderate (being the main driver of eutrophication) and the susceptibility of the estuary to stressors is assessed as low-moderate due to the estuary being well flushed (with low residence time) and a wide range of habitat types[4]. However due to a combination of nutrient loads and excessive sediment deposition, the nutrient enrichment condition of the estuary is poor. A contributing factor is the estuary type; shallow tidal river estuaries can receive an order of magnitude higher nitrogen loads than shallow tidal lagoons for the same nutrient enrichment condition[3].

3.3 Soils and Physiographic Zones

Soil types and physiographic zones present will guide the choice of which Good Management Practices (GMPs) the applicant will adopt to ensure that potential adverse effects associated with the proposed activities are managed as far as reasonably practicable.

The following provides a description of the soils, FDE classifications and physiographic zone(s) present as well as the associated risks. The farm has been assessed as a whole, following the addition of the new block.

---

[2] Wriggle Coastal Management, 2008. *Southland Coast Te Waewae Bay to the Catlins: Habitat mapping, risk assessment and monitoring recommendations.* Prepared for Environment Southland, August 2008.

[3] Condition grade: >3 is very good condition, 2.6 – 3.0 is good condition, 2.0 – 2.5 is moderate/fair condition and <2 is poor condition.

Table 5: Summary of Soils, Physiographic Zone(s) and Risks

Soil Type	Vulnerability Factors			FDE Classification	*Physiographic Zones*
	Structural Compaction	N leaching	Waterlogging		
Pukemutu	Severe	Slight	Severe	Category A	Gleyed (no variant)
Edendale	Slight	Moderate	Slight	Category A	Oxidising (no variant)

3.3.1 Soils

Pukemutu soils have heavy silt loam, grading with depth to silty clay, textures and are poorly drained, with a dense frangipan between 60 and 90 cm depth, which restricts water drainage. They respond well to mole and tile drainage. These soils are poorly drained, with very slow permeability in the subsoil and limited aeration during sustained wet periods.

Edendale soils are well-drained and have a deep rooting depth, high water-holding capacity, and silt-loam textures. Whilst these soils are well-drained, the compact subsoil is slowly permeable and may cause short-term waterlogging after heavy rainfall.

The proposed expansion in the effluent disposal area and expansion of the dairy platform will not impact on any soil types that aren't already included in the effluent disposal area or dairy platform.

3.3.2 Farm Dairy Effluent Classification

All of the soils across the property are categorised as Category A – artificial drainage or coarse soil structure. The average FDE application rate needs to be less than the soil infiltration rate and FDE must only be applied when a soil water deficit exists.

The proposed expansion in the effluent disposal area and expansion of the dairy platform will not impact on FDE categories that aren't already included in the effluent disposal area or dairy platform.

3.3.3 Physiographic Zones

The western part of the property is within the Oxidising physiographic zone, which coincides with the presence of the Edendale soils. The rest of the property, which is underlain by Pukemutu soils, is within the Gleyed physiographic zone.

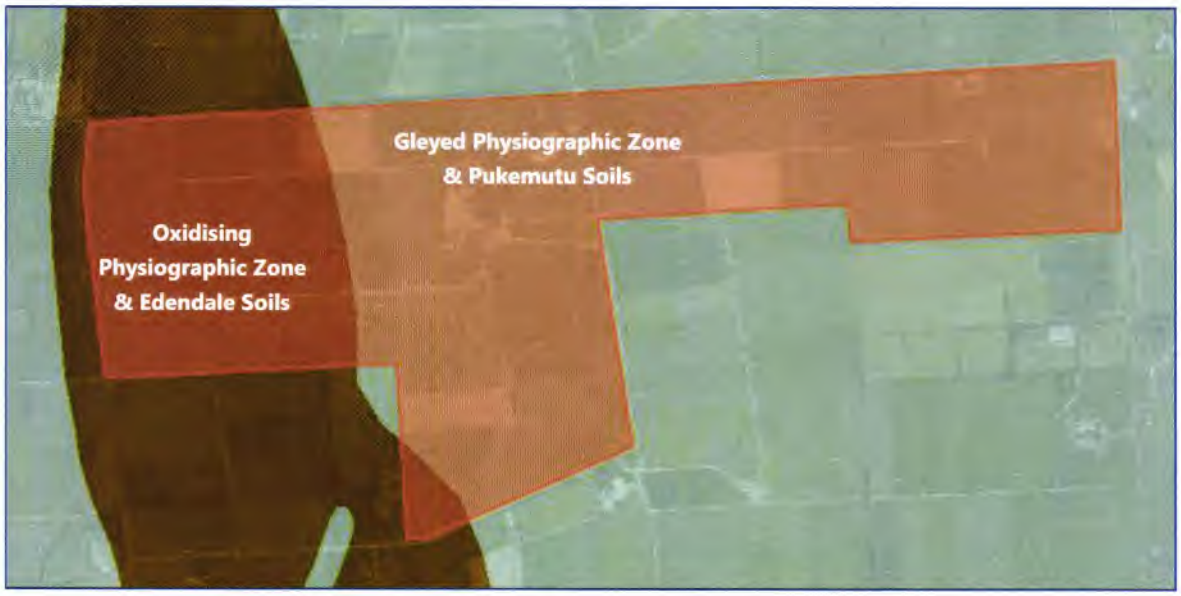

Figure 8: Physiographic zones present across the subject property

The Gleyed physiographic zone comprises predominately flat to undulating land that occurs between major river systems where soils are fine textured and poorly drained. This zone is characterised by soils which have distinctive redoxomphoric features such as mottling and gleying (resulting from extending periods of soil waterlogging). Soils in this zone have some ability to remove nitrogen from water to the atmosphere via denitrification, however this process can be bypassed when contaminants are flushed to nearby surface water bodies via artificial drains and overland flow following heavy or sustained rainfall event.

The Oxidising zone is well aerated with plenty of oxygen. High levels of oxygen allow nitrate nitrogen to build up, and therefore this setting has little to no ability to remove nitrogen (i.e. denitrification). When soils are wet, any nitrogen not used by plants has the potential to drain down into the underlying groundwater. Soils in Oxidising zone generally have good permeability although some soils in this zone have low subsoil permeability making them susceptible to waterlogging and therefore artificial drainage is used. However, Edendale soils are not prone to waterlogging.

The proposed expansion in the effluent disposal area and expansion of the dairy platform will not impact on any physiographic zones that aren't already included in the effluent disposal area or dairy platform.

3.3.4 Summary

The depth of nearby bores (6 – 13 m) indicates that there is a relatively shallow groundwater resource available locally and ES's factsheets for the Lower Oreti and Makarewa groundwater zones suggest that this groundwater resource is recharged predominantly by rainfall. Nutrients, such as N, could potentially be leached from the upper soil profiles contaminate this groundwater resource. This is particularly true in the western portion of the property that is in the Oxidising physiographic zone, although a significant local groundwater quality issue has not been detected. This may be because the underlying aquifer consists of poorly sorted gravels and groundwater migration is relatively slow in the area.

The key contaminant pathway on the western-most portion of the property is deep drainage and the key contaminant pathway for the rest of the farm is artificial drainage. In either area, FDE application at low depths is required to avoid the accumulation of contaminants in the topsoil and subsequent leaching through to tile drains and/or groundwater.

4. ACTIVITY CLASSIFICATION

4.1 Consents Required

The following resource consents are required under Regional Water Plan for Southland, 2010 (RWPS) and Proposed Southland Water and Land Plan, 2018 (PSWLP).

Table 6: Applicable Rules

Consent	Plan	Rule	Activity Status
Discharge Permit to discharge agricultural effluent to land	RWPS	50(d)	*Restricted Discretionary*
	PSWLP	35(c)	*Discretionary*
Water Permit to abstract groundwater for dairy shed wash down and stock drinking	RWPS	23(d)	*Discretionary*
	PSWLP	54(a)	*Permitted*
Land Use Consent to use land for dairy farming	PSWLP	22(e)	*Discretionary*

Overall, the proposal is for ***discretionary*** activity.

4.2 Consents Not Required

In accordance with Schedule 4 of the RMA, an application must describe and demonstrate compliance with any permitted activity that is part of the proposal to which the application relates.

Table 7: Activities for which Consent is Not Required

Activity	Compliance with the relevant permitted rules of the RWPS and PSWLP
Use of land for the maintenance and use of an existing agricultural effluent storage facility (Rule 32D of the pSWLP)	The use of land for the maintenance and use of an existing agricultural storage facility (includes ponds, weeping walls, sumps and stone traps etc) that was authorised before 4 April 2018 is a permitted activity providing the construction of the facility was authorised by a resource consent.
Incidental discharges from farming (Rule 24 pSWLP)	The land use associated with this discharge is authorised under Rules 20, 25 or 70.
Fertiliser (Rule 10 RWPS & Rule 14 pSWLP)	All practicable measures will be taken to minimise fertiliser drift beyond the target areas. Fertiliser will be applied to selected areas of the farms in accordance with nutrient budget recommendations, and soil tests to avoid excess leaching of nutrients to groundwater. Fertiliser will be applied when a soil water deficit exists, and all waterways will have riparian margins with stock excluded.
Silage storage and silage leachate (Rule 51 of the RWPS, and Rules 40 & 41 of the pSWLP.)	All silage storage facilities are located away from sensitive receiving environments, in accordance with permitted rule setbacks and no direct discharge of silage leachate to any waterbody is proposed. The silage pad is not hooked up to the effluent system, and therefore silage leachate is discharged to land in accordance with the rules listed in the column to the left.
Sludge (Rule 38 of the PSWLP)	Solid sludge effluent collected from the stone traps and effluent pond will be laid out to dry before applying to land when conditions are suitable, observing appropriate separation distances, and there will be no disposal of solids to any waterway.
Cleanfill, Farm Landfills and Offal Holes	No more than 500 m^3 of material will be discharged within cleanfill sites. Stormwater will be directed away from fill areas and no unauthorised material will

Activity	Compliance with the relevant permitted rules of the RWPS and PSWLP
(Rules 53, 54 & 55 of the RWPS, and Rules 42 & 43 of the pSWLP)	be placed into proposed fill areas. No naturally formed limestone rock is known to reside within the property. Excavation of fill holes do not intercept springs and are not below the seasonal mean groundwater level in that location. Sensitive areas can be easily avoided when undertaking these associated activities. Offal sites are to be covered and the surfaces to be restored to a similar state as surrounding land upon closing.
Drainage of Land (Rule 9 RWPS & Rule 13 pSWLP)	It is not anticipated that any discharge from subsurface drains would result in a conspicuous change to the colour and/or clarity of the receiving waters at a distance of 20 metres from the point of discharge. The proposed good management practices will significantly reduce the likelihood of any contaminants reaching the subsurface drains.

5. NOTIFICATION AND CONSULATION

A consent authority has the discretion whether to publicly notify an application unless a rule or National Environmental Standard (NES) precludes public notification or section 95A(2) applies.

The effects of the activity will be no more than minor, the applicant does not request public notification and there are no rules or NES' which require the public notification of the application. In addition, there are no special circumstances relating to the application. As such, notification of the application is not necessary.

Clause 6(1)(f) of Schedule 4 of the RMA requires the identification of, and any consultation undertaken with, persons affected by the activity. The assessment of environmental effects below demonstrates that no persons will be adversely affected by the proposal to a degree that is minor or greater. Overall, it is considered that this application will be processed non-notified and without the need for written approvals.

6. ASSESSMENT OF ENVIRONMENTAL EFFECTS

In addition to the application being made in the prescribed forms and manner, Section 88 of the RMA also requires that every application for consent includes an assessment of the effects of the activity on the environment as set-out in Schedule 4 of the RMA.

6.1 Effluent Disposal

6.1.1 Application Rate/Depth

The proposed application rate and depth are 10 mm/hr and 25 mm respectively. This is appropriate for Category A soils and will be achieved using a low rate pod system. The slurry tanker will apply effluent at a maximum depth of 5mm.

In Southland, regular soil water deficits greater than 10 mm mainly occur between the months of October to May, which makes it difficult to accurately schedule the application of effluent to coincide with soil moisture deficits over the entire milking season, which usually begins in August. The applicant checks weather forecasts, checks the nearest soil moisture site on the ES website and checks paddocks before application to ensure that effluent is only applied when a soil water deficit exists.

The applicant also plans to install his own soil moisture probe/tapes on the property to ensure a higher level of effluent management that is targeted at site-specific soil conditions. It is appropriate for the discharge consent sought to require that this is installed within 6 months of the consent being exercised.

Careful irrigation scheduling will maintain nutrients within the top 200 mm of soil[4], enabling the assimilation of nutrients into a form which can be used by plants whilst avoiding ponding, odour, overland flow and or/nutrient leaching and microbial leaching to groundwater and surface water. Ensuring that effluent is not applied at depths greater than those specified above will ensure that when there is a soil water deficit, the nutrients should remain in the top 200 mm of soil.

Effluent discharge will observe a 28-day return period. Effluent will be discharged to land year-round, on days when conditions are suitable. Furthermore, "proof of placement" of irrigators provides a record of effluent application and the required information to make informed decisions daily and seasonally regarding the forecasting of FDE disposal.

With regards to the typical tile drain located at least 1 m beneath ground level, the proposed depth of application and assimilation in the topsoil will ensure that an appropriate separation distance to subsurface drains (should they occur in the disposal area) is maintained.

Provided that FDE is applied to land in the manner described, then any potential adverse effects associated with ponding, odour, overland flow and or/nutrient leaching and microbial leaching to groundwater and surface water should be avoided as far as reasonably practicable.

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[4] Houlbrooke, D J, Monaghan R M, *The influence of soil drainage characteristics on contaminant leakage risk associated with the land application of farm dairy effluent*, 2009, AgResearch Ltd

6.1.2 Storage

Currently, effluent storage at the farm consists of a relatively new 3,261m^3 lined pond with a mechanical stirrer, which was designed by RDAgritech Ltd. There are no signs to suggest that the pond is leaking. The attached Dairy Effluent Storage Calculator (DESC) report shows the pond is adequately sized as the total volume exceeds the minimum of 2,670m^3 suggested by the DESC. Adequate storage will enable irrigation of effluent to be deferred when conditions are not suitable.

6.1.3 Nutrient Loading

Calculations using the DESC attached indicates that the farm will produce around 10,200 m^3 of FDE per year. This equates to 148 m^3/ha/yr based on an irrigation area of 69 ha. Using DairyNZ (2010) guideline N concentration of FDE of 0.45 kg/m^3, this equates to an annual loading rate of 67 kg N/ha/yr (assuming all areas receive an equal amount of effluent. An areal loading of 67 kg N/ha/yr equates to 44% of ES's recommended maximum areal rate of 150 kg N/ha/yr for all N inputs, and is less than the limit imposed by current consent conditions.

ES's recommended maximum areal rate of 150 kg N/ha/yr is supported by the 2009 report for ES by AgResearch[5] that recommended the maximum N load as a management criterion to avoid direct losses of land-applied FDE. Given that the proposed areal loading is a fraction of the limit recommended by AgResearch, land-applied FDE nitrogen leaching will be within acceptable limits.

FDE can be used as an organic fertiliser, which means that it relies on soil organisms to break down the organic matter. Nutrients are released more slowly than they are from inorganic fertilisers and this slow-release method reduces the risk of nutrient leaching. Inorganic fertilisers, such as urea, provide the same nutrition in a plant-ready form immediately, but the rapid release of nutrients creates a higher risk of leaching past the root zone.

Overall, the effluent disposal system described above allows the effluent to be used as both a fertiliser and soil conditioner with a lower risk of nutrient leaching than inorganic fertilisers.

6.1.4 Disposal Area

A total discharge area is to be extended to 69.3 ha which provides a discharge area to stock ratio of 10 ha per 100 cows, which is greater than the recommendation of 4 ha/100 cows. The available disposal area is also greater than the minimum required in ES's Best Practice Guidelines, which is 8 ha/100 cows. This limit is derived as a further method for ensuring that ES's recommended 150 kg N/ha/yr areal loading limit for N (discussed above) is not exceeded.

Effluent will not be applied within the following buffer zones:

- 20 m of any surface watercourse
- 100 m of any potable water abstraction point
- 20 m to any landholding boundary; and

[5] Houlbrooke, D J, Monaghan R M, *The influence of soil drainage characteristics on contaminant leakage risk associated with the land application of farm dairy effluent*, 2009, AgResearch Ltd

- 200 m of any residential dwelling on a neighbouring property

There are no other sensitive receptors that require separation measures to be implemented. Provided that these buffers zones are maintained, there should be no significant adverse effects resulting from the siting of the disposal area.

6.1.5 Effects on Water Quality from FDE Disposal

A desktop assessment of the potential effects of the potential loss of N from the disposal of FDE to land has been undertaken.

Using a 304-day milking season, potential effects associated with N leaching have been calculated. It has been assumed that:

- Attenuation (e.g. plant uptake etc) accounts for 97% of total N input[6]; and
- Drainage equates to 368 mm/yr (based on land surface recharge for the Lower Oreti Groundwater Management Zone[7]); and
- An average of 50 L/cow/day of FDE will be produced and that FDE has an average TN loading of 0.45 kg/m^3.

Based on these assumptions, the average TN concentration in drainage water as a result of FDE application will be 0.54 g/m^3.

This application seeks to increase the size of the disposal area over soils with the same characteristics and within the same physiographic zones as the existing disposal area. Application of effluent over a wider area reduces the risk of overloading, deep drainage and through-flow, therefore the expansion of the disposal area is expected to result in less risk of environmental harm than the current scenario.

These concentrations are well within limits set by the New Zealand Drinking Water Standards, 2005. There is a registered drinking water site at Lochiel School (LOC001), which is located approximately 1.5 km down-gradient of the subject property. Based on the above assessment of potential TN concentration in drainage water, the fact that effluent is going to spread over a greater area than present and the fact that groundwater migration is relatively slow in the area, then the risk of the proposed FDE disposal activity adversely affecting this drinking water supply is very low.

Other contaminants of concern include sediment and micro-organisms. Contaminant transportation towards sensitive receiving environments is dependent on many factors, including soil type, climate and anthropogenic influences such as the presence of drains. All of these factors have been considered when determining an appropriate irrigation location and method (including rate and depth), and in ensuring that there is adequate storage to allow for deferred irrigation. By restricting effluent irrigation to periods where drainage events are less likely to occur, there is less risk of leaching, overland flow and losses via artificial drains occurring. The proposed

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[6]Houlbrooke D, Longhurst B, Laurenson S and Wilson T, 2014, *Benchmarking N and P loss from dairy effluent derived nutrient sources*

[7]Chanut P, 2014, *Estimating time lags for nitrate response in shallow Southland groundwater*, Environment Southland publication number 2014-03, Invercargill.

application depths will enable nutrients to be assimilated in the root zone in the top 200 mm of soil (tile drains are located beneath this) and avoid direct contamination of waterbodies via discharges.

Provided that effluent is applied at the proposed rate/depths and effluent irrigation is avoided when conditions are not suitable, then adverse effects on water quality should be avoided as far as reasonably practicable.

6.1.6 Odour

The effects of odour are most likely to occur from the discharge of FDE or from the storage of effluent where it may be encountered beyond the boundary of the site. The effluent pond is located at a suitable distance from the property boundaries and nearest dwellings. The physical location of the effluent infrastructure coupled with the proposed low application rate irrigation and effluent discharge buffers means there is little risk of adverse effects from odour and spray drift on surrounding land owners and occupiers. As such, the effects of odour are avoided.

6.1.7 Contingency Plans

An alarm and automatic switch-off system is installed and this acts as a contingency measure in the event of an effluent system failure such as sudden pressure drop, irrigator stoppage or breakdown.

A slurry tanker may be used at certain times if the usual methods of effluent discharge are under repair or if conditions allow for more effluent to be applied than the usual system is capable of conveying. Any discharges from the slurry tanker must adhere to the rate and depth limits imposed on the consent.

6.2 Groundwater Abstraction

6.2.1 Allocation

The applicant's proposed abstraction represents a negligible portion of the allocation of the respective groundwater management zone. This application seeks to replace existing groundwater permits with no increase in the volume of water sought, therefore there will be no effect on current allocation volumes.

6.2.2 Stream Depletion and Interference Effects

Policy 29 in the RWPS and Policy 23 of the pSWLP requires a stream depletion assessment when the daily average rate of take is more than 2 L/s because takes less than this are expected to have a minor effect on stream flows. Over 24 hours of pumping, the rate of take is less than 2 L/s and therefore does not require a stream depletion assessment.

Significant interference effects on neighbouring bores are not expected. Given that the average rate of take is relatively low, it is unlikely that the radius of interference would affect any of these bores.

6.2.3 Effects on Groundwater Quality

The low rate of take is highly unlikely to result in the drawdown of contaminants from the upper soil profiles and so the proposed abstraction is not expected to have any adverse effects in terms of groundwater

quality. The applicant will need to ensure that the bore head casing is adequately sealed to prevent the ingress of contaminants.

6.2.4 Efficiency of Use

The proposed rate of take is estimated at 120 L/cow/day, which is consistent with Council's recommendations. The applicant is not opposed to the continued monitoring of water abstraction on the property to ensure that use is not excessive.

6.2.5 Monitoring

The proposed abstraction will continue to be metered with records kept on a monthly basis, consistent with the existing conditions of consent. These records will be provided to Council annually at the end of the "water year" and upon request.

6.3 Expansion of the Dairy Platform and the Addition of Cows

Conservative Assessment

The modelling of the "existing environment" has taken into consideration the activities that have been occurring on-site for the past three years, rather than just last year, and also uses actual cow numbers on the dairy platform rather than consented cow numbers. Although Council must consider activities that are authorised by a resource consent as part of the lawful existing environment (Hawthorne Estates Ltd v QLDC, 2006), modelling *actual* cow numbers is a more conservative approach and provides Council with more certainty about how future losses compare with historic losses.

The applicant took over ownership of the east block in October 2016 it has since been gradually transitioned into a dairy support block. Before that is was used for sheep grazing only. To create a meaningful assessment of likely losses for the past three years, three separate budgets were created for the Eastern Block and these are discussed in the attached Overseer modelling report. The modelling undertaken represents a meaningful, conservative estimate of nutrient losses for the past 3 years.

A less conservative assessment would attempt to model the consented cow numbers on the current milking platform (599). This would drive up the nutrient losses from the "current" scenario and therefore a more intensive operation could be proposed for the "future" scenario without any relative increase in nutrient losses.

Results from Overseer Modelling

CURRENT SCENARIO

Overseer was used to model losses from the existing sheep farm (east block) and existing dairy farm for the last three years to formulate a current scenario model. Three separate budgets were modelled for the east block to account for the transition that this block has undertaken from a sheep grazing block in the 2015/2016 season to a dairy support block in the 2017/2018 season. These three budgets were then averaged to represent a current scenario and nutrient losses were modelled to be:

- 17kg N/ha/year
- 0.7kg P/ha/year

The existing dairy farm has maintained a consistent farm system for the preceding three years and accordingly one nutrient budget was prepared which used actual inputs from farm records which has been averaged for the three years. The applicants peak milked 573 cows producing 473 kg MS/cow. A total of 516 cows were wintered off the platform at a grazier with the remaining average of 83 cows wintered at home on fodder beet.
NOTE: The cows on fodder beet are averages across the month to allow for some of the herd to stay on farm at the start of June, and to allow for early calvers to be brought home early at the end of July. The numbers used in the model (20 in June and 86 in July) are an average across those months. So, if there were 300 cows on-site for the first two days in June and none for the rest of the month, or 20 cows on-site for every day in June, the effect would be the same.

The current scenario for the existing dairy platform modelled nutrient losses to be:

- 53kg N/ha/year
- 1.2 kg P/ha/year

Combining the two current scenarios for the east block and dairy platform gives a representation of the level of predicted nutrient losses occurring from the whole landholding currently, prior to any proposed land use change. The current combined scenario predicts nutrient losses to be:

- 51 kg N/ha/year
- 1.2 kg P/ha/year

This is equivalent to 11.5 tonnes of N and 0.26 tonnes of P per year. These figures represent modelled long-term average losses with inherent uncertainties and are in no way absolute.

PROPOSED SCENARIO
Overseer was then used to model the proposed scenario, which sees 700 cows being milked over the expanded dairy platform onto east block. Under the proposed scenario, the same number of cows are wintered at a grazier (516 cows) with the remainder of the herd being wintered on farm on grass/baleage over the winter period. Supplement usage and fertilizer inputs have been adapted to suit the proposed farm system with the only major changes being the expansion of the effluent discharge area and the concurrent partial substitution of the nutrients in applied fertilizer with effluent to facilitate pasture growth. Modelled nutrient losses from the entire landholding are predicted to be:

- 51 kg N/ha/yr
- 1.2 kg P/ha/yr

This is equivalent to 11.3 tonnes of N and 0.27 tonnes of P per year. These figures represent modelled long-term average losses with inherent uncertainties and are in no way absolute.

The modelling has shown that authorising the expansion of the dairy farm as proposed will result in a net reduction in the quantity of N lost from the landholding. This is because of the following changes in the way that the land will be used:

- Removing winter crop area from the dairy platform and replacing it with grass/baleage wintering to enable the wintering of 216 cows on farm.

- Increasing the effluent discharge area so that the concentration of effluent in any one area is reduced; and
- Reduced N fertiliser use on the effluent discharge area.

Phosphorous

The modelling undertaken as part of this consent application indicates that there could be small increase in the amount of P lost to water following the expansion of the dairy farm (from 262 kg/yr to 278 kg/yr).

It is widely known that mitigation measures and GMPs that reduce the loss of P from a dairy farm are often not accounted for when modelling using Overseer because the model is not spatially explicit. As a result, lossess of P modelled in Overseer are over-estimated. Most of the predicted P losses are attributed for in the Overseer model by runoff and "other sources". "Other sources" includes standoff/feed pads, effluent management systems (such as from uncovered stored solid effluent), silage stacks, yards, laneways and crossings and Overseer assumes that 30% of P deposited on a lane is lost directly to water, even if the lanes are on flat land and there are no nearby surface water bodies.

The East Block is flat, there are no waterways on this block and only one new lane will need to be constructed. The photos below show existing ways in which the applicant mitigates against direct P losses to waterways. The installation of bargeboards and sandbags on crossings prevent sediment and effluent runoff from the lane into the waterway and direct drainage to the adjacent pasture.

Figure 9: Laneway crossing with kickboard to prevent direct runoff into creek

Figure 10: Laneway crossing with kickboard to prevent direct runoff into creek

Figure 11: Laneway crossing with sandbags to prevent direct runoff into creek

Artificial drainage is the key contaminant pathway for much of the existing dairy farm and the new east block, but the risk of P infiltrating the topsoil and being transported to surface water via tile drains is low because P adsorbs to soil articles and so it is not prone to leaching in the same way that N is. Overland flow is the more common mechanism for P loss to water and this is not a key contaminant pathway on this property, although the applicant adequately mitigates against the risk of contaminant loss via this pathway in accordance with the measures in the FEMP.

The applicant will operate the farm in accordance with this FEMP to ensure that any potential effects associated with the proposed farming operation will be managed appropriately.

Based on the above, the risk of adverse environmental effects occurring because of an increase in P loss to water as a result of the proposed expansion is negligible.

Microbial Contamination

With respect to microbiological contamination from pastoral farms, research by AgResearch[8] shows that late autumn until mid-spring is the high-risk period as this is when surface runoff and mole-pipe drainage is most likely to occur. They also note that *"not all areas of the landscape contribute to flow pathways of loss. Those that do are termed critical source areas and are characterised as being directly "connected" to water bodies"*. AgResearch suggest that improved effluent management, stock exclusion and the elimination of stock crossings will have the greatest impact in reducing microbiological contamination from pastoral farms. These GMPs will be adopted on farm through the implementation of the FEMP, which will ensure that adverse effects resulting from microbial contamination will be reduced as far as reasonably practicable and should be less than occurring prior to the implementation of the FEMP.

Receiving Environments Affected

The East Block contains similar soil types and physiographic zones as the existing dairy farm and so the risk of adverse effects from contaminant losses from the proposed dairy platform is comparable to the current dairy platform through the use of mitigation measures and therefore effects change little in nature, scale and extent. The nutrient inputs contained within the nutrient budget take account of the key contaminant pathways identified for the physiographic zones and soils present on the farm and have been implemented to minimise nutrient losses to the practical minimum. Specific activities have been sited, timed and designed to avoid the application of nutrients to high risk areas and during high risk periods.

The proposal sees the expansion of the dairy farm further into the Makarewa River catchment and the Makarewa GMZ. Given there is not predicted to be an increase in contaminant losses as a result of the proposal, no further adverse effects on the surface water or groundwater receiving environments are expected. The nutrient budgeting undertaken suggest that N losses will decrease under the proposal which will result in a reduction in cumulative N loading to the catchment. Considering that the pSWLP sets a strong direction for halting the decline in water quality, the proposed land use change will be environmentally beneficial, although there are no catchment nutrient limits set yet.

6.4 Effects of the Off-Farm Activities

According to recent advice from ES, when assessing an application for resource consent to increase cow numbers, where the increase in cow numbers is being justified or off-set by exporting some of the increased losses to an off-farm site, it may be appropriate to consider consequential effects on the receiving environment at the off-farm site if not too uncertain or remote. This may include activities that require resource consents which may yet be applied for.

[8] Monaghan, R. M., Semadeni-Davies, A., Muirhead, R. W., Elliott, S and Shankar, U., 2010. *Land use and land management risks to water quality in Southland.* Prepared for Environment Southland, April 2010.

In this case, the proposed increase in the size of the milking herd by 101 cows has been fully accounted for in the proposed scenario nutrient budgets in terms of both their 300 approx days rotating on the milking platform and the winter period spent on the 4ha grass/baleage block.

The current farming system is, and will continue to be, one where the majority of the milking herd is wintered offsite at a graziers. Under the proposal the same number of cows will be sent to a graziers during June and July and into August as is occurring currently. The wintering activity occurring outside of the landholding at the graziers is controlled by the relevant provisions of the pSWLP and will be adequately and appropriately assessed as part of any consent application (if needed) made by the owner of the off-site landholding where the grazing is occurring.

This application is not, therefore, an example where the increase in cow numbers is being justified or off-set by exporting some of the increased losses to an off-farm site. The proposed nutrient budget internalises all losses generated by the proposed farming activity on the landholding.

6.5 Cumulative Effects

The proposal detailed in this report seeks to reduce the amount of N lost to water, which will reduce the total load of N that may accumulate further down in the catchment. Losses of P are modelled to increase by 7% but for the reasons outlined earlier in this report, this increase is not actually expected to occur. Overall, the proposal will result in net positive outcomes in terms of cumulative effects on the catchment.

There is a registered drinking water site at Lochiel School (LOC001), which is located approximately 1.5 km down-gradient of the subject property. If this proposal resulted in increased N loss to water (through leaching), and if the subsurface conditions were conducive to rapid migration of contaminants (which they are not), then there could be a concern about cumulative effects on water quality in the Lochiel School bore. However, this proposal sees a reduction in N loss to water and groundwater movement in the area is slow, so this proposal is unlikely to add to any cumulative effects on this bore.

6.6 Good Management Practices

The applicant already has a Farm Activity Focus Plan, and this has been incorporated into the attached draft FEMP. The FAFP doesn't cover the East Block but there is no waterways or CSAs on the East Block that require specific management.

Plans showing the areas to be cultivated and the areas to be intensively winter grazed over the following season need to be provided before the FEMP can be completed, however, there is no sense in doing this until the applicant knows if/when the new land use consent might be granted. For example, the cultivation and winter grazing areas could be mapped now, but if consent is not granted soon then these maps may not longer be applicable.

The subject site covers two different physiographic units therefore it requires a range of GMPs to be adopted, with the key contaminants pathways being deep drainage and artificial drainage (see earlier in this report report).

The table below outlines which GMPs will be adopted and which physiographic zones they provide most benefit in. Most of the GMPs detailed in the first three lines of the table below will be particularly effective in managing the risk of P loss to water as well as N.

Table 8: Site Specific Good Management Practices for the Subject Property

Good Management Practices to be adopted	Most effective in these zones
Protect soil structure • Wintering the majority of the herd off the milking platform • Wintering a small portion of the herd on grass/baleage • Re-sow bare soils as soon as possible • Use of calving pad when ground conditions are saturated (not for a fixed period)	Gleyed
Manage CSAa • Avoid working CSAs and their margins • Leave grassed areas (or native vegetation) around CSAs • All riparian margins to be fenced and planted	CSAs (Gleyed and Oxidising)
Reduce P loss • Reduce use of P fertilizer where Olsen P values are above agronomic optimum • Reduce the risk of run-off to water from laneways and other sources	Gleyed
Reduce N accumulation in soil • Control the intensity of grazing of pasture by opening up breaks during adverse weather conditions • Wintering the majority of the herd off the milking platform • Optimise timing and amounts of FDE application to avoid high risk drainage periods and saturated soils • Time N fertilizer application to meet pasture and crop demand using split applications • Re-sow bare soils as soon as possible	Gleyed, Oxidising
Avoid preferential flow of FDE through drains • Defer effluent application when soil conditions unsuitable • Apply effluent at low rates • Utilize the full effluent discharge area to reduce N loading	Gleyed

6.7 Other Assessment Matters

In accordance with Clause 7 of Schedule 4 of the RMA the following provides an assessment of the activity's effects on the environment:

a) *any effect on those in the neighbourhood and, where relevant, the wider community, including any social, economic, or cultural effects*

The effects of the proposal to abstract ground water and discharge dairy shed effluent already form part of the existing environment. Throughout the duration of the existing consents, there have been no known complaints from neighbours, which indicates that the potential adverse effects on the neighbourhood are less than minor.

The proposed activities will result in net positive benefits to the neighbourhood as there will be capacity to provide for the social and economic benefits with the employment of staff, as well as contractors and consultants, and the farm is serviced by local schools and many businesses that would not benefit if the activities were unable to occur. More generally, the dairy sector continues to contribute greatly to the New Zealand economy in many ways including gross domestic productivity, employment, community growth and resilience and reinvestment capacity via tax revenues. The ability for the applicant to continue to operate their dairying operation will enable them to provide for their own social, economic and cultural wellbeing.

In terms of the potential effects on cultural values, an assessment of the proposal against the Te Tangi a Tairua is the Iwi Environmental Management Plan (applicable to the Southland Region), is made below. The proposal is considered to be wholly consistent with the relevant policies of the Iwi Management Plan.

b) *any physical effect on the locality, including any landscape and visual effects*

In terms of landscape and visual effects, the presence of effluent irrigation, other farming equipment and cows is expected within the rural locality. It is expected that the proposal will not have any significant physical effects on the locality over and above that currently experienced.

c) *any effect on ecosystems, including effects on plants or animals and any physical disturbance of habitats in the vicinity*

The dairy farm is located within a highly modified ecological landscape and it is anticipated that the proposal will not have any significant adverse effects on ecosystems above that which has been occurring for many decades.

d) *any effect on natural and physical resources having aesthetic, recreational, scientific, historical, spiritual, or cultural value, or other special value, for present or future generations*

It is not considered that the activities will have any effect on aesthetic values, as the existing dairy platform is established and in keeping with the general rural nature of the area. The land in this area is historically known for farming activity, and the presence of a dairy operation on this property does not result in any effect contrary to the historical values associated with the natural and physical resources in the vicinity.

The waterways within the proposed dairy platform are non-navigable and public access would be by permission of the applicant only. There is no evidence to suggest popular recreation fishing spots nearby which may be affected by the proposal. The effects on any cultural values are assessed below.

e) *any discharge of contaminants into the environment, including any unreasonable emission of noise, and options for the treatment and disposal of contaminants*

Effluent is proposed to continue to be treated and discharged to land as described earlier in this report. The assessment of alternatives provided in this report has concluded that this is the preferred solution for managing FDE generated at the property. The activity is in keeping with the rural nature of the area, therefore it is not considered there will be any unreasonable emission of noise or odour.

f) *any risk to the neighbourhood, the wider community, or the environment through natural hazards or the use of hazardous substances or hazardous installations*

All hazardous materials carried and used onsite will comply with the relevant rules of the Part operative Southland District Plan 2012, and the Hazardous Substances and New Organisms Act 1996. As such, there will be no risk to the neighbourhood, wider community or the environment due to natural hazards or the use of hazardous substances or hazardous installations.

6.8 Assessment of Alternatives

Clause 6(1) of the Resource Management Act requires that an assessment of environmental effects must include a description of any viable alternative locations or methods for undertaking the activity if it is likely that the activity will result in any significant adverse effect on the environment and/or if the activity includes the discharge of contaminants. None of the activities described in this report are expected to result in significant adverse effects on the environment and so this assessment of alternatives considers the proposed discharge of FDE only.

Method of Discharge

Deferred irrigation methods will be utilised on the property to ensure that effluent is only applied when conditions are suitable. Detention in the effluent pond also provides some level of treatment to the effluent before it is applied to land. Alternative methods may include direct discharge of the effluent to land on an as-required basis, regardless of the conditions. This would likely result in over-saturation of soils, ponding, overland flow and/or excessive leaching of contaminants, all of which can lead to significant adverse environmental effects. There are no other practicable environmentally acceptable alternatives to applying FDE to land.

Receiving Environment

Discharging effluent to land, if conducted appropriately, enables the reuse of a waste product as a soil conditioner and provides nutrients for plant growth. Attenuation of contaminants cannot occur if effluent is discharged directly to water and is therefore considered unsuitable. Direct discharge to water would almost certainly be more detrimental to the receiving environment than discharging to land.

Overall, the proposed discharge methods and receiving environment are the most suitable for managing the FDE generated at the farm.

6.9 Summary

This proposal seeks to expand the footprint of an existing dairy farm and increase the number of cows milked. Modelling indicates that the proposal will reduce the amount of N lost to water. The very slight increase in P losses modelled is not actually expected to occur.

The effluent collection, treatment and disposal methods proposed are appropriate given on-site conditions and will ensure that any potential effects associated with effluent disposal are managed appropriately. No adverse effects are anticipated from the continued abstraction of groundwater.

Potential adverse effects associated with the operation of the dairy farm will be managed through the FEMP, which contains site-specific GMPs that have been identified as being the most effective for managing the risks associated the soil types and physiographic zones present.

The proposed activities will enable the applicant to provide for their economic and social wellbeing while providing environmental benefits in the form of reduced losses to the environment and no cultural values will be compromised.

Overall, no adverse effects over and above those occurring from the existing dairy farm (which forms part of the existing environment) are proposed. For the reasons outlined in this report, such as the implementation of the FEMP, the proposal may even result in a reduction in environmental effects associated with the dairy farm.

7. STATUTORY CONSIDERATIONS

Schedule 4 of the RMA requires that an assessment of the activity against the matters set out in Part 2 and any relevant provisions of a document referred to in Section 104 of the RMA is provided when applying for a resource consent for any activity. These matters are assessed as follows.

7.1 Part 2 of the RMA

The proposal is consistent with the purpose and principles of the RMA, as outlined in Section 5. The proposal will have less than minor effect on the environment's ability to meet the reasonably foreseeable needs of future generations, or on the life-supporting capacity of the environment and any ecosystems associated with it. The proposal ensures that adverse effects on the environment are avoided or mitigated.

There are no matters of national importance under Section 6 of the RMA that will be affected by the proposal. In regard to Section 7, particular regard has been given to the efficient use and development of natural resources, and the maintenance and enhancement of the quality of the environment. Regarding Section 8, the proposed activity is not inconsistent with the principles of the Treaty of Waitangi.

Overall, the activity is considered to be consistent with Part 2 of the RMA, given the minor nature of the activity and the proposed mitigations.

7.2 Section 104(1)(b) of the RMA

In accordance with Schedule 4 of the RMA, an assessment of the activity against the relevant provisions of a document referred to in 104(1)(b) of the RMA must be included in an application for resource consent. Relevant documentation covered by this section are:

- National Environmental Standard for Sources of Human Drinking Water, 2007
- National Policy Statement for Freshwater Management, 2014
- Te Tangi a Tauira - The Cry of the People, Ngai Tahu Ki Murihiku, Natural Resource and Environmental Iwi Management Plan, 2008
- Regional Policy Statement for Southland, 2017
- Regional Water Plan for Southland, 2010
- Proposed Southland Water and Land Plan, 2018

Under the RMA, regional plans need to give effect to NPSs, NESs and RPSs. For an application of this scale, an assessment of the application against the regional plans is adequate as these plans ultimately give effect to the higher order statutory instruments.

Regional Water Plan for Southland, 2010

The following policies, which give effect to the plan's objectives, are relevant to this application for resource consent.

Table 9: Applicable policies from the RWPS 2010

Policy	Wording	Comment
1A	Any assessment of an activity covered by this plan must take into account any relevant Iwi Management Plan.	Te Tangi a Tauira is considered below.
7	Prefer discharges to land over discharges to water where this is practicable, and the effects are less adverse.	The proposed discharge is to land, not water.
14A	To determine the term of a water permit consideration will be given, but not limited, to: (a) the degree of certainty regarding the nature, scale, duration and frequency of adverse effects from the activity; (b) the level of knowledge of the resource; (c) relevant tangata whenua values (d) the allocation sought, particularly the proportion of the resource sought; (e) the duration sought by the applicant, plus material to support the duration sought; (f) the permanence and economic life of the activity; (g) capital investment in the activity; (h) monitoring and review requirement in permit conditions; (i) the desirability of applying a common expiry date for water permits that allocate water from the same resource; and (j) the applicant's compliance with the conditions of the previous permit (where a new water permit is sought for a previously authorised activity).	The consent term sought is discussed later in this report.
21	To ensure that the rate of abstraction and abstraction volumes specified on water permits to take and use water are no more than reasonable for the intended end use.	The rate and volume sought are reasonable for the intended use.
22	Require, where appropriate, the installation of water measuring devices on all new permits to take and use water.	The water take will be metered.
25	To avoid, remedy or mitigate the adverse effects arising from point source and non-point source discharges so that there is no deterioration in groundwater quality after reasonable mixing, unless it is consistent with the promotion of the sustainable management of natural and physical resources, as set out in Part 2 of the Resource Management Act 1991, to do so.	Adverse effects on groundwater from the discharge of FDE will be avoided and mitigated as discussed earlier in this report.
28	To manage groundwater abstraction to avoid significant adverse effects on: • long-term aquifer storage volumes • existing water users • surface water flows and aquatic ecosystems and habitats • groundwater quality	There will be no adverse effects on any of the matters listed from the proposed groundwater abstraction.
29	Manage the stream depletion effect of any groundwater abstraction with a rate of take exceeding 2 L/s.	The average rate of abstraction over 24 hrs is less than 2 L/s.

31	Limit the cumulative interference effect of any new groundwater abstraction (in conjunction with other lawfully established groundwater takes) to no more than 20 percent of the available drawdown in any unconfined aquifer or up to 50 percent of the potentiometric head in any confined aquifer. The effects on any neighbouring bore will be considered where that bore is lawfully established and an assumption will be made that the bore fully penetrates the aquifer.	This application is for a replacement consent and so this policy is not applicable.
31A	Matching discharges to land to the level of risk posed by the following risk factors: (a) Nature and quantity of contaminants; (b) Sloping land; (c) Soil drainage characteristics; (d) Climate; (e) Proximity to surface water; (f) Natural hazards	As discussed earlier in this report, the proposed discharge method, rate and depth are appropriate for the subject property.
31C	Manage discharges to land to avoid, remedy or mitigate adverse effects on: (a) soil quality; (b) amenity values; (c) ecological factors; (d) historic, cultural and traditional values; (e) natural character; (f) outstanding natural features.	As discussed earlier in this report, the proposed discharge is no expected to have any significant adverse effects on any of the matters listed.
31D	Encourage the beneficial reuse of materials, to promote discharges of these materials onto land to maximise potential reuse of nutrients	As discussed earlier in this report, the proposed discharge allows for the beneficial reuse of FDE.
42	Avoid adverse effects on water quality and other adverse environmental effects associated with the application of farm dairy effluent to land by matching farm dairy effluent management to receiving environment risk.	As discussed earlier in this report, the proposed discharge method, rate and depth are appropriate for the subject property.
43	Match consent duration and inspection and audit requirements on resource consents to apply farm dairy effluent to land to the level of risk of adverse environmental effects.	The consent term sought is discussed later in this report.

Proposed Southland Water and Land Plan, 2018

The following policies, which give effect to the plan's objectives, are relevant to this application for resource consent.

Table 10: Applicable policies from the pSWLP 2018

Policy	Wording	Comment
1	Enable papatipu rūnanga to effectively undertake their kaitiaki (guardian/steward) responsibilities in freshwater and land management through the Southland Regional Council: 1. providing copies of all applications that may affect a Statutory Acknowledgement area, tōpuni (landscape features of special importance or value), nohoanga, mātaitai or taiāpure to Te Rūnanga o Ngāi Tahu and the relevant papatipu rūnanga; 2. identifying Ngāi Tahu interests in freshwater and associated ecosystems in Murihiku (includes the Southland Region); and 3. reflecting Ngāi Tahu values and interests in the management of and decision-making on freshwater and freshwater ecosystems in Murihiku (includes the Southland Region), consistent with the Charter of Understanding.	Te Tangi a Tauira is considered below.
2	Any assessment of an activity covered by this Plan must: 1. take into account any relevant iwi management plan; and 2. assess water quality and quantity, taking into account Ngāi Tahu indicators of health.	Te Tangi a Tauira is considered below.
6	In the Gleyed, Bedrock/Hill Country and Lignite-Marine Terraces physiographic zone, avoid, remedy, or mitigate adverse effects on water quality from contaminants, by: 1. requiring implementation of good management practices to manage adverse effects on water quality from contaminants transported via artificial drainage, and overland flow where relevant; and 2. having particular regard to adverse effects on water quality from contaminants transported via artificial drainage, and overland flow where relevant when assessing resource consent applications and preparing or considering Farm Environmental Management Plans.	Potential contaminant transportation pathways in the Gleyed physiographic zone and appropriate GMPs are discussed elsewhere in this report. The addition of the East Block requires the expansion of the dairy platform further into the Gleyed physiographic zone. Although nutrient losses are expected to decrease as a result of the proposal, our application and nutrient budgeting have been completed on the premise that the dairy farm is acting as an entire unit and that activities occurring on specific parts of the platform have been thoroughly considered and if necessary, mitigated by activities on other

		parts of the platform. In this respect, the farming system needs to be assessed as a whole and we consider that the application is consistent with Policy 6 as contaminant losses are predicted to decrease.
10	In the Oxidising physiographic zone, avoid, remedy, or mitigate adverse effects on water quality from contaminants, by: 1. requiring implementation of good management practices to manage adverse effects on water quality from contaminants transported via deep drainage, and overland flow and artificial drainage where relevant; 2. having particular regard to adverse effects on water quality from contaminants transported via deep drainage, and overland flow and artificial drainage where relevant when assessing resource consent applications and preparing or considering Farm Environmental Management Plans; and 3. decision makers generally not granting resource consents for additional dairy farming of cows or additional intensive winter grazing where contaminant losses will increase as a result of the proposed activity.	Potential contaminant transportation pathways in the Oxidising zone and appropriate GMPs are discussed elsewhere in this report. Contaminant losses will not increase as a result of the proposed activities. The addition of the east block into the milking platform doesn't extend into the Oxidising physiographic zone. However, the nutrient budgets have been completed based on a long term scenario where the entire farming system acts as a cohesive unit where mitigation measures on certain parts of the farm are balanced and in equilibrium with activities which may be occurring on other parts of the farm which may be in a different physiographic zone. Our assessment is that contaminant losses from the entire activity are not increasing and therefore when viewed as a whole farm system, the application is consistent with this policy.
13	1. Recognise that the use and development of Southland's land and water resources, including for primary production, enables people and communities to provide for their social, economic and cultural wellbeing. 2. Manage land use activities and discharges (point source and non-point source) to enable the achievement of Policies 15A, 15B and 15C.	Granting of the consents sought will enables people and communities to provide for their social, economic and cultural wellbeing. The proposed discharge will be managed appropriately.

14	Prefer discharges of contaminants to land over discharges of contaminants to water, unless adverse effects associated with a discharge to land are greater than a discharge to water. Particular regard shall be given to any adverse effects on cultural values associated with a discharge to water.	The proposed discharge is to land, not water.
16	1. Minimising the adverse environmental effects (including on the quality of water in lakes, rivers, artificial watercourses, modified watercourses, wetlands, tidal estuaries and salt marshes, and groundwater) from farming activities by: (a)... (b) ensuring that, in the interim period prior to the development of freshwater objectives under Freshwater Management Unit processes, applications to establish new, or further intensify existing, dairy farming of cows or intensive winter grazing activities will generally not be granted where: (i) the adverse effects, including cumulatively, on the quality of groundwater, or water in lakes, rivers, artificial watercourses, modified watercourses, wetlands, tidal estuaries and salt marshes cannot be avoided or mitigated; or (ii) existing water quality is already degraded to the point of being overallocated; or (iii) water quality does not meet the Appendix E Water Quality Standards or bed sediments do not meet the Appendix C ANZECC sediment guidelines; and (c)... 2. Requiring all farming activities, including existing activities, to: (a) implement a Farm Environmental Management Plan, as set out in Appendix N; and (b) actively manage sediment run-off risk from farming and hill country development by identifying critical source areas and implementing practices including setbacks from waterbodies, sediment traps, riparian planting, limits on areas or duration of exposed soils and the prevention of stock entering the beds of surface waterbodies; and (c) manage collected and diffuse run-off and leaching of nutrients, microbial contaminants and sediment through the identification and management of critical source areas within individual properties. 3. When considering a resource consent application for farming activities, consideration should be given to the following matters: (a)... (b) granting a consent duration of at least 5 years.	1(b) The proposal seeks to maintain the status quo in terms of actual losses to the environment and will actually reduce the losses when compared to the activities that are currently consented. There are no adverse effects expected over and above what are currently occurring, and so the proposal will not result in a reduction in the quality of groundwater, or water in any receiving surface water body. Given the conservative assessment provided in this report, the proposal is expected to result in an improvement to the quality of the receiving environment. 2 The applicant's intentions regarding the FEMP are discussed elsewhere in this report. A Farm Activity Focus Plan has already been developed for the existing dairy platform. This details the setbacks, fencing, riparian planting and avoidance of CSAs that the applicant is already doing. 3. The consent term sought is discussed later in this report.

17	1. Avoid significant adverse effects on water quality, and avoid, remedy, or mitigate other adverse effects of the operation of, and discharges from, agricultural effluent management systems. 2. Manage agricultural effluent systems and discharges from them by: (a) designing, constructing and locating systems appropriately and in accordance with best practice; and (b) maintaining and operating effluent systems in accordance with best practice guidelines; and (c) avoiding any surface run-off or overland flow, ponding or contamination of water, including via sub-surface drainage, resulting from the application of agricultural effluent to pasture; and (d) avoiding the discharge of untreated agricultural effluent to water.	Collected agricultural effluent is treated and stored by means of a recently-constructed effluent pond, which has been kept in immaculate condition. The rate, depth and location of effluent application is appropriate for the soil types present.
20	Manage the taking, abstraction, use, damming or diversion of surface water and groundwater so as to: 1A. recognise that the use and development of Southland's land and water resources, including for primary production, can have positive effects including enabling people and communities to provide for their social, economic and cultural wellbeing; 1. avoid, remedy or mitigate adverse effects from the use and development of surface water resources on: (a) the quality and quantity of aquatic habitat, including the life supporting capacity and ecosystem health and processes of waterbodies; (b) natural character values, natural features, and amenity, aesthetic and landscape values; (c) areas of significant indigenous vegetation and significant habitats of indigenous fauna; (d) recreational values; (e) the spiritual and cultural values and beliefs of tangata whenua; (f) water quality, including temperature and oxygen content; (g) the reliability of supply for lawful existing surface water users, including those with existing, but not yet implemented, resource consents; (h) groundwater quality and quantity; (j) mātaitai, taiāpure and nohoanga; 2. avoid, remedy or mitigate significant adverse effects from the use and development of groundwater resources on: (a) long-term aquifer storage volumes;	The volume of water sought is reasonable for the intended use and none of the adverse effects listed in this policy will result from the proposed abstraction of groundwater.

	(b) the reliability of supply for lawful existing groundwater users, including those with existing, but not yet implemented, resource consents; (c) surface water flows and levels, particularly in spring-fed streams, natural wetlands, lakes, aquatic ecosystems and habitats (including life supporting capacity and ecosystem health and processes of waterbodies) and their natural character; and (d) water quality; 3. ensure water is used efficiently and reasonably by requiring that the rate and volume of abstraction specified on water permits to take and use water are no more than reasonable for the intended end use following the criteria established in Appendix O and Appendix L.4.	
21	Manage the allocation of surface water and groundwater by: 1. determining the primary allocation for confined aquifers not identified in Appendix L.5, following the methodology established in Appendix L.6; 2. determining that a waterbody is fully allocated when the total volume of water allocated through current resource consents and permitted activities is equal to either: (a) the maximum amount that may be allocated under the rules of this Plan, or (b) the provisions of any water conservation order; 3. enabling secondary allocation of surface water and groundwater subject to appropriate surface water environmental flow regimes, minimum lake and wetland water levels, minimum groundwater level cutoffs or seasonal recovery triggers, to ensure: (a) long-term aquifer storage volumes are maintained; and (b) the reliability of supply for existing groundwater users (including those with existing resource consents for groundwater takes that have not yet been implemented) is not adversely affected; 4. when considering levels of abstraction, recognise the need to exclude takes for nonconsumptive uses that return the same amount (or more) water to the same aquifer or a hydraulically connected lake, river, modified watercourse or natural wetland.	The proposed abstraction of groundwater is a replacement of an existing consent and so there will be no effect on existing allocation limits.
22	Manage the effects of surface and groundwater abstractions by: 1. avoiding allocating water to the extent that the effects on surface water flow would not safeguard the mauri of that waterway and mahinga kai, taonga species or the habitat of trout and salmon;	The proposed rate of abstraction is less than 2 L/s as an average over 24 hrs and so none of the adverse effects listed in this policy are expected.

	2. ensuring interference effects are acceptable, in accordance with Appendix L.3; 3. utilising the methodology established in Appendix L.2 to: (a) manage the effects of consented groundwater abstractions on surface waterbodies; and (b) assess and manage the effects of consented groundwater abstractions in groundwater management zones other than those specified in Appendix L.5.	
23	Manage stream depletion effects resulting from groundwater takes which are classified as having a Riparian, Direct, High or Moderate hydraulic connection, as set out in Appendix L.2 Table L.2, to ensure the cumulative effect of those takes does not: 1. exceed any relevant surface water allocation regime (including those established under any water conservation order) for groundwater takes classified as Riparian, Direct, High or Moderate hydraulic connection; or 2. result in abstraction occurring when surface water flows or levels are less than prescribed minimum flows or groundwater levels for takes classified as Riparian, Direct or High hydraulic connection.	The proposed rate of abstraction is less than 2 L/s as an average over 24 hrs and so none of the adverse effects listed in this policy are expected.
39A	When considering the cumulative effects of land use and discharge activities within whole catchments, consider: 1. the integrated management of freshwater and the use and development of land including the interactions between freshwater, land and associated ecosystems (including estuaries); and 2. through the Freshwater Management Unit process, facilitating the collective management of nutrient losses, including through initiatives such as nutrient user groups and catchment management groups.	This report discusses the contaminant transportation mechanisms through the identification of the physiographic zones present.
40	When determining the term of a resource consent consideration will be given, but not limited, to: 1. granting a shorter duration than that sought by the applicant when there is uncertainty regarding the nature, scale, duration and frequency of adverse effects from the activity or the capacity of the resource; 2. relevant tangata whenua values and Ngāi Tahu indicators of health; 3. the duration sought by the applicant and reasons for the duration sought; 4. the permanence and economic life of any capital investment;	The consent term sought is discussed later in this report.

	5. the desirability of applying a common expiry date for water permits that allocate water from the same resource or land use and discharges that may affect the quality of the same resource; 6. the applicant's compliance with the conditions of any previous resource consent, and the applicant's adoption, particularly voluntarily, of good management practices; and 7. the timing of development of FMU sections of this Plan, and whether granting a shorter or longer duration will better enable implementation of the revised frameworks established in those sections.	
42	When considering resource consent applications for water permits to take and use water: 1. except for non-consumptive uses, consent will not be granted if a water body is over allocated or fully allocated; or to grant consent would result in a water body becoming over allocated or would not allow an allocation target for a water body to be achieved within a time period defined in this Plan; and 2. except for non-consumptive uses, consents replacing an expiring resource consent for an abstraction from an over-allocated water body will generally only be granted at a reduced rate, the reduction being proportional to the amount of over-allocation and previous use, using the method set out in Appendix O; and 3. installation of water measuring devices will be required on all new permits to take and use water and on existing permits in accordance with the Resource Management (Measurement and Reporting of Water Takes) Regulations 2010; and 4. where appropriate, minimum level or flow cut-offs and seasonal recovery triggers on resource consents for groundwater abstraction will be imposed; and 5. conditions will be specified relating to a minimum flow or level, or environmental flow or level regime (which may include flow sharing), in accordance with Appendix K, for all new or replacement resource consents (except for water permits for non-consumptive uses, community water supplies and water bodies subject to minimum flow and level regimes established under any water conservation order) for: (a) surface water abstraction, damming, diversion and use; and (b) groundwater abstraction in accordance with Policy 23.	The water sought is within the allocation limits set for the subject aquifer. The take will continue to be metered as it has been. No minimum level cut-offs are necessary.

Other Documentation

Te Tangi a Tauira is the Iwi Environmental Management Plan for the Murihiku area. This plan replaces Te Whakatau Kaupapa O Murihiku which is recognised in Policy 1.2 of the RPS. The application is not contrary to the relevant policies of Te Tangi a Tauira, particularly as;

- The provision of buffer zones to water abstraction sites and waterways;
- The application of effluent is proposed to land rather than water;
- The applicant proposes best practice for land application of managing farm effluent;
- Those existing riparian margins will be protected;
- Deferred application of FDE is provided for;
- Nutrient loading from effluent discharges to land will be within industry best practice limits;
- The system and management practices are considered appropriate for the risks associated with the receiving environment;
- Water abstraction will be monitored with metering results to be submitted to Council;
- The applicant is not averse to appropriate potential monitoring conditions; and
- Regarding Policies 3.5.14.17 and 3.5.1.17, the consent periods proposed are less than 25 years.

7.3 Sections 105 and 107 of the RMA

In addition to the matters in Section 104(1) of the RMA, if an application is for a discharge permit a consent authority must have regard to the matters as specified in Section 105. The proposed discharge can be undertaken in a manner which avoids contaminants from entering water through controls on application method and conditions of consent. As nutrients can be reused, there is a direct benefit to the property as a method for improving soil fertility. The discharge of effluent to land is the best method for avoiding adverse effects on water as might otherwise occur in the event that the discharge was directly to water, which would result in a worse environmental outcome.

There are no matters under Section 107(1) of the RMA that would require the consent authority to decline this application.

8. CONSENT DURATION, REVIEW AND LAPSE

With regard to consent duration, special consideration has been given to Policies 14A and 43 of the RWPS and Policy 40 of the pSWLP, which have been grouped below for ease of assessment.

Certainty of the nature, scale, duration and frequency of effects

Potential effects of the proposed activities are understood reasonably well and these are to be managed as far as reasonably practicable. Whilst the potential adverse effects of this dairy farm are expected to be similar to those expected from an average dairy farm, it is noted that the level of understanding in this field is increasing. Council's level of knowledge regarding the underlying aquifer, the receiving soils and surface water management zone is also improving, with continued knowledge and research of Southland and the site being achieved in the form of the proposed physiographic units and future catchment specific studies.

Potential adverse effects have in the first instance been mitigated by appropriate management techniques on farm followed by contingency planning, ongoing monitoring and reporting in an auditable format. Whilst the potential effects are reasonably well understood, the advances in research and development suggest that there is still a lot to be understood. It is because of this that a 35-year term is not proposed.

Matching consent duration to the level of risk of adverse effects

The extent and nature of the actual and potential adverse effects of the activities on the existing environment (which includes the current dairy farm) were assessed in this document and concluded to be no more than occurring historically in the existing environment, with potential for improvement following the implementation of a FEMP.

Relevant Tangata Whenua values and Ngai Tahu Indicators of Health

The application has been assessed as consistent with the relevant tangata whenua values as outlined in the iwi management plan, with particular regard to the proposed consent duration being less than 25 years.

Duration sought by the applicant and supporting information

A consent term of 10 years is sought for all of the consents applied for.

The permanence and economic life of any investment

Significant investment has been required just to get to the point of making application with expenditure on professional services, including business feasibility studies, nutrient advice, effluent system review, water quality and policy and planning assessments.

Commodity market influence is always a factor in the permanence of individual dairying units, hence why effluent discharge activities are often considered to have semi-permanent economic life. The economic life of the farm is firstly dependent on the granting of the relevant consents. Should consents be granted, the permanence of the dairying operation and associated activities should be inter-generational. Furthermore, the permanence of the economic life of the activity requires resource consents be granted from the Council for a reasonable duration.

Common expiry date for permits that affect the same resource

A common expiration date for all the permits applied for is considered appropriate.

Applicant's compliance history

The applicant has demonstrated an overall good compliance history with the existing resource consents and there is no evidence to suggest that future compliance will not continue to be good, and water records will be provided to Council on time in future.

Timing and development of FMUs

It is considered that granting a longer consent duration (i.e. 15 years) will better enable implementation of any revised framework establish in the FMU section of the PSWLP, as Council will be able to review all consents in the catchment collectively, which will serve to better implement any limit setting process.

In conclusion, due to the low level of environmental risk of the proposed activities and a substantial value of investments on the property, 10-year consent durations are considered appropriate.

Review and Lapse

The applicant is happy for ES to impose standard review conditions in accordance with Sections 128 and 129 of the RMA. In accordance with Section 125 of the RMA, the applicant seeks a 5-year lapse period for these consents. These consents must not be exercised until any current consents for the same activity have been surrendered or have expired.

9. CONCLUSION

A decision to grant consent pursuant to Section 104B under delegated authority can be made on the basis that:

a) It is expected that the adverse effects on the environment will be minor or less.
b) The proposal meets the non-notification requirements of Section 95A of the RMA.
c) The proposal is consistent with the requirements of the RMA, Council policy and other relevant matters.

Granting of the consents will be consistent with the purpose of the RMA for the reasons explained within this report. The proposed activities are not expected to result in further degradation of water quality and potential adverse effects will be avoided, remedied or mitigated as far as practicable.

Attachment A

Attachment B

Attachment C

Dairy Effluent Storage Calculator
Summary Report

Regional authority: Environment Southland Regional Council
Authorised agent: RDAgritech - KML
Client: Landpro (T Driscoll)
Program version: 1.48
Report date: Thursday, 22 March 2018
General description:

Updated storage model for proposed changes to farm system:
Milking 700 cows 01/08 - 31/05 @ 50L/c/day average water use for peak cows, (as advised by the Client).
The entire property is classified as high risk for effluent application and the Nutrient Budget has calculated a minimum required area of 41ha for effluent application.
Cow numbers are monthly averages with a median calving date of 20 August.
Stormwater from the shed roof is diverted all year, and the yards diverted outside of the milking season only.
Raw stirred effluent is irrigated using RX "Maxi-pods" with a nominal application rate of 4mm/hr at 24m3/hr flow.
No irrigation during June & July (low soil temperatures).
Winter irrigation depth of minimum 2mm @ 48m3/day.
Summer irrigation of minimum 4mm @ 96m3/day.
The existing storage pond allows the required minimum 3 days emergency storage. No sludge buildup is allowed for due to the use of a foot stirrer to incorporate solids into irrigated effluent.

Climate

Rainfall site: Winton
Mean annual rainfall: 958 mm/year

Effluent Block

Area of low risk soil: 0.0 hectares
Minimum area of high risk soil: 41.0 hectares
Surplus area of high risk soil: 73.0 hectares

Wash Water

Yard wash:

- Milking season starts: 01 August
- Milking season ends: 31 May

Month	Number of Cows	Hours in Yard	Wash Volume (cubic metres)
January	700	5.0	35.0
February	700	5.0	35.0
March	700	5.0	35.0
April	677	5.0	34.0
May	608	5.0	31.0
June	0	0.0	0.0
July	0	0.0	0.0
August	280	3.0	27.0
September	537	5.0	28.0
October	700	5.0	35.0
November	700	5.0	35.0
December	700	5.0	35.0

Irrigation

Winter-spring depth: 2 mm
Spring-autumn depth: 4 mm

Winter-spring volume:	48 cubic metres
Spring-autumn volume:	96 cubic metres
Irrigate all year?	No
Don't irrigate start:	01 June
Don't irrigate end:	31 July

Catchments

Yard Area:	1200 square metres
Diverted?	Yes
- diversion start:	01 June
- diversion end:	31 July
Shed Roof Area:	450 square metres
Diverted?	Yes
Feedpad Area:	0 square metres
Covered?	No
Diverted?	Yes
- diversion start:	01 June
- diversion end:	01 August
Animal Shelter Area:	0 square metres
Covered?	Yes
Diverted?	No
Other Areas:	0 square metres

Storage

Pond/s present?	Yes
No. of ponds:	1 pond/s
Includes irregular ponds?	No
Pond 1	
- total volume:	3261 cubic metres
- pumpable volume:	2771 cubic metres
- surface area:	1681 square metres
- width:	41.0 metres
- length:	41.0 metres
- batter:	2.0:1
- total height:	2.5 metres
- pumped?	Yes
Tank/s present?	No
Emergency storage period:	3 days

Solids Separation

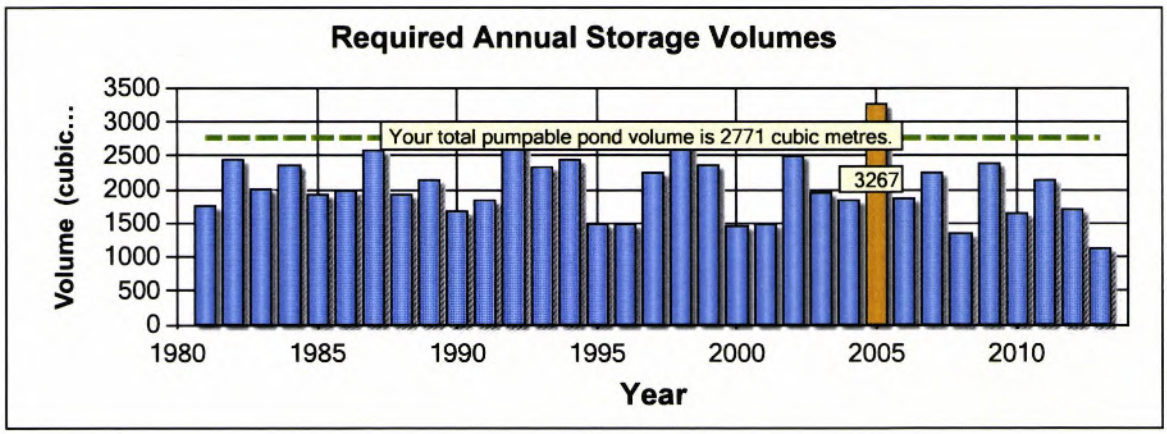
Solids separator/s present?	No

Outputs

Maximum required storage pond volume:	3267 cubic metres
90 % probability storage pond volume:	2670 cubic metres
During the period from:	01 July 1980

To:

30 June 2013



FARM ENVIRONMENTAL MANAGEMENT PLAN

A: Property Overview

Contact Person(s)	Tim and Jocelyn Driscoll	**Plan Prepared By**	Landpro Ltd
Contact Phone	022 076 9093	**Date**	17 July 2018
Email Address	driscolldairy@gmail.com	**Date of Next Review**	17 July 2019
Physical Address	266 O'Shannessy Road, Winton		
Consent Numbers and Expiry Dates	TBC		
Farm Area	224.5 ha	**Peak Milked Herd Size**	700
Legal Descriptions	Pt Secs 29 & 30 Blk I Winton Hundred, Secs 43 – 45 & 54 Blk I Winton Hundred, Lots 1 & 2 DP 449518		

This FEMP sets out the management practices that will be implemented and adopted to actively manage the operation of the property to ensure that environmental risks are managed appropriately, and resource consent conditions complied with.

Objectives of this plan:

- Comply with all legal requirements related to land use and discharge.
- Take all practicable steps to minimise the risk of harm to onsite and nearby water resources.
- Take all practicable steps to ensure that there is an adequate supply of soil nutrients to meet plant needs.
- Take all practicable steps to minimise the risk of harm to significant vegetation and/or wildlife habitat.

This will be achieved through;

- Identifying and documenting contaminant pathways for the property (based on Physiographic Zones);
- Identifying relevant good management practices (GMP) and where they are required to be implemented to minimise environmental risks; and
- Documenting evidence to be provided to show adherence with consent conditions.

As the person responsible for implementing this plan, I confirm that the information provided is correct:

Name:.....Signed:.....Date:.....

B: Site Plans

This FEMP contains various site plans identifying key features of the subject property in accordance with Part B(3) of Appendix N of the proposed Southland Water and Land Plan, 2018. The following table can be used as a reference point for locating these features.

Table 1: Schedule of where key features have been mapped

	Plan(s) where features are mapped
Site boundary	All site plans in this FEMP
Physiographic zones, variants and soil types	Figure 1: Physiographic zones and variants present
Lakes, rivers, streams ponds, artificial watercourses, modified watercourses and natural wetlands	Attachment B: Existing Waterways and Critical Source Areas (from Environment Southland Farm Activity Focus Plan)
Other critical source areas (gullies, swales etc)	Attachment B: Existing Waterways and Critical Source Areas (from Environment Southland Farm Activity Focus Plan)
Land with a slope greater than 20 degrees	N/A
Existing and proposed riparian vegetation and fences (or other stock exclusion methods) adjacent to waterbodies	Attachment B: Riparian Fencelines and Planting (from Environment Southland Farm Activity Focus Plan)
Places where stock access or cross water bodies (including bridges, culverts and fords)	Attachment B: Riparian Fencelines and Planting (from Environment Southland Farm Activity Focus Plan)
Known subsurface drainage system(s) and the location of drain outlets	TBC
All land that may be cultivated over the next 12 months	TBC
All land that may be intensively winter grazed over the next 12 months	TBC

C: Physiographic Zones and Key Contaminant Pathways

This section of the FEMP documents the physiographic zones and variants present across the property and key contaminant pathways associated these. The Physiographic Plan (figure 1) shows the location and extent of the physiographic zones on the property.

Table 2: Key transport pathways and contaminants for each physiographic zone

Physiographic Zone	Key Contaminant Transport Pathways (✓)	
	Deep Drainage	Artificial Drainage
Oxidising	✓	-
Gleyed	-	✓

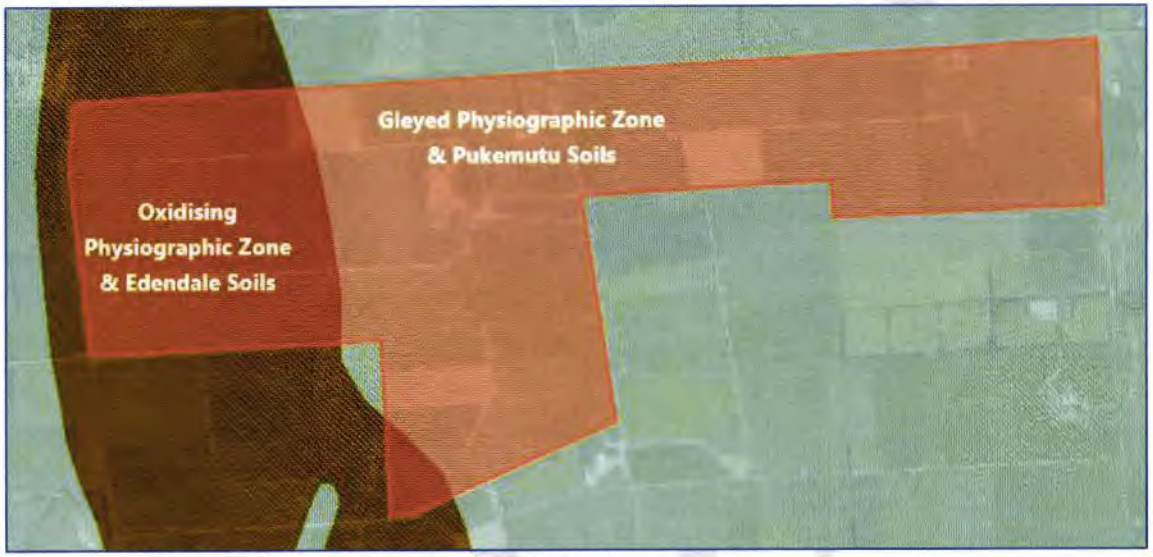


Figure 1: Physiographic Zones and variants present

Figure 1 shows that:

- The Oxidising physiographic zone is the predominant physiographic zone in the western part of the farm.
- The Gleyed physiographic zone is the predominant physiographic zone in central and the eastern part of the farm;
- No variants of either of these physiographic zones are present.
- The key contaminant pathway on the western-most portion of the property is deep drainage and the key contaminant pathway for the rest of the farm is artificial drainage.

D: Good Management Practices

The table below outlines general good management practices which will be undertaken across the whole farm over the 12-month period from the first exercise of the land use consent for expanded dairying. Critical Source Areas (CSAs) for this property consist predominantly of drains and waterways, as shown on the attached maps.

Table 3: Good Management Practices for the Farm

Mitigation	Good Management Practice	Area where most effective
Protect soil structure (will also help to reduce P and N loss)	1. Wintering the majority of the herd off-site	Whole farm
	2. Re-sow bare soils as soon as possible	
	3. Use calving pads to stand off cows during periods of high soil moisture content	
Manage Critical Source Areas (will also help to reduce P loss)	4. Avoid working CSAs and their margins	CSAs (see Attachment B)
	5. Leave grassed areas (or native vegetation) around CSAs	
	6. All riparian margins to be fenced and planted	
Additional P loss reduction GMPs	7. Reduce use of P fertilizer where Olsen P values are above agronomic optimum	Whole farm
	8. Reduce the risk of run-off to laneways and other sources by ensuring crossings are designed and maintained adequately	
Additional GMPs to reduce accumulation of N in soil	9. Open up breaks during adverse weather and avoid stock camping	Whole farm
	10. Time N fertilizer application to meet crop demand using split applications	
	11. Optimise timing and amounts of FDE application	FDE disposal area
Avoid preferential flow of FDE through drains	12. Defer effluent application when soil conditions unsuitable	
	13. Apply effluent at low rates and depths	

The GMPs above have been chosen as being the most optimal methods for minimising the risks associated with the key contaminant pathways identified for the property, which are deep drainage in the western-most portion of the property (oxidising physiographic zone) and artificial drainage for the rest of the farm (gleyed physiographic zone).

Practices that protect soil structure and ensure appropriate management of CSAs to ensure that the risk of sediment and nutrient loss via overland flow is minimised are included in the table above (particularly GMPs 1, 2, 3, 4, 5, 6, 8, 12, 13)

Cultivation practices are included in the table above (particularly GMPs 3, 5, 6, 7, 8, 13, 14). Areas to be cultivated over the forthcoming 12-month period are shown on Attachment X.

Winter grazing practices are also included in the table above (particularly GMPs 2, 4, 12). Areas planted for winter grazing over the forthcoming winter are shown on Attachment X.

Riparian management practices are included in the table above (particularly GMPs 4, 5 6) and addressed in more detail below.

E: Riparian Management

The majority of the property is contained within the Lower Oreti Surface Water Management Zone, and the eastern-most portion is contained within the Tussock Creek catchment/Makarewa Surface Water Management Zone. The Makarewa River is a tributary of the Oreti River.

There are several tributaries of the Oreti River on the property. The tributaries discharge to the Oreti River approximately 3.6 km downstream of the property boundary. As shown on Attachment B, there are no tributaries of Tussock Creek/the Makarewa River on the subject property.

All waterways across the property have been fenced to prevent stock access, as shown on Attachment B. An unnamed tributary of the Oreti River runs through the property in a north-south direction and this is maintained by Envrionment Southland's catchment team. Any drain cleaning works facilitated by the consent holder will be undertaken in accordance with Environment Southlands *Drainage and Channel Maintenance Fact Sheet.*

Where appropriate and as part of good grazing management, temporary fencing will also be erected to prevent any point source discharges occurring. This includes fencing off swale areas where they may directly discharge to surface water. Such practices will be adopted as set out elsewhere in this plan as part of the management of CSAs, and as set out in the Environment Southland Factsheet on *Critical Source Areas,* and *Dairy NZ Wintering in Southland and South Otago Guide.*

Several small culvert crossings exist on the property, as shown on Attachment B. These will all be inspected over the next 12 months and additional containment and diversion mechanisms will be installed as necessary to ensure there is no direct run-off of effluent from any crossing to water, in accordance with the GMPs outlined in the table above.

F: Farm Dairy Effluent

This section of this plan documents the methods that will be employed in the operation of the Farm Dairy Effluent (FDE) System to ensure that the discharge of effluent occurs in accordance with conditions of consent.

Table 4: Effluent System Overview

Total Effluent Disposal Area (ha):	93.3	**Available Storage Volume:**	3,261	**Storage Type:**	Lined pond with mechanical stirrer installed in the pond
Effluent Application Method(s):		RX Plastics Maxi Pods Slurry tanker may also be used on rare occasions		**Maximum Rate and Depth of Application:**	10 mm/hr 25 mm depth

Table 5: FDE Good Management Practices (existing and proposed to continue to be undertaken on farm)

Mitigation	Good Management Practice	Monitoring
Reduction in effluent generation	• Reduce water use in shed by reusing clean water where possible • Treat the herd gently to avoid upset	N/A
Effluent applied only when soil conditions are appropriate	• Sufficient storage provided so that when soils are at or above field capacity and/or during adverse weather conditions, effluent can be stored in the effluent storage pond until conditions are suitable for application • Monitoring of soil moisture and temperature will be used to determine soil water deficits for sustainable application depths, from data obtained from the ES website. • Paddocks will be inspected before effluent application to check that soil water deficit exists. • Low rate application will be used at all times.	Record irrigation dates, times, areas on the Irrigator run sheet (attached)
Avoidance of direct effluent disposal or runoff to sensitive areas	• Effluent discharge will observe a range of buffers from sensitive receiving environments as shown on the Appendix I plan attached to the discharge permit • Low rate effluent discharge will avoid ponding and/or runoff • Effluent will not be discharged onto any land areas that have been grazed within the previous 5 days • Effluent disposal will be to an area of at least 4 ha/100 cows	Record irrigation dates, times, areas on the Irrigator run sheet (attached)

Mitigation	Good Management Practice	Monitoring
Avoidance of effluent contamination in tile drains	• Low rate effluent discharge to reduce the risk of through-drainage and associated risk of effluent entering water	N/A
Efficient and effective collection, storage and delivery infrastructure at all times	• Monthly/frequent system checks will be undertaken using the Monthly Effluent Check Sheet attached • All parts of the effluent system will be checked and maintained regularly • Leaks will be repaired immediately • Fail safe systems will be kept in place and kept in good working order i.e. automatic alarm and shut off system • Application Rates shall be assessed annually thereafter in accordance with the methodology specified in *Dairy NZ Staff Guide to Operating Your Effluent Irrigation System – Low Rate System*	Record all repairs and maintenance Monthly Effluent Check Sheets filled out and signed
Staff appropriately trained in operation and understand the effluent system	• All staff involved in the management of the effluent system are fully trained in its use • All staff are familiar with and understand the conditions of consent • All new staff will be taken through the "Staff Training Guide" (attached) • Staff to take immediate action if incident or breakdowns occur including; - Rectifying the problem - Cleaning up if possible	Keep signed training record in the back off this FEMP Ensure both farm manager and employee sign to confirm training
Application that is not offensive to neighbours	• Wind conditions will be checked to ensure the effluent can be discharged without resulting in spray drift and odour beyond the property boundary • Observation of buffers to dwellings not located on the property (200 m) and property boundaries (20 m)	Complaints received by Environment Southland

G: Compliance & Reporting

This section sets out the records which are required to be kept which will enable the Consent Holder to demonstrate compliance, as well as detailing the reporting requirements of the consents. The Consent Holder will also participate in annual compliance monitoring inspection programs that are to be implemented by Environment Southland.

Table 6: Records to be kept by the consent holder

Record	Date of most recent version
Nutrient budget	
Fertiliser application records	
Soil sampling results	
Water meter certification	
Water abstraction records	
Effluent system Staff Training Record	
Effluent system monthly maintenance check sheets	
Effluent proof of placement	
Effluent application depth test results	

Annual reporting requirements are set out in the conditions of resource consent and include;

- Prior to the first exercise of the Effluent Discharge Consent the Consent Holder shall notify Environment Southland of the operator of the effluent system
- The Farm Environmental Management Plan shall be reviewed annually, and any amendments reported to Environment Southland by 31 June each year
- The Consent Holder shall provide records from the Water Permit to ES by 31 May each year

H: Annual Review & Audit of FEMP

This FEMP shall be reviewed on an at least annual basis. The review shall include (but not be limited to) an assessment of;

- Verification of compliance with conditions of consent
- Details of the implementation of GMPs and identification of any new GMPs that would be appropriate to employ on the farm to manage risks identified
- Review of the data obtained from the monitoring undertaken in accordance with this FEMP and any changes to farming practice required as a consequence
- A report detailing items above shall be submitted to the consent authority each year including an updated version of the FEMP if any amendments made

I: Industry Guidelines

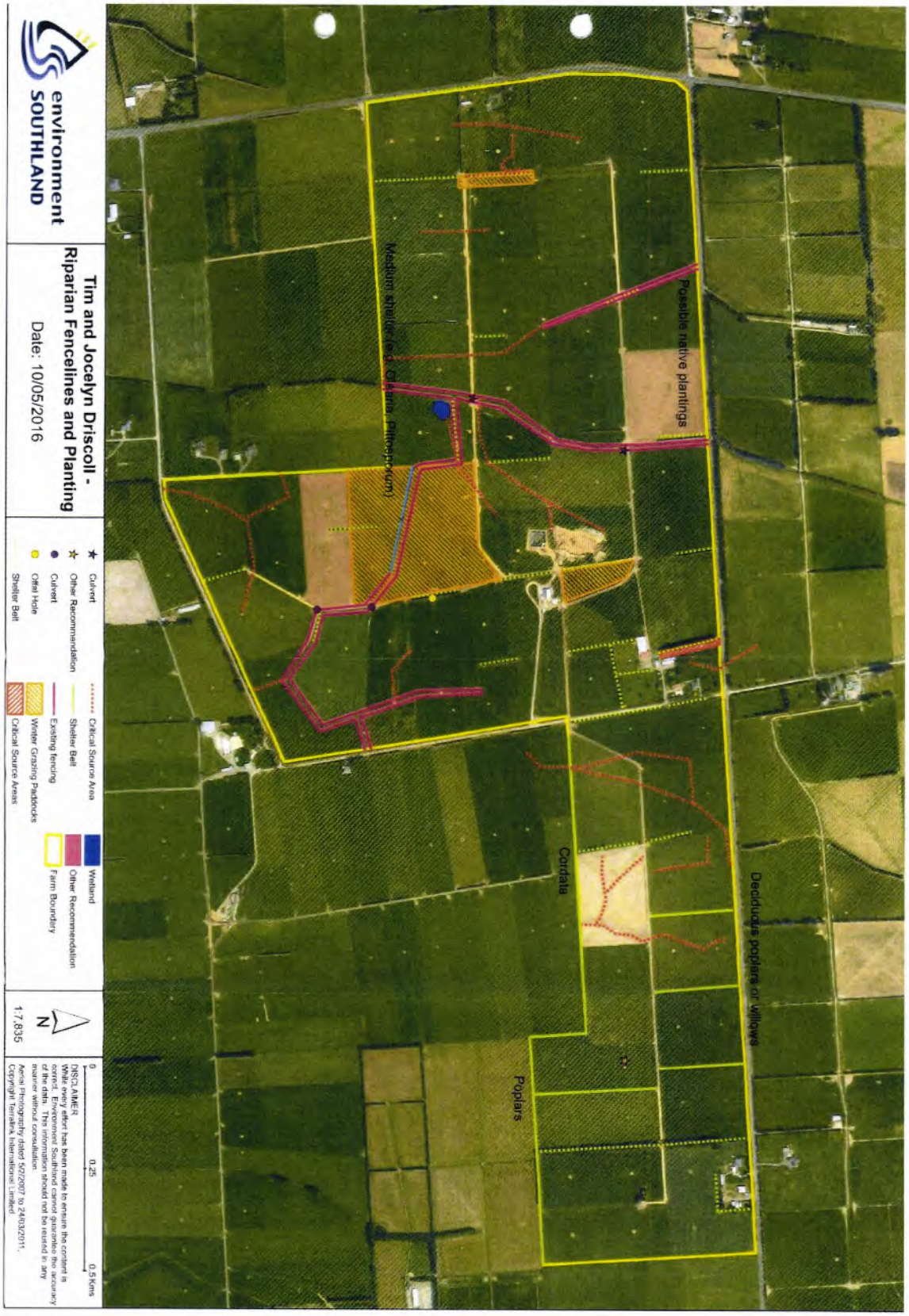
A complete list of the industry guidelines which have been referenced in the development of this FEMP are listed below. The Consent Holder is also referred to the following general sources for guidance in respect to the operation and management of their property.

Environment Southland www.es.govt.nz **Dairy NZ** www.dairynz.co.nz **Fonterra** www.fonterra.com

Dairy NZ – A staff guide to operating your effluent irrigation system – Low Rate System
Dairy NZ – A farmer's guide to managing farm dairy effluent – A good practice guide for land application systems
Dairy NZ – Wintering in Southland and South Otago – A land management guide to good environmental practice
Dairy NZ – Land management on Canterbury Dairy Farms – Managing land to reduce sediment and phosphorous loss
Environment Southland Factsheet – Critical Source Areas
Environment Canterbury – Information Sheet for Farmers on OVERSEER®
Sustainable Dairying: Water Accord

Attachment A – Consents

Attachment B – Farm Plans



Attachment C – Nutrient budget for the previous season

Attachment D – Effluent Management

Dairy Shed Effluent Monthly Check Sheet

On a monthly basis the following checks and measures must be undertaken. The details of the monthly check shall be recorded on this sheet, and at the completion of the inspection the sheet shall be filed for future reference. If there are any matters requiring follow up work i.e. you note that an effluent nozzle needs replacing, please make a note of these, and ensure that the actions are followed up immediately.

Employee Name:

Date of Inspection:

Task	Done? (Y/N)	Any further action required?
Clean out stone trap		
Clean out sump		
Check all inlet and outlet pipes to storage pond to ensure they are free of debris to prevent blockages.		
Check the pond's leak detection system for the presence of effluent (visual and odour)		
Check effluent nozzles are clear and in good working order		
Check effluent irrigator pipe is in good working order and does not have any leaks		
Check well-head(s) remain capped and in good condition		

Effluent Orientation and Training Record

Season___/___

Effluent Competencies	Employee name	Employee name	Employee name
General			
Understands the regional council rules and farm policies for effluent management			
Understands health and safety around the effluent system			
Understands record keeping for irrigator runs and maintenance			
At the Dairy			
Use of stormwater diversion system			
Good hosing practice and water management			
Animal handling to minimise effluent volume			
Cleaning the stone trap			
Sump, pump & pond monitoring and management (including float switches)			
In the Paddock			
When to irrigate: assessing soil and weather conditions			
Where to irrigate: runs, paddock rotations, high risk vs low risk soils etc (mark on farm map)			
Where not to irrigate: near waterways, drains, boundaries, slopes etc (mark on farm map)			
How the irrigator works, how to use it, set up, hose layout and performance checks			
Measuring the depth of effluent application			
Irrigator, pump maintenance/cleaning			
Greasing and general maintenance requirements (how and when)			
How to check and replace rubber nozzles and seals (same time as dairy rubber ware)			
Tyre pressure and condition			
Pipe-work, hose and hydrant condition			
Wire-rope, cam and ratchet condition			
Other			

Trainer signature			
Employee signature			
Date			

Date when staff become competent in each skill. If all training provided in one day, tick and date at the bottom.

DairyNZ

Irrigator run sheet

- ☑ Check the records to ensure effluent is due to be applied to that particular area
- ☑ Allow a minimum interval of 10 days between applications and grazing for animal health
- ☑ Ensure irrigator will be applying effluent to short pasture.

Date	Paddock	Run	Name	Comments

dairynz.co.nz

0800 4 DairyNZ (0800 4 324 7969)

You can use your Fonterra Dairy Diary as an alternative to this form, or photocopy a farm map – draw and date the runs on the copy then file it.

DairyNZ

T & J Driscoll Family Trust

266 O'Shannessy Road, Winton

Overseer modelling report for the purposes of as part of a consent application for expanded dairying

Report prepared for:
Tim and Jocelyn Driscoll
266 Thomsons Crossing Road East
RD1, Winton

Prepared By:
Mo Topham
FarmWise Consultant
B.Agr.Sci (Hons)
Invercargill, Southland
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Report Peer Reviewed By:
Miranda Hunter
Roslin Consultancy Limited
B.Agr.Sci

1 October 2018

Executive Summary

T & J Driscoll Family Trust operate a high performance dairy farm near Winton, in Central Southland. The partially self-contained 210.6ha total property has a flat contour. There are two soil types on the property – Waikiwi and Pukemutu, separated by a small terrace. Calves are grazed on the platform until weaning and return to the platform as incalf heifers. Over the past three years, an average of 2.8ha of fodder beet and 1ha of winter turnips were planted. The farm has peak milked 573cows on average over the last three seasons.

In October 2016, Tim and Jocelyn purchased a neighbouring 13.9ha sheep grazing block – called the East Block. Following the purchase of the block, Tim and Jocelyn have transitioned the block into dairy support. It is proposed that the East Block (13.9ha) be converted to dairy and incorporated into the milking platform. In the proposed farm system, a portion of the herd will be wintered on 4ha with a baleage and grass diet. Young stock will continue to be grazed off farm from weaning to their return as incalf heifers.

Using Overseer (version 6.3.0) nutrient budgets have been constructed for the current land use and a proposed dairy unit nutrient budget to inform the consent application for expanded dairying. The nutrient budgets show the average nutrient losses for the last three years. Data inputs and methodology are explained in detail within this report.

A summary of the modelling output is given in Table 1. It shows a small decrease (loss than 5%) in the total Nitrogen loss from the property. Total Phosphorus loss from the property is predicted to increase (by less than 7%).

Table 1. Summary data from the Overseer analysis of the T & J Driscoll Family Trust Current and Proposed systems

	Current Total (averaged over 3 years)	Proposed system
Total Farm N Loss (kg)	11503	11345
N Loss/ha (kgN/ha/yr)	51	51
N Concentration in Drainage (ppm)		Pastoral – 9.8 – 29.3
Total Farm P Loss (kg)	262	278
P loss/ha (kgP/ha/yr)	1.2	1.2
Overseer - predicted pasture grown (tDM/ha/yr)		16.2

The key drivers of a decrease in nitrogen loss are shown below. In comparison to the current system, the proposed system has:

- Increased the area that effluent is applied to – reduced effluent N application to this area
- Reduced nitrogen fertiliser use on the effluent block
  Increased cow numbers – increasing loss risk

The key driver of the increase in phosphorus loss is an increase in losses from "other sources".

Overseer can model a range of good management practices. However, some farm specific good management practices cannot be modelled. Recommendations of further good management practices that cannot be modelled by Overseer are given within this report to further reduce the nutrient losses from this farm system.

Property legal description

Part Section 29 and 30 Block I Winton HUN

Section 1 and 2 SO 12000

Section 43, 44, 45 and 54 Block I Winton HUN

Lot 1 and 2 DP 449518

Report purpose

To quantify the losses of nitrogen and phosphorus from the current and the proposed farm systems being operated on this property. The report details the data inputs, the modelling outputs and areas of environmental risk within the system.

Disclaimer

The Overseer 6.3.0 model has been utilised to assess the nutrient losses from this property. Details of how the property is operated currently, and how the property will be operated going forward have been gathered from the farm owner. Where accurate data was unavailable, conservative assumptions have been made using professional judgement.

The proposal

Farm objectives

T & J Driscoll Family Trust operate their farm business with the following objectives:

- To refine the farm system to maximise farm profitability – targeting $2000/ha EBIT at a $5.00 milk price
- To operate in an environmentally sustainable manner with an emphasis on continual education and improvement
- Consolidate the business to ensure it is resilient
- "Farm for the future" – the property must remain flexible to deal with changes in market forces

Current System

Nutrient budgets have been constructed to determine the average actual nutrient losses over three years (June 2015 – May 2018).

Dairy platform

T & J Driscoll Family Trust operate a high performing dairy farm near Winton, in Central Southland. The farm is owned by the Driscoll trust (JP, CA, TJ and JA Driscoll), and is operated under a lease arrangement by T & J Driscoll Family Trust (Tim and Jocelyn Driscoll). The partially self-contained 210.6ha total property has a flat contour. There are two soil types on the property – Waikiwi and Pukemutu. Calves are grazed on the platform until weaning and return to the platform as incalf heifers.

Over the previous three seasons, the property has milked an average of 573cows at peak. There has been an average of 2.8ha fodder beet and 1ha turnips grown on farm for winter and early spring grazing. Nitrogen fertiliser has been applied at an average of 213kgN/ha in split applications from August to April over the whole milking platform. In the last three seasons, the majority of the herd has been wintered off farm at a graziers property. On average, 83 cows were wintered at home in June and July, while the remaining 516 were off farm. Early calving heifers and cows return to the platform in mid July. Bought in feed has been assumed to ensure that a feasible pasture growth rate is achieved in an average season.

East Block

In October 2016, Tim and Jocelyn purchased a neighbouring 13.9ha sheep grazing block – called the East Block. Following the purchase of the block, Tim and Jocelyn have transitioned the block into dairy support. In order to create accurate actual budgets for the previous three years, three separate budgets have been created for the East Block:

- Pre purchase use (15-16 season) – a sheep grazing block. Accurate stock numbers were not available. A conservative estimation of stocking rate and management practice has been made utilising Google Earth imaging and the Beef and Lamb farm monitoring data.

- Transition (16-17 season) – All feed grown on farm was cut as baleage. This was fed to incalf heifers or exported from the block.
- Dairy support (17-18 season) – 125incalf heifers and 100cows were wintered on a baleage/grass diet on the block. The block was grazed by heifers in January and February of 2018. All other feed grown was made into baleage.

Proposed system:

Through the development of the proposed system, a number of scenarios were run through Overseer. The proposed system detailed below was chosen as it was in line with the farm objectives, the farm system preferences and the proposed Water and Land Plan.

It is proposed that the East Block (13.9ha) be converted and incorporated into the milking platform. The total farm area would then be 224.5ha total and peak cow numbers would be increased to 700 cows. The property will winter 216cows on farm, and continue to winter the remaining 516cows off farm at a graziers property. The cows wintered on farm will be grazed of 4ha with a baleage grass diet. Young stock will continue to be grazed off farm from weaning to their return as incalf heifers. The effluent system will be extended to 93.3ha and fertiliser nitrogen applications will be targeted to 197kgN/ha on the effluent area and 218kgN/ha on the non-effluent area. Bought in feed has been assumed to ensure that a feasible pasture growth rate is achieved in an average season when consented cow numbers are being milked.

Modelling method

Nutrient losses have been estimated using the Overseer Version 6.3.0 model. Overseer 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, 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.

Overseer assumptions

Within the Overseer 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
  Overseer assumes the property is managed is line with accepted industry good management practice.

Overseer limitations

Key limitations of the Overseer model are:

- Overseer 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.
- Overseer does not calculate outcomes from extreme events (floods and droughts), but provides a typical years result based on a long-term average.
- Overseer does not calculate the impacts of a conversion process, rather it predicts the long-term annual average nutrient budgets for changed land use.
- Overseer 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 Overseer model
- Overseer does not represent all farm systems in New Zealand
- Components of Overseer have not been calibrated against measured data from every combination of farm systems and environment

Information on Overseer 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 Overseer Version 6.3.0 model.

The nutrient budget have been developed in accordance with the Overseer data input protocols - "Overseer, Best Practice Data Input Standards, March 2018." No deviations have been made from these protocols.

Modelling Inputs

To construct the nutrient budgets the following assumptions have been made;

Blocks

The farm has been split into the following pastoral (effluent and non-effluent) and fodder crop blocks. Total farm area has been taken from the legal area (ex the rates demand). The area of each block has been determined using the measure function on Beacon. Soils on the property were assessed utilising the topoclimate information. Overseer soil settings were obtained from SMap for all soil types.

	Block Name	Soil Type (from Beacon)	Smap Ref	Contour	Current Dairy Platform (ha)	East Block (ha)	Proposed Land Use (ha)
	Effluent – Waikiwi	Edendale	Waiki_30a.1	Flat	**20.1**		**41.7**
	Effluent – Pukemutu	Pukemutu	Pukem_6a.1	Flat	**41.9**		**49.9**
	Non Effluent – Waikiwi	Edendale	Waiki_30a.1	Flat	**42.2**		**19.4**
	Non Effluent – Pukemutu	Pukemutu	Pukem_6a.1	Flat	**98.4**		**101.5**
	East Block - Pukemutu	Pukemutu	Pukem_6a.1	Flat		**13.9**	
	Baleage winter Eff Waikiwi	Edendale	Waiki_30a.1	Flat			**0.8**
	Baleage winter Eff Pukemutu	Pukemutu	Pukem_6a.1	Flat			**0.9**
	Baleage Winter Non Eff Waikiwi	Edendale	Waiki_30a.1	Flat			**0.4**
	Baleage winter Non Eff Pukemutu	Pukemutu	Pukem_6a.1	Flat			**1.9**
		Effective Farm Area			**202.6**	**13.9**	**216.5**
		Non productive			8.0		8.0
		Total Farm Area			**210.6**	**13.9**	**224.5**
Rotating fodder crops							
	Fodder beet				2.8		
	Winter Turnips				1.0		

Climate Data

- Southland as the location setting
- The following climate information has been used from the Overseer climate station tool;
  - 1094mm of rainfall
  - 10.1 degrees Celsius mean annual temperature
  - Daily rainfall pattern setting of 731 to 1450mm, low
  - Mean annual PET of 711mm (moderate variation)

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Farm System

Description	Current Dairy Platform (average of three seasons)	East Block – Sheep (15-16 season)	East Block – Transition (16-17season)	East Block – Dairy Support (17-18season)	Proposed Land Use
Milk solids production	271,130 kg MS 473 kgMS/cow Median calving date – 20th August Drying off – 31st May				329,000 kg MS 470 kgMS/cow Median calving date – 20th August Drying off – 31st May
Cows on farm (Lactating and wintered)	Breed Fr J X Jul 140 Aug 599 Sep 593 Oct 573 Nov 573 Dec 573 Jan 573 Feb 573 Mar 573 Apr 530 May 487 Jun 83 Peak cows: 573			Breed Fr J X Winter grazing for 100MA and 125R2 cows (Jun and Jul)	Breed Fr J X Jul 273 Aug 732 Sep 724 Oct 700 Nov 700 Dec 700 Jan 700 Feb 700 Mar 700 Apr 647 May 595 Jun 216 Peak cows: 700
Dairy replacements on farm	Calves are reared on farm until weaning (1-4months old) Aug - 135 Sep - 160 Oct - 160 Nov – 160		Grazing for R2 heifers May 125	Grazing for R2 heifers Jan 125 Feb 125	Calves are reared on farm until weaning (1-4months old) Aug - 152 Sep - 187 Oct - 187 Nov – 187
Breeding bulls	Thirteen 2yr old Jersey bulls (Dec and Jan)				Fifteen 2yr old Jersey bulls (Dec and Jan)
Sheep		Wintered: 120 MA ewes 46replacements 3rams Coopworth			

Description	Current Dairy Platform (average of three seasons)	East Block – Sheep (15-16 season)	East Block – Transition (16-17season)	East Block – Dairy Support (17-18season)	Proposed Land Use
		125% lambing percentage 20% replacement rate Mean lambing date of the 15th September. All non-replacement lambs sold by the end of May			
Relative productivity	No differences between blocks	No differences between blocks	No differences between blocks	No differences between blocks	No differences between blocks
Structures	Calving Pad Not modelled as used when ground conditions are saturated rather than for fixed time				Calving Pad Not modelled as used when ground conditions are saturated rather than for fixed time
In Shed Feeding	Management 100% of milkers fed Aug - May				Management 100% of milkers fed Aug - May
Rotating fodder crop management	2.8ha fodder beet Yield: 25tDM/ha Conventional cultivation October Fertiliser: 500kg/ha Winton Fodder Beet mix at sowing (delivering 50kg/ha N, 32kg/ha P, 75kg/ha K and 27kg/ha S) 100kg/ha Urea in December 100kg/ha Potassium				Cows on farm in June/July are wintered on a baleage grass diet. 4ha Baleage/Grass wintering This area rotates around the platform and is part of the property's regrassing strategy All feed required is imported (160tDM baleage)

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Description	Current Dairy Platform (average of three seasons)	East Block – Sheep (15-16 season)	East Block – Transition (16-17season)	East Block – Dairy Support (17-18season)	Proposed Land Use
	Chloride in December 100kg/ha Urea in January Grazed by dairy cows May – Aug Resown in permanent pasture in September				
	1.0ha Turnips Yield: 8tDM/ha Conventional cultivation February Fertiliser: 150kg/ha DAP and 150kg/ha super at sowing 100kg/ha Urea in March Grazed by dairy cows Jun – Aug Resown in permanent pasture in September				
Imported Supplements	In shed: 236tDM PKE 33tDM Barley In paddock: 418tDM Silage			In paddock: 65 tDM baleage	In shed: 300tDM PKE 100tDM Barley 100tDM DDG In paddock: 850tDM baleage For wintering: 160tDM baleage

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Description	Current Dairy Platform (average of three seasons)	East Block – Sheep (15-16 season)	East Block – Transition (16-17season)	East Block – Dairy Support (17-18season)	Proposed Land Use
Exported Supplements			130tDM baleage		
Soil Fertility	Olsen P 32 (soil test results June 2017) All other values entered at agronomic optimum	All soil test values entered at agronomic optimum (Olsen P of 20)	All soil test values entered at agronomic optimum (Olsen P of 20)	All soil test values entered at agronomic optimum (Olsen P of 20)	Olsen P 32 (soil test results June 2017) All other values entered at agronomic optimum
Fertiliser	Phosphorus, Potassium and Sulphur applied to maintain fertility levels	Phosphorus, Potassium and Sulphur applied to maintain fertility levels	Phosphorus, Potassium and Sulphur applied to maintain fertility levels	Phosphorus, Potassium and Sulphur applied to maintain fertility levels	Phosphorus, Potassium and Sulphur applied to maintain fertility levels
Nitrogen Fertiliser	213 kgN/ha in split applications (Aug – April)				<u>Non Effluent blocks</u> 218kgN/ha in split applications (Aug – April) <u>Effluent Blocks</u> 197kgN/ha in split applications (Aug – April)
Drainage	100% mole and tile drained	100% mole and tile drained	100% mole and tile drained	100% mole and tile drained	100% mole and tile drained
Farm dairy effluent	Holding pond Solids aren't separated from the liquid Liquid effluent is applied at a depth of <12mm to the "effluent" blocks An effluent area of at least 39 ha is required to achieve a loading of less than 150 kg N / ha / year				Holding pond Solids aren't separated from the liquid Liquid effluent is applied at a depth of <12mm to the "effluent" blocks An effluent area of at least 34 ha is required to achieve a loading of less than 150 kg N / ha / year

Predicted Overseer Results

Current land use

	Current Dairy Platform (3yr average)	East Block – Sheep (15-16 season)	East Block – Transition (16-17 season)	East Block – Dairy Support (17-18 season)	East block (average of 3yrs)	Current Total (averaged over 3 years)
Total Farm N Loss (kg)	11262	204	132	386	241	11503
N Loss/ha (kgN/ha/yr)	53	15	10	28	17	51
N Concentration in Drainage (ppm)	Pastoral – 9.9 to 12.8 Crops – 21.1 to 42.1	Pastoral – 3.2	Pastoral – 2.1	Pastoral - 6.1		
Total Farm P Loss (kg)	252	10	9	10	10	262
P loss/ha (kgP/ha/yr)	1.2	0.7	0.7	0.7	0.7	1.2
Overseer - predicted pasture grown (tDM/ha/yr)	16.2	11.8	11.8	11.9		

Proposed system

	Current Total (averaged over 3 years)	Proposed system
Total Farm N Loss (kg)	11503	11345
N Loss/ha (kgN/ha/yr)	51	51
N Concentration in Drainage (ppm)		Pastoral – 9.8 – 29.3
Total Farm P Loss (kg)	262	278
P loss/ha (kgP/ha/yr)	1.2	1.2
Overseer - predicted pasture grown (tDM/ha/yr)		16.2

Conclusions from the modelling

Nutrient budgets have been developed for Driscoll Dairy. These budgets compare the nutrient loss of the current farm system with the proposed farm system. Overseer has predicted that losses of nitrogen will decrease slightly (less than 5%) and losses of phosphorus will increase slightly (less than 7%).

The key drivers of a decrease in nitrogen loss are shown below. In comparison to the current system, the proposed system has:

- Increased the area that effluent is applied to – reduced N application in effluent to this area
- Reduced nitrogen fertiliser use on the effluent block
- Increased cow numbers – increasing loss risk
-

The key driver of the increase in phosphorus loss is an increase in losses from "other sources".

Please note: Losses from "other sources" include predicted losses from laneways, calving pads and yards. The increase in losses from other sources is a result of an increase in animal excretion onto laneways. Overseer estimates amount of excreta and assumes all P ends up in dung. Some of this dung is assumed to fall on laneways and 30% of that P is assumed to be lost from the farm. Furthermore, Overseer is not spatially explicit; so it does not take into account critical source area on farms. These critical source areas accumulate overland flow from adjacent areas and deliver overland flow to surface water bodies. On farms where there is not a direct connection (or a less connection) via critical source areas, or where management mitigates risk, Overseer cannot model the impact of these at an individual farm scale.

Recommendations:

Apart from the system changes outlined above, the following recommendations are given to reduce the nutrient losses from this farm system.

Overseer can model a range of good management practices. However, some farm specific good management practices cannot be modelled. It is recommended that the following good management practices are implemented on this property:

- Fertiliser is applied at the correct rate, and is not applied in close proximity to waterways
- Identify and manage critical source areas to reduce the risk of losses. These include loses from laneways, gateways and high traffic zones.
- Stand cows off on the calving pad during periods of high soil moisture content to minimise soil damage and leaching risk.
- Fertiliser applications are made during periods of plant growth.
- An effluent management plan is in place that takes into account soil moisture and temperature, and includes a fail safe system

The nutrient budgets within this report have been developed assuming that the Olsen P is 32 and all other soil fertility measures are at the agronomic optimum. It also assumes that fertiliser is applied at a maintenance rate. A soil testing regime should be implemented and fertiliser recommendations should be developed in line with these soil testing results.

The proposed Southland Water and Land Plan is currently in process. 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 farm environmental management plan detailing the recommendations within this report should be developed for the property.

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Current system - Dairy Platform

Table 2. Current system whole farm nutrient budget

(kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Nutrients added							
Fertiliser, lime & other	201	24	2	34	0	0	0
Rain/clover N fixation	74	0	3	5	3	7	35
Irrigation	0	0	0	0	0	0	0
Supplements	80	11	58	9	9	6	4
Nutrients removed							
As products	87	15	21	5	19	2	6
Exported effluent	0	0	0	0	0	0	0
As supplements and crop residues	0	0	0	0	0	0	0
To atmosphere	89	0	0	0	0	0	0
To water	53	1.2	12	46	61	6	20
Change in farm pools							
Plant Material	0	0	-2	0	0	0	0
Organic pool	125	19	11	-3	7	3	1
Inorganic mineral	0	2	-23	0	-2	-3	-3
Inorganic soil pool	1	-2	43	0	-72	6	15

Table 3. Current system Nitrogen report

Block name	Total N lost kg N/yr	N lost to water kg N/ha/yr	N in drainage * ppm	N surplus kg N/ha/yr	Added N ** kg N/ha/yr
Waikiwi Effluent	1,003	51	**11.4**	264	285
Pukemutu Effluent	2,464	60	**12.8**	272	285
Waikiwi non effluent	1,793	43	9.9	213	211
Pukemutu non effluent	4,850	50	11.2	220	211
Fodder Beet	630	225	**42.1**	21	142
Turnips	111	111	**21.1**	2	72
Other sources	410				
Whole farm	11,262	53			
Less N removed in wetland	0				
Farm output	11,262	53			

Table 4. Current system Phosphorus report

Block name	Total P lost kg P/yr	P lost to water kg P/ha/yr	P loss categories		
			Soil	Fertiliser	Effluent
Waikiwi Effluent	9	0.5	Low	Low	Low
Pukemutu Effluent	39	0.9	Medium	Low	Medium
Waikiwi non effluent	17	0.4	Low	Low	N/A
Pukemutu non effluent	79	0.8	Medium	Low	N/A
Fodder Beet	3	1.2	N/A	N/A	N/A
Turnips	1	1.1	N/A	N/A	N/A
Other sources	104				
Whole farm	252	1.2			

East Block – Sheep

Table 5. East Block – Sheep whole farm nutrient budget

(kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Nutrients added							
Fertiliser, lime & other	0	16	0	24	0	0	0
Rain/clover N fixation	97	0	3	5	3	7	35
Irrigation	0	0	0	0	0	0	0
Nutrients removed							
As products	20	3	1	3	5	0	1
Exported effluent	0	0	0	0	0	0	0
As supplements and crop residues	0	0	0	0	0	0	0
To atmosphere	37	0	0	0	0	0	0
To water	15	0.7	7	35	33	6	19
Change in farm pools							
Plant Material	0	0	0	0	0	0	0
Organic pool	25	11	0	-8	0	0	0
Inorganic mineral	0	0	-25	0	-2	-3	-4
Inorganic soil pool	0	2	19	0	-33	4	18

Table 6. East Block - sheep nitrogen report

Block name	Total N lost kg N/yr	N lost to water kg N/ha/yr	N in drainage * ppm	N surplus kg N/ha/yr	Added N ** kg N/ha/yr
East block - Pukemutu	200	14	3.2	74	0
Other sources	4				
Whole farm	204	15			
Less N removed in wetland	0				
Farm output	204	15			

Table 7. East Block - Sheep phosphorus report

Block name	Total P lost kg P/yr	P lost to water kg P/ha/yr	P loss categories		
			Soil	Fertiliser	Effluent
East block - Pukemutu	9	0.6	Low	Low	N/A
Other sources	1				
Whole farm	10	0.7			

East Block – Transition

Table 8. East Block – Transition whole farm nutrient budget

(kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Nutrients added							
Fertiliser, lime & other	0	36	204	33	0	0	0
Rain/clover N fixation	152	0	3	5	3	7	35
Irrigation	0	0	0	0	0	0	0
Nutrients removed							
As products	0	0	0	0	0	0	0
Exported effluent	0	0	0	0	0	0	0
As supplements and crop residues	162	24	203	17	46	11	9
To atmosphere	4	0	0	0	0	0	0
To water	10	0.7	15	30	29	6	19
Change in farm pools							
Plant Material	0	0	0	0	0	0	0
Organic pool	-24	12	6	-8	1	0	0
Inorganic mineral	0	0	-22	0	-2	-3	-4
Inorganic soil pool	0	0	5	0	-72	-7	10

Table 9. East Block - transition nitrogen report

Block name	Total N lost kg N/yr	N lost to water kg N/ha/yr	N in drainage * ppm	N surplus kg N/ha/yr	Added N ** kg N/ha/yr
East block - Pukemutu	132	9	2.1	-15	0
Other sources	1				
Whole farm	132	10			
Less N removed in wetland	0				
Farm output	132	10			

Table 10. East Block - Transition phosphorus report

Block name	Total P lost kg P/yr	P lost to water kg P/ha/yr	P loss categories		
			Soil	Fertiliser	Effluent
East block - Pukemutu	9	0.7	Low	Low	N/A
Other sources	0				
Whole farm	9	0.7			

East Block – Dairy support

Table 11. East Block – Dairy support whole farm nutrient budget

(kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Nutrients added							
Fertiliser, lime & other	0	0	0	8	0	0	0
Rain/clover N fixation	81	0	3	5	3	7	35
Irrigation	0	0	0	0	0	0	0
Nutrients removed							
As products	9	2	1	1	5	0	0
Exported effluent	0	0	0	0	0	0	0
As supplements and crop residues	0	0	0	0	0	0	0
To atmosphere	40	0	0	0	0	0	0
To water	28	0.7	9	30	43	6	19
Change in farm pools							
Plant Material	-75	-14	-94	-11	-23	-8	-7
Organic pool	79	12	4	-7	1	0	0
Inorganic mineral	0	0	-16	0	-2	-3	-4
Inorganic soil pool	0	-1	98	0	-21	12	25

Table 12. East Block – Dairy support nitrogen report

Block name	Total N lost kg N/yr	N lost to water kg N/ha/yr	N in drainage * ppm	N surplus kg N/ha/yr	Added N ** kg N/ha/yr
East block - Pukemutu	381	27	6.1	139	0
Other sources	5				
Whole farm	386	28			
Less N removed in wetland	0				
Farm output	386	28			

Table 13. East Block – Dairy support phosphorus report

Block name	Total P lost kg P/yr	P lost to water kg P/ha/yr	P loss categories		
			Soil	Fertiliser	Effluent
East block - Pukemutu	8	0.6	Low	N/A	N/A
Other sources	2				
Whole farm	10	0.7			

Proposed system

Table 14. Proposed system whole farm nutrient budget

(kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Nutrients added							
Fertiliser, lime & other	199	21	0	30	0	0	0
Rain/clover N fixation	73	0	3	5	3	7	35
Irrigation	0	0	0	0	0	0	0
Supplements	103	21	97	16	22	11	7
Nutrients removed							
As products	99	17	24	5	21	2	7
Exported effluent	0	0	0	0	0	0	0
As supplements and crop residues	0	0	0	0	0	0	0
To atmosphere	87	0	0	0	0	0	0
To water	51	1.2	13	49	59	6	20
Change in farm pools							
Plant Material	0	0	0	0	0	0	0
Organic pool	138	20	15	-3	8	4	1
Inorganic mineral	0	2	-19	0	-2	-3	-3
Inorganic soil pool	0	2	87	0	-62	9	17

Table15. Proposed system nitrogen report

Block name	Total N lost kg N/yr	N lost to water kg N/ha/yr	N in drainage * ppm	N surplus kg N/ha/yr	Added N ** kg N/ha/yr
Waikiwi Effluent	1,887	45	10.2	241	249
Pukemutu Effluent	2,662	53	11.5	249	249
Waikiwi non effluent	830	43	9.8	210	215
Pukemutu non effluent	5,030	50	11.1	217	215
Baleage winter - waikiwi Eff	88	111	25.2	506	249
Baleage winter - Pukemutu Eff	120	133	29.3	530	249
Baleage winter - Waikiwi Non Eff	40	99	22.6	451	215
Baleage winter - Pukemutu Non Eff	240	126	28.3	498	215
Other sources	449				
Whole farm	11,345	51			
Less N removed in wetland	0				
Farm output	11,345	51			

Table 8. Proposed system phosphorus report

Block name	Total P lost	P lost to water	P loss categories		
	kg P/yr	kg P/ha/yr	Soil	Fertiliser	Effluent
Waikiwi Effluent	19	0.5	Low	Low	Low
Pukemutu Effluent	46	0.9	Medium	Low	Medium
Waikiwi non effluent	8	0.4	Low	Low	N/A
Pukemutu non effluent	82	0.8	Medium	Low	N/A
Baleage winter - waikiwi Eff	0	0.5	Low	Low	Low
Baleage winter - Pukemutu Eff	1	0.9	Medium	Low	Medium
Baleage winter - Waikiwi Non Eff	0	0.4	Low	Low	N/A
Baleage winter - Pukemutu Non Eff	2	0.8	Medium	Low	N/A
Other sources	121				
Whole farm	278	1.2			

Farm Map

Figure 1. Driscolls farm map showing the current and proposed effluent areas

Figure 2. Driscolls farm map showing the soil types on farm