Bronwyn Auckram

From: Sue Bradley
Sent: Thursday, 18 October 2018 3:27 p.m.
To: Bronwyn Auckram
Subject: FW: Consent lodgment - Hillview Dairying Ltd
Attachments: 20181018 18087 AEE Expanded dairying. FINAL.pdf; Appendix A - DESC.pdf; Appendix B - Nutrient budget report.pdf; Appendix C - FEMP.pdf; Appendix D - effluent discharge map.pdf; Appendix E - pond design philosophy.pdf; Appendix E - pond drawings.pdf; Appendix E - pond sign off.pdf; Part A form and company register.pdf

Hi Bronny,

Please scan into our mail as 1 document.

Thamls

From: Tanya Copeland [mailto:tanya@landpro.co.nz]
Sent: Thursday, 18 October 2018 2:16 p.m.
To: Consents Team
Cc: Severna & Graeme Kilpatrick
Subject: Consent lodgment - Hillview Dairying Ltd

Good morning,

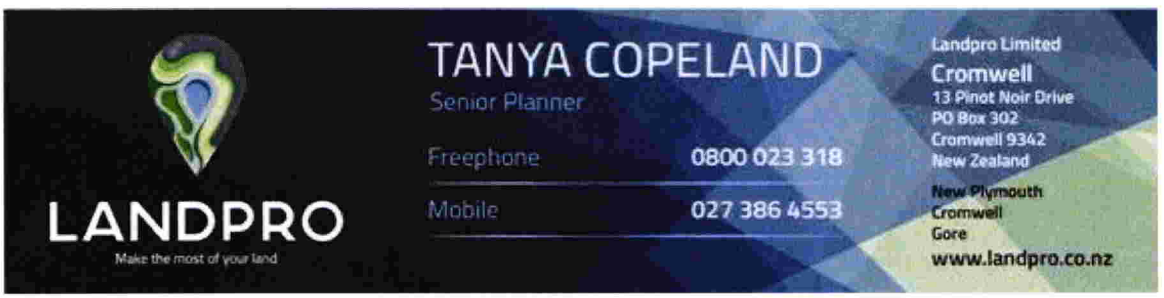
Please find attached a resource consent application for Hillview Dairying Ltd. The applicants will be depositing $1500 into the ES bank account today to cover the resource consent deposit required for this application.

The consent is for expanded dairy farming, a new discharge and water permit and a land use consent for feed pads. We have included a FEMP and nutrient budgets completed by a CNMA. The applicants are in the process of obtaining written approval from the landowner with whom they lease a parcel of land from. I spoke briefly with Emily this morning about this written approval and she agreed that it was not necessary to have it at lodgement stage as the consent process allows provision for obtaining written approvals if needed.

Any questions please give me a call,

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 Tatao 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: HILLVIEW DAIRYING LTD

Address: 488 FOREST HILL CROSSING RD
RD1 WINTON.

Email: gskilpat@xtra.co.nz

Phone: _____ *Preferred* _____ *Additional* Fax: _____

Consultant contact details *(if different from above)*

Contact name/agent: TANYA COPELAND

Address: LANDPRO
PO Box 302 CROMWELL

Email: tanya@landpro.co.nz

Phone: 027 3861553 *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	***Discharge***	***Coastal***
☐ Bore/well	☐ To air	☐ Whitebait stand
☑ New or expanded dairy farming	☐ To water	☐ Structures/occupation of space
☐ Effluent storage	☑ To land	☐ Removal of natural materials
☐ Cultivation	***Water***	☐ Disturb foreshore/seabed
☐ Tree planting	☐ Take and use surface water	☐ Discharge/deposit substances
☐ Gravel extraction	☑ Take and use groundwater	☐ Commercial surface water activity
☐ Hill country burning	☐ Dam water	☐ Reclaim/drain foreshore/seabed
☐ Riverbed activity (incl streams/ creeks and stopbanks)	☐ Divert water	☐ Marine farming
☑ ~~Bridges and culverts~~ Feed pad		☐ 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 300235
AUTH 300236

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.)

Expand dairy, discharge FDE, take groundwater, feed pads

4 **Location** of proposed activity

Address: 140 Cooper Rd
RD1 Winton

Legal Description: SEE AEE

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.**

SEE AEE

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.

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)*
- [ ] Written approval from all potentially affected parties *(forms available from the Environment Southland website)*
- [x] Site plan/location map/sketch of the proposed activity
- [x] 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** 18.10.18.

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

HILLVIEW DAIRYING LIMITED *(1115468) Registered*

To maintain this company log on here

Last updated on 08 Aug 2018

Company Summary | Addresses | Directors (2) | Shareholdings (2) | Documents (36) | PPSR Search

Company number:	1115468
NZBN:	9429037009106
Incorporation Date:	15 Feb 2001
Company Status:	Registered
Entity type:	NZ Limited Company
Constitution filed:	Yes
AR filing month:	August , last filed on 08 Aug 2018
Ultimate holding company	No
Company addresses:	**Registered Office** Agrifocus Limited, 25d Victoria Avenue, Invercargill, 9810 , New Zealand **Address for service** Agrifocus Limited, 25d Victoria Avenue, Invercargill, 9810 , New Zealand View all addresses
Directors	Showing 2 of 2 directors Graeme KILPATRICK 488 Forest Hill Crossing Road, Rd 1, Winton, 9781 , New Zealand Severna KILPATRICK 488 Forest Hill Crossing Road, Rd 1, Winton, 9781 , New Zealand
Company record link:	http://app.companiesoffice.govt.nz/co/1115468

Additional NZBN Information
Trading Name:
Phone Number:
Email Address:
Website:
Industry Classification:

Generated on Thursday, 18 October 2018 10:21:09 NZDT

Hillview Dairying Ltd

Resource Consent Application to Southland Regional Council for:

- Expansion of dairy farming
- Replace Discharge Permit AUTH-300235
- Replace Water Permit AUTH-300236
- Land use consent for feed pad

Prepared For
G & S Kilpatrick
488 Forest Hill Crossing Road, RD1, Winton

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

Tel +64 3 445 9905
Fax +64 3 445 0194

18 October 2018

QUALITY INFORMATION

Reference:	Hillview Dairying – AEE expanded dairying
Prepared by:	Tanya Copeland
Reviewed by:	Hilary Lennox
Client Review:	G & S Kilpatrick

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LIST OF APPENDICES

1. INTRODUCTION

1.1 Overview

Hillview Dairying Ltd (the applicant) own a farm near Tussock Creek to the south of Winton. The applicant currently operates under Discharge Permit AUTH-300235 and Water Permit AUTH-300236 which authorize the applicant to discharge farm dairy effluent from up to 599 cows and abstract groundwater for dairy farming purposes on a dairy platform with a total size of 189ha. The consents do not expire until 2021 but the applicant wishes to expand the dairy platform onto a neighbouring block of land which they intend to purchase, bringing the total dairy platform area to 346ha. The applicant wishes to obtain consents to enable an increase to both the milking platform and the herd size.

The applicant utilizes a support/runoff block in close proximity to their existing dairy farm for wintering, young stock grazing and growing supplement. The support block is 154ha in total and is partially owned by the applicant (93ha) and the remaining area (61ha) is leased from a neighbour for the past five years.

This application considers the landholding to include the dairy platform and the support land, and accordingly activities on these areas have been included in the nutrient budgets.

Consents are sought for:

- To use land for new dairy farming that did not exist as of June 2016
- A discharge permit to consent the discharge of FDE and other effluent (silage pad, underpass) from up to 850 cows
- A water permit to consent the abstraction of groundwater for dairy purposes for up to 850 cows
- A land use consent for three feed pads which will each hold greater than 120 adult cattle

1.2 The Applicant

Applicant address: G & S Kilpatrick
488 Forest Hill Crossing Road
RD1
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 THE PROPOSAL

2.1 Site Location

The farm (marked with red dot) is located near Tussock Creek, which is south east of Winton township.

Figure 1: Topographic map location of farm

Figure 2 below shows the spatial location of the existing dairy platform, proposed new block and existing support block which are subject to this application.

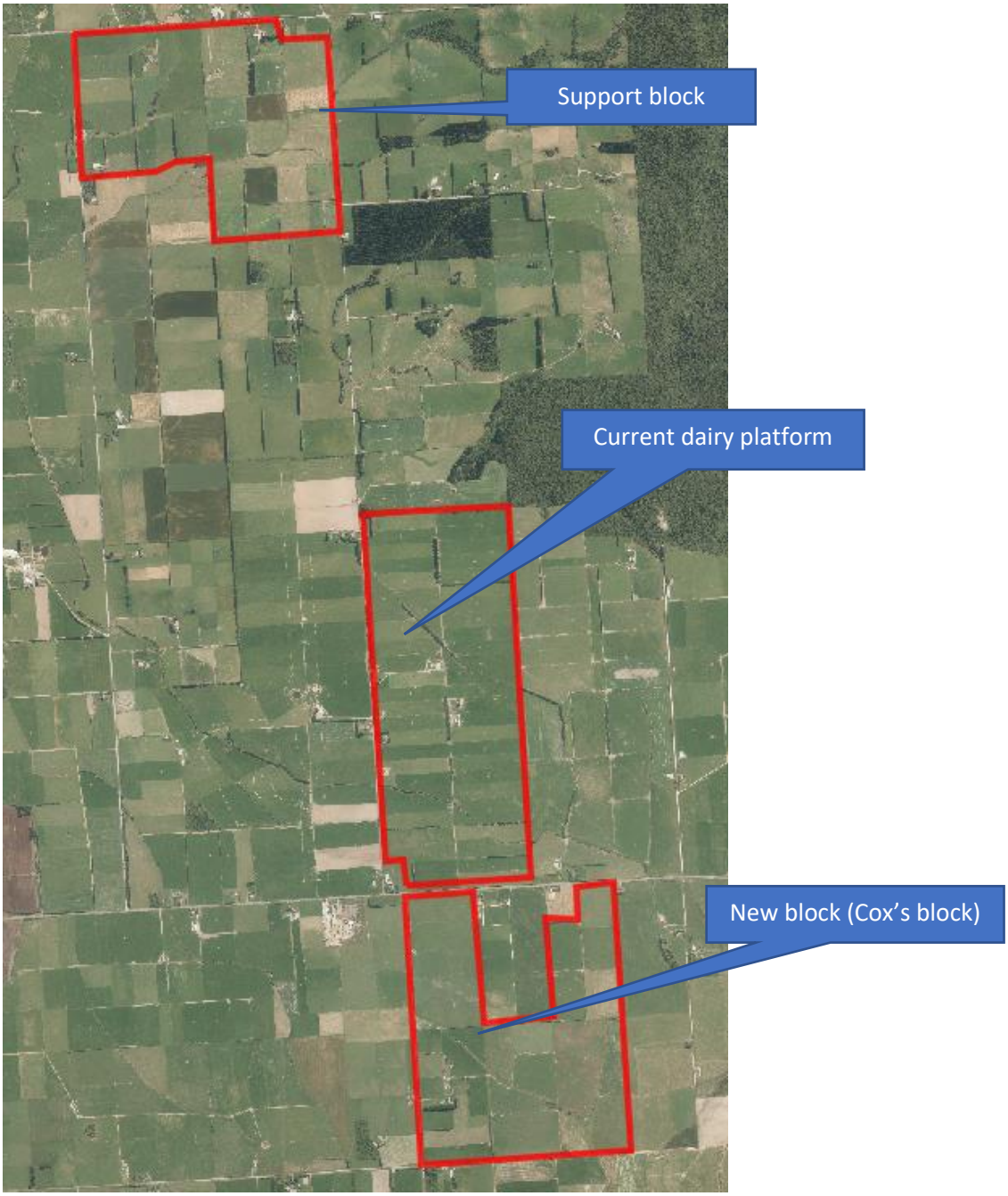


Figure 2: Map showing landholding subject to this application

2.2 Details of the Dairy Farm

The following table provides further details of the farming system proposed.

Table 1: Details of the proposal

Property Details	
Property address	140 Cooper Road, RD1, Winton
Property owner(s)	Hillview Dairying Ltd - G & S Kilpatrick
Legal Description of the landholding	Sec 23 Block VIII New River Hundred
	Sec 24 Block VIII New River Hundred
	Sec 25 Block VIII New River Hundred
	Sec 27 Block VIII New River Hundred
	Pt Sec 26 Block VIII New River Hundred
	Lot 2 and 3 DP 520309
	Sec 11 Block X New River Hundred (new block)
	Sections 12 Block X New River Hundred (new block)
	Pt Sec 6 and 13 Block X New River Hundred (new block)
	Lot 1 DP14135 (new block)
	Lot 2 DP 11675
	Lot 2 DP 378224 (support block owned)
	Sec 38 Block VIII New River Hundred (support block owned)
	Lot 3 and 4 and pt lot 1 DP 350528 (support block leased)
Property area (ha)	Current dairy platform: 189ha total, 180ha effective Current Support block: 154ha total Proposed dairy platform: 346ha total, 330ha effective Proposed support block: 154ha total (unchanged)
Change in scale/intensity/farm boundary?	Increase in dairy platform area (increase of 166ha) and cow numbers (increase of 251 cows)
Discharge Permit Details:	
Replacement of permit no.	AUTH-300235
Number of dairy cows	850
Stocking rate (cows/ha)	2.6 (previously 3.3)
Winter milking?	No
Wintering barn?	No
Feed pad/stand off pad?	Three pads that don't drain into the effluent pond. Woodchip base (require land use consent, see below)
Other sources of effluent?	Silage pad (proposed)
Type of shed	50 bale rotary
Effluent treatment	Double sludge bed with weeping wall

Storage available (m^3)	3008m^3 total volume, 2415m^3 pumpable volume
Storage required (m^3)	2364m^3 (as per attached dairy effluent storage calculator)
Discharge area (ha)	124 ha
Irrigator proposed	3 sets of low rate pods (4 pods per set) and Briggs travelling irrigator and slurry tanker/muck spreader/umbillical
Application rate and depth	10 mm/hr rate and 25 mm depth per application (pods), 10mm depth (travelling irrigator) and 5mm depth (slurry tanker/muck/umbillical)
Monitoring proposed	Discontinuation of surface water monitoring. Use of SOE site on boundary
Water Permit Details:	
Replacement of permit no.	AUTH-300236
Freshwater Management Unit	Makarewa
Groundwater Zone	Bore is located in the Makarewa groundwater management zone
Maximum instantaneous rate of take (L/s)	2 L/sec
Average rate of take over 24 hrs (L/s)	1.18 L/sec
Daily volume (L)	107,810 L/day
Allocation per cow (L/cow/day)	120 L/cow/day for milking herd, 70 L/cow/day for beef and young stock on platform
Location of point of take	Well Number E46/1069, which is located near Cooper Road on the western boundary. An additional bore is proposed on the new block which will abstract stockwater and pump to the dairy shed for distribution.
Freshwater storage onsite?	4 x 30,000 L tanks
Yearly volume (m^3/year)	34,026.5m^3
Discretionary allocation limit for groundwater zone (m^3/year)	44,650,000 RWPS 62,670,000 PSWLP
Percentage of discretionary allocation currently allocated	8% RWPS 4.7% PSWLP
Land Use Consent (use land for dairying)	
Area of new block (ha)	157 ha (150 ha effective)
Use of land pre-May 2016	Sheep/cattle/deer trading block
Description of the landholding	Includes existing dairy platform, new block and support/runoff block
Proposed use of new block	Incorporation into dairy platform
Land Use Consent (feed/wintering pads)	
Construction	Minimum of 500mm woodchip base Pad#1 Cox's Road – 1550m^2 for 150 cows Pad#2 Existing – 1400m^2 for 140 cows Pad#3 Collinson Road – 1550m^2 for 150 cows
Effluent management	Material scraped from the feed/wintering pad is applied to land under Rule 38
Number of cows	The proposal is to construct three separate pads to hold a maximum of 150 adult cows each.

2.3 Discharge of farm dairy effluent to land activity

The applicant seeks a new discharge permit to allow the discharge of effluent from 850 cows during the milking season and silage leachate from a proposed silage pad to an effluent discharge area of 124ha (see Appendix D). The effluent will be applied to land using three sets of low rate pods, travelling irrigator and slurry tanker/muck spreader/umbillical. The proposal seeks improvements to the existing discharge activity by adding two sets of additional pods, increasing the utilized discharge area and including a slurry tanker/muck spreader/umbillical. The three sets of pods will be preferentially used during the majority of the season, with the travelling irrigator used during summer and the slurry tanker/muck/umbillical utilized when the pond is emptied and de-sludged.

Effluent is generated from four sources on this property and discharged to land: dairy shed, silage pad, underpass and feed/wintering pads.

- Effluent from the dairy shed (FDE) flows under gravity to an adjacent pump sump. From the pump sump, effluent is pumped to a double sludge bed with weeping wall. Liquid effluent is gravity fed from the centre of the weeping wall into the effluent storage pond. The effluent storage pond was constructed in 2013 by OPUS Consultants under a land use consent and has been built and certified by a Chartered Professional Engineer to be in accordance with IPENZ practice note 21. The pond contains a leak detection system that covers the entire floor area of the pond and therefore meets the permitted activity criteria.
- Effluent from a proposed silage pad will flow directly into the double-sided sludge bed. The silage pad has not been constructed yet but has been included in all storage calculator workings.
- Effluent from the proposed underpass (not shown in picture) will be directed to adjacent pasture. Southroads have designed the proposed underpass and advised that effluent collected will be minimal due to the fact that the underpass is level with the incoming lanes thereby avoiding a situation where there is a low point for effluent to collect.
- Effluent collected on the feed/wintering pads will be stored in-situ until spring and applied to land as a sludge (with the wood chip) under the permitted activity criteria of Rule 38.

Figure 3: Effluent infrastructure layout

Figure 4: Double sludge bed with weeping wall

Figure 5: Effluent storage pond with HDPE liner

The Dairy Effluent Storage Calculator (attached) shows that 2,364m^3 of pumpable storage is required to enable effective deferred irrigation.

The proposal seeks to maintain the 124ha existing effluent discharge area as approved in Appendix 1 of Discharge Permit AUTH-300235 (attached) . This area is sized to ensure that nutrients are distributed over an area large enough to reduce the intensity of loading in any particular paddock. Currently the effluent discharge area is underutilized by the applicant which is something that will be changed under the proposal to ensure the area is fully utilized all year round.

2.4 Groundwater abstraction activity

The applicant is applying for an increase in the consented abstraction volume to account for the increase in cow numbers on the property. The abstraction volume will increase from 71,880 L/day to 107,810 L/day.

Daily Volume	107,810 L/day
Monthly Volume	3,234m^3/month
Annual Volume	34,026.5m^3

The daily volume equates to 120 L/cow/day based on shed wash down water of 50 L/cow/day and stockwater of 70 L/cow/day (full allocation) for the 850 cows plus 70 L/cow/day for the 83 beef and young stock on the platform all year round. The annual volume is based on the above milking season requirement plus 370 cows on farm for 65 days during winter requiring only stockwater.

The proposed abstraction represents an overall increase in the total volume of water abstracted on both a daily and annual basis. The Makarewa groundwater zone has a current allocation of 8% of the discretionary allocation specified in the RWPS and 4.7% of the discretionary allocation specified in the pSWLPS.

2.5 Land use consent to use land for dairying

The applicant operates a high performing dairy farm and associated support block near Winton. The proposal is to purchase a neighbouring stock trading block (157 ha total, 150ha effective) and incorporate this into the existing 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 850.

Under the proposal, there will be 850 cows peak milked on the property with the farm system enabling the wintering of up to 318 cows on three wintering pads on the dairy platform plus the wintering of some additional replacements on 2.5ha of kale. The effluent area which has been utilized will be increased from 33.3ha to 124.9ha. There will be 16 beef cows grazing on the platform all year round, plus 67 young stock from weaning.

The support block will continue to operate to compliment the dairy platform and winter 565 incalf cows and graze 154 young stock. Stock will be wintered on brassicas and silage will continue to be grown and exported to the milking platform.

The applicant has utilized OVERSEER nutrient modelling to assess the proposal against the current land use. Overall the modelling shows a decrease in the total nitrogen lost from the property and an increase in total phosphorus lost from the property.

The key drivers for the reduction in nitrogen loss are:

- Reduced winter crop area on the dairy platform by 14.7ha
- Increasing the area that effluent is regularly applied to (i.e utilized area) thereby reduced N application in effluent to this area
- Reduced nitrogen fertiliser use across the whole farm particularly in the late season
- Reduced stocking rate per hectare on the milking platform
- Culled cows earlier reducing supplement feed required and urinary N deposition late in the season
- Wintering a portion of the herd on a wintering pad
- Reduced fertilizer N use on crop in 1st year

The key drivers of the increase in phosphorus loss are:

- Soil Olsen P – soil fertility on the new block is expected to be lifted under the proposal to lift potential pasture production in line with the current milking platform. Higher soil P content equals higher modelled losses.
- 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.

2.6 Land use consent for three feed/wintering pads

The proposal is to utilize three separate feed/wintering pads on the dairy platform. These pads will contain a 500mm woodchip base and will be used over the winter period for the portion of the herd which is not wintered at the runoff block. The pads will be designed and located in accordance with the provisions in Rule 35A and only require consent (i.e breach permitted activity criteria) due to the animal number threshold. The proposal is to construct two larger pads of 1550m^2 which will hold a maximum of 150 adult cows and re-purpose and existing smaller pad of 1400m^2 to hold a maximum of 140 adult cows.

The nutrient budgeting scenario sees a total of 370 cows/young stock wintered on the platform with approximately 318 cows on these wintering pads. The pads are sized adequately to cater for the cows which will remain on farm. The cows will be fed from self-feed stacks near the pads.

Figure 6 below shows the location of the pads on the Cox's block which will become part of the dairy platform under the proposal.

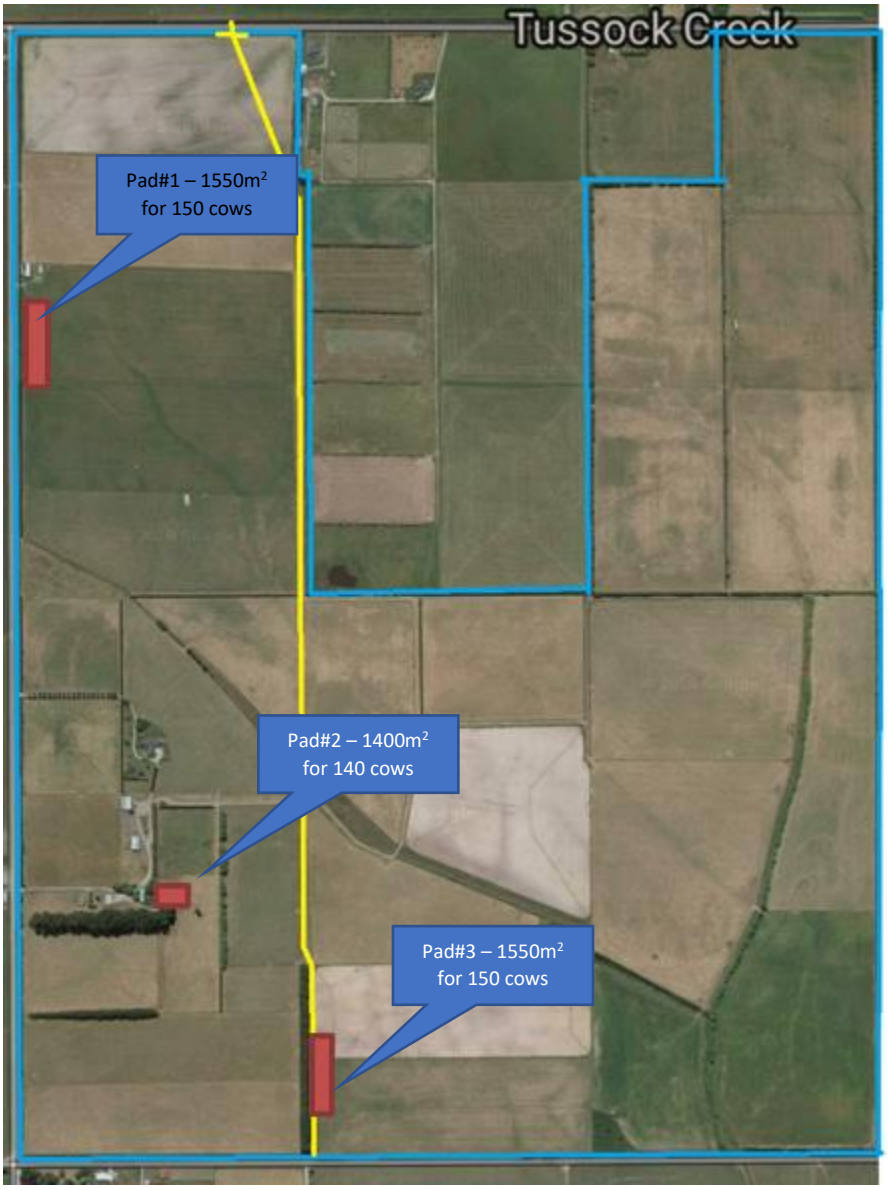


Figure 6: Feed/wintering pad locations and dimensions

3. DESCRIPTION OF THE EXISTING ENVIORNMENT

3.1 Land use, topography & climate

The existing dairy farm and new block (Cox's block) are flat in topography. The support/runoff block is rolling in topography.

The existing dairy farm is used only as milking platform and is used in conjunction with the support/runoff block which grazes young stock, provides wintering for the herd and exports silage supplement to the dairy farm. Cox's block is currently used as a stock trading block.

The following climate information was used in the Overseer climate station tool for all blocks modelled;

- 1120mm of rainfall
- 10.0 degrees Celsius mean annual temperature
- Daily rainfall pattern setting of 731 to 1450mm (low variation)
- Mean annual PET of 727mm (moderate variation)

3.2 Current consents

The existing dairy farm operates under Discharge permit AUTH-300235 which permits the milking of 599 cows with effluent spread over a 108ha block using low rate pods and travelling irrigator. The farm is currently required to have effluent storage capacity of 2,300m^3. The Appendix 1 map from AUTH-300235 is attached in Appendix D and is not proposed to change.

Water Permit AUTH-300236 allows the applicant to abstract 71,880 L of groundwater per day for dairy purposes.

This application seeks to replace these existing permits to allow for the increase in herd size, change of effluent application method and increase in water abstraction volume.

3.3 Land Resource

Soil types and physiographic zones present on the farm 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 appropriately. The proposed dairy farm is underlain with Makarewa, Pukemutu and Te Mara soils and is located within the Gleyed physiographic zone according to Beacon.

The support block contains Orono soils alongside the same soil types as the dairy farm and is mapped as being within the Gleyed and Oxidising physiographic zones.

Table 2: Soils and physiographic zones on the landholding

Soils				***Physiographic Zones and key contaminant pathway(s)***
Type and area (ha)	**Vulnerability Factors**			
	Structural Compaction	**N leaching**	**Waterlogging**	
Pukemutu	Severe	Slight	Severe	Gleyed (no variant) Overland flow and artificial drainage
Makarewa	Moderate	Slight	Severe	Gleyed (no variant) Overland flow and artificial drainage

Te Mara	Moderate	Moderate	Moderate	Gleyed (no variant) Overland flow and artificial drainage
Orono/Isla Bank	Moderate	Moderate	Slight	Gleyed (no variant) Oxidizing – Artificial drainage

SOILS

The Pukemutu soils are described in the Topoclimate Southland Information Sheet as "having a moderately deep potential rooting depth that is severely restricted by the fragipan at 60–90 cm depth. The depth of the fragipan means the Pukemutu soils typically have moderately high to high plant available water. The soils are poorly drained, with very slow permeability in the subsoil and limited aeration during sustained wet periods. Textures are typically heavy silt loams, increasing to silty clay in the lower subsoil. Topsoil clay content is typically 25–30%, and stone free. The moderately deep variants have gravel between 45 and 90cm depth."[1]

The Makarewa soils are described in the Topoclimate Southland Information Sheet as being "Makarewa soils have a deep rooting depth and moderately high available soil water, although the rooting depth may be limited by poor aeration during wet periods due to the poor drainage and slow subsoil permeability. Texture is variable, with layered texture profiles common, but there is always at least one horizon with silty clay texture and topsoil clay content is 3060%. The soils are typically stone free, although the moderately deep phase will have gravel between 45 and 90cm depth."[2]

The Te Mara soils are described in the Topoclimate Southland Information Sheet as being "Te Mara soils have a deep rooting depth and moderately high plant available water. The soils have compact lower subsoils that are slowly permeable, causing the soils to be imperfectly drained. Textures through the profile are heavy silt loam to silty clays, with a topsoil clay content of 30–45%. Deep soils are stone free, with bedrock or gravelly colluvium between 45 and 90cm in moderately deep soils."[3]

No information is available about the Orono soils on the support block. They are mapped on Topoclimate to be Isla Bank soils. These soils have a deep rooting depth and high plant available water, meaning there is no major restriction to plant growth. Aeration is typically good, but the slow permeability of the lower subsoil can cause short-term waterlogging after heavy rain. Textures are heavy silt loams, with topsoil clay content of 28–32%. Soils are stonefree.[4]

[1] Topoclimate Southland Information Sheet no.31, 2002, *Pukemutu soils,* Crops for Southland publication

[2] Topoclimate Southland Information Sheet no.31, 2002, *Makarewa Soils,* Crops for Southland publication

[3] Topoclimate Southland Information Sheet no.31, 2002, *Te Mara Soils,* Crops for Southland publication

[4] Topoclimate Southland Information Sheet no.31, 2002, *Isla Bank Soils,* Crops for Southland publication

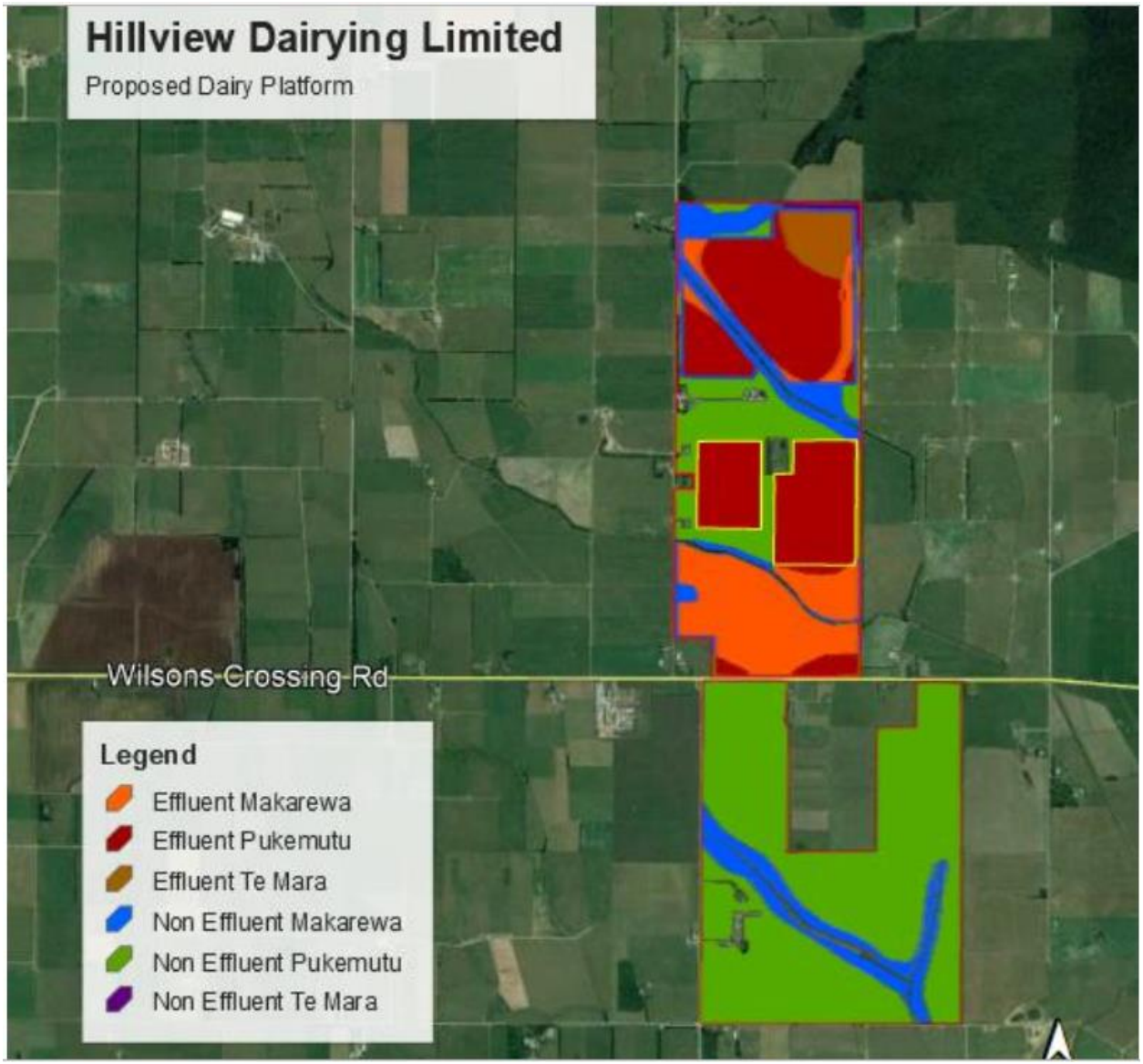


Figure 7: Soil map of proposed dairy farm

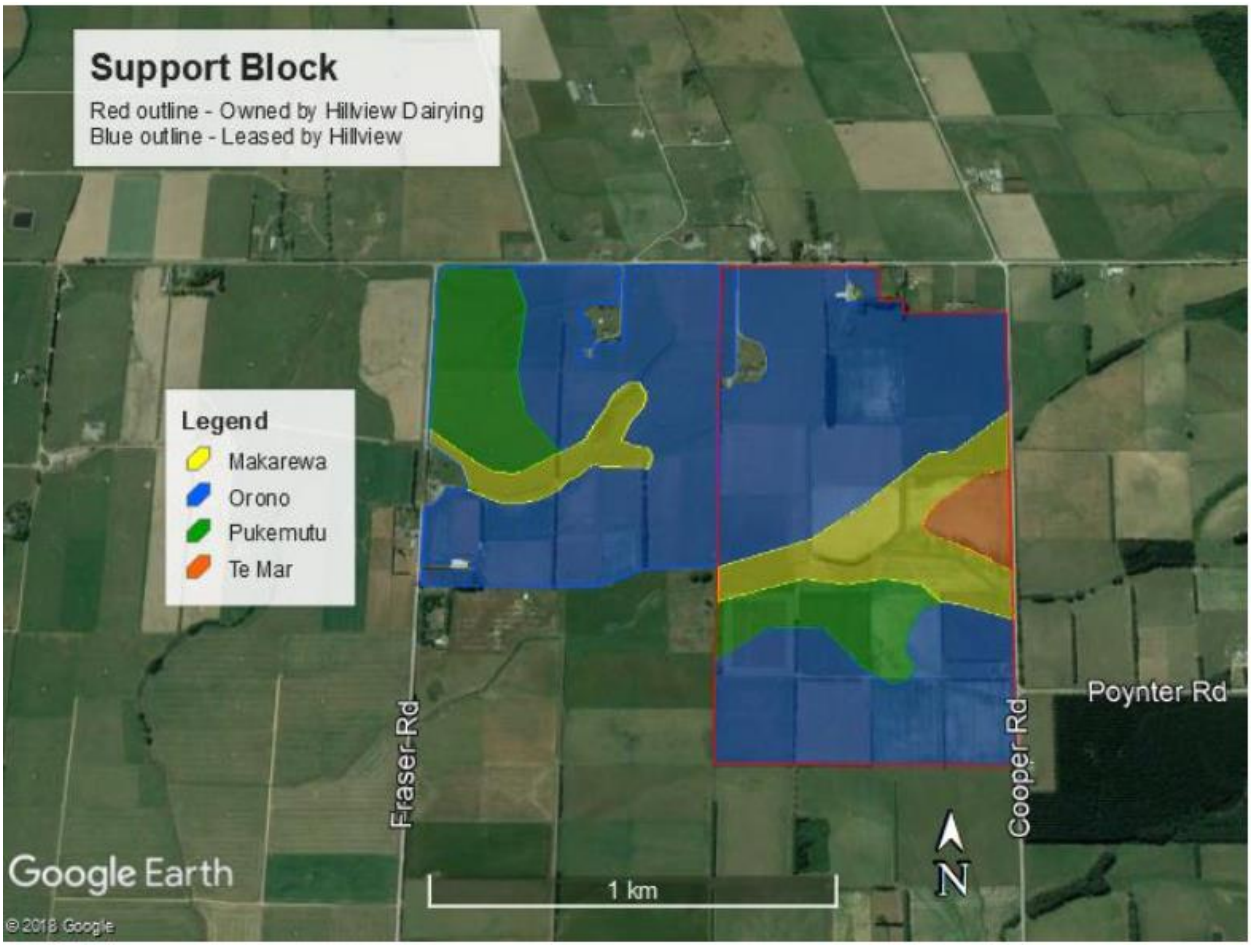


Figure 8: Soil map of existing and proposed support block

PHYSIOGRAPHIC ZONE

The proposed dairy platform is entirely located within the Gleyed physiographic zone under the Proposed Southland Water and Land Plan (PSWLP). An Environment Southland factsheet[5] summarises the key features of the zone below with the contaminant pathways identified for the entire zone as artificial drainage and overland flow. A portion of the support block is located within the Oxidizing physiographic zone with a variant of artificial drainage.

Mole and tile drainage is present across approximately 80% of the proposed dairy platform and support block due to the poorly and imperfectly drained soils (OVERSEER input value). The presence of artificial drains gives rise to a risk of contaminant loss through these drainage pathways which can rapidly transfer drainage water to surface water and/or groundwater bodies.

[5] Water and Land 2020 and Beyond, Environment Southland Factsheet, *Gleyed*

Overland flow of contaminants may be a risk on the property particularly during prolonged wet periods however waterlogging will be mitigated in part by the continued installation and maintenance of subsurface drainage networks on the property.

Measures to mitigate adverse effects from these identified contaminant pathways are discussed in Section 5.5 of this report.

Key features of the Gleyed zone

- Low-lying flat to undulating land on alluvial terraces, located between the major river systems on northern and southern plains.
- Generally found in historic wetland areas, and have a high water table during winter that's up to one metre below ground.
- Soils are generally fine textured, prone to water-logging, and have extensive artificial drainage (mole and tile drains).
- Some nitrogen is removed from water infiltrating through the soil zone via denitrification (lost as nitrogen gas).
- Loss of nutrients, sediments and microbes via artificial drains following heavy or prolonged rainfall are a key feature of this zone.
- Water in this zone is not directly linked to any of the major rivers and therefore does not experience dilution from Alpine or pristine Bedrock/ Hill Country zones.

Water source and movement

- When soils are wet, excess water from rainfall in flatter areas will flow via an extensive drainage network to nearby streams.
- In undulating areas excess water may also flow across the land surface as overland flow (runoff) during heavy rainfall.
- Some water will slowly make its way down to underlying aquifers.
- Aquifers are shallow and interconnect with streams and drains.

Contaminant movement

Soils may accumulate and store nitrogen during summer and early autumn when soil moisture levels are low. However, some nitrogen will be removed from the soil and aquifers via denitrification (lost as nitrogen gas), resulting in relatively low groundwater nitrate concentrations. Accumulated nitrogen starts moving with water when soils become wet in late autumn and winter and may be lost via artificial drains or overland flow.

FARM DAIRY EFFLUENT CLASSIFICATION

The majority of the effluent discharge area is classified as Artificial Drainage (Category A) in the Southland Regional Water Plan (RWPS). The small portion of Te Mara soils are classified as Sloping Land (Category C). FDE application to both Category A and C land is considered to be high risk. The table from Policy 42 is attached below which recommends that Farm dairy effluent (FDE) application on Category A and C land must be at a depth less than the soil water deficit. In addition, the average application rate should be less that the soil infiltration rate. Maximum N loadings from effluent application are recommended at less than 150 kg N/ha/year. On Category A land the instantaneous application rate is not an essential criteria whereas on Category C land the instantaneous application rate should be less than the infiltration rate.

Table 1: Minimum management criteria for a land applied effluent system to achieve

	Category A	Category B	Category C	Category D	Category E
Soil and landscape feature	Artificial drainage or coarse soil structure	Impeded drainage or low infiltration rate	Sloping land (>7°)	Well drained flat land (<7°)	Other well drained but very stony[x] flat land (<7°)
Application depth (mm)	< SWD*	< SWD	< SWD	< 50% of PAW#	≤ 10 mm & <50% of PAW#
Instantaneous application rate (mm/hr)	N/A**	N/A**	< soil infiltration rate	N/A	N/A
Average application rate (mm/hr)	<soil infiltration rate	<soil infiltration rate	<soil infiltration rate	<soil infiltration rate	<soil infiltration rate
Storage requirement	Apply only when SWD exists	Apply only when SWD exists	Apply only when SWD exists	24 hours drainage post saturation	24 hours drainage post saturation
Maximum N load	150 kg N/ha/yr	150 kg N/ha/yr	150 kg N/ha/yr	150 kg N/ha/yr	150 kg N/ha/yr

* SWD = soil water deficit (The amount of water (mm) required to restore a soil to field capacity from its current moisture status)
# PAW = Plant available water (The state of top 300mm of soil after rapid drainage has effectively ceased and the soil water content has become relatively stable)
[x] Very stony= soils with > 35% stone content in the top 200 mm of soil
** N/A = Not an essential criteria, however level of risk and management is lowered if using low application rates

To account for this, the pods will be used on the category C land only to ensure that the application rate less is than the soil infiltration rate as required by Policy 42. All other land will receive effluent via both methods which ensures compliance with Policy 42 by restricting the application rate to 10mm/hr for the pods and application depth to 10mm for the travelling irrigator. Policy 42 states that if the above criteria are met then valuable nutrients contained within FDE will be kept in the root zone so they can be taken up by plants instead of being lost into groundwater or surface waterways.

3.4 Surface water resources

According to the PWLPS, the entire property is contained within the Oreti Freshwater Management Unit. The Environment Southland Beacon mapping service has the entire property located within the Makarewa catchment which is a tributary of the Oreti River.

There are a number of waterways which traverse the property. Tussock Creek is in the southern part of the existing dairy platform. Various other tributaries of both Tussock Creek and the Makarewa River traverse the property (both dairy platform and support block) as shown below.

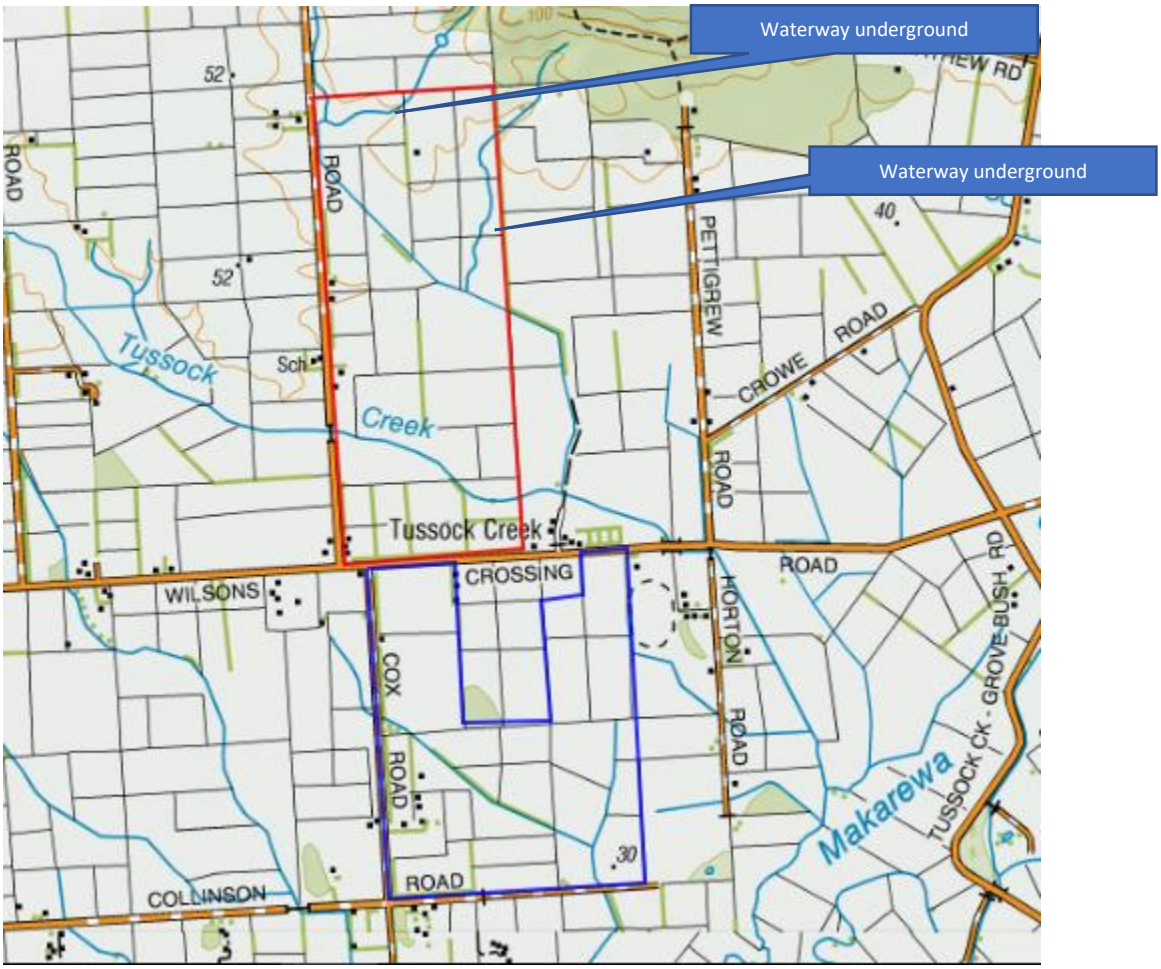


Figure 9: Map of surface waterways on the proposed dairy platform (RED is existing platform and BLUE is new block)

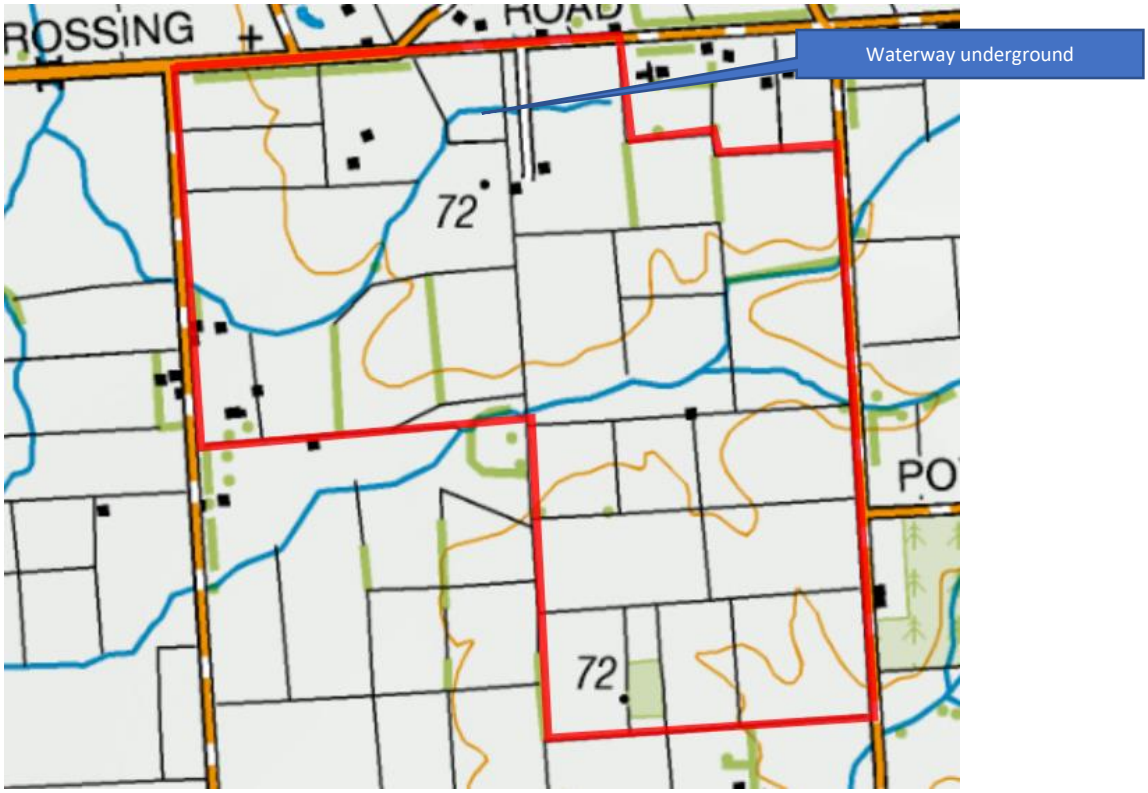


Figure 10: Surface waterways on support/runoff block

The applicant has gone to great lengths to fence off all naturally occurring waterways and drainage channels from stock. Most have extensive and mature riparian planting on the northern aspect to protect water quality. The following photos are taken on both the current block and new block and show the existing riparian margins.

Figure 11: Riparian planting on existing dairy platform

Figure 12: Riparian planting on existing dairy platform

Figure 13: Riparian planting on existing dairy platform

Figure 14: Riparian planting and fencing on new block

Figure 15: Riparian buffer zone and fencing on new block

There is a state of the environment (SOE) water quality monitoring site on the western boundary of the existing farm on the entry point of Tussock Creek into the farm boundary. The next closest SOE water quality monitoring site is situated on the Oreti River at Wallacetown . Information from the Land and Water website (www.lawa.org.nz) collates water quality data from a number of sources and provides the most recent water quality data available. Table 3and Table 4 below gives a summary of the state and trend measured at these two sites over a variety of different parameters. 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 3: **Summary of State and Trend for Tussock Creek 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 raw data which forms the basis for the information in the above table is provided in Appendix 5 of the 2017 Environment Southland technical report named *Water Quality in Southland: Current State and Trends*[6] The data includes 59-60 samples for this site across all of the parameters. Out of 59 samples for E.Coli the maximum recorded value is 41,000 MPN, the median value is 1100 MPN and the 95% value is 28,400 MPN. These values equate to a D rating under the guidelines in the 2014 National Freshwater Policy Statement which indicates a high risk of infection for waders/boaters in Tussock Creek. In contrast, nitrogen concentrations in Tussock Creek are showing meaningful improvement.

The Tussock Creek monitoring site measures water quality prior to the entry into the applicant's property. The results are therefore indicative of background water quality and cannot be directly attributed to practices on the applicant's farm. The applicant understands that this SOE site may no longer be in use.

The Oreti River monitoring site is located on the main stem of the Oreti River low down in the catchment and will capture water quality effects from a large and diverse area including effects from the Tussock Creek/Makarewa Catchment which drains into the Oreti River.

Table 4: Summary of State and Trend for Oreti River at 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

[6] Hodson et al, 2017, *Water Quality in Southland: Current State and Trends Technical Report*, Environment Southland

The results at the Wallacetwon site indicate that water quality on the mainstem of the Oreti River is consistent with the regional plan objectives, and no trends in water quality have been determined. Appendix 5 of the report referenced above shows that 47 samples have been collected at this site to inform the data in Table 3.

In summary, the surface water quality monitoring data indicates:

- no significant deterioration in water quality in the Oreti River in relation to any measured parameters
- a significant degradation of water quality in Tussock Creek in relation to E.Coli.
- a meaningful improvement in trend data for nitrogen concentrations in Tussock Creek.

The data highlights 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.

3.5 Groundwater resources

The RWPS and PSWLP have delineated groundwater management zones for the Southland Region. Under both Plans, the property is located entirely within the Makarewa groundwater management zone (GMZ).

The Makarewa GMZ is classified as a lowland aquifer and 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 as shown in Figure 8 below. 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.

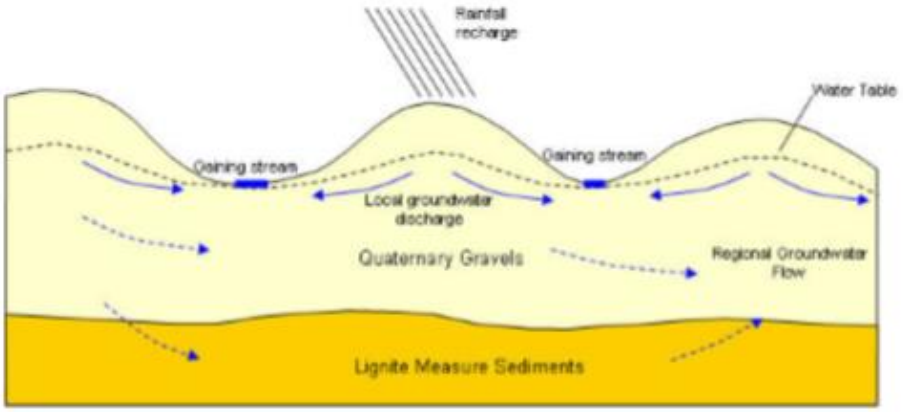


Figure 16: Schematic cross-section of the Makarewa Groundwater Zone[7]

[7] Makarewa Groundwater Management Zone ES Factsheet, retrieved 21 March 2018

3.5.1 Groundwater Quality

Information from ES indicates that groundwater quality in the Makarewa Groundwater Management Zone is generally good[8]. Regional nitrate levels maps from Beacon indicate that groundwater quality across the site ranges between the two lowest classifications - "pristine, pre-European" and "modern day background" (0.01 mg/L – 1.0 mg/L).

There is no property-specific groundwater quality monitoring available. The 2017 *Water Quality in Southland: Current State and Trends Technical Report* was again used to ascertain water quality trends in the vicinity of the property based on all of the nearby monitoring bores that ES has monitoring access to. The monitoring site closest to the property is marked on the map. The 2017 trend report notes a deterioration trend at this site between 2000 and 2016 in regards to nitrogen and an indeterminate trend over the same time period for DRP.

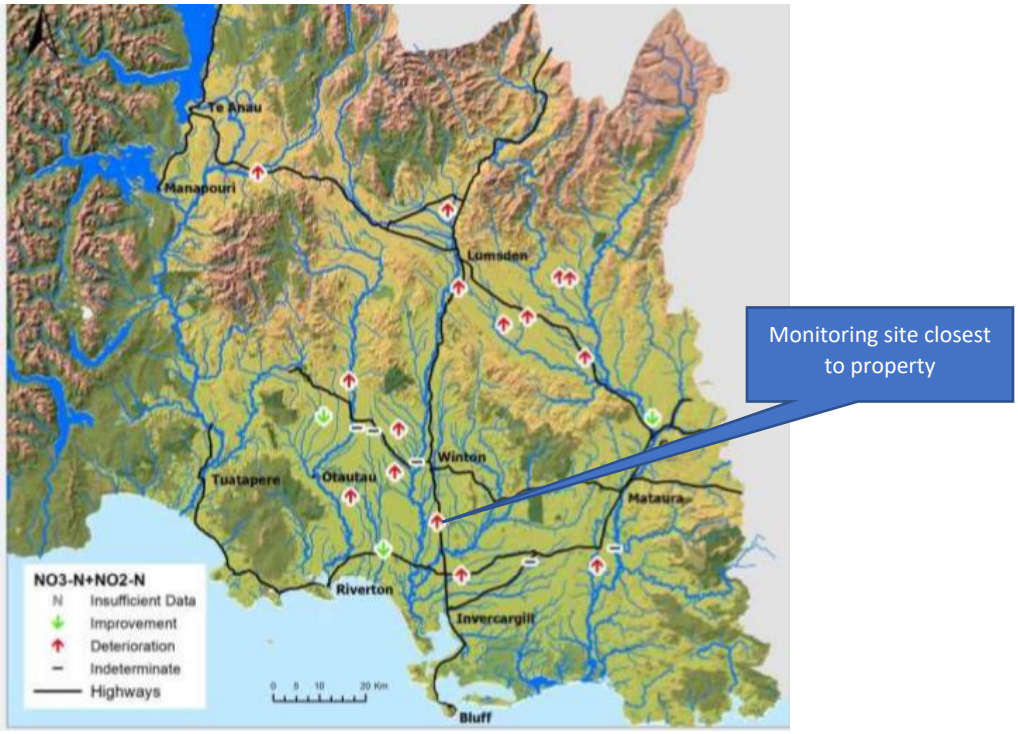


Figure 17: Groundwater quality trend between 2000 and 2016 for NO3-N+NO2-N at ES monitoring site[9]

[8] Makarewa Groundwater Management Zone ES Factsheet, retrieved 21 March 2018

[9] Hodson et al, 2017, *Water Quality in Southland: Current State and Trends Technical Report*, Environment Southland

There are no drinking water sites down-gradient of the subject property.

In summary, the groundwater quality monitoring data indicates:

- a deterioration in groundwater nitrate concentrations between 2000 and 2016 in the vicinity of the property.
- Overall groundwater nitrate concentrations are very low between 0.01 and 1.0 mg/L

The data highlights the need to minimise contaminant loss from land into water bodies to ensure that the water quality of groundwater remains consistent with the relevant objectives in the relevant statutory planning provisions.

3.5.2 Groundwater Quantity

The applicant is applying for an increase in the consented daily abstraction volume to 102,000 L/day over a 300 day milking season plus stockwater for 370 cows over winter. This volume represents an increase to the previous annual volume which was not restricted in accordance with the milking season. The proposed abstraction represents a negligible portion of the allocation of the respective groundwater management zone. The Makarewa groundwater zone has a current allocation of 8% of the discretionary allocation specified in the RWPS and 4.7% of the discretionary allocation specified in the pSWLP.

3.6 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[10] 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 5: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

[10] 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.

	Existing Condition Rating	*Susceptibility Rating*	*Vulnerability Rating*
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[11].

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: Activities for which consent is required

Consent	Plan	Rule	Activity Status
Discharge permit to discharge agricultural effluent to land	RWPS	50(c)	*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(d)	*Discretionary*
Land use consent to use land for dairy farming	RWPS	17A	*Permitted*
	PSWLP	20(d)	*Restricted discretionary*
Land use consent for feed/wintering pad	PSWLP	35A(b)	*Discretionary*

The proposed discharge activity is a **discretionary activity** on the basis that the discharge activity will be increasing in scale due to an increase in cow numbers. The setback requirements in Rule 35(c) are met under the proposal.

The water abstraction activity is a **discretionary activity** on the basis that the abstraction exceeds 86m^3 per day but the abstraction is within the primary allocation limits in the PSWLP.

The use of land for farming is a **restricted discretionary activity** on the basis that the application includes an assessment of the annual amount of contaminants discharged from the landholding for the preceding five years as well as meeting the other requirements of Rule 20(d).

[11] 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.

The use of land for a feed/wintering pad is a **discretionary activity** on the basis that the number of adult cattle on the pads will exceed 120. All other criteria of Rule 35A(b) are met.

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 existing effluent storage pond has a leak detection facility which covers the entire pond and was constructed under a land use consent in 2013. The pond has a HDPE liner and therefore meets permitted activity criteria. See Appendix E for pond construction drawings and certification
Incidental discharges from farming (Rule 24 PSWLP)	The land use associated with this discharge will be authorised under Rules 20, 25 or 70.
Establishment of a New Dairy Farm (Rule 17A RWPS)	The proposal does not seek to intensify the existing operation with the addition of a new dairy shed, so this rule does not apply.
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 will be located away from sensitive receiving environments, in accordance with permitted rule setbacks and no direct discharge of silage leachate to any waterbody is proposed.
Sludge (Rule 38 of the PSWLP)	Solid sludge effluent collected from the stone traps, effluent pond, sludge beds and feed/wintering pads 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 (Rules 53, 54 & 55 of the RWPS, and Rules 42 & 43 of the PSWLP)	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 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

Activity	Compliance with the relevant permitted rules of the RWPS and PSWLP
	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. ASSESSMENT OF ENVIRONMENTAL EFFECTS – EFFLUENT DISCHARGE ACTIVITY AND LAND USE CONSENT FOR FEED/WINTERING PAD

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.

5.1 Application rate/depth

The applicant proposes to apply effluent using low rate pods (or equivalent low rate system), travelling irrigator and slurry tanker/muck spreader with umbilical. The inclusion of the slurry tanker/muck spreader/umbillical represents a change from the existing application system and is to provide for instances where the applicant brings a contractor onsite to empty and desludge the pond.

The proposal is to utilize three sets of low rate pods. Effluent is pulsed alternatively down the thee pod sets applying 4mm each for an average of 15 hours per day during summer and 7.5 hours during winter. The system has an automatic low and high pressure shutoff valve.

The applicant proposes maximum application restrictions of:

- 10mm/hr application rate for the pods with a maximum depth of 25mm per application (using pulsing)
- 5mm application depth for the slurry tanker/muck spreader/umbillical
- 10mm application depth for the travelling irrigator

These application restrictions are appropriate given the presence of imperfectly drained soils on the farm and the existence of subsurface drainage.

Effluent will only be applied to land when an appropriate soil moisture deficit occurs to match the depth of application in order to ensure that nutrients are maintained within the top 200mm of soil[12], enabling the

[12] 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

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 rates and 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. The applicant utilizes visual inspection and the ES soil moisture sites to guide effluent application decisions. Effluent will be discharged to land year-round, on days when conditions are suitable. Staff at the dairy shed keep a record of effluent application by paddock number to ensure return periods are maintained.

Effluent from the feed/wintering pads will be stored in-situ until late spring/early summer when it will be discharged to land and applied as a sludge under Rule 38 of the PSWLP. The material is likely to be applied to worked paddocks prior to sowing or applied to the areas outside of the effluent discharge area to ensure nutrients are spread across the largest area possible.

The proposed rate and depth of application and assimilation in the topsoil will ensure that an appropriate separation distance to subsurface drains (should they occur in the discharge 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 to surface water will be avoided as far as reasonably practicable. Similarly, these controls will ensure that leaching of contaminants to groundwater is reduced to an acceptable minimum. This is supported by Policy 42 of the RWPS.

5.2 Storage

Currently, effluent storage at the farm consists of a main effluent storage pond. The continued use of this structure is a permitted activity under the proposed plan as the effluent storage pond was constructed under a land use consent is synthetically lined and has a leak detection facility which covers the entire pond. Appendix E contains the pond constructions drawings and certifications.

The sizing of the structures is relevant to the matters of discretion for the discharge permit application. The applicant has used the Dairy Effluent Storage Calculator (DESC) to show that the current volume of the effluent storage pond is sufficient based on the soil types on farm, application depth and volume of effluent generated to ensure effluent can be deferred during periods where the soil moisture deficit is not suitable to enable effluent application. The DESC report shows that the minimum pond volume required on the farm in an average year to cover a 90% probability of rainfall events is 2,364m^3. The effluent storage pond has an estimated total volume of 3,008m^3 and therefore includes excess capacity for effluent storage.

The sludge beds provide 448m^3 of storage for solid effluent which exceeds the DESC minimum requirement of 245m^3 to cater for the expected solid effluent generation.

5.3 Nutrient loading

The OVERSEER scenario reports calculate that liquid effluent application will result in a loading of 47 kg N/ha/year over the 124ha effluent area which meets ES's recommended maximum areal rate of 150 kg N/ha/yr.

Adverse effects on all three receiving environments (land, surface water and groundwater) are influenced by the estimated nutrient load from the discharge activity. The applicant will control nutrient loading on the effluent discharge area by:

- Ensuring the effluent discharge area is fully utilised to ensure nitrogen loading is below 150 kg N/ha/year from effluent over the discharge area.
- The applicant proposes the imposition of a consent condition to restrict N from effluent to 150 kg N/ha/year.
- A reduction in fertiliser usage across the discharge area due to the wider distribution of nutrients
- The use of annual nutrient budgeting to manage nutrient inputs and outputs on the property.

ES's recommended maximum areal rate of 150 kg N/ha/yr is supported by the 2009 report for ES by AgResearch[13] 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 less than a third of the limit recommended by AgResearch, land-applied FDE nitrogen leaching will be within acceptable limits.

According to ES's Beacon GIS, there are no down-gradient registered drinking water sites which abstract from groundwater. The nearest down-gradient drinking water site is on the Oreti River for Invercargill City Council and is over 12 km to the south of the effluent disposal field.

For properties in the Gleyed physiographic zone, underlain with poorly drained soils, it is highly unlikely that there would be any significant adverse effects associated with nutrient losses from the proposed discharge activity on groundwater quality. The characteristics of the Gleyed zone mean that there is typically lower groundwater nitrate accumulation as "soils and aquifers can remove some to all nitrogen via denitrification"[14]. There will be further attenuation, dilution and dispersion processes that will further reduce the concentration of nitrate nitrogen in drainage water between the discharge location and shallow groundwater resources.

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

[13] 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

[14] Gleyed physiographic zone Factsheet, accessed 11 October 2018

anthropogenic influences such as the presence of drains. Microbiological contamination of groundwater is generally localised close to a contaminant source because of natural processes of filtration, adsorption and die-off in soils and groundwater. The soils in this location and the underlying aquifer will combine to provide significant attenuation of faecal indicator microorganisms[15].

All of these issues have been considered when determining an appropriate effluent application 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 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.

5.4 Discharge area

The applicant proposes to retain the existing 124ha effluent discharge area but increase the area which is regularly utilized on a day to day basis. The size of the discharge area provides a discharge area to stock ratio of 14.5ha per 100 cows which is greater than the minimum suggested in ES's best practice guidelines of 8ha per 100 cows. The applicant will purchase two additional sets of pods to allow for greater coverage of the effluent discharge area and allow for pulsed effluent application. This proposed change to the system is aimed to mitigate against effects from the increase in the quantity of effluent under the proposal.

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 of any landholding boundary; and
- 200 m of any residential dwelling on a neighbouring property

There applicant has sited the effluent discharge area away from any other sensitive receptors that require separation measures to be implemented such as critical source areas and ephemeral waterways.

The proposed buffers zones and their ongoing maintenance will ensure that there will be no significant adverse effects resulting from the siting of the discharge area.

5.5 Effects on receiving environment – land

The applicant's effluent system includes low rate and depth application and deferred application. These two fundamental management controls mean that effluent will only be applied when an adequate soil moisture deficit occurs. Effluent applied in this manner will be able to be preferentially used in the root zone minimising the loss of nutrients via the main contaminant pathways: overland flow, deep drainage and artificial drainage. The use of low application rate/depth and deferred application is appropriate for the Pukemutu and Makarewa soils present on the effluent discharge area and the presence of the Gleyed

[15] Environment Southland (2010) State of the Environment: Groundwater Quality Technical Report

physiographic zone which is sensitive to the rapid transfer of nutrients to water bodies via artificial drainage and overland flow.

Contaminant Pathways – Overland Flow and Artificial drainage

Loss of nutrients applied in effluent via overland flow and artificial drainage presents the highest risk to the environment from the proposed discharge activity due to the presence of poorly and imperfectly drained soils. The applicant will avoid and mitigate the risk of overland flow and artificial drainage by:

- Deferring all effluent irrigation until a soil moisture deficit occurs.
- The use of low depth/rate effluent application which ensures that the depth of effluent applied can match the soil moisture deficit.
- Use of pulsed effluent application to lower overall application rate and create spelling windows
- Identifying the locations of tile drains on the property and preferentially utilizing low rate and depth irrigation above subsurface drainage to mitigate the risk of nutrients being transported to water bodies. The reason is because effluent will only be applied when conditions are suitable to retain nutrients in the root zone and prevent leaching through into drainage channels.
- Avoiding the application of effluent either side of known high rainfall events. Metservice forecasting will be used to ensure that staff are up to date with planned high rainfall events ahead of time to limit the risk of effluent being unutilized on the ground surface at the time of rainfall.

5.6 Effects on receiving environment – surface water quality

Under the restrictions on discretion on pSWLP Rule 35(b), the application must consider cumulative effects on the environment from the proposed discharge. The proposed discharge activity is increasing in scale but has been designed to fully meet good management practices and will therefore contribute to maintaining water quality in the catchment and not further exacerbate bacterial, sediment, nitrogen and phosphorus degradation in the surrounding surface water bodies. The continued adoption and refinement of all good management practices will contribute positively towards the goal of enhancing surface water quality in the catchment.

Risks to surface water quality are classified as high on the effluent discharge area (ES Beacon mapping system). Section 3.4 of this report described Tussock Creek, Oreti River and New River Estuary as the wider surface water receiving environments for the discharge activity. The state and trend water quality data indicated:

- no significant deterioration in water quality in the Oreti River in relation to any measured parameters
- significant degradation of water quality in Tussock Creek in relation to E.Coli, but no deterioration trend.
- a meaningful improvement in trend data for nitrogen concentrations in Tussock Creek.
- due to a combination of nutrient loads and excessive sediment deposition, the nutrient enrichment condition of the New River estuary is poor.

In combination with the scientific water quality data, the LAWA website collates ecological data at certain sites. The Oreti River site at Wallacetown is the nearest site to the property which contains ecological data.

The EPT richness indices estimates the percentage of EPT macroinvertebrates which are sensitive to water pollution. Figure 16 below shows a fluctuating reduction in the percentage of EPT invertebrates between 2008 and 2016. A decrease in the percentage of EPT richness is one of several indicators of water quality degradation.

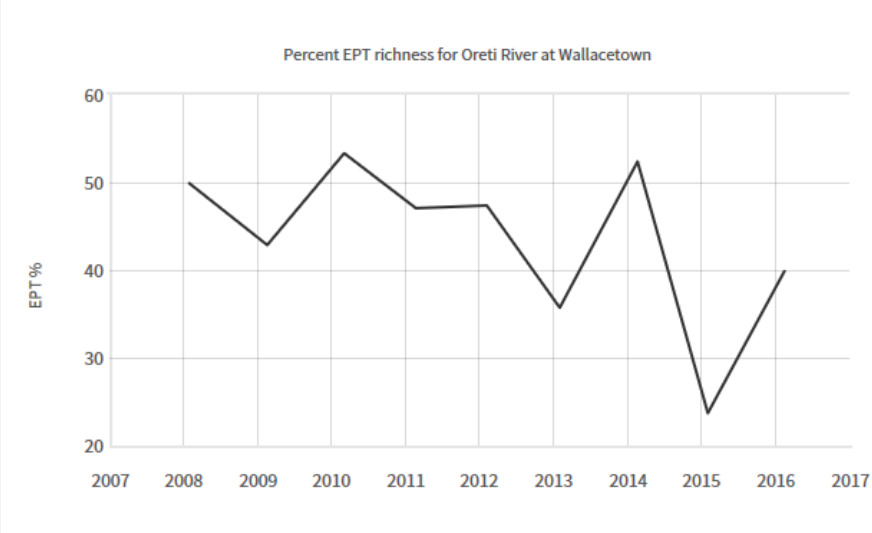


Figure 18: Percent of EPT richness for Oreti River at Wallacetown[16]

The MCI index displayed in Figure 17 shows a similar trend to EPT richness. MCI stands for Macroinvertebrate Community Index which is a qualitative index where macroinvertebrates are assigned a score based on their tolerance or sensitivity to organic pollution. The MCI score at this site classifies the stream as being in fair ecological condition in terms of water quality and habitat and indicates a fluctuating but slight reduction in MCI score between 2008 and 2016.

[16]https://www.lawa.org.nz/explore-data/southland-region/river-quality/oreti-river/oreti-river-at-wallacetown/

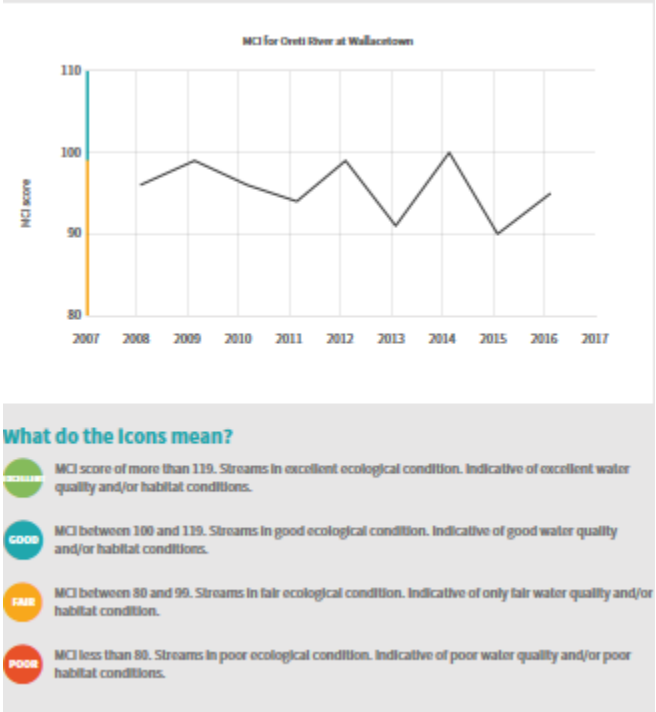


Figure 19: MCI for Oreti River at Wallactown[17]

There is insufficient information to identify the specific cause of the fluctuation and reduction in both MCI and EPT. Water Quality in the tributaries of the Oreti River (such as Tussock Creek) may be a factor. It is difficult for the current level of water quality testing and modelling to attribute the degradation of E.Coli within Tussock Creek to any one particular industry or property. As a result, it is the responsibility of every landowner within the catchment to improve practices to minimise nutrient and microbial loss to surface water bodies. The applicant is located downstream of the SOE site at Coopers Road, however the applicant provides the following reassurances that they are not further contributing to bacterial degradation within Tussock Creek.

- The applicant has gone to great lengths to plant all riparian margins with a variety of vegetation which acts to capture and filter nutrients in the instance that they may be migrating towards the surface waterways on the property (see Figures 9-13)
- The majority of the laneways have been sited away from waterways
- All lane crossings over waterways have been graded to direct runoff towards pasture and bargeboards have been installed on the crossings to contain effluent from spilling into waterways.
- The applicant has sited the effluent discharge area away from sensitive receptors and ensured that effluent is only applied when a soil moisture deficit occurs.
- The applicant has mapped tile drains in order to be mindful of applying effluent overtop of subsurface drainage particularly during higher risk periods.

[17]https://www.lawa.org.nz/explore-data/southland-region/river-quality/oreti-river/oreti-river-at-wallacetown/

The discharge activity meets good management practices and when combined with the continued adoption and refinement of all good management practices identified in the FEMP will contribute positively towards the goal of enhancing surface water quality in the catchment.

5.7 Effects on receiving environment – groundwater quality

Risks to groundwater quality are classified as high on this property by the ES beacon mapping system. Section 3.5 of this report described the groundwater environment as having low to very low nitrate concentrations and a deterioration trend in underlying groundwater nitrate nitrogen concentrations.

Nutrient loss to groundwater has been and will continue to be minimised to the practicable minimum by the low rate/depth effluent application and deferred storage which will maximise the retention of nutrients in the root zone.

The property overlies the Makarewa Groundwater Zone according to the PSWLP which is classified as a lowland aquifer. In the absence of an in-depth scientific report specifically for this groundwater zone, a 2014 Environment Southland Technical report titled *Estimating Time Lags for Nitrate Response in Shallow Southland Groundwater* has been used to indicate how quickly shallow groundwater beneath properties in Southland will respond to a reduction in leaching rates. The report concludes that most of Southland's shallow groundwater (close to the water table) is expected to show some response to a change in farming practices within five years. Large future increases in nitrate concentrations are only expected in discrete areas beneath older more elevated outwash gravel deposits.

The 2014 technical report mapped the vadose zone transit time and shallow aquifer mixing time combined to estimate the total time lag beneath a property. This combination of the two travel-time estimates determines the time it will take for nitrate leached at the surface to impact on groundwater quality beneath properties. Figure 10 shows a map of the combined vadose zone and saturated time lags and the location of the property.

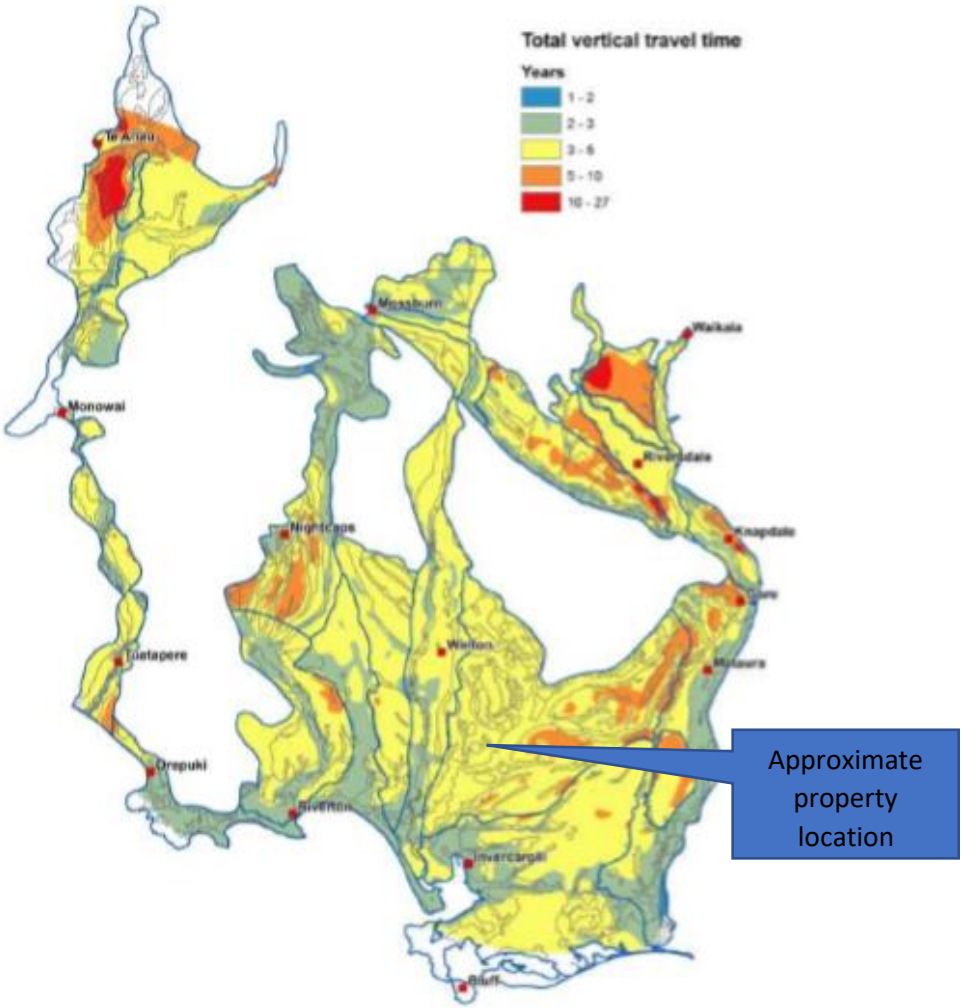


Figure 20: Map of total vertical travel time through the unsaturated zone and into the uppermost saturated zone[18]

The map above estimates that lag time under the property is between 3 and 5 years. The report concludes that "The results of our modelling show that the majority of Southland's shallow groundwater quality would show some response to a change in farming practices within five years. This indicates that Southland's recent dairy farming boom will have already impacted shallow groundwater quality for most of the region. Conversely, if nitrate leaching losses are reduced, we can expect to see an improvement in shallow groundwater quality beneath properties within five years for most of the region."[19]

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

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

In relation to this property, the results of the time lag report suggest that the continued improvements to good management practices should provide fairly rapid environmental benefits for underlying groundwater nitrate concentrations. On a wider perspective, land use changes and the implementation of good management practices on surrounding and neighbouring properties will also contribute to improvement in groundwater nitrate nitrogen concentrations.

5.8 Odour

The effects of odour are most likely to occur from the discharge and storage of FDE. 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/depth irrigation and effluent discharge buffers means there is no significant risk of adverse effects from odour and spray drift on surrounding land owners and occupiers. As such, the effects of odour are avoided.

5.9 Contingency plans

The low rate pods are protected with a pressure sustaining valve which acts as a contingency measure in the event of an effluent system failure such as a sudden pressure drop.

A "gator buddy" system is installed on the travelling irrigator which acts as a contingency measure in the event of an effluent system failure such as sudden pressure drop, irrigator stoppage or breakdown.

Replacement parts and contractors can be used at certain times if the usual methods of effluent discharge are under repair.

5.10 Monitoring

The existing discharge permit requires surface water monitoring to be undertaken three times per year and analysed for pH, electrical conductivity, nitrogen, DRP and E.coli concentration. Environment Southland has ceased undertaking surface water monitoring for discharge permits and the applicant supports this stance because the results are too ambiguous and are difficult to attribute to a discharge activity in isolation. The applicant will operate the discharge activity in a manner to ensure effluent does not reach surface water bodies.

5.11 Good management practices

The applicant has a Farm Environmental Management Plan (FEMP) which details how they will manage potential environmental effects associated with the farm. This plan is attached to this application and contains details of Good Management Practices (GMPs) which will be adopted by the applicant to ensure that discharge activity is operated in accordance with industry accepted and promoted good practice.

6. ASSESSMENT OF ENVIRONMENTAL EFFECTS – GROUNDWATER ABSTRACTION ACTIVITY

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 Allocation

The applicant is applying for an increase in the daily abstraction volume to 107,810 L/day over a 300 day milking season for the 850 cows plus the 83 other stock on the platform and 25,900 L/day over the winter to account for stock drinking water for 370 cows on crop and feed/wintering pads. The proposed abstraction represents a negligible portion of the allocation of the respective groundwater management zone.

The applicant will use the existing bore at the dairy shed to abstract all shed water wash down water and the stock water for the 189ha of the original dairy platform. This bore will be metered in accordance with the expected consent conditions. A new bore on the Cox's block will be used in support of the existing bore and will pump all water to the dairy shed to enable metering. The new bore will be located adjacent to the road. A consent for this new bore will be applied for at the time of drilling. The support block has an existing stockwater scheme.

6.2 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 as takes less than this are expected to have a minor effect on stream flows. As the maximum proposed take is 107,810 L/day, over 24 hours of pumping the rate of take is less than 2 L/s and therefore does not require a stream depletion assessment. The applicant has four water storage tanks at the dairy shed to allow for the storage of water to enable this low pumping rate.

Significant interference effects on neighbouring groundwater abstractions are highly unlikely to occur because the rate of take is less than 2 L/s and the distance to the nearest bore is 1500m to the west. There is a small hut close to where the new bore will be placed which will not be occupied under the applicant's ownership. The other adjacent houses utilize rainwater.

6.3 Effects on Groundwater Quality

The abstraction of groundwater can represent a risk of drawing contaminants from the upper soil profiles into the groundwater as well as the ingress of contaminants from the land surface. Well head protection is provided on the existing bore to prevent the ingress of contaminants. The broader farm management practices will ensure that contaminant loss from the soil zone is reduced to the practicable minimum.

6.4 Efficiency of Use

The proposed abstraction of 107,810 L/day equates to a rate of take of 120 L/cow/day over the milking season for all stock on the dairy platform and 25,900 L/day over the winter period for all stock on the dairy platform. The applicant proposes an annual restriction of 34,026.5m^3. Policy 21 requires 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. In this instance the intended end use of the water is for wash down and stock drinking water. The applicant requires a maximum of 50 L/day for shed washdown during peak milking. The remaining water is currently allocated for stock drinking water over 12 months of the year. Our assessment is that the current volume is consistent with Policy 21 as it is reasonable in terms of intended end use.

6.5 Monitoring

Conditions of the existing water permit required the installation of flow meters which record the flow rate. The applicant is required to record the volume of water abstracted every month and to submit the water take data by 31 May each year which has been complied with to date The applicant supports the continued application of this condition on the replacement consent.

7. ASSESSMENT OF ENVIRONMENTAL EFFECTS – USE OF LAND FOR NEW AND EXPANDED DAIRY FARMING OF COWS

The proposal to incorporate the new block into the farm boundary and incorporate it into the milking platform of the existing activity is a **restricted discretionary activity** under Rule 20 (d) of the PSWLP. The assessment of effects on the environment for this activity needs to specifically address the effects of the conversion of the new block to dairy farming as well as the overall increase to 850 cows, plus ancillary activities on the landholding which arise as a result of the proposal. For this reason, the applicant considers their landholding to include the proposed dairy platform (made up of the existing platform plus the new block) and their existing support/runoff block which is unchanged in extent under the proposal. The entire landholding has been modelled using OVERSEER for both the current and proposed scenarios. The proposed activity has been assessed against the existing environment which is the level of activity in which the applicant has been operating in the preceding years (I,e actual cow numbers).

This application provides the information required under Rule 20 (d) of the PSWLP which specifies that an application must include:

(1) an assessment that shows that the annual amount of nitrogen, phosphorus, sediment and microbiological contaminants discharged from the landholding will be no greater than that which was lawfully discharged annually on average for the five years prior to the application being made; and

(2) for any mitigation proposed, a detailed mitigation plan (taking into account contaminant loss pathways) that identifies the mitigation or actions to be undertaken including any physical works to be completed, their timing, operation and their potential effectiveness.

7.1 Existing land use

7.1.1 Cox's block

The new block (referred to as Cox's block) is part of an existing stock trading block and has never been used for dairy farming. The block is 157ha total with an effective area of 150ha. The farm has relatively flat topography and is located on a mix of Pukemutu and Makarewa soils and is mapped as being within the Gleyed physiographic zone. Tile and mole drainage is assessed as covering 80% of the property.

The property has been operated as a stock trading block for the last five years. Information around the management of this block has been collected from the vendor. Until January 2016, the property was operated as a deer, lamb and weaner cattle finishing block. From January 2016 onwards there was a change in farm strategy to increase finishing of lambs and remove the finishing of deer. Throughout the five years stock were wintered on farm on 17.2 ha of brassicas and on a feed pad. Fertilizer usage was fairly similar throughout the five years with phosphorus, potassium and sulphur applied to maintain fertility levels. No nitrogen fertilizer was applied.

The proposal is to incorporate Cox's block into the milking platform. As required under Rule 20 (d) of the PSWLP, OVERSEER nutrient budgets have been prepared by Monique Topham and reviewed by a certified Nutrient Management Advisor based on five years of actual data. These five individual budgets for each season have been used to generate a weighted average for the current operation on Cox's block and to provide a baseline for the existing land use.

A summary of the weighted average nitrogen and phosphorus outputs from the OVERSEER model for the current stock trading block are:

Land Use	Nitrogen Losses (total kg)	Nitrogen Losses (kg/ha/year)	Phosphorous Losses (total kg)	Phosphorous Losses (kg/ha/year)
Stock trading block	4621	29	132	0.8

7.1.2 Dairy platform - current

The existing dairy platform is 189ha total with 180ha effective. The property is of flat contour and is underlain with Pukemutu, Makarewa and Te Mara soils. The farm holds discharge permit AUTH 300235 to discharge farm dairy effluent from 599 cows. Over the last five years the applicants have run a fairly stable farming system with the only variations being the type and level of imported feed and the timing of culling dependant upon pasture growth (climatic conditions) and payout. The Nutrient Management Advisor has averaged inputs over the five years to reduce the impacts of fluctuations in particular seasons in line with the intention of OVERSEER as a long-term status quo model.

The OVERSEER model for the current dairy platform has used an average of 546 cows peak milked producing 462 kgMS/cow. Nitrogen fertilizer was applied at an average rate of 231kgN/ha across the pastoral area, with 1.4ha of summer turnips planted and silage and hay imported from the support/runoff block. Further supplement was imported to satisfy feed shortages.

A summary of the nitrogen and phosphorus outputs from the OVERSEER current dairy platform model are:

Land Use	Nitrogen Losses (total kg)	Nitrogen Losses (kg/ha/year)	Phosphorous Losses (total kg)	Phosphorous Losses (kg/ha/year)
Dairy Farm	11,292	60	259	1.4

7.1.3 Support/Runoff block

The support/runoff block is 154ha total of rolling topography. The block is partially owned by the applicant and partially leased from a neighbour for the preceding five years (with three years remaining on the lease agreement). The support/runoff block is operated as a separate system to the dairy platform but run under the same management structure. All of the milking herd cows have been wintered on 31.7ha of brassicas with cows returning to the dairy platform as springers. Young stock are reared on the block from 4 days old until they return as in-calf heifers to the platform. Silage is grown and exported to the dairy farm along with 4.8ha of forage oats whole crop. The farm system on this block has been predominantly unchanged for the preceding five years and therefore inputs into the model have been averaged based on the applicant's records.

A summary of the nitrogen and phosphorus outputs from the OVERSEER current support/runoff block model are:

Land Use	Nitrogen Losses (total kg)	Nitrogen Losses (kg/ha/year)	Phosphorous Losses (total kg)	Phosphorous Losses (kg/ha/year)
Support/runoff	6790	44	170	1.1

7.1.4 Current combined scenario

The three current OVERSEER scenarios from Sections 7.1.1 – 7.1.3 have been combined to provide a weighted average of the entire existing environment. This current combined weighted average is used to directly compare against the proposal to ascertain whether overall nutrient outputs/losses are increasing or decreasing.

A summary of the nitrogen and phosphorus outputs as a weighted average from the current combined scenario is:

Land Use	Nitrogen Losses (total kg)	Nitrogen Losses (kg/ha/year)	Phosphorous Losses (total kg)	Phosphorous Losses (kg/ha/year)
Current combined	22,703	45	561	1.1

7.2 Proposed land use

7.2.1 Proposed dairy platform

The proposal involves bringing Cox's block into the milking platform and retaining a self-contained farm system in conjunction with the support/runoff block. The total dairy platform will be 346ha with 331ha effective to milk 850 cows at peak producing 462kgMS/cow. A portion of the herd (318 cows) will be wintered on the dairy platform on three wintering pads. A small number of replacements will be run on the dairy platform and will be wintered on 2.5ha of kale. Throughout the year, 83 other stock will be on the dairy platform from weaning. Effluent will be regularly spread to a larger area and will make use of the full size of the currently consented effluent discharge area. Nitrogen fertilizer will be reduced to a weighted average of 205kgN/ha/year across the pastoral areas. Supplementary feed is at a level which ensures feed gaps are catered for.

OVERSEER has been used to model the proposed scenario on the dairy platform. A summary of the nitrogen and phosphorus outputs are:

Land Use	Nitrogen Losses (total kg)	Nitrogen Losses (kg/ha/year)	Phosphorous Losses (total kg)	Phosphorous Losses (kg/ha/year)
Proposed dairy platform	16,356	47	465	1.3

7.2.2 Proposed support/runoff block

The support/runoff block will continue to operate to compliment the dairy platform. The support/runoff block will continue to winter 565 in-calf cows and graze 154 young stock. Stock will still be wintered on brassicas with cows returning to the platform as springers. Silage will be grown and exported to the dairy platform.

OVERSEER has been used to model the proposed scenario on the support/runoff block. A summary of the nitrogen and phosphorus outputs are:

Land Use	Nitrogen Losses (total kg)	Nitrogen Losses (kg/ha/year)	Phosphorous Losses (total kg)	Phosphorous Losses (kg/ha/year)
Proposed support block	6299	41	174	1.1

7.2.3 Proposed combined scenario

The two proposed OVERSEER scenarios from Sections 7.2.1 and 7.2.2 have been combined to provide a weighted average for the proposal. This proposed combined weighted average is used to directly compare

against the current combined scenario to ascertain whether overall nutrient outputs/losses are increasing or decreasing.

A summary of the nitrogen and phosphorus outputs as a weighted average from the proposed combined scenario is:

Land Use	Nitrogen Losses (total kg)	Nitrogen Losses (kg/ha/year)	Phosphorous Losses (total kg)	Phosphorous Losses (kg/ha/year)
Proposed combined	22,655	45	639	1.3

7.3 Land use change comparison

A comparison of the current combined and the proposed combined OVERSEER scenarios allows us to determine whether overall nutrient outputs/losses are increasing or decreasing.

Land Use	Nitrogen Losses (total kg)	Nitrogen Losses (kg/ha/year)	Phosphorous Losses (total kg)	Phosphorous Losses (kg/ha/year)
Current combined	22,703	45	561	1.1
Proposed combined	22,655	45	639	1.3
DIFFERENCE	-48	0	+78	+0.2

The OVERSEER modelling shows a reduction in estimated nitrogen losses under the proposal and an increase in estimated phosphorus losses under the proposal.

7.3.1 Nitrogen

OVERSEER modelling shows the nitrogen losses from the proposal are estimated to be **less than** from the existing land use by approximately 48kgN/ha/year. Overall nitrogen loads on the property, in Tussock Creek, Oreti River, New River Estuary and the Makarewa Groundwater Zone receiving environments are estimated to reduce as a result of this proposal. However, it is important to note that the modelled losses represented above do not quantify an effect on the environment. The reason being is that the modelled losses are not inclusive of attenuation by plant uptake, dilution or accumulation which may occur in the receiving environment. The PSWLP sets a strong direction for halting the decline in water quality and the proposed land use change as modelled in OVERSSEER represents an overall reduction of in nitrogen losses which is likely to be environmentally beneficial to water quality in the receiving environments.

The key drivers for the nitrogen loss reduction in the proposed OVERSEER models compared to the current models are:

- Reduced winter crop area by 14.7ha
- Increase in utilized effluent discharge area
- Reduced N application in effluent to the discharge area on a per hectare basis
- Reduced nitrogen fertilizer use particularly in the later part of the season
- Culled cows earlier reducing supplementary feed required and urinary N deposition late in the season

- Wintered a portion of the herd on standoff/wintering pads
- Reduced fertilizer N use on crops for "1st year" crop paddocks

7.3.2 Phosphorus

OVERSEER® modelling shows that the phosphorus losses from the proposal **are greater than** under the existing land use. Overall modelled phosphorus loads on the property have increased. The phosphorus loss per hectare increases from a weighted average of 1.1 kg/ha/year to 1.3 kg/ha/year.

The key drivers for the phosphorus increase in the OVERSEER® modelling are:

- Soil fertility on Cox's block is expected to be lifted under the proposed system in order to lift potential pasture production in line with the existing dairy platform. As a result there is higher soil P content and therefore modelled losses.
- An increase in loss from "other sources" as generated by the model. The "other sources" loss estimates that 30% of all phosphorus is lost directly to waterways. Unfortunately, this sub-model within OVERSEER® fails to take into account some farm specific good management practices. Reviewing the block report highlights that losses from other sources is the key driver for the increase in P loss predicted in the model. The current scenario (dairy platform) models a loss of 96 kg P from other sources compared with 158 kg P from other sources under the proposed scenario (dairy platform).

The nutrient budget report explains the "other sources" loss with the following note and this is explained in context to the application below:

> *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 can not model the impact on these at a farm scale.*

The increase in predicted P losses from "other sources" is effectively the model saying that P losses occur from standoff/feed pads, effluent management systems (such as from uncovered stored solid effluent), silage stacks yards and laneways etc. OVERSEER generates these figures by assuming that 30% of P deposited on a lane is lost to water, even if there is no nearby surface water body.

In terms of meeting Policy 16, it is the applicant's responsibility to prove that losses from "other sources" as modelled in OVERSEER will be lower in reality to the level of losses modelled. The applicant has chosen to highlight the additional measures implemented on farm which aim to reduce P losses to the environment which are not captured or modelled in OVERSEER. These mitigation measures are also strongly linked to mitigating effects from bacterial loss and sedimentation. The table below presents a list of potential

management tools which will result in less actual P loss to water, whether or not they are rewarded in OVERSEER and which management practices the applicant will undertake to minimise P, *E.Coli* and sediment loss on farm under the proposed dairy expansion.

Type of Strategy	Phosphorus Loss Mitigation	Rewarded in OVERSEER®?	Proposed to be implemented
Riparian	Fencing Streams	Yes	✓
	Appropriate vegetated buffers from water ways	Not assessed – but likely to be rewarded for 3 m buffers	✓ (applicant proposes greater than 3 m buffer throughout most of the property)
	Filter areas downstream of unfenced waterways	Partially – only if wetland able to be captured	✓ (all waterways fenced anyway)
	Uncultivated ephemeral stream margins	No	✓ (grass buffer strips/uncultivated ephemeral stream margins – increased sizing for critical source areas)
	Swales/gullies which run into creeks are to be fenced with a wider buffer zone to act as an additional filter	Not assessed – but unlikely to be rewarded	✓
Effluent Management	Providing sufficient effluent storage to enable deferred application	Not assessed – but likely to be rewarded	✓
Infrastructure	Identification of critical source areas with regards to P loss	Not assessed – but unlikely to be rewarded	✓
	Infrastructure to keep stock away from unfenced streams (e.g. troughs, shade)	No	✓
	Culverts and bridges	No	✓
	Amend tile drains	Not assessed – but unlikely to be rewarded	N/A
Effluent Management	Using low rate effluent application	Not assessed – but may be rewarded in that OVERSEER assumes good management practices have been implemented on farm	✓ (it is unclear if low rate of effluent irrigation would be assumed as a good management practice on farm)
Sediment Management	Cultivating with contour – rather than up and downslope	No	✓
	Spread fertiliser evenly	No – assumed already	✓

Type of Strategy	Phosphorus Loss Mitigation	Rewarded in OVERSEER®?	Proposed to be implemented
Nutrient Management	Avoiding high risk times for fertiliser application	Yes	✓
	Change fertiliser type	Yes	✓ (low solubility P fertiliser)
	Avoiding applying fertiliser directly to streams	No	✓
	Appropriate fertiliser rates	Yes	✓
	Targeting optimum Olsen P	Yes	✓
	Precision fertiliser placement	Partially – through lower application rates	✗
Stock Management	Reducing ability of stock to form camps	No	✓
Infrastructure	Managing track runoff	No	✓
Wintering and Grazing Management	Wintering Majority of stock off farm (1 June – 31 July)	Yes	✓(stock wintered on support block or on wintering pads)
	Restricted grazing including remaining crop cover after grazing	Not assessed – but unlikely to be rewarded	No
	Shifting break fences strategically	No	✓ (strategic grazing of winter forage crop)
Riparian and Sediment Management	Installation of sediment traps	Not assessed – but unlikely to be rewarded	No
	Erosion control plantings	No	N/A

The table highlights that many mitigation measures which are spatially explicit are not captured in the model. The photos below from both the existing platform and the new block show clearly that the applicant is already managing critical source areas to control runoff in ways which are not included in the model. The photos show the existing implementation of barge boards on crossings, gradients which direct runoff to pasture, crop buffer zones and critical source area planting.

Figure 21: Photo of existing crossing on current dairy platform with barge boards to capture runoff

Figure 22: Photo of riparian vegetation and buffer zones on existing dairy platform

Figure 23: Photo of bridge crossing showing bargeboards and gradient to direct runoff to pasture

Figure 24: Photo showing CSA buffer zones from crop to waterway (on other side of hedge)

Figure 25: Photo showing riparian buffer zone on Cox's block

The P losses modelled by OVERSEER represent 'worst case scenario' on the basis that a number of strategies to be implemented on farm are effective at reduced P loss and are not rewarded in the OVERSEER® model. As highlighted above, actual P loss is likely to be less than predicted, even without additional mitigations not rewarded in OVERSEER because the model assumes that 30% of P lost is direct to waterways. This is a clear over estimation of potential P losses to water if P is in fact captured before being lost to water as shown in the above photos.

Another key driver for the increase in total P lost from the proposal is due to Olsen P levels. The proposed land use changes results in an increase in total P loss of 78kg P or 0.2kg P/ha/year (based on weighted average). The OVERSEER modelling has increased P fertilizer inputs on the new block in order to raise soil P levels to optimum Olsen P levels of about 40 for pasture production and to match Olsen P levels on the existing dairy platform. This has increased predicted P losses due to more P being in the system. An Olsen P of 40 is higher than the agronomical optimum of Olsen P 30 typically used on dairy farms. The applicants operate under a higher Olsen P currently and wish to continue this practice going forward. A higher Olsen P above what is considered agronomical optimum is appropriate where pasture production is high and where a farm system can cope with skipping maintenance fertilizer application in low payouts. The applicants have higher than normal milk production on a mainly grass based system making it feasible to operate under a higher Olsen P level.

When looking at the sources of P losses on farm at the block level, the risk levels remains similar when you compare the current and the proposed scenarios in OVERSEER®. Under the proposed land use, risk of P

loss from fertiliser and effluent application is assessed as mostly low (which on a scale of low – extreme, low is ranked the bottommost risk possibility) and for soil it is assessed as medium. Under the current scenario risk of P loss from fertilizer and effluent application are assessed as low with soil being assessed as medium. From this comparison it is evident that a key driver for the modelled P loss increase is P in soil – i.e Olsen P levels.

In the Gleyed zone, the key contaminant pathways are identified as artificial drainage and overland flow. Phosphorus adsorbs strongly to soil particles and doesn't filter through the soil layers like nitrogen and so potential phosphorus losses to water via artificial drainage are low. Phosphorus losses via overland flow are heavily mitigated with riparian planting and are discussed at length above. The absence of sloping land on the property also reduces the risk of P losses from overland flow.

In summary, it is reasonable to conclude that actual phosphorus losses on farm will be much less than predicted by OVERSEER, and that the effects of the activity may be fully mitigated by the full implementation of the mitigation methods contained within the FEMP which are property specific and spatially explicit. As a result, the proposed increase in P losses is unlikely to have any significant impact on the water quality in this catchment.

7.3.3 Sediment and microbial losses

Sediment and microbial losses are not parameters which are modelled in OVERSEER but both sediment and microbial losses often go hand in hand with phosphorus losses due to the chemical bonds that exist in the soil profile. At a recent consultants forum at Environment Southland, industry representatives and Council staff agreed that phosphorus losses as modelled in OVERSEER can be used as a proxy for potential sediment and microbial losses. Mitigation measures to control sediment and microbial losses on farm mirror those used for the mitigation of P losses. Namely, riparian planting, use of buffer zones to waterways and from forage cropping, good management grazing practices, use of standoff/wintering pads and stock management to control camping areas. It is in the best interest of all farmers to avoid the loss of sediment from their farms in order to maintain fertility and stop erosion. The applicant implements all of the above measures to control erosion effects.

The proposal sees the dairy platform increase in area over Cox's block. An increase in the spatial extent of the dairy platform has the potential to increase the risk of sediment and microbial losses due to the increase in extent of lanes plus the increase in the extent of farming activities adjacent to waterways and critical source areas. As discussed above in relation to phosphorus, the new block contains several waterways which have existing riparian vegetation and buffer zones which will be maintained by the applicant. The farm layout plan does not include any new laneways adjacent to waterways, and only 1 new culvert crossing. In addition, the new block is flat and the risk of sediment and microbial contamination via erosion or overland flow is low. The mitigation measures proposed for phosphorus are applicable to mitigation measures for sediment and microbial losses and accordingly, losses are not projected to increase under the proposal.

7.3.4 Physiographic Zones and contaminant pathways

Environment Southland have indicated that they interpret certain physiographic zones policies within the PSWLP to set a direction that contaminant losses should not increase within the various zones, regardless of the predicted losses from the landholding in its entirety. Whilst we do not agree with this interpretation in the manner in which it is being interpreted, the applicant's entire landholding which is subject to a land use change is located within the Gleyed physiographic zone which is subject to Policy 6 of the PSWLP. This policy requires an assessment of adverse effects on water quality from contaminants transported via artificial drainage and overland flow and does not contain the statement indicating that "consent should generally not be granted". The area of the landholding located in the Oxidizing physiographic zone is located on the support/runoff block and is not subject to a land use change or intensification under the proposal as activities on this block are continuing with minor changes proposed.

Loss of nutrients from the farming of animals via overland flow and artificial drainage presents the highest risk to the environment on the entire landholding due to the presence of poorly drained soils. The soils have a high vulnerability to waterlogging which can increase the risk of overland flow. Poorly drained soils require artificial drainage which can rapidly transfer nutrients to water bodies if not managed appropriately. The proposed nutrient budgets, combined with proposed mitigation measures show that predicted losses will not increase under the proposal compared to the current scenario.

The applicant will avoid and mitigate the risk of overland flow and loss of nutrients to artificial drainage by:

- Utilizing nutrient budgeting to identify practices which may result in the presence of large quantities of nutrients which may be susceptible to direct losses to water. Modelling allows the applicant to tweak the timing and scale of different farm management practices to provide the best nutrient efficiency outcome.
- Utilizing nutrient budgeting alongside soil testing to decide on an efficient and effective fertilizer program to avoid the application of fertilizers during high risk periods.
- Reducing winter forage crop grazing on the landholding and introducing wintering pads for a portion of the herd over the winter period.
- Reducing fertilizer usage to account for the spreading of effluent over the property
- Identifying critical source areas on the farm and fencing off during adverse weather conditions to exclude stock from depositing dung and urine in these sensitive locations during high drainage periods.
- Utilizing the existing standoff pads to remove cows from pasture during high risk periods for drainage.

7.3.5 Cumulative effects

Regional scale modelling of nitrogen and phosphorous losses from agricultural land use in the Southland Region by Aqualinc in 2014[20] showed:

- Adoption of mitigation measures on farms could result in reductions in nutrient loads discharged in Southland;
- Within the agricultural sector, nutrient loss from dairy farms make up a disproportionately large proportion of the nutrient load in most Southland catchments compared to the farm area;
- Adoption of mitigation measures on dairy farms alone significantly reduces catchment scale improvements in nutrient losses because sheep and beef farms make up the greatest area of land use[21]. Overall, contributions from both land uses are significant; and,
- Under the status quo of ongoing conversions and increasing production on dairy farms, water quality will not be maintained or improved in the long term even if very stringent mitigation requirements were to be adopted. Setting limits for catchment nutrient loads and then managing discharges to meet these limits appears to be the most appropriate method of ensuring the goal of maintaining and improving water quality in Southland will be achieved.

Although this study shows dairying is a significant contributor to nutrient loads in the Southland Region, it does not consider the receiving environment's assimilative capacity. Based on the information available, the proposed activity is likely to reduce Nitrogen accumulation in the Lower Oreti Catchment. As contaminant losses (both nitrogen and phosphorus) are assessed as predominantly occurring from artificial drainage and runoff, contaminant losses can be minimised through careful management of critical source areas which may in fact result in less phosphorus losses than predicted by the OVERSEER modelling (as discussed above). It is anticipated that subject to adherence to the good management practices proposed in the FEMP as well as the consultation and working relationship with Land Sustainability, and regular monitoring of effects, adverse actual or potential effects on the receiving environment are avoided, remedied or mitigated.

Overall, the use of the land for dairy farming is not expected to cause an adverse effect on the environment greater than the current land uses and which are lawfully occurring, and overall loading of N to the wider catchment following the expansion of the dairy farm is actually expected to decrease.

Until such time catchment limits are set for the Southland Region which balance community values for interconnected water bodies, and account for contaminant contributions from all land use types (in

[20] Aqualinc, 2014. *Assessment of Farm Mitigation Options and Land Use Change on Catchment Nutrient Loads*. Prepared for Environment Southland, report number C13055/04.

[21] Adoption of the M1 mitigation package on all farms (i.e. mitigations most easily implemented) reduced agricultural nitrogen loads by 18 – 32% however when only dairy farms adopted M1, nitrogen loads were reduced by only 1 – 6%. Similarly, when all farms adopted M3 (i.e. the most effective but most expensive mitigation measures), nitrogen loads were reduced by 29-37% and phosphorous loads by 40-80% however when only dairy farms adopted M3, nitrogen and phosphorous loads were reduced by 2-18% and 5-32% respectively.

accordance with the requirements of the National Policy Statement for Freshwater Management, 2014), it is difficult to assess where the cumulative effect threshold applies in reference to an individual activity.

7.3.6 Value of Investment

Under Section 104 (2A) of the Resource Management Act, the consenting authority must have regard to the value of the investment of an existing consent holder. In this instance, the applicant is an existing consent holder of a discharge and water permit for the current activity. The applicant is seeking to replace the discharge and water permits as part of the application.

The applicant has a sale and purchase agreement on a neighbouring sheep/cattle block and intends to extend their current milking platform to incorporate this block. The applicant will be undertaking significant investment in the existing facilities on the current block to bring them up to capacity and on the new block in the form of construction of new laneways which will link up to the existing network of laneways on the existing dairy property, regrassing the paddocks into a rye/clover and crops and installing an underpass. Each paddock needs to be re-fenced and troughs installed.

A significant financial investment and effort has been made by the applicant, including proposed feed budgets, financial budgets, preparation of the property and eventual purchasing of the property, all of which has been in preparation for the expansion of the existing dairy farm. The investment is likely in the order of millions of dollars, at a cost to the applicant.

7.4 Mitigation plan

Rule 20(d)(ii)(2) of the PSWLP requires a detailed mitigation plan for any mitigations proposed, that identifies the mitigation or actions to be undertaken including any physical works to be completed, their timing, operation and their potential effectiveness. The table below describes the mitigation measures which will be adopted on the proposed landholding.

Table 8: Mitigation plan for proposed landholding

Mitigation	Physical works needed	Timing	Operation	Level of effectiveness
Full utilization of the effluent discharge area by adding two additional sets of low rate pods to the effluent discharge system.	New hydrants will be installed and two new sets of pods connected.	Immediately upon first exercise of the consent.	Effluent is applied to land via low rate pods, travelling irrigator and slurry tanker at a depth less than the available soil moisture deficit. Effluent will now be regularly applied to the full consented area of 124 ha.	High level of effectiveness for reducing contaminant losses via the key contaminant pathways: artificial drainage and overland flow when applied at a depth less than soil water deficit which allows nutrients to be utilized in pasture production. Effluent volumes will increase proportionally under the

				proposal and the full utilization of the effluent discharge area will lower nutrient loadings overall. The remainder of the farm can be used to spread solid effluent which will lower the overall nutrient loadings over the milking platform.
Stocking rate reduction	Construction of lanes, re-fencing and water troughs on Cox's block to enable conversion of land to milking platform	Immediately once consent is issued.	Lanes will be constructed from imported material. Contractors will undertake fencing and water scheme installation.	Stocking rate reduction reduces average per hectare nutrient losses by reducing the concentration of urine deposition on pasture. Overall stock reduction enables various other nutrient inputs to be reduced.
Winter cropping area will reduce	Full cultivation of brassicas on both the dairy platform (2.5ha of Kale) and the support block (31.7ha swede/kale)	Crop area will be reduced in accordance with nutrient budget by the first October following the first exercise of the consent. Crop sown in October and resown to pasture/crop in October.	Applicant will now sow winter crop based on the nutrient budget	High level of effectiveness as winter forage crops are a high contaminant loss activity. Less area reduces the risk of nutrient leaching through the drainage profile, overland flow of nutrients and drainage through artificial drainage channels.
Wintering of a portion of the herd on wintering pads	Three pads need to be made fit for purpose.	The pads will be constructed prior to the first May following the first exercise of the consent.	The three pads will hold between 140 and 150 adult cows fed via self-feed silage stacks.	High level of effectiveness for reducing nutrient losses due to a reduction overall in urine deposition and the ability to capture effluent and redistribute to pasture when soil moisture conditions are suitable (December). Containing cows on wintering pads reduces accumulated N in the soil over the winter period which has the potential to be flushed out during high drainage periods. The

				presence of the gleyed soils also reduces this risk due to denitrification potential.
Best practice winter forage grazing techniques	CSA buffer zones, back fencing when appropriate, use of portable water troughs	The winter period in any year	Winter forage crop grazing on the platform and runoff will be undertaken using best management principles to reduce risks of overland flow and loss of nutrients via artificial drainage and profile leaching pathways.	Medium level of effectiveness as the milking platform is flat in topography. All CSA's are well protected with buffer zones. Grazing on a flat block reduces risk of overland flow of contaminants and reduces the width of buffer zones required.
Fertilizer usage based on soil tests and fertilizer reduction	Soil testing Fertilizer spreading – proof of placement	Soil testing to be undertaken on an annual basis, preferably at the same time every year.	Soil tests are used to guide fertilizer recommendations, particularly in regards to the decision whether to apply capital or maintenance fertilizer. Maintain Olsen P levels at optimum levels.	High level of effectiveness as using soil testing can significantly reduce nutrient inputs and avoid the excess accumulation of nutrients in the soils – especially P. Higher than optimum Olsen P levels in the soil increases the risk of P losses from the farm system. In the current scenario, capital fertilizer applications have been used due to this being a new conversion. These transition towards maintenance fertilizer applications which will be effective at reducing total nutrient inputs.
Little and often N fertilizer applications timed to avoid high risk periods.	None	As per timings in the nutrient budget	The fertilizer regime includes several urea applications between September and April which is lower than the current regime. Effluent paddocks receive less fertilizer. Fertilizer applications are avoided during the winter, late autumn and early spring period when plant growth is reduced and there is a higher risk of	High level of effectiveness for reducing potential nutrient losses via key contaminant pathways. Fertilizer application is designed to meet pasture demand and reduce the likelihood of excess nutrients applied.

			N accumulation in the soil profile.	
Culled cows earlier to reduce supplement usage	None	Timings in accordance with nutrient budget.	Cows are culled earlier in accordance with average cow numbers in the nutrient budget. No carry over cows are wintered on the runoff or kept throughout the season.	High level of effectiveness for reducing supplementary feed required and urinary N deposition in late season.
Reduction in fertilizer usage on crop paddocks	None	Timings in accordance with nutrient budget	Reduction in applied N fertilizer due to higher soil mineralised N	High level of effectiveness for reducing mineralised N available in the soil.
Control of runoff risk from lanes, gateways	Laneways and gateways re-levelled to direct runoff to pasture. Maintenance of existing riparian vegetation.	Prior to the start of the season	New lanes to be constructed away from waterways and any crossings to be designed to direct runoff to pasture. Gravel used in gateways to avoid tramping damage and runoff directed to pasture. Riparian vegetation to be kept in-situ behind stock exclusion fences.	High level of effectiveness for reducing P losses via "other sources" as modelled in Overseer.

7.5 Summary

In summary, we have assessed that the use of land for new dairy farming should not have a significant adverse effect on water quality.

1. The actual effect on water quality from the current and proposed activity is unknown because OVERSEER predicts losses below the root zone, not effect on water quality.
2. Water quality upstream of the property in Tussock Creek is characterised by elevated E.Coli levels
3. Water quality upstream of the property in Tussock Creek is improving in regards to nitrate concentrations.
4. There is no significant deterioration in water quality in the Oreti River in relation to any measured parameters.
5. Whilst predicting with certainty the localised effect of the proposal within this reach is not possible, it can be said that small changes in nutrient losses would tend to be consistent with small effects on water quality.;
6. The proposal will reduce the amount of N being lost from the landholding each year and losses of P to water are not expected to increase.

7. The attached FEMP details management practices which will be adopted on farm (whole farm system) in order to reduce nutrient, sediment, and bacteria losses as a result of the proposal.
8. There are multiple mitigation measures especially related to phosphorus and sedimentation mitigation which are not captured or rewarded in OVERSEER modelling which may have a net positive effect on predicted P losses to water.
9. There are many nutrient reducing tools/mitigations which are new and experimental. The applicant intends to keep abreast of new technologies and as part of the annual FEMP review process and evaluate incorporating additional GMPs/mitigations as and when required.
10. The proposal includes a farm system which is fully self contained within the landholding, allowing the applicant to be fully aware and fully in control of the potential adverse effects of their activities.
11. The proposal doesn't involve the transfer of any effects offsite.

8. 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 applicant is in the process of obtaining the written approval of the leasor of the support/runoff block. The assessment of environmental effects below demonstrates that no other 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.

9. OTHER ASSESSMENT MATTERS

9.1 Assessment of Alternatives

Schedule 4 of the RMA requires that an assessment of environmental effects must include a description of any possible 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.

Pods, travelling irrigator and slurry tanker are proposed for effluent application on this property. Pod irrigation is currently used on the farm and is a proven good method for effluent application, which can apply to low depths and avoid environmental risk. Pods are able to be moved easily over the effluent disposal areas and can pump out sufficient volumes of effluent when conditions are suitable so that management of the effluent storage is easy. The travelling irrigator applies effluent at a low depth and higher rate depending upon speed and nozzle size. This method is preferentially used when a higher soil moisture deficit occurs. The slurry tanker/muck spreader/umbillical is used only when the pond/weeping wall is emptied and desludged.

Alternatives to the above are to change from pods to another application system such as Cobra Rain gun, or to use a slurry tanker all season. While a Cobra-Rain gun is a good option, this would require additional capital investment for no real environmental gain as the pods are able to apply to low depths already (and as proven by the attached application depth test). A slurry tanker is not the preferred option due to the presence of wetter soils making the use of a heavy truck on farm impractical.

In considering the receiving environment and environmental risks, the applicant will utilize a mixture of pods and travelling irrigator. This is the best alternative for the property.

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. Taking into consideration the vulnerability of the catchment, direct discharge to water would be more detrimental to the receiving environment, than discharging to land.

The proposed application area maintains the appropriate separation distances while providing sufficient effluent area to support a nitrogen loading rate of no more than 150 kg/N/ha/yr.

Overall, the discharge of effluent to land is the preferred receiving environment.

9.2 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 as the majority of the activities have been authorised by existing resource consents for at least the past 10 years. Throughout the duration of the existing consents, there have been no known complaints from neighbours relating to the operation of the effluent system, which asserts that the potential adverse effects on the neighbourhood are less than minor.

The proposed increase in cows and platform area will likely to result in net positive benefits to the neighbourhood as there will be a greater capacity to provide for the social and economic benefits with the employment of additional staff, as well as contractors and consultants, and the farm is serviced by local schools and many businesses that would not benefit in the event that the activities were unable to occur. In terms of community benefit, the applicant is heavily involved in their small community. More generally, the dairy sector continues to contribute greatly to the New Zealand economy in a number of ways including gross domestic productivity, employment, raising incomes, 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 in Section in 6.2 of this report. 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 the physical effect on the landscape and visual effects, the presence of effluent irrigation and other farming equipment is expected within the rural locality, and the presence of additional cows and expanded dairy platform will be absorbed into the surrounding landscape and amenity. The expansion of dairying will require some minor disturbance in the form of tracks and regrassing, but these effects will be temporary in nature and once completed not impact on the landscape in a manner that is more than minor, It is expected that the continued abstraction of water from existing groundwater bores will not have any physical effects on the locality, including any landscape and visual effects that are less than minor.

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

As discussed, the discharge of effluent to land is the preferred method due to the nutrients which can be utilised by pasture and soils, when discharged appropriately.

The disturbances expected as a result of dairy expansion are minor and unlikely the effect habitats in the vicinity. Also, the expansion of dairying will not require a new dairy shed or other ancillary sheds as the majority of the existing infrastructure will suffice.

A search of the NZ freshwater fish database did not reveal the presence of fish within the property. It is not anticipated that the proposal will not have any effect above that what has been occurring for the past decade.

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 platforms are established and in keeping with the general rural nature of the area. The expanded dairy platform will be assimilated to the surround landscape and amenity once 'converted'. 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 may be affected by the proposal. Due to the nature of the takes, being a groundwater takes, the water takes will not have an impact on any recreational fishing near the property.

Furthermore, with regard to the effluent discharge to land, due to the inclusion of separation distances from waterways and efficient and appropriate application of effluent, any potential adverse effects on the identified surface waterways and associated recreation values are minimised, and regarded to be no more than minor. Therefore, no potential fishing and bathing values are to be affected by the proposal. Adherence to good management practices as outlined in the attached FEMP will ensure that overall, the effects of the farming activities will be avoided, mitigated and remedied.

The effects on any cultural values of the natural and physical resources of the property, and surrounding area, are assessed below. It is not considered the proposed activities, will have any effect on these values, particularly as the unnamed tributaries are not identified as areas where food is gathered.

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 discharged to land. No further treatment of effluent, above solids separation via the existing methods are proposed as it is not considered necessary to the operation of the effluent system on farm. A contingency plan of a deferred storage pond is existing and will be used on days when soils are unsuitable for the application of FDE further details of contingency methods are described throughout this document and in the attached FEMP. 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

The nature of this proposal will not cause or exacerbate current natural hazards which are present in this environment and which are particularly relevant to this proposal. The property is not identified on the HAIL register and 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.

10. 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.

10.1 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 lands ability to meet the reasonably foreseeable needs of future generations, or on the life-supporting capacity of the land and any ecosystems associated with them. The proposal ensures that adverse effects on the environment are avoided, remedied or mitigated.

There are no matters of national importance under Section 6 of the RMA that will be affected by the proposal. The proposal is also consistent with the requirements of Section 7 of the RMA, with particular regard given to the ethic of stewardship. 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 activities and the proposed mitigation.

10.2 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 application includes:

- 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, 1997
- Proposed Southland Regional Policy Statement, 2012
- Regional Effluent Land Application Plan, 1998
- Regional Water Plan for Southland, 2010
- Proposed Southland Water and Land Plan, 2016

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.

10.2.1 Regional Plans

Regional Effluent Land Application Plan, 1998

The following policies, which give effect to the plan's objectives, and relevant to this application are:
Policies 4.2.1, 4.2.2, 4.2.3, 4.2.7, 4.2.9 and 4.2.10.

The application is considered a discretionary activity pursuant to Rule 5.4.6 of the Regional Effluent Land Application Plan. The application is considered consistent with Policy 4.2.7 to promote the use of storage systems so that discharge may be deferred when soils are at or near field capacity. Policy 4.2.10 supports monitoring of the discharge and its effects.

Policy 4.2.6 is to avoid, where practicable, adverse effects on human or animal health. The larger disposal areas recommended by Councils "Best Practice Guidelines for Farm Dairy Effluent" are designed to avoid excessive build-up of potassium concentrations in pasture that can affect stock health.

Consideration of Te Tangi a Tauira is given in Section 6.6 of this report and is thus consistent with Policy 4.2.8.

Regional Water Plan for Southland, 2010

The following policies, which give effect to the plan's objectives, and relevant to this application are:
Policies: A4, 1A, 1, 6, 7, 13, 14A, 21, 22, 23, 25, 28, 30, 31, 31A, 31C, 31D, 35, 42 and 43.

In accordance with Policy 1A, an assessment of the proposal against the Iwi Management Plan is given in Section 6.2.2 below.

The characteristics of lowland soft bed waterbodies have been recognised, and it is noted that the standard for lowland waterbodies are lower and more realistic for these waterbodies given the existing water quality and the highly developed nature of the surrounding land, as is consistent with Policy 1A.

Consistent with policy 6, best management practices are promoted on farm, as demonstrated in the attached FEMP.

The proposed effluent disposal is to land, consistent with Policies 7 and 13. Policies 31A, 31C, 31D and 42 are for ensuring that any adverse effects of effluent discharge to land are appropriately mitigated, remedied and avoided where possible. The risks to the receiving environment have been assessed in depth above, and the proposed effluent discharges and level of management (outlined in the attached FEMP) matches the level of the environmental risk identified, while enabling the re-use of effluent as a soil conditioner and the return nutrients for plant uptake and growth. All stock is to be excluded from waterbodies, consistent with Policy 35. Adverse effects on water quality associated with the application of effluent to land will be avoided in accordance with Policy 42. The effluent discharge method and proposed rates for the pods and travelling irrigator and slurry tanker/muck spreader/umbillical are also consistent with the table provided in Policy 42 which guides effluent application methods in accordance with environmental risk.

The AEE section of this report has assessed that sufficient water is available, the abstraction is sustainable, with any effect on aquifer sustainability as less than minor and that efficient water use is promoted on the property, which is particularly consistent with Policy 28. The rate of take from each of the bores will be no more than 2L/s therefore stream depletion and Policy 29 does not apply.

In terms of Policy 21, the application is consistent with the Council's guideline of 120 L/cow/day. While a water meter is installed at the dairy shed and is consistent with Policy 22.

Policy 30 acknowledges that, as information about the groundwater resource increases, it should be fed back into management to allow development to progress.

The applicant is not opposed to review conditions.

As discussed above, Policies A4 and B7 have been inserted in the RWPS from the NPSFM. In terms of Policy B7, the policy requires consideration of the effects of water allocation on the life-supporting capacity of freshwater. In this case, the water take is not expected to adversely affect surface water bodies and is within the available allocation for groundwater.

Further assessment of policies 14A and 43 is given in Section 8 below.

Overall the proposed activities are considered fully consistent with the objectives and policies listed above, if particular regard has not been given for each individual policy and objective in this section, it has been provided in the relevant AEE section above.

Proposed Southland Water and Land Plan, 2016

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

Policies 1, 2, 6, A4, 13, 14, 15A, 16, 17, 18,20, 21, 22, 23, 39, 40, 41 and 42.

The application has considered the relevant iwi management plan (Te Tangi a Tauira) and is therefore consistent with Policy 1 and 2 PSWLP.

The proposal includes a FEMP which outlines the GMP's that the applicant will adopt to avoid, remedy or mitigate any actual or potential effects of the proposed activity. The proposal is consistent with Policy 6 for the Gleyed Physiographic Zone as the applicant has identified the key contaminant pathways on the property to be artificial drainage and overland flow and designed both the effluent management system and wider FEMP management techniques for the entire farming activity to reflect this. The additional land which will be converted to new dairy farming land is located in the Gleyed physiographic zone similar to the rest of the landholding. The nutrient budgeting which has been undertaken for the proposal shows that nutrient losses are predicted to decrease across the entire landholding as a result of a suite of mitigation measures which the applicant proposes to implement. The implementation of these measures ensure that the key contaminant pathways are recognized and losses are minimized to a practical minimum in all areas of the landholding.

The effluent discharge activity is an existing activity which will be increasing in scale under the proposal. In relation to Policy A4, the consent authority must have regard to the potential impact of this discharge on the life supporting capacity of the freshwater environment and the health of people and communities. Our assessment of environmental effects which is primarily supported by nutrient budgeting and phosphorus mitigations suggests that the proposal will result in a net reduction in contaminant losses to the environment. This reduction has been carefully crafted by the applicant by opting to implement a raft of mitigation measures which improve the utilization and efficiency of applied nutrients. As a result, no adverse effects are anticipated on freshwater ecosystems or the heath of people and communities in accordance with this policy. Concurrently, the continuation of this activity will enable the applicant and others associated with the farm to provide for their social, economic and cultural wellbeing.

The proposal to discharge effluent to land is consistent with Policy 14.

The surrounding water bodies meet the water quality standards specified in Policy 15A. The proposal should result in both the maintenance and enhancement of water quality as a result of the mitigation measures which will be implemented to minimize nutrient losses to water. Continued nutrient budgeting will aid in ensuring the activity continues to operate under the same premise.

Part 1 of Policy 16 seeks to minimise the environmental effects of farming activities on water quality. In the first instance, the policy directs the Consent Authority to strongly discourage the establishment of new dairy farming or new intensive winter grazing activities in close proximity to sensitive water bodies identified in Appendix Q of the pSWLP. The subject property is not located within close proximity to any waterbody listed in Appendix Q. Therefore, the proposal in consistent with Policy 16(1)(a) of the pSWLP.

The second part of Policy 16 directs the Consent Authority to strongly discourage applications to further intensify existing dairy farming of cows where the effects on the quality of water, including cumulatively cannot be avoided or fully mitigated or in areas where water quality is already degraded to the point of being overallocated. In the absence of water quality limits, it is difficult to ascertain the allocation status of water quality in a complete sense. The Oreti catchment has not been determined 'over-allocated' in terms of water quality in published reports. Modelling via OVERSEER shows that existing nitrogen losses to water will reduce as a result of the proposal. In terms of phosphorous losses to water, OVERSEER predicts P losses to increase overall. However, modelling is only one method of determining predicted losses and at the current stage provides for shortfalls particularly in regards to phosphorus. The applicant has detailed the mitigation measures already implemented on farm and also proposed which are not rewarded in OVERSEER which may result in a scenario where the change in land use is fully mitigated in practice from a nutrient loss perspective. The proposal therefore presents benefits to the catchment in that existing allocation of water quality is predicted to be on the balance at least maintained, albeit the allocation status is yet to be determined. The effects of the proposal are to be mitigated as fully as possible.

The second part of Policy 16 also requires that all farming activities manage effects on water quality. A FEMP in accordance with Appendix N has been prepared for the proposal. The FEMP clearly details the proposed management of critical source areas on the landholding and we conclude that the proposal is wholly consistent with Part 2 of Policy 16.

The application is consistent with Policies 17, 18, 20, 21 and 22. The effluent management system has been designed by an appropriately qualified person and in accordance with best management practice in terms of low rate application via low rate pods preferentially and travelling irrigator and deferred storage. The applicant is also proposing an effluent disposal area which meets the recommended best practice of 8 ha/100 cows. All waterways on the property are fenced off from stock, achieving the purpose of Policy 18. In terms of the proposal to abstract water, the volumes of water to be abstracted are an efficient use of the resource, and are appropriate for the intended end use which signals that the proposal is consistent with Policy 20 and 21. Similarly, the abstraction of water is avoiding allocating water to the extent that the base flow of any waterway is depleted in accordance with Policy 22.

The applicant supports the Consenting Authorities guidelines for determining the duration of consents detailed in Policy 40. With specific reference to matching monitoring to risk under Policy 41, the applicants have determined that monitoring of surface water courses is the most effective method to measure the effectiveness of the GMP's adopted and allow these methods to be improved over time. However, in terms

of the practicality of this, the applicant accepts that surface water monitoring, particularly of a discharge activity can sometimes not provide valuable outcomes. Due to the presence of an SOE water quality monitoring site nearly on the farm boundary, the applicant requests that this site is used to obtain an indication of surrounding surface water quality.

The proposal is consistent with Policy 42 and there should be no barriers to approving the water abstraction sought in relation to this policy.

The proposed conditions of consent and FEMP are the primary methods for ensuring that good environmental management practices are documented and implemented by the applicant. The proposal does not seek to intensify the dairy farming activities as the overall stocking rate remains the same. This, along with a reduction in the overall nitrogen loading from the farm, will result in a net positive effect in terms of nitrogen loading to the catchment.

Overall, the application is considered to be consistent with the above policies of the pSWLP.

As discussed below, a consent term of 10 years is considered to be appropriate for this consent. In accordance with the policies a 35year term is, therefore, not considered to be appropriate. However, the applicant has made significant investment in the acquisition and improvement of the existing and new block of land, and so a short consent term does not provide a reasonable balance between the level of economic investment and the relatively low level of risk from the proposed activity and the associated reduction in nutrient loading to the catchment. Implementation of the FEMP should reduce the risk even further. The applicant has a good compliance history on their existing farm. Council are yet to indicate when the FMU sections of the plan will be development and so this clause 7 above has been given little weight. Overall a consent term of 10 years is considered to be consistent with Policy 40 of the pSWLP.

10.2.2 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, which the risks have been assessed in the AEE section above;
- The applicant proposes best practice for land application of managing farm effluent;
- Those areas of tile drains have been identified;
- Those existing riparian margins will be protected;
- Deferred application of FDE is provided for;
- Nutrient loading and stocking rates will be within industry best practice limits;
- The system and management practices are considered appropriate for the risks associated with the receiving environment;

- The applicant is not averse to appropriate potential monitoring conditions; and
- The adoption of best management techniques in association with the conversion and subsequent operation of the property as a dairy unit.

With regard to Policies 3.5.14.17 and 3.5.1.17, the consent periods proposed are less than 25 years.

10.2.3 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 proposal involves the discharge of effluent to land with the effects on the catchment are minimised when the discharge is carried out in accordance with the proposed FEMP attached to the application. The discharge can be undertaken in a manner which avoids contaminants from entering water through controls on application method and conditions of consent.

As nutrients are able to be reused, there is a direct benefit to the property as a method for improving soil fertility, and secondly 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.

In this case, the alternative discharge options will either result in a worse environmental outcome (discharge to water) or they are not practicable (trucking of effluent offsite or investment in different irrigators).

In conclusion, the requirements of Section 105 of the Act are met having had regard to those expert opinions, proposed mitigation and monitoring, and the matters set out in Section 105 (1) (a) – (c).

There are no matters under Section 107(1) of the RMA that would require the consent authority to decline the applications for a discharge permit.

11. CONSENT DURATION, REVIEW AND LAPSE

With regard to consent duration, special consideration has been given to Policy 16 and 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. Council's level of knowledge regarding the underlying aquifer, the receiving soils and surface water management zone is improving on a continuing basis, with ongoing 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 been mitigated by appropriate management techniques on farm which are detailed in the mitigation plan within this application and in the FEMP for each farm. 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

The applicant is seeking a 10 year consent for all consents being applied for. A common expiry date is preferred.

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 these 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 as discussed above.

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

The granting of a 10 year or longer consent duration may better enable implementation of the impending limit setting process.

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.

Draft consent conditions are included in the application.

In conclusion, due to the low level of environmental risk of the proposed activities on the property a substantial value of investments on the existing properties and the recent purchase of the new block, and a history of good compliance, 10-year durations of consent are considered appropriate.

12. CONCLUSION

In concluding, 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 no more than minor.
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.

Dairy Effluent Storage Calculator
Summary Report

Regional authority: Environment Southland Regional Council
Authorised agent: RES Rural Environmental Solutions - DC
Client: LAN015- G & S Kilpatrick Family Trust
Program version: 1.49
Report date: Wednesday, 26 September 2018
General description:

7. RES Base Calculation with updated information.

850 Cows, high risk soils, permanent roof diversion, yard diversion when cows are dried off, NO pads or underpasses, sulage pad (750m2, but cover diverted, RES has added half thsi area into other ctchemtns), 35 lt/cow/day wash down, 3 sets of low rate pods (20m3/hr for 7.5 hours per day in winter and 15 hours per day in summer), existing pond, application all year round, 3 days emergency storage.

All information entered and assumptions made in this report are based upon information gathered from management and staff while onsite.

Please check that all information and assumptions made in this report are correct.

Under the management system parameters described in this report and on the balance of probability,it is 90% likely that 2,409m³ of liquid effluent storage will be adequate for storage in any one year.

Based on the pond dimensions of 47.5m x 26.5m x 4m, with a 2:1 batter, you currently have 2,415m³ which is approximately 90% probability that you will have sufficient storage in any one year.

Good management is essential for liquid effluent storage of this size.

Under the management system parameters described in this report, approximately 236m³ of solids storage is required, if the solids pond is emptied around March adn October each season.

Based on the solids storage dimensions of 45m x 11m x 2 m, with a 2:1 batter, you currently have approximately 448m³ of solids storage capacity.

Good management is essential for solids storage this size.

Climate

Rainfall site: Woodlands Garvie Rd
Mean annual rainfall: 1031 mm/year

Effluent Block

Area of low risk soil: 0.0 hectares
Minimum area of high risk soil: 72.0 hectares
Surplus area of high risk soil: 0.0 hectares

Wash Water

Yard wash:

- Milking season starts: 02 August
- Milking season ends: 31 May

Month	Number of Cows	Hours in Yard	Wash Volume (cubic metres)
January	850	5.0	42.5
February	850	5.0	42.5
March	850	5.0	42.5

April	756	5.0	26.5
May	699	5.0	24.5
June	0	0.0	0.0
July	0	0.0	0.0
August	613	5.0	21.5
September	806	5.0	28.2
October	850	5.0	29.8
November	850	5.0	42.5
December	850	5.0	42.5

Irrigation

Winter-spring depth: 4 mm
Spring-autumn depth: 4 mm
Winter-spring volume: 148 cubic metres
Spring-autumn volume: 300 cubic metres
Irrigate all year? Yes

Catchments

Yard Area: 1190 square metres
Diverted? Yes
- diversion start: 01 June
- diversion end: 31 July
Shed Roof Area: 418 square metres
Diverted? Yes
Feedpad Area: 0 square metres
Covered? No
Diverted? No
Animal Shelter Area: 0 square metres
Covered? Yes
Diverted? No
Other Areas: 375 square metres

Storage

Pond/s present? Yes
No. of ponds: 1 pond/s
Includes irregular ponds? No
Pond 1
- total volume: 3008 cubic metres
- pumpable volume: 2415 cubic metres
- surface area: 1259 square metres
- width: 26.5 metres
- length: 47.5 metres
- batter: 2.0:1
- total height: 4.0 metres
- pumped? Yes
Tank/s present? No
Emergency storage period: 3 days

Solids Separation

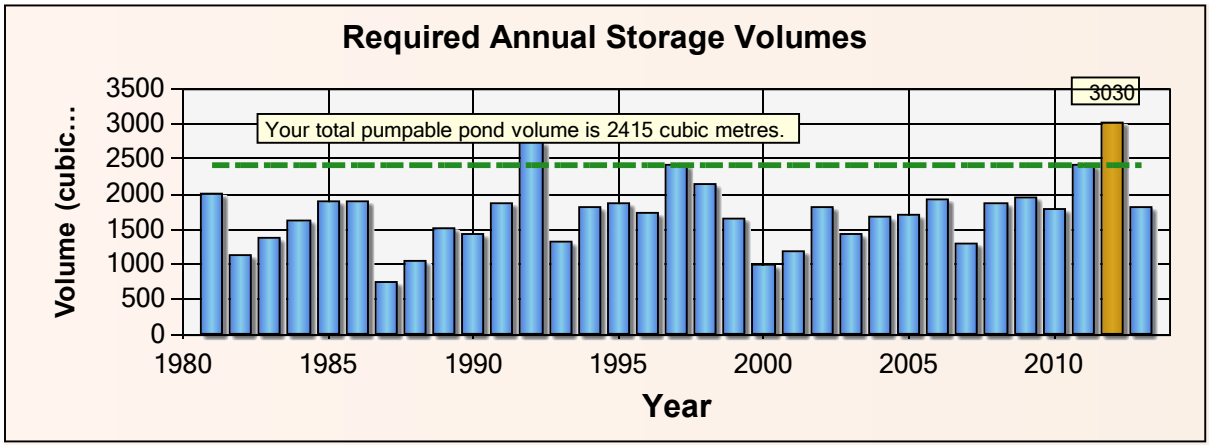
Solids separator/s present? Yes
No. of separators: 1 separator/s

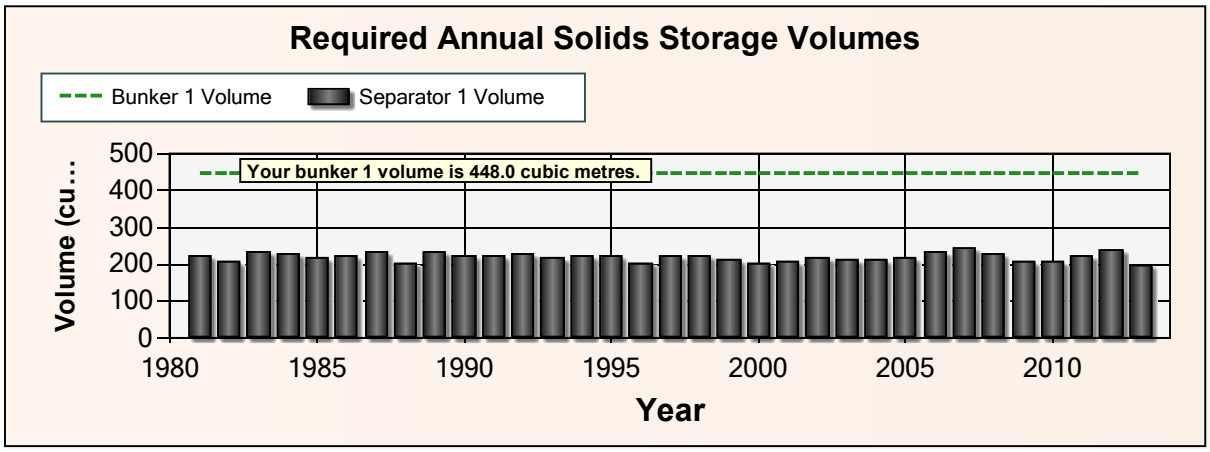
Separator 1

- dry matter:	20 %	
- source/s:	Yard	
- separation starts:	01 August	
- separation ends:	31 July	
- bunker length:	45.0 metres	
- bunker width:	11.0 metres	
- bunker height:	0.9 metres	
- minimum SWD:	10 mm	
- minimum 4 day SWD excess:	10 mm	
- bunker emptied on these dates:	12 March	01 October

Outputs

Maximum required storage pond volume:	3030 cubic metres
90 % probability storage pond volume:	2364 cubic metres
Maximum required solids bunker volume:	245.1 cubic metres
During the period from:	01 July 1980
To:	30 June 2013





Hillview Dairying Limited

140 Cooper road, Tussock Creek

Overseer modelling report as part of a consent application for extended dairying to 850cows

Report prepared for:
Graeme and Severna Kilpatrick
488 Forest Hill Crossing road
RD1, Winton

Prepared By:
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Report Peer Reviewed By:
Miranda Hunter
Roslin Consultancy Limited
B.Agr.Sci

25 September 2018

Executive Summary

Hillview Dairying Limited own and operate a high performing dairy farm and associated support block near Winton, in Central Southland. The business is self contained in terms of stock grazing. The dairy platform is 189.4ha total with a flat contour, of which 180.6ha are effective. Hillview Dairying Limited currently hold a discharge permit for dairy shed effluent for 599cows. Over the last five years, an average of 546cows were milked at peak on the property producing 462kgMS/cow. The property has three soil types – Pukemutu, Makarewa and Te Mara. Effluent is applied to 33.3 ha.

Hillview Dairying Limited also operate a support block. The 154ha block is rolling in topography. It is partially owned (93ha) by Hillview Dairying Limited, while the remaining area (61ha) has been leased from a neighbour for the last five years. The current lease arrangement has three years left to run. All of the Hillview Dairying cows are wintered on brassicas on the support block, with cows returning to the platform as springers (7-10days pre calving). Young stock are also reared on the support block from 4days old until they return as incalf heifers to the platform. Silage is grown and exported to the dairy farm along with 4.8ha of forage oats whole crop.

An opportunity has arisen to purchase a neighbouring property and incorporate this into the milking platform. This block, known as the Cox's Road block, has been operated as a stock trading block for the last five years. Information around the management of this block was able to be collected from the vendor. Until January 2016, the property was operated as a deer, lamb and weaner cattle finishing block. From January 2016 onwards, there was a change in farm strategy to increased finishing of lambs and no finishing of red deer. Throughout the five years, stock were wintered on farm on brassicas and a feed pad.

It is proposed to bring Cox's block into the milking platform and remain self-contained. The farm will milk 850 cows (2.6 cows per hectare) at peak producing 462kgMS/cow. A portion of the herd (318cows) will be wintered on two wintering pads on the milking platform. A small number of replacements will be run on the dairy platform and will be wintered on 2.5ha kale. The effluent area will be increased by from 33.3ha to 124.9ha. The overall operation will be self-contained in terms of stock grazing.

The support block will continue to operate as a compliment to the dairy platform. It will continue to winter 565 incalf cows and graze 154 youngstock. Stock will continue to be wintered on brassicas, with cows returning to the platform as springers (7-10days pre calving). Silage will continue to be grown on the support block and exported to the dairy farm.

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. Data inputs are given in detail within this report.

A summary of the modelling outputs are given in Tables 1 and 2. It shows a decrease in the total Nitrogen lost from the property. Total Phosphorus lost from the property is predicted to increase.

Table 1. Summary data from the Overseer analysis of the current land use for the dairy platform, associated support block and the neighbouring Cox's block

Description	Current Dairy Farm	Current Cox's Road Block			Weighted average Cox's road current	Current Support Block	Weighted average Current system
		Deer fattening (13-14 and 14-15 years)	Transition (15-16 year)	Lamb trading (16-17 and 17-18 years)			
Total Area (ha)	189.4	157.5	157.5	157.5	157.5	154.0	500.9
Total Farm N Loss (kgN)	11,374	4719	4539	4742	4692	6444	22510
Average N Loss (kgN/ha/yr)	60	30	29	30	30	42	45
N Concentration in Drainage (ppm)	Pastoral – 6.7 to 16.1 Crops – 7.7	Pastoral – 2.6 to 3.2 Crops – 19.1 – 32.1	Pastoral – 2.4 to 3.0 Crops – 19.2 to 32.7	Pastoral – 2.9 to 3.6 Crops – 18.8 to 30.3		Pastoral – 3.3 to 5.0 Crops – 9.9 to 31.2	
Total Farm P Loss (kgP)	258	134	134	134	134	170	562
Average P loss (kgP/ha/yr)	1.4	0.9	0.9	0.9	0.9	1.1	1.1
Overseer - predicted pasture grown (tDM/ha)	15.9	12.7	12.3	12.2		14.4	

Table 2. Summary data from the Overseer analysis of the proposed land use for the dairy platform and associated support block

Description	Proposed Dairy Farm	Proposed Support Block	Weighted Average Proposed system
Total Area (ha)	346.9	154.0	**500.9**
Total Farm N Loss (kgN)	16486	5953	22439
Average N Loss (kgN/ha/yr)	48	39	45
N Concentration in Drainage (ppm)	Pastoral – 6.7 to 11.4 Crops – 8.0 to 19.6	Pastoral – 3.0 to 4.7 Crops – 15.6 to 29.5	
Total Farm P Loss (kgP)	463	174	637
Average P loss (kgP/ha/yr)	1.3	1.1	1.3
Overseer - predicted pasture grown (tDM/ha)	15.7	14.3	

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

- Reduced winter crop area by 14.7ha (48.9ha to 34.2ha)
- Increased the area that effluent is applied to – reduced effluent N application
- Reduced nitrogen fertiliser use, particularly in late season
- Reduced stocking rate per hectare on the milking platform
- Culled cows earlier reducing supplementary feed required and urinary N deposition in late season
- Wintered a portion of the cows on a wintering pad
- Reduced fertiliser N use on crops "1st year" crop paddocks due

The key drivers of the increase in phosphorus loss are an increase in soil Olsen P fertility over the block and an increase in losses from "other sources".

- Soil Olsen P
  Soil fertility on the Cox's block is expected to be lifted under the proposed system in order to lift potential pasture production in line with the current dairy platform. As a result, there is higher soil P content and therefore higher loss risk.
- 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.

I recommend developing a farm specific environmental management plan. Particular reference should be made to the following aspects of the system:

- Management of the crop blocks to minimise the risk of sediment, P and ecoli loss, such as paddock selection, buffer zones, grazing direction and back fencing.
- Effluent management including farm protocols around the set up and use of the effluent system. A fail safe system should also be implemented
- Management of critical source areas, especially on the laneways at drain and creek crossings to reduce soil, P and ecoli loss.
- A nitrogen fertiliser management plan that includes reference to soil temperature, soil moisture content and total amount of fertiliser N applied.
- Developing a plan with your fertiliser representative to target decreasing the Olsen P levels to the agronomic optimum

Property legal description

Dairy Farm

Sections 23, 24, 25, 27 and part section 26 Block VIII New River Hundred

Cox's Road Block

Sections 11, 12 and part section 13 Block X New River Hundred

Lot 1 DP14135

Support block

Owned:
Lot 2 Deposited Plan 378224 and Section 38 Block VIII New River Hundred

Leased:
Lot 1, 3 and 4 Deposited Plan 350528, 271,605 m2

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 owners. Where accurate data was unavailable, conservative assumptions have been made using professional judgement.

The proposal

Farm objectives

Hillview Dairying Limited operate their farm business with the following objectives:

- To refine the farm system to maximise farm profitability and sustainability
- Consolidate the business to ensure it is resilient
- Operate a farm system that is delivers excellent results and is flexible so that opportunities and risks can be effectively managed

Current System

Dairy Platform

Hillview Dairying Limited own and operate a 189.4ha total dairy platform. The property has a flat contour and is 180.6ha are effective. The property currently holds a discharge permit for dairy shed effluent for 599cows. The property has three soil types – Pukemutu, Makarewa and Te Mara. Over the last five years, minimal changes have been made to the farm system. There have been fluctuations in the type and level of imported feed and timing of culling depending on the pasture growth (climatic conditions) and payout environment. As Overseer is a model designed to be used as a long term status quo, inputs have been averaged over the five years to reduce the impact of any particular season.

Over the last five years, an average of 546cows were milked at peak on the property producing 462kgMS/cow. Effluent was applied to 33.3ha. Nitrogen fertiliser was applied at a weighted average of 231kgN/ha across the pastoral area. 1.4ha of turnips were planted for summer feed for the herd. Silage and Hay were imported from the support block. Further supplement was imported including PKE, DDG, Molasses and Barley.

Support block

Hillview Dairying Limited also operate a support block. The block is located on Forest Hill Crossing road. The 154ha property is rolling in topography. It is partially owned (93ha) by Hillview Dairying Limited, while the remaining area (61ha) has been leased from a neighbour for the last five years. The current lease arrangement has three years left to run. It is operated as a separate system to the dairy platform, under the same management structure. This 154ha total (142.2ha effective) block is partially owned (93ha) with the remaining area leased from a neighbour (61ha). All of the Hillview Dairying Limited cows are wintered on 31.7ha brassicas on the support block, with cows returning to the platform as springers (7-10days pre calving). Young stock are also reared on the support block from 4days old until they return as incalf heifers to the platform. Silage is grown and exported to the dairy farm along with 4.8ha of forage oats whole crop.

Cox's block

An opportunity has arisen to purchase a neighbouring property and incorporate this into the milking platform. This block, known as the Cox's Road block is 157.5ha in total, of which 150.4ha is effective. The block is flat in contour and is comprised of Pukemutu and Makarewa soils. The property has

been operated as a stock trading block for the last five years. Information around the management of this block was able to be collected from the vendor. Until January 2016, the property was operated as a deer, lamb and weaner cattle finishing block. From January 2016 onwards, there was a change in farm strategy to increased finishing of lambs and remove the finishing of red deer. Throughout the five years, stock were wintered on farm on brassicas and a feed pad.

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.

Dairy platform

It is proposed to bring Cox's block into the milking platform and remain self-contained. The 346.9ha property (331ha effective) will milk 850 cows at peak producing 462kgMS/cow. A portion of the herd (318cows) will be wintered at on the platform on two wintering pads. A small number of replacements will be run on the dairy platform and will be wintered on 2.5ha kale. The effluent area will be increased from 33.3 ha to 124.9ha. The remaining cows and young stock will continue to be grazed on the support block. Nitrogen fertiliser use will be reduced to a weighted average of 205kgN/ha/year across pastoral areas. 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.

Support block

The support block will continue to operate as a compliment to the dairy platform. It will continue to winter 565 incalf cows and graze 154 youngstock. Stock will continue to be wintered on brassicas, with cows returning to the platform as springers (7-10days pre calving). Silage will continue to be grown on the support block and exported to the dairy farm.

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 transition 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

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 rateable area. The area of each block has been determined using the measure function on Google Earth. Soils on the property were assessed utilising the ES Beacon topoclimate information. Overseer soil settings were obtained from SMap for all soil types.

Block Name	Smap Ref	Contour	Current land Use			Proposed Land use	
			Dairy Farm (ha)	Cox's Block current (ha)	Support Block (ha)	Dairy Farm (ha)	Support Block (ha)
Dairy Platform							
Effluent – Makarewa	Makar_3b.1	Flat	**0.1**			**40.5**	
Effluent – Pukemutu	Pukem_6a.1	Flat	**33.2**			**76.1**	
Effluent – Te Mara	Temar_3a.1	Flat				**8.3**	
Non Effluent – Makarewa	Makar_3b.1	Flat	**62.3**			**39.1**	
Non Effluent – Pukemutu	Pukem_6a.1	Flat	**74.9**			**165.2**	
Non Effluent – Te Mara	Temar_3a.1	Flat	**10.1**			**1.8**	
Cox's Block							
Pukemutu	Pukem_6a.1	Flat		**118.0**			
Makarewa	Makar_3b.1	Flat		**15.2**			
Swedes – Pukemutu	Pukem_6a.1			**7.6**			
Swedes – Makarewa	Makar_3b.1			**1.0**			
Kale - Pukemutu	Pukem_6a.1			**7.6**			
Kale - Makarewa	Makar_3b.1			**1.0**			
Support Block							
Owned Orono	Orono_101a.1	Rolling			**50.0**		**50.0**
Owned Makarewa	Makar_3b.1	Rolling			**11.0**		**11.0**
Owned Pukemutu	Pukem_6a.1	Rolling			**6.2**		**6.2**
Owned Te Mara	Temar_3a.1	Rolling			**2.8**		**2.8**
Leased Orono	Orono_101a.1	Rolling			**31.8**		**31.8**
Leased Makarewa	Makar_3b.1	Rolling			**4.2**		**4.2**
Leased Pukemutu	Pukem_6a.1	Rolling			**9.8**		**9.8**
Kale – owned poorly drained	Makar_3b.1				**3.9**		**3.9**
Kale – owned imperfectly drained	Orono_101a.1				**12.0**		**12.0**
Kale – lease poorly drained	Makar_3b.1				**3.2**		**3.2**
Kale – lease imperfectly drained	Orono_101a.1				**7.3**		**7.3**
	Effective Farm Area		**180.6**	**150.4**	**142.2**	**331.0**	**142.2**
	Non productive		8.8	7.1	11.8	15.9	11.8
	Total Farm Area		**189.4**	**157.5**	**154.0**	**346.9**	**154.0**
Fodder crops block							
Turnips rotating through the dairy platform			1.4			6.6	
Kale						2.5	
Swedes					5.3		5.3
Whole crop					4.8		

Farm System

Description	Current Dairy Farm	Current Cox's Road Block			Current Support Block	Proposed Dairy Farm	Proposed Support Block
	Average of last five years	**Deer fattening (13-14 and 14-15 years)**	**Transition (15-16 year)**	**Lamb trading (16-17 and 17-18 years)**	**Average of last five years**		
Location	Southland	Southland	Southland	Southland	Southland	Southland	Southland
Climate – from the Overseer climate station tool	Rainfall: 1120mm Mean annual temp.: 10.0°C Daily rainfall pattern: 731 to 1450mm, low variation Mean annual PET: 727mm (mod variation)	Rainfall: 1120mm Mean annual temp.: 10.0°C Daily rainfall pattern: 731 to 1450mm, low variation Mean annual PET: 727mm (mod variation)	Rainfall: 1120mm Mean annual temp.: 10.0°C Daily rainfall pattern: 731 to 1450mm, low variation Mean annual PET: 727mm (mod variation)	Rainfall: 1120mm Mean annual temp.: 10.0°C Daily rainfall pattern: 731 to 1450mm, low variation Mean annual PET: 727mm (mod variation)	Rainfall: 1112mm Mean annual temp.: 10.0°C Daily rainfall pattern: 731 to 1450mm, low variation Mean annual PET: 713mm (mod variation)	Rainfall: 1120mm Mean annual temp.: 10.0°C Daily rainfall pattern: 731 to 1450mm, low variation Mean annual PET: 727mm (mod variation)	Rainfall: 1112mm Mean annual temp.: 10.0°C Daily rainfall pattern: 731 to 1450mm, low variation Mean annual PET: 713mm (mod variation)
Milk solids production	Production: 252,146 kg MS 462 kgMS/cow Median calving date: 24th August Drying off: 31st May	NA	NA	NA	NA	Production: 392,700 kg MS 462 kgMS/cow Median calving date: 24th August Drying off: 31st May	NA

Hillview Dairying Limited

Description	**Current Dairy Farm**	**Current Cox's Road Block**			**Current Support Block**	**Proposed Dairy Farm**	**Proposed Support Block**
	Average of last five years	**Deer fattening (13-14 and 14-15 years)**	**Transition (15-16 year)**	**Lamb trading (16-17 and 17-18 years)**	**Average of last five years**		
Cows on farm (**Lactating, wintered, Carry overs**)	Breed Friesian Jul 20 Aug 295 Sep 501 Oct 546 Nov 546 Dec 546 Jan 541 Feb 541 Mar 541 Apr 531 May 521 Jun 0 Peak cows: 546	NA	NA	NA	Breed Friesian Jul 575 Aug 300 Sep 85 Oct 30 Nov 30 Dec 30 Jan 30 Feb 30 Mar 30 Apr 30 May 30 Jun 595	Breed Friesian Jul 338 Aug 613 Sep 806 Oct 850 Nov 850 Dec 850 Jan 842 Feb 842 Mar 811 Apr 756 May 699 Jun 318 Peak cows: 850 *Note: earlier culling date*	Breed Friesian Jul 545 Aug 270 Sep 55 Oct 0 Nov 0 Dec 0 Jan 0 Feb 0 Mar 0 Apr 0 May 0 Jun 565 *Note: No Carry overs wintered or throughout year*
Dairy replacements on farm	Calves leave the property at 4days old and return as incalf heifers	NA	NA	NA	Replacements arrive at 4days old and are grazed on farm until incalf R2s. 154 animals	Total of 221 replacements reared. 67 calves are reared and grazed on farm. All other replacement calves (154) leave the property at 4days old and return as incalf heifers	Replacements arrive at 4days old and are grazed on farm until incalf R2s. 154 animals

Hillview Dairying Limited

Description	Current Dairy Farm	Current Cox's Road Block			Current Support Block	Proposed Dairy Farm	Proposed Support Block
	Average of last five years	Deer fattening (13-14 and 14-15 years)	Transition (15-16 year)	Lamb trading (16-17 and 17-18 years)	Average of last five years		
Breeding bulls	Ten 2yr old bulls on farm in Dec and Jan (5 Jersey and 5 Beef)	NA	NA	NA	Ten 2yr old jersey bulls on farm from Oct – Dec	Sixteen 2yr old bulls on farm in Dec and Jan (5 Jersey and 5 Beef)	Ten 2yr old jersey bulls on farm from Oct – Dec
Sheep	NA	Lamb finishing <u>Lambs</u> Lambs bought at weaning and sold as finished Dec – Apr (2000) May – Oct (500)	Lamb finishing <u>Lambs</u> Lambs bought at weaning and sold as finished Dec – Apr (2000) May – Jun (1800) Jul – Oct (500)	Lamb finishing <u>Lambs</u> Multiple lines of lambs bought as stores and sold as finished Dec – Jan (1585) Feb (2335) Mar – Apr (2935) May – Aug (1800) Sep – Oct (2100) Nov – Jan (300)	NA	NA	NA
Beef cattle	NA	160head of Steers and Heifers purchased in Sep at 13months old. 100 finished and sold to works in May, rest	160head of Steers and Heifers purchased in Sep at 13months old. 100 finished and sold to works in May, rest	160head of Steers and Heifers purchased in Sep at 13months old. 100 finished and sold to works in May, rest	25 beef cross calves are reared from 4days old and are finished in May as R2s	NA	25 beef cross calves are reared from 4days old and are finished in May as R2s

Hillview Dairying Limited

Description	**Current Dairy Farm**	**Current Cox's Road Block**			**Current Support Block**	**Proposed Dairy Farm**	**Proposed Support Block**
	Average of last five years	**Deer fattening (13-14 and 14-15 years)**	**Transition (15-16 year)**	**Lamb trading (16-17 and 17-18 years)**	**Average of last five years**		
		wintered and sold to works in Aug.	wintered and sold to works in Aug.	wintered and sold to works in Aug.			
Deer	NA	600 red deer weaners purchased at 5months old (Mar). They are finished and sold to the works during Dec and Jan.	600 red deer weaners on farm from previous year. These are finished and sold to the works during Dec - Jan	NA	NA	NA	NA
Animal distribution	No differences between blocks	No differences between blocks	No differences between blocks	No differences between blocks	No differences between blocks	No differences between blocks	No differences between blocks
Structures	<u>Calving Pad</u> Uncovered with a barkchip surface. Not lined Barkchips spread onto non effluent paddocks in Dec	<u>Wintering pad</u> Uncovered with a barkchip surface Not lined Barkchips spread onto grass paddocks in Dec	<u>Wintering pad</u> Uncovered with a barkchip surface Not lined Barkchips spread onto grass paddocks in Dec	<u>Wintering pad</u> Uncovered with a barkchip surface Not lined Barkchips spread onto grass paddocks in Dec	<u>None</u>	<u>Calving and wintering pads</u> Cows will be wintered on the "Cox's road" wintering pad and the "Platform" calving pad Uncovered with a barkchip surface. Not lined	<u>None</u>

Description	Current Dairy Farm	Current Cox's Road Block			Current Support Block	Proposed Dairy Farm	Proposed Support Block
	Average of last five years	Deer fattening (13-14 and 14-15 years)	Transition (15-16 year)	Lamb trading (16-17 and 17-18 years)	Average of last five years		
Structures (cont.)	<u>Management</u> Cows are on the pad for 24hrs/day and are fed on the pad Jul – 100% Aug – 31% Sep – 18% Oct – 2%	<u>Management</u> Deer are on the pad for 24hrs/day and are fed on the pad Jun – Aug – 50%	<u>Management</u> Deer are on the pad for 24hrs/day and are fed on the pad Jul – Aug – 50%	<u>Management</u> Beef animals on the pad 24hrs/day and are fed on the pad Jun – Aug – 100%		Barkchips spread onto non effluent paddocks in Dec <u>Management</u> Cows are on the pad for 24hrs/day and are fed on the pad Jun - 100% Jul – 100% Aug – 15% Sep – 12% Oct – 2%	
In Shed Feeding	<u>In shed feeding</u> 100% milkers fed (Aug – May)	NA	<u>NA</u>	<u>NA</u>	<u>NA</u>	<u>In shed feeding</u> 100% milkers fed (Aug – May)	<u>NA</u>
Crop management	<u>Rotating fodder crop</u> 1.4ha Summer turnips	<u>Winter crop</u> 17.2ha of crop is planted each year in a Pasture -> Swede -> Kale -> pasture rotation.	<u>Winter crop</u> 17.2ha of crop is planted each year in a Pasture -> Swede -> Kale -> pasture rotation.	<u>Winter crop</u> 17.2ha of crop is planted each year in a Pasture -> Swede -> Kale -> pasture rotation.	<u>Winter crop</u> 31.7ha of crop is planted each year in a Pasture -> Swede -> Kale (x5yrs) -> pasture rotation. 4.8ha of Whole crop forage oats	<u>Fodder crops</u> 6.6ha Summer turnips and 2.5ha kale are planted each year. These crops rotate around the block.	<u>Winter crop</u> 31.7ha of crop is planted each year in a Pasture -> Swede -> Kale (x5yrs) -> pasture rotation. 4.8ha of Whole crop forage oats

Description	Current Dairy Farm	Current Cox's Road Block			Current Support Block	Proposed Dairy Farm	Proposed Support Block
	Average of last five years	Deer fattening (13-14 and 14-15 years)	Transition (15-16 year)	Lamb trading (16-17 and 17-18 years)	Average of last five years		
Crop management (cont.)	<u>Turnip management:</u> Yield of 12t DM / ha Conventional cultivation October 300kg/ha Serpentine Super applied at sowing 65kg/ha Urea in November Grazed by dairy cows Jan – Feb Resown in permanent pasture in March	<u>Swede management:</u> Yield of 12tDM/ha Conventional cultivation in November 200kg/ha Serpentine super at sowing 200kg/ha DAP at sowing 100kg/ha Urea in January Grazed by lambs, deer and beef animals in May – Aug	<u>Swede management:</u> Yield of 12tDM/ha Conventional cultivation in November 200kg/ha Serpentine super at sowing 200kg/ha DAP at sowing 100kg/ha Urea in January Grazed by lambs, deer and beef animals in May – Aug	<u>Swede management:</u> Yield of 12tDM/ha Conventional cultivation in November 200kg/ha Serpentine super at sowing 200kg/ha DAP at sowing 100kg/ha Urea in January Grazed by lambs in Jun – Aug	are grown for silage <u>Swede management:</u> Yield of 12tDM/ha Conventional cultivation in December 285kg/ha DAP at sowing 100kg/ha Urea in January and March Grazed by cows and replacements from Jun – Sep	<u>Turnip management:</u> Yield of 12t DM / ha Conventional cultivation October 300kg/ha Serpentine Super applied at sowing 65kg/ha Urea in November Grazed by dairy cows Jan – Feb Resown in permanent pasture in March	are grown for silage <u>Swede management:</u> Yield of 12tDM/ha Conventional cultivation in December 285kg/ha DAP at sowing 100kg/ha Urea in February Grazed by cows and replacements from Jun – Sep

Description	Current Dairy Farm	Current Cox's Road Block			Current Support Block	Proposed Dairy Farm	Proposed Support Block
	Average of last five years	Deer fattening (13-14 and 14-15 years)	Transition (15-16 year)	Lamb trading (16-17 and 17-18 years)	Average of last five years		
Crop management (cont.)		<u>Kale management</u> Yield of 12tDM/ha Conventional cultivation in December 200kg/ha Serpentine super at sowing 200kg/ha DAP at sowing 100kg/ha Urea in Feb Grazed by lambs, deer and beef animals in May – Aug Resown in permanent pasture in Oct	<u>Kale management</u> Yield of 12tDM/ha Conventional cultivation in December 200kg/ha Serpentine super at sowing 200kg/ha DAP at sowing 100kg/ha Urea in Feb Grazed by lambs, deer and beef animals in May – Aug Resown in permanent pasture in Oct	<u>Kale management</u> Yield of 12tDM/ha Conventional cultivation in December 200kg/ha Serpentine super at sowing 200kg/ha DAP at sowing 100kg/ha Urea in Feb Grazed by lambs in Jun – Aug Resown in permanent pasture in Oct	<u>Kale management</u> Yield of 14tDM/ha Conventional cultivation in December 285kg/ha DAP at sowing 100kg/ha Urea in January and March Grazed by cows and replacements from Jun – Sep <u>Whole Crop</u> Yield of 10tDM/ha Conventional cultivation in November 200kg/ha DAP at sowing	<u>Kale management:</u> Yield of 14tDM/ha Conventional cultivation in December 285kg/ha DAP at sowing 100kg/ha Urea in February Grazed by youngstock in Jun – Aug Resown in permanent pasture in October *Note: Yield of crop is the same as currently achieved under Hillview Dairying management. Reduction in fertiliser N due to higher soil mineralisable N availability (first crop) than under the support block current management (2nd – 6th year crop)*	<u>Kale management</u> Yield of 14tDM/ha Conventional cultivation in December 285kg/ha DAP at sowing 100kg/ha Urea in January and March Grazed by cows and replacements from Jun – Sep *Note: Reduction in N fertiliser use on swedes(first crop) due to high soil mineralisable N availability.*

Hillview Dairying Limited

Description	**Current Dairy Farm**	**Current Cox's Road Block**			**Current Support Block**	**Proposed Dairy Farm**	**Proposed Support Block**
	Average of last five years	**Deer fattening (13-14 and 14-15 years)**	**Transition (15-16 year)**	**Lamb trading (16-17 and 17-18 years)**	**Average of last five years**		
					Cut for silage in Jan		
Supplements	<u>In shed:</u> 218tDM PKE 44tDM DDG 22tDM Barley 49tDM Molasses <u>Calving pad:</u> 21tDM Hay 82tDM silage 3tDM straw <u>On pasture:</u> 228tDM silage 48tDM cereal silage	<u>None</u>	<u>None</u>	<u>None</u>	<u>None</u>	<u>In shed:</u> 200tDM PKE 40tDM DDG 20tDM Barley 45tDM Molasses <u>Calving/wintering pad:</u> 21tDM Hay 225tDM silage 3tDM straw <u>On pasture:</u> 250tDM silage	
Supplements Exported	None	None	None	None	<u>To the platform</u> 310tDM silage 21tDM hay	None	<u>To the platform</u> 475tDM silage 21tDM hay

Hillview Dairying Limited

Description	Current Dairy Farm	Current Cox's Road Block			Current Support Block	Proposed Dairy Farm	Proposed Support Block
	Average of last five years	**Deer fattening (13-14 and 14-15 years)**	**Transition (15-16 year)**	**Lamb trading (16-17 and 17-18 years)**	**Average of last five years**		
					48tDM cereal silage		
Soil Fertility	Olsen P 40 (test results June 2018). All other values entered at ag. optimum	All values entered at ag. optimum (Olsen P of 20)	All values entered at ag. optimum (Olsen P of 20)	All values entered at ag. optimum (Olsen P of 20)	Olsen P 35 (test results June 2018). All other values entered at ag. optimum	Olsen P 40 All other values entered at ag. optimum	Olsen P 35 (test results June 2018). All other values entered at ag. 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	Phosphorus, Potassium and Sulphur applied to maintain fertility levels	Phosphorus, Potassium and Sulphur applied to maintain fertility levels
Nitrogen Fertiliser	<u>Non – effluent</u> 270kgN/ha in split applications (Sep – May) <u>Effluent</u> 60kgN/ha in split applications (Oct and Jan) Weighted average = 231kgN/ha	None	None	None	111kgN/ha in split applications (Aug – Mar)	<u>Non – effluent</u> 228kgN/ha in split applications (Sep – Apr) <u>Effluent</u> 166kgN/ha in split applications (Sep – Apr) Weighted average = 205kgN/ha	111kgN/ha in split applications (Aug – Mar)

Description	Current Dairy Farm	Current Cox's Road Block			Current Support Block	Proposed Dairy Farm	Proposed Support Block
	Average of last five years	Deer fattening (13-14 and 14-15 years)	Transition (15-16 year)	Lamb trading (16-17 and 17-18 years)	Average of last five years		
Drainage	80% mole and tile drained	80% mole and tile drained	80% mole and tile drained	80% mole and tile drained	80% mole and tile drained	80% mole and tile drained	80% mole and tile drained
Farm dairy effluent	Holding pond Solids are separated from the liquid Liquid effluent is applied at a depth of <12mm to the "effluent" blocks Solids are applied to the non-effluent area in December An effluent area of at least 50 ha is required to achieve a loading of less than 150 kgN/ha/year	NA	NA	NA	NA	Holding pond Solids are separated from the liquid Liquid effluent is applied at a depth of <12mm to the "effluent" blocks Solids are applied to the non-effluent area in December An effluent area of at least 80 ha is required to achieve a loading of less than 150 kg N / ha / year The effluent area of 124.9 ha has 47 kg N / ha applied in the form of liquid effluent. A further	NA

Description	Current Dairy Farm	Current Cox's Road Block			Current Support Block	Proposed Dairy Farm	Proposed Support Block
	Average of last five years	Deer fattening (13-14 and 14-15 years)	Transition (15-16 year)	Lamb trading (16-17 and 17-18 years)	Average of last five years		
	The effluent area of 33.3 ha has 105 kg N / ha applied in the form of liquid effluent. A further 28kgN/ha is applied to the non effluent area as solid effluent.					32kgN/ha is applied to the non effluent area as solid effluent.	

Predicted Overseer Results

Current system

Description	Current Dairy Farm	Current Cox's Road Block			Weighted average Cox's road current	Current Support Block	Weighted average Current system
		Deer fattening (13-14 and 14-15 years)	Transition (15-16 year)	Lamb trading (16-17 and 17-18 years)			
Total Area (ha)	189.4	157.5	157.5	157.5	157.5	154.0	500.9
Total Farm N Loss (kgN)	11,292	4637	4464	4684	4621	6790	22703
Average N Loss (kgN/ha/yr)	60	29	28	30	29	44	45
N Concentration in Drainage (ppm)	Pastoral – 6.7 to 16.0 Crops – 7.6	Pastoral – 2.6 to 3.2 Crops – 18.2 – 31.7	Pastoral – 2.4 to 3.0 Crops – 18.3 to 32.3	Pastoral – 2.8 to 3.6 Crops – 17.9 to 29.9		Pastoral – 3.3 to 5.0 Crops – 9.9 to 31.2	
Total Farm P Loss (kgP)	259	132	131	132	132	170	561
Average P loss (kgP/ha/yr)	1.4	0.8	0.8	0.8	0.8	1.1	1.1
Overseer - predicted pasture grown (tDM/ha)	15.9	12.7	12.3	12.2		14.4	

Proposed system

Description	Proposed Dairy Farm	Proposed Support Block	Weighted Average Proposed system
Total Area (ha)	346.9	154.0	**500.9**
Total Farm N Loss (kgN)	16356	6299	22655
Average N Loss (kgN/ha/yr)	47	41	45
N Concentration in Drainage (ppm)	Pastoral – 6.6 to 11.3 Crops – 7.9 to 19.6	Pastoral – 3.0 to 4.7 Crops – 18.1 to 29.5	
Total Farm P Loss (kgP)	465	174	639
Average P loss (kgP/ha/yr)	1.3	1.1	1.3
Overseer - predicted pasture grown (tDM/ha)	15.7	14.3	

Conclusions from the modelling

Nutrient budgets have been developed for Hillview Dairying Limited. These budgets compare the nutrient loss of the current dairy farm, associated support block and Cox's road block with the proposed dairy platform and support block. Overseer has predicted that losses of nitrogen will decrease and losses of phosphorus will increase**.**

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

- Reduced winter crop area by 14.7ha (48.9ha to 34.2ha)
- Increased the area that effluent is applied to – reduced effluent N application
- Reduced nitrogen fertiliser use, particularly in late season
- Culled cows earlier reducing supplementary feed required and urinary N deposition in late season
- Wintered a portion of the cows on a wintering pad
- Reduced fertiliser N use on crops "1st year" crop paddocks due

The key drivers of the increase in phosphorus loss are an increase in soil Olsen P fertility over the block and an increase in losses from "other sources".

- Soil Olsen P
  Soil fertility on the Cox's block is expected to be lifted under the proposed system in order to lift potential pasture production in line with the current dairy platform. As a result, there is higher soil P content and therefore higher loss risk.
- 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.

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 can not 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. Specifically, I recommend developing a detailed farm environmental management plan. Particular reference should be made to the following aspects of the system:

- Management of the winter crop blocks to minimise soil, P and ecoli loss. This includes:
    - Ensure there are appropriate buffer zones in place for winter grazing to reduce the risk of sediment runoff
    - Winter crops should be grazed with the use of back fences and portable water troughs. A grazing plan of the winter crop should be developed to take into account the contour of the paddock and any waterways.
- Effluent management including farm protocols around the set up and use of the effluent system. A fail safe system should also be implemented
- Management of storm water on laneways especially at drain and creek crossings to reduce soil, P and ecoli loss.
- A nitrogen fertiliser management plan that includes reference to soil temperature, soil moisture content and total amount of fertiliser N applied.
- A soil testing program is continued. Fertiliser is applied at the recommended 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.

Recent soil tests show that the property has a higher Olsen P than the agronomic optimum. Research has shown that there is little yield improvement when soil fertility is lifted above the optimum range. Furthermore, soil P loss risk is increases with Olsen P. Consider taking steps to reduce Olsen P to reduce P loss risk on farm.

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

Overseer outputs

Current system

Dairy Farm

Table 3. Current system whole farm nutrient budget

(kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Nutrients added							
Fertiliser, lime & other	218	26	0	20	0	0	0
Rain/clover N fixation	74	0	3	5	3	7	35
Irrigation	0	0	0	0	0	0	0
Supplements	79	12	66	10	12	7	4
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	101	0	0	0	0	0	0
To water	60	1.4	19	52	71	6	21
Change in farm pools							
Plant Material	0	0	-1	0	0	0	0
Organic pool	110	18	0	-21	1	0	0
Inorganic mineral	0	2	-22	0	-2	-3	-3
Inorganic soil pool	2	-1	48	0	-76	10	15

Table 4. 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
Effluent - Makarewa	3	34	6.7	230	166
Effluent - Pukemutu	1,651	50	9.9	228	166
Non Effluent - Makarewa	2,871	46	10.5	249	297
Non Effluent - Pukemutu	5,160	69	**15.1**	252	297
Non Effluent - Te Mara	745	74	**16.0**	255	297
Summer Turnips	58	41	7.6	-48	30
Other sources	803				
Whole farm	11,292	60			
Less N removed in wetland	0				
Farm output	11,292	60			

Table 5. 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
Effluent - Makarewa	0	0.9	Medium	Low	Low
Effluent - Pukemutu	32	1.0	Medium	Low	Low
Non Effluent - Makarewa	54	0.9	Medium	Low	Low
Non Effluent - Pukemutu	69	0.9	Medium	Low	Low
Non Effluent - Te Mara	6	0.6	Low	Low	Low
Summer Turnips	2	1.3	N/A	N/A	N/A
Other sources	96				
Whole farm	259	1.4			

Support block

Table 6. Support block system whole farm nutrient budget

(kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Nutrients added							
Fertiliser, lime & other	108	40	80	26	0	0	0
Rain/clover N fixation	87	0	3	5	3	7	33
Irrigation	0	0	0	0	0	0	0
Nutrients removed							
As products	14	3	1	2	7	0	0
Exported effluent	0	0	0	0	0	0	0
As supplements and crop residues	59	8	46	4	10	3	2
To atmosphere	37	0	0	0	0	0	0
To water	44	1.1	10	31	45	6	24
Change in farm pools							
Plant Material	-9	-1	-9	2	-1	-1	0
Organic pool	28	7	4	-8	1	0	0
Inorganic mineral	0	3	-17	0	-2	-3	-3
Inorganic soil pool	20	19	48	0	-57	1	10

Table 7. Support block 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
Owned Orono	1,044	23	5.0	93	113
Owned Makarewa	146	15	3.3	95	113
Owned Pukemutu	127	22	4.8	94	113
Owned Te Mar	61	23	5.0	93	113
Leased Orono	666	23	5.0	94	113
Leased Makarewa	56	15	3.3	95	113
Leased Pukemutu	198	22	4.8	94	113
Kale - Owned poorly drained	395	101	**18.3**	250	142
Kale - Owned Imperfectly drained	1,566	131	**22.6**	250	142
Kale - Leased Poorly drained	324	101	**18.3**	250	142
Kale - Leased Imperfectly drained	953	131	**22.6**	250	142
Swedes	921	174	**31.2**	272	142
Whole crop	277	58	9.9	-55	35
Other sources	56				
Whole farm	6,790	44			
Less N removed in wetland	0				
Farm output	6,790	44			

Table 8. Support block 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
Owned Orono	37	0.8	Medium	Low	N/A
Owned Makarewa	23	2.3	High	High **	N/A
Owned Pukemutu	14	2.4	High	High **	N/A
Owned Te Mar	4	1.4	Medium	Medium	N/A
Leased Orono	24	0.8	Medium	Low	N/A
Leased Makarewa	9	2.3	High	High **	N/A
Leased Pukemutu	22	2.4	High	High **	N/A
Kale - Owned poorly drained	5	1.3	N/A	N/A	N/A
Kale - Owned Imperfectly drained	5	0.4	N/A	N/A	N/A
Kale - Leased Poorly drained	4	1.3	N/A	N/A	N/A
Kale - Leased Imperfectly drained	3	0.4	N/A	N/A	N/A
Swedes	2	0.4	N/A	N/A	N/A
Whole crop	1	0.2	N/A	N/A	N/A
Other sources	19				
Whole farm	170	1.1			

Cox's Block – Deer Fattening

Table 9. Cox's block Deer fattening system whole farm nutrient budget

(kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Nutrients added							
Fertiliser, lime & other	9	21	0	21	3	1	0
Rain/clover N fixation	96	0	3	5	3	7	35
Irrigation	0	0	0	0	0	0	0
Nutrients removed							
As products	26	5	1	3	10	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	44	0	0	0	0	0	0
To water	29	0.8	11	29	31	5	23
Change in farm pools							
Plant Material	-3	0	-6	2	0	-1	0
Organic pool	3	7	0	-7	0	0	0
Inorganic mineral	0	0	-28	0	-2	-3	-3
Inorganic soil pool	6	9	24	0	-33	6	16

Table 10. Cox's block Deer fattening 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
Pukemutu	1,756	15	3.2	76	1
Makarewa	174	11	2.6	81	1
Swedes - Pukemutu	1,284	169	**31.7**	51	81
Swedes - Makarewa	127	127	**24.9**	51	81
Kale - Pukemutu	976	128	**22.1**	61	81
Kale - Makarewa	100	100	**18.2**	61	81
Other sources	218				
Whole farm	4,637	29			
Less N removed in wetland	0				
Farm output	4,637	29			

Table 11. Cox's block Deer fattening 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
Pukemutu	71	0.6	Low	Low	N/A
Makarewa	9	0.6	Low	Low	N/A
Swedes - Pukemutu	17	2.2	N/A	N/A	N/A
Swedes - Makarewa	1	1.3	N/A	N/A	N/A
Kale - Pukemutu	16	2.1	N/A	N/A	N/A
Kale - Makarewa	1	1.3	N/A	N/A	N/A
Other sources	17				
Whole farm	132	0.8			

Cox's Block Transition

Table 12. Cox's block transition system whole farm nutrient budget

(kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Nutrients added							
Fertiliser, lime & other	9	20	0	20	3	1	0
Rain/clover N fixation	90	0	3	5	3	7	35
Irrigation	0	0	0	0	0	0	0
Nutrients removed							
As products	20	4	1	2	8	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	41	0	0	0	0	0	0
To water	28	0.8	10	29	30	5	23
Change in farm pools							
Plant Material	-3	0	-6	2	0	-1	0
Organic pool	7	7	0	-7	0	0	0
Inorganic mineral	0	0	-28	0	-2	-3	-3
Inorganic soil pool	6	9	26	0	-31	7	16

Table 13. Cox's block transition 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
Pukemutu	1,612	14	3.0	74	1
Makarewa	160	11	2.4	77	1
Swedes - Pukemutu	1,308	172	**32.3**	105	81
Swedes - Makarewa	129	129	**25.2**	61	81
Kale - Pukemutu	983	129	**22.2**	68	81
Kale - Makarewa	100	100	**18.3**	68	81
Other sources	172				
Whole farm	4,464	28			
Less N removed in wetland	0				
Farm output	4,464	28			

Table 14. Cox's block transition 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
Pukemutu	71	0.6	Low	Low	N/A
Makarewa	9	0.6	Low	Low	N/A
Swedes - Pukemutu	17	2.2	N/A	N/A	N/A
Swedes - Makarewa	1	1.3	N/A	N/A	N/A
Kale - Pukemutu	16	2.1	N/A	N/A	N/A
Kale - Makarewa	1	1.3	N/A	N/A	N/A
Other sources	17				
Whole farm	131	0.8			

Cox's Block Lamb Fattening

Table 15. Cox's Block Lamb Fattening system whole farm nutrient budget

(kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Nutrients added							
Fertiliser, lime & other	9	20	0	21	3	1	0
Rain/clover N fixation	93	0	3	5	3	7	35
Irrigation	0	0	0	0	0	0	0
Nutrients removed							
As products	24	4	1	3	8	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	41	0	0	0	0	0	0
To water	30	0.8	10	29	32	5	23
Change in farm pools							
Plant Material	-2	0	-6	2	0	0	0
Organic pool	3	7	0	-8	0	0	0
Inorganic mineral	0	0	-27	0	-2	-3	-3
Inorganic soil pool	6	9	24	0	-32	6	16

Table 16. Cox's Block Lamb Fattening 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
Pukemutu	1,946	16	3.6	73	1
Makarewa	190	13	2.8	76	1
Swedes - Pukemutu	1,210	159	**29.9**	69	81
Swedes - Makarewa	121	121	**23.7**	69	81
Kale - Pukemutu	959	126	**21.7**	79	81
Kale - Makarewa	98	98	**17.9**	79	81
Other sources	159				
Whole farm	4,684	30			
Less N removed in wetland	0				
Farm output	4,684	30			

Table 17. Cox's Block Lamb Fattening 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
Pukemutu	71	0.6	Low	Low	N/A
Makarewa	9	0.6	Low	Low	N/A
Swedes - Pukemutu	17	2.2	N/A	N/A	N/A
Swedes - Makarewa	1	1.3	N/A	N/A	N/A
Kale - Pukemutu	16	2.1	N/A	N/A	N/A
Kale - Makarewa	1	1.3	N/A	N/A	N/A
Other sources	17				
Whole farm	132	0.8			

Proposed system

Dairy Platform

Table 18. Proposed system whole farm nutrient budget

(kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Nutrients added							
Fertiliser, lime & other	191	29	0	24	1	0	0
Rain/clover N fixation	85	0	3	5	3	7	35
Irrigation	0	0	0	0	0	0	0
Supplements	52	7	43	6	8	4	3
Nutrients removed							
As products	88	15	21	5	20	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	94	0	0	0	0	0	0
To water	47	1.3	19	52	61	6	21
Change in farm pools							
Plant Material	-1	0	-3	1	0	0	0
Organic pool	95	17	-2	-22	0	0	-1
Inorganic mineral	0	2	-24	0	-2	-3	-3
Inorganic soil pool	4	0	34	0	-68	8	15

Table 19. 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
Effluent - Makarewa	1,237	31	6.6	219	212
Effluent - Pukemutu	3,584	48	10.1	219	212
Non Effluent - Makarewa	1,167	31	6.9	224	260
Non Effluent - Pukemutu	7,828	49	10.6	224	260
Non Effluent - Te Mara	95	53	11.3	226	260
Summer Turnips	286	43	7.9	-50	30
Effluent Te Mar	414	51	10.7	220	212
Kale	274	109	19.6	55	96
Other sources	1,472				
Whole farm	16,356	47			
Less N removed in wetland	0				
Farm output	16,356	47			

Table 20. Proposed 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
Effluent - Makarewa	36	0.9	Medium	Low	Low
Effluent - Pukemutu	71	1.0	Medium	Medium	Low
Non Effluent - Makarewa	33	0.9	Medium	Low	Low
Non Effluent - Pukemutu	149	0.9	Medium	Low	Low
Non Effluent - Te Mara	1	0.6	Low	Low	Low
Summer Turnips	7	1.1	N/A	N/A	N/A
Effluent Te Mar	5	0.6	Low	Low	Low
Kale	4	1.6	N/A	N/A	N/A
Other sources	158				
Whole farm	465	1.3			

Support Block

Table 21. Support Block system whole farm nutrient budget

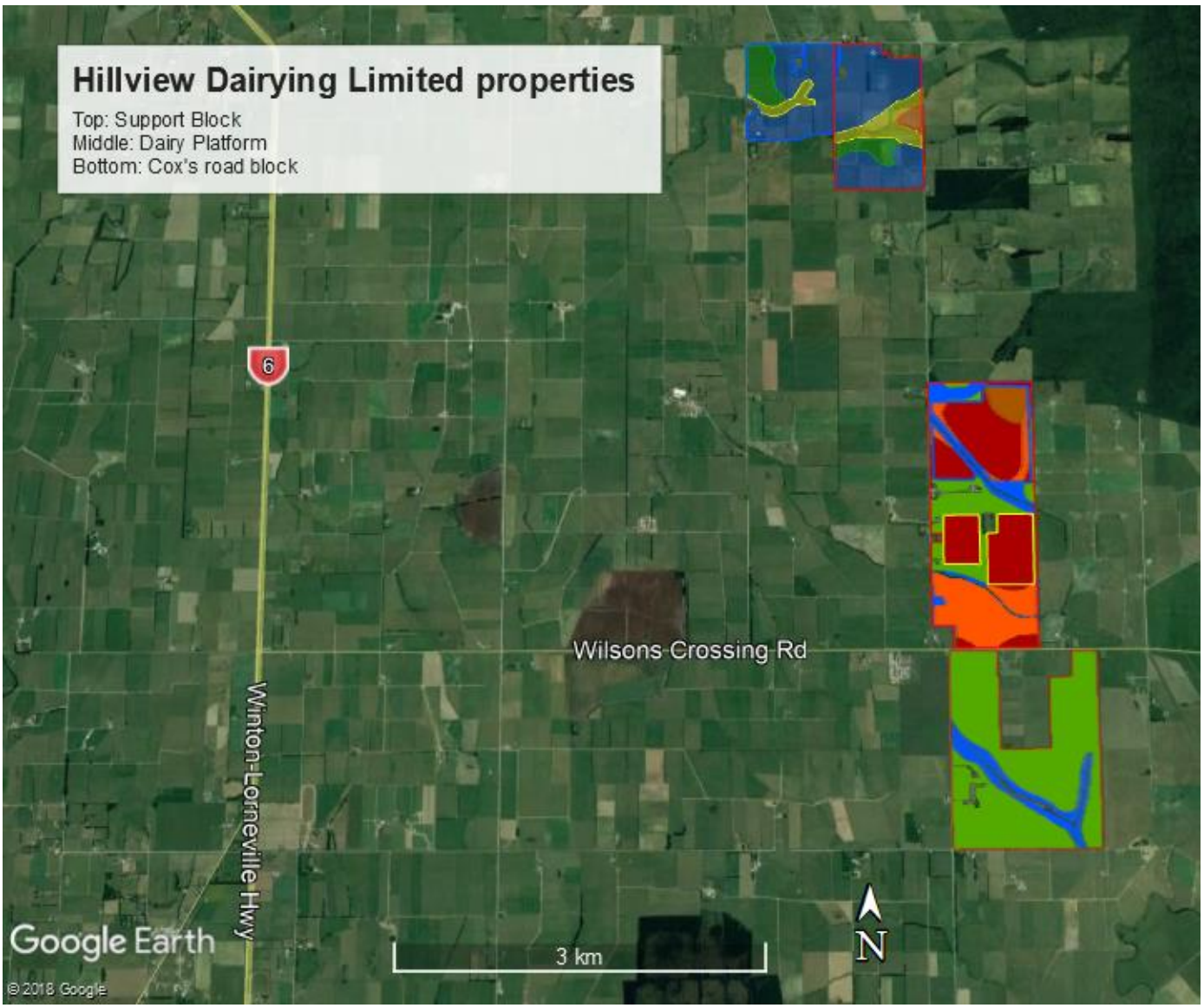
(kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Nutrients added							
Fertiliser, lime & other	108	42	107	28	0	0	0
Rain/clover N fixation	97	0	3	5	3	7	33
Irrigation	0	0	0	0	0	0	0
Nutrients removed							
As products	14	3	1	2	7	0	0
Exported effluent	0	0	0	0	0	0	0
As supplements and crop residues	83	9	68	5	15	4	3
To atmosphere	34	0	0	0	0	0	0
To water	41	1.1	12	31	42	6	24
Change in farm pools							
Plant Material	-5	-1	-5	2	0	0	0
Organic pool	27	7	4	-7	1	0	0
Inorganic mineral	0	3	-16	0	-2	-3	-3
Inorganic soil pool	12	18	46	0	-60	0	10

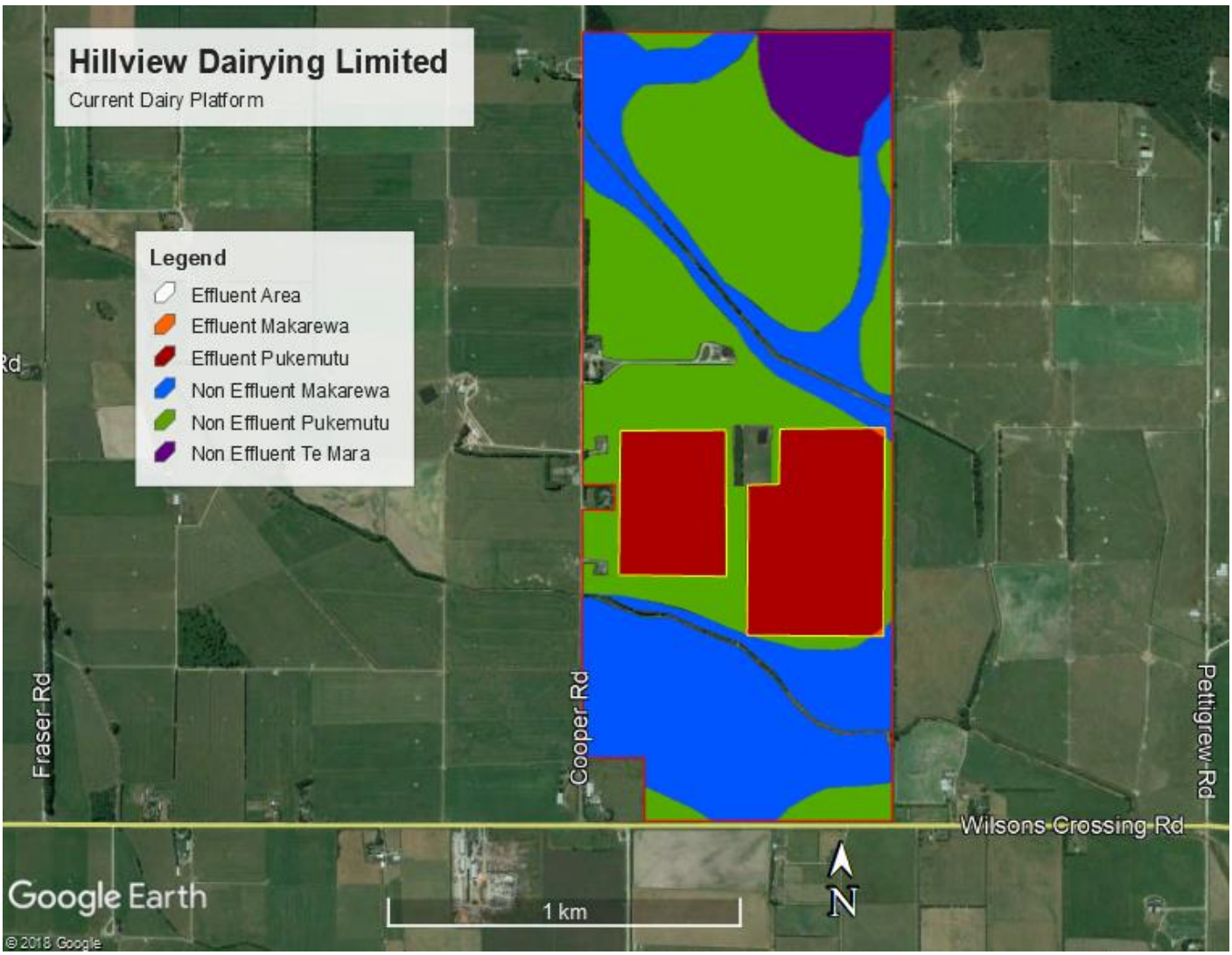
Table 22. Support Block system nitrogen report

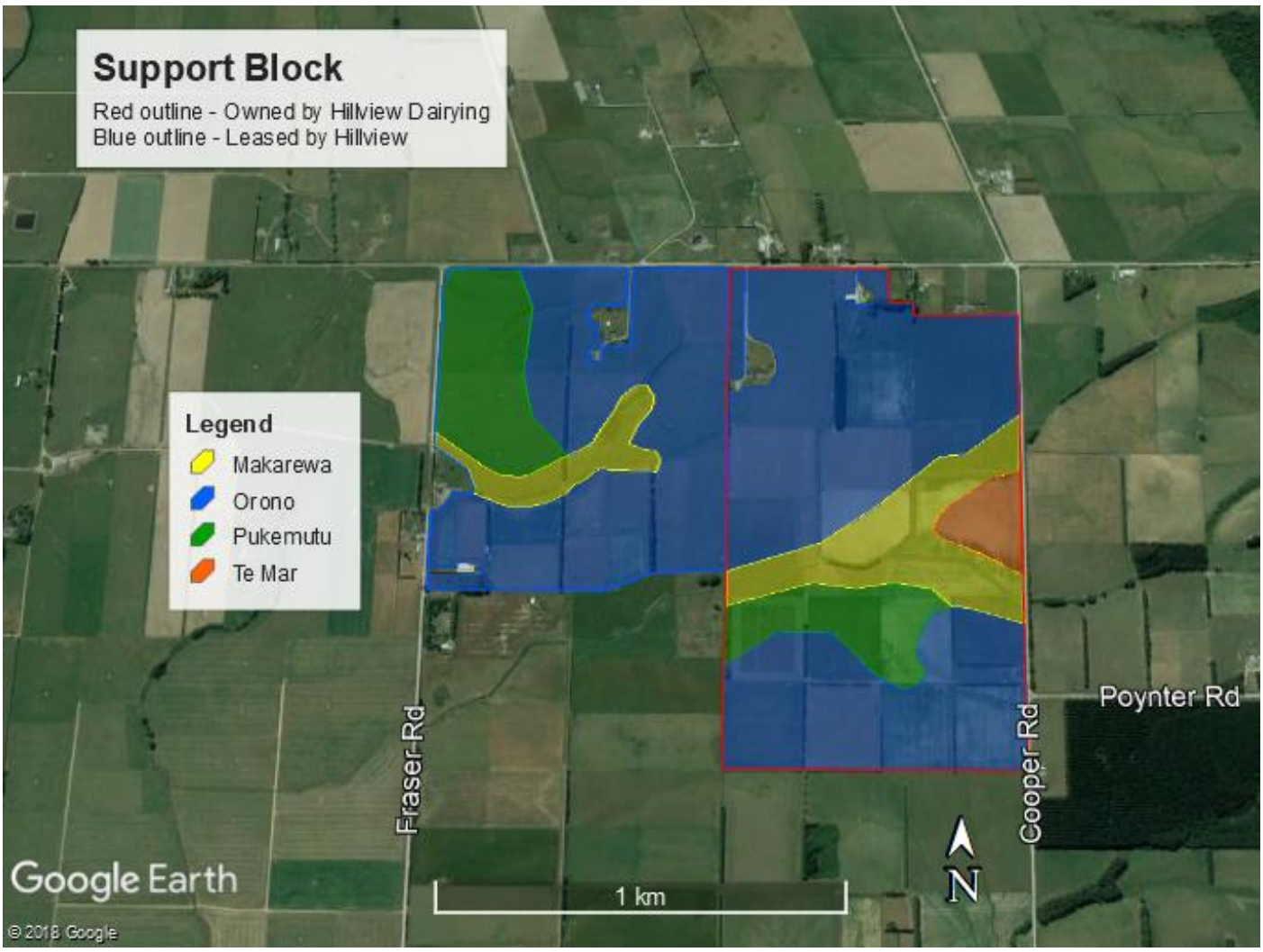
Block name	Total N lost kg N/yr	N lost to water kg N/ha/yr	N in drainage * ppm	N surplus kg N/ha/yr	Added N ** kg N/ha/yr
Owned Orono	989	21	4.5	72	113
Owned Makarewa	141	13	3.0	73	113
Owned Pukemutu	120	20	4.4	75	113
Owned Te Mar	59	22	4.7	78	113
Leased Orono	632	21	4.6	73	113
Leased Makarewa	54	14	3.0	75	113
Leased Pukemutu	191	20	4.4	74	113
Kale - Owned poorly drained	391	100	**18.1**	248	142
Kale - Owned Imperfectly drained	1,542	129	**22.3**	248	142
Kale - Leased Poorly drained	321	100	**18.1**	248	142
Kale - Leased Imperfectly drained	938	129	**22.3**	248	142
Swedes	869	164	**29.5**	222	96
Other sources	52				
Whole farm	6,299	41			
Less N removed in wetland	0				
Farm output	6,299	41			

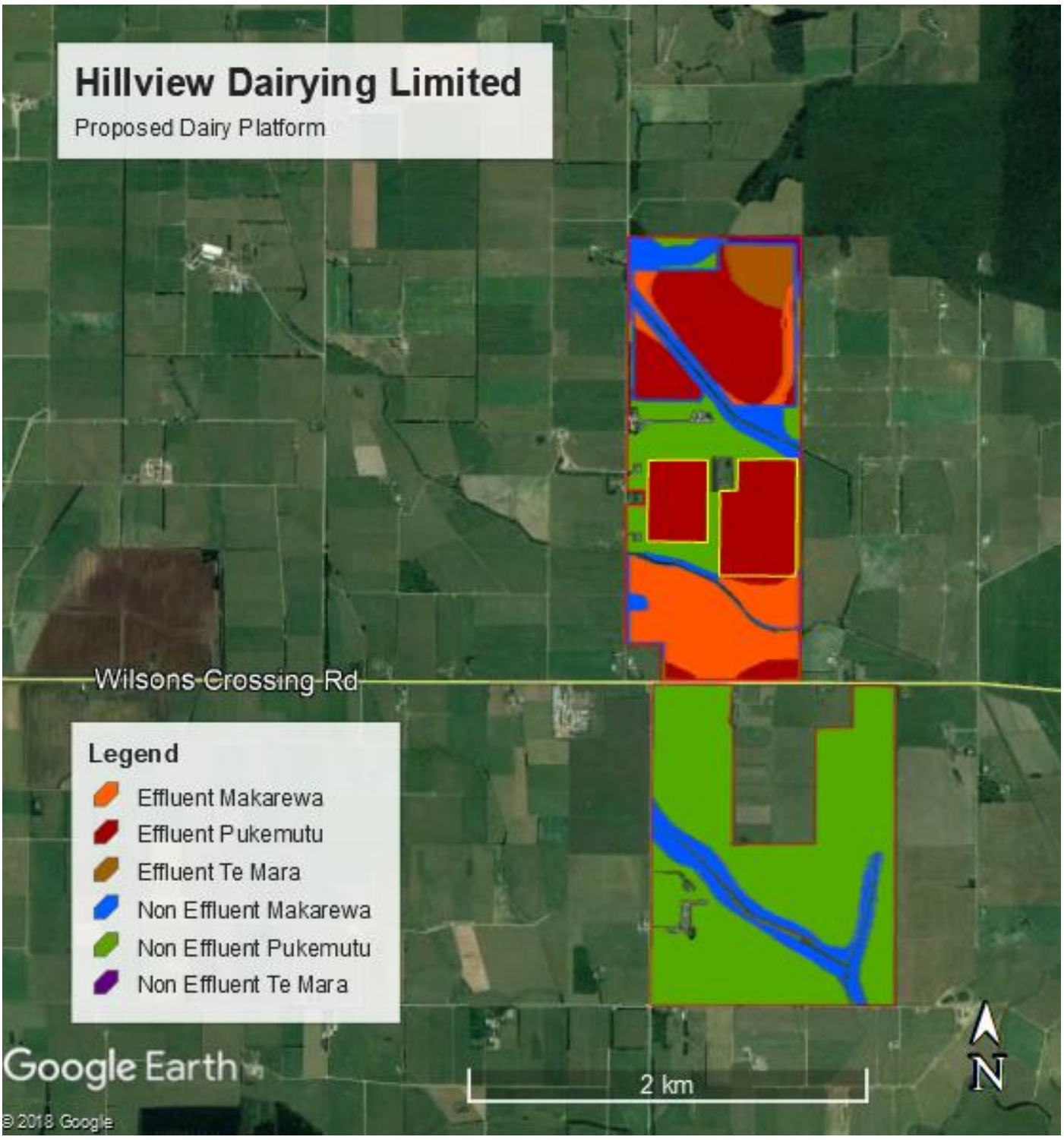
Table 23. Support Block system phosphorus report

Block name	Total P lost	P lost to water	P loss categories		
	kg P/yr	kg P/ha/yr	Soil	Fertiliser	Effluent
Owned Orono	39	0.8	Medium	Low	N/A
Owned Makarewa	24	2.3	High	High **	N/A
Owned Pukemutu	15	2.5	High	High **	N/A
Owned Te Mar	4	1.4	Medium	Medium **	N/A
Leased Orono	25	0.8	Medium	Low	N/A
Leased Makarewa	9	2.3	High	High **	N/A
Leased Pukemutu	23	2.5	High	High **	N/A
Kale - Owned poorly drained	5	1.3	N/A	N/A	N/A
Kale - Owned Imperfectly drained	5	0.4	N/A	N/A	N/A
Kale - Leased Poorly drained	4	1.3	N/A	N/A	N/A
Kale - Leased Imperfectly drained	3	0.4	N/A	N/A	N/A
Swedes	2	0.4	N/A	N/A	N/A
Other sources	17				
Whole farm	174	1.1			









FARM ENVIRONMENT MANAGEMENT PLAN

Hillview Dairying Ltd

A: PROPERTY OVERVIEW

Contact Person(s)	Graeme and Severna Kilpatrick	**Plan Prepared By**	Landpro Ltd
Contact Phone	0272272510	**Date**	12 October 2018
Email Address	gskilpat@xtra.co.nz	**Date of Next Review**	12 October 2019
Physical Address	488 Forest Hill Crossing Road, Winton		
Consent Numbers and Expiry Dates	TBC		
Farm Area	501.5 ha	**Peak Milked Herd Size**	850
Legal Descriptions	**Dairy Farm** Sections 23, 24, 25, 27 and part section 26 Block VIII New River Hundred, Lot 2 and 3 DP 520309 **Cox's Road Block** Sections 11, 12 and part section 6 and 13 Block X New River Hundred Lot 1 DP14135 , Lot 2 DP11675 **Support block** Owned: Lot 2 DP 378224 and Section 38 Block VIII New River Hundred Leased: Lot 3 and 4 and part lot 1 Deposited Plan		

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

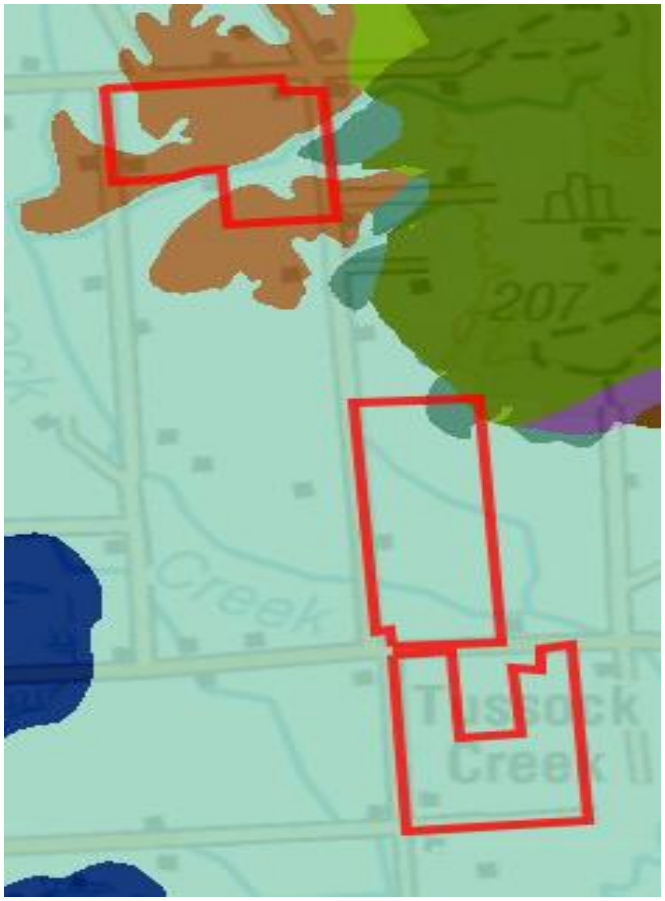
This FEMP contains various site plans identifying key features of the subject property in accordance with Part B(3) of Appendix N of the proposed Southland Water and Land Plan, 2018. The following table can be used as a reference point for locating these features.

KEY FEATURES	PLAN(S) WHERE KEY FEATURES ARE MAPPED
Site boundary	All site plans in this FEMP
Physiographic zones, variants and soil types	Figure 1: Physiographic Plan Figure 2: Soil map
Lakes, rivers, streams ponds, artificial watercourses, modified watercourses and natural wetlands	Appendix A: Existing Waterways and Critical Source Areas
Other critical source areas (gullies, swales etc)	Appendix A: Existing Waterways and Critical Source Areas
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	Appendix A: Waterway location, most have riparian planting
Places where stock access or cross water bodies (including bridges, culverts and fords)	Appendix A: crossings labelled
Known subsurface drainage system(s) and the location of drain outlets	Appendix B
All land that may be cultivated over the next 12 months	TBC – once consent granted
All land that may be intensively winter grazed over the next 12 months	TBC – once consent granted

C: PHYSIOGRAPHIC ZONES AND KEY CONTAMINANT PATHWAYS

This section of the FEMP documents the physiographic zones and key contaminant pathways present across the property.

The Physiographic Plan (**Error! Reference source not found.**) shows the spatial distribution of the physiographic zones on the entire property according to the Environment Southland Proposed Water and Land Plan 2018 (PSWLP) as mapped by Beacon Mapping Service. The mapping system also details the key contaminant pathways present for each physiographic zone and any variants for the location.



Physiographic Zone	Key Contaminant Pathways		
	Deep drainage	Artificial drainage	Overland flow
Gleyed		X	X
Oxidising	X	X	

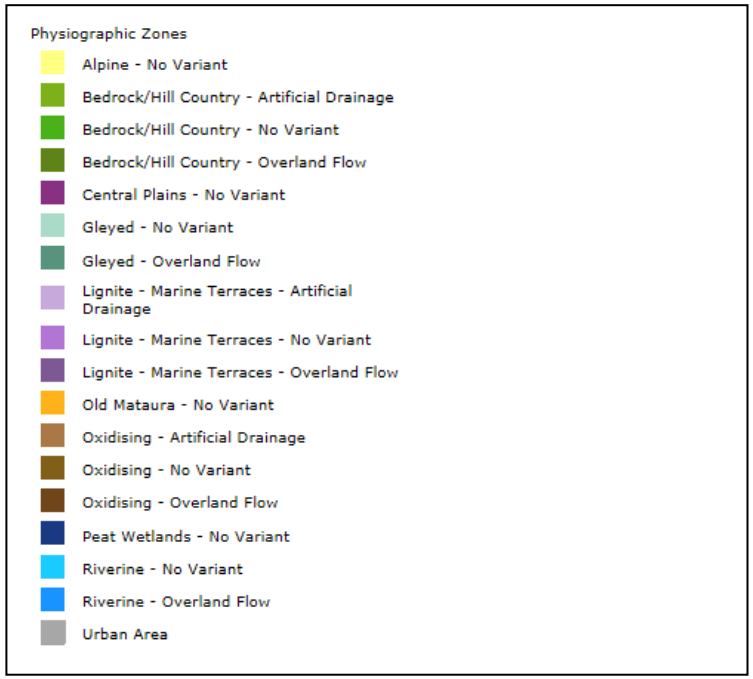


FIGURE 1: PHYSIOGRAPHIC ZONES AS MAPPED BY BEACON MAPPING SERVICE (WATER AND LAND PLAN)

D: SOIL TYPES

This section of the FEMP documents the soil types present across the property.

The Soil Maps below shows the spatial distribution of the soil types across entire property according to the Environment Southland Beacon Mapping Service.

FIGURE 2: SOIL MAP FOR DAIRY PLATFORM

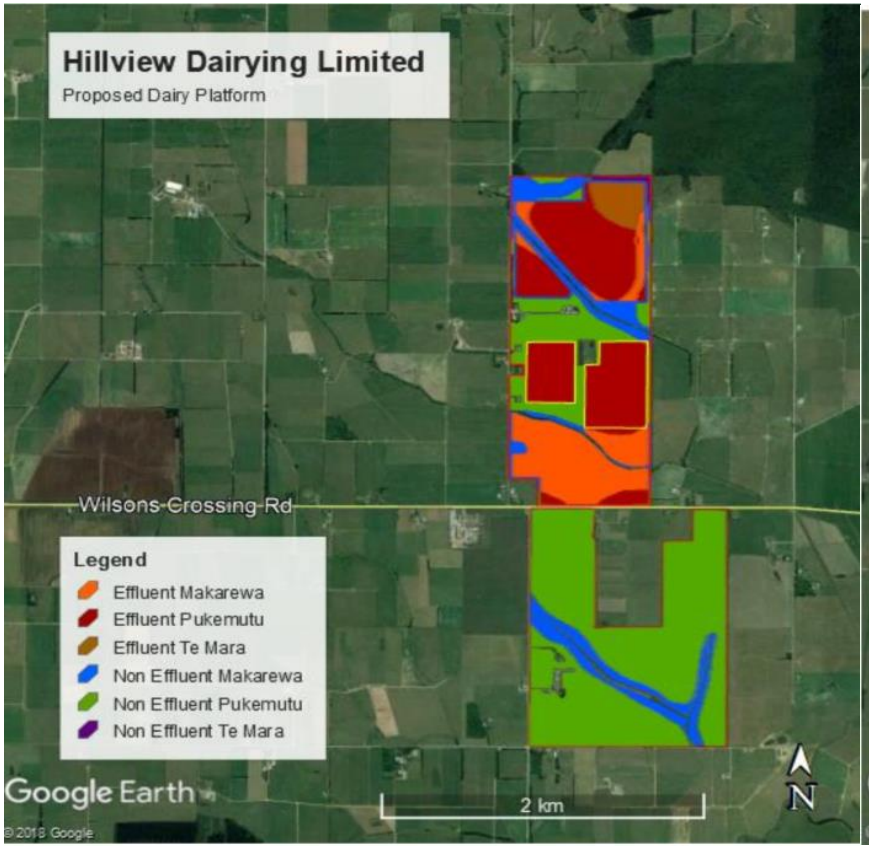
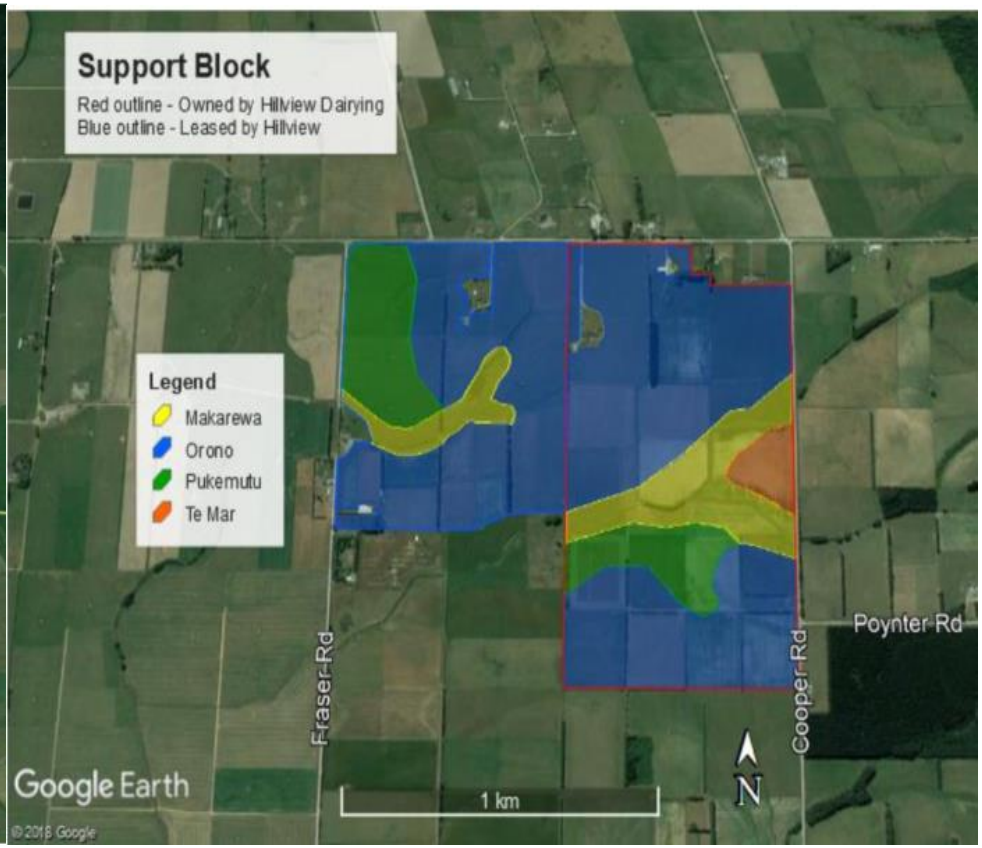


FIGURE 3: SOIL MAP FOR SUPPORT BLOCK



E: GOOD MANAGEMENT PRACTICES - GENERAL

Mitigation	Good Management Practice	Area where most effective	Review notes
Protect soil structure (will also help with P and N loss	Wintering the milking herd on brassicas on the support block and the remaining cows are wintered on three wintering pads on the dairy platform.	Entire farm	
	Re-sow bare soils as soon as possible	Entire farm	
	Use of selective grazing to avoid grazing very wet paddocks and open the breaks up to avoid pugging and treading damage.	Entire farm	
	Utilize stand off pads (or areas) to remove cows from pasture during adverse weather conditions	Primarily milking platform	
Manage Critical Source Areas (CSA)	Avoid working CSAs and their margins	Entire farm	
	Leave grassed areas (or native vegetation) around CSAs especially when grazing winter forage crop and/or graze as "last bite". Grazing direction should be down the slope or towards CSA.	Entire farm	
	All riparian margins to be fenced and left to establish with grasses to enable filtration of contaminants that may be transported via overland flow processes.	Entire farm	
Additional P loss reduction	Reduce use of P fertilizer where Olsen P values are above agronomic optimum. Maintain Olsen P levels at around 40	Milking platform	
	Reduce the risk of run-off to laneways and other sources by ensuring crossings are adequately maintained and maintain gradients of laneways to direct runoff to pasture.	Entire farm	
Reduce accumulation of N in the soil	Use nutrient budgeting to manage nutrient inputs and outputs	Entire farm	
	Time N fertilizer application to meet crop and pasture demand using split applications and avoid high risk times of	Entire farm	

	the year i.e when soil temperature is low or during drought periods		
Avoid preferential flow of FDE through soil profile and artificial drains	Defer effluent application when soil conditions are unsuitable especially when applying effluent to high risk paddocks	Milking platform	
	Apply effluent at low rates and depths and utilize entire effluent discharge area	Milking platform	

F: RIPARIAN MANAGEMENT

The property is mapped to drain to Tussock Creek and Makarewa River catchment which ultimately flows to the Oreti catchment.

All waterways are already fenced to exclude stock as required by the supplier. All riparian margins are left to establish with grasses and native vegetation in the first instance or as a minimum. The majority of the waterways are already extensively riparian planted.

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*.

Appendix A maps the waterways present on the property, any stock crossings and/or CSA's for riparian management.

G: INTENSIVE WINTER GRAZING

Intensive winter grazing is defined in the PSWLP as the *"Grazing of stock between May and September (inclusive) on forage crops (including brassica, beet and root vegetable crops), excluding pasture and cereal crops."*

Appendix C includes a farm map of winter grazing paddocks for 2018/2019 and 2019/2020 seasons. Full cultivation is undertaken and crop type is swedes, kale and turnips.

The table below outlines the good management practices which will be adopted on site for the intensive winter grazing activity.

Mitigation	Good Management Practice	Review notes
Protect soil structure and reduce N and P loss from intensive winter grazing activities	Grazing direction top of slope to bottom of slope. Use break or block feeding and ensure a last bite of 5-20m is left from CSA's	
	Back fencing to prevent stock from entering previously grazed areas	
	Use of portable water troughs to prevent stock from entering previously grazed areas	
	Use portable feed containers for supplementary feed to avoid feed wastage (From May 2019)	

H: NUTRIENT MANAGEMENT

Nutrient management is a key component to ensuring good on farm environmental practice. The farm utilizes nutrient budgeting through their supplier (Fonterra) as well as via their fertilizer representative (Ravensdown) and will append full nutrient budgets by May 2019 in accordance with the PSWLP. Any resulting nutrient budgets are reviewed and updated as required especially if farm system changes are proposed, but not less than on an annual basis. Any budget reviews are guided by a fertiliser representative and nutrient management advisor.

Regular soil tests will be undertaken to establish the nutrient status of the soils. Soils should be at nutrient levels which avoid any adverse effects on the environment but maintain good pasture production and animal health, by ensuring that the soils are suitable for optimal plant nutrient uptake.

Areas which are receiving FDE will be carefully managed to ensure nitrogen loadings are at acceptable levels and are compliant with conditions imposed by resource consents. The annual effluent nitrogen loading rate shall not exceed 150kg/N/ha. Effluent will be applied utilising low rate application. Effluent management is discussed in Section H of this FEMP.

The table below describes the good management practices which will be adopted in relation to nutrient management.

Mitigation	Good Management Practice	Review notes
Minimise nutrient losses from farming activities to ground and surface water by utilizing nutrient budgeting	Whole farm nutrient modelling using OVERSEER budget (or equivalent model) prepared by a suitably qualified person	
	Whole farm nutrient budget reviewed annually and updated in accordance with significant farm system changes	
	Minimise N losses by using soil testing to guide fertilizer recommendations and match fertilizer application with plant and animal requirements.	
	Use of a fertilizer representative to advise on fertilizer type, timing and application rates. Split applications where application rates exceed 100kg P/ha	
	Limit P application between June and August	
	Crop rotations adjusted to maximise the use of residual N in the soil	
	Stock wintering practices adjusted to minimise nutrient losses	

The following table sets out the evidence which needs to be collected for nutrient budgeting purposes:

Record	Nature of information/person	Collated (Y or N)
Production	Fonterra App, dockets	
Soil test results	Lab results, Ravensdown rep	
Fertiliser application records	MINDA land & feed, Ravensdown rep	
Proof of placement	MINDA land & feed	
Effluent application records	Dairy diary	
Crop rotation records	Farm map with total hectares	
Stock numbers	Culling timeframes Young stock grazed on farm Breeding bulls	
Record of supplements purchased	Invoices/Cash manager, MINDA	
Records of supplements made on farm	Invoices/Cash manager	
Farm map/effective hectares	Farm manager	

I: 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. Appendix D includes a full FDE Management Plan, monthly check sheets and staff training record.

Total effluent discharge area:	124 ha
Available storage volume:	3,008m^3
Storage Type:	Lined pond with leak detection system underlying the entire pond. Double weeping wall/sludge bed
Effluent application method:	Low rate pods x 3 Slurry tanker/muck spreader/umbillical Travelling irrigator
Maximum application rate and depth of application:	10mm/hr 25mm depth per application. 5mm depth for slurry/muck spreader/umbillical

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 • Utilize greenwash system	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 using the ES website. • Paddocks will be inspected before effluent application to check that soil water deficit exists.	N/A

	• Low rate application will be preferentially used during higher risk periods of the year with the travelling irrigator used mainly in summer when a greater soil moisture deficit occurs	
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 discharge will be to the entire effluent discharge area	Record irrigation dates, times and areas in the DAIRY DIARY
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 • Mapping of tile drains	N/A
Efficient and effective collection, storage and delivery of effluent from 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	Record all repairs and maintenance (invoices, cash manager) 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	Complaints received by Environment Southland

	• Observation of buffers to dwellings not located on the property (200 m) and property boundaries (20 m)	

J: COMPLIANCE AND 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.

Record	Kept	Date of most recent version
Nutrient budget		
Fertilizer application records		
Soil sampling results		
Water meter certification		
Water abstraction records		
Effluent system training record		
Effluent system monthly maintenance checks		
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

K: ANNUAL REVIEW AND 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
- Updated maps of winter crop paddocks and CSA's if applicable

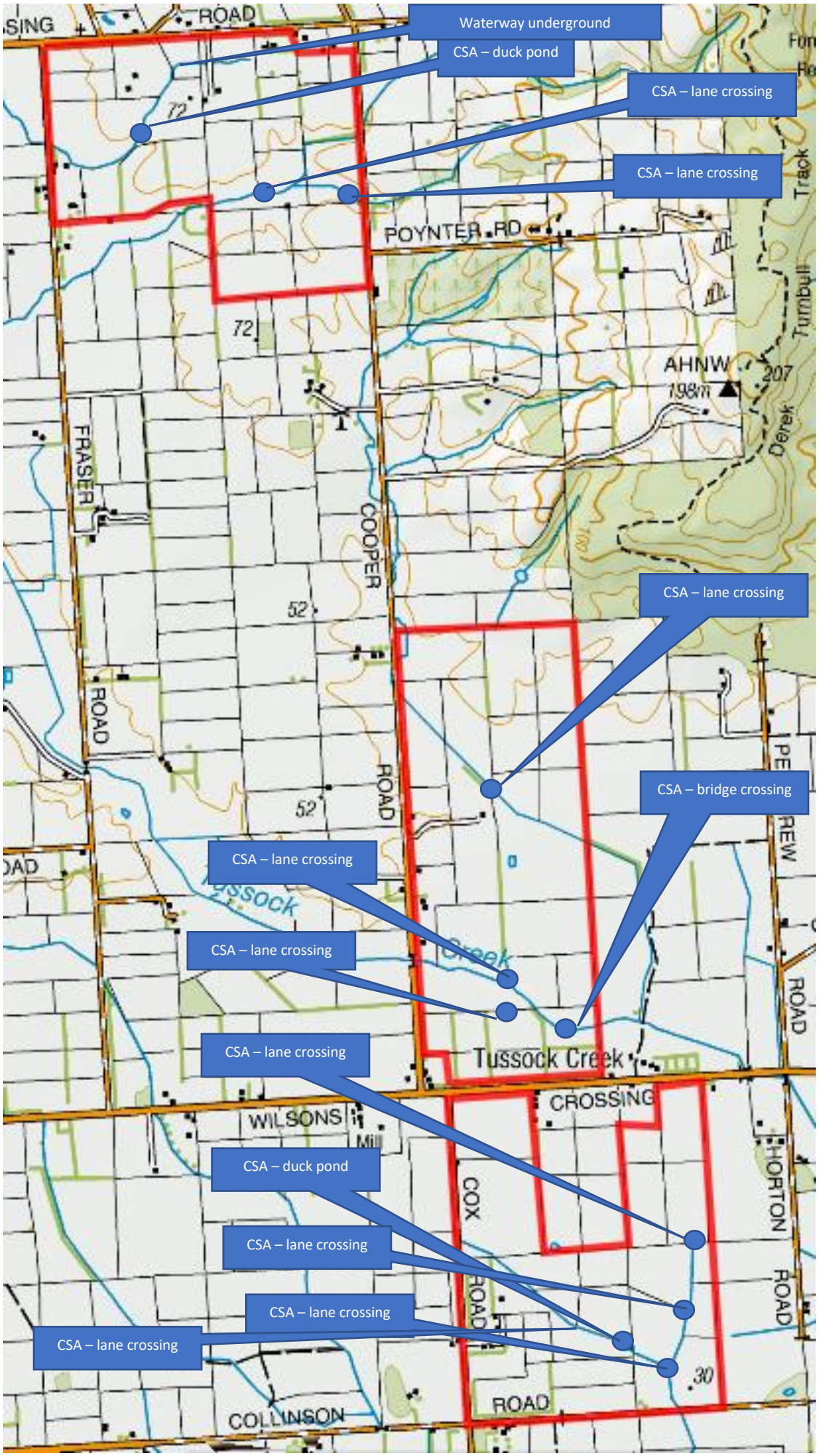
L: INDUSTRY GUIDELINES

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.

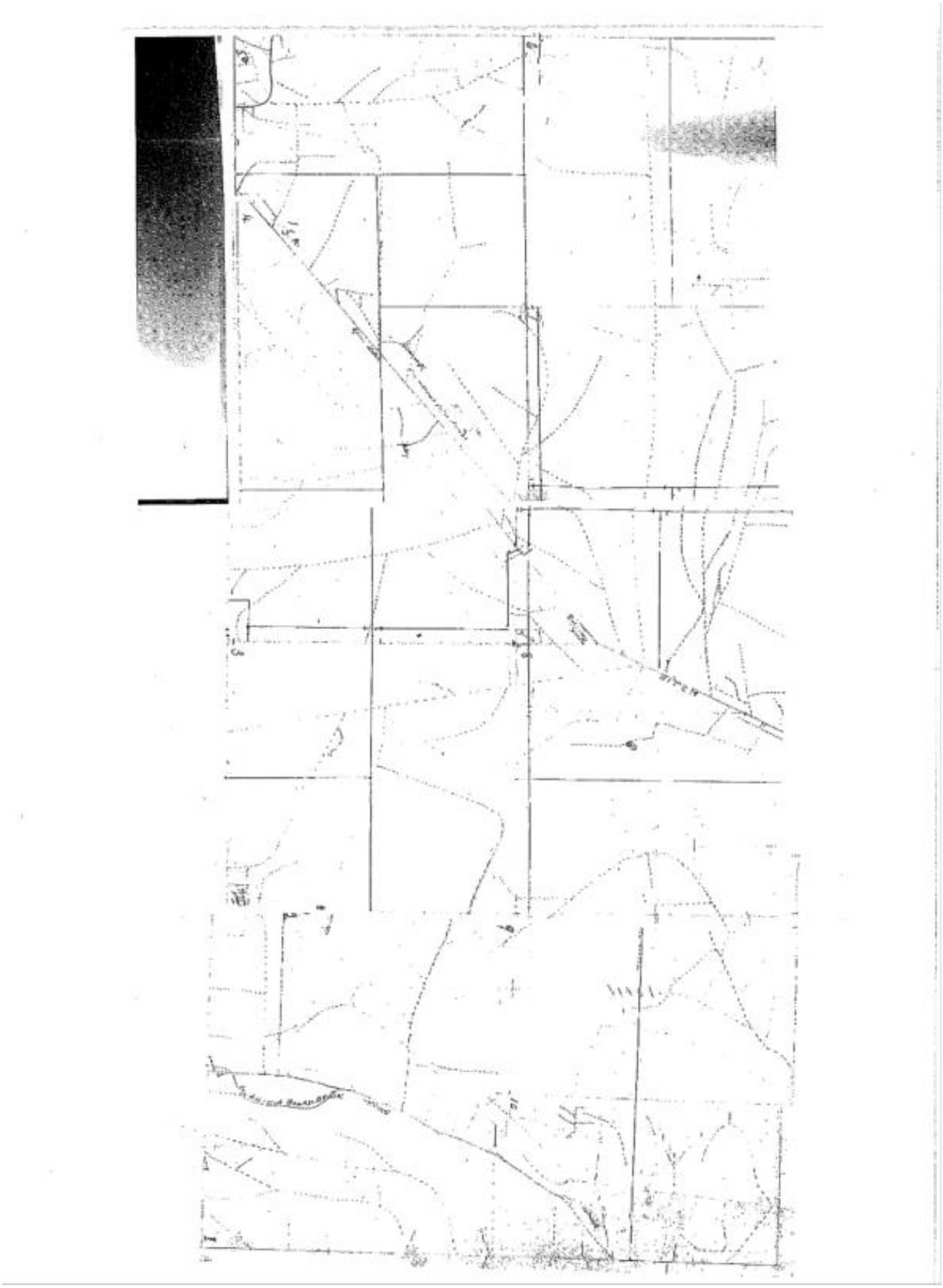
Environment Southland www.es.govt.nz **Dairy NZ** www.dairynz.co.nz **Fonterra** www.fonterra.com

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

APPENDIX A – FARM MAP



APPENDIX B – Tile drain map (existing dairy platform, FDE area)



APPENDIX C – Crop paddocks

Maps will be provided once consent is granted and the applicant is able to plan which paddocks will be sown in crop.

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

Effluent Orientation and Training Record

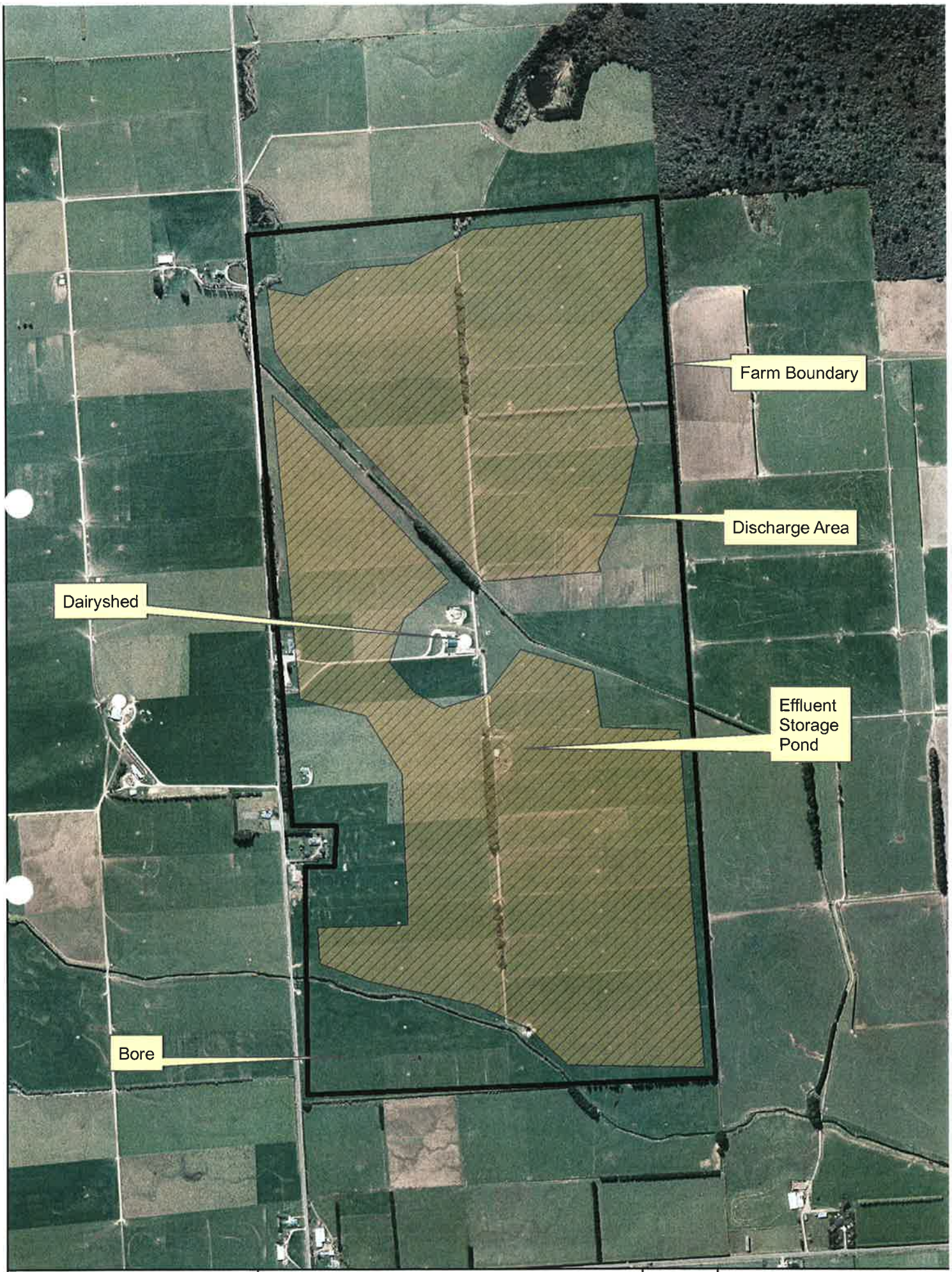
Season___/___

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



environment SOUTHLAND

G & S Kilpatrick for Hillview Dairying
Appendix 1
December 2010

N
1:10,184

1 Site Characteristics

1.1 Geotechnical Information

The farm surface soil layer consists of Pukemutu and Makarewa soils. Both soils have impeded drainage or low infiltration rates (http://map.es.govt.nz/departments/landsustainability/soil**).**

A number of test pits were dug in the area of the proposed effluent pond and sludge bed (refer attached test pit logs). These pits indicate that the pond base level should be contained within the upper layers, typically down to 1.5m, of yellow/brown silty clay and clayey silt. With increasing depth the soils are sandier and more weathered, with increased risk to leakage should effluent escape into them.

1.2 Water (Hydrological Setting)

There is one bore in the south west corner of the property. Ground water level is 3.3m below ground level in pond location.

The catchment of the property flows into tributaries of Tussock Creek.

2 Effluent Calculations

Mean Rainfall: 988mm/yr (Otahuti Middle Creek Rainfall Site)

Proposed No cows milked: 599

Milking Time: 5hr/day

Wash Volume: 55 litres/cow/day

Yard Area: 1190m^2 (Diverted 31st May – 1st Aug)

Shed Area: 380m^2 (Diverted all year)

Feedpad Area: There is no proposed feedpad

Pond Volume: 2.3M litres. This will provide for 70days storage, which equates to 60 days effluent storage + 10days rainfall.

3 Effluent Collection Design

3.1 Design type

Effluent will be transferred by gravity from dairy shed yard to concrete stone trap (with draining pad) to existing concrete sump.

On allowable irrigatable days, fresh effluent will be discharged directly from this sump to pasture through irrigation. On non-irrigatable days, effluent will be pumped to sludge beds.

3.2 Reason/justification

Stone removal is required prior to pumping effluent from the existing pond to the new effluent treatment area. The draining pad allows effluent to drain back into the stone trap and semi-solids retained for drying, removal, and pasture spreading.

4 Effluent Treatment Design

4.1 Design type

Double sludge-beds with weeping walls and sump with pump. One sludge bed will be filled with effluent while the other one will be allowed to dry and be cleaned out at least once a year. Drained effluent from the weeping walls will be pumped to the storage pond.

Sludge beds will be fenced off.

4.2 Reason/Justification

Client request. Weeping wall design has an acceptable track record if it is designed and constructed correctly. Lower installation and maintenance cost than a mechanical separator.

5 Effluent Storage Design

5.1 Design type

Earth bunded pond, partially above and below ground level. Batter slopes 3:1 on inside, 2.5:1 outside, with 3.5m crest width. Pond will be fenced off.

5.2 Lining design

Clay lined, minimum 400mm thick. Compacted in 100mm layers to 96% of optimum water content. Design will endeavor to match volume of required cut material to the fill volume available. Additional clay material may need to be 'borrowed' from the area immediately north of the pond. Stockpiled topsoil will be respread, the slope recontoured and regrassed.

5.3 Reason/justification

Clay material is available on site. During pond excavation suitable surface clay is able to be cut, stockpiled, and reused as a liner.

6 Irrigation Method Design as supplied by WaterForce Winton

Proposed: Travelling irrigator

Model, depth and volume: Yet to be confirmed. We will notify Environment Southland once this has been confirmed.

Irrigation will take place all year round when Environment Southland requirements permit.

7 Monitoring and Maintenance Required for Design

7.1 Collection

Daily inspections of stone trap. Removal of any stones, debris, or other obstructions.

7.2 Treatment

Daily inspections of sludge beds and pump.

7.3 Storage Pond

Observation around pond for leaks, cross checking volume of effluent applied against the volume accumulated.

7.4 Irrigator/pumps

Prior to each days operation: inspection of nozzles, hoses and fittings.

Monitoring of pumping pressure.

8 Contingency

Temporary storage in existing pond.

Contact pump provider to provide a temporary pump.

Request vacuum tank contractor to remove effluent.

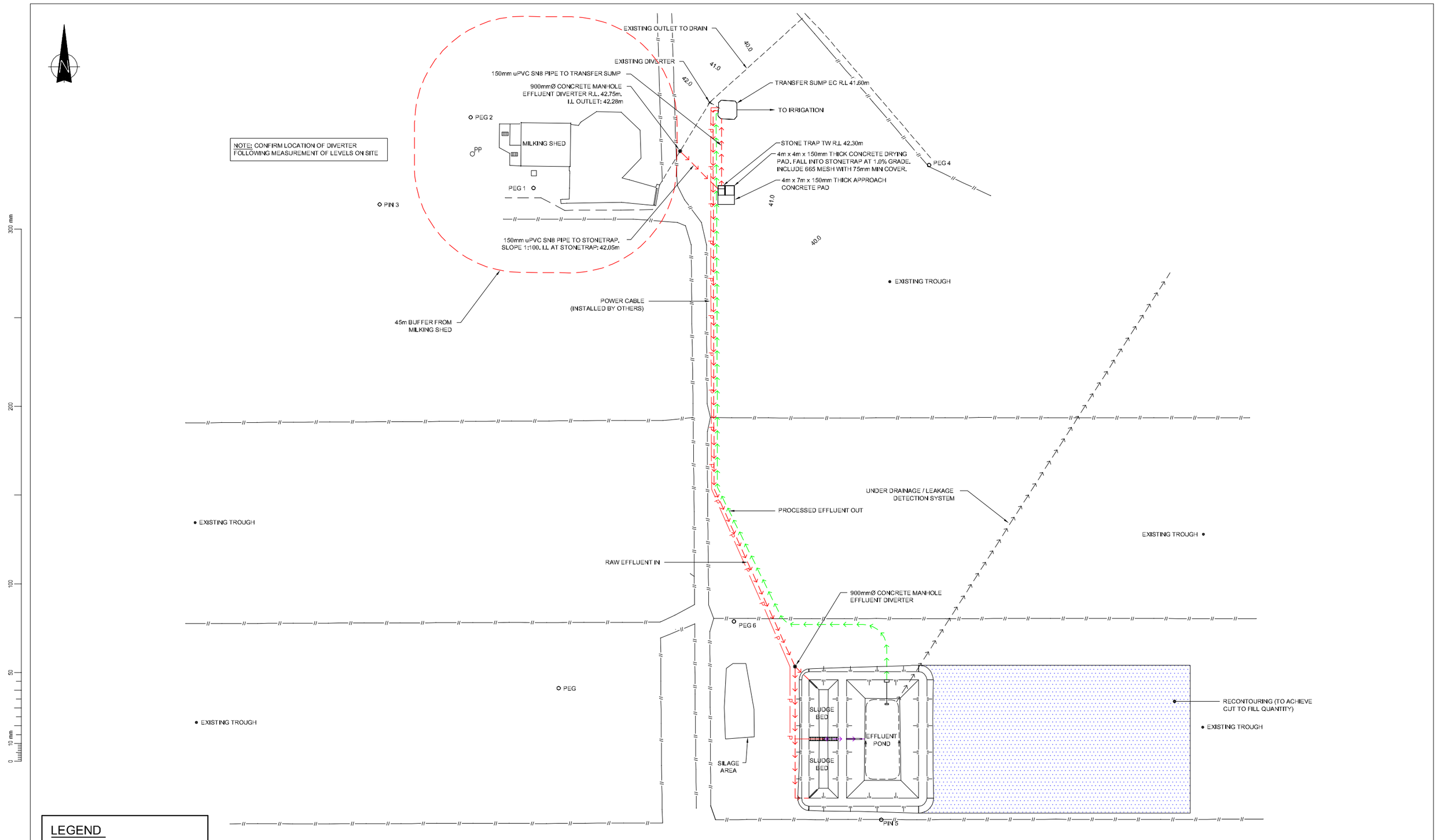
9 Certification

I *Rex Hylton Corlett MIPENZ CPEng* hereby certify that the following have been
Certifying Engineer

incorporated into the design and shall achieve the following outcomes:

- a leakage rate low enough to avoid environmental contamination;
- a floor level at a safe height above the water table;
- ongoing monitoring and maintenance undertaken by the consent holder is provided for; and
- regulatory requirements are met.

Signed _____ Date ____/____/____
Certifying Engineer



LEGEND

- STORED EFFLUENT OUT
- RAW EFFLUENT IN
- EFFLUENT FROM WEEPING WALL
- NEW POWER CABLE
- NEXUSCOIL (UNPUNCHED)
- NEXUSFLO (PUNCHED)
- EXISTING FENCE LINE
- TOP OF BANK
- BUFFER AREA
- RECONTOURING

A1 1:750
A3 1:1500
0 10 20 30 40 50 60 70 m

Coordinate Schedule

Northing	Easting	Level	Description
739629.00	305819.19	45.81	PEG
739840.48	305808.54	43.94	PEG 1
739870.37	305782.01	44.42	PEG 2
739850.21	305975.76	39.02	PEG 4
739657.24	305893.31	44.87	PEG 6
739833.51	305743.54	45.97	PIN 3
739573.36	305955.57	44.08	PIN 5

Revision	Amendment	Approved	Revision Date
R1	POND LINER DESIGN AMENDED	E.C.M	08/02/12

HILLVIEW DAIRYING LTD

OPUS
Invercargill Office
PO Box 647
Invercargill, NZ
Tel: 03 211 3580

Drawn	Designed	Approved	Revision Date
J.BURNS	R.CORLETT	R.CORLETT	25/02/2011

Project No.	Scale
VQ419.03	A1 1:750 A3 1:1500

CONSTRUCTION

Project
HILLVIEW DAIRYING LTD
EFFLUENT SYSTEM UPGRADE
140 COOPER RD, TUSSOCK CREEK

Sheet
SITE PLAN

Drawing No.	Sheet No.	Revision
7/808/512/7734	1	R1

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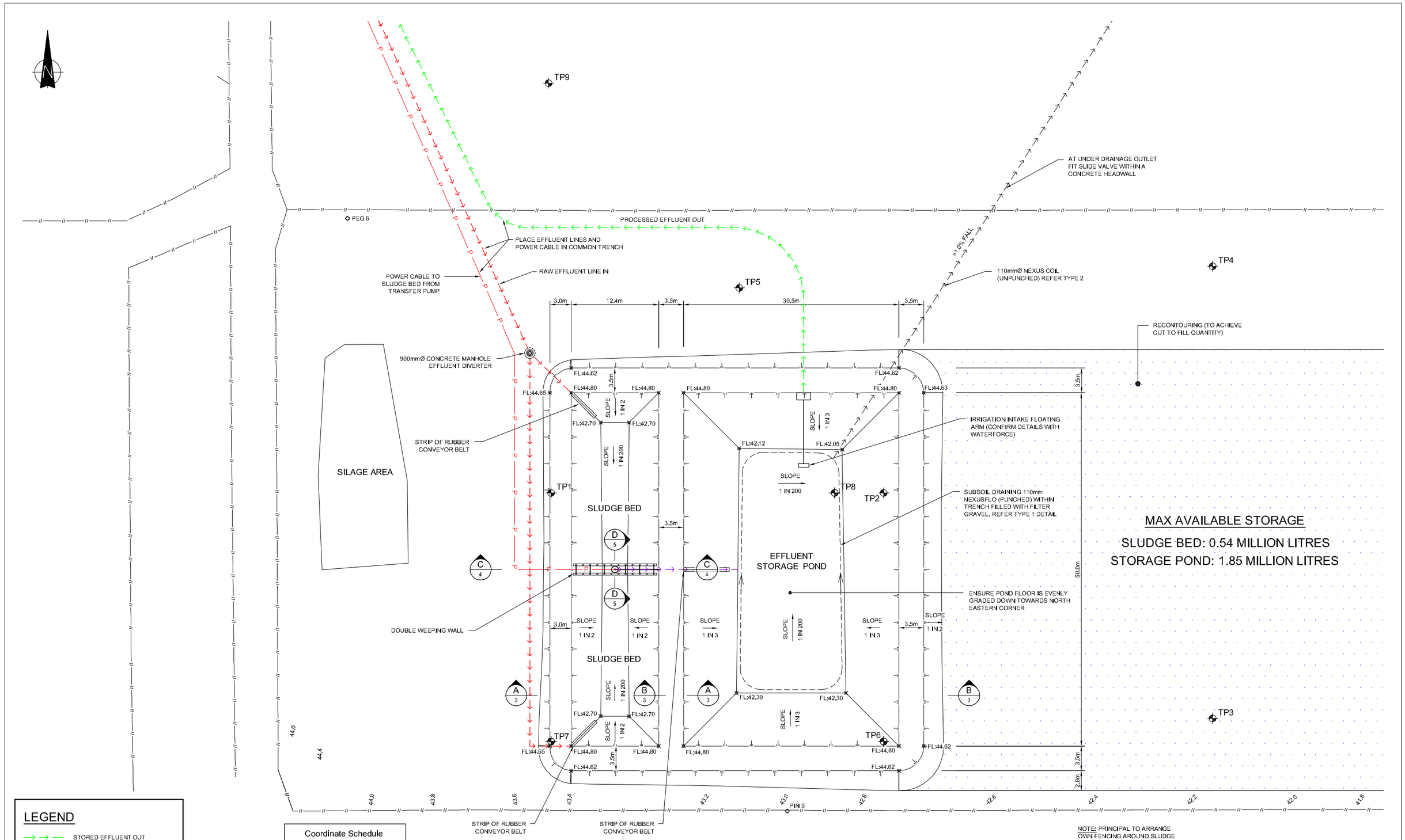

LEGEND

- STORED EFFLUENT OUT
- RAW EFFLUENT IN
- EFFLUENT FROM WEEPING WALL
- NEW POWER CABLE
- NEXUSFLOW (PUNCHED)
- NEXUSCOIL (UNPUNCHED)
- EXISTING FENCE LINE
- TOP OF BANK
- MANHOLE
- TP4 TEST PIT

A1 1:250
A3 1:500
0 4 8 12 16 20 24 m

Coordinate Schedule

Northing	Easting	Level	Description

CONSTRUCTION

Revision	Amendment	Approved	Revision Date
R1	POND LINER DESIGN AMENDED	E.C.M	08/02/12

HILLVIEW DAIRYING LTD

OPUS
Invercargill Office
PO Box 647
Invercargill, NZ
Tel: 03 211 3580

Drawn	Designed	Approved	Revision Date
J.BURNS	R.CORLETT	R.CORLETT	25/02/2011

Project No.	Scale
VQ419.03	A1 1:250 A3 1:500

Project: HILLVIEW DAIRYING LTD
EFFLUENT SYSTEM UPGRADE
140 COOPER RD, TUSSOCK CREEK

Sheet: POND PLAN

Drawing No.	Sheet No.	Revision
7/808/512/7734	2	R1

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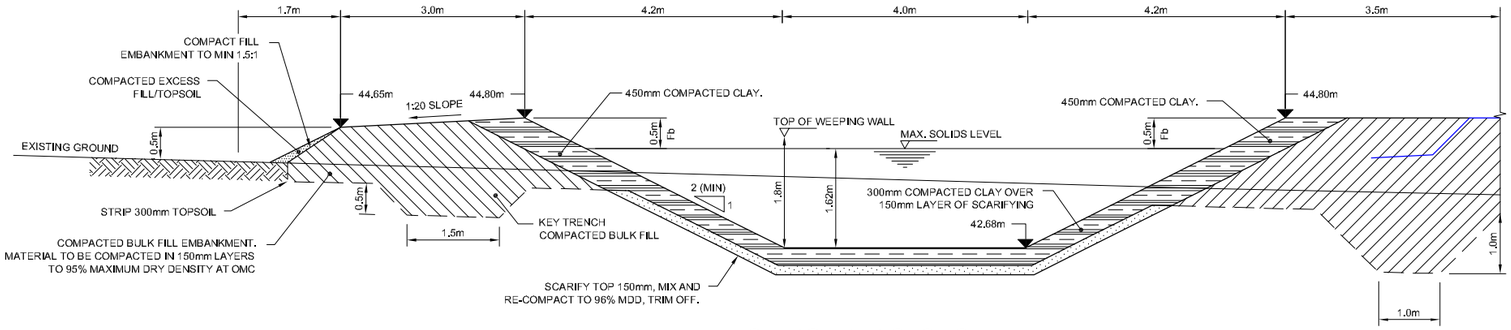
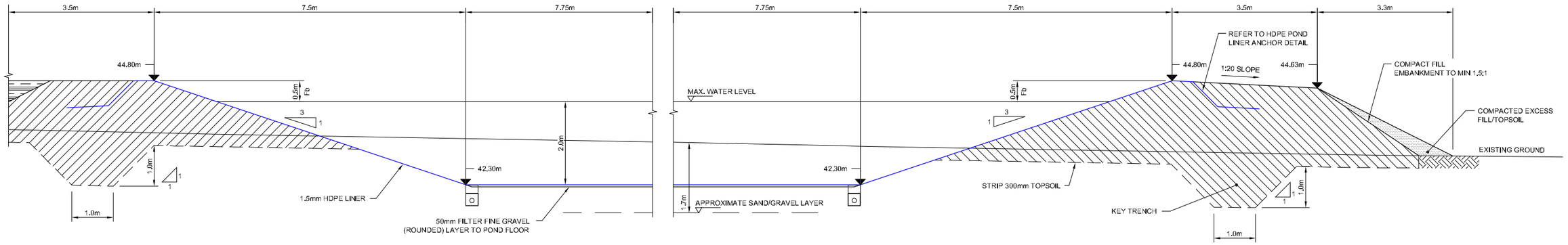


SLUDGE BED SECTION

A1 1:50 A3 1:100

A / 1



EFFLUENT POND SECTION

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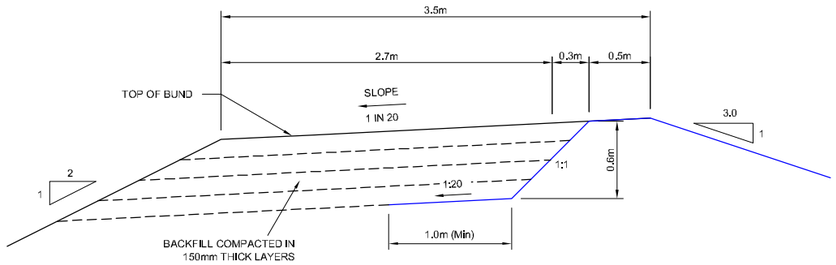
B / 2



HDPE POND LINER ANCHOR DETAIL

A1 1:25 A3 1:50

CONSTRUCTION

Revision	Amendment	Approved	Revision Date
R1	POND LINER DESIGN AMENDED	E.C.M	08/02/12

HILLVIEW DAIRYING LTD

OPUS
Invercargill Office
PO Box 647
Invercargill, NZ
Tel: 03 211 3580

Drawn	Designed	Approved	Revision Date
J.BURNS	R.CORLETT	R.CORLETT	25/02/2011

Project
HILLVIEW DAIRYING LTD
EFFLUENT SYSTEM UPGRADE
140 COOPER RD, TUSSOCK CREEK

Sheet
SLUDGE BED & EFFLUENT POND CROSS SECTIONS

Project No.	Scale	Drawing No.	Sheet No.	Revision
VQ419.03	AS SHOWN	7/808/512/7734	3	R1

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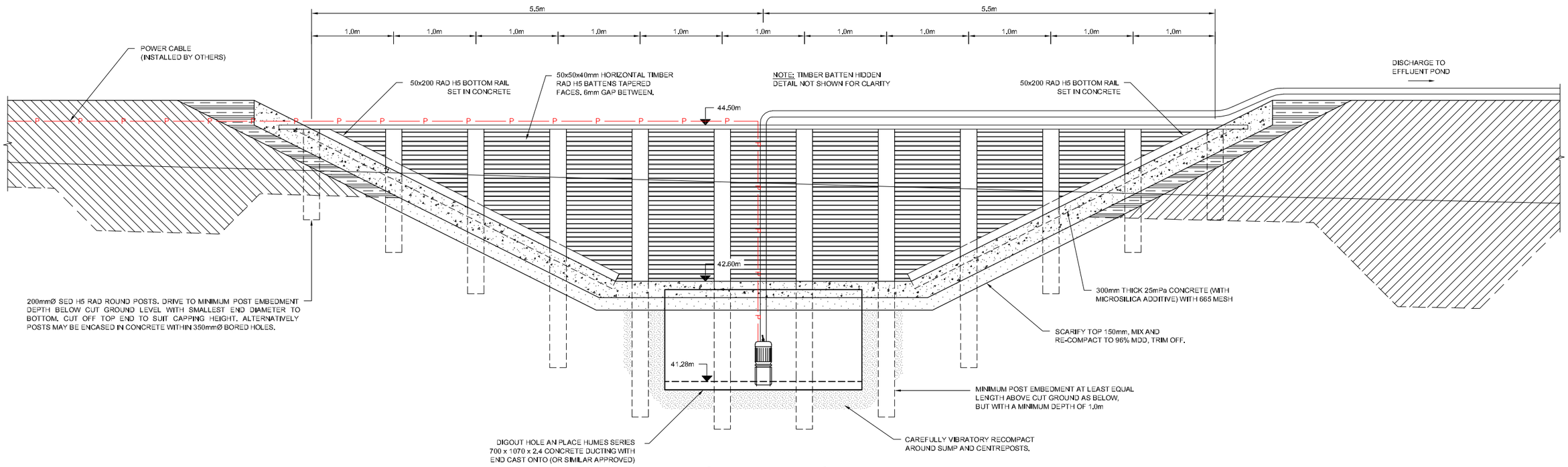
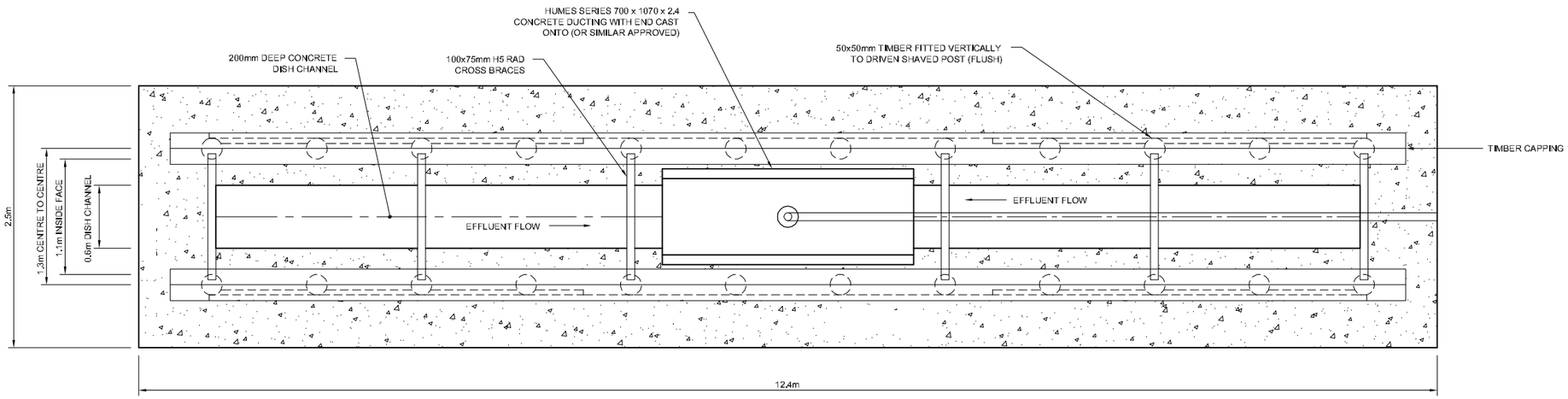


WEEPING WALL ELEVATION

C 2

A1 1:25 A3 1:50



WEEPING WALL PLAN

A1 1:25 A3 1:50

CONSTRUCTION

Revision	Amendment	Approved	Revision Date
R1	SLUDGE BED LEVEL LIFTED	E.C.M	08/02/12

HILLVIEW DAIRYING LTD

Invercargill Office
PO Box 647
Invercargill, NZ
Tel: 03 211 3580

Drawn	Designed	Approved	Revision Date
J.BURNS	R.CORLETT	R.CORLETT	25/02/2011

Project
HILLVIEW DAIRYING LTD
EFFLUENT SYSTEM UPGRADE
140 COOPER RD, TUSSOCK CREEK

Sheet
WEEPING WALL PLAN AND CROSS SECTION

Project No.	Scale	Drawing No.	Sheet No.	Revision
VQ419.03	A1 1:25 A3 1:50	7/808/512/7734	4	R1

A1 1:25
A3 1:50
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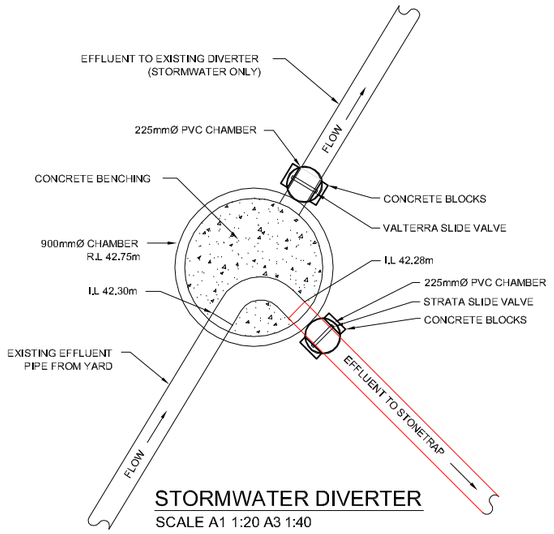
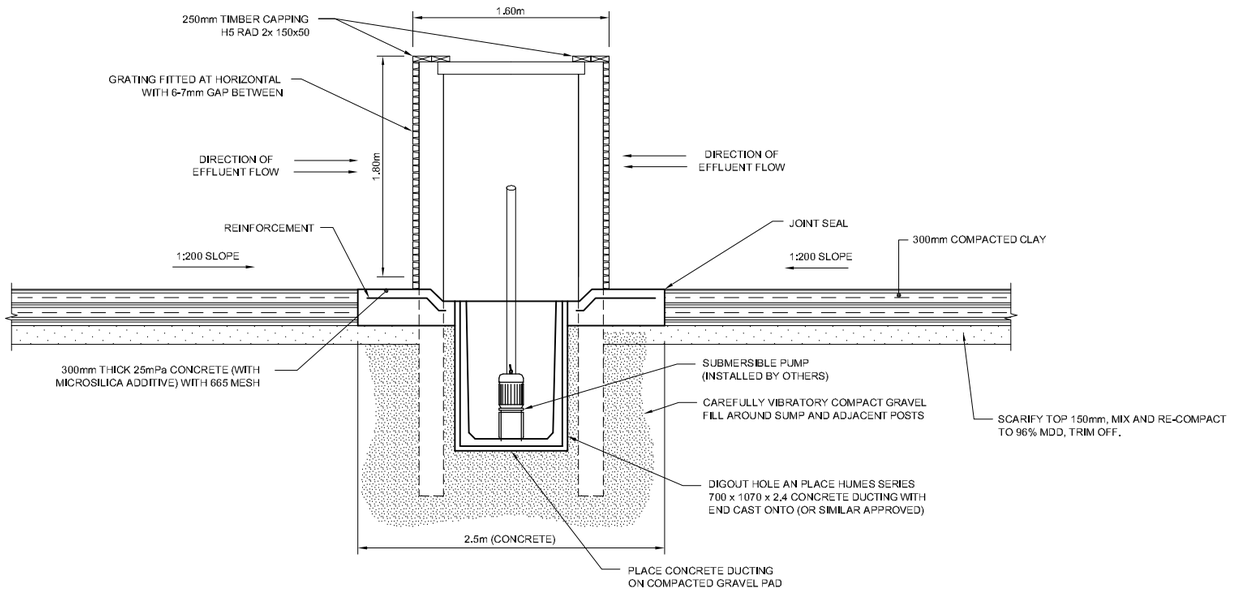
Original Sheet Size A1 [841x594] Plot Date 08/02/12 @ 11:31 g:\proj\edsdv\l3d\7_808\7_808_512_hillview dairies ltd\7_808_512_7734_1-5_r1.dwg - SHEET 4

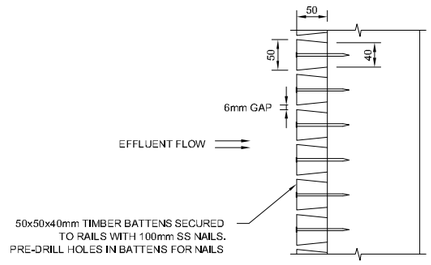


STORMWATER DIVERTER
SCALE A1 1:20 A3 1:40

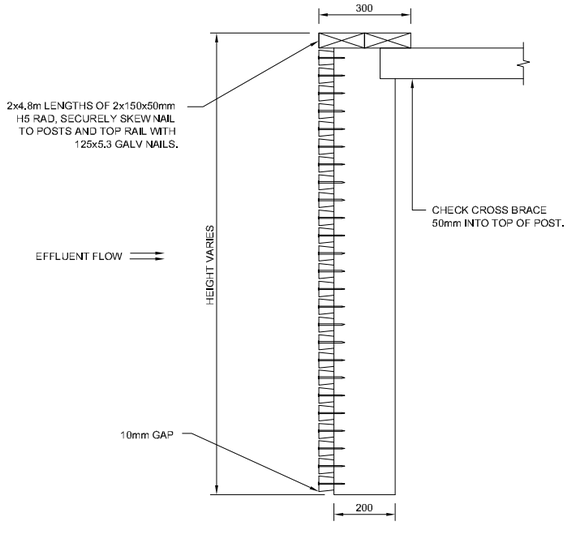


WEEPING WALL SECTION
A1 1:25 A3 1:50

D
2



BATTEN DETAIL
A1 1:5 A3 1:10



WEEPING WALL CROSS SECTION
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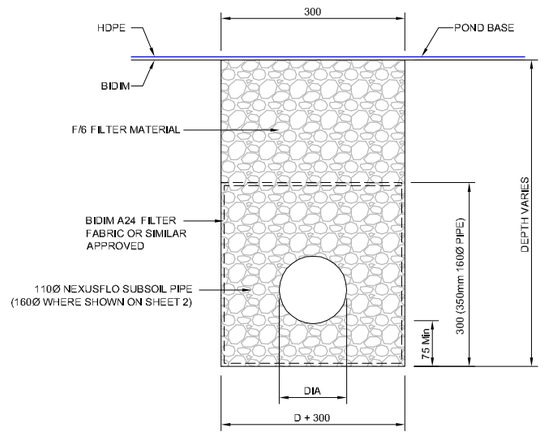
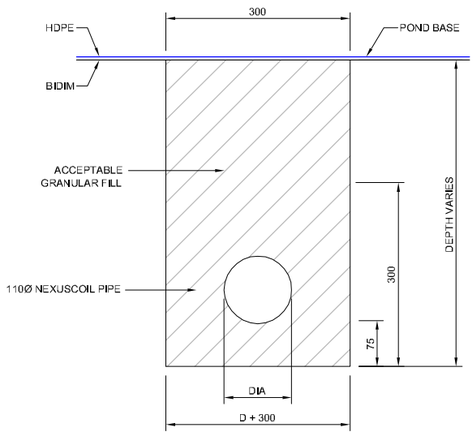


TYPE 1 - NEXUSFLO SUBSOIL PIPE BEDDING DETAIL
A1 1:5 A3 1:10



TYPE 2 - NEXUSCOIL PIPE BEDDING DETAIL
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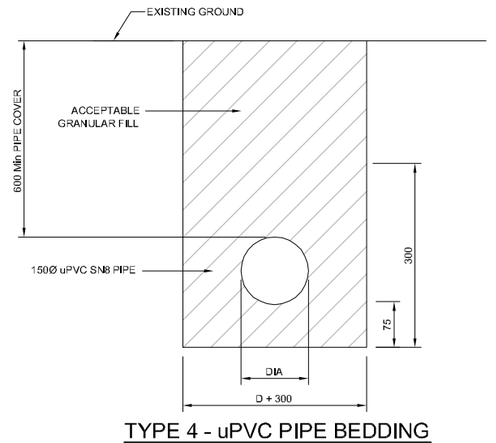

TYPE 4 - uPVC PIPE BEDDING DETAIL (PADDOCK)
A1 1:5 A3 1:10

CONSTRUCTION

Revision	Amendment	Approved	Revision Date
R1	SLUDGE BED LEVEL LIFTED	E.C.M	08/02/12

HILLVIEW DAIRYING LTD

OPUS
Invercargill Office
PO Box 647
Invercargill, NZ
Tel: 03 211 3580

Drawn	Designed	Approved	Revision Date
J.BURNS	R.CORLETT	R.CORLETT	25/02/2011

Project No.	Scale
VQ419.03	AS SHOWN

Project
HILLVIEW DAIRYING LTD
EFFLUENT SYSTEM UPGRADE
140 COOPER RD, TUSSOCK CREEK

Sheet
DETAILS

Drawing No.	Sheet No.	Revision
7/808/512/7734	5	R1

Original Sheet Size A1 [841x594] Plot Date 08/02/12 @ 11:31 g:\projects\vl3d\7_808\7_808_512_hillview dairies ltd\7_808_512_7734_1-5_r1.dwg - SHEET 5

Opus International Consultants Ltd
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New Zealand

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w: www.opus.co.nz

30 April 2013

Environment Southland
Private Bag 90116
Invercargill 9810
Attention: Compliance Manager

VQ419.03

To Whom it May Concern

K & S KILPATRICK - HILLVIEW DAIRYING LTD - FDE POND CONSTRUCTION - CERTIFICATION OF COMPLETION

Please find enclosed a producer statement for construction review by Rex Hylton Corlett of Opus International Consultants, for the construction of the farm dairy effluent (FDE) containment structure at 140 Cooper Road, Tussock Creek, these being:

Construction review was undertaken and certification for this construction review is provided in accordance with Condition 3(b) and (c) of Land Use Consent 300236 (ES File Ref: K058-001) as follows:

3. ...

(b) The supervising suitably qualified person shall, upon completion of the construction, certify in writing to Southland Regional Council's Compliance Manager that the pond has been designed and constructed in accordance with the conditions of this consent and the "Environment Southland Code of Practice for Design and Construction of Agricultural Effluent Ponds, March 2009" or equivalent.

(c) No effluent may be stored in the pond until the certification is received by the Council's Compliance Manager.

It is noted that the consent holder obtained two extensions in the timeframe for the construction of the FDE pond, firstly to 17 April 2011 and latterly to 31 March 2012.

Further, Opus advised Council's Compliance team of the completion of the pond to a satisfactory standard for use in accordance with Condition 7 of Discharge Permit 300235 but that practical completion of all earthworks was still required for construction certification as required under Land use 300236, Condition (3) above (see email Friday, 10 August 2012 2:35 p.m. Subject: 'Hillview Dairying Ltd').

If you have any queries, please contact me on (03) 211 3580.

Yours sincerely

Rex Corlett
Chartered Professional Engineer

cc: G & S Kilpatrick Family Trust, 488 Forest Hill Crossing Road, RD 1, WINTON 9781

Appendix B2 – FORM OF PRODUCER STATEMENT FOR: CONSTRUCTION REVIEW OF FARM DAIRY EFFLUENT PONDS

ISSUED BY Opus International Consultants Ltd (Construction Review Firm)

TO G & S Kilpatrick Family Trust
(Owner/Developer)

TO BE SUPPLIED TO Environment Southland (Consent Authority)

IN RESPECT OF Construction of a pond for agricultural effluent storage (Description of Contract Works)

AT 140 Cooper Road, Southland (Address)

Opus International Consultants Ltd (Design Firm)

65 Arena Avenue, PO Box 647, Invercargill 9840

has been engaged by G & S Kilpatrick Family Trust (Principal)

to carry out construction monitoring in accordance with Condition(s) Landuse consent conditions 3 (a) and (b)

Of council decision on Resource Consent Application K058-001

I (Suitably Qualified Person), Rex Hylton Corlett a duly authorised representative of

Opus International Consultants Ltd (Design Firm)

CPEng, MIPENZ (Qualifications)

CPEng [✓]

ETPract [ ]

IPENZ Member No. 192884

Believe on reasonable grounds that the pond structure(s) when constructed in accordance with the drawings, specifications and other documents provided or listed , will comply with the relevant codes and rules stated below.

[ ] All [✓] Part only, of the building works has been completed in accordance with the relevant consents.

IPENZ Practice Note 21: Code of Practice for the Design and Construction of Farm Dairy Effluent Ponds

(Signature of Authorised Representative)

12 February 2013 (Date)