30 August 2021

Landpro Reference: 20554
Council Reference: App-20211092

Environment Southland
Private Bag 90116
Invercargill, 9840

Dear, Jade

Re: Request for Further Information under Section 92(1) of the Resource Management Act 1991 – Application for Titipua Dairies Ltd

In reference to your request for further information dated 9 June, please find outlined below our response to this request.

1 A visual inspection of the sludge beds and weeping wall.

The applicant has decided to renew their discharge and water permit together with their Rule 20 expansion application. The visual inspection results are found in Appendix C of this application, attached.

2 Confirmation of a leak detection system.

Pond design drawings are found in Appendix A of the attached application for the discharge and water permit renewal.

3 Updated DESC.

An updated DESC is found in Appendix B of the attached application for the discharge and water permit renewal.

0800 023 318
13 Pinot Noir Drive
PO Box 302
Cromwell 9342
Central Otago, NZ
info@landpro.co.nz
landpro.co.nz

4 An application depth and rate test for the travelling irrigator.

The applicant is waiting for contracts to come to farm and test the travelling irrigator depth and rate. They are happy for this to be a consent condition to keep the process rolling.

5 Confirmation all waterways are fenced with a 3m setback to exclude all stock from waterways.

Existing fencing on the dairy platform is between 1-1.5m setback from waterways. Fencing on the Scharma block is between 1-5m. As required by Regulations 9 and 11 of the Resource Management Stock Exclusion Regulations 2020 any new fencing will have a 3 metre setback. As per Schedule 1, Part 1 (1) existing fencing is exempt from these regulations.

6 Confirmation the feed pad is a non-complying activity.

The feed pad is a non-complying activity under the National Environmental Standards for Freshwater Management 2020 as they are not able to comply with regulation 10(3)(a), i.e., the base of the feedlot is not sealed to a minimum permeability standard of 10^{-9} m/s. The edges of the feedlot are nibbed and the feed lot is at a lower elevation to the surrounding land meaning that over flow is unlikely. The feedlot has a slight decline where effluent can make its way to the end of the feed pad where it is collected and pumped to the effluent pond. Regulation 10(3)(b) and 10(3)(c) are both met.

7 Confirmation 12 ha is the largest area per year of crop the applicants will use during the life of the consent

The applicant confirms that 12ha is the largest area per year that they will have in crop for the lifetime of the consent.

8 An assessment against Policy 4 of the National Policy Statement for Freshwater in regard to an increase in GHG emissions.

Policy 4 of the National Policy Statement for Freshwater Management 2020 states: '*Freshwater is managed as part of New Zealand's integrated response to climate change.*

As part of this proposal it is estimated that there will be a 6.7% decrease in nitrogen losses and a 11.2% decrease in phosphorus. These decreases are estimated to contribute to an improvement in water quality.

He Waka Eke Noa requires that by the end of 2021, 25% of farms will know their green house gas emission amount. As part of this application the applicant has modelled their emissions and therefore is complying with this. As part of He Waka Eke Noa, the applicant will work towards reducing their green house gas emissions within appropriate timeframes, currently advice and requirements around this have not been released.

He Waka Eke Noa accounts for the agricultural emissions, methane and nitrous oxide. CO2 is covered by the emissions trading scheme. The increase in CO2 as part of this application will be accounted for under this, i.e. fuel used on farm etc, and the company supplying the fuel is responsible for this.

This application is consistent with Policy 4 of the NPS, there is a decrease in nitrogen and phosphorus losses, resulting in an increase in water quality. The applicant is compliant with He Waka Eke Noa, as they are part of the 25% of farms that know their emission output and as such are consistent with New Zealand's integrated response to climate change.

9 Confirmation a variation application will be submitted to include the feed pad effluent

Attached is an application for the renewal of the discharge and water permit. Including in the discharge permit renewal is the addition of the effluent from the feed pad.

10 Address concerns raised in the audit of the nutrient budget

Attached is a memo from Mo Topham outlining the consents that were raised as part of the nutrient budget audit.

I trust that the information set out above satisfies the request for further information. However, if you have any further queries, please do not hesitate to contact me.

Kind Regards

Matilda Ballinger

Matilda Ballinger

Planner

LANDPRO

Make the most of your land

Resource Consent Application to Environment Southland

To replace Discharge Permit AUTH-301081-V1

and Water Permit AUTH-301082-V1

Prepared for Titipua Partnership Limited

Prepared For

Titipua Partnership Limited

Prepared By

Landpro Ltd
13 Pinot Noir Drive
PO Box 302
Cromwell
Tel +64 3 445 9905

QUALITY INFORMATION

Reference:	20554 - Titipua Partnership Limited- Assessment of Environmental Effects
Date:	30 August 2021
Prepared by:	Andrea Richardson
Reviewed by:	Matilda Ballinger
Client Review:	
Version Number:	FINAL

TABLE OF CONTENTS

1. INTRODUCTION 1
   1.1 Overview of proposal 1
   1.2 The Applicant 2
   1.3 Purpose of documentation 2
2. DETAILS OF PROPOSAL 3
   2.1 Location 3
   2.2 General Property Details 3
   2.3 Details of Activities 5
      2.3.1 Discharge of dairy effluent 5
      2.3.2 Take and use of groundwater 8
3. DESCRIPTION OF EXISTING ENVIRONMENT 10
   3.1 Land use and topography 10
   3.2 Climate 10
   3.3 Soils and physiographic zones 10
      3.3.1 Soils 10
      3.3.2 Physiographic zones 11
      3.3.3 Farm Dairy Effluent Classification 13
   3.4 Water resources 13
      3.4.1 Groundwater 13
      3.4.2 Surface waterways 17
      3.4.3 Surface water quality 17
      3.4.4 Estuary 19
4. ACTIVITY CLASSIFICATION 20
   4.1 Consents required 20
   4.2 Ancillary activities 22
   4.3 Consents not required 22
5. NON-NOTIFICATION & CONSULTATION 24
6. ASSESSMENT OF ENVIRONMENTAL EFFECTS 24
   6.1 Discharge of Agricultural Effluent 24
      6.1.1 Effluent Storage 25
      6.1.2 Effluent Application Area, Depth/Rate and Timing 25
      6.1.3 Effluent Nitrogen Loading 27
      6.1.4 Effluent Irrigation Area 28
      6.1.5 Effects on Groundwater Quality from Effluent Disposal 28
      6.1.6 Odour 30
      6.1.7 Contingency Plans 30
      6.1.8 Monitoring 30
   6.2 Groundwater Abstraction 31
      6.2.1 Allocation 31
      6.2.2 Stream Depletion and Interference Effects 31
      6.2.3 Effects on Groundwater Quality 31
      6.2.4 Efficiency of Use 32
      6.2.5 Monitoring 32
   6.3 Archaeological effects 32

6.4 Cumulative Effects 32
6.5 OverseerFM Modelling and Good Management Practices 33
6.6 Other Assessment Matters 34
6.7 Assessment of Alternatives 36
6.8 Summary 36
7. STATUTORY CONSIDERATIONS 37
7.1 Part 2 of the RMA 37
7.2 Section 104(1) of the RMA 38
7.2.1 National Policy Statement for Freshwater Management 2020 39
7.2.2 Regional Plans and Te Tangi a Tauira 42
7.3 Sections 105 and 107 of the RMA 47
8. CONSENT DURATION, REVIEW AND LAPSE 47
8.1 Consent Duration 47
8.2 Review of Lapse 49
9. CONCLUSION 49

LIST OF APPENDICES

Appendix A: Original Effluent Pond Design Drawings

Appendix B: Dairy Effluent Storage Calculations – Original and Current

Appendix C: Visual Assessment Report

Appendix D: Peer Review of Visual Assessment Report

Appendix E: Map of Effluent Discharge Area

1. INTRODUCTION

1.1 Overview of proposal

Titipua Partnership Limited (the applicant) owns and operates a dairy farm located at 354 Hedgehope Block Road, Hedgehope, approximately 23 km northeast of Invercargill. The property currently operates as a 181.5 ha dairy farm.

The applicant holds discharge permit AUTH-301081-V1 which authorises the discharge of dairy effluent to land and water permit AUTH-301082-V1 authorises the taking of groundwater at this farm. These consents expire on 1 September 2022.

Effluent is collected at the dairy shed, yard and feed pad, and is stored in an effluent pond and sludge beds. The pond and sludge beds have recently passed a visual inspection to confirm there are no visible cracks, holes or defects that would allow effluent to leak from the effluent storage facility. The applicant has sufficient effluent storage in the pond and sludge beds, as per a recent Dairy Effluent Storage Calculation report. The amount of dairy shed effluent disposed of onto land does not exceed that from 600 cows. Effluent is discharged to approximately 100 ha of land via a low-rate cobra travelling irrigator (and/or other low-rate effluent irrigation system).

The existing water permit authorises groundwater abstraction from bore E46/1068 on the property at up to 72,000 L/day. No changes are sought to the existing effluent discharge area or rate of groundwater take.

This application seeks the following resource consents:

- replacement of discharge permit AUTH-301081-V1 for the discharge of dairy effluent to land, with a variation to add the discharge of feed pad effluent; and
- replacement of water permit AUTH-301082-V1 for the taking of groundwater for dairy operations and stock drinking water.

The applicant may continue to operate under the existing effluent discharge and water permits until the new consents are granted under s124 of the RMA.

The applicant has also lodged a consent application (APP-20211092) that seeks to use land for farming, to use land for dairy support and to use land for a feed pad. That application includes the applicant's Farm Environmental Management Plan and nutrient budget. That application covers the applicant's proposal to expand their existing dairy platform onto a neighbouring 84 ha block of land, known as the "Schrama Block", which is owned by the applicant. No farm dairy effluent will be discharged onto the Schrama Block.

1.2 The Applicant

Applicant Address: 354 Hedgehope Block Road
Hedgehope, 9872

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

1.3 Purpose of documentation

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

2. DETAILS OF PROPOSAL

2.1 Location

The farm is located at 354 Hedgehope Block Road, Hedgehope, 23 km northeast of Invercargill, as shown in Figure 1 below. The farm is situated in the Titipua Stream catchment.

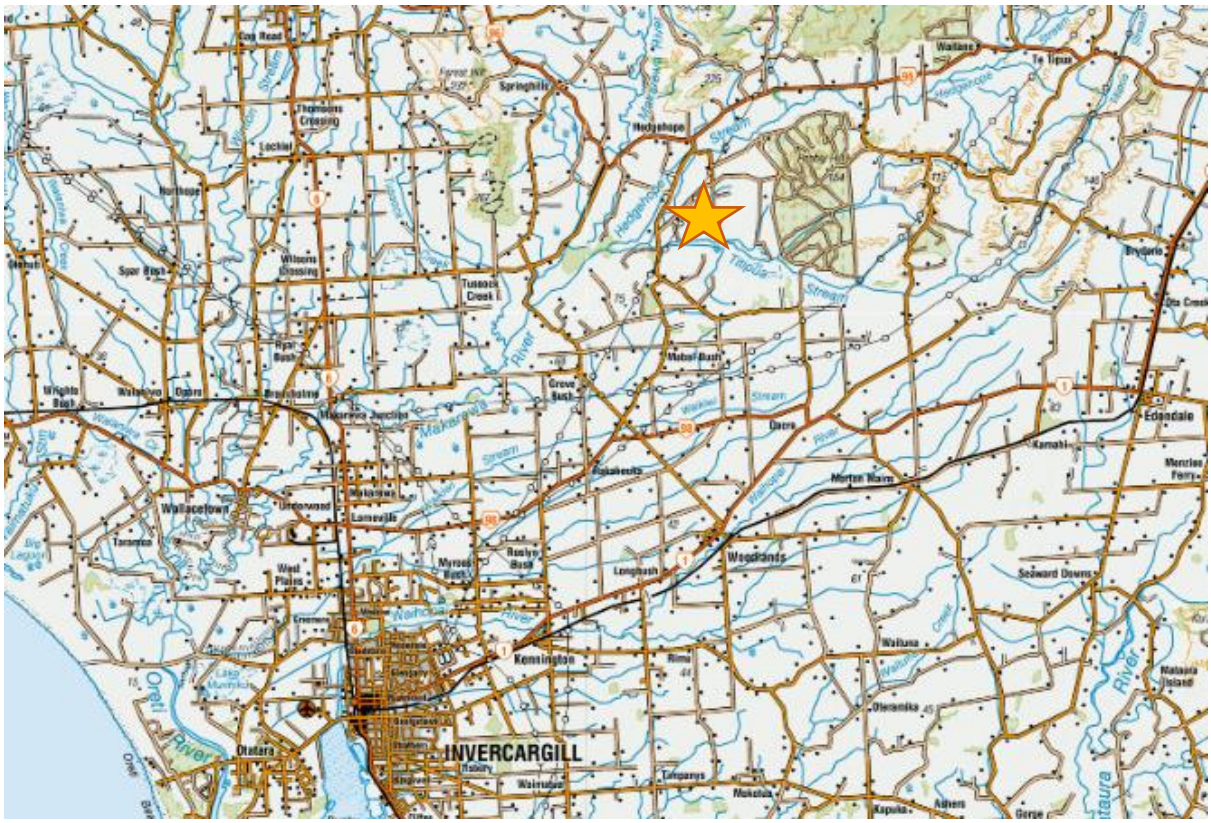


Figure 1: Location of property *(Source: NZTopoMap).*

2.2 General Property Details

Table 1: Land Use consent for Farming

Farm Details		
Farming Operation	Dairy	
Address	354 Hedgehope Block Road	
Property owner(s)	Titipua Partnership Limited	Titipua Partnership Limited
Legal Description	<u>Original Farm</u> Lot 2 DP 420431 Lot 1 DP 470872 Lot 3 DP 1494 Lots 1 and 2 DP 386399	<u>Schrama Block</u> Lot 1 DP 4406

	Lot 2 DP 4406	
Total Area	181.5 ha (dairy platform) + 84.2 ha (Schrama Block) = 265.7 ha total	

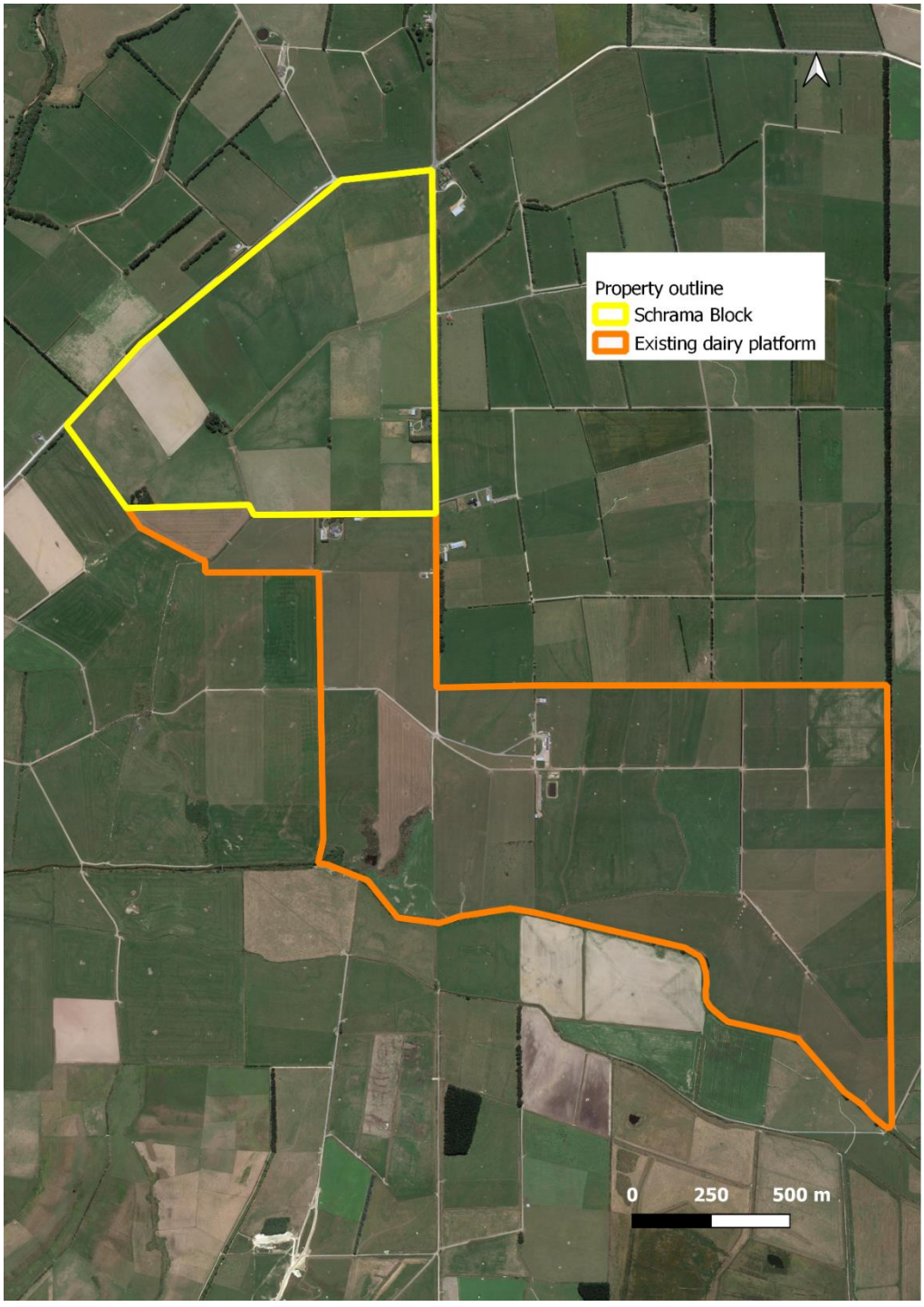


Figure 2: Map showing the extent of the existing dairy platform and the Schrama Block (Source: Beacon).

2.3 Details of Activities

This subject application seeks the following resource consents:

- replacement of discharge permit AUTH-301081-V1 for the discharge of dairy effluent, with the addition of the discharge of effluent from a feed pad; and
- replacement of water permit AUTH-301082-V1 for the taking of groundwater for dairy operations and stock drinking water.

As set out in the associated consent application APP-20211092, the applicant wishes to expand their existing 181.5 ha dairy platform onto a neighbouring 84.2 ha block of land, known as the "Schrama Block". That application seeks consent for the following:

- to use land for dairy farming (that did not exist as of May 2016);
- to use land as dairy support (Schrama Block);
- to convert land on farm to dairy farmland; and
- to use land for a feed pad/lot.

The applicant proposes to milk up to 600 cows across the new extended dairy platform. However, the effluent disposal area of approximately 100 ha will not increase from that consented under AUTH-301081-V1 and no effluent disposal will occur on the Schrama Block.

2.3.1 Discharge of dairy effluent

Table 2: Effluent Storage and Discharge activities

Discharge Permit Details	
Permit no.	AUTH-301081-V1
Number of dairy cows	600
Stocking rate (cows/ha)	3.3
Winter milking?	No milking between 20 June and 20 July other than slipped cows
Wintering barn?	No
Feed pad/standoff pad?	Yes - The feed pad is 110m x 13m, split into two pens.
Type of shed	44 aside herringbone shed
Effluent sources	Dairy shed, yard, feed pad
Greenwash	Yes – greenwash used at the dairy shed 40 L/cow/day
Effluent treatment	Weeping wall
Storage available	2,392 m^3
Disposal area	99.7 ha
Irrigator proposed	Low-rate cobra travelling irrigator (and/or other low-rate irrigation system)
Application rate and depth	10mm/hr rate and 10mm depth per application

Monitoring	Soil moisture conditions assessed by reference to Environment Southland Beacon website before effluent application.

Effluent at the dairy shed and yard gravity flows to two sludge beds. Nib walls and sumps allow full capture of effluent from the yard areas and shed platforms. The sludge beds are clay-lined, and in parallel, with parallel weeping walls that divide the beds. Having passed through the weeping walls, the filtered effluent is pumped to the effluent pond.

The pond is synthetically lined and includes a leakage detection system around the perimeter of the pond, as shown on the pond construction plans (refer Appendix A). The pond holds at least 2,320 m^3 of effluent, which is sufficient to contain the 90th percentile as determined by the Dairy Effluent Calculator Report (DESC), attached in Appendix B.

The pond and southern sludge bed have recently (16 June 2021) been visually assessed by a Suitably Qualified Person, Q Scandrett of Dairy Green Ltd, who confirmed that no visible cracks, holes or defects were evident that would allow effluent to leak from the effluent storage system. The pond's leak detection drainage was also identified and inspected during the visual inspection. The Visual Assessment report was peer reviewed by a Chartered Professional Engineer, Colin Macdiarmid of GeoSolve, who agreed with the conclusions reached and recommended that the northern sludge bed be inspected when emptied. The Visual Assessment report and peer review by Chartered Professional Engineer are contained in Appendices C and D, respectively.

The effluent disposal area is 99.7 ha. The filtered effluent is pumped from the pond on all suitable days and discharged to land via low-rate 'cobra' travelling irrigation system (and/or other low-rate effluent irrigation system). When the ground is at or near field capacity, there is enough buffer storage in the pond that irrigation is not required. The maximum application depth of 10 mm and instantaneous rate of application of 10 mm/hr is proposed to continue on farm.

The existing transfer pump at the weeping wall has a level sensor alarm system installed so that there is early warning of any problems prior to it overflowing. The effluent irrigation system has an automatic cut-off for pressure and flow abnormalities due to breakdown of the pipework or irrigators.

A feed pad is situated to the west of the effluent pond beside a shelter belt. The feed pad is 110m x 13m, split into two pens. A woodchip/bark base is used for bedding and cows are fed silage and hay. The feed pad is used in early spring and during adverse weather. The feed pad naturally slopes to the south and effluent is captured by drains in the pad and collected in a concrete tank. A pump transfers the effluent to the effluent storage pond. The feed pad is not used for more than 3 continuous months and is located approximately 300m from the nearest waterway. The feed pad is unlikely to receive overland flow from surrounding land, and all runoff and effluent from each feed pad is gravity fed directly to the effluent storage pond. Solid effluent is scraped from the feed pad and disposed to land.

Silage is stacked on a rock/limestone pad (30m x 14m) with earth banks on 3 sides. The stack is over 600m

from the Titipua Stream. Silage leachate and runoff from the silage stack does not discharge into the effluent storage system.

Figure 3: Layout of effluent system (source: Google Earth)

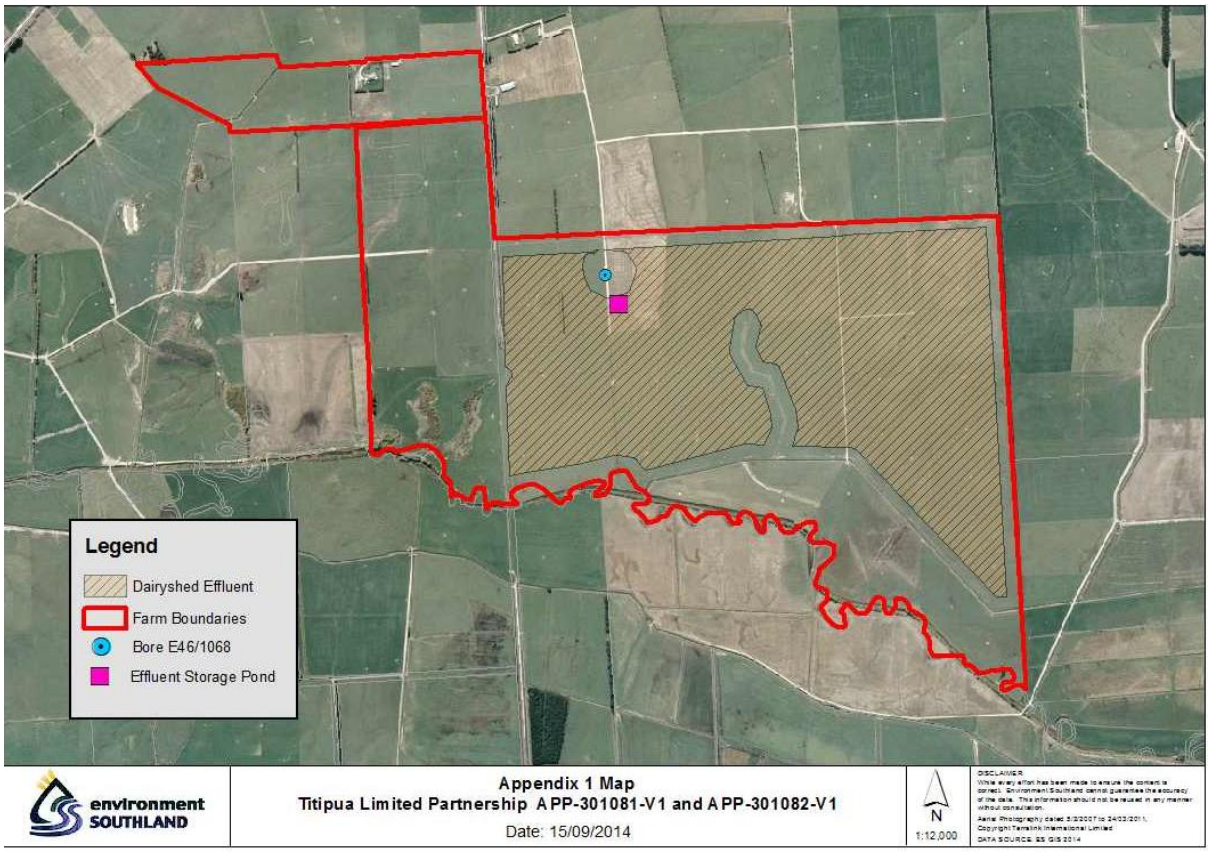


Figure 4: Proposed effluent discharge area (as per Appendix 1 of existing consent APP-301081-V1)

2.3.2 Take and use of groundwater

Table 3: Summary of Water Take and Use details

Water Permit Details	
Permit no.	AUTH-301082-V1
Bore	E46/1068, at or about NZTM 1257613E 4869560N
Freshwater Management Unit	Oreti
Groundwater Zone	Makarewa
Average rate of take over 24 hours	<2L/s
Daily volume	72,000 L/day
Allocation per cow	120 L/day
Yearly volume (m^3/year)	26,280 m^3
Discretionary allocation limit for groundwater zone (m^3/year)	RWP – 49,065,000 m^3 PSWLP – 62,670,000 m^3
Amount currently allocated from groundwater zone, including current permit (m^3/year)	RWP – 4,004,891 m^3 PSWLP – 3,085,440 m^3 As of November 2020.

Groundwater for dairy shed operations and stock drinking water is pumped from a bore west of the dairy shed (Well E46/1068). The bore is capped and protected from stock or other sources of contamination, as

shown in the below photograph. The water take is metered, with volumes recorded each month as per the conditions of existing consent AUTH-301082-V1.

Figure 5: Location of Bore E46/1068 in relation to Hedgehope Block Road (Source: ES Beacon)

Figure 6: Photograph of Bore E46/1068 (Source: Tiaki Farm Environment Plan)

Compliance

The applicant has demonstrated good compliance with their water permit AUTH-301082-V1 and discharge permit AUTH-301081-V1. Compliance commentary for AUTH-301081-V1 identifies a very tidy and well-maintained effluent system.

3. DESCRIPTION OF EXISTING ENVIRONMENT

3.1 Land use and topography

The property currently operates as a 181.5 ha dairy farm. The 84 ha Schrama Block was purchased by the applicant in 2020. The applicant proposes to incorporate the Schrama Block into their milking platform, milking up to 600 cows across the extended platform. An application for this expansion is currently with council.

The farm is generally 40 meters above sea level. The property is generally rolling with some flat areas.

3.2 Climate

The area receives on average 1121-1130mm of rain per annum[1] and is in a moderately wet part of the Southland Region that experiences modest climate extremes with wet and dry conditions. Average temperature on the property is 10 degrees Celsius. The area experiences early frosts in April to May, with late frosts uncommon, although these can occur in early October.

3.3 Soils and physiographic zones

3.3.1 Soils

Environment Southland's Beacon indicated that there are primarily Pukemutu soils across the dairy effluent discharge area. Makarewa and Titipua soils are located in the south-eastern tip of the discharge area.

Table 4: Summary of Soils, Physiographic Zone(s) and Risks at the Mapped Discharge Area

Soil Characteristics			
	Vulnerability Factors		
Soil type	**Structural compaction**	**Nutrient Leaching**	**Waterlogging**
Pukuemutu	Severe	Slight	Severe
Makarewa	Moderate	Slight	Severe

[1] As per the OverseerFM report attached to the applicant's associated land use consent application.

Titipua	Minimal	Slight	Severe

Pukemutu

Typically, a heavy silt loam, increasing to silty clay in the lower subsoil. Pukemutu soils have a moderately deep potential rooting depth that is severely restricted by the fragipan at 60-90cm depth. This fragipan means that there is typically a moderately high to high plant available water. There is typically poor drainage, very slow permeability in the subsoil and limited aeration during sustained wet periods. The structural compaction and water logging vulnerability is severe, and the nutrient leaching vulnerability is slight.

Makarewa

Texture of Makarewa soils is variable with layered texture profiles common, there is always at least one horizon with silty clay texture. The soils have poor drainage, slow subsoil permeability and may have poor aeration during wet periods. They have a deep rooting depth and moderately high available soil water. Structural compaction vulnerability is moderate, nutrient leaching vulnerability is slight and waterlogging vulnerability is severe.

Titipua

A silt loam to silty clay soil. Titipua soils have poor drainage and slow subsoil permeability. They have a deep rooting depth and very high available soil water. There may be limited aeration during wet periods. The structural compaction vulnerability and the nutrient leaching vulnerability is minimal/slight, and the waterlogging vulnerability is severe.

3.3.2 Physiographic zones

The proposed dairy effluent discharge area (refer to the mapped area in Appendix E) occurs within the Lignite/Marine Terraces and the Peat Wetlands Physiographic Zones. [2]

The Lignite/Marine Terraces physiographic zone comprises predominantly low elevation land, flat to gently undulating, where the geology has high organic content which has a strong influence over groundwater quality. This zone can have high denitrifying potential in groundwater in areas close to organic carbon sediments. Overland flow is common in this zone in areas that are poorly drained and sloping.

Peat Wetlands physiographic zone comprise predominantly low-lying flat land. This zone is characterised by soils which have extremely acidic soils which are prone to waterlogging. Often there is a seasonal water table that sits close to the ground surface resulting in seasonal ponding and overland flow to nearby streams. There is a high soil and aquifer denitrification potential in this zone.

[2] Environment Southland Physiographic Zone Fact Sheets (2015).

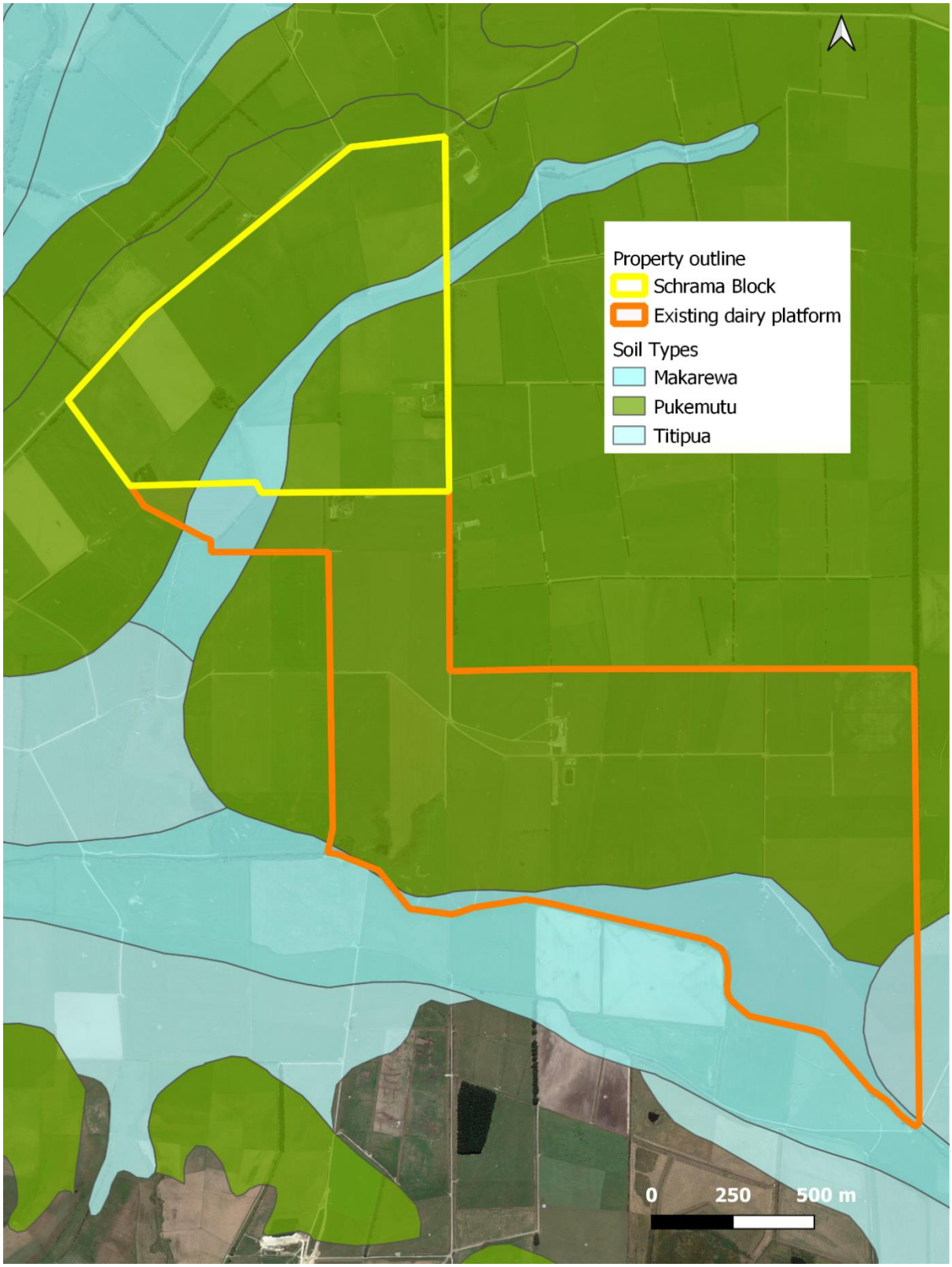


Figure 7: Soil types on the property, noting that the effluent discharge only occurs within a portion of the existing dairy platform to the east of Hedgehope Block Road and not within the Schrama Block (Source: S-Map).

3.3.3 Farm Dairy Effluent Classification

Table 5: Minimum Management Criteria for land applied effluent systems 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

Environment Southland's Beacon indicated that the effluent disposal area is primarily on soil/landscape category C (sloping land > 7 degrees), as identified on Map 1 of Appendix N of the RWPS. The soil/landscape at the south-eastern tip of the effluent discharge area is mapped as category A (artificial drainage or course soil structure). As per Table 1 of Policy 42 of the Regional Water Plan for Southland, the recommended depth of effluent application for soil/landscape categories A and C is less than soil water deficit.

3.4 Water resources

3.4.1 Groundwater

The property is within the Makarewa Groundwater Management Zone (GMZ). According to Environment Southland GMZ Factsheet, the typical properties of the Makarewa GMZ are as follows[3]:

- The zone has an area of 66,000 ha and typical depth to water of 2m – 10 m;
- Groundwater flow direction generally occurs obliquely to individual hydraulically connected surface waterways.

[3] https://www.es.govt.nz/environment/water/groundwater/groundwater-management-zones/makarewa (accessed 16/07/2021)

- The zone has a low water allocation status, indicating it is plentiful.
- The majority of recharge is infiltration of local rainfall. Average annual rainfall recharge is estimated at 272 mm /year.
- Groundwater quality in this zone may be compromised by elevated nitrate and microbial contamination levels in some locations.

The figure below shows the estimated groundwater flow direction. Topographic contours show the southern and western end of the property being lower elevation than the northern proportion of the property. This indicates that if following general topographic gradient, groundwater flow would be towards the south-west. This is consistent with the information above.

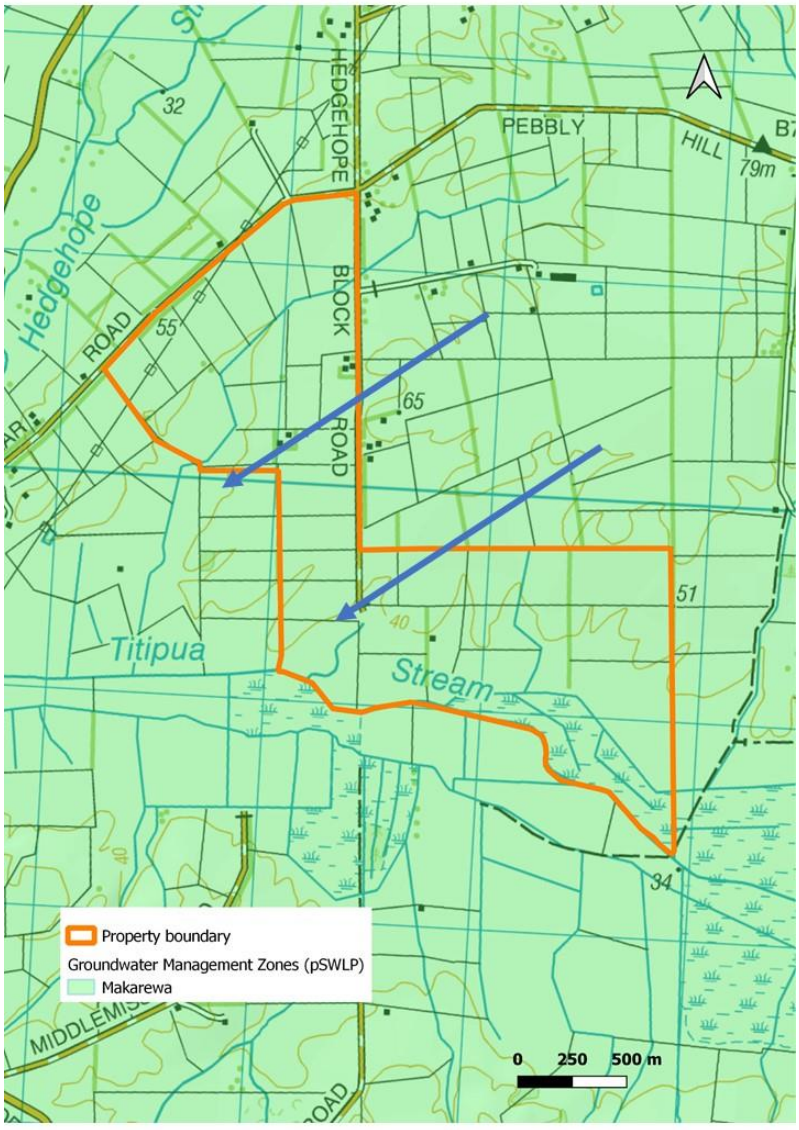


Figure 8: Estimated groundwater flow direction (purple arrows), noting that the effluent discharge area is to the east of Hedgehope Block Road.

Data from Environment Southland's Beacon shows that the estimated total oxidised nitrogen (TON) concertation under the effluent discharge area varies between 3.2 and 5.0 mg/L. The TON estimates are higher at the west and south of the property, and again higher piezometrically down-gradient (in the south-western direction). Further groundwater data from Environment Southland monitoring bores show that the groundwater data to the south of the property being of varying quality, ranging from NOF band A to NOF band D. There is an area of elevated nitrogen levels (up to 9.5 mg/L approximately 7 km south-west of the effluent discharge area.

There is water quality monitoring data from around 25 bores on neighbouring properties within a 5km radius of the applicant's existing bore E46/1068. This groundwater quality monitoring data indicates that overall groundwater quality meets the Maximum Acceptable Value (MAV) for *E. coli* in the New Zealand drinking water standards (less than one in 100 mL of sample). For nitrate nitrogen, the concentrations range from 0.01 to 6.61 g/m^3 (= mg/L), although noting that the second highest reading was 2.53 g/m^3. The MAV for nitrate (as the nitrate ion) in drinking water is 50 mg/L to prevent against short-term health risk to bottle-fed babies, and when expressed as nitrate nitrogen, the MAV is equivalent to 11.3 mg/L. This mean that groundwater quality is generally good in the vicinity of the applicant's effluent discharge area.

Of the bores piezometrically down-gradient of the effluent discharge area, only one is recorded as being used for domestic water supply, which is bore E46/0190 (47 m deep) located over 4 km south-west of the effluent discharge area.

The closest registered drinking water supply site sourced from groundwater that is piezometrically down-gradient of the effluent discharge area is Myross Bush School. This site is approximately 18 km south-west of the property, supplies water to 25-501 people and is in the Waihopai Groundwater Zone. There are no down-gradient community drinking water supply sites in the Makarewa GMZ.

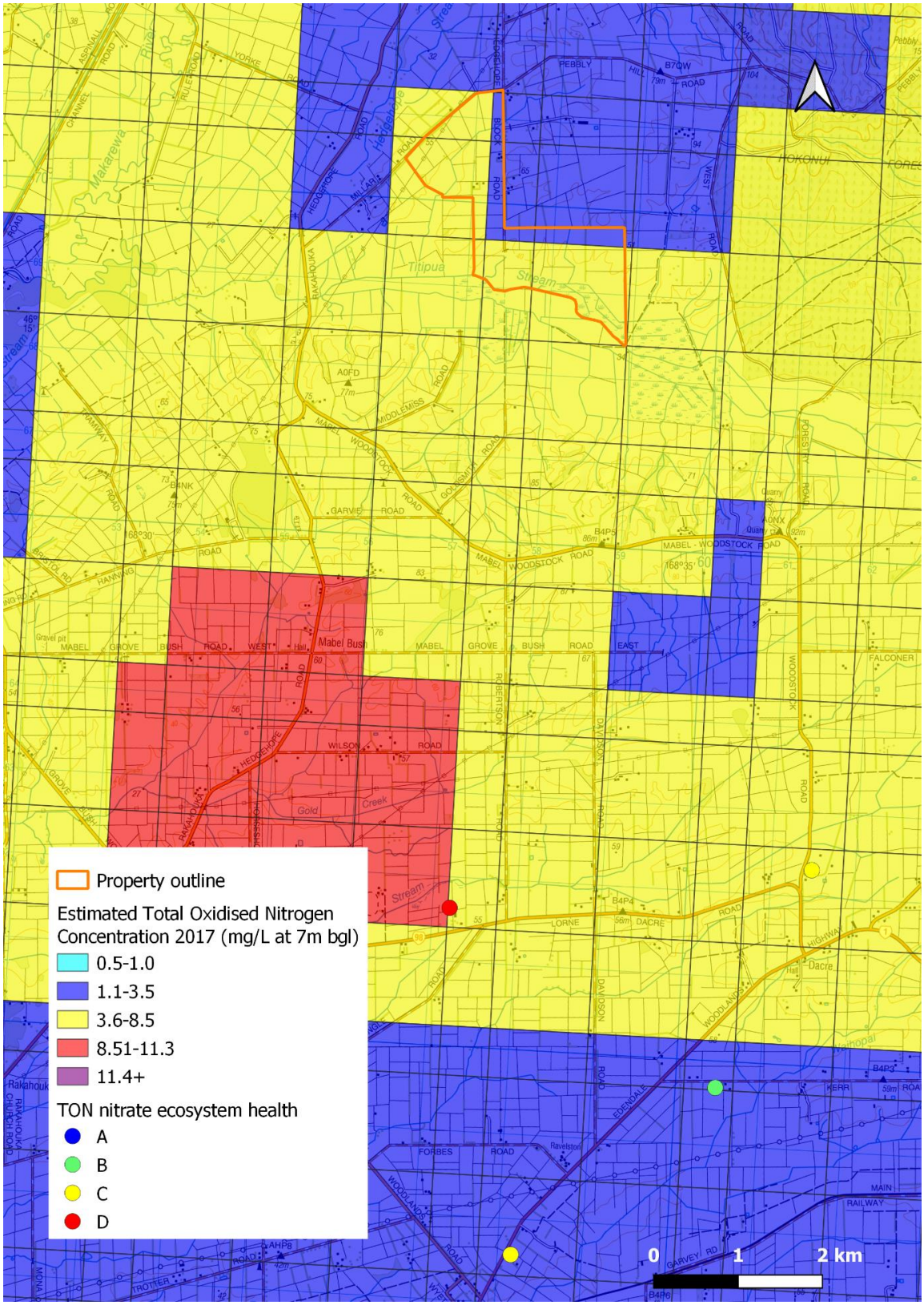


Figure 9: Modelled TON groundwater concentrations from ES data. Background shows estimated total oxidised nitrogen concentrations with coloured dots showing TON nitrate ecosystem health as measured from monitoring bores.

3.4.2 Surface waterways

One unnamed tributary of the Titipua Stream runs through the effluent discharge area and the Titipua Stream flows along the southern boundary of the farm. There is a second tributary immediately to the west of the discharge area. The tributaries predominantly flow in a north-south direction with the Titipua Stream flowing from east to west. All waterways on the existing dairy platform are fenced and have grassed buffers.

The Titipua Stream joins the Hedgehope Stream, and latterly the Makarewa River approximately 8.5 km south west of the property. The Makarewa River joins the Oreti River which discharges into the New River Estuary approximately 30km downstream of the property boundary. This estuary drains several coastal catchments including the Makarewa Catchment.

There are two registered drinking water supply sites sourced from surface water downstream of the property, which is important for understanding the potential effects of a land use change on human health. Drinking water is supplied to Alliance Group - Makarewa Processing Plant and Alliance Group – Lorneville Processing Plant from the Makarewa River, approximately 20km and 27km respectively downstream of the property. The Alliance Makarewa site supplies water to 25-501 people, and the Alliance Lorneville site supplies water to >501 people.

3.4.3 Surface water quality

The following tables provide summary information on indicative surface water quality downstream of the property. There is no surface water quality data upstream of the property.

The water quality data has been sourced from the LAWA (Land and Water Aotearoa) website. LAWA is the most up to date national database which connects people with New Zealand's environmental monitoring data, enabling communities to access information relating to the different pressures and conditions on freshwater resources. The state of water quality presented on the LAWA website compares the median of monitoring results for the last five years at a site with other sites around the country. The median for a site can be compared to all other sites with a similar land use and altitude. The data used to calculate trends is the same as used for the regional state. LAWA displays regional trends for the last five to ten years which helps to identify whether a site has improved, degraded or stayed the same. The state of water quality is assessed against the objectives within the NPSFM 2020.

The table below provide a summary of the state and trend of Hedgehope Stream 20m upstream of the confluence with the Makarewa River (approximately 8.5 km downstream of the effluent discharge area).

Table 6: Water quality data for Hedgehope Stream at the Makarewa River confluence

Variable	State (compared to all lowland rural sites)	LAWA National Objective Framework (NOF) Band/Attribute State 5-year median (2015-2019)	NOF Trend (5 year); and National Policy Statement for Freshwater (NPSFM 2020) national bottom line.
E. Coli	In the worst 25% of all sites	E – For more than 30% of the time the estimated risk is >=50 in 10000 (5% risk). 5yr Median: 580 n/100ml	Trend: Likely improving. NPSFM 2020: does not meet national bottom line for 5-yr median for primary contact sites.
Clarity (black disc)	In the worst 25% of all sites	5yr Median: 0.885 metres	Trend: Very likely improving. NPSFM 2020: uncertain – depends on suspended sediment class.
Total Oxidised Nitrogen	In the worst 50% of all sites	5yr Median: 0.62 g/m^3	Trend: Likely Degrading NPSFM 2020: meets NBL for total nitrogen (trophic state).
Ammoniacal N	In the worst 25% of all sites	B - 95% species protection level. Starts impacting occasionally on the 5% most sensitive species 5yr Median: 0. 0185 g/m^3	Trend: not assessed NPSFM 2020: meets national bottom line.
Dissolved Reactive Phosphorus (DRP)	In the best 50% of all sites	C- Moderate DRP elevation about natural reference conditions 5yr Median: 0.0105 g/m^3	Trend: Very likely improving NPSFM 2020: meets numeric attribute state for C[1] band status. There is no NPSFM 2020 NBL for this attribute.

[1] Ecological communities impacted by substantial DRP elevation above natural reference conditions. In combination with other conditions favouring eutrophication, DRP enrichment drives excessive primary production and significant changes in macroinvertebrates and fish communities, as taxa sensitive to hypoxia are lost.

The water quality trends indicate that the overall water quality in Hedgehope Stream has raised concentrations of various contaminants. Trend indicators have not been assessed over a ten year period to determine whether there are improvements in water quality or not, and are variable for the five year period.

With regards to the National Policy Statement for Freshwater (2020), for the variables assessed, clarity, TON and ammoniacal nitrogen meet the national bottom line (NBL) attribute state for attributes requiring limits. *E. Coli* likely does not meet the NBL for primary contact sites, noting that the is no NBL for this attribute beyond primary contact sites. Dissolved reactive phosphorus meets C band attribute status for variables that require action plans.

3.4.4 Estuary

The Makarewa River joins the Oreti River which discharges into the New River Estuary approximately 30km downstream of the property boundary. This estuary drains several coastal catchments including the Makarewa Catchment.

The New River Estuary is a 'tidal lagoon' type estuary, and is the largest estuary in Southland, being about 4,100 ha in size. The wetlands adjoining the New River Estuary and the Seaward Moss wetlands that flow into the New River Estuary are listed in Appendix A of the PSWLP as 'Regionally Significant Wetlands and Sensitive Water Bodies in Southland' and are similarly listed in Appendix B of the RWPS.

The estuary has been significantly affected by urban and rural development over the past 150 years. This includes large areas of reclaimed land, urban discharges including treated sewage and untreated stormwater, past landfill leaching, and agricultural activities and run-off further up the catchment. Nuisance blooms of macroalgae, failure to meet faecal bacterial guidelines in regard to swimming and gathering shellfish, and sedimentation problems are common within the estuary. As a consequence of the much reduced saltmarsh area, the estuary is more vulnerable to issues of eutrophication and sedimentation (given that saltmarsh acts to reduce nutrient and sediment impacts).[4]

Section 3.8 in the Regional Coastal Plan describes the key values for the New River Estuary. In summary, the key values 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.

Long-term estuary monitoring is undertaken for New River Estuary. The 'New River Estuary Macroalgal Monitoring 2018'[5] report combined with the 'New River Estuary Review of Water Quality data' report[6] show that regions of the upper estuary are under stress and showing eutrophication. There is excessive macroalgal growth including sediment quality decline and high concentrations of chlorophyll-a in the water column. Chlorophyll-a was used as an indicator of eutrophic conditions in the water column, and is a colour pigment present in many types of algae that can give an indication of how much algae is present in the water column.

The more recent (Dec 2019) Environment Southland report 'Current Environmental State and the "Gap" to Draft Freshwater Objectives for Southland' states that New River Estuary is currently receiving nutrient and sediment inputs beyond its assimilative capacity. The estuary is showing signs of eutrophication and

[4] https://www.es.govt.nz/environment/water/estuaries/estuaries-in-the-oreti

[5] Stevens, L.M. 2018. New River Estuary: 2018 Macroalgal Monitoring. Report prepared by Wriggle Coastal Management for Environment Southland.

[6] Robertson, B.M., Stevens, L.M., and Dudley, B. 2017. New River Estuary - review of water quality data in relation to eutrophication 1991-2015. Report prepared by NIWA and Wriggle Coastal Management for Environment Southland.

expansive degraded areas, as indicated by areas currently in D band state for macroalgae, Gross Eutrophic Zone, mud content and extent, and sediment oxygen levels. A reduction in nutrient and sediment inputs would be needed to avoid further deterioration and achieve C band or better consistently to improve all these attributes above D band at all monitoring sites in this estuary.

Eutrophication occurs when nutrients in streams, rivers, lakes and estuaries cause excessive growth of aquatic plants and algae (primary producers). This excessive growth can impact the ecological health, recreational and food-gathering value of the affected water bodies. Run-off from productive land use is a leading cause of nutrient input to water bodies, and subsequent eutrophication.

The table below summarises the agricultural source loads of nitrogen and phosphorus as estimated by Aqualinc[7] in 2014. For agricultural source loads of nitrogen in the New River Estuary catchment, dairy farming contributes 52% of the total load, whilst sheep and beef farming (including wintering-off of dairy cows) contributes 48%. For phosphorus, dairy farming contributes 67% of the total load in the catchment, whilst sheep and beef farming contributes 32% and forestry contributes 1%.

Table 7: Summary agricultural source loads for New River Estuary (source: Aqualinc 2014 report)

Catchment agricultural source load (t/year)		Total catchment source nitrogen load (*including from non-agricultural land*) (t/year)	Estimated realised nitrogen loads (*based on water quality monitoring data*) (t/year)	Estimated attenuation (*i.e. amount by which source load reduced in the environment*) (%)
Nitrogen	Phosphorus			
4,969	139	5,513	3,718	33

4. ACTIVITY CLASSIFICATION

We have carefully considered all the applicable regional rules and national regulations that are relevant to the activities proposed by the applicants that are relevant to these effluent discharge and groundwater take activities.

4.1 Consents required

The applicant holds discharge permit AUTH-301081-V1 which authorises the discharge of dairy effluent to land and water permit AUTH-301082-V1 authorises the taking of groundwater at this farm. These consents expire on 1 September 2022. This proposal does not seek to increase the milked herd from which effluent

[7] Aqualinc (2014). Assessment of farm mitigation options and land use change on catchment nutrient contamination loads in the Southland region. Report number C13055/04.

will be collected, or stock drinking or washdown water requirements from that authorised in these consents. The applicant seeks to replace these permits and to also include feed pad effluent in the sources of effluent that will be discharged to land.

The following resource consents are required under the Regional Water Plan for Southland, 2010 (RWPS) and Proposed Southland Water and Land Plan, 2018 (PSWLP). Many of the Rules in the PSWLP are under appeal.

Table 8: Applicable Rules

Consent	Plan	Rule	Activity Status
Discharge Permit to discharge agricultural effluent to land	RWPS	50(e)	Discretionary
	PSWLP	35(b)	Restricted discretionary
Water Permit to abstract groundwater for dairy shed wash down and stock drinking	RWPS	23(d)(ii)	Discretionary
	PSWLP	54(a)	Permitted

Discharge permit for discharge of effluent to land

Effluent disposal occurs on soil/landscape categories A and C, as identified on Map 1 of Appendix N of the RWPS, and first commenced sometime after17 July 2010 (source: google earth historic imagery). The discharge to land is via a 'low-rate irrigation' system as defined in the RWPS, as the maximum instantaneous rate of effluent application is 10 mm/hr in accordance with the current effluent discharge permit AUTH-301081-V1. The discharge of dairy effluent to land is therefore a **discretionary activity** under the RWPS Rule 50(e).

The discharge is a **restricted discretionary activity** under Rule 35(b) of the PSWLP, as it is a replacement of the existing discharge permit AUTH-301081-V1, and the maximum number of dairy cows from which the effluent is collected is specified in that permit, is not increasing (i.e., 600 cows).

Water permit to abstract groundwater for dairy use and stock drinking water

The take is from the Makarewa Groundwater Management Zone, which is a lowland aquifer as identified on Groundwater Map 9 of Appendix D of the RWPS. The rate of abstraction for dairy operations and stock drinking water will not exceed 72 m^3 per day and the rate of take is less than or equal to 2L/s.

The abstraction and use of groundwater from a lowland aquifer where the total volume of water allocated is less than 15% of mean annual land surface recharge is a **discretionary activity** under Rule 23(d)(ii) of the RPWS.

Under the PSWLP, the abstraction of groundwater water is a **permitted activity** under Rule 54(a) as less than 86 m^3 per day is proposed to be abstracted, and the applicant has a water meter on the bore.

Summary

Overall, the proposal is 'bundled' to mean that the consent applications are considered as **discretionary activities.**

4.2 Ancillary activities

Separate to this application, we note that the applicant has also lodged a consent application (APP-20211092) to Environment Southland that seeks to use land for dairy farming (that did not exist as of May 2016), to use land for dairy support (Schrama Block), to convert land on farm to dairy farm land, and to use land for a feed pad/lot. That application includes the applicant's Farm Environmental Management Plan and nutrient budget.

4.3 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 9: Activities for which Consent is not required.

Activity	Compliance with the relevant permitted activity rules.
Intensive Winter Grazing under the NES-FW	A Land Use Consent for Intensive Winter Grazing under the NES-F is determined to not be needed. The Intensive Winter Grazing that does occur meets the permitted activity thresholds and was conducted during the reference period. 12 ha of IWG that occurs, is about 4.5% of the proposed new land area. Significantly less than either the PSWLP or NES thresholds Refer to consent application APP-20211092 for further details.
Feed pads/lots (Rule 35A of the PSWLP)	Solid effluent is scraped from the feed pad and disposed to land in accordance with Rule 38 of the PSLP. Liquid effluent is collected and stored in the effluent storage pond. Feed pads are located approx. 300m from the nearest waterway. Refer to consent application APP-20211092 for further details.
Use of land for the maintenance and use of an existing agricultural effluent storage facility (Rule 32D of the PSWLP)	The use of land for the maintenance and use of an existing agricultural storage facility (includes ponds, weeping walls, sumps and stone traps etc) that was authorised before 4 April 2018 is a permitted activity providing the construction of the facility was authorised by a resource consent). The existing effluent storage infrastructure meets this provision.
Incidental discharges from farming (Rule 24 PSWLP)	The land use associated with this type of discharge is or will be authorised under Rule 20, 25 or 70.
Fertiliser (Rule 10 RWPS & Rule 14 PSWLP)	All practicable measures will be taken to minimise fertiliser drift beyond the target areas. Fertiliser will be applied to selected areas of the farms in accordance with nutrient budget

Activity	Compliance with the relevant permitted activity rules.
	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.
The use of land for a silage storage facility and silage leachate (RWPS Rule 51, PSWLP Rules 40 & 41)	Silage is stacked on a rock/limestone pad (30m x 14m) with earth banks on 3 sides. The facility is approximately 100 m north of the dairy shed and over 500m from Titipua Stream and any of its tributaries. Silage leachate and runoff from the silage stack does not discharge into the effluent storage system. All silage storage facilities are located away from sensitive receiving environments, in accordance with permitted rule setbacks in the RWPS and PSWLP, and no direct discharge of silage leachate to any waterbody is proposed. No part of the silage storage facility is located on land that is made permanently or intermittently wet by the presence of springs, seepage, high groundwater, ephemeral streams, or flows of stormwater. There is no discharge of leachate directly to groundwater via a pipe, soak pit or other soil bypass mechanism and there is no overland flow or ponding of silage leachate outside of the silage storage facility. Cattle are not able to graze directly from the silage storage facility.
Solids and sludge (Rule 38 of the PSWLP)	Sludge effluent collected from the sludge beds and effluent pond (when desludged) will be dried as much as reasonably practical before applying to land when conditions are suitable, observing appropriate separation distances to critical source areas and other sensitive receptors such as streams, bores, property boundaries and dwellings. The application of sludge will be via muck spreader when soil and weather conditions are suitable and will not exceed 10 mm depth. Sludge is not discharged onto the same area any more frequently than once every two months and is only discharged to land when soil temperature is greater than 5 degrees Celsius in winter and 7 degrees Celsius in spring. There will be no disposal of solids to any waterway.
Cleanfill, Farm Landfills and Offal Holes (Rules 53, 54 & 55 of the RWPS, and Rule 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.
Stock exclusion from waterbodies (Rule 70 PSWLP)	All water bodies are fenced, and crossings are bridged over unnamed tributaries. Bed disturbance from stock is thus avoided and dairy cattle on the dairy platform are excluded from water bodies.
Drainage of Land (Rule 9 RWPS & Rule 13 PSWLP)	It is not anticipated that any discharge from subsurface drains would result in a conspicuous change to the colour and/or clarity of the receiving waters at a distance of 20 metres from the point of discharge. The proposed good management practices will significantly reduce the likelihood of any contaminants reaching the subsurface drains.

5. NON-NOTIFICATION & CONSULTATION

A consent authority has the discretion whether to publicly notify an application unless a rule or National Environmental Standard (NES) precludes public notification (in which case the consent authority must not publicly notify) or section 95A(2) applies.

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

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

6. ASSESSMENT OF ENVIRONMENTAL EFFECTS

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

6.1 Discharge of Agricultural Effluent

The discharge of agricultural effluent includes liquid effluent and sludge collected and discharged to the effluent pond from the feed pad. Existing discharge permit AUTH-301081-V1 currently excludes effluent from a feedlot or wintering pad. However, the existing effluent system incorporates effluent from the feed pad and so the effects of the dairy effluent discharge (discussed in the sections below) includes effluent from the feed pad.

While the application for the replacement of the existing effluent discharge permit has been bundled up as a discretionary activity, the PSWLP Rule 35 matters of discretion have been used as sub-headings below to assess the environmental effects of the proposal. These are:

1. Application depth or rate, storage requirements, nutrient loading rates (in particular nitrogen), size of the disposal area, timing of the discharge, and contingency plans;
2. The separation distance of the discharge from a river, lake, artificial watercourse, modified watercourse, natural wetland, subsurface drain, the coastal marine area, infrastructure, residential dwellings, places of assembly, urban areas, landholding boundaries, water abstraction points and registered drinking water supplies;

3. Measures to avoid, remedy or mitigate adverse effects (including cumulative effects directly related to the discharge of farm dairy effluent) on water quality, taking into account the nature and sensitivity of the receiving environment; and
4. The duration of consent, including in order to implement the outcomes of any Freshwater Management Unit Process to be undertaken in accordance with Policy 47.

6.1.1 Effluent Storage

The current effluent storage pond was constructed in 2014/2015 under the authority of land use consent AUTH-301083-V1. The pond is synthetically lined and includes a leakage detection system around the perimeter of the pond, as shown on the original pond layout plans in Appendix A.

The pond has a useable volume of 2,392 m^3 (after allowing for 0.5 m of freeboard). The existing discharge permit requires at least 2,332 m^3 of effluent storage. The Dairy Effluent Storage Calculation (DESC) assessment carried out for the original (2013) application showed that the maximum required volume was 2,788 m^3 and the 90% probability volume was 2,332 m^3. The DESC undertaken in June 2021 for this property determined the maximum required volume to be 2,548 m^3 and the 90% probability volume to be 2,320 m^3 (i.e., less than the original volume required). This means there is sufficient storage capacity in the applicant's existing effluent system. Providing adequate storage will enable irrigation of effluent to be deferred when conditions are not suitable. Refer to Appendix B for the original and current DESC reports.

There is sufficient storage in the existing effluent pond to provide for any liquid effluent from the existing feed pad. Feed pad effluent is captured by drains in the pad and collected in a concrete tank, and a pump then transfers the effluent to the effluent storage pond. When calculating the required effluent storage pond, both the original DESC and current DESC accounted for liquid effluent from a 1,300 m^3 feed pad.

The pond and southern sludge bed have recently (16 June 2021) been visually assessed by a Suitably Qualified Person, Q Scandrett of Dairy Green Ltd, who confirmed that no visible cracks, holes or defects were evident that would allow effluent to leak from the effluent storage system. The pond's leak detection drainage was also identified and inspected during the visual inspection. The Visual Assessment report was peer reviewed by a Chartered Professional Engineer, Colin Macdiarmid of GeoSolve, who agreed with the conclusions reached and recommended that the northern sludge bed be inspected when emptied. The Visual Assessment report and peer review by Chartered Professional Engineer are contained in Appendices C and D, respectively.

6.1.2 Effluent Application Area, Depth/Rate and Timing

The applicant will apply effluent using a low-rate cobra travelling irrigator, but for flexibility seeks the ability to use an alternative or additional low-rate effluent irrigation system. The current discharge permit AUTH-301083-V1 authorises a maximum depth of application not exceeding 10 mm and maximum instantaneous rate of application of 10mm/hour. The applicant proposes to continue with this rate and depth of effluent application. This is considered appropriate for the following reasons, which are expanded on further below:

- proposed mitigations / Good Management Practices targeted at the different soil types and the Gleyed physiographic zone will reduce the risk of nutrient loss and surface contaminant loss
- large available effluent area
- alternate and contingency effluent irrigation system
- careful soil moisture deficit application

Effluent will be discharged onto Pukemutu, Makarewa and Titipua soils, which have a slight risk of nutrient leaching to groundwater. Effluent will always be applied at a depth less than the soil water deficit which ensures nutrients remain in the root zone to be taken up and utilized by plants for pasture production.

The relevant physiographic zones, Lignite/Marine Terraces and Peat Wetlands Physiographic Zones, indicate that soils in this zone have very good ability to remove nitrogen from groundwater to the atmosphere via denitrification. However, this process can be bypassed when contaminants are flushed to nearby surface water bodies via artificial drains and overland flow following heavy or sustained rainfall events. Good management practices in these zones include avoiding preferential flow of effluent through drains.

There is no tile drain map available for the property although it is likely that there is a field drain network due to the significant vulnerability of these soils to waterlogging (refer to previous Section 3.3.1). Regardless, the shallow depth of effluent application, topsoil assimilation and avoiding application in saturated conditions allows for appropriate treatment and reduces the risk of contaminants entering any field drains that may discharge into the nearby waterways.

The large available effluent area of approximately 100 ha allows some flexibility in selecting suitable paddocks in recognition of the key contaminant pathways of the relevant physiographic zones. Nevertheless, caution will be required to ensure effluent application only occurs when soil moisture deficit exists. The adequate existing effluent storage allows for application to be deferred until soil conditions are suitable.

As an alternative and/or contingency to use of their low-rate effluent system, the applicant will use a contractor with a slurry tanker or umbilical system (or other low-rate effluent system) to apply effluent at application depths no greater than 5 mm.

To ensure effluent is only applied when a soil water deficit exists, the applicant checks weather forecasts, checks the nearest soil moisture site on the ES website and checks paddocks before application to ensure that effluent is only applied when a soil water deficit exists. Effluent discharge will observe a 28-day return period. Effluent will be discharged to land year-round, on days when conditions are suitable. Furthermore, "proof of placement" of irrigators provides a record of effluent application and the required information to make informed decisions daily and seasonally regarding the forecasting of farm dairy effluent disposal.

In Southland, regular soil water deficits greater than 10 mm occur between the months of October to May. It is more difficult to schedule the effluent application to coincide with soil moisture deficits in August and

September. The applicant has accounted for this by ensuring there is sufficient storage through these times, allowing use of both their low-rate effluent application system and alternate/contingency contractor systems, and a large effluent irrigation area. Careful soil moisture deficit application scheduling can help maximise nutrient retention within the top 200 mm of soil[8], enhancing the availability of nutrients which can be used by plants whilst avoiding ponding, odour, and overland flow.

Investigations undertaken at Lincoln, Massey, Invermay and other sites including some in Southland and Otago over the past 30+ years have shown that even with careful management of effluent applications in a situation where dairy shed effluent is being applied to dairy grazed land in relatively high precipitation environments, like Southland, there will be some annual average loss of nitrogen in drainage water. Similarly, other contaminants (phosphorus, sediment and faecal indicator organisms) lost to surface water rather than groundwater can be significantly reduced because of the application of good management practices. The good management practices described in this application will significantly reduce the risk to water quality.

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

6.1.3 Effluent Nitrogen Loading

Adverse effects from contaminant loss to water include water quality degradation which can adversely impact aquatic ecosystems and the overall health of water bodies. If nutrient loadings exceed 150 kg N/ha/year or nutrients are applied in excess then there is a risk of contaminant loss (N, P, sediment and microbial) to groundwater and surface water bodies.

The Overseer modelling (refer to associated application APP-20211092) indicates that the annual loading rate of liquid effluent is 28 kg N/ha/yr based on an effluent discharge area of 99.7 ha and assuming all areas receive an equal amount of effluent. An areal loading of 28 kg N/ha/yr equates to 19% of Environment Southland's recommended maximum loading rate of nitrogen onto any land area of 150 kg N/ha/yr from agricultural effluent or water containing agricultural effluent.

ES's recommended maximum loading rate of 150 kg N/ha/yr is supported by the 2009 report for ES by AgResearch[9] that recommended the maximum nitrogen load as a management criterion to avoid direct losses of land-applied FDE. Given that the proposed areal loading is a fraction of the limit recommended by AgResearch, land-applied FDE nitrogen leaching will be within acceptable limits.

---

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

[9] 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

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

The nutrient concentration of sludge is higher than liquid effluent due to the lack of dilution from rainwater or washdown water. However, sludge is generally considered lower risk to apply to land because it does not have the same risks of leaching, overland flow/runoff that purely liquid effluent has. Due to the higher concentration of nutrients, the application of sludge to land is carefully managed to ensure that nutrient loadings on any particular land area does not exceed the recommended level of 150 kg N/ha/year of effluent (both sludge and liquid effluent). This loading is achieved by ensuring the discharge area is large enough and the application depth is restricted to a maximum of10mm.

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

6.1.4 Effluent Irrigation Area

The effluent disposal area will be unchanged from that authorised by existing discharge permit AUTH- AUTH-301083-V1. The discharge area of 99.7 ha provides a discharge area to stock ratio of 16.6 ha per 100 cows, which achieves the minimum required in ES's Best Practice Guidelines, which is 8 ha/100 cows. This limit is derived as a further method for ensuring that ES's recommended 150 kg N/ha/yr areal loading limit for N (discussed above) is not exceeded.

Maintaining the relatively large current effluent irrigation area gives flexibility to ensure that paddocks selected for individual applications have sufficient soil moisture deficits.

Effluent will not be applied within the following buffer zones:

- 20 m of any surface watercourse
- 100 m of any potable water abstraction point
- 20 m to any landholding boundary; and
- 200 m of any residential dwelling on a neighbouring property

There are no other sensitive receptors that require separation measures to be implemented. Provided that these buffers zones are maintained, there should be no significant adverse effects resulting from the extent of the disposal area. A map of the existing/proposed effluent discharge area is contained in Appendix E.

6.1.5 Effects on Groundwater Quality from Effluent Disposal

As the applicant will adhere to the buffer zones and is not seeking to change the existing effluent application area as described above, the disposal of effluent would very likely result in the same or reduced adverse

effects on groundwater quality in the vicinity of the property. The buffer zones ensure that any overland movement of contaminants is minimised. Contaminant transport towards sensitive receiving environments is dependent on many factors, including soil type, climate, and anthropogenic influences such as the presence of drains. These factors have been considered when confirming that the existing effluent discharge area and method (including rate and depth) are appropriate, and in ensuring that there is adequate storage to allow for deferred irrigation.

According to ES's Beacon GIS, the nearest community groundwater drinking water supply site that is piezometrically down-gradient of the effluent discharge area is Myross Bush School. This site is approximately 18 km south-west of the property, supplies water to 25-501 people and is in the Waihopai Groundwater Zone. There are no down-gradient community drinking water supply sites in the Makarewa GMZ. Of the bores piezometrically down-gradient of the effluent discharge area, only one is recorded as being used for domestic water supply, which is bore E46/0190 (47 m deep) located over 4 km south-west of the effluent discharge area.

Groundwater quality monitoring data within 5 km of the applicant's bore E46/1068 (which is within the effluent discharge area) indicates that overall groundwater quality meets the Maximum Acceptable Value (MAV) for *E. coli* in the New Zealand drinking water standards (less than one in 100 mL of sample).

For nitrate nitrogen, the concentrations in bores within 5 km of the applicant's bore range from 0.01 to 6.61 g/m^3 (= mg/L), although noting that the second highest reading was 2.53 g/m^3. The MAV for nitrate (as the nitrate ion) in drinking water is 50 mg/L to prevent against short-term health risk to bottle-fed babies, and when expressed as nitrate nitrogen, the MAV is equivalent to 11.3 mg/L. This mean that groundwater quality is generally good in the vicinity of the applicant's effluent discharge area.

Given the estimated nitrogen concentration in drainage, it is highly unlikely that there would be any adverse effects associated with nutrient losses from the disposal of effluent to land on these drinking water supplies or any other nearby drinking water sources. For any domestic bores that are piezometrically down-gradient, the proposed farm system is highly likely to reduce nitrogen and faecal pathogen losses relative to the status quo. There will be further attenuation, dilution and dispersion processes that will further reduce the concentration of contaminants in groundwater between the property and any sensitive receptors.

Other contaminants of concern include sediment and micro-organisms. Contaminant transportation towards sensitive receiving environments is dependent on many factors, including soil type, climate and anthropogenic influences such as the presence of drains. All of these factors have been considered when determining an appropriate irrigation location and method (including rate and depth), and in ensuring that there is adequate storage to allow for deferred irrigation.

The applicant restricts effluent irrigation to periods of good weather, and not under wet conditions. In addition, buffer zones, low application depths, and a 28-day return period for effluent application are

complied with. This means there is less risk of leaching, overland flow and losses via artificial drains occurring. The proposed application depths will enhance the ability of nutrients to be assimilated in the root zone in the top 200 mm of soil and reduce losses of contaminants to both surface and groundwater.

Provided that effluent is applied at the proposed rate/depths and effluent irrigation is avoided when conditions are not suitable, then adverse effects on water quality as a result of effluent application should be avoided as far as reasonably practicable. Accordingly, the effects on groundwater quality from the continued effluent disposal are considered to be no more than minor.

6.1.6 Odour

The effects of odour are most likely to occur from the discharge of farm dairy effluent. The existing effluent pond is located approximately 300 m from the nearest property boundaries and at least 1 km from the nearest neighbouring dwelling (located on Hedgehope Block Road).

The proposed maximum effluent application rate of 10 mm/hr is the same as authorised in the existing effluent discharge consent and will be applied via a low rate effluent irrigation system. Effluent will not be discharged within 20 m of any property boundary.

The physical location of the effluent infrastructure coupled with the proposed low application rate irrigation and effluent discharge buffers means there is no significant risk of adverse effects from odour and spray drift on surrounding landowners and occupiers. As such, the effects of odour are avoided.

6.1.7 Contingency Plans

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

The contingency effluent irrigation system may be used at certain times if the usual methods of effluent discharge are under repair or if conditions allow for more effluent to be applied than the usual system is capable of conveying. This will be a contractor-operated irrigation system such as (but not limited to) an umbilical system or slurry tanker. A contractor-operated system may also be used for pond desludging as required, although noting that pond sludge build up will be relatively slow due to the use of the solids separator unit. Any discharges from the contingency effluent irrigation system must adhere to the rate and depth limits imposed on the consent.

6.1.8 Monitoring

Under existing discharge permit AUTH-301083-V1, the applicant pays an annual administration and monitoring charge to Environment Southland, which may include the cost of surface water quality monitoring of the watercourse near the effluent disposal field up and downstream of the discharge area.

Surface water quality monitoring has not occurred on this property, or any nearby property, and therefore

there is no data to form accurate conclusions of surface water quality trends at the site. Environment Southland have identified that infrequent sampling of surface water quality cannot adequately determine what impact, is any, a nearby activity is having on water quality. Surface water sampling is only effective in confirming the impact of gross pollution incidents for compliance purposes, as this has not been carried out to date.

Groundwater quality monitoring at the applicant's bore has also not been undertaken by Environment Southland, as discussed in Section 3.4.1.

6.2 Groundwater Abstraction

6.2.1 Allocation

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

6.2.2 Stream Depletion and Interference Effects

Policy 29 in the RWPS and Policy 23 of the PSWLP requires a stream depletion assessment when the daily average rate of take is more than 2 L/s because takes less than this are expected to have a minor effect on stream flows. As the proposed take is 72,000 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. In addition, the bore is not within 5 m of a surface water body, and so is not considered to meet the 'riparian' hydraulic connection classification in Table L.2 of the PSWLP.

Given that the rate of take is relatively low, our experience of bore interference modelling is that it is highly likely that any adverse interference effects on any existing neighbouring bores will be 'acceptable' in accordance with Appendix L.3 of the PSWLP, if at all measurable.

6.2.3 Effects on Groundwater Quality

The sparsity of groundwater quality information in the vicinity of the applicant's property makes it difficult to draw any conclusions on the state of the receiving groundwater.

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

The bore is fenced to protect from stock and vehicle access or damage, and the bore head is raised above ground. The applicant is aware that the bore head needs to be adequately sealed to minimise the risk of contaminant ingress.

6.2.4 Efficiency of Use

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

6.2.5 Monitoring

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

6.3 Archaeological effects

A search of the Heritage NZ website and Section 5.2 of the Southland District Plan indicates there are no recorded archaeological sites located on or near the property. Therefore, there will be no archaeological / historic heritage effects from the proposed activities.

6.4 Cumulative Effects

Regional scale modelling of N and P losses from agricultural land use in the Southland Region by Aqualinc in 2014[10] 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 makes 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. Overall, contributions from both land uses are significant; and
- Under the status quo of 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.

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

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, or where measures are incorporated that would maintain or improve water quality. The report indicates there are 1,125 farms and a total farm area in the order of 249,000 ha in the New River Estuary catchment, being the relevant catchment for this farm. To quantify cumulative loads on a catchment scale would require the sophisticated modelling and setting of catchment limits that are outside the scope of this application.

The applicant proposes no changes to the maximum cow numbers, dairy effluent discharge area, or rate of groundwater abstraction. The proposed mitigations in this application and the Good Management Practices set out in the associated land use application and will result in an overall reduction in environmental impacts relative to the current dairy farming operation.

The sensitivity of the receiving environments to nitrogen and phosphorus inputs has been described in this report and it is considered that this individual activity provides sufficient mitigation measures to conclude that the significance of the activity on an individual scale is negligible on the New River Estuary catchment.

6.5 OverseerFM Modelling and Good Management Practices

Under Rule 20 of the PSWLP, the use of land for dairy farming that was authorised before 4 April 2018 may continue until the PSWLP becomes fully operative provided that the effects of the activity are the same or similar in character, intensity, and scale.

As set out in the accompanying consent application, the applicant wishes to expand their existing 181.5 ha dairy platform onto a neighbouring 84.2 ha block of land, known as the "Schrama Block". The applicant proposes to milk up to 600 cows across the new extended dairy platform (265.7 ha total area). Therefore, in addition to this water take and effluent discharge consent application, the applicant has also sought consent to use land for dairy farming (that did not exist as of May 2016) under the PSWLP and to convert land on farm to dairy farmland (land use and discharge permit) under the NES-F.

The accompanying consent application includes the implementation of a wide range of good management practices and mitigation measures which avoid and mitigate adverse effects on the environment. These are also included in the applicant's Farm Environmental Management Plan (FEMP) that is attached to that application. The proposal also includes the recommendation that nitrogen and phosphorus output limits are imposed on the resulting land use consent. These limits would ensure that the activity is undertaken at a predicted contaminant loss level which is significantly less than the existing situation when modelled using the latest version of Overseer. These limits would be implemented via the land use consent conditions and the FEMP that includes all the relevant good management practices (GMPs) and mitigation measures.

The relevant physiographic zones, Lignite/Marine Terraces and Peat Wetlands Physiographic Zones, indicate that soils in this zone have very good ability to remove nitrogen from groundwater to the atmosphere via

denitrification. However, this process can be bypassed when contaminants are flushed to nearby surface water bodies via artificial drains and overland flow following heavy or sustained rainfall events. The applicant's good management practices associated with the discharge of effluent include reducing the accumulation of surplus nitrogen in the soil, and avoiding preferential flow of effluent through drains to reduce effects of overland flow and artificial drainage on underlying water quality.

6.6 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 already form part of the existing environment. Throughout the duration of the existing consents, there have been no known complaints from neighbours, which indicates that the potential adverse effects on the neighbourhood are less than minor.

The proposal will result in net positive benefits to the neighbourhood as there will be ongoing ability to provide for the social and economic benefits with the employment of staff, as well as contractors and consultants, and the farm is serviced by local schools and many businesses that would not benefit if the activities were unable to occur. More generally, 2018 data indicates that the dairy sector accounts for 7% of the regional employment in Southland, and agriculture more broadly contributed 8% to Southland Regional Gross Domestic Product.[11] The ability for the applicant to continue to operate their dairying operation will enable them to provide for their own social, economic and cultural wellbeing.

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

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

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

[11] Regional Fact Sheet: Southland. Retrieved 15/7/2021. https://www.mbie.govt.nz/dmsdocument/11452-regional-factsheet-southland-pdf

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

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

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

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

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

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

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

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

According to Environment Southland's Beacon GIS database, the southern tip of the effluent discharge area is located within the Makarewa Significant Floodplain. However, the effluent storage system (including effluent pond) is over 300 m north of this mapped floodplain area, outside of any mapped 'liquification risk' area and more than 30 km from the closest mapped active fault line.

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.

On this basis, any risk to the neighbourhood, the wider community, or the environment through natural hazards or the use of hazardous substances is considered to be less than minor.

6.7 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 on the environment and so this assessment of alternatives considers the proposed discharge of farm dairy effluent only.

Method of Discharge

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

Receiving Environment

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

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

6.8 Summary

This proposal seeks to replace the current dairy effluent discharge permit and groundwater take permit. There are no new risks of effluent application or water abstraction beyond that already occurring on farm.

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

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

7. Statutory Considerations

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

7.1 Part 2 of the RMA

Section 104(1) RMA states that when considering an application for a resource consent, the matters which we have discussed above are subject to the purpose and principles in Part 2 RMA. However, the Supreme Court in King Salmon found that, in the absence of any uncertainty, invalidity or incomplete coverage in the relevant policy of plan document, there is no need to have recourse to an overall judgement approach under Part 2. We do not consider there are any instances of uncertainty, invalidity or incomplete coverage in the planning instruments discussed in the above sections.

Nevertheless, out of an abundance of caution, we have provided a discussion of the proposal in the light of Part 3. We have provided this discussion in the normal way treating the principles contained in sections 6, 7 and 8 as being subordinate to the purpose of the RMA as set out in section 5.

Section 5 RMA – Purpose

The purpose of the RMA is to promote the sustainable management of natural and physical resources. That is, the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic and cultural well-being and for their health and safety while:

a. sustaining the potential of natural and physical resources to meet the reasonably foreseeable needs of future generations; and
b. safeguarding the life supporting capacity of air, water, soil and ecosystems; and
c. avoiding, remedying, or mitigating any adverse effects of activities on the environment.

The proposal is for the discharge of farm dairy effluent and the abstraction of groundwater, which are farming activities that use natural resources. The continuation of the activities as proposed will enable the applicant to provide for their economic and social wellbeing, and that of the immediate small Southland community and the wider regional economy in which it operates. Potential adverse effects of the proposal may exist, however the adverse effects have been adequately identified and assessed as able to be reduced or mitigated under the proposal.

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

Section 6 RMA – Matters of national importance

Section 6 of the RMA required consideration of several matters of natural importance. The matters specifically relevant to this proposal include:

- The preservation of the natural character of the coastal environment, wetlands, and lakes and rivers and their margins and the protection of them from inappropriate subdivision, use and development;
- The relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu and other taonga.

The proposed activities will not impact directly on the coastal environments, wetlands, lakes and rivers. However, there is the potential for water quality effects on the wider receiving environment which includes these features. The assessment of environmental effects identifies potential effects on these receiving water bodies and provides appropriate and adequate mitigation measures to avoid adverse effects. The applicant acknowledges Maori have a long history and relationship with the area and consider that their proposal will not compromise or have an adverse impact on Maori culture, traditions or taonga.

Section 7 RMA- Other matters

Section 7 of the RMA lists matters which all persons shall have particular regard to. Relevant to this application, these matters include kaitiakitanga, the efficient use and development of natural and physical resources, the intrinsic value of ecosystems, the maintenance and enhancement of the quality of the environment, and the protection of the habitat of trout and salmon.

As previously discussed, the assessment of environmental effects outlines mitigation measures to avoid or minimise adverse effects on water quality which in turn will avoid or minimise impacts on Section 7 matters.

Section 8 RMA- Treaty of Waitangi

Section 8 of the RMA requires that applicants shall take into account the principles of the Treaty of Waitangi (Te Tititi O Waitangi). Section 8 recognises the relationship of tangata whenua with natural and physical resources and encourages active participation of, and consultation with, tangata whenua in resource management decision-making.

We consider that the proposed activity is not inconsistent with the principles of the Treaty of Waitangi as required by Section 8.

7.2 Section 104(1) of the RMA

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

- National Environmental Standard for Sources of Human Drinking Water, 2007
- National Environmental Standard for Freshwater Management, 2020 (NESFM)
- National Policy Statement for Freshwater Management, 2020 (NPSFM)
- Te Tangi a Tauira - The Cry of the People, Ngai Tahu Ki Murihiku, Natural Resource and Environmental Iwi Management Plan, 2008
- Regional Policy Statement for Southland, 2017
- Region Water Plan Southland (RWPS), 2010
- Proposed Southland Water and Land Plan (PSWLP), 2018

Under the RMA, regional plans need to give effect to any NPS, NES and RPS. For an application of this scale, an assessment of the application against the regional plans is generally adequate as these plans ultimately give effect to the higher order statutory instruments. Relevant additional assessment is made against the National Policy Statement for Freshwater Management 2020 and National Environmental Standard for Freshwater 2020, as these documents post-date all of Southland's Plans (RPS, RWPS and PSWLP).

The following policies from the RWPS, and the PSWLP, which give effect to the plans' objectives, are relevant to this application for resource consent.

7.2.1 National Policy Statement for Freshwater Management 2020

The National Policy Statement for Freshwater Management 2020 (NPSFM 2020) took effect on 3 September 2020, as part of Government's Essential Freshwater package to restore and protect the health of New Zealand's waterways. The Essential Freshwater package signals a significant change in how activities that affect freshwater are dealt with. Instrumental in implementing this significant change is the fundamental concept of *Te Mana o te Wai* and a requirement to engage with tangata whenua to determine what Te Mana o te Wai means at a local scale. Determining the local approach to Te Mana o te Wai in consultation with tangata whenua and the rest of the community, will take time and will ultimately result in a formal RMA planning process to be notified prior to 31 December 2024[12].

The NPSFM 2020 post-dates all of Southland's Plans (RPS, RWPS and PSWLP), and so as a later-in-time piece of national direction, it carries considerable weight in resource consent decision-making. Therefore, it is considered appropriate to undertake an assessment of the proposal against the objective and policies of the NPSFM 2020.

The objective and policies in the NPSFM 2020 give effect to the fundamental concept of Te Mana o te Wai and the associated hierarchy of obligations. Part 1.3 of the NPSFM 2020 sets of the concept of Te Mana o te

[12] Clause 4.1(1) of the NPSFM 2020 provides that "*Every local authority must give effect to this National Policy Statement as soon as reasonably practicable*". Further, Section 80A(4) of the RMA requires regional councils to publicly notify any proposed plan, plan change, or variation, where the purpose of the same is to give effect to the NPSFM 2020, by 31 December 2024.

Wai as follows:

(1) Te Mana o te Wai is a concept that refers to the fundamental importance of water and recognises that protecting the health of freshwater protects the health and well-being of the wider environment. It protects the mauri of the wai. Te Mana o te Wai is about restoring and preserving the balance between the water, the wider environment, and the community.

(2) Te Mana o te Wai is relevant to all freshwater management and not just to the specific aspects of freshwater management referred to in this National Policy Statement.

Te Mana o Te Wai, as articulated by the NPSFM 2020, imposes a hierarchy of obligations. This hierarchy means prioritising the health and well-being of water bodies and freshwater ecosystems first. The second priority is the health needs of people (such as drinking water) and the third is the ability of people and communities to provide for their social, economic and cultural well-being. Clause 2.1 of the NPSFW 2020 similarly prioritises the health and wellbeing of waterbodies and freshwater ecosystems first when managing natural and physical resources as follows:

(1) The objective of this National Policy Statement is to ensure that natural and physical resources are managed in a way that prioritises:

(a) first, the health and well-being of water bodies and freshwater ecosystems

(b) second, the health needs of people (such as drinking water)

(c) third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.

Six principles [mana whakahaere, kaitiakitanga, manaakitanga, governance, stewardship, and care and respect] inform the implementation of Te Mana o te Wai, in addition to the hierarchy of obligations.

A number of the principles set out for Te Mana o te Wai are relevant to Councils in giving effect to the NPSFM (for example through plan making processes), as they focus on tangata whenua's authority and responsibility and actions, as well as governance by the council. The first four principles (a-d) are difficult for an applicant to give effect to. Principle (e) regarding stewardship, and principle (f) regarding care and respect, are given effect to on the applicant's farm through the wintering barn and effluent system upgrades that will reduce contaminant loss to water. In addition, the applicant continues to implement on-farm GMPs including extensive riparian fencing, planting and wetland enhancement. For the same reasons, this proposal is consistent with the Te Mana o te Wai framework that priorities the health and well-being of water bodies and freshwater ecosystems.

This proposal has been carefully considered against the objective and policies which give effect to the fundamental concept of *Te Mana o te Wai.* In the context of the detailed assessment of adverse and positive effects in Section 6, we consider the proposal is not inconsistent with the hierarchy of obligations (Objective of the NPSFM) and with managing freshwater in a way that gives effect to Te Mana o te Wai (Policy 1 of the

NPSFM).

This proposal has been prepared with the wider catchment in mind, and cumulative effects of farming activities in the catchment. This is consistent with the 'Ki uta ki tai' (from mountains to the sea) integrated management framework, where users, stakeholders, Environment Southland, and community have been involved in identifying values for protection through the work to propose plan changes and Freshwater Management Units.

Further discussion of relevant policies within the NPSFM is provided in the table below.

Table 10: Applicable policies from the NPSFM (2020).

Policy	Wording	Comment
1	Freshwater is managed in a way that gives effect to *Te Mana o te Wai*.	See above discussion.
2	*Tangata whenua* are actively involved in freshwater management (including decision making processes) and Māori freshwater values are identified and provided for.	See above discussion.
3	Freshwater is managed in an integrated way that considers the effects of the use and development of land on a whole-of-catchment basis, including the effects on receiving environments.	Trend data indicates both declining and improving trends depending on the parameter. Surface water quality in the receiving environment (as measured at 'Hedgehope Stream at the Makarewa River confluence') indicate that the overall water quality is degraded for various contaminants. The health and well-being of the receiving environments is predicted to improve as a result of mitigations implemented on farm in association with the proposed activities.
4	Freshwater is managed as part of New Zealand's integrated response to climate change.	Same as for Policy 3.
5	Freshwater is managed through a National Objectives Framework to ensure that the health and well-being of degraded water bodies and freshwater ecosystems is improved, and the health and well-being of all other water bodies and freshwater ecosystems is maintained and (if communities choose) improved.	Same as for Policy 3.
12	The national target (as set out in Appendix 3) for water quality improvement is achieved.	The national targets from primary contact are based on water quality in terms of *E. coli* and cyanobacteria. As there are no proposed changes to the effluent system, which has been designed

		to utilise low-rate application, deferred storage of effluent and strategic application to a variety of soil types, water quality improvements are likely being made.
13	The condition of water bodies and freshwater ecosystems is systematically monitored over time, and action is taken where freshwater is degraded, and to reverse deteriorating trends.	Water quality monitoring on Hedgehope Stream is carried out under ES's State of the Environment monitoring program to ensure monitoring over time to identify trend data. The proposal includes management of nutrient inputs and outputs from the farm in order to identify areas of improvement which could improve water quality in the receiving waters.
15	Communities are enabled to provide for their social, economic, and cultural wellbeing in a way that is consistent with this National Policy Statement."	The proposal provides greater opportunities of the local economy in terms of permanent jobs and support of local schools and communities. Positive economic, social and cultural well-being should result.

7.2.2 Regional Plans and Te Tangi a Tauira

Relevant policies from the RWPS, and the PSWLP are considered relevant to this application and are assessed below. The rules and policies in PSWLP have legal effect from the date of notification and weight must be given to the policies contained in PSWLP alongside the existing policies in the RWPS. Consideration of the Iwi Management Plan – Te Tangi a Tauira is also included below.

7.2.2.1 Water Quality

Planning Document	Particularly relevant sections
Southland Regional Policy Statement	Objectives WQUAL.1, WQUAL.2, Policies WQUAL, 1, 2, 5, 7, 8
Regional Water Plan for Southland	Policies 6, 11, 25, 41 and 42
Proposed Southland Water and Land Plan	Policy A4 of NPSFM Objectives 6 and 8 Policies 6, 15B, 16, 17, 18, and 39A
Te Tangi a Tauira	Section 3.5.13 and 3.6.13

Objective WQUAL.1 is of significant relevance to the proposal as it sets the water quality framework for the management of water quality in Southland. The objective requires four primary things:

- The life supporting capacity of water and related ecosystems is safeguarded;

- The health of people and communities is safeguarded;
- Water quality is maintained or improved in accordance with the National Policy Statement for Freshwater Management 2020;
- Freshwater quality is managed to meet the reasonably foreseeable social, economic and cultural needs of future generations.

The proposed dairy discharge area is within the Lignite/Marine Terraces and Peat Wetlands Physiographic Zones. Policies 6 and 11 of the PSWLP requires the implementation of GMPs to manage adverse effects cumulatively and propose GMPs and mitigations (where appropriate) to mitigate and/or avoid effects of the activities on water quality. These GMPs and mitigations will be implemented from the FEMP, and through this and the associated land use consent. Genuine attention and thought have been given to the potential adverse effects of the proposal on water quality, in the context of the most likely contaminant pathways.

Policy 15B aims to improve water quality by reducing nutrient discharge (both direct and diffuse) from the farm. The application strongly indicates that nutrient discharge will be reduced under the proposal across the landholding:

- Cow numbers are not increasing, and there is no change to the dairy effluent discharge area.
- Farm dairy effluent is disposed via a low-rate irrigation system at a rate no more than 10 mm per hour onto Category A and C soils.
- Good management practices, such as effluent discharge buffer zones, and applying effluent at depths less than soil water deficit are adhered to.
- The effluent pond provides sufficient deferred storage and provides certainty that effluent will only be irrigated on land when soil conditions permit.

Therefore, the application is consistent with this policy and adverse effects of the discharge to the receiving environment will be appropriately mitigated.

Policy 16 of the PSWLP requires the minimising of adverse environmental effects from farming activities. This proposal does not involve an increase in the number of cows from what is already consented and therefore no increase in dairy effluent discharge. Therefore, the proposal is consistent with Policy 16 as the assessment here demonstrates the mitigation applied to minimise adverse environmental effects on the downstream sensitive receiving environments.

Policy 16(1)(b)(iii) may apply as it is our assumption that no lowland surface water body in Southland meets the Appendix E water quality standards for all attributes. However, in the context of demonstrating that there will be some improvement in water quality over time as a consequence of the effluent discharge mitigations, it is considered that the 'generally' component of the policy applies and Policy 15B and the higher objectives would provide an appropriate approach that would support granting application that have been able to

demonstrate that they would result in an improvement in water quality.

Policy 15B of the PSWLP requires improvement of water quality where it does not meet Appendix E standards and this proposal is consistent with this policy. The proposal provides for a variety of measures which either avoid or further mitigate against adverse effects on water quality which are described in detail earlier.

7.2.2.2 Water Quantity

Planning Document	Particularly relevant sections
Southland Regional Policy Statement	Objectives WQUAN.1, WQUAN.2, Policies WQUAN 2, 5, 6, 7, 8
Regional Water Plan for Southland	Policies 14A, 21, 22, 28, 29 and 31
Proposed Southland Water and Land Plan	Policy B7 of NPSFM Objectives 11 and 12 Policies 20, 21, 22, 23 and 42
Te Tangi a Tauira	Section 3.5.14

Objective WQUAN.1 is of significant relevance to the proposal as it sets the water quantity framework for the management of water quantity in Southland. The objective requires four primary things:

- The life supporting capacity of water, catchments and related ecosystems is safeguarded;
- The limits and targets set to achieve freshwater objectives are complied with;
- Water quality is maintained or improved in accordance with the National Policy Statement for Freshwater Management 2020;
- Freshwater quality is managed to meet the reasonably foreseeable social, economic and cultural needs of future generations.

Policy 20(1A) of the PSWLP requires the management of groundwater abstraction and use so as to recognise that the use and development of Southland's land and water resources, including for primary production, can have positive effects including enabling people and communities to provide for their social, economic and cultural wellbeing. The proposal provides greater opportunities of the local economy in terms of permanent jobs and support of local schools and communities. Positive economic, social and cultural well-being should result, and therefore the proposal is consistent with this policy.

Policy 20(2) of the PSWLP requires a proposal to avoid, remedy or mitigate significant adverse effects from the use and development of groundwater resources on: (a) long-term aquifer storage volumes; (b) the reliability of supply for lawful existing groundwater users, including those with existing, but not yet implemented, resource consents; (c) surface water flows and levels, particularly in spring-fed streams,

natural wetlands, lakes, aquatic ecosystems and habitats (including life supporting capacity and ecosystem health and processes of water bodies) and their natural character; and (d) water quality. The rate of take and volume of water sought is the same as authorised in existing water permit AUTH- 301082-V1, is reasonable for the intended use and none of the adverse effects listed in this policy will result from the proposed abstraction of groundwater.

Policy 21 of the PSWLP sets out the requirements to manage the allocation of groundwater. The proposed abstraction of groundwater will not increase the existing consented daily volume and so will not adversely affect existing allocation limits.

Policy 22 of the PSWLP sets out the requirements to manage the effects of groundwater abstraction by avoiding stream depleting abstractions that would not safeguard the mauri of that waterway and mahinga kai, taonga species or the habitat of trout and salmon, and by ensuring interference effects are acceptable, in accordance with Appendix L.3. The proposed rate of abstraction is less than 2 L/s as an average over 24 hrs and so none of the adverse effects listed in this policy are expected. In terms of interference effects, given that the rate of take is relatively low, our experience of bore interference modelling is that it is highly likely that any adverse interference effects on any existing neighbouring bores will be 'acceptable' in accordance with Appendix L.3 of the PSWLP, if at all measurable.

Policy 23 of the PSWLP requires the management of stream depletion effects resulting from groundwater takes which are classified as having a Riparian, Direct, High or Moderate hydraulic connection, as set out in Appendix L.2 Table L.2. The proposed instantaneous rate of abstraction is 2 L/s, with a minor daily volume decrease, and so none of the adverse effects listed in this policy are expected.

Therefore, the proposal is consistent with the relevant policies noted above.

7.2.2.3 Effluent discharge

Planning document	Particularly relevant sections
Southland Regional Policy Statement	Objectives WQUAL.1 Policies WQUAL.8, WQUAL.10
Regional Water Plan for Southland	Policies 7, 31A, 31C, 31D, 41 and 42
Proposed Southland Water and Land Plan	Policies 13, 14 and 17
Te Tangi a Tauira	Section 3.5.1

Policies throughout the relevant planning documents stress a preference for the discharge of contaminants to land as it creates less environmental effects, enables an effective and efficient re-use of a waste produce and protects values as described in Te Tangi a Tauira. The management of effluent in the proposal meets best practice and is designed to avoid any surface runoff, overland flow, ponding, contamination of water via,

deep drainage or overland flow from the application of effluent to land. The land which will be receiving effluent is considered suitable and the discharge areas are sized appropriately to lower overall nutrient loads from the application of effluent.

7.2.2.4 Tangata Whenua

Planning Document	Particularly relevant sections
Southland Regional Policy Statement	Policies TW.3, TW.4
Regional Water Plan for Southland	Polices 1A
Proposed Southland Water and Land Plan	Policies 1 and 2
Te Tangi a Tauira	Entire document

The Southland Regional Policy Statement describes the resource management issues important to Ngai Tahu in the Southland regional and includes ensuring tangata whenua is considered in decision making, iwi management plans are recognised, taonga and sites of special significance are protected and food gathering resources are protected. Te Tangi a Tauira is the iwi management plan recognised by Ngai Tahu which encompasses the Southland region. Policies TW.3 and Policy 2 of the PSWLP require iwi management plans to be taken into account.

This proposal includes mitigation that will ensure that the effects of the activities will not materially impact on tangata whenua values or compromise sites of special significance of food gathering sites. The cumulative effects assessment concludes that any effects felt outside the boundary of the property will not degrade water quality and not impact on cultural values such as mahinga kai.

In addition, the application provides for the following in accordance with Te tangi a tauira:

- The provision of buffer zones to water abstraction sites and waterways;
- The application effluent is to land rather than water;
- The applicants already adopts best practice for land application of managing farm effluent;
- The existing riparian margins are protected;
- Deferred application of liquid effluent and solid effluent is provided for;
- Nutrient loading from effluent discharges to land is already within industry best practice limits;
- The system and management practices are considered appropriate for the risks associated with the receiving environment;
- Water abstraction is monitored with metering results to be submitted to Council;
- Regarding Policies 3.5.14.17 and 3.5.1.17, the consent periods proposed are less than 25 years.

7.3 Sections 105 and 107 of the RMA

In addition to the matters in Section 104(1) of the RMA, if an application is for a discharge permit a consent authority must have regard to the matters as specified in Section 105. The proposed discharge will be undertaken in a manner which further reduces contaminants entering water through controls on application method and conditions of consent. As land-applied nutrients can be reused, there is a direct benefit to the property as a method for improving soil fertility. The discharge of effluent to land is the best method for avoiding adverse effects on water, especially relative to discharges directly to water.

There are no matters under Section 107(1) of the RMA that would require the consent authority to decline this application i.e., the effluent discharge to land is unlikely to cause any of the listed adverse effects.

8. Consent Duration, Review and Lapse

8.1 Consent Duration

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

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

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

Potential adverse effects have in the first instance been mitigated by appropriate management techniques on farm followed by contingency planning and ongoing monitoring. 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 AEE and concluded to be no more than occurring historically in the existing environment.

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 seeks a 10-year consent duration for all activities requiring consent set out in this application based on the following information:

- The level of certainty about potential effects for this specific application is high because of the ongoing use of the current effluent storage, and the low-rate effluent irrigation system.
- The proposed daily volume of water applied for is the same as in the current permit, is reasonable for the intended use, and is unlikely to result in over-allocation or depletion of the groundwater resource within a 10 year consent term.

A 10 year consent duration for the effluent discharge permit and water take permit is consistent with Policy 40 PSWLP.

The permanence and economic life of any investment

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

The investment in both properties is significant and in the order of millions of dollars. The market for dairy products both nationally and globally is strong. Commodity market influence is always a factor and will influence the profitability of the proposed farm. An appropriate consent duration will encourage investment and improvements on farm which can improve environmental outcomes and buffer the applicant's ability to respond to commodity market changes which secures the permanence of the activity. Furthermore, the permanence of the economic life of the activity requires resource consents to be granted from the Council for a reasonable duration.

Common expiry date for permits that affect the same resource

A common expiry date for the effluent discharge and groundwater permits is considered appropriate because these activities are part of an integrated dairy farm operation with impacts on the same or related land and water resources.

Applicant's compliance history

The applicant has demonstrated a good compliance history with the existing resource consents and there is no evidence to suggest that future compliance will not continue to be good.

Timing and development of FMUs

Granting 10 year duration resource consents will not adversely affect the development and implementation of any revised framework established in the FMU section of the PSWLP, as Council has the ability to have new rules take effect from the date of notification of a plan change and would also be able to review all contents in the catchment collectively.

Summary

In conclusion, due to the low level of environmental risk of the proposed activities and a substantial value of investments on the property, a 10 year duration for the effluent discharge and groundwater take permits is considered appropriate.

8.2 Review of Lapse

The applicants have no objection to the Environment Southland standard review conditions in accordance with Sections 128 and 129 of the RMA. A lapse condition is not needed for an application to continue an existing activity.

9. Conclusion

A decision to grant the resource consent applications under Section 104B of the RMA is recommended on the basis that:

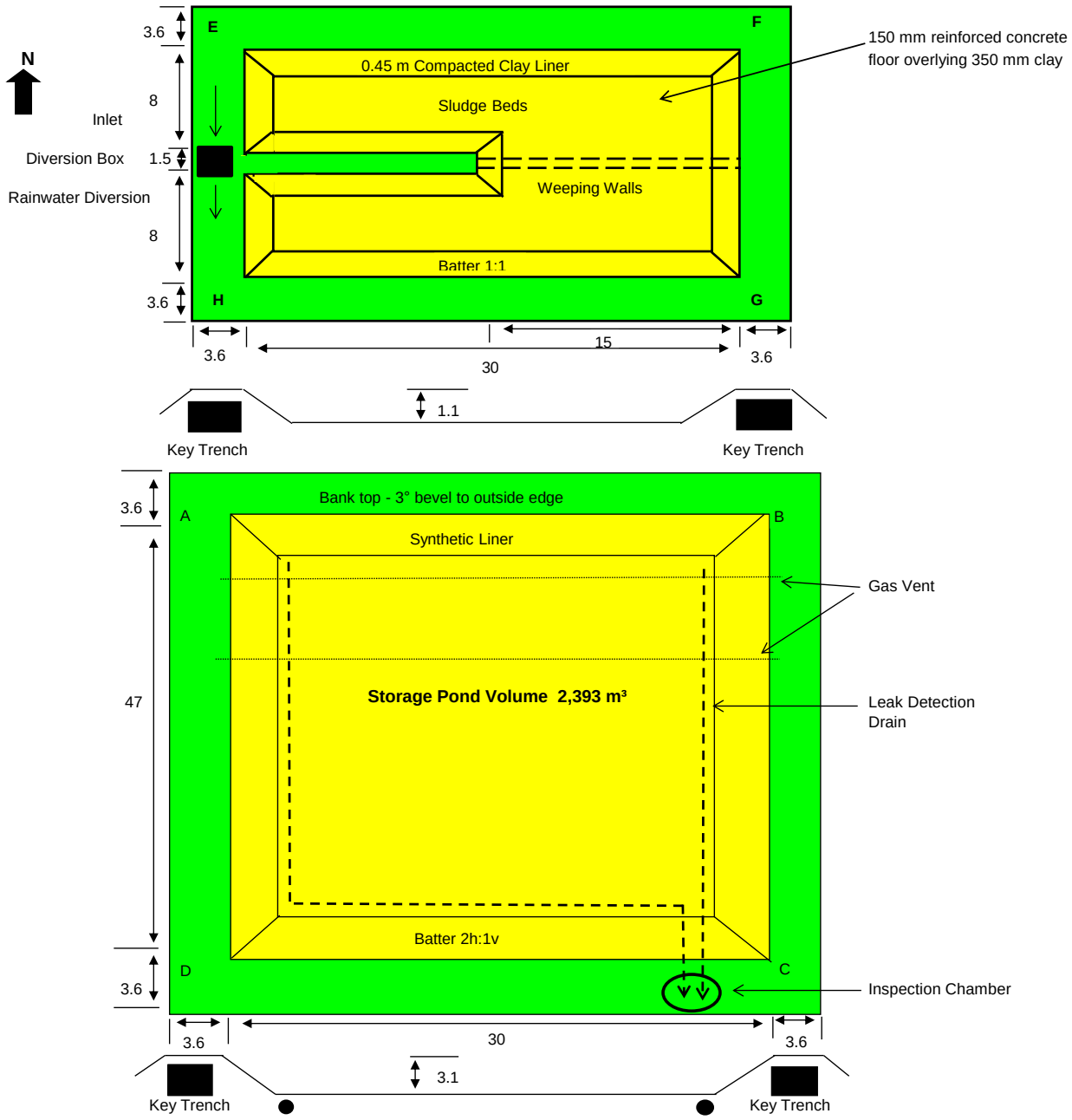
a) the adverse effects on the environment are highly likely to be insignificant;
b) The proposal is consistent with the requirements of the RMA, relevant plan objectives and policies and other relevant matters.

The proposal enables opportunities for the applicant to sustainably, efficiently and profitably run their dairy farm whilst still maintaining positive environmental outcomes. Granting the resource consent applications will be consistent with the purpose of the RMA for the reasons explained within this report. The proposed activities are highly unlikely to result in further degradation of water quality and potential adverse effects will be appropriately avoided or mitigated.

Appendix A: Original Effluent Pond Design Drawings

Titipua Ltd Partnership

Storage Pond and Sludge Beds Plan © Dairy Green Not To Scale Dimensions = m Outside Batters 1:1



Point	Cut m	Fill m	Relative Height m
A	3.10	0	9.66
B	2.46	0.64	8.02
C	0.42	2.68	5.98
D	1.60	1.50	8.94
Datum **E**	1.51	-0.41	10.00
F	0.77	0.33	9.26
G	0.11	0.99	8.60
H	0.79	0.31	9.28

Datum will be invert of dairy shed drain once supplied by the builder

Appendix B: Original Dairy Effluent Storage Calculations

Dairy Effluent Calculator Report

Disclaimer

I/We acknowledge and agree that:

1. the results contained in the report which DairyNZ will provide following my/our use of the Dairy effluent storage calculator ("the calculator") are generated based on the data which I/we have inputted into the calculator; and
2. the reliability of the results and the report is dependent upon a number of variables including, without limitation, the accuracy of the input data, and the validity of the assumptions and algorithms used in the calculator in relation to the input data which may be updated to reflect development in effluent knowledge; and
3. the results contained in the report cannot be relied upon solely to ensure the effluent storage system:
   a. meets the current or future requirements of the district or regional plans of the local territorial authority or regional council or any other authority having jurisdiction.
   b. has the storage capacity to allow practical management of the effluent system.

Accordingly, DairyNZ does not accept liability for any loss, damage, cost or expense suffered or incurred by me/us or any third party to whom this report has been provided (whether by me/us or another person) in connection with the use of, and reliance on, the report and the results contained in it.

DairyNZ's website terms and conditions (which can be found at https://www.dairynz.co.nz/terms-and-conditions) otherwise apply to the use of this service and the provision of the report and the results in it.

Titipua Partnership

Hedgehope Block Road

Supplier Number	
Storage max m³	2,548.29
90th percentile m³	2,279.40
Total pond useable volume m³	2,320.83
File owned by	Quinton Scandrett
Created by	Quinton Scandrett
Created on	20 Jun 2021
Last modified by	Quinton Scandrett
Last modified on	22 Jun 2021

600 cows consented, twicer per day milking until 15 Dec, then 16 hour milking

Greenwash used at the dairy shed 40 L/cow/day water use
Rainwater diversion used in the off season

High risk soils for effluent application

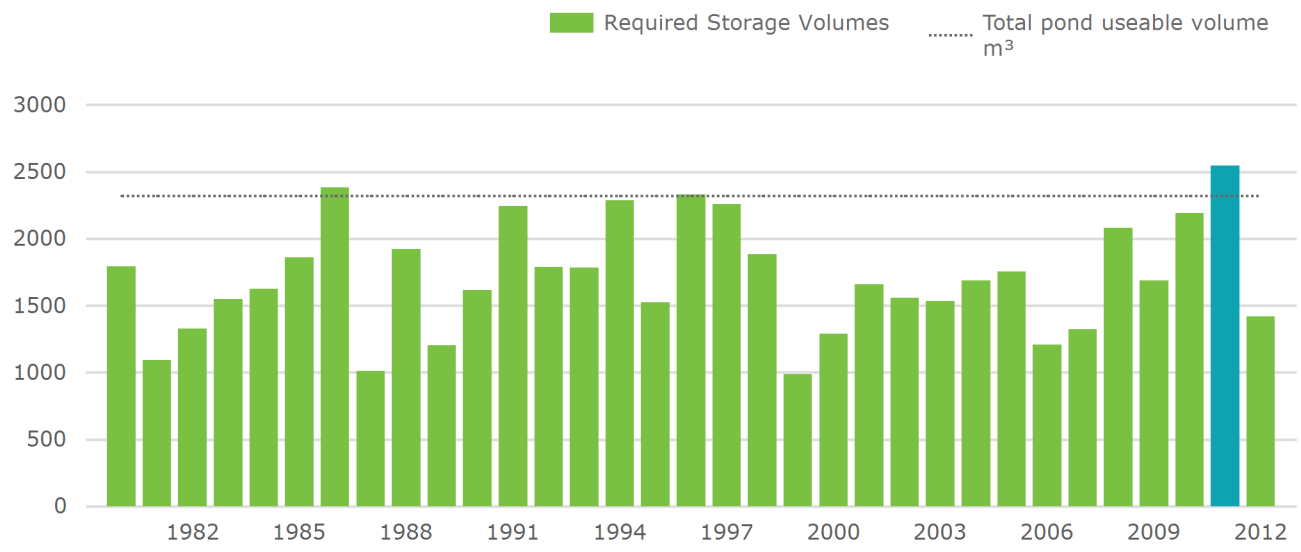
Cobra rain gun used for effluent application

Sludge beds entered in solids separation

Calving pad entered in animal shelter used by 120 cows in spring - not diverted

Existing effluent pond entered

Required Storage Volumes



Report generated on: 22 Jun 2021

Climate

Site	Mean Rainfall mm	Altitude m
Woodlands Garvie Rd	1031	52

Soil

Low Risk Soil ha	Minimum High Risk Soil ha	Surplus high risk soil ha
0	80	0

Irrigation

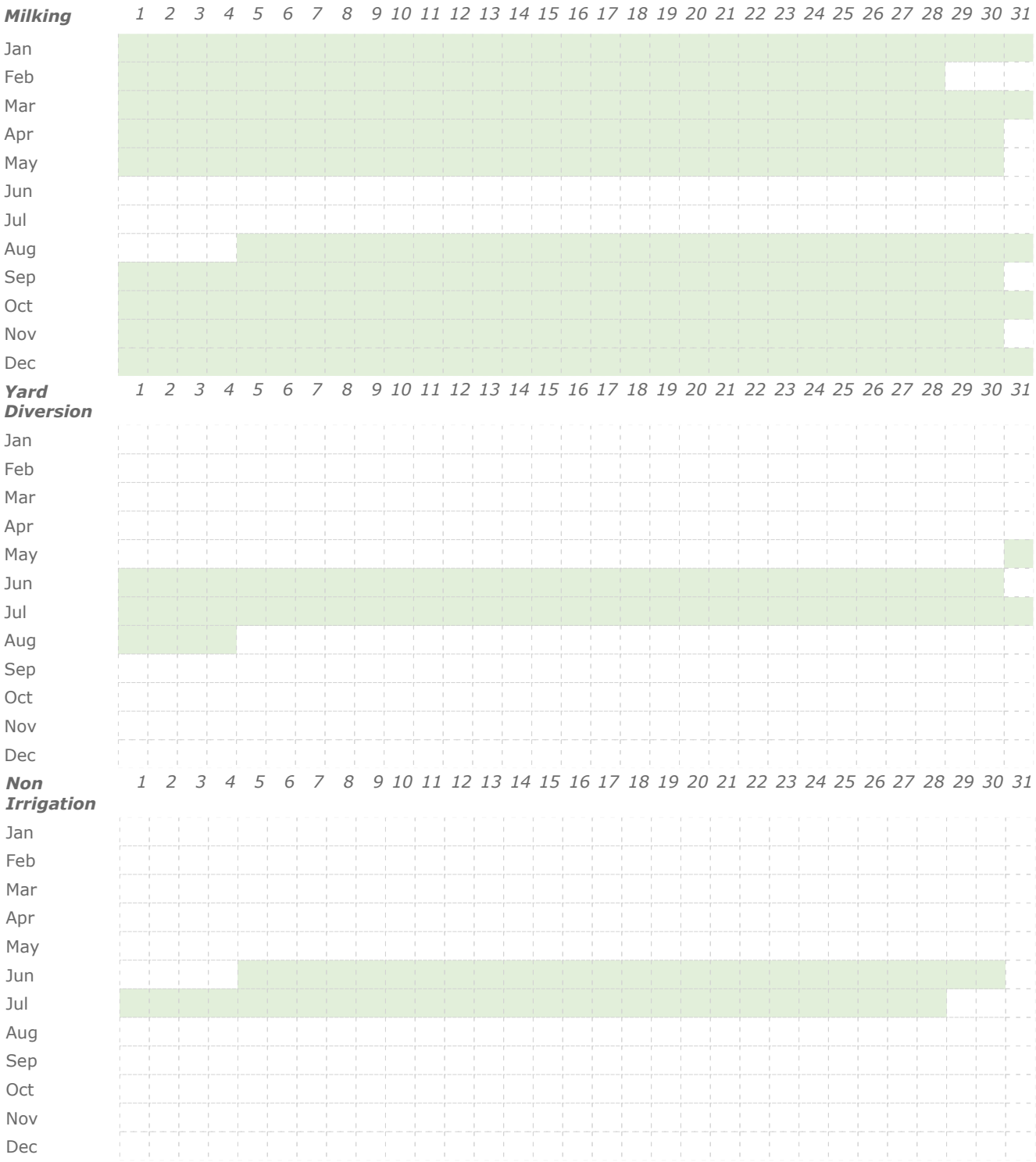
Calculated option	Application depth mm	Pump volume m³
Specified	2	55
Specified	5	125
Specified	10	200

Catchment

Shed		Yard		Feedpad			Animal Shelter			Other
Area m³	Diverted	Area m³	Diverted	Area m³	Covered	Diverted	Area m³	Covered	Diverted	Area m³
350	Yes	998	Yes	0	No	No	1320	No	No	0

	Yard				Animal Shelter		
	Cows	Hours	Volume m³	Wash LCD	Cows	Hours	Volume m³
Jan	600	3	24	0	0	0	0
Feb	600	3	24	0	0	0	0
Mar	600	3	24	0	0	0	0
Apr	600	3	24	0	0	0	0
May	550	3	22	0	0	0	0
Jun	0	0	0	0	0	0	0
Jul	0	0	0	0	0	0	0
Aug	350	3	14	0	120	24	0
Sep	550	4	22	0	120	24	0
Oct	600	4	24	0	60	24	0
Nov	600	4	24	0	0	0	0
Dec	600	4	24	0	0	0	0

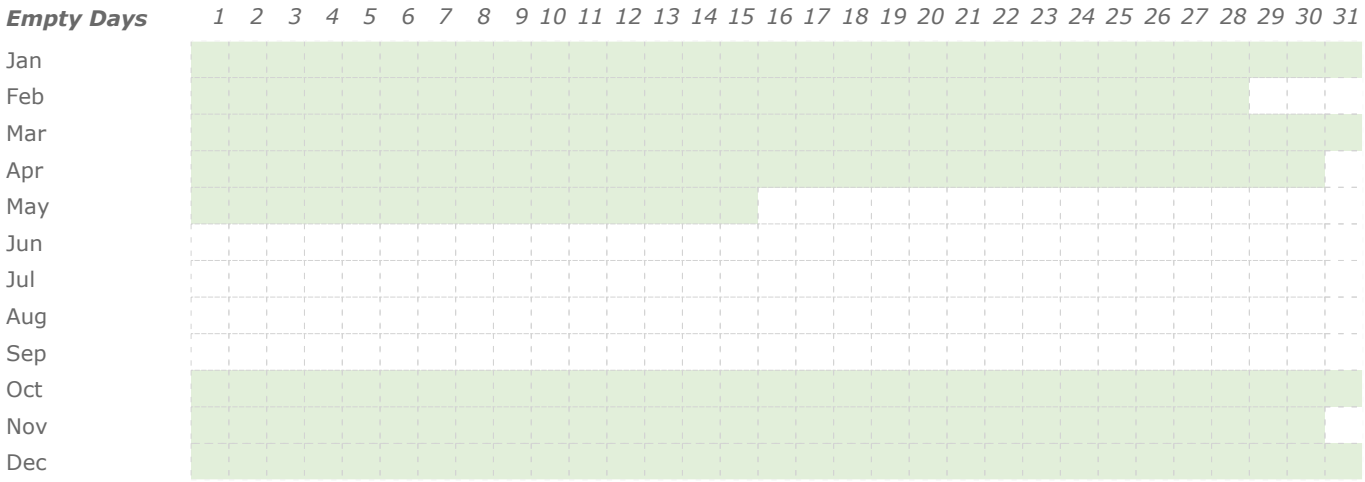
Calendar

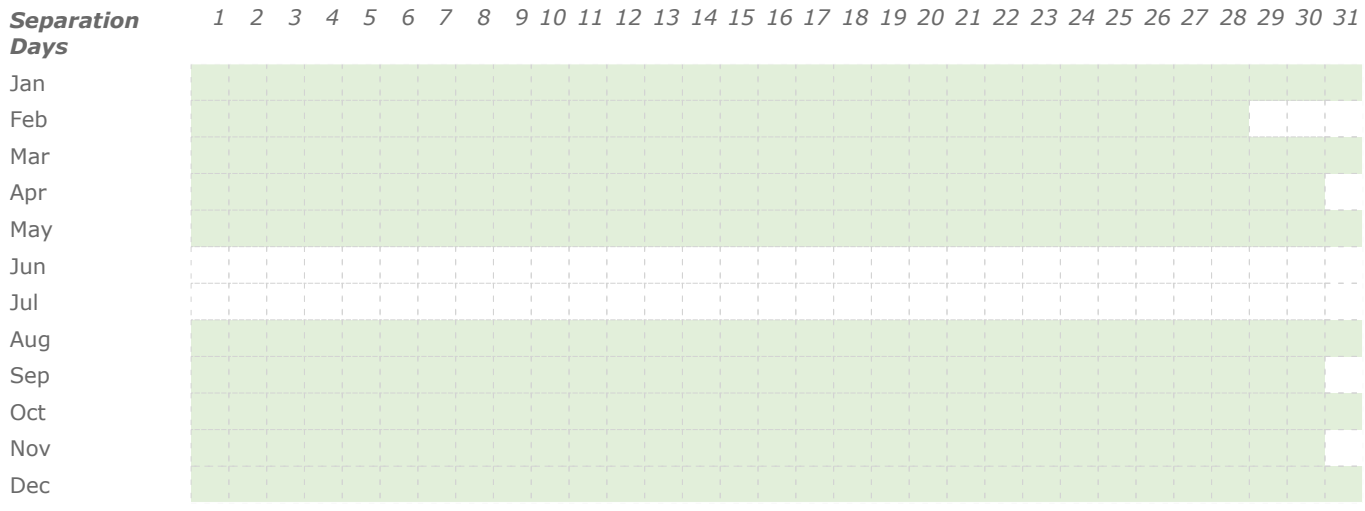


Report generated on: 22 Jun 2021

Solid Unit

Name	Sludge Beds
Type	Regular
Dimension	length 30m, width 8m and height 1m
Input Source	Yard
Dry Matter %	6
Separator Efficiency %	35
Four Day Forecast SWDExcess	5
Minimum SWD Application	10





Report generated on: 22 Jun 2021

Storage

Emergency Storage Period	0

Storage Name	*Covered*	*Pumped*	*Type*	*Dimension*
Irrigation Pond	No	On	Regular - Rectangular	length 47m, width 30m, height 3.1m, sludge height 0.1m freeboard height 0.5m and batter 2:1

Appendix

Season	*Required Storage Volumes m³*
1980	1,793.73
1981	1,091.79
1982	1,325.77
1983	1,546.73
1984	1,626.36
1985	1,861.10
1986	2,380.61
1987	1,010.60
1988	1,924.60
1989	1,200.60
1990	1,614.68
1991	2,241.85
1992	1,786.85
1993	1,783.65
1994	2,285.27
1995	1,522.19
1996	2,329.67
1997	2,255.92
1998	1,884.17
1999	986.05
2000	1,291.43
2001	1,657.18
2002	1,557.53
2003	1,532.03
2004	1,686.90
2005	1,752.57
2006	1,207.66
2007	1,321.84
2008	2,078.34
2009	1,686.11
2010	2,191.60
2011	2,548.29
2012	1,420.94

Appendix C: Visual Assessment Report

Dairy Green Ltd

Practical Engineering Solutions
Consents, Effluent, Stock water, Irrigation
Design through to Installation

EFFLUENT POND VISUAL INSPECTION

Titipua Partnership Ltd

Hedgehope Block Road
Pebbly Hills

24 June 2021

Q SCANDRETT
DAIRY GREEN LTD

10 Kinloch Street, PO Box 5003, Waikiwi, Invercargill 9843
Phone Invercargill 03 215 4381
Email: scandrettrural@xtra.co.nz

Visual Pond Inspection

Introduction

This report is to satisfy the permitted activity status described in Environment Southland's decision version of the Water and Land Plan, Rule 32 D, clause (a) (2), which states for existing agricultural effluent storage facilities, "certified by a Suitably Qualified Person in accordance with Appendix P within the last three years as: (a), having no visible cracks, holes or defects that would allow effluent to leak from the effluent storage facility".

Methodology

The methodology used is aimed at detecting obvious physical defects that are causing or could cause leakage.
It involves a physical inspection of the lining material above the liquid height, the crest and external batters, if any. It also considers the likely failure mode for the type of containment structure being inspected. If there is a drop test report available, it will be assumed that this report confirms the performance of the pond batters and floor surfaces below liquid level since these surfaces cannot be observed unless the pond is empty.

For synthetically lined ponds, where there is a leak detection drainage system installed the inspection piezo will be checked where possible. The condition of the lining membrane and its anchoring will be recorded. As well the material creating any embankment and its stability will be noted and any items of maintenance that may be required.

A visual inspection cannot record faults that are not observable which could include unsatisfactory material below the liquid level or underneath a synthetic liner or in the core of the bank. It doesn't include an assessment of bank performance in an earthquake or calculated internal and external batter performance under the normal range of operating conditions that a pond has to perform under.

POND

The effluent pond and sludge beds for Titipua Partnership Ltd are located south of the dairy shed on the property at 425 Hedgehope Block Road and were inspected by request on the 16th June 2021 with details recorded as follows:

Observations

The pond is rectangular in shape consisting of two constructed banks and two banks formed predominantly in cut. The east bank inside top dimension is approx. 47 m long and north bank approx. 30 m long. The inflow to the storage pond is in the northeast corner of the pond with gravity inflow via a PVC pipe from the sludge beds with liquid passing through the weeping walls prior. The pond bank crests consist of a clayey silt subsoil with the wider sludge bed and pond area fenced to exclude stock.

The following aerial view shows the site layout.

Figure 1: Aerial view of the dairy shed, sludge beds and pond.

Soils

Topoclimate records the pond to be situated within the Pukemutu soil type. The pond's bank crest material would indicate the pond has been constructed in a clayey silt soil type which is typical of the Pukemutu soil. These soils have a heavy silt loam texture and are formed from loess. The topsoil appears to have been stripped from the pond site and only subsoil used for bank construction.

Banks

The pond banks appear to be formed from local material, and the pond looks to have been constructed with cut and fill to balance. The pond site is sloping from northwest to south east with the north bank in cut and the other three banks at differing heights above ground level. The core bank material is predominantly clayey silt. Crest widths were approx. 4 m. The bank crests appear to be stable with good gras cover.

Batters
The batter slope for the internal batters was visible for the top two thirds of the pond's depth due to the low level of the pond, these were estimated to be 2.0H:1V. The inside batter slope that was visible looked to be stable with no slumping or bulges identified. The external batter slopes have good grass cover, no defects were identified.

Liner
The pond looks to have been lined with 1.5 mm EPDM. The internal batter surfaces above liquid level were inspected looking for defects or holes. There were no defects identified that would allow effluent to leak from the pond. No seepages were identified around the outside of the pond. The pond has gas venting and leak detection drainage.

Photographs of each pond batter and bank are appended.

Comments

The pond was approx. two thirds empty which allowed an inspection of the majority of the internal bank batters. The internal and external batters are stable, there were no defects identified that would allow effluent to leak from the pond.

…… ……

Author
Q Scandrett
Agricultural & Engineering Consultant
Dairy Green Ltd

Reviewer
J S Scandrett
Agricultural & Engineering Consultant
Dairy Green Ltd

POND PHOTOGRAPHS

West Bank

The west bank internal batter slope view looking south.

East Bank

The east bank, view looking north.

10 Kinloch Street, PO Box 5003, Waikiwi, Invercargill 9843
Phone Invercargill 03 215 4381
Email: scandrettrural@xtra.co.nz

North Bank

The north bank and batter slope view looking east.

South Bank

The south bank internal batter slope and bank crest view looking east.

10 Kinloch Street, PO Box 5003, Waikiwi, Invercargill 9843
Phone Invercargill 03 215 4381
Email: scandrettrural@xtra.co.nz

Sludge Beds:

The property has two parallel sludge beds, with parallel weeping walls that divide the beds, these service the dairy shed effluent. Effluent gravity flows in from the dairy shed and yard. Liquid effluent passes through the weeping walls and gravity flows via PVC pipe to the storage pond.

The sludge beds have been constructed predominantly in cut with the banks and internal batters constructed from the material in-situ. The sludge beds have been lined with a clayey silt loam that was stripped from the site. The floor has approx. 150 mm depth of concrete overlying the clay lining. The sludge beds internal batters are approx. 1H:1V, the batter slopes look to be stable with some material having been removed during cleaning out over the life of the structure. The south bed had not long been emptied prior to the visual inspection which allowed the internal surfaces of the structure to be inspected. The north bed will need to be emptied when soil conditions allow in spring to allow inspection. The weeping walls have sufficient concrete footing to ensure they work effectively and to prevent erosion. The inlet plumbing to both beds discharges onto concrete to prevent erosion from the effluent. There does not appear to be any holes, cracks or defects that would allow effluent to leak from the structure. No seepages were identified around the external batters of the structure.

Sludge Beds Photos:

South bed, south bank, view looking east.

10 Kinloch Street, PO Box 5003, Waikiwi, Invercargill 9843
Phone Invercargill 03 215 4381
Email: scandrettrural@xtra.co.nz

West end of the south bed, view looking north.

East end of the south bed looking north.

10 Kinloch Street, PO Box 5003, Waikiwi, Invercargill 9843
Phone Invercargill 03 215 4381
Email: scandrettrural@xtra.co.nz

Appendix D: Peer Review of Visual Assessment Report

GeoSolve Ref: 190595.20_Titipua
2 July 2021

Consents Section
Environment Southland
Private Bag 90116
Invercargill 9840

Effluent Pond Visual Inspection – Titipua Partnership Ltd, Hedgehope Block Road Pebbly Hills

GeoSolve Ltd have been engaged by Dairy Green Ltd to review a visual inspection report at the above effluent pond.

This visual inspection was carried out in accordance with Environment Southland's decision version of the Water and Land Plan, Rule 32 D, clause (a) (2), which requires that existing agricultural effluent storage facilities are *"certified by a Suitably Qualified Person in accordance with Appendix P within the last three years as: (a), having no visible cracks, holes or defects that would allow effluent to leak from the effluent storage facility".*

I have reviewed the report dated 8 June 2021 and based on the provided information I consider that:

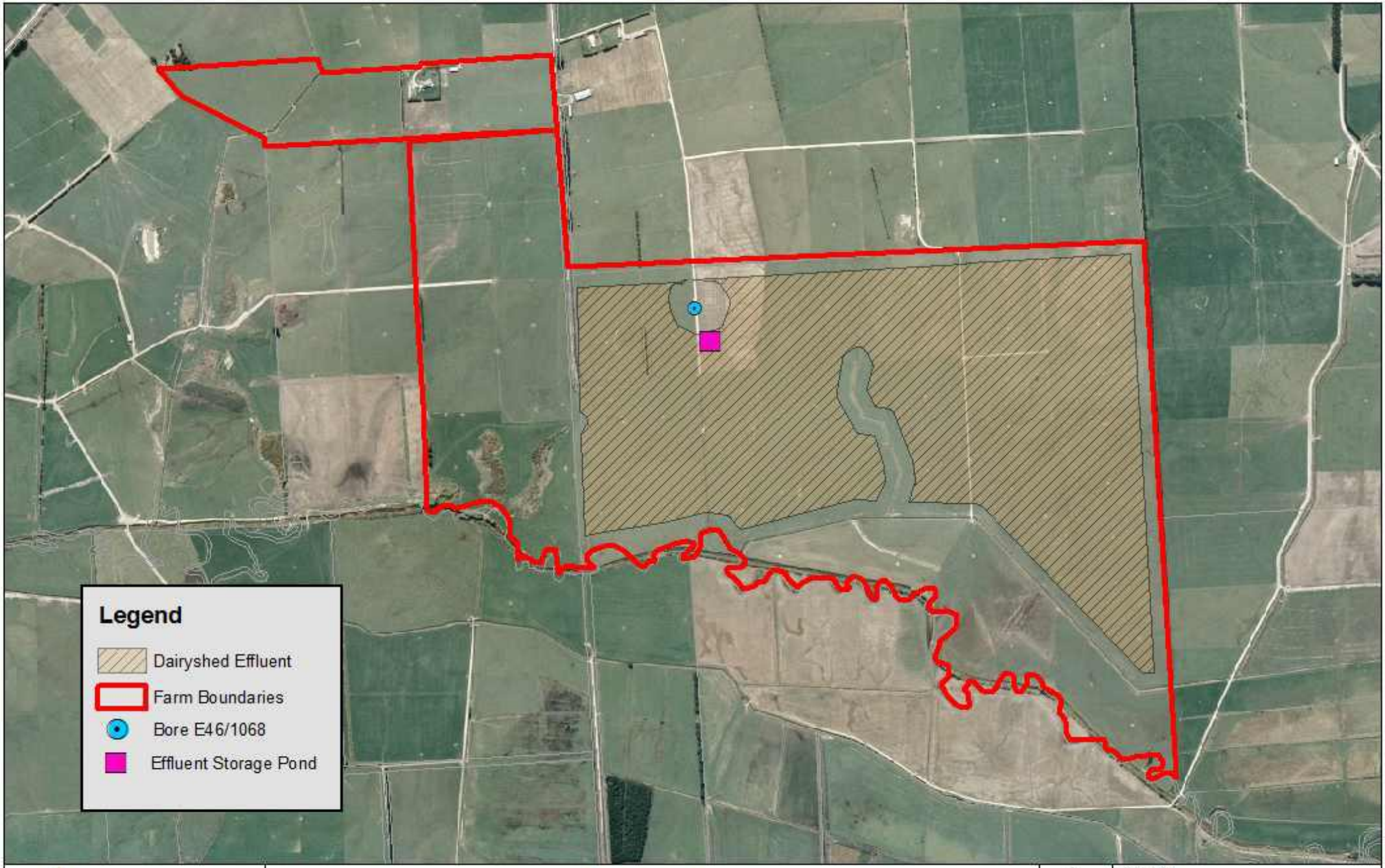
- Based on the descriptions and photographs within the report that there were no visible defects observed within the effluent pond or sludge beds, noting that it is recommended that the north sludge bed is inspected when emptied; and
- The effluent pond and slude beds appear to meet the requirement in italics above and had no visible cracks, holes or defects that would allow effluent to leak it.

This report has been prepared for the benefit of Dairy Green Ltd with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

Yours faithfully,

Colin Macdiarmid
Senior Engineer –Geotechnical
CPEng 1023934

Appendix E: Map of Effluent Discharge Area



environment SOUTHLAND

Appendix 1 Map
Titipua Limited Partnership APP-301081-V1 and APP-301082-V1

Date: 15/09/2014

N

1:12,000

Mo Topham
CNMA
Southland
Ph: 027 279 7449
Email: mo.topham@outlook.com

File Note: Titipua Ltd Partnership – Pasture Grown

June 2021

1.0 Supporting information to this report:

This file note is not a standalone report. It is intended to be read in conjunction with:

- The Overseer modelling report, dated 23rd March 2021 titled "Titipua Ltd Partnership – OverseerFM farm system modelling to support a consent application for expanded dairy". This report has been attached to this file note.

2.0 Purpose of this report:

The Overseer Nutrient Budget Review, completed by Nicky Watt of Irricon raised points of clarification over the pasture grown estimates in the proposed nutrient budget scenario when compared to that estimated in the current dairy and Schrama block scenarios. This report seeks to explain the pasture grown figures to give council confidence that they are reasonable.

3.0 Modelled pasture grown results:

Table 1 below has been completed using information from the Overseer modelling report (section 1.1 and appendix 2 in that report). It shows the estimated pasture grown in each of the scenarios modelled – current dairy, Schrama block and the proposed dairy system.

Table 1. Estimated pasture grown figures in the current, Schrama and proposed system scenarios as per the Overseer report, dated 23rd March 2021.

	Current system	**Schrama Block**	**Proposed system**
Pasture grown (TDM/ha)	16.8	11.2	16.1
N Fertiliser applied (kgN/ha)	239	18	166 (average for pastoral area) *175 (non Effluent areas)* *154 (effluent areas)*

4.0 Overseer modelling process

Overseer calculates pasture grown from the data inputted using a back calculation and an assumed pasture quality. Overseer is not able to check the feasibility of these pasture production estimates and therefore the user must check them.

For the Titipua Ltd Partnership, input data was collected for the last three seasons and then averaged to reduce the impact of one seasons climatic conditions during the period.

As described in the Overseer modelling report, detailed input data for the Schrama block was not available due to the death of the previous owner. Therefore, a nutrient budget has been created

using data from the Beef and Lamb NZ economic survey alongside information available from Google Earth and the purchaser. The property has been modelled in a conservative approach that resulted in a pasture grown estimate at the lower end of the expected range. It should be noted that if a conservative approach had not been taken it would have resulted in higher nutrient losses, and thus an easier threshold for the Titipua Ltd Partnership to reach.

The proposed dairy system model is the Titipua Ltd Partnerships preferred future farm system. The inputs for the proposed system were discussed with the client at length to ensure that a viable system was modelled.

The Schrama block, when compared to the current dairy platform, has the same soil types, drainage, topography, rainfall and temperature, and similar or better soil fertility.

In Southland there are significant differences between sheep and dairy grazing systems. Sheep farms tend to be set stocked for a significant part of the season and grazed to lower residuals. These practices influence growth rates, and result in lower growth rates than a dairy farming system. It is not relevant to make direct comparisons between sheep and dairy farming growth rates. It should be noted that Woodlands growth data is from a sheep farm, but as it uses "caged cuts" is not reflective of standard sheep grazing practices.

The Schrama block, given the same farm system, nitrogen use and pasture management, has the same potential to grow pasture as the current dairy farm. Therefore, the pasture grown estimate in the proposed scenario should be compared to the current dairy farm only (not the previous sheep grazing system).

4.0 Interpretation of Overseer pasture grown estimates:

Section 4.1.1 of the Overseer modelling report discusses that the pasture grown estimations in Overseer for Southland dairy farms are higher than expected. I have included this section below:

"It should be noted that the estimated pasture grown outputs from Overseer are higher than expected. Overseer uses a default value for ryegrass/white clover pasture quality irrespective of the land use and management. The default Overseer value in Southland ranges from 10.5 to 11.17 MJ ME/ kg DM depending on the month (reference: Characteristics of pasture, June 2018, D M Wheeler AgResearch Ltd). Pasture cuts from an Eastern Southland monitor farm show MEs of 11.5 to 12.2 (reference: Pasture growth and quality on Southland and Otago dairy farms, D. E. Dalley and T. Geddes, DairyNZ, NZ Grasslands Publication 2012).

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

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

The Overseer Nutrient Budget Review completed by Irricon also noted that Overseer assumes a lower ME (metabolizable energy) than that found in the South Island. The lower ME assumed results in pasture grown estimates that are higher than expected.

Table 2 below shows the estimated pasture grown figures for the dairy scenarios at 10.8ME (as per the average of the Overseer assumed pasture quality) and at 11.85ME (as per the average of the pasture quality measured by Dalley and Geddes, 2012).

Table 2. Pasture grown estimates taken directly from Overseer compared to an updated pasture grown figure using pasture quality figures measured on Southland dairy farms.

	Current system	Schrama Block	Proposed system
Overseer Pasture grown estimate – 10.8 MJME/kgDM (TDM/ha)	16.8	11.2	16.1
Updated pasture grown estimate – 11.85MJME (TDM/ha)	15.3	NA	14.7

Therefore, the pasture production estimated by Overseer and corrected for Metabolisable Energy content is 15.3TDM/ha and 14.7TDM/ha on the current and proposed dairy system scenarios, respectively.

5.0 Expected pasture grown in Southland

Pasture production has been measured at the Woodlands Research Station on a fortnightly basis since 2000. The trial is operated in a nil nitrogen, optimal soil fertility system. The results of these measurements are publicly available, and I note that the Irricon report referenced a paper written about this trial which averaged pasture production from 2001 – 2012. Recent data released by the Woodlands Research Station including the years 2013 - 2021 showed that the average annual pasture production for this trial is now 13.0 TDM/ha (with no nitrogenous fertiliser input).

Pasture production in the current and proposed dairy farm scenarios is 2.3 and 1.7 TDM/ha higher respectively than the Woodlands Research Station average. This difference can be explained by nitrogen fertiliser pasture growth. As shown in Table 1, the current and proposed dairy farm scenarios included fertiliser nitrogen use of 239 and 166kgN/ha respectively. At a 10:1 response rate (10kgDM per 1kgN applied per ha), we would expect that the current and proposed would grow 2.39TDM/ha and 1.66TDM/ha more than the Woodlands Research Station. **This equates to an expected pasture grown of 15.39TDM/ha and 14.66TDM/ha on the current and proposed system respectively.**

5.0 Conclusions:

Due to differences in pasture management and its effect on pasture production, it is not justifiable to directly compare pasture grown figures rates for a sheep and dairy system. This comparison, by Irricon has led to incorrect conclusions regarding robustness of the modelling.

Pasture production is estimated by Overseer using a back calculation and an assumed pasture quality. Overseer overestimates pasture production on Southland dairy farms due to an under estimation of pasture quality. After correcting for this error, Overseer estimates pasture production on the current and proposed scenarios to be 15.3 and 14.7TDM/ha respectively.

The Woodlands Research Station has measured pasture production for the last 20yrs. The average annual pasture production on a Nil Nitrogen site is 13.0TDM. Considering the nitrogen applied to the current and proposed system, and a 10:1 response rate, we would expect pasture production on the Titipua Ltd Partnership property to be 15.39 and 14.66TDM/ha in the current and proposed systems respectively.

Given that the corrected Overseer pasture grown estimates are within 0.1TDM/ha of the Woodlands + nitrogen estimates, it can be concluded that the pasture grown is feasible and sensible.