BEFORE THE HEARING PANEL OF SOUTHLAND REGIONAL COUNCIL

In the matter of sections 88 to 115 of the Resource Management Act 1991

And

In the matter Applications for resource consents by:

WOLDWIDE ONE LIMITED, WOLDWIDE TWO LIMITED,

Applicants

SUBMISSIONS OF COUNSEL FOR THE APPLICANT AS TO EXISTING ENVIRONMENT

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INTRODUCTION

1 These legal submissions are filed in accordance with the directions issued by the Panel following allegations by the s42A reporting officer that the modelling provided by the applicants could not be relied on because it included:

1.1 Activities which had allegedly been undertaken unlawfully at some stage in the past; and

1.2 Activities that could not be lawful by virtue of a suite of consents issued in 2017, which are said to have altered the existing environment.

2 The s42A report seeks to exclude activities modelled by the applicants because of alleged past contraventions of permitted activity conditions, yet seeks to include the suite of 2017 consents despite the fact that key conditions which are clearly preconditions to the lawful exercise have not been complied with.

3 The Applicants' position is that these past non-compliances do not affect the existing environment under *Hawthorn*, for which the key question is what the Applicants can and are likely to do lawfully in reliance on existing rules and consents. That renders critical the question as to whether the Panel ought to find that the 2011 consent remains something on which the Applicants can rely, or that it is properly excluded by the 2017 consents.

4 The only reason the current applications are before this panel is because a significant error was made when processing the applications lodged in 2017, as will become clear below. This resulted in the applications being incorrectly assessed as including as mitigation the removal of 52 hectares from dairy farming altogether. That removal was never proffered. A full timeline provided by Mr and Mrs De Wolde is **enclosed**. From it a number of facts emerge.

5 The intent was always to develop WW1 and WW2 as a package, as discussed in a pre-lodgement meeting in 2016. A key feature was to transfer s54ha of land owned by WW1, but leased by and forming part of WW2's dairy platform, back to WW1. This was permissible as that land had a baseline as part of WW2's platform.

6 Unfortunately the Council's processing of WW2 occurred ahead of WW1. It was granted, because it was assessed as having 54ha less land area than previously, which brought the "new" scenario well below the "old" scenario. Other errors were made as well. They are outlined by Mr and Mrs De Wolde. When WW1 was assessed by the processing officers, they then indicated that including the 54ha previously leased by WW2 would increase the baseline, as a result of which the application was publicly notified and a refusal recommended.

7 This came to a head when preparing for the hearing, at which point the WW1 Application process was put on hold on 23 March 2018 with a view to exploring with council officers whether starting afresh with a joint application would be simpler, as it would set aside the problematic 2017 consents. Without prejudice meetings were held with the Council officers, as a result of which WW1 decided not to proceed with its application but to start afresh with a joint application. The only reason for applying for the set of consents now before you was to put to one side the 2017 consents, which could not be exercised given the critically flawed basis of their grant, which relied on mitigation never proffered.

8 Under the approach the S42A officers now take, putting those consents aside is impossible. Of course that renders the entire reason for lodging these new applications pointless and the whole process thus far (including the very high costs the processing officers were content to incur) futile. Despite any explanations that might be given by the Council officers, it is unavoidable that these applicants would never have let matters get to this point unless they had been allowed to believe that a fresh joint application was the correct way to resolve the 2017 consent mistakes.

9 This not only provides further grounds for a finding that there was never any exercise of the 2017 consents, but also raises issues of fairness. Either way, this background requires that the 2017 consents (or past alleged non-compliances) are not used by the s42A officers to invalidate the basis of the current modelling.

2017 CONSENTS

10 The legal submissions presented on 4 October for the Applicants set out the correct approach to the issue of whether the 2017 consents have been exercised. The key issue is that the word "exercised" is not the same as

"given effect". They are used in different contexts for different purposes (s125 vs s126).

11 The submissions for the s42A officer stated that they were the same, but contained no law or basis on which to find that. Section 125 is about whether the consent holder has done enough to prevent the consent from lapsing. Its focus is on whether the consent holder is ought still to be allowed to rely on it. It provides for a scenario where the lapsing can be avoided even where a consent has not been given effect. The decisions on giving effect are therefore of little assistance.

12 In contrast the word "exercise" is used in the appropriate consent condition specifically to prevent both consents from being relied on at the same time. In its ordinary meaning it must denote some form of conscious reliance on the consent. To put it simply, the holder must be established to have done something that would be unlawful but for the consent, precisely because he or she now knew the activity was lawful because of the consent. There cannot be any suggestion of "inadvertent exercise". That would be an oxymoron. It is the same as suggesting that this Panel could accidentally "exercise" the powers it has been given to determine these applications. This makes the evidence of the consent holder critical. The mere fact that something may have occurred that would also occur if the consent was exercised does not illustrate that it was exercised unless the consent holder is clear that the reason it was done was because it was authorised by that consent. Unfortunately there is no case law to support this contention, but it is submitted it must flow logically from the meaning of the word and the way that it is used in the consent conditions.

13 Another key reason not to invoke the case law around "giving effect" is that much of it is focused on district plan land use issues, where bulk and location are typically key issues. They are associated with the permanent modification of the built environment. In contrast, many of the regional consents, such as those to contravene ss15 and 14 are activities that can be turned on and off at will. In this way it is possible to have all the infrastructure in place without actually undertaking the activity, which often occurs. Some land uses can also operate like that. These would include the current examples, where the prohibition that triggers the need for consent under rule 20(a) PSWLP is against the increase in cow numbers or addition of land. It is quite possible to put in place all the infrastructure in anticipation of a grant,

but keep cow numbers and the dairy platform to the level that does not trigger the need for consent.

Indicators that 2011 consent Not Surrendered

14 Critically, the 2011 consent was never surrendered. Even to a lay person who is unaware of the *Gillies* line of authority, the wording of all the consents makes it obvious that the consent *cannot* be exercised *until* the 2011 consent has been surrendered. The same applies to the land use consent, which makes it very clear that it *cannot* be exercised *unless* the discharge and water permits are also being exercised. It is simply not logical to infer that a person who was aware of these requirements consciously relied on the authorisations without doing the very first thing required to do so. In view of the *Gillies* line of authority it would be analogous to arguing that someone drove somewhere in a car without wheels. A consent with this type of condition, which has not been complied with, is simply not capable of authorising the activities and therefore not capable of being relied on until there is compliance with those conditions.

15 The conduct of the Applicants is also consistent with the absence of a deliberate or express reliance on the new permissions. The cost of not using the extra pasture and not doing the other activities only allowed by the 2017 consents is significant. Nevertheless their evidence indicates that they held back on the key elements that would require the new set of consents. They state that what they did they did in anticipation of the grant of the consents before you, which they had been led to believe would occur as long as they approached them on a joint basis with a fresh set of applications.

16 The wording of the land use consent is also critical. It is very unusual in that it simply repeats many of the activities covered by the discharge permit. Those are actually discharges rather than land uses. Importantly, none of the infrastructure upgrades done in anticipation of the grant of the current suite of consents required that land use consent to occur. In the absence of the land use consents they would have been entirely lawful. That differentiates them from the *Goldfinch* scenario, where the consent was actually needed to authorise the structure itself, which breached the recession plane. Importantly, the s42A officers' view is certainly that WW1 and WW2 form one "landholding". If they are right on that, then the 2017 land use consent is fatally flawed, as it relates only to the WW2 land, which is only part of the "landholding" in question.

17 The very point of the current applications was to bypass the errors made in the processing of the 2017 consents. The mere fact that the current applications are before you is very powerful proof of the fact that the Applicants' intent was to do anything but rely on the 2017 suite of consents;

18 The Applicants continued being invoiced for and paying monitoring charges for the 2011 consent. The Council would not have invoiced them and the Applicants would not have paid had these consents been implicitly surrendered. Copies of the invoices are included with the evidence provided.

Silage Pad not Determinative

19 The legal submissions for the s42A officer mention the installation of the silage leachate collection system as an indication that the discharge permit has been exercised. Mr De Wolde's evidence is that he did not believe he was doing anything that required a discharge permit. His explanation is that he installed it in anticipation of the new consents. There is certainly nothing to suggest that the reason he installed it was because he knew that it was authorised by the 2017 discharge permit. In the absence of the surrender of the 2011 consent he could not possibly have thought this. It may well be that the dry matter content of the silage would not have prevented stormwater that fell on it from picking up enough soluble substances from the leachate to render what came from it a "contaminant". Perhaps some of that did end up in the pond. If it did, it would have been a very small amount – at a *de minimis* level. Aside from this, it would have been authorised by Rule 41 of the PSWLP and therefore did not need the consent to authorise it.

20 Ironically, the connection was environmentally more responsible than allowing the stormwater from the pad to run off onto the surrounding land in accordance with Rule 15. It is understood that more often than not compliance officers will not insist that it ceases or does not commence until a change of consent conditions has been granted to authorised this additional discharge. That is particularly so where as is the case here, the amount that would end up in the pond is likely to be so small that it poses no risk at all to the storage capacity of the pond. All of this reinforces Mr De Wolde's own evidence that he did not connect the silage system because he knew he now could, given the 2017 consent had been granted. In his mind, it was environmentally more responsible to do so. As a matter of fact and law therefore, the 2017 consent has not been exercised.

SUTTON V MOULE

21 Given that the facts demonstrate that the 2017 consents have not been relied on, the issue as to whether there can be an implicit surrender becomes academic. Nevertheless, it is submitted that *Sutton v Moule* can be distinguished on some key points that mean it is not authority for the proposition that a consent can be implicitly surrendered.

22 As counsel for the s42A officer appropriately pointed out, it is a Town and Country Planning Act decision dealing with the issue as to whether the applicant ought to have applied to "vary" the consent under s71 rather than seek a fresh consent. Importantly, the Town and Country Planning Act did not include an equivalent to s138 RMA. There was no prescribed procedure for surrender. Nor was there an equivalent of s126 RMA. In view of this it seems logical that the Court would have looked to an implied surrender given the specific factual matrix in play in that particular case. Critically, it did not have to render nugatory in its entirety an entire provision with very express procedural requirements. In the absence of binding authority to the effect that you are able to do so, the words of the statute must prevail and irrespective of whether the 2017 consents were exercised, the 2011 consent has not been surrendered. The very need for the prior surrender condition is a very powerful indication that this is the case.

23 Counsel for the s42A officer has urged you to ignore in its entirety the existence of s138, but then urges you to take a very literal reading of s127 and in particular the omission of ss125 and 126. It is respectfully submitted that it is considerably more difficult to interpret away an entire section than it is to find that an omission may not have been deliberate. Indeed it is submitted that this was not an intentional omission, but rather an oversight, due to the fact that it may not have been considered likely that a person already holding a consent would go to the trouble of changing it and then not acting on it. As it is, though, given the way this was tied in with the suite of 2017 consents, that is precisely what occurred here. Even if you disagree with this, then it is submitted that because the very purpose of the current applications was to undo the errors in the 2017 suite of consents, this is the only fair way of dealing with it.

24 Finally and critically, as indicated above, the Council has continued to invoice Woldwide Two Ltd for the 2011 consent. It ought not to be permitted to collect fees that rely on the consent still being extant and at the same time argue that it is not.

UNFAIRNESS

25 *The Anzani Investments Limited* case has been cited in previous legal submissions for the applicants. If you find in favour of the Applicants on either of the last points, then this section becomes somewhat academic. Conversely, if you find that fairness requires the 2017 consents not be considered as part of the existing environment, then it effectively renders the previous issue academic. It is submitted that it is directly relevant to this matter, in view of the facts set out by Mr and Mrs De Wolde. Specifically, what is evidence from the factual information provided by the applicants and attached to these submissions is:

25.1 The only reason these applications proceeded was to address the problems caused with the errors in the 2017 consents. This was done in consultation with the Council officers, commencing in early to mid 2018. It would have been clear that the exercise would have been futile if the current process was incapable of doing so.

25.2 The consents were receipted and the applications progressed, without any indication that they were misconceived in their very basis. Experts were engaged to assess the Applicants' modelling information, which would have been futile if the 2017 applications meant that the wrong matters had been modelled. This continued through the hearing, when the Council's experts commented on the modelling.

25.3 The Applicants had altered their position by abandoning the initial WW1 application and committing very significant resources to the lodgement and hearing of these applications, in reliance on the belief that the Council's conduct had engendered in them, that this was the means of correcting the errors with the 2017 consents.

25.4 If the s42A report is right, then the Applicants were in blatant contravention of key 2017 consent conditions, but no enforcement action was taken. Meanwhile, the Applicants continued to be invoiced administration fees for the 2011 consent and paid those.

26 Irrespective of what explanations might be given by the Council officers, it is unavoidable that the Applicants were entitled to form the view, based on their dealings with the Council through pre-lodgement, receipt and initial

processing, that this process would be the way to correct the errors made in the 2017 consents.

27 It should not now be open to the s42A officers to take a position that is diametrically opposed to that. The 42A officers' positions are internally inconsistent elsewhere too. They are adamant that WW1 and WW2 form part of a single "landholding", but then argue that the land use consent for WW2 only has taken effect. On their own approach it cannot authorise the land uses on the WW1 and WW2 single "landholding", because it authorises only part of it. They also argue that a temporary non-compliance with a permitted activity rule condition entirely excludes something from the existing environment, yet despite the major issues and significance of the non-compliance with the surrender condition, the 2017 consents are argued to form part of the existing environment. The only consistency between all these self-contradicting positions is that they are all relied on to support a refusal recommendation.

28 It is submitted that this approach cannot be fair or transparent. The only fair approach is to reject any contention that seems only to be aimed at undermining the use of the current applications to cure the problems caused by the errors in the 2017 consents.

Dated 10 October 2019

J M van der Wal
Solicitor for the Applicants

ORIGINAL application WW1
2017

1 INTRODUCTION

This Assessment of Environmental Effects (AEE) has been prepared in accordance with the Fourth Schedule of the Resource Management Act 1991 (RMA) to support the applications of the RMA by Woldwide One Limited (the applicant) to discharge dairy effluent (from 800 cows) and take and use 84 m^3/day of groundwater for dairy shed and stockwater supply.

Section 88(4)(b) of the RMA requires that every application shall include an assessment of any actual or potential effects that the activity may have on the environment, and the ways in which any adverse effects may be mitigated. Section 88(6)(b) also requires that any assessment shall be in such detail as complies with the scale and significance of the actual or potential effects that the use may have on the environment, and shall be prepared in accordance with the Fourth Schedule. This assessment is made in accordance with these requirements.

The legal description of the property is Lot 4 DP 399915, Parts Lot 18 DP 942, Lot 1 DP 10885 and Section 420 Taringatura Survey District.

The location of the property is illustrated in Appendix A.

A copy of resource consents 301663 and 301664 are included in Appendices D and E respectively.

The proposed consents are sought to expire 9th November 2027 (same as existing consents 301663 and 301664).

2 BACKGROUND

Woldwide One Limited (the applicant) own and operate a dairy farm located at Hundred Line Road, Heddon Bush. The operation is consented under resource consents 301663 to discharge dairy effluent and 301664 to take groundwater for a dairy purposes.

Existing consent 301663 is to discharge dairy effluent from a maximum of 540 cows. This application is to increase the effluent discharged at the property from 540 cows to 800 cows. Although, this will be limited to a maximum of 700 cows until a new dairy shed is built at the property, once the new shed is built 800 cows will be able to be milked at the dairy shed. The applicant also wishes to change the boundary of the Woldwide One property as part of a land swap with the neighbouring property Woldwide Two. The new property boundary is shown in Appendix A.

The property has an existing effluent storage pond with a storage volume of 3,397 m^3. The dairy effluent storage calculator has been used to determine the volume of effluent storage required (a copy of the results are included in Appendices F and G).

The existing water supply for dairy shed use and stockwater supplies for the property is taken from groundwater via bore E45/0071 under existing consent 301664. Consent 301664 allows a maximum of 60 m^3/day to be taken from bore E45/0071. The applicant wishes to increase the volume taken to 84 m^3/day.

This application seeks to have a new consent for the discharge of dairy effluent granted for 10 years. Best practice effluent management utilising buffer effluent storage and low rate irrigation will be incorporated into the farming system to ensure compliance. Good management practices relevant to dairy farming in Oxidising and Central Plains physiographic zones are implemented on farm.

2.1 Increase in cow numbers

This application is to increase the effluent discharged at the property to 800 cows, from 540 cows consented under resource consent 301663. This is considered to be a discretionary activity under rule 21 of the Proposed Southland Water and Land Plan.

This proposal has been modelled in Overseer by Cain Duncan (Fonterra Farm Source) a copy of the .xml files and Nutrient Budgets/Analysis have been attached to this application. The results of the Overseer modelling are shown in Table 1 for the combined Woldwide One and Woldwide Two properties.

Table 1: Estimated nitrogen and phosphorus loss to water - Woldwide One and Woldwide Two combined

	Nitrogen loss to water (kg/year)	Nitrogen loss to water (kg/ha/year)	Phosphorus loss to water (kg/year)	Phosphorus loss to water (kg/ha/year)
Existing situation	11,162	17	330	0.7
Proposed situation	11,002	16	357	0.7
Change	**-160**	**-1**	**27**	**No change**

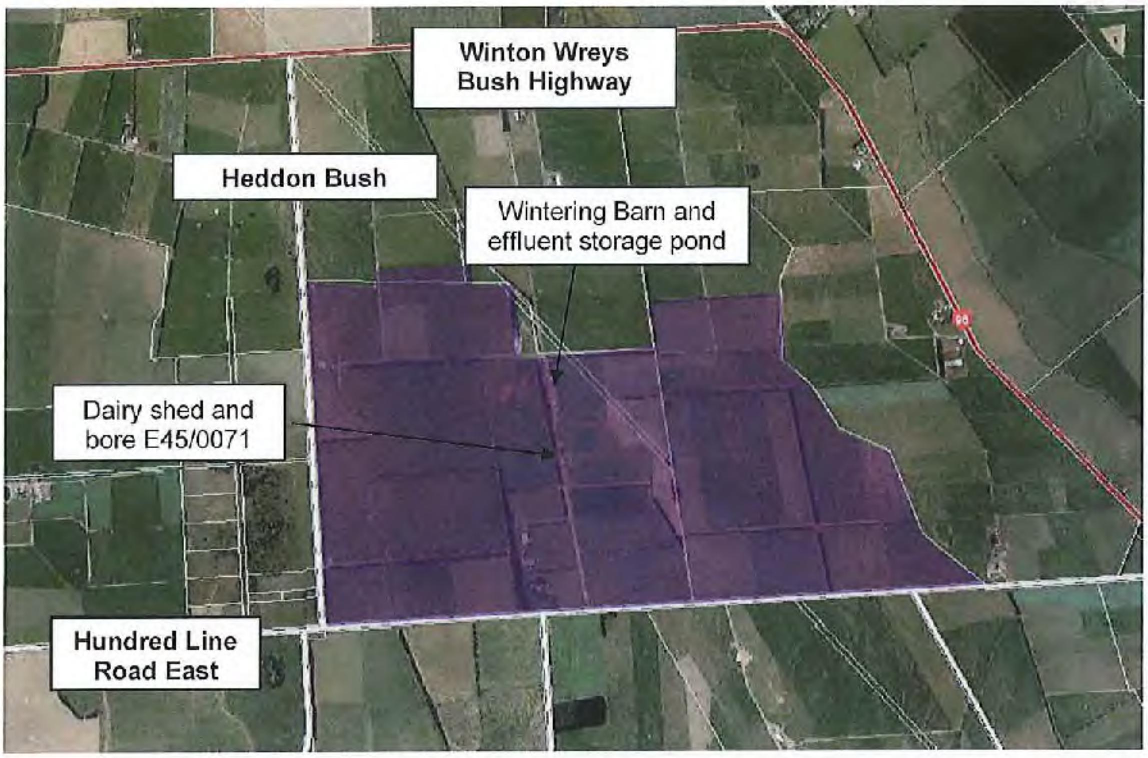
The Overseer modelling shows the nitrogen loss to water decreases as a result of this proposal but the phosphorus loss to water increases slightly. The increase in phosphorus loss has been explained in the Nutrient Budgets/Analysis for Woldwide One prepared by Cain Duncan (Sustainable Dairy Advisor, Fonterra Farm Source) which has been included with the application. The Overseer model assumes 30% of all phosphorus deposited on stocklanes is lost to water, with assumptions also from other structures on farm such as feed pads, silage pits etc. However, the model does not take into account the location of stocklanes on the property or on farm Good Management Practices (as per the attached Farm Environment Management Plan), such as ensuring runoff from stocklanes is unable to enter waterways. Therefore it is considered that in reality the phosphate loss to water is likely to reduce of remain the same as the current situation.

Because the Overseer modelling has indicated that both the nitrogen and phosphorus loss to water is likely to remain the same or decrease as a result of this proposal together with the implantation of good management practices (as per the attached Farm Environment Management Plan), further assessment on the effects of dairying farming on groundwater and surface water has been assessed as not being required.

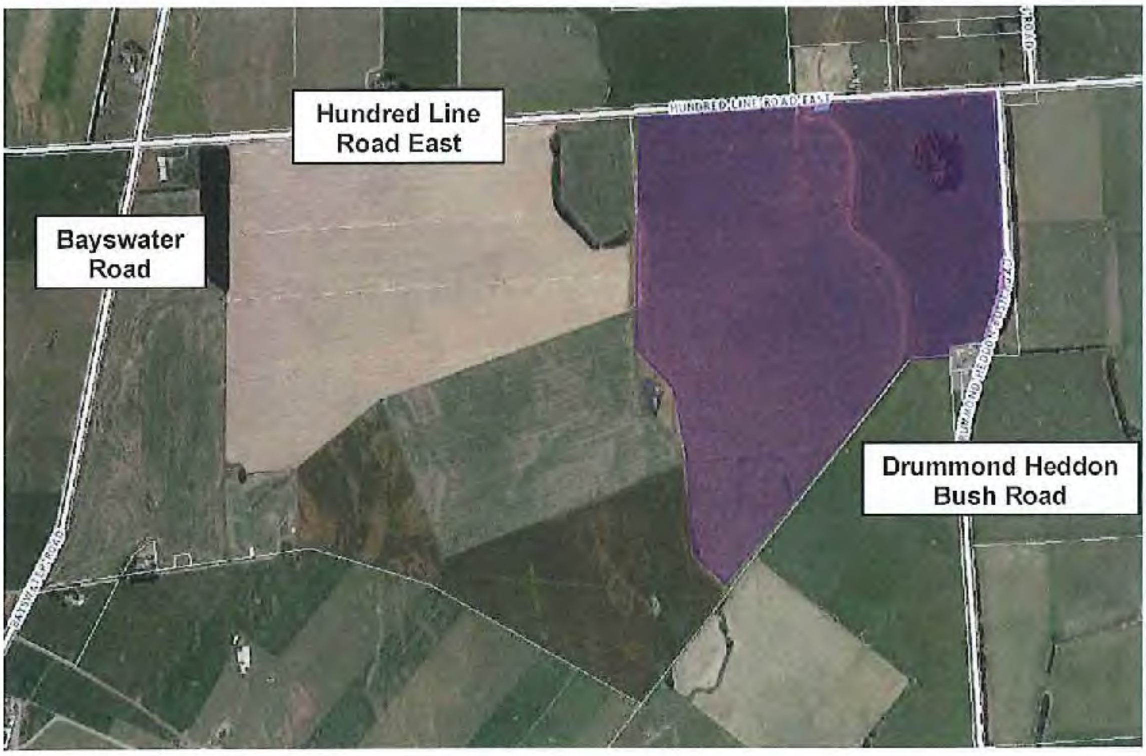
As a result of the no change or a small decrease in nitrogen and phosphorus lost to water the cumulative effects of this proposal for dairy farming are likely to remain the same or decrease and hence no change or a slight improvement in the water quality of both the groundwater and surface water.

Appendix A: Location Plans

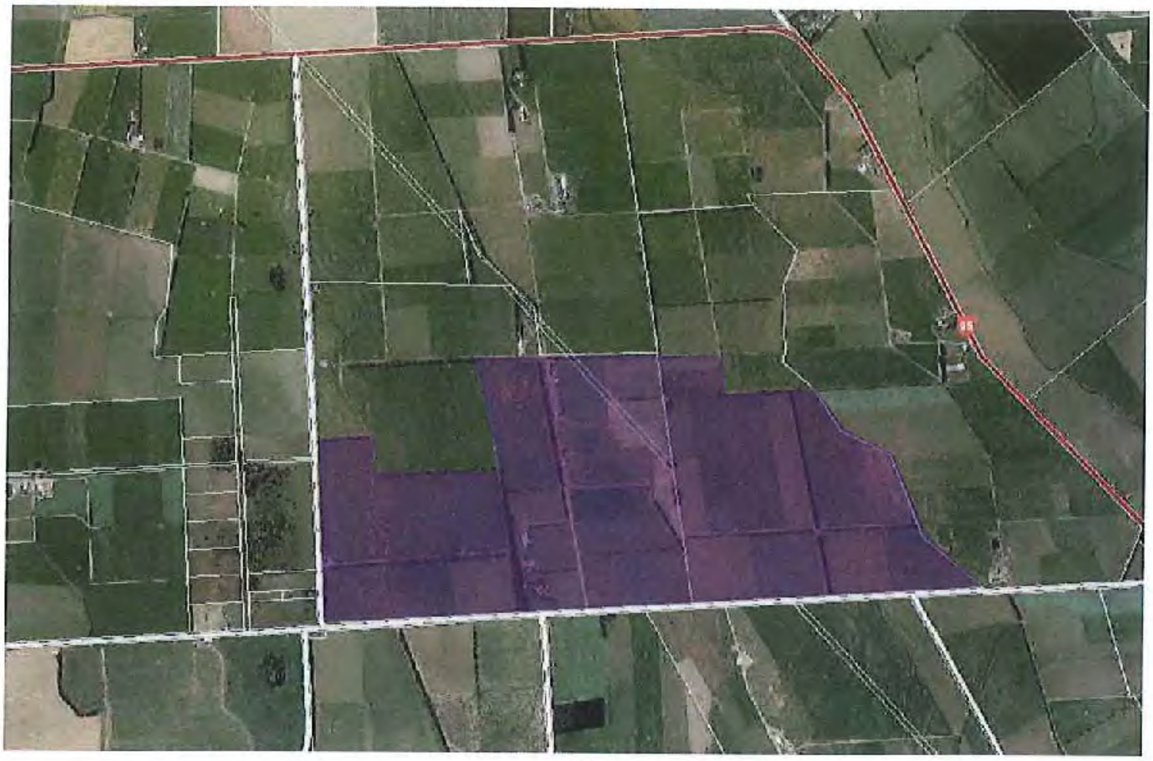
Woldwide One Milking Platform – Proposed



Horner Block



Woldwide One Milking Platform – Existing



ORIGIONAL Application WW2
2017

1 INTRODUCTION

This Assessment of Environmental Effects (AEE) has been prepared in accordance with the Fourth Schedule of the Resource Management Act 1991 (RMA) to support the application by Woldwide Two Limited (the applicant) to discharge dairy effluent (from 800 cows) and take and use 96 m^3/day of groundwater for dairy shed and stockwater supply.

Section 88(4)(b) of the RMA requires that every application shall include an assessment of any actual or potential effects that the activity may have on the environment, and the ways in which any adverse effects may be mitigated. Section 88(6)(b) also requires that any assessment shall be in such detail as complies with the scale and significance of the actual or potential effects that the use may have on the environment, and shall be prepared in accordance with the Fourth Schedule. This assessment is made in accordance with these requirements.

The legal description of the property is Lot 1 DP 14660, Lot 1 DP 9925, Lot 1 DP 10885, Pt Lots 1 and 2 DP 4092, Pt Lot 18 DP 942, Lots 1 and 3 DP 5610, Pt Section 417 Taringatura SD and Section 419 Taringatura SD

The location of the property is illustrated in Figure 1.

A copy of resource consents 300626-V2 and 300627-V1 are included in Appendices A and B respectively.

The proposed duration for the new consents is 10 years.

2 BACKGROUND

Woldwide two Limited (the applicant) own and operate a dairy farm located on State Highway 99, Heddon Bush. The operation is consented under resource consents 300636- V2 to discharge dairy effluent and 300627-V1 to take groundwater for a dairy purposes. Both of these consents expire on 2 December 2021.

Existing consent 300626-V2 is to discharge dairy effluent from a maximum of 800 cows and to discharge wintering barn effluent from 600 cows. This application is to increase the amount of effluent discharged from the wintering barn to 640 cows and to change the area of property where dairy farming occurs. The applicant wishes to change the boundary of the Woldwide Two property as part of a land swap with the neighbouring Woldwide One property. Therefore this application is for a new consent to discharge dairy effluent.

In addition this application also proposes to use a further 75 ha for dairy farming that is currently used for dairy support. The new property boundary is shown in Figure 1. This is considered to be a discretionary activity under rule 22 of the Proposed Southland Water and Land Plan as the new area of land is within the Oxidising and Central Plains physiographic zones and a Farm Environment Management Plan has been completed which accompanies this application.

5.10 Area of land

The total land area of the dairy platform is 240 ha plus 48 ha of the Horner Block which will be used for effluent application. This application seeks to discharge dairy effluent to approximately 288 ha, excluding standard buffers from dwellings, bores and waterways (as indicated in Figure 1).

Figure 1: Wordwide Two effluent discharge area

the Topoclimate layer in Environment Southlands Beacon mapping service. The Horner block is overlying Braxton and Pukemutu, Drummond and Gleneg and Waiau and Tuatapere as shown in Figure 6.

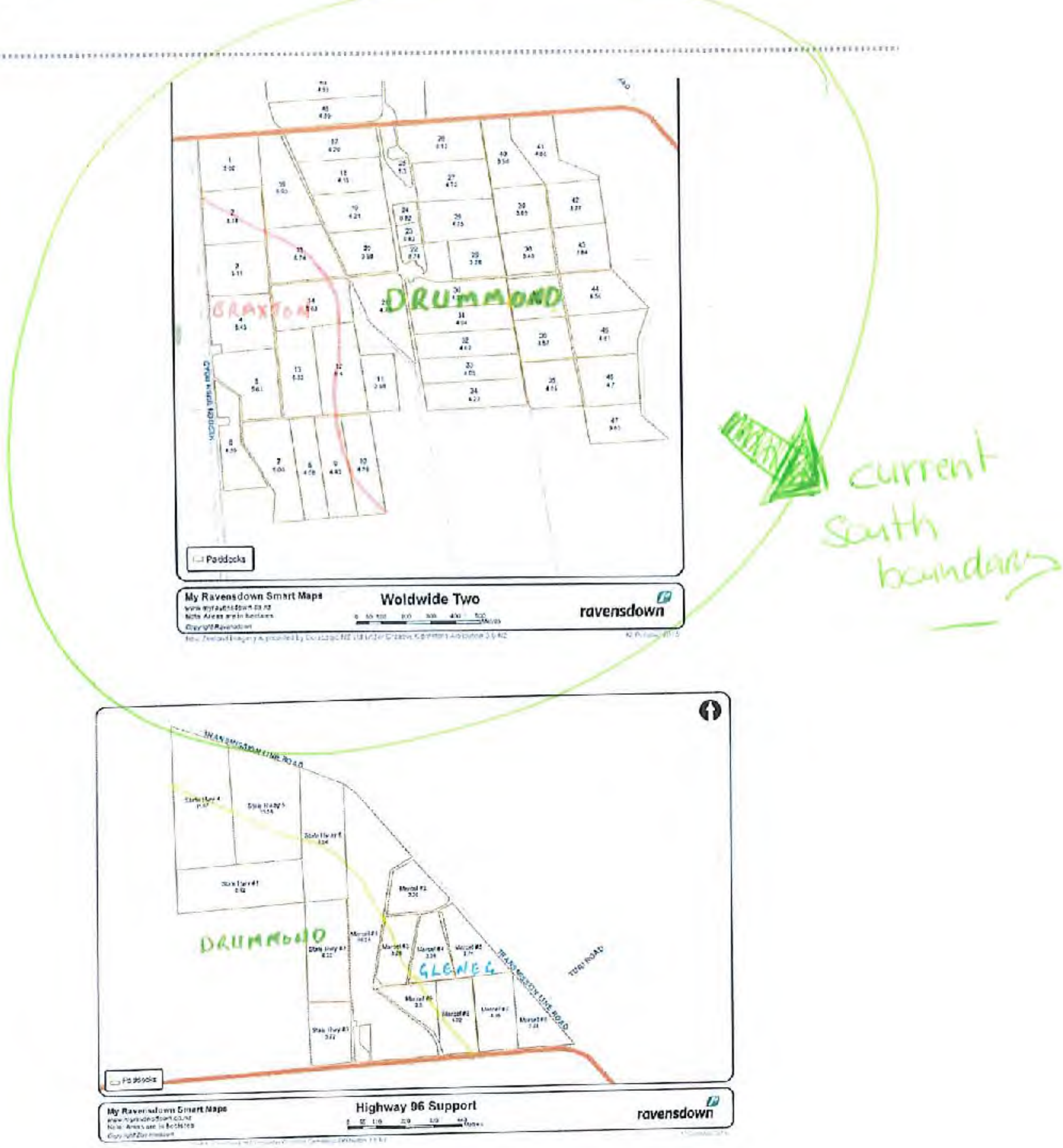
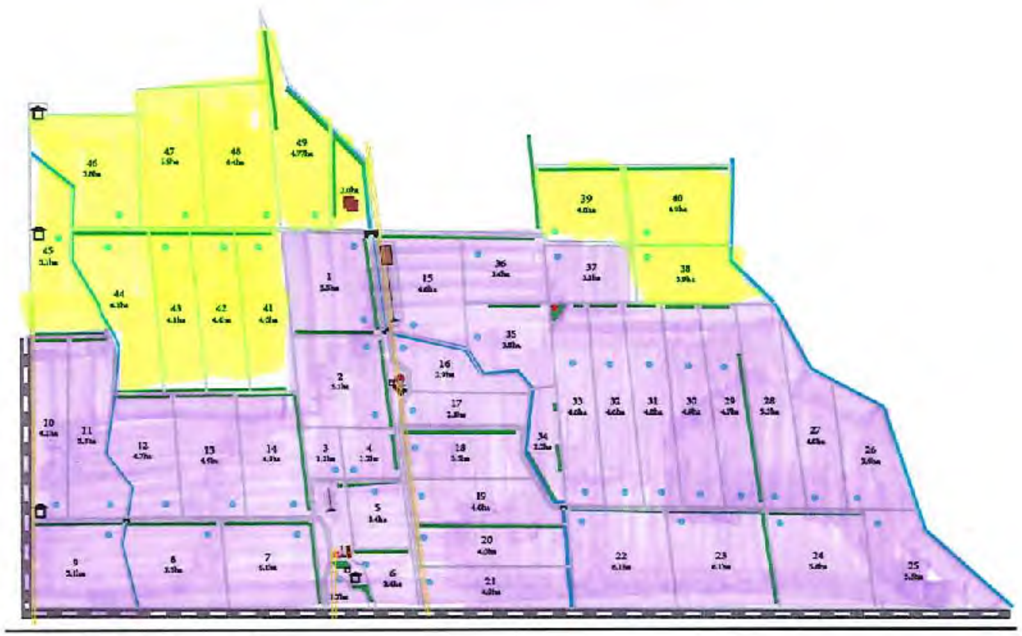


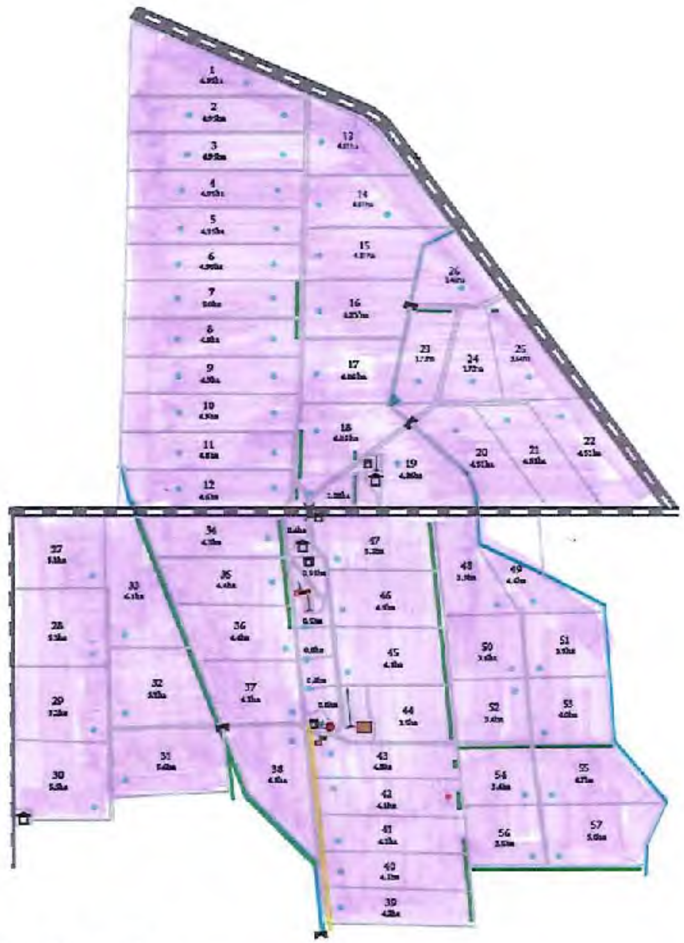
Figure 5: Map of soil types at the Woldwide Two property

IF: Consent area's W1 2011 consent and W2 2017 consent

then: The un-included land.



Woldwide One Ltd
1354 Hundred Line Rd, Dunearn 9783



Woldwide Two Ltd
1915 Winton-Wreys Bush highway, Dunearn 9783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50
100m

A HEARING BEFORE

ENVIRONMENT SOUTHLAND

Under	An application under the Resource Management Act **APP-20171445**
Applicant	**WOLDWIDE ONE LIMITED** **ABE AND ANITA DE WOLDE**

BRIEF OF EVIDENCE OF NICOLE MATHESON

20 March 2018

Contents

QUALIFICATIONS AND EXPERIENCE

1 My full name is Nicole Joy Matheson. I am a Resource Management Consultant at Aqualinc Research Limited. I have been in this role since July 2008.

2 I have 10 years' experience in the resource management sphere. My previous relevant work experience includes the preparation of Assessment of Environment Effects for resource consent applications for activities for taking and using groundwater and surface water for dairy shed, stockwater and irrigation, contaminant discharges of dairy shed to land and land use changes. I also assist farmers to prepare Farm Environment Plans.

3 I hold a degree in Environmental Management from Lincoln University. I hold qualifications in Sustainable Nutrient Management in New Zealand Agriculture, Advanced Sustainable Nutrient Management and Farm Dairy Effluent: System Design and Management. I also am an Environment Canterbury Farm Environment Plan Auditor. I am a member of the New Zealand Institute of Primary Industry Management.

4 I have read, and agree to comply with, the Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2014. Other than where I state that I am relying on the evidence of another person, I confirm that the issues addressed in this evidence are within my area of expertise. I have not omitted to consider material facts known to me that alter or detract from the opinions that I express.

SCOPE OF EVIDENCE

5 This evidence addresses the following issues:

5.1 Background to Application;

5.2 Water permits;

5.3 Activity Status.

5.4 Assessment of water takes and nutrient loss against operative and proposed plan policies;

5.5 Key RPS policies;

6 The evidence that I will give on these issues is within my area of expertise.

BACKGROUND

7 Worldwide One Ltd (WOL) is one of two closely connected companies with common directors and shareholdings; the other is Worldwide Two Limited (WTL). The current set of applications are part of an upgrade across both properties, whereby environmental and nutrient loss practices are to be radically improved, thereby enabling nutrient loss and environmental management to achieve the aims of the applicable policy documents, while also increasing the productivity of the land through an increase in cow numbers. These requirements are met because the nutrient loss and environmental management systems are so far-reaching that the increase in cow numbers and productivity can be achieved without increasing adverse effects, including nutrient loss.

8 An application for land use consent was triggered because of the increase in cow numbers. The improvements across the two properties required a reconfiguration of land, so that 54ha previously operated as part of the WTL property is now to be operated as part of the WOL property. The applications for both properties were submitted at the same time. However, ES processed the consents for the WTL property first, granting those in October 2017.

9 It seems a key error was made when doing that, because the processing officer failed to note that 54ha of the land that had been farmed as part of WTL was to be farmed as part of the WOL operation under the new arrangement and that the WTL applications did not seek to authorise activities on that 54ha. The Applicant has a degree of sympathy for the processing officer in this regard, as it has to accept that the way the modelling information was presented was not the clearest means of identifying this or enabling the correct comparison to be made.

10 Nevertheless, the nutrient loss for the existing use of land for the farming of cows on the land subject to the WTL application was therefore seriously over-assessed, as the land subject to the WTL application was incorrectly assessed as having an existing nutrient loss that included the loss from that 54ha, which did not form part of that application. That nutrient loss has to remain with that 54ha, meaning it has to be removed from WTL because that block is not part of the proposed WTL operation, as per the application. The

legal consequences of that for the WTL consents will be addressed by legal submissions for the applicant.

11 However, it is important to note that the current application for WOL does include the 54ha. Therefore the nutrient loss associated with the existing (pre-application) land use of that 54ha (erroneously included in the assessment for the WTL property) must be included in the existing nutrient loss from the use of the land to which this application applies for the farming of cows. That existing loss from the existing land use of the land subject to the application is that which existed on the "old" WOL, plus that which existed on the 54ha. My evidence has been prepared on that basis: I have compared the existing use of land for the farming of dairy cows on the "old" WOL plus the 54ha now part of WOL ("new WOL"), with the situation for which WOL seeks consents over that same land (i.e. the new WOL).

12 For completeness I note from Mr Duncan's evidence that when comparing existing with proposed nutrient losses:

12.1 There is no net increase on WOL plus the 54ha as at 30 May 2016;

12.2 There is unlikely to be a net increase on WTL minus the 54ha;

12.3 There is unlikely to be an increase on WOL plus WTL, including the 54ha.

13 Mr Duncan addresses these matters more closely in his evidence, but they are important to note at the outset by way of background.

14 The WOL property is located Hundred Line East Road at Heenans Corner approximately 15 km northeast of Winton. It now includes an additional 54ha of leased land that as at 30 May 2016 formed part of WTL. In November 2012 Woldwide was granted resource consents 301663 to discharge dairy effluent from 540 milking cows and wintering barn effluent from 400 cows and consent 301664 to take up to 60 m^3/day of groundwater for a dairy operation. Copies of resource consents 301663 and 301664 are included in Appendices A and B respectively. From these it will be apparent that those consents do not cover the 54ha that was at the time part of WTL. For this reason I have also included copies of the existing (pre-application) consents for WTL, which do cover the existing situation on the 54ha. As explained above, this 54ha is

part of the land use that was occurring on the land to which the current applications (APP-20171445) relate.

15 The Section 42a report incorrectly identifies the existing stocking rate as 1.05 cows/ha. This is based on the area in Appendix 1 of resource consent 301663 showing an area of 510 ha. However this area includes the WTL milking platform as at 30 May 2016. As of 30 May 2016 the WOL milking platform was an area of 166 ha giving a stocking rate of 3.25 cows/ha.

16 The current consent applications are for the following;

- Land Use Consent to increase cow numbers;
- To discharge dairy shed effluent to land for up to 800 milking cows and wintering barn effluent for up to 640 cows; and
- To take and use up to 91 m^3/day of groundwater from bore E45/0071 in the Waimatuku Groundwater Zone for stockwater and dairy shed use.

17 Mr Cain Duncan (sustainable Dairy Advisor, Fonterra Farm Source) has remodelled the Overseer scenarios for Woldwide One Limited, to include the 54 ha Woldwide One is taking ownership from Woldwide Two in the existing situation for the 2016/17 season. Which is discussed in his evidence. The results of the Overseer modelling are shown in Table 1.

Table 1: Estimated nitrogen and phosphorus loss to water - Woldwide One

	Nitrogen loss to water (kg/year)	Nitrogen loss to water (kg/ha/year)	Phosphorus loss to water (kg/year)	Phosphorus loss to water (kg/ha/year)
Existing situation	4,510	16	189	0.7
Proposed situation	4,350	16	176	0.7
Change	**-160**	**No change**	**-13**	**No change**

Other sources of information

18 I have also obtained and viewed the following information:

- Section 42a Report – prepared by Alexandra King
- Evidence of Mr Cain Duncan dated 20/03/2018

- Evidence of Mr John Scandrett dated 20/03/2018

19 I also prepared the resource consent application document for Woldwide One Ltd (App 20171445) and the Farm Environment Management Plan dated 23rd November 2017, with information from the above sources. Both documents are included in the Consents Hearing Appendices.

20 The applications cover consents in three key areas, namely the take and use of water, the discharge of dairy effluent to land and the management of nutrient loss from the land use of dairy cow farming. I cover the effects of the water take and use, while Mr Duncan deals with the nutrient loss management and Mr Scandrett addresses the discharge of contaminants to land. I also then address the key policies and objectives as they apply to all the applications. I shall firstly address the take and use of water before dealing with those.

TAKE AND USE GROUNDWATER

Effects on neighbouring bores

21 The Environment Southland proposed Southland Water and Land Plan (pSWLP) provides a methodology for carrying out well interference assessments. This seeks to ensure the interference effect of any new groundwater abstraction should be limited to no more than 20 percent of the available drawdown in any neighbouring bore. Appendix L.3 of the pSWLP states that:

> *The cumulative interference effect of any new groundwater abstraction (in conjunction with other lawfully established groundwater takes) is considered "acceptable" if the drawdown does not exceed any of the following limits:*
>
> *(i) 20 percent of the available drawdown in any existing bore which adequately penetrates an unconfined aquifer that is not utilised for long-term monitoring of water levels; or*
>
> *(ii) 50 percent of the potentiometric head in any existing bore screened in a confined aquifer that is not utilised for long-term monitoring of water levels; or*
>
> *(iii) no more than 10 percent of the available drawdown in a unconfined aquifer which exists 50 percent of the time during natural conditions when no pumping is occurring for bores utilised for long-term monitoring of water levels; or*

(iv) no more than 20 percent of the available potentiometric head in a confined aquifer that exists 50 percent of the time during natural conditions when no pumping is occurring for bores utilised for long-term monitoring of water levels.

22 Due to a lack of information regarding the drawdown in bores and water levels in this area, it is not possible to accurately determine 20 percent of available drawdown in neighbouring bores. Because of this, 20 percent of the aquifer thickness has been assumed as an alternative threshold. This approach has been adopted in other groundwater take applications within the Southland region.

23 The potential effects of pumping bore E45/0071 have been assessed using the Theis (1935) drawdown assessment. This method of assessment provides a conservative estimate of the drawdown effects of the proposed groundwater abstraction and often provides an over-estimate of the effects on neighbouring bores.

24 Brydon Hughes (LWP Limited) advised a transmissivity value of 200 m^2/day and a storativitiy value of 0.001 are appropriate for the Waimatuku Groundwater Allocation Zone in the vicinity of the Woldwide One property (emails dated 14/02/2017 and 16/02/2017).

25 The nearest neighbouring bore used for pumping purposes (not owned by the applicant) is bore E45/0605 which is located approximately 1.25 km southeast of bore E45/0071 and is used for dairy shed supply.

26 Based on a maximum groundwater use of 91 m^3/day a pumping rate of 1.05 l/s has been used.

27 The well interference graphs in Appendix E show that the nearest neighbouring pumping bore (E45/0605) may have a drawdown of approximately 0.035 m from the pumping of bore E45/0071 for 7 days and approximately 0.161 m from the pumping of bore E45/0071 for 300 days at a distance of approximately 1.25 km. Based on an aquifer thickness of 10 m the drawdown of 0.035 m in bore E45/0605 for 7 days pumping is approximately 0.35 percent of the aquifer thickness and the drawdown of 0.161 m in bore E45/0605 for 300 days pumping is approximately 1.61

percent of the aquifer thickness which is within the 20 percent available drawdown recommended by Appendix L.3 of the pSWLP.

Cumulative effects

28 The Woldwide One property is located in the Waimatuku Groundwater Allocation Zone. This application is to increase the maximum daily volume from 60 m^3/day to 91 m^3/ day. Under the proposed Southland Water and Land Plan the Waimatuku Groundwater Allocation Zone is less than 10 % allocated. Therefore there is adequate allocation available to increase the groundwater take from bore E45/0071 as a result of this proposal.

Reasonable and efficient use

29 The RMA requires that the quantity of water abstracted for stockwater and dairy shed use is both reasonable and efficient. Woldwide One propose taking groundwater for stockwater and dairy shed use from bore E45/0071 at a rate of up to 2 l/s, with a volume of up to 91 m^3/day and 29,172 m^3/year for up to 800 cows. Table 1 shows how this volume was calculated.

Table 2: Daily water allocation for stock water and dairy shed water use

Water use activity	Number of cows	Water use (ℓ/cow/day)	Daily water use (m^3/day)	Water use period (days)	Annual water use (m^3/year)
Stockwater (during milking season)	800	70	56	300	16,800
Stockwater (outside of milking season)	640	45	28.8	65	1,872
Dairy shed water	700*	50	35	300	10,500
		Total	**91**		**29,172**

*** Note** –Once the new dairy shed is constructed, 800 cows will be able to be milked in the dairy shed. However, as the new shed will have an effluent scraper system, the volume of water used for dairy shed wash down will not increase above the volume required for 700 cows i.e. 35 m^3/day for dairy shed washdown.

30 The proposed stockwater and dairy shed use for the property is reasonable and this water will be used efficiently. Features of the stockwater and dairy shed system that assist in the efficient use and management of water use on the property are;

- The new dairy shed yard will have an effluent scraper system reducing the amount of water used to wash down the yard;

- Monitoring the rate of water abstraction from the bore using a flow meter; and

- Recycling the water used for cooling (refrigeration)

- The proposed stockwater and dairy shed use for the property is reasonable and this water will be used efficiently. Features of the stockwater and dairy shed system that assist in the efficient use and management of water use on the property are;

31 The applicant is also proposing the following consent condition to the groundwater consent to ensure water is not wasted;

The consent holder shall take all practicable steps to avoid leakage from pipes and structures

Stream depletion

32 The potential stream depletion effects of have been assessed using the Hunt Stream Depletion assessment.

33 Appendix L2 of the pSWLP outlines the framework for the management of stream depletion effects resulting from groundwater abstraction in the Southland Region. The appendix specifies criteria for classifying the degree of hydraulic connection between a bore and nearby surface water ways including a method to proportion the allocation between surface water and groundwater. The appendix also identifies those groundwater takes that may be subject to minimum flow control to mitigate impacts during periods of low flow.

34 Bore E45/0071 is approximately 1,000 m west from a tributary of the Bog Burn.

35 The stream depletion calculations are shown in Appendix F. The stream depletion analysis shows that over 7 days pumping at an average rate of 1.05 ℓ/s the depletion will be 0.5 ℓ/s or a depletion rate of 48 % and that over 300 days pumping at an average rate of 1.05 ℓ/s the depletion will be 0.9 ℓ/s or a depletion rate of 86 %. Therefore according to Appendix L2 of the pSWLP

pumping from bore E45/0071 would be classified as a high degree of connection with the tributary of the Bog Burn.

36 Appendix L2 of the pSWLP states that a groundwater take with a high degree of hydraulic connection *"where the magnitude exceeds 2 litres per second the calculated stream depletion effect will be managed as an equivalent take from an adjacent surface waterbody with the remainder of the allocation included in the allocation volume for the relevant groundwater zone. Groundwater takes classified as having a high degree of hydraulic connection will be subject to any relevant minimum flow regime."* As the stream depletion assessment has assessed the groundwater take to have a high hydraulic connection, but the hydraulic connection is less than 2 l/s the take will not be included within the Bog Burn allocation and no specific minimum flow restrictions are required to be imposed on the groundwater take.

37 I consider the groundwater take and use from bore E45/0071 to be a discretionary activity under Rule 54(d) of the pSWLP due to the following;

- Bore E45/0071 is within the Waimatuku Aquifer which is listed in primary allocation limits in Appendix L5 of the pSWLP;
- The hydraulic connection between bore E45/0071 and the stream has been assessed as "high" however as the hydraulic connections is less than 2 l/s no specific minimum flow restrictions are required to be imposed on the groundwater take (as per the management approach in Table Y.2 of the pSWLP).
- The well interference effects are acceptable; and
- The groundwater allocation is not within the secondary allocation limits.

38 As I note below, this is different from what the s42A officer concludes, however, as I shall explain, I consider the report makes an error in this regard. It is my view that the only logical way of applying the applicable rule and appendix is to regard a connection of less than 2l/s as not being "high" for the purposes of Rule 54(d). Ultimately this is an issue of legal interpretation that will be addressed in the legal submissions for the Applicant.

39 I consider the groundwater take and use from bore E45/0071 to be a discretionary activity under Rule 23(d)(ii) of the Regional Water Plan (RWP) as the take is within the Waimatuku Groundwater Allocation Zone which is a lowland aquifer. Overall then, the take and use of water is to be assessed as a discretionary activity.

PLANNING FRAMEWORK

Activity Status

Discharge of Dairy Effluent

40 The proposed discharge of dairy effluent is a restricted discretionary activity under Rule 50(d) of the operative RWP as the consent application is to increase the number of cows above what was milked on 17 July 2010. The discharge of wintering barn effluent is not provided for under the operative RWP, therefore Rule 5.4.6 of the Regional Effluent Land Application Plan applies. Under Rule 5.4.6 the discharge of wintering barn effluent is considered a restricted discretionary activity as the application is to discharge wintering barn effluent from more than 100 cows.

41 The proposed discharge of dairy effluent and wintering barn effluent is considered a discretionary activity under Rule 35(c) of PSWLP, as this application is to increase the number of cows milked at the property and wintered in the wintering barn, and the property is located within the Central Plains and Oxidising physiographic zones. Overall the discharge of dairy effluent and wintering barn effluent is to be assessed as a discretionary activity.

Land Use

42 The proposed land use does not contravene a rule in the operative Regional Water Plan. However, this application is considered a discretionary activity under Rule 22(a) of the Proposed SWLP as this application is to increase the number of cows milked at the property and a Farm Environment Management Plan has been prepared for the property

Take and Use of Water

43 The take and use of groundwater is considered a discretionary activity under Rule 23(d)(ii) of the Operative RWP as the groundwater take is from the Waimatuku aquifer which is a is a lowland aquifer and is less than 10 % allocated.

44 As explained above, the take and use of water under the Proposed SWLP is a discretionary activity. Overall then the take and use of water is to be considered as a discretionary activity.

Overall Activity Status

45 The most stringent activity status that arises is fully discretionary, which is a common activity status over all three types of consent sought. There is therefore no need for “bundling”, as this would not alter then overall activity status.

46 It should also be noted that the amount of water sought is only $6m^3$ per day more than what can be taken as a permitted activity under Rule 54 of the Proposed SWLP. It is understood that if necessary, the applicant could reduce the take and use to this amount, which would then render the water take and use under that plan permitted. In that case the discretionary activity status of the other applications and that under the operative plan still require the application to be considered as a discretionary activity.

Consequences of Activity Status

47 Because the overall activity status is discretionary, the test under s104D does not arise. The application is simply to be processed as a discretionary activity without the gateway tests in s104D applying.

APPLICABLE OBJECTIVES AND POLICIES

48 I now assess the applications against the applicable objectives and policies.

Operative Regional Water Plan

49 The Regional Water Plan was notified on 31 March 2010. Less weight is being placed on the RWP by Environment Southland staff, than the proposed Southland Water and Land Plan, as the proposed Plan gives effect to higher order documents (National Policy Statement for Freshwater Management 2014 and Resource Management Act 1991).

50 The objectives and policies of the Regional Water Plan have been outlined in the Section 42A Report.

51 **Objectives 2 and 3 –** the Overseer modelling undertaken by Mr Duncan has shown that the water quality in the vicinity of the property will not be reduced as a result of this proposal.

52 **Objective 4 –** A Farm Environment Management Plan is operational at the Woldwide One property. This Plan promotes Good Management Practices and as a result of this application the Overseer modelling has shown that the nitrogen and phosphorus loss to water will reduce and therefore the water quality (nitrogen and phosphorus) in the vicinity of the property will likely to be maintained or improved.

53 **Objective 5 –** As a result of this proposal the Woldwide One property will support 5 staff and their families, therefore helping to support the economic, social and cultural needs of the community and of future generations.

54 **Objectives 7, 9 and Policy 21 –** The total volume and rate of groundwater abstraction have been assessed as reasonable and efficient. An effluent scraper system is to be installed in the new dairy shed limiting the volume of washdown water required.

55 **Objective 8 –** Parts of the Waimatuku aquifer have very high nitrogen levels, however Mr Duncan's Overseer modelling has indicated that both the nitrogen and phosphorus loss to water is likely to remain the same or decrease as a result of this proposal and together with the implantation of good management practices will likely to maintains or improve the groundwater quality in the vicinity of the property.

56 **Policy 3 –** The Overseer modelling shows that the nitrogen and phosphorus loss to water will reduce as a result of this proposal therefore improving the groundwater quality in the vicinity of the property.

57 **Policy 7 –** this application is to discharge dairy effluent and wintering barn effluent to land, therefore meeting policy 7.

58 **Policy 13 –** this application is not a point source discharge of dairy effluent and wintering barn effluent to water.

59 **Policy 13A –** this application is not for a new dairy conversion.

60 **Policies 14A,14B and 43 –** This application proposes the same existing expiry date as the existing consents 301663 and 301664 of 9 November 2027.

61 **Policy 22 –** the applicant proposes to ensure the take bore E45/0071 is metered, with data sent to Environment Southland as required.

62 **Policy 23 –** The applicant proposes a consent condition for the consent to take and use groundwater which enables the Environment Southland to review consent conditions in accordance with Sections 128 and 129 of the RMA.

63 **Policy 25** – Mr Duncan's Overseer modelling has indicated that both the nitrogen and phosphorus loss to water is likely to remain the same or decrease as a result of this proposal and together with the implantation of good management practices will also help to maintain and improve water quality in the vicinity of the property.

64 **Policy 28 –**The AEE shows that adverse effects on existing water users, surface water flows, aquatic ecosystems and habitats, and on groundwater quality will be no more than minor.

65 **Policy 29 –** A stream depletion assessment was carried out as part of the consent application. The assessment showed that there is a high degree of hydraulic connection between bore E45/0071 and the closest stream, however as the hydraulic connections is less than 2 l/s no specific minimum flow restrictions will be imposed on the groundwater take.

66 **Policy 30 –** The AEE carried out to support this application provides adequate information about potential adverse environmental effects of this proposal. The information is supported by a conceptual hydrogeological model that corresponds to the level of allocation from the aquifer.

67 **Policy 31 –** The well interference assessment carried out in the AEE indicates that adverse effects on neighbouring bores are no more than minor.

68 **Policy 31C** – Mr Duncan's Overseer modelling has indicated with the implantation of good management practices the discharge of dairy effluent and wintering barn effluent will be mitigated i.e. nitrogen and phosphorus loss to water is likely to remain the same or decrease as a result of this proposal.

69 **Policy 31D** – this application is to discharge dairy effluent and wintering barn effluent to land, therefore meeting policy 31D.

70 **Policy 41** – The applicant's proposed effluent storage pond:

- will have a synthetic liner to ensure no leakage to groundwater;
- will be managed to ensure no overflow of effluent; and
- the effluent storage volume has been determined using the Dairy Effluent Storage Calculator.

71 **Policy 42** – The applicant has proposed mitigation measures (good management practices) to ensure the discharge of dairy effluent and wintering barn effluent to land will be managed to ensure the effects of the activity will be no more than minor. This can be confirmed by Mr Duncan's Overseer modelling which has indicated that both the nitrogen and phosphorus loss to water is likely to remain the same or decrease as a result of this proposal.

REGIONAL EFFLUENT LAND APPLICATION PLAN

72 The Regional Effluent Land Application Plan was made operative on 30th May 1998. This consent application is considered to be consistency with the following objectives and policies.

73 The discharge of wintering barn effluent is not provided for under the operative Regional Water Plan, therefore the Regional Effluent Land Application Plan applies.

74 The objectives and policies of the Regional Effluent Land Application Plan have been outlined in the Section 42A Report.

75 This consent application is considered to be consistency with the following objectives and policies.

76 Objectives 4.1.1 – 4.1.5 and policies 4.2.1 – 4.2.4, 4.2.6, and 4.2.8 – 4.2.10 – I consider that the discharge of dairy effluent and wintering barn effluent will be managed to ensure the environmental effects are minimal, as the following good management practices are proposed;

- Soil moisture monitoring;

- Buffer distances to neighbouring dwellings, waterways and groundwater bores;
- Low rate supplication; and
- Deferred irrigation during times of adverse weather and soil conditions.

Proposed Southland Water and Land Plan

77 The Proposed Southland Water and Land Plan was notified on 3 June 2016, the hearing concluded in September 2017 and a reply report was produced by Environment Southland staff in November 2017. The decision version of the proposed Plan is expected to be released imminently.

78 More weight is being placed on the proposed Southland Water and Land Plan by Environment Southland staff, than the operative Regional Water Plan and Regional Effluent Land Application Plan. As the proposed Plan gives effect to higher order documents (National Policy Statement for Freshwater Management 2014 and Resource Management Act 1991).

79 The objectives and policies of the proposed Southland Water and Land Plan have been outlined in the Section 42 a Report.

80 **Objective 2 –** As a result of this proposal the WOL property will support 5 staff and their families, therefore helping to support the, economic, social and cultural needs of the community and of future generations.

81 **Objectives 3 and 4 –** address the potential effects on Ngai Tahu. The objectives and policies address the management of activities to ensure the effects on freshwater and ecosystems are minimal, I consider that the proposal will not adversely affect the environment in the vicinity of the property as the good management practices included in the Overseer modelling show the water quality in the vicinity of the property will be maintained or improved.

82 **Objective 8 (a) and (b) –** Cain Duncan's Overseer modelling has indicated that both the nitrogen and phosphorus loss to water is likely to remain the same or decrease as a result of this proposal and together with the implantation of good management practices will likely to maintain or improve the groundwater quality in the vicinity of the property.

83 **Objective 11 –** The Waimatuku Groundwater Allocation Zone is less than 10 % allocated and the use of groundwater has been assessed as reasonable and efficient, for stockwater and dairy shed use. The applicant will ensure the groundwater take from bore E45/0071 is managed efficiently and water is not wasted.

84 **Objective 18 –** A Farm Environment Management Plan has been prepared for the WOL property (a copy has been submitted to Environment Southland). The Farm Environment Management Plan outlines the Good Management Practices (and above Good Management Practice) undertaken on farm to optimise efficient resource use and protect the region's land, soils, and water from quality and quantity degradation.

85 **Policies 1 – 3 –** All waterways on the WOL property are fenced which will ensure taonga species are not affected by the farming operation. Within the Resource Consent application the Te Tangi a Tauira, (Iwi Management Plan for the Murihiku area) was addressed.

86 **Policies 5 and 10 –** the applicant's property is within the Central Plains and Oxidising Physiographic Zones, which has the following transport pathways;

- artificial subsurface drainage
- deep drainage of nitrogen;
- overland flow

The applicant has implemented good management practices on the property to reduce the effects on groundwater and surface water quality (see Farm Environment Management Plan). The most significant of the good management practices/mitigation measures to reduce the effects on water quality are as follows;

- Cows are housed inside during the winter;
- Wintering barn can be used as a feed pad during wet conditions;
- All streams on the property are fenced to reduce sediment run-off into waterways;

- The effluent storage pond will have sufficient capacity to enable the effluent to be managed so that effluent can be stored in the storage pond when soil moisture levels are high or if the soils are dry and cracking and fissures are present; and

- Fertiliser is applied little and often when conditions are appropriate.

87 **Policy 13 –** This application proposes mitigation measures to manage the discharge of dairy effluent and management of land use activities and discharges to ensure the health of humans, animals and aquatic life are protected. Heddon Bush School and the water supply for the school (bore E45/0718) is located approximately 2 km south of the WOL boundary. Given, groundwater in the vicinity of the property flows in a south to south-east direction the school water supply may be affected. The water supply potentially passes through a Trojan Ultra Violet Water Treatment System before the water enters the school water supply. Given this treatment system the school water supply will be protected from E-coli and other pathogens.

88 The Principal of Heddon Bush School has also indicated that E-coli and coliforms have been absent from all samples taken in the last 3 years (while she has been Principal). Since the drilling of the new bore water quality sampling of the bore will be carried out quarterly. John Scandrett has carried out water quality monitoring which is presented in his evidence.

89 **Policy 14** – this application is to discharge dairy effluent and wintering barn effluent to land, therefore meeting policy 14.

90 **Policy 15 –** Cain Duncan's Overseer modelling has indicated that both the nitrogen and phosphorus loss to water is likely to remain the same or decrease as a result of this proposal and together with the implantation of good management practices will also help to maintain and improve water quality in the vicinity of the property.

91 **Policy 16 –** This application meets the conditions of Policy 16 given the following;

- The applicant's property is not in close proximity to any of the sensitive waterbodies listed in Appendix Q of the pSWLP or to coastal lakes, lagoons, tidal estuaries, salt marshes or coastal wetlands;

- The Overseer modelling has indicated that the effects on groundwater and surface water quality are likely to reduce or remain the same as a result of this proposal.

- A farm environment management plan has been prepared for the property;

- The property is flat and all waterways are fenced to reduce sediment run-off to waterways;

- Critical source areas have been mapped; and

- Central Plains and Oxidising Physiographic Zones are managed according to the Environment Southland Good Management Practice Factsheets. A copy of the Factsheets are included in Appendix G.

92 **Policy 17 –** This application has given regard to the relevant provisions of Policy 17 and finds that it is in accordance with them given the following;

- As part of the consent application the applicant has proposed mitigation measures to ensure the effects on water quality from the discharge and storage of effluent is less than minor;

- The proposed effluent pond will be constructed to meet the Dairy NZ Farm Dairy Effluent Design Standards and Code of Practice and Practice Note 21;

- The proposed effluent storage pond has been sized using the Dairy Effluent Storage Calculator;

- The applicant proposes to maintain and operate the effluent systems in accordance with good management practice guidelines;

- The applicant will ensure the discharge of dairy effluent does not result in surface run-off/overland flow, ponding or contamination of water; and

- This application does not propose to discharge of raw sewage and untreated agricultural effluent to water.

93 **Policy B7 of the National Policy Statement for Freshwater Management 2014 and Policy 20** – the AEE included in the original consent application assessed the effects on existing water users, surface water flows, aquatic ecosystems and habitats, and on groundwater quality as no more than minor.

94 **Policy 21 –**The Waimatuku Groundwater Allocation Zone is less than 10 % allocated and the use of groundwater has been assessed as reasonable and efficient, for stockwater and dairy shed use. The applicant will ensure the groundwater take from bore E45/0071 is managed efficiently and water is not wasted.

95 **Policy 22 –** The well interference assessment carried out in the AEE indicates that adverse effects on neighbouring bores are no more than minor.

96 **Policy 23 –** The stream depletion assessment carried out in the AEE shows that there is a high degree of hydraulic connection between bore E45/0071 and the Bog Burn, however as the hydraulic connections is less than 2 l/s no specific minimum flow restrictions are required to be imposed on the groundwater take.

97 **Policy 39 –** Application of the permitted baseline: When considering any application for resource consent for the use of land for a farming activity, Environment Southland will consider all adverse effects of the proposed activity on water quality, whether or not this Plan permits an activity with that effect. However, as the Applicant's legal submissions will indicate, this does not allow the existing lawful environment to be ignored. Of critical importance is that the existing consents have the same expiry date. If this consent is not granted, the existing lawful environment and its discharges will be able to continue to exist.

98 **Policy 40** – This application proposes the same existing expiry date as the existing consents 301663 and 301664 of 9 November 2027.

SOUTHLAND REGIONAL POLICY STATEMENT

99 The Southland Regional Policy Statement was made operative on 7th October 2017. This consent application is considered to be consistency with the following objectives and policies.

100 **Objectives WQUAL.1 (d) and QUAN.1 (c) and Policies WQUAL.7, WQUAN.7 and RURAL.1 –** As a result of this proposal the WOL property will support 5 staff members and their families, therefore helping to support the, economic, social and cultural needs of the community and of future generations.

101 **Policies WQUAL.2 and WQUAL.5 –** Mr Duncan's Overseer modelling has indicated that both the nitrogen and phosphorus loss to water is likely to remain the same or decrease as a result of this proposal together with the implantation of good management practices which will also help with improving the catchment water quality.

102 **Policy WQUAL.8 and WQUAL.9** – This application is to discharge dairy effluent and wintering barn effluent to land i.e. effluent will not be discharged directly to water.

103 **Policy WQUAL.11 –** Heddon Bush School and the water supply for the school (bore E45/0718) is located approximately 2 km south of the WOL boundary. Given, groundwater in the vicinity of the property flows in a south to south-east direction the school water supply may be affected. The water supply passes through a Trojan Ultra Violet Water Treatment System before the water enters the school water supply. Given this treatment system the school water supply will be protected from E-coli and other pathogens.

104 The Principal of Heddon Bush School has also indicated that E-coli and coliforms have been absent from all samples taken in the last 3 years (while she has been Principal). Since the drilling of the new bore water quality sampling of the bore will be carried out quarterly. John Scandrett has carried out water quality monitoring which is presented in his evidence.

105 **Objective WQUAN.2 and Policies WQAN.2 and WQUAN.6 –** The Waimatuku Groundwater Allocation Zone is less than 10 % allocated and the use of groundwater has been assessed as reasonable and efficient, for stockwater and dairy shed use. Features of the stockwater and dairy shed system that assist in the efficient use and management of water use on the property are;

- The new dairy shed yard will have an effluent scraper system reducing the amount of water used to wash down the yard;

- Monitoring the rate of water abstraction from the bore using a flow meter; and

- Recycling the water used for cooling (refrigeration)

106 The applicant is also proposing the following consent condition to the groundwater consent to ensure water is not wasted;

The consent holder shall take all practicable steps to avoid leakage from pipes and structures

COMMENTS ON COUNCIL POSITION

Activity Status

107 I disagree with the Section 42A Report (top of page 8) that the groundwater take is a non-complying activity under the pSWLP. I have already explained above why I consider that the activity status of the water take and use is fully discretionary and that as a result the entire application is to be considered as fully discretionary. As indicated, this issue will be more closely addressed by the Applicant's legal submissions.

108 However, for the sake of clarification the pSWLP (Reply Report Nov 2017) Table L.2 has been reworded to state that for the hydraulic connection to be considered "high" the stream depletion effect is assessed as *(iii) greater than 2 l/s*. The stream depletion assessment in paragraph has assessed the depletion as 0.9 l/s after 300 days. The classification for a "moderate" hydraulic connection has also been reworded to state that for the hydraulic connection to be considered "moderate" the stream depletion effect is assessed as *(ii) greater than 5 l/s*. As the depletion effect has been assessed as less than 5 l/s under the Reply Report of the pSWLP the hydraulic connection would be considered a low hydraulic connection and no surface water minimum flow restrictions would be required to be imposed on the groundwater take. This reaffirms my position that the water take and use cannot be non-complying.

Section 104D

Bundling

109 As indicated above, I consider that the classification of the water take application as a non-complying activity is incorrect, as a result of which the

issue of bundling does not arise. However, even if it had been correct, the legal submissions will show that bundling is not obligatory. In the current situation, where the permitted activity is only 6m^3/day less and there is clearly a problem with the drafting of the applicable test for hydraulic connection which has been rectified in the Proposed Plan's s42A report, bundling would be entirely inappropriate. In the absence of bundling, even if I am wrong on the activity status of the water take and use (which I do not consider I am), then the only application that would need to be considered under s104D is that one.

Effects

110 With respect, it seems absurd to suggest that effects that Table 2 does not seek to manage, and which are only 6m^3/day above the permitted activity level in the proposed plan, can be "more than minor". In my opinion no real adverse effect of the take and use of water can be demonstrated and there is no basis on which the effects of that take can be more than minor. On that basis the first leg of s104D would be addressed.

111 Even if bundling were undertaken, the evidence above and that provided by Mr Duncan and Mr Scandrett shows that, when compared with the lawfully consented existing environment, if anything there will be a decrease in effects. As a result there is no basis on which to conclude effects that are more than minor. It is my opinion that the effects overall, of granting the consents sought, cannot be more than minor.

Contrary to Objectives and Policies

112 As the applicant's legal submissions will show, the correct legal test is not the singling out of an individual policy, but an assessment against all applicable objectives and policies as a whole. Also, since the effects are not more than minor, the second test in s104D does not arise either. Nevertheless I address it for completeness.

113 My assessment of the water take and use, and of all the applications shows that granting consent is in accordance with the applicable objectives and policies. In my opinion there is no basis on which to conclude that either the water take and use on its own, or all applications considered together, are contrary to the applicable objectives and policies, when read as a whole.

PROPOSED CONSENT CONDITIONS

114 Under s108 the Council can impose consent conditions. The effects of the activity must be assessed as being mitigated by the conditions proffered.

General

115 The applicant agrees with the conditions recommended by the s42A report, but in In order to mitigate any potential environmental effects the applicant proposes the following additional consent conditions for the groundwater take;

- The consent holder shall take all practicable steps to avoid leakage from pipes and structures.

116 In order to mitigate any potential environmental effects the applicant proposes the following additional consent conditions for the discharge of dairy effluent and wintering barn effluent ;

- Include the use of a low rate effluent discharge system (i.e. pods or a low rate travelling irrigator);

- Soil moisture monitoring on the property to assist with timing of dairy effluent and wintering barn effluent discharge.

- Before the wintering shed is used for the 2018 winter the effluent/slurry storage pond at the property will have a pumpable volume of at least 4,238 m^3.

117 In order to mitigate any potential environmental effects the applicant proposes the following additional consent conditions for the use land for dairy farming;

- Six monthly groundwater quality sampling from bores sited at both an upstream and downstream site of the WOL property. All samples to be analysed for for nitrate, nitrite, nitrate + nitrite (TON), total nitrogen, total Kjeldahl nitrogen, E coli (as MPN), electrical conductivity and chloride. All results to be submitted to Environment Southland.

- No fodder crops to be grown at the property.

- Overseer modelled annually to assess the nitrogen and phosphorus loss to water, with the scenario forwarded to Environment Southland.

Special Condition

118 The legal submissions for the Applicant will deal with the extent to which this hearing panel can address the errors made with WTL (the erroneous inclusion of the 54ha and its resultant exclusion from WOL).

119 Subject to that issue, I do consider that a condition could also be imposed that would require the errors with WTL to be corrected before the current applications can be given effect. This would ensure the outcomes set out in my paragraph 12 above.

CONCLUSION

120 These applications are to be considered together as a discretionary activity. When the mitigation proffered in the conditions is applied, then in my opinion the grant of the consents as sought would:

120.1 Not increase the overall adverse environmental effects, but if anything represent an improvement over the situation as it existed at 30 May 2016;

120.2 Ensure any adverse effects on the environment are appropriately avoided, remedied or mitigated;

120.3 Be in accordance with objectives, policies and rules of both the pSWLP and the RWP and in accordance with the policies and objectives of the RPS.

121 In my opinion therefore, when the appropriate tests are applied under the Act, it is appropriate to grant the consents accordingly.

Dated 20 March 2018

NMatheson

Nicole Matheson

APPENDIX A: RESOURCE CONSENT 301663

Consent No: 301663

environment SOUTHLAND

Cnr North Road and Price Street
(Private Bag 90116)
Invercargill

Telephone (03) 211 5115
Fax No. (03) 211 5252
Southland Freephone No. 0800 76 88 45

Discharge Permit

Pursuant to Section 104B of the Resource Management Act 1991, a resource consent is hereby granted by the Southland Regional Council (the "Council") to **Woldwide One Ltd** (the "consent holder") of **C/- A and J J de Wolde, 104 Shaws Trees Road, Heddon Bush, R D 3, Winton 9783** from **9 November 2012.**

Please read this Consent carefully, and ensure that any staff or contractors carrying out activities under this Consent on your behalf are aware of all the conditions of the Consent.

Details of Permit

Purpose for which permit is granted:		To discharge dairy shed effluent to land
Location	- site locality	Hundred Line, Heddon Bush
	- map reference	E45:350-504
	- receiving environment	Land
	- catchment	Waimatuku
Legal description of land at the site:		Lot 4 DP 399915, Parts Lot 18 DP 942, Lot 1 DP 10885, and Section 420 Taringatura Survey District
Expiry date:		9 November 2027

Schedule of Conditions

These conditions should be read in conjunction with the best practice recommendations that are appended. These will reduce the risk of non-compliance with the consent conditions.

1. This consent is granted for a period of 15 years and shall commence on the surrender or expiry of resource consent 202559.

   (Note: Pursuant to Sections 123 and 124 of the Resource Management Act 1991, a new consent will be required at the expiration of this consent. The application will be considered in accordance with the plans in effect at that time, and the adverse effects of the proposed activity.)

2. This consent authorises the discharge of dairy shed effluent and herd home slurry onto land, via a land disposal system, as described in the application, on land known as Lot 4 DP 399915, Parts Lot 18 DP 942, Lot 1 DP 10885, and Section 420 Taringatura Survey District.

(Note: The effluent/slurry disposal area shown in Appendix 1can be altered and/or extended, subject to the approval of the Director of Environmental Management, if the consent holder submits a new plan showing the new effluent disposal area, and providing the written approval(s) of any person whose property boundary will be closer to that area. In the event that written approval cannot be obtained, the effluent disposal area can only be amended by way of limited notification.)

3. (a) No dairy shed effluent/slurry shall be discharged to any surface watercourse by overland flow, run-off, or via a pipe, nor shall there be any surface run-off/overland flow, ponding or contamination of water resulting from the exercise of this consent. *See Best Practice Notes 1, 2 & 3*

   (b) The land disposal system shall be operated and maintained to ensure that there is no odour or spray drift to the extent that it causes an adverse effect beyond the property boundary.

   (c) The consent holder shall install and maintain an alarm and automatic switch-off system as a contingency measure in the event of a system failure such as a sudden pressure drop, irrigator stoppage or breakdown of the travelling irrigator. *See Best Practice Note 4*

4. (a) Subject to condition 3(a), the land disposal system is limited to the following:

   (i) a maximum depth of application of 10 mm for each individual application. Where the slurry is applied by the trailing shoe system, the depth of application shall be averaged across the width of the applicators on the tanker.
   Note: The application depth needs to be less than the soil-water deficit (i.e. the depths above are maximum depths and as soil moisture levels approach field capacity, smaller depths will be necessary to avoid losses of contaminants from the root zone. When soil moisture levels reach field capacity, irrigation will need to cease completely to prevent these losses.)

   (ii) the maximum loading rate of nitrogen onto any land area shall not exceed 150 kg of nitrogen per hectare per year from the effluent/slurry; *See Best Practice Note 5*

   (b) (i) within six months of commencement of this resource consent he consent holder shall measure the application rate of the irrigator as installed to confirm the operating conditions required to ensure compliance with condition 4(a);

   (ii) within one month of commencing use of the trailing shoe-type tanker, the consent holder shall measure the application rate of the tanker to confirm compliance with condition 4(a);

   (iii) the consent holder shall notify the Council's Compliance Manager in advance of each measurement (escompliance@es.govt.nz);

   (iv) the Council may audit the measurement of the application rate to ensure accuracy. The consent holder shall pay the costs of auditing the measurement in accordance with Section 36 of the Resource Management Act.

The result of each measurement shall be forwarded to the Council's Compliance Manager, (escompliance@es.govt.nz) within 10 working days of the measurement being completed.

5. Effluent/slurry may be applied to the land as described in the application and generally as shown in Appendix 1, but the following specific buffers shall be observed:

   (a) there shall be no application of effluent and/or slurry within:

      (i) 20 metres of any surface watercourse;
      (ii) 100 metres of any potable water abstraction point;
      (iii) 100 metres of any residential dwelling other than residential dwellings on the property;

   (b) dairy shed effluent shall not be applied to land by travelling irrigator within 20 metres of a property boundary.

   (Note: this does not prevent discharge within 20 metres of the property boundary of effluent and/or slurry applied by trailing shoe-type tanker.)

   Where there is conflict between Appendix 1 and these specified buffers, the latter shall apply.

6. (a) The amount of dairy shed effluent disposed of onto land shall not exceed that from 540 cows.

   (b) The amount of herd home slurry disposed of onto land shall not exceed that from 400 cows.

7. The consent holder shall have at least 3,000 m^3 of effluent/slurry storage for the purpose of:

   (a) avoiding irrigation of effluent/slurry when soils are at or above field capacity; *see Best Practice Note 8*
   (b) providing a contingency measure when the irrigation system is inoperative; and/or
   (c) for primary treatment when it is necessary for the proper operation of the effluent disposal system.

8. (a) The consent holder shall notify the Council, by 31 March 2013, of the person who is in charge of the operation of the effluent/slurry disposal system. If the person in charge of the effluent system changes during the term of this consent, the consent holder shall notify the Council of the new operator no later than five working days after that person takes responsibility. *See Best Practice Notes 6 & 7*
   (Note: The person identified by condition 8(a) will be the primary contact for Council staff for monitoring purposes and/or in the event of an incident. Nothing in this condition removes or limits the consent holder's liability to ensure compliance with the consent and its conditions.)

   (b) The consent holder shall notify the Council's Compliance Manager (escompliance@es.govt.nz or ph 03 211 5115) prior to the commencement of the discharge of slurry/effluent from the storage pond each year.

9. The Southland Regional Council may serve notice of its intention to review the conditions of this consent, in accordance with the conditions of this resource consent and Sections 128 and 129 of the Resource Management Act 1991, during the period 1 February to 30 September

each year, or within two calendar months of the completion of any enforcement action (prosecution or infringement notice), for the purposes of:

(a) dealing with any adverse or cumulative effects, including the adverse effects of high stocking rates, on the environment which may arise from the exercise of this consent;
(b) considering any changes to information on the effects of land disposal of dairy shed effluent/slurry;
(c) complying with the requirements of a regional plan;
(d) amending monitoring requirements; or
(e) imposing a notification requirement for potential effects on registered drinking water supplies.

10. The consent holder shall pay an annual administration and monitoring charge to the Southland Regional Council, collected in accordance with Section 36 of the Resource Management Act. This charge may include the costs of inspecting the site three times each year (or otherwise as set by the Council's Annual Plan), and of monitoring the effects of the discharge on groundwater by taking representative samples of the bore water, from Bore E45/0622 once every six months and analysing for:

- electrical conductivity;
- nitrate nitrogen concentration;
- Total Nitrogen concentration;
- Dissolved oxygen concentration – field measurement;
- *E. coli* concentration;
- bromine concentration;
- chloride concentration.

Except that the first sample shall also be analysed for Dissolved Iron concentration.

(Note: The Administration Charges are payable for the costs of the Council's administration, monitoring and supervision of this resource consent. For new conversions, the first monitoring inspection by the Council, in accordance with the Council's Annual Plan, of the exercise of the resource consent shall be carried out following installation of the effluent disposal system.)

11. If an event (such as effluent/slurry overflow to water, significant over-application on a free-draining area or pond collapse) occurs that may have significant adverse effect on water quality at the abstraction point of a registered drinking-water supply, the consent holder shall notify, as soon as reasonably practicable, the following:

- Environment Southland's Compliance Manager (ph 03 211 5115 or 03 211 5225 after hours);
- Southland District Council (ph 0800 732 732).

(Note: The consent holder is advised to contact Environment Southland's Compliance Manager in the event of any unexpected event that may result in non-compliance with the conditions of this resource consent or the rules of a regional plan.)

for the **Southland Regional Council**

Ken Swinney
Policy and Planning Manager

Best Practice and Explanatory Notes

1. Dairy shed effluent should not be discharged onto any land area that has been grazed within the previous 5-10 days. Where there has been significant damage to soil during grazing, it is recommended that effluent not be applied until that damage has been repaired.

2. To avoid contaminating water directly or indirectly, the consent holder should not apply effluent to land when the soils are at or above field capacity. Moisture content is to be determined by either actual monitoring on site or by reference to the appropriate Council monitoring site. The Council's soil moisture monitoring sites can be viewed at http://www.es.govt.nz and following the "Farming", "Dairy Advisor" and "Soil Moisture Map" links.

3. For the purposes of this condition, ponding is the accumulation of effluent on the soil surface resulting from the application of effluent to saturated soils, or the application of effluent inducing saturated soil conditions. It does not refer to the temporary accumulation of effluent on the soil surface resulting from the application of effluent at a rate that exceeds the soil infiltration rate.

4. Where the effluent reticulation system is installed in such a way that effluent can be siphoned when pumping ceases, the consent holder should install and maintain an anti-siphon device in the effluent pipe line.

5. A loading of 150 kg N/ha/year is approximately equivalent to a loading of dairy shed effluent to land of 4 ha/100 cows. However, there are significant benefits to having a larger effluent disposal area in terms of managing potassium. Further, scientific research has highlighted decreased nitrogen use efficiency and increased nitrogen leaching losses at annual nitrogen loading rates (from combined fertiliser and effluent N) greater than 150 kg/N/ha/yr. Extreme caution should therefore be taken when applying nitrogen fertiliser to the effluent disposal area. It is recommended that a nutrient budget is used to check that nitrogen and potassium application rates to the effluent disposal area are not excessive.

6. The consent holder should prepare and comply with a Farm Environmental Management Plan. The plan should:

   - specify and implement a nutrient budgeting system for the property;
   - provide for the management of effluent disposal to avoid applications when soils are at or above field capacity;
   - identify, as far as is practicable, the drains in the effluent disposal area, so that appropriate management procedures can be taken to avoid contamination of the drains by effluent;
   - if relevant, provide for the operation and management of any feedlot and/or wintering pad;
   - include the provision for monitoring application rates to ensure the consent requirements are being met;
   - include the monitoring requirements specified in this consent; and
   - address ancillary matters such as protecting well-head(s) from contamination; preventing leachate from any silage pits entering water, including groundwater; preventing soil damage; controlling run-off from lanes; and preventing stock access to and maintaining the riparian margins of any watercourses on the property.

   A template may be viewed at:

http://www.es.govt.nz/media/4831/dairy-farm-plan-consent-template.pdf

7. The consent holder should display, in a prominent place in the dairy shed, a copy of the resource consent and relevant limits about the operation of the effluent disposal system that must be complied with. The material to be displayed will be provided by the Council on laminated sheets suitable for display purposes.

8. Storage ponds should be operated at low levels when conditions for effluent disposal are suitable in order to maintain storage for wet weather periods. In particular, storage ponds should be emptied in late summer/early autumn to ensure sufficient storage capacity for the following late winter/early spring period.

9. Storage ponds should not, for practical purposes, leak. This resource consent does not authorise the discharge of contaminants due to leaks or failure of the storage ponds. If an existing storage pond is modified (such as by increasing the embankment height to increase storage), the modification will require resource consent.

Environment Southland*

(03) 211 5115

Toll Free 0800 76 88 45 (Southland only)

or

Emergency After Hours (03) 211 5225

if you have an effluent or pollution problem, call us

environment SOUTHLAND

Held by: Woldwide One Ltd

- the total milking herd cannot exceed 540 cows.
- the amount of herd home slurry disposed of onto land shall not exceed that from 400 cows.
- effluent may only be applied within the area shown on the attached map, as detailed in the application for the Consent.
- effluent cannot be applied within 20 metres of the property boundary.
- if there are waterways within the approved area, effluent cannot be applied within 20 metres of the waterways and ditches.
- a maximum depth of application of 10 mm for each individual application. Where the slurry is applied by the trailing shoe system, the depth of application shall be averaged across the width of the applicators on the tanker.
- the contingency plan consists of:

  - Ability to defer the effluent discharge by storing effluent in a 3,300 m^3 storage pond during adverse conditions.

(the above is a synopsis. You should ensure you understand the full consent. If you do not have a copy, contact Environment Southland")

Problem Solving

• the number of cows intended to be milked exceeds the consent limit	**Contact Environment Southland for a Variation to the Consent**

If you have any effluent or pollution problems, please contact Environment Southland at the following numbers: Environment Southland: (03) 211 5115 or 0800 76 88 45 during office hours or 03 211 5225 (emergency response) after hours.

environment SOUTHLAND

Appendix 1
WoldeWide One Ltd
Date: 23/08/2012

N
1:17,500

Cadastral information derived from Land Information New Zealand. CROWN COPYRIGHT RESERVED Aerial Photography dated 5/2/2007 to 14/03/2006, Copyright Terralink International Limited

DISCLAIMER: Environment Southland cannot guarantee that the information shown is 100% accurate and should not be reused in any manner without proper consultation.

APPENDIX B: RESOURCE CONSENT 301664

Consent No: 301664

environment
SOUTHLAND

Cnr North Road and Price Street
(Private Bag 90116)
Invercargill

Telephone (03) 211 5115
Fax No. (03) 211 5252
Southland Freephone No. 0800 76 88 45

Water Permit

Pursuant to Section 104B of the Resource Management Act 1991, a resource consent is hereby granted by the Southland Regional Council (the "Council") to **Woldwide One Ltd** (the "consent holder") of **C/- A and J J de Wolde, 104 Shaws Trees Road, Heddon Bush, R D 3, Winton 9783** from **9 November 2012.**

Please read this Consent carefully, and ensure that any staff or contractors carrying out activities under this Consent on your behalf are aware of all the conditions of the Consent.

Details of Permit

Purpose for which permit is granted:		To take groundwater for a dairy operation
Location	- site locality	Hundred Line, Heddon Bush
	- map reference	E45:350-507
	- groundwater zone	Waimatuku
	- catchment	Waimatuku Stream
Legal description of land at the site:		Part Lot 18 DP 942
Expiry date:		9 November 2027

Schedule of Conditions

1. This consent is granted for a period of 15 years and shall commence on the surrender or expiry of Resource Consent 202560.

   (Note: Pursuant to Sections 123 and 124 of the Resource Management Act 1991, a new consent will be required at the expiration of this consent. The application will be considered in accordance with the plans in effect at that time, and the adverse effects of the proposed activity).

2. This consent authorises the abstraction of water from bore/well E45/0071 at about NZMS 260 E45:350-507.

3. The rate of abstraction shall not exceed 60,000 litres per day.

4. The consent holder shall install a backflow prevention device or take other appropriate measures to ensure water and/or contaminants cannot return to the water source.

5. The consent holder shall monitor water usage to ensure compliance with condition 3 of this consent, as follows:

   (a) by installing a flow meter prior to commencement of the abstraction:
      (i) able to continuously measure the amount of water taken;
      (ii) capable of accuracy to within 5% of the true flow rate, on each abstraction;
      (iii) that shall record volumes in litres;
      (iv) in accordance with the manufacturer's instructions;
      (v) that is sealed and as tamper proof as practicable;
      (vi) in a location that measures all water taken;
      (vii) that is suited to the qualities of the water it is measuring (such as temperature, algae content and sediment content);

   (b) by recording the volume of abstraction, at or about the same time each month when the consent is being exercised.

   A copy of this record is to be provided to the Council's Compliance Manager by 31 May each year (escompliance@es.govt.nz).

6. The consent holder shall pay an administration and monitoring charge to the Southland Regional Council collected in accordance with Section 36 of the Resource Management Act, payable in advance on the first day of July each year.

7. The Council may, in accordance with section 128 and 129 of the Act, serve notice, during the period 1 February to 30 September each year, of its intention to review conditions for the purpose of:

   (a) dealing with any adverse effects on the environment which may arise from the exercise of this consent;
   (b) requiring monitoring of the rate of, or the effects of, the abstraction;
   (c) requiring efficiency of water use; and/or
   (d) complying with the requirements of a regional plan.

for the **Southland Regional Council**

Ken Swinney
Policy and Planning Manager

APPENDIX C: RESOURCE CONSENT 300626 (WOLDWIDE TWO LTD)

AUTH-300626-V2

environment
SOUTHLAND

Cnr North Road and Price Street
(Private Bag 90116)
Invercargill

Telephone (03) 211 5115
Fax No. (03) 211 5252
Southland Freephone No. 0800 76 88 45

Discharge Permit

Pursuant to Section 104B of the Resource Management Act 1991, a resource consent is hereby granted by the Southland Regional Council (the "Council") to **Woldwide Two Ltd** (the "consent holder") **C/- A & J J de Wolde, 104 Shaws Trees Road, RD 3, Heddon Bush, Winton 9683** from 2 **December 2011.**

Please read this Consent carefully, and ensure that any staff or contractors carrying out activities under this Consent on your behalf are aware of all the conditions of the Consent.

Details of Permit

Purpose for which permit is granted:	To discharge dairy shed and wintering barn effluent to land.
Location - site locality - map reference - receiving environment - catchment	State Highway 99, Heddon Bush, Winton E45:349-516 Land Middle Creek and Terrace Creek
Legal description of land at the site:	Lot 1 DP 14660, Lot 1 DP 9925, Lot 1 DP 10885, Pt Lot 1 DP 4092, Pt Lot 2 DP 4092, Pt Lot 18 DP 942, Lot 1 DP 5610, Lot 3 DP 5610, Pt Section 417 Taringatura SD and Section 419 Taringatura SD
Expiry date:	2 December 2021

Consent Amended

Conditions amended on 4 August 2014 as follows:

Schedule of Conditions

These conditions should be read in conjunction with the best practice recommendations that are appended. These will reduce the risk of non-compliance with the consent conditions.

1. This consent is granted for a period of 10 years and shall commence on the surrender or expiry of Resource Consent 200870.

Note: *Pursuant to Sections 123 and 124 of the Resource Management Act 1991, a new consent will be required at the expiration of this consent. The application will be considered in accordance with the plans in effect at that time, and the adverse effects of the proposed activity.*

2. This consent authorises the discharge of dairy shed and wintering barn effluent onto land, via a land disposal system, as described in the application, on land known as Lot 1 DP 14660, Lot 1 DP 9925, Lot 1 DP 10885, Pt Lot 1 DP 4092, Pt Lot 2 DP 4092, Pt Lot 18 DP 942, Lot 1 DP 5610, Lot 3 DP 5610, Part Section 417 Taringatura SD, Section 419 Taringatura SD and Lot 1 DP 14661.

Note: *The effluent disposal area shown in Appendix 1 can be altered and/or extended, subject to the approval of the Director of Environmental Management, if the consent holder submits a new plan showing the new effluent disposal area, and providing the written approval(s) of any person whose property boundary will be closer to that area. In the event that written approval cannot be obtained, the effluent disposal area can only be amended by way of limited notification.*

3. (a) No dairy shed or wintering barn effluent shall be discharged to any surface watercourse by overland flow, run-off, or via a pipe, nor shall there be any surface run-off/over land flow, ponding or contamination of water resulting from the exercise of this consent. ***See Best Practice Notes 1, 2 & 3.***

(b) The land disposal system shall be operated and maintained to ensure that there is no offensive or objectionable odour beyond the property boundary, or any spray drift into or beyond the buffer zones specified in Condition 5.

(c) The consent holder shall install and maintain an alarm and automatic switch-off system as a contingency measure in the event of an effluent system failure such as a sudden pressure drop, irrigator stoppage or breakdown. ***See Best Practice Note 4.***

4. (a) Subject to Condition 3(a), the land disposal system is limited to the following:

(i) a maximum depth of application of 10 mm for each individual application;

Note: The application depth needs to be less than the soil-water deficit (i.e. the depths above are maximum depths and as soil moisture levels approach field capacity, smaller depths will be necessary to avoid losses of contaminants from the root zone. When soil moisture levels reach field capacity, irrigation will need to cease completely to prevent these losses.)

(ii) the maximum loading rate of nitrogen onto any land area shall not exceed 150 kg of nitrogen per hectare per year from dairy shed and wintering barn effluent. **See Best Practice Note 5.**

(b) Before this consent is exercised, the consent holder shall measure the application rate of the irrigator as installed to confirm the operating conditions required to ensure compliance with condition 4(a).

(i) the consent holder shall notify the Council's Compliance Manager in advance of the measurement; (escompliance@es.govt.nz);

(ii) the Council may audit the measurement of the application rate to ensure accuracy. The consent holder shall pay the costs of auditing the measurement in accordance with Section 36 of the Resource Management Act.

The result of the measurement shall be forwarded to the Council's Compliance Manager, (escompliance@es.govt.nz) within 10 working days of the measurement being completed.

5. Effluent may be applied to the land as described in the application and generally as shown in Appendix 1, but the following specific buffers shall be observed:

   (a) 20 metres of any surface watercourse;
   (b) 100 metres of any potable water abstraction point;
   (c) 20 metres of any property boundary (unless the adjoining landowner's consent is obtained to do otherwise); and
   (d) 100 metres of any residential dwelling other than residential dwellings on the property.

   Where there is conflict between Appendix 1 and these specified buffers, the latter shall apply.

6. (a) The amount of dairy shed effluent disposed of onto land shall not exceed that from 800 cows.

   (b) The amount of wintering barn effluent disposed of onto land shall not exceed that from 600 cows.

7. Prior to exercising this consent the consent holder shall provide at least 3,282 m^3 of effluent storage for the purpose of:

   (a) avoiding irrigation of effluent when soils are at or above field capacity – **see Best Practice Note 8**;
   (b) providing a contingency measure when the irrigation system is inoperative; and/or
   (c) for primary treatment when it is necessary for the proper operation of the effluent disposal system.

   Note: *The storage volume is equivalent to 90 days of effluent based on 50 litres/cow/day.*

8. The consent holder shall notify the Council, by 1 February 2012, of the person who is in charge of the operation of the effluent disposal system. If the person in charge of the effluent system changes during the term of this consent, the consent holder shall notify the Council of the new operator no later than five working days after that person takes responsibility. ***See Best Practice Notes 6 & 7***

   Note: *The person identified by condition 8 will be the primary contact for Council staff for monitoring purposes and/or in the event of an incident. Nothing in this condition removes or limits the consent holder's liability to ensure compliance with the consent and its conditions.*

9. By 31 January 2015 the consent holder shall drill or access a bore (or well) for the purposes of monitoring groundwater quality. Unless otherwise agreed in writing by Environment Southland's Compliance Manager the bore shall conform with the following requirements:

   (a) the bore shall be located within the south eastern corner of the effluent disposal field, at least 500 m from the dairy shed and 200 m from the south eastern farm boundary.

   (b) the depth of the bore shall be between 2 and 4 metres below the static groundwater level, and no more than 12 metres deep in total;

(c) the internal diameter of the bore shall be between 50 and 100 mm;

(d) the bore is to be used solely for monitoring purposes. This may include abstraction to take samples or to flush the bore prior to sampling, but excludes abstraction of water for domestic or farm supply.

Note 1: *Construction of a bore will require a separate land use consent. However the land use consent is a controlled activity and should not pose an impediment to the exercise of the discharge permit. A guideline on monitoring bore construction is available*

Note 2: *If a bore cannot be established in accordance with this condition, the consent holder may seek the Compliance Manager's agreement for an alternative monitoring bore, or may seek amendment to the resource consent.*

Note 3: *If it is necessary to draw water supply from the monitoring bore it may be necessary to install a new monitoring bore.*

10. The Southland Regional Council may serve notice of its intention to review the conditions of this consent, in accordance with the conditions of this resource consent and Sections 128 and 129 of the Resource Management Act 1991, during the period 1 February to 30 September each year, or within two calendar months of the completion of any enforcement action (prosecution or infringement notice), for the purposes of:

(a) dealing with any adverse or cumulative effects, including the adverse effects of high stocking rates, on the environment which may arise from the exercise of this consent;
(b) considering any changes to information on the effects of land disposal of dairy shed or wintering barn effluent; or
(c) complying with the requirements of a regional plan; or
(d) amending monitoring requirements; or
(e) imposing a notification requirement for potential effects on registered drinking water supplies.

11. The consent holder shall pay an annual administration and monitoring charge to the Southland Regional Council, collected in accordance with Section 36 of the Resource Management Act. This charge may include the costs of inspecting the site three times each year (or otherwise as set by the Council's Annual Plan), and:

(a) from 1 February 2015 monitoring the effects of the discharge on groundwater by taking representative samples from the monitoring bore or well to be established under Condition 9 once every six months and analysing for:

- chloride;
- electrical conductivity;
- nitrate nitrogen concentration;
- *E. coli* concentration;

except that the first sample shall also be analysed for Dissolved Iron concentration.

(b) monitoring the effects of the discharge on surface water, as follows:

(i) monitoring of watercourses may be undertaken up to three times each year;

(ii) representative samples will be taken from the watercourse near the effluent disposal field, upstream and downstream of the discharge area, at points approved by the Council's Compliance Manager.

(iii) the samples will be analysed for:

- pH
- electrical conductivity
- ammoniacal nitrogen concentration
- nitrate nitrogen concentration
- dissolved reactive phosphorous concentration
- *E. coli* concentration

for the **Southland Regional Council**

Vin Smith
Director of Policy, Planning and Regulatory Services

Best Practice and Explanatory Notes

1. Dairy shed or wintering barn effluent should not be discharged onto any land area that has been grazed within the previous 5-10 days. Where there has been significant damage to soil during grazing, it is recommended that effluent not be applied until that damage has been repaired.

2. To avoid contaminating water directly or indirectly, the consent holder should not apply effluent to land when the soils are at or above field capacity. Moisture content is to be determined by either actual monitoring on site or by reference to the appropriate Council monitoring site. The Council's soil moisture monitoring sites can be viewed at http://www.es.govt.nz and following the "Farming", "Dairy Advisor" and "Soil Moisture Map" links.

3. For the purposes of this condition, ponding is the accumulation of effluent on the soil surface resulting from the application of effluent to saturated soils, or the application of effluent inducing saturated soil conditions. It does not refer to the temporary accumulation of effluent on the soil surface resulting from the application of effluent at a rate that exceeds the soil infiltration rate.

4. Where the effluent reticulation system is installed in such a way that effluent can be siphoned when pumping ceases, the consent holder should install and maintain an anti-siphon device in the effluent pipe line.

5. A loading of 150 kg N/ha/year is approximately equivalent to a loading of dairy shed and wintering barn effluent to land of 4 ha/100 cows. However, there are significant benefits to having a larger effluent disposal area in terms of managing potassium. Further, scientific research has highlighted decreased nitrogen use efficiency and increased nitrogen leaching losses at annual nitrogen loading rates (from combined fertiliser and effluent N) greater than 150 kg/N/ha/yr. Extreme caution should therefore be taken when applying nitrogen fertiliser to the effluent disposal area. It is recommended that a nutrient budget is used to check that nitrogen and potassium application rates to the effluent disposal area are not excessive.

6. The consent holder should prepare and comply with a Farm Environmental Management Plan. The plan should:

   - specify and implement a nutrient budgeting system for the property;
   - provide for the management of effluent disposal to avoid applications when soils are at or above field capacity;
   - identify, as far as is practicable, the drains in the effluent disposal area, so that appropriate management procedures can be taken to avoid contamination of the drains by effluent;
   - if relevant, provide for the operation and management of any feedlot and/or wintering pad;
   - include the provision for monitoring application rates to ensure the consent requirements are being met;
   - include the monitoring requirements specified in this consent; and
   - address ancillary matters such as protecting well-head(s) from contamination; preventing leachate from any silage pits entering water, including groundwater; preventing soil damage; controlling runoff from lanes; and preventing stock access to and maintaining the riparian margins of any watercourses on the property.

A template may be viewed at:
http://www.es.govt.nz/media/4831/dairy-farm-plan-consent-template.pdf

7. The consent holder should display, in a prominent place in the dairy shed, a copy of the resource consent and relevant limits about the operation of the effluent disposal system that must be complied with. The material to be displayed will be provided by the Council on laminated sheets suitable for display purposes.

8. Storage ponds should be operated at low levels when conditions for effluent disposal are suitable in order to maintain storage for wet weather periods. In particular, storage ponds should be emptied in late summer/early autumn to ensure sufficient storage capacity for the following late winter/early spring period.

9. Storage ponds should not, for practical purposes, leak. This resource consent does not authorise the discharge of contaminants due to leaks or failure of the storage ponds. If an existing storage pond is modified (such as by increasing the embankment height to increase storage), the modification will require resource consent.

Environment Southland*

(03) 211 5115

Toll Free 0800 76 88 45 (Southland only)

or

Emergency After Hours (03) 211 5225

if you have an effluent or pollution problem, call us

environment SOUTHLAND

Held by: Woldwide Two Ltd

- The amount of dairy shed effluent disposed of onto land shall not exceed that from 800 cows.
- The amount of wintering barn effluent disposed of onto land shall not exceed that from 600 cows.
- Effluent may only be applied within the area shown on the attached map, as detailed in the application for the Consent.
- Effluent cannot be applied within 20 metres of the property boundary.
- If there are waterways within the approved area, effluent cannot be applied within 20 metres of the waterways and ditches.
- The maximum depth of application of 10 mm for each individual application.

  Note: The application depth needs to be less than the soil-water deficit (i.e. the depths above are maximum depths and as soil moisture levels approach field capacity, smaller depths will be necessary to avoid losses of contaminants from the root zone. When soil moisture levels reach field capacity, irrigation will need to cease completely to prevent these losses.)

- The contingency plan consists of:

  - effluent storage for deferred irrigation

(the above is a synopsis. You should ensure you understand the full consent. If you do not have a copy, contact Environment Southland*)

Problem Solving

• the application is leaving a heavy residue or smothering the grass	**Speed up the irrigator**
• the irrigator is stalling and over-applying	**Minimise the amount of hose being pulled by looping the hose ahead of the irrigator**
• the number of cows intended to be milked exceeds the consent limit	**Contact Environment Southland for a Variation to the Consent**

If you have any effluent or pollution problems, please contact Environment Southland at the following numbers: Environment Southland: (03) 211 5115 or 0800 76 88 45 during office hours or 03 211 5225 (emergency response) after hours.

environment SOUTHLAND

Appendix 1
Woldwide Two Ltd
APP-300626-V2

N
1:12,000

APPENDIX D: RESOURCE CONSENT 300627 (WOLDWIDE TWO LTD)

AUTH-300627-V1

environment SOUTHLAND

Cnr North Road and Price Street
(Private Bag 90116)
Invercargill

Telephone (03) 211 5115
Fax No. (03) 211 5252
Southland Freephone No. 0800 76 88 45

Water Permit

Pursuant to Section 104B of the Resource Management Act 1991, a resource consent is hereby granted by the Southland Regional Council (the "Council") to **Woldwide Two Ltd** (the "consent holder") **C/- A & J J de Wolde, 104 Shaws Trees Road, RD 3, Heddon Bush, Winton 9683** from **2 December 2011.**

Please read this Consent carefully, and ensure that any staff or contractors carrying out activities under this Consent on your behalf are aware of all the conditions of the Consent.

Details of Permit

Purpose for which permit is granted:		To take groundwater for a dairy operation.
Location	- site locality	State Highway 99, Heddon Bush, Winton
	- map reference	E45:348-516
	- groundwater zone	Waimatuku
	- catchment	Middle Creek and Terrace Creek
Legal description of land at the site:		Part Lot 2 DP 4092
Expiry date:		2 December 2021

Consent Amended

Conditions amended on 4 August 2014 as follows:

Schedule of Conditions

1. This consent is granted for a period of 10 years and shall commence on the surrender or expiry of Resource Consent 200906.

   (Note: Pursuant to Sections 123 and 124 of the Resource Management Act 1991, a new consent will be required at the expiration of this consent. The application will be considered in accordance with the plans in effect at that time, and the adverse effects of the proposed activity).

2. This consent authorises the abstraction of water from bore/well Bore E45/0083 at about NZMS 260 E45: 348-516.

3. The rate of abstraction shall not exceed 80,000 litres per day.

4. The consent holder shall install a backflow prevention device or take other appropriate measures to ensure water and/or contaminants cannot return to the water source.

5. The consent holder shall monitor water usage to ensure compliance with Condition 3 of this consent, as follows:

   (a) by installing flow meters:
      (i) capable of accuracy to within 5% of the true flow rate, on each abstraction;
      (ii) the meters shall be installed in accordance with the manufacturer's instructions;
      (iii) the water meters shall record volumes in litres or cubic metres; and

   (b) by recording the volume of abstraction, at or about the same time each month when the consent is being exercised.

   A copy of this record is to be provided to the Council's Compliance Manager by 31 May each year (escompliance@es.govt.nz).

6. The consent holder shall pay an administration and monitoring charge to the Southland Regional Council collected in accordance with Section 36 of the Resource Management Act, payable in advance on the first day of July each year.

7. The Council may, in accordance with section 128 and 129 of the Act, serve notice, during the period 1 February to 30 September each year, of its intention to review conditions for the purpose of:

   (a) Dealing with any adverse effects on the environment which may arise from the exercise of this consent; and/or
   (b) Requiring monitoring of the rate of, or the effects of, the abstraction; and/or
   (c) Requiring efficiency of water use; and/or
   (d) Complying with the requirements of a regional plan.

for the **Southland Regional Council**

Vin Smith

Vin Smith
Director of Policy, Planning and Regulatory Services

APPENDIX E: WELL INTERFERENCE GRAPHS

Bore E45/0071 – Aquifer Parameters

Transmissivity = 200 m^2/day

Storativity = 0.001

7 day pumping rate = 1.05 ℓ/s (based on 91 m^3/ day)

300 day pumping rate = 1.05 ℓ/s (same as 7 day pumping rate)

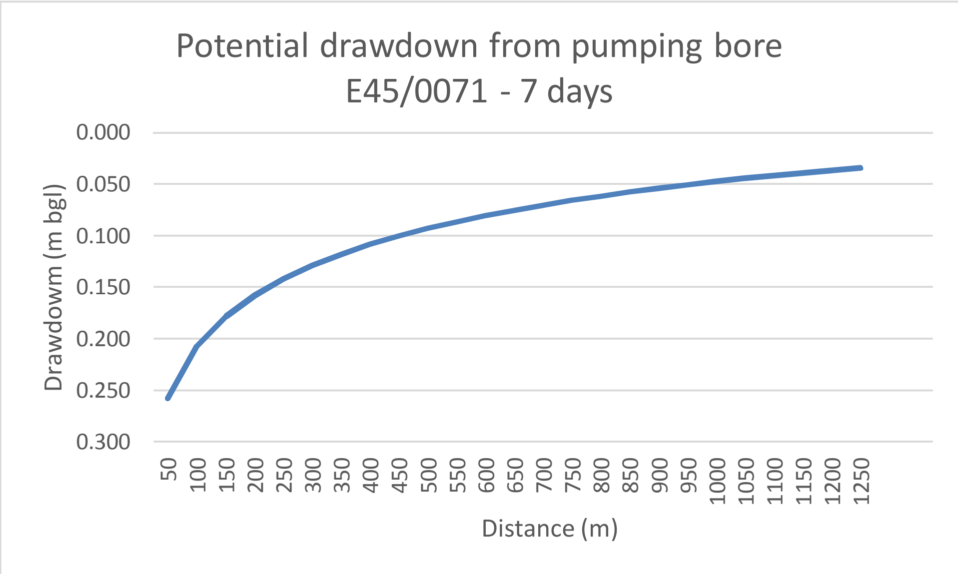

Figure 1: Estimated maximum drawdown effects from pumping bore E45/0071 for 7 days

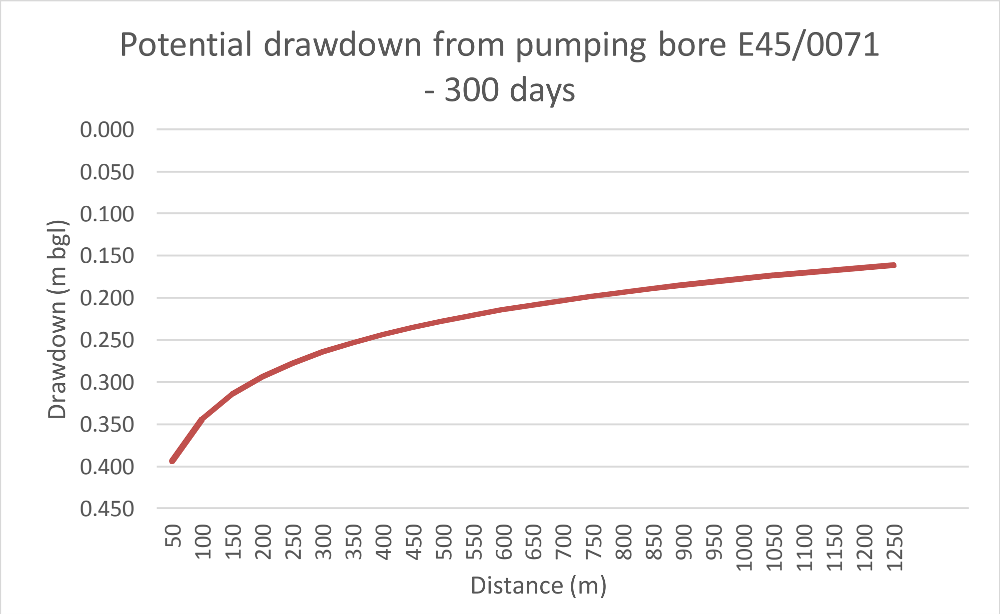

Figure 2: Estimated maximum drawdown effects from pumping bore E45/0071 for 300 days

APPENDIX F: STREAM DEPLETION GRAPHS

Table 3: Parameters used in stream depletion analysis

Parameters	Bores E45/0071
Transmissivity (m^2/day)	200
Storativity	0.001
Separation distance from Bog Burn (m)	1,000
Lambda (m/day)	2
Pump rate over 7 days (ℓ/s)	1.05
Pump rate over 300 days (ℓ/s)	1.05

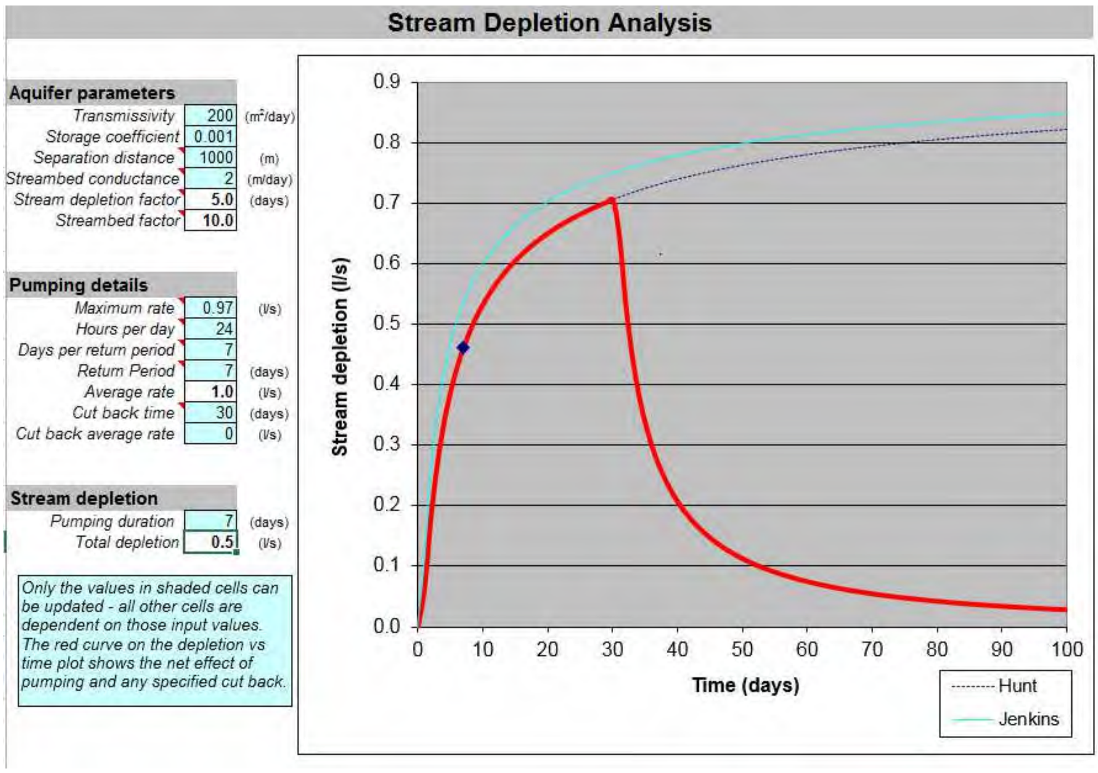

Figure 1: Stream depletion assessment – pumping bore E45/0071 for 7 days

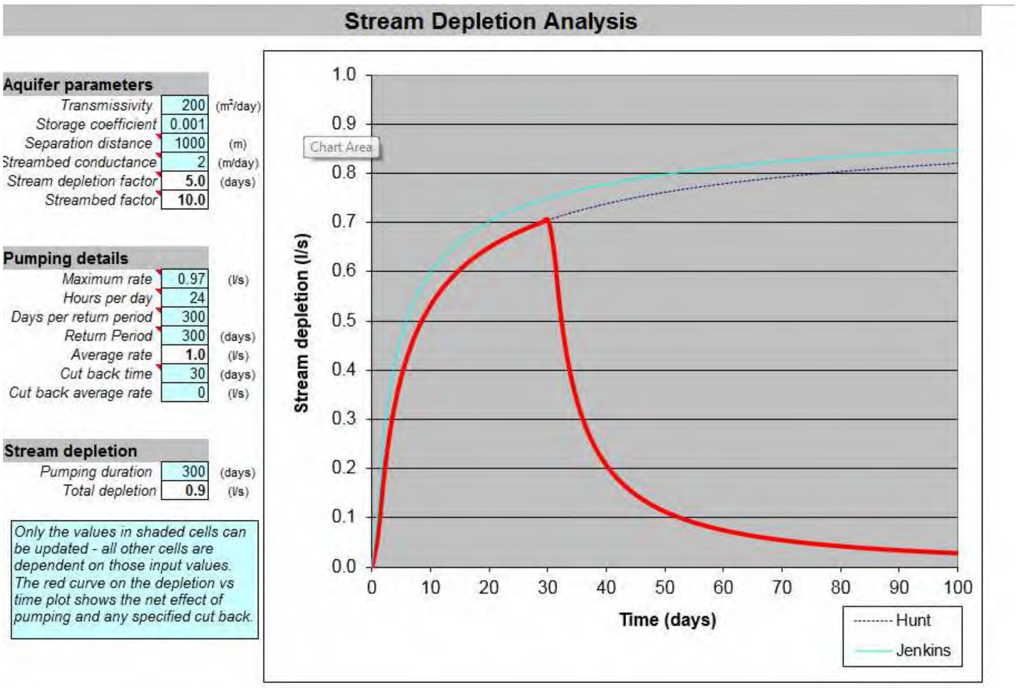

Figure 2: Stream depletion assessment – pumping bore E45/0071 for 7 days

APPENDIX G: GOOD MANAGEMENT FACTSHEETS

GOOD MANAGEMENT PRACTICES
FACTSHEET

WATER AND LAND 2020 & BEYOND

Artificial subsurface drainage

Artificial subsurface drainage (e.g. mole pipe or tile drains) is a key transport pathway for contaminants in the following physiographic zones:

- Central Plains
- Gleyed
- Peat Wetlands

Artificial subsurface drainage is also a key transport pathway in other physiographic zones but only in parts of those zones. These parts are referred to as the artificial drainage variant, or (a). The physiographic zones with an (a) variant are:

- Bedrock/Hill Country
- Lignite/Marine Terraces
- Oxidising

Please note

The factsheet on General Good Management Practices is applicable everywhere, and should be referred to in conjunction with this factsheet. There may also be other key transport pathways and associated good management practices which are relevant to your property, depending on which physiographic zones and variants are present.

You can search for your property and view the physiographic zones map on http://gis.es.govt.nz

Some example good management practices for artificial subsurface drainage which could be included in your Farm Environmental Management Plan include[1]:

Mitigation	Examples	✓
Protect soil structure, particularly in gullies and near stream areas	Minimise fence line pacing by deer by creating a visual barrier	
	Use minimum or no-till cultivation practices such as direct drilling	
	Re-sow areas of bare or damaged soil as soon as possible	
	Match stock management to land use capability, e.g. avoid grazing heavy stock on steeper, more vulnerable soils, especially when wet	
Reduce P use or loss	Reduce use of P fertiliser where Olsen P values are above agronomic optimum	
	Use low solubility P fertiliser forms if runoff risk is high; or fertilise outside risk months (May to September inclusive)	
	Plant split grass/clover swards in near-stream areas	
Reduce the accumulation of surplus N in the soil, particularly during autumn and winter	Reduce inputs of N, such as fertiliser or nitrogen contained in imported feed	
	Control the duration of grazing of pasture and forage crops (on-off grazing)	
	Winter stock off-paddock	
	Plant catch crops to capture N from grazed winter forages (e g barley and triticale)	
	Optimise timing and amounts of irrigation input	
	Substitute autumn diets with low-N feed (such as whole crop silage)	
	Time N application to meet crop demand using split applications	
	Re-sow areas of bare or damaged soil as soon as possible	
	Reduce stocking rate	
Avoid preferential flow of effluent through drains	Defer effluent application when soil conditions unsuitable	
	Avoid placing effluent applicators directly over tile drains	
	Apply effluent at low rates and depths	
Capture contaminants at drainage outflows	Where landscapes allow, run tile drainage outflows into wetlands or sediment traps prior to entering ditches	

[1]Regardless of the good management practices chosen, the entire farm environmental management plan must be prepared in accordance with Appendix N. On-form actions must comply with all relevant rules in the Southland Water and Land Plan 2016, and any relevant resource consent conditions.

GOOD MANAGEMENT PRACTICES
FACTSHEET

WATER AND LAND
2020 & BEYOND

Deep drainage of nitrogen

Deep drainage is a key transport pathway for nitrogen in the following physiographic zones:

- Central Plains
- Old Mataura
- Oxidising
- Riverine

Please note

The factsheet on General Good Management Practices is applicable everywhere, and should be referred to in conjunction with this factsheet. There may also be other key transport pathways and associated good management practices which are relevant to your property, depending on which physiographic zones and variants are present.

You can search for your property and view the physiographic zones map on http://gis.es.govt.nz

Some example good management practices for leaching of nitrogen to groundwater which could be included in your Farm Environmental Management Plan include[1]:

Mitigation	Example GMPs	✓
Reduce the accumulation of surplus N in the soil, particularly during autumn and winter	Reduce inputs of N, such as fertiliser or nitrogen contained in imported feed	
	Control the duration of grazing of pasture and forage crops (on-off grazing)	
	Winter stock off-paddock	
	Plant catch crops to capture N from grazed winter forages (e.g. barley and triticale)	
	Optimise timing and amounts of irrigation input	
	Substitute autumn diets with low-N feed (such as whole crop silage)	
	Reduce stocking rate	
	Cut and carry fodder crops if practical and affordable	
	Use gibberellic acid to boost pasture growth to reduce overall N inputs	
	Re-sow areas of bare or damaged soil as soon as possible	

[1] *Regardless of the good management practices chosen, the entire farm environmental management plan must be prepared in accordance with Appendix N. On-farm actions must comply with all relevant rules in the Southland Water and Land Plan 2016, and any relevant resource consent conditions.*

environment SOUTHLAND REGIONAL COUNCIL
Te Taiao Tonga

Post: Private Bag 90116, Invercargill 9840 | Deliver: Cnr North Road and Price Street, Invercargill
Phone: 0800 76 88 45 | Email: service@es.govt.nz | Online: www.es.govt.nz

May 2016

GOOD MANAGEMENT PRACTICES
FACTSHEET

WATER AND LAND 2020 & BEYOND

Overland flow

Overland flow is a key transport pathway for contaminants in the Alpine physiographic zone.

In some physiographic zones, overland flow is a key transport pathway, but only in part of the physiographic zone. The part of the physiographic zone where overland flow is a key transport pathway is referred to as the overland flow variant, or (o). The physiographic zones with an (o) variant are:

- Bedrock/Hill Country
- Gleyed
- Lignite/Marine Terraces
- Oxidising
- Peat Wetlands
- Riverine

Please note

The factsheet on General Good Management Practices is applicable everywhere, and should be referred to in conjunction with this factsheet. There may also be other key transport pathways and associated good management practices which are relevant to your property, depending on which physiographic zones and variants are present.

You can search for your property and view the physiographic zones map on **http://gis.es.govt.nz**

Some example good management practices for overland flow which could be included in your Farm Environmental Management Plan include[1]:

Mitigation	Example GMPs	✓
Protect soil structure, particularly in gullies and near stream areas	Minimise fence line pacing by deer by creating a visual barrier or separating mobs	
	Use minimum or no-till cultivation practices such as direct drilling	
	Re-sow areas of bare or damaged soil as soon as possible	
	Match stock management to land use capability, e.g. avoid grazing heavy stock on steeper, more vulnerable soils, especially when wet	
	Plant spaced poplars or other poles on steep country	
	Cultivate along contours on sloping ground	
Manage critical source areas (CSA)	Restrict grazing of crop and pasture CSAs when soils are near saturation	
	Avoid working critical source areas and their margins	
	Leave grassed areas (or native vegetation) around critical source areas and margins	
	Plant riparian margins	
	Provide deer wallows away from waterways	
	Move troughs and gateways away from water flow paths	
	Reduce runoff from tracks and races (using cut offs and shaping)	
	Graze from the top of the slope toward the critical source area (such as a stream or gully), or leave a buffer zone to be grazed last	
	Use low solubility P fertiliser if applying to critical source areas	
	Seek advice from Environment Southland Land Sustainability Team to identify critical source areas	
Reduce P use or loss	Reduce use of P fertiliser where Olsen P values are above agronomic optimum	
	Use low solubility P fertiliser forms if runoff risk is high; or fertilise outside risk months (May to September inclusive)	
	Plant split grass/clover swards in near-stream areas	

[1]*Regardless of the good management practices chosen, the entire farm environmental management plan must be prepared in accordance with Appendix N. On-farm actions must comply with all relevant rules in the Southland Water and Land Plan 2016, and any relevant resource consent conditions.*

A HEARING BEFORE

ENVIRONMENT SOUTHLAND

Under	An application under the Resource Management Act **APP-20171445**
Applicant	**WOLDWIDE ONE LIMITED** **ABE AND ANITA DE WOLDE**

APPLICATION TO SUSPEND PROCESSING UNDER S91A

23 March 2018

Duncan Cotterill
Solicitor acting: J M van der Wal
PO Box 5, Christchurch 8140

Phone +64 3 379 2430
Fax +64 3 379 7097
hans.vanderwal@duncancotterill.com

1 In accordance with s91A the Applicant, Woldwide One Ltd, seeks that the processing of resource consent application **APP-20171445**, seeking land use consent, a water permit and a discharge permit, currently set down for a hearing on 5 April 2018 ("the Application"), be suspended.

2 The request is made on the basis of the following:

2.1 In accordance with s91A(2), in that the application has been notified, but the hearing is yet to be held;

2.2 In accordance with s91A(3)(c), no working days have been excluded from the time limits in s88B;

2.3 Under s91A(1) suspension is obligatory given the lodgement of this request in accordance with s91A.

3 The reasons for the request are:

3.1 In preparing expert evidence for the hearing, it has become evident that a significant error has occurred with the assessment of the lawfully existing environment. Matters beyond the jurisdiction of the hearing panel have arisen in this context.

3.2 It is considered more appropriate and transparent if those matters are addressed before any decision is made on the current application.

4 For completeness it is recorded that the Applicant retains the right under s91B(2) to end the suspension.

Dated 23 March 2018

J M van der Wal

Solicitor for the Applicant

Summary of meeting

25/6/18

Location: Environment Southland

Present: Aurora Grant (ES), Courtney Guise (ES), Cain Duncan (Fonterra Farm Sustainability), Nessa Legg (Dairy Green)

Regarding: An upcoming application for expanded dairy farming by Abe and Anita de Wolde (i.e. the applicants) at their Woldwide One (WOL) and Woldwide Two (WLD) dairy farms, Heddon Bush.

The following is a brief summary of items discussed at the meeting:

Nessa explained that it the intention of the applicants to apply for a single land use consent for expanded dairy farming, which will include the WOL and WTL dairy units. The expansion is for an increase of 160 cows. The WOL and WTL dairy units will be managed under a single land use consent. The discharge permits will be replaced with a single discharge permit, the water permits will be replaced under a single water permit. Two dairy sheds and dairy units will be operated. There are two wintering barns, one on each unit. Aurora and Courtney understood the structure of what is being proposed.

Cain explained the background to the nutrient budget analysis and showed maps etc. 3 years of high quality data with evidence has been used to prepare 3 nutrient budgets for the entire land area. A nutrient budget has been prepared for 13/14, which has slightly less land area as a small area (38 ha) was not under the control of the applicants at the time. Cain has used a proxy for this area (i.e. a conservative estimate for a sheep farm of 15 kg N/ha/year) and completed a nutrient budget for the entire land area. With 13/14 included, 4 years of nutrient losses based on high quality data and evidence are available. Aurora and Courtney are satisfied that the application will be based on this.

The application will fall under Rule 20 e) as a discretionary activity. Cain asked if ES would potentially have an issue with an application being based on 4 years of pre-expansion data, instead of 5. Aurora and Courtney confirmed that it will be a higher level activity (i.e. discretionary) but there is no other issue with it. Aurora said if it was based on one year's data it would be different.

Cain explained the sort of evidence that will be submitted to support the NB inputs; Ravensdown fert reports, Fonterra production reports, in-depth dairy consultants reports, fertiliser records for the former support block to the north. The evidence will be submitted in the nutrient budget report appendix. Aurora and Courtney indicated the evidence should be sufficient. They indicated that the auditor/reviewer of the nutrient budgets will review the evidence.

Nessa explained that all land within the proposed boundary has been used for dairy farming for a long time (pre 3 June 2016) or was used for dairy support and subsequently consented for dairy farming in October 2017. Aurora and Courtney confirmed that the interpretation that the expansion does not include new land/increased land into dairy farming, but is an expansion through an increase in cow numbers is correct.

Nessa pointed out that the boundary on WLD's discharge map is incorrect as it has left out a small block. The block left out is however listed in the legal description for WLD on its land use consent. Aurora confirmed that there should be no issue with this as it is on the legal description and the boundary appears to have been drawn wrong.

Aurora asked when the wintering barns will be up to capacity. She recommended that they will need to be in place if they are going to be used as a mitigation measure. Courtney said another mitigation would have to be used if the barns are not upgraded to take all cows over winter. It will be important that the application is clear on the timeline. It will be unacceptable to ES if winter grazing is still used post-expansion if wintering barns are not upgraded.

Nessa asked about the interpretation of Policy 15A and 15B. They seem to apply more to industrial discharge, e.g. sediment quality relating to heavy metals. There was some discussion on this. Aurora said she thought it may relate to industry. Nessa will address it as much as possible but hard to see how it relates to dairy farming and this application specifically.

There was a discussion was around Rule 20 and the term "land holding." Under its definition in the Appendix of the pSWLP, there may be an implication requiring the inclusion of the Horner Block, which receives effluent from WOL and WTL and supplies feed to WOL and WTL (and other dairy farms), in the nutrient budget analysis and in the farm boundary. Cain explained that a nutrient budget analysis of this block will be difficult due to it being used for multiple uses and other enterprises in the past. Also evidence will be challenging. Cain explained that including it would be likely to increase pre-expansion nutrient losses so there is no advantage to the applicant in leaving it out. Aurora reviewed the rule and the definition and came to the inclusion that it may have to be included. She will see if the Council had obtained legal advice on this and communicate back the Council's initial views. It was discussed that if a valid legal argument is made that the Horner Block is a separate business entity then it could fall outside the definition of landholding.

Courtney asked if WOL's application on hold will remain on hold. Nessa and Cain were unsure. Cain commented that the NB analysis for WOL's 2017 application was different and under a different version of Overseer. This time the pre-expansion NBs are based on actual numbers, which in earlier years were well below consented cow numbers. Aurora commented that the approach being taken this time appears to be clear and effective. There was a brief discussion on this.

WYNNWILLIAMS

30 November 2018

Attention: Michael Durand and Aurora Grant

Environment Southland
Corner of North Road & Price Street
Waikiwi
INVERCARGILL 9810

By email to: michael.durand@es.govt.nz and aurora.grant@es.govt.nz

RESOURCE CONSENT APPLICATIONS BY WOLDWIDE COMPANIES - NOTIFICATION

1. In August 2018, companies associated with the de Wolde family (**Applicant**) lodged applications with Southland Regional Council (**Council**) seeking resource consents to expand and operate dairy farming activities (and associated discharges and water takes).

2. Two separate applications were lodged: one by Woldwide One Limited and Woldwide Two Limited (**WW 1 & 2 Application**); the other by Woldwide Four Limited and Woldwide Five Limited (**WW 4 & 5 Application**).

3. On 14 and 15 November 2018, the Council decided to publicly notify the WW 4 & 5 and WW 1 & 2 Applications. Public notification of the Applications was published on or about 16 and 20 November 2018.

4. The Applicants have raised concerns that the notification decisions and public notices do not reflect their current operation or their proposal. They have requested a number of changes to the notification decisions and public notices.

5. The Council's Team Leader Consents has undertaken a review of the notification decisions, public notices and requested changes. The Team Leader Consents has concluded that:

    a. there are some errors in the notification decisions, however, while some should be corrected or clarified prior to the hearing, they are not material to the decisions;

    b. the public notices contain material inaccuracies: both public notices summarise the reasons for notification and incorrectly refer to "an increase of intensive winter grazing" where they should refer to "additional dairy farming".

6. The Team Leader Consents' memorandum for the WW 4 & 5 Application identifies a further issue. The WW 4 & 5 Application is based on an effects assessment that relies on a resource consent that has been surrendered. As this was identified post-notification, the Applicants have not been given an opportunity to address this.

7. You have asked for our opinion on the feasibility of re-notifying the applications.

AUCKLAND Vero Centre, Level 25, 48 Shortland Street, Auckland 1010 | PO Box 2401, Shortland Street, Auckland 1140, New Zealand
CHRISTCHURCH Wynn Williams House, Level 5, 47 Hereford Street, Christchurch | PO Box 4341, DX WX11179, Christchurch 8140, New Zealand

Executive summary

8. We agree with the Team Leader Consents that while the notification decisions contain some errors, the errors are not fatal to the notification decisions. The Council can issue errata notices to correct the errors in the reports.

9. We also agree with the Team Leader Consents that the public notices contain material inaccuracies. As a result, in our opinion the public notices are defective and are void. In other words, in effect, the Council has not yet given valid public notice of the Applications. Accordingly, the Council can amend and reissue the public notices with the material inaccuracies (and any minor errors) corrected.

10. In respect of the WW 4 & 5 Application and the surrendered consent, we agree that the issue should be raised with the Applicants and they should be given an opportunity to respond.

11. An alternative, pragmatic solution exists. The Council could engage with the Applicants and request that they withdraw and relodge the Applications. The if the Applicants agree to do so, the Council could issue new, corrected, notification decisions and public notices for the new Applications.

Analysis

12. We have reviewed the notification decisions, public notices, Applicants' comments and proposed amendments, and the Team Leader Consents' assessment and recommendations. Our analysis and advice is provided below.

Notification decisions

13. We agree with the Team Leader Consents' assessment and recommendations in respect of the notification decisions.

14. While the notification decisions contain some errors, the errors are typographical (eg referring to the wrong block name as an apparent "copy and paste error") or minor (eg mis-summarising where winter grazing occurs or is to occur).

15. In our opinion, the errors identified are immaterial to the reasons why the Council decided to notify the Applications (for example, the potential environmental effects from additional dairy farming on Braxton Soils and in the Central Plains Zone, nitrogen loading in excess of standard limits and the depth of effluent discharge on Class E land). There is therefore no need to reconsider the notification decision.

16. Despite the above, the Council may wish to amend the notification decisions to correct the errors it has identified (in particular, the more obvious errors identified with the notification decision on the WW 1 & 2 Application). Section 13 of the Interpretation Act 1999 provides the Council with limited powers to correct errors or omissions. Given the nature of the errors identified, we consider that the Council can correct those errors by errata notices, in reliance on the Interpretation Act.

Public notices

17. We agree with the Team Leader Consents that the public notices contain material inaccuracies.

18. Both public notices provide summaries of the reasons for the decision to publicly notify the Application. Both notices refer to Policy 16 of the Proposed Southland Water and Land Plan as providing context to the effects of the activity. However, rather than referring to additional dairy farming the notices incorrectly reference the part of Policy 16 on intensive winter grazing (which is not the activity for which land use consents are sought).

19. The Environment Court has outlined the relevant considerations for determining whether deficiencies in a public notice are such that it should be set aside:[1]

> In summary the relevant considerations are an approach to substance, not a technical approach; having regard to the purpose of the legislation and the importance of the particular provision; the degree or extent of non-compliance; the actual effect of non-compliance on third parties; the overall circumstances, including other publicity; and prejudice to the applicants weighed against the nature and consequence of the defects.

20. In our opinion, because the public notices reference the wrong part of Policy 16, both notices (considered in their entirety) mischaracterise the activity for which resource consent is sought. The effect is that the public may not properly understand the notice and that the application may draw irrelevant submissions or cause otherwise interested parties not to submit. When all the factors are weighed, we consider that the public notices are defective.

21. Given our conclusion that the public notices are defective, they should be treated as void, as if the Council had never published the notices. To remedy this, the Council should amend the public notices to correct the material inaccuracies (and any minor errors) and reissue the notices. The normal notification process should be followed, as it was the first time the Applications were notified.

22. As the public notices will be reissued outside the 20 working days allowed by section 95(2)(b), the Council will also need to extend that timeframe under section 37 of the RMA.

23. In practical terms, when the Council reissues the public notices, we recommend that it also provide a short explanation as to why it has reissued the notices, rather than leaving it to the public to identify the reasons for the change. If the Council sent the original public notices to any potentially affected persons when it notified the Applications, we recommend that the reissued notices be sent to those same people, also with a short explanation of the change.

Surrendered consent

24. The WW 4 & 5 Application refers to a resource consent granted in 2015 for the conversion of Collie's Block from sheep to dairy. The Application confirms that Collie's Block is still used as a sheep farm, but in reliance on the 2015 resource consent has assessed the Application as if the block were being used for dairy farming. However, the notification decision identifies that the 2015 resource consent was surrendered in 2016 (this is confirmed in the Team Leader Consents' memorandum).

25. Given the 2015 resource consent has been surrendered, the effects of dairy farming on Collie's Block cannot be disregarded as if they are already occurring. As the Application does not seek to authorise dairy farming on Collie's Block, we consider the approach taken by the notification decision (to neither disregard nor assess the effects of dairy farming on Collie's Block) is appropriate.

26. We agree with the suggestion in the Team Leader Consents' memorandum that this issue should be raised with the Applicant, who should be given an opportunity to respond. However, rather than amending the assessment of environmental effects (which the notification decision is based on), the Applicants should be invited to provide further information to inform the Council's processing in advance of the

[1] *Australian Conference Assn v Auckland City Council* (1994) 3 ELRNZ 49, referred to in *Vodafone (NZ) Ltd v Manukau City Council* (2000) EnvC A101/2000, at [25].

section 42A report. We note that if the Applicants wish to convert Collie's Block to a dairy farm, resource consent may be required under rule 20 of the Proposed Southland Water and Land Plan.

Recommendations

27. We recommend that the Council:

    a. engage with the Applicants to confirm that it does not oppose the Council's proposal to reissue the public notices;

    b. update the notification decisions and public notices to correct the errors it has identified (in particular, the errors in the public notices) and reissue the public notices;

    c. explain the issue with the WW 4 & 5 Application and Collie's Block to the Applicants and provide an opportunity for the Applicants to respond.

28. As an alternative, the Council could engage with the Applicants and offer a pragmatic solution. If the Applicants withdraw the Applications and relodge them with the Council, the Council could begin processing the Applications afresh and issue new, corrected notification decisions and public notices. There is no legal impediment to this option, provided that the Applicants agree to it.

29. As a related point, in future, the Council may wish to consider the level of detail it provides when publicly notifying resource consent applications. The RMA and associated Regulations[2] do not require that notices include a summary of the reasons for public notification – only the bare requirements in Form 12 of the Regulations are necessary.

30. Please let us know if you would like to discuss any of the above.

Yours faithfully
Wynn Williams

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2 Resource Management (Forms, Fees, and Procedure) Regulations 2003, Form 12.

Dairy Green Ltd

Practical Engineering Solutions

Consents, Effluent, Stock water, Irrigation

Design through to Installation

Irrigation NZ Accredited Designer

Woldwide Farming Group:

Woldwide One Limited and Woldwide Two Limited

/1/2019

Application for:

- Land Use Consent for Use of Land for Dairy Farming – Replacement of **20171278-03**
- Discharge Permit – Replacement of **301663** and **20171278-01** under one discharge permit
- Water Permit – Replacement of **301664** and **20171278-02** under one water permit

Farm Location: Heddon Bush

Application prepared on behalf of applicant by Dairy Green Ltd.

10673602_1

Table of Contents:

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Key

ES	Environment Southland
HB	Horner Block – cut and carry/slurry receiving
pSWLP	proposed Southland Water and Land Plan (2018)
PZ	Physiographic Zone
WOL	Woldwide One Limited
WOL/WTL	Woldwide One and Woldwide Two dairy platform
WR	Woldwide Runoff – Merrivale and Merriburn blocks
WTL	Woldwide Two Limited

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1. Overview

1.1 Background

Background

Woldwide One Limited (WOL) and Woldwide Two Limited (WTL) operate two adjoining dairy farms situated at Heddon Bush. Both dairy farms are under the same ownership structure.

WOL currently operates under an effluent discharge permit (AUTH-301663) and water permit (AUTH-301664). Both consents were granted a 15-year term and expire in 2027.

WTL currently operates under a land use consent for expanded dairy farming (AUTH-20171278-03), effluent discharge permit (AUTH-20171278-01) and water permit (AUTH-20171278-02). All were granted a ten-year term and expire in 2027.

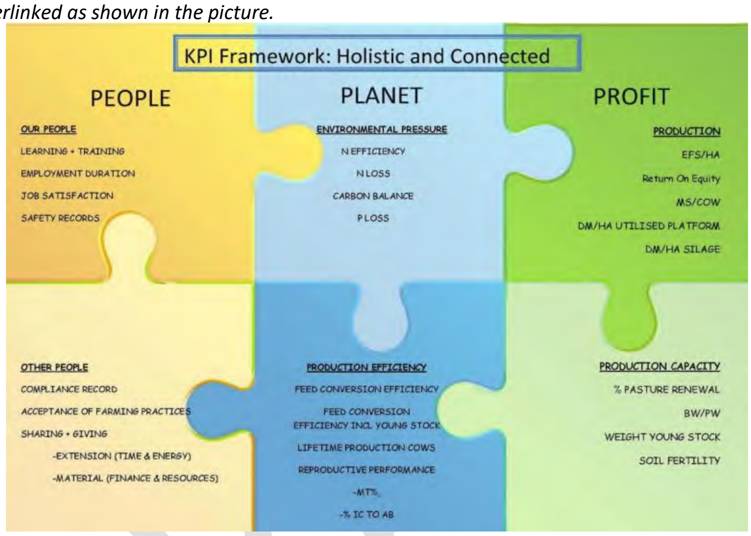
Both WOL and WTL utilise a nearby support block (Horner Block) for cut and carry and to discharge pond slurry. The Horner Block is under separate ownership to the dairy platforms at WOL and WTL and is not part of either dairy platform. The discharge of agricultural effluent at the HB is authorised under respective effluent discharge permits for WOL and WTL.

Both the WOL and WTL dairy platforms graze young stock at Woldwide Runoff (WR), which comprises the Merrivale and Merriburn blocks in the Merrivale area. WR is under separate ownership to the dairy platforms at WOL and WTL and is not part of either dairy platform.

Applicant's philosophy

In the words Abe and Anita de Wolde from the Woldwide Farming Group:

> *Sustainability (environmental, economic and social) has been at the core of all we do at Woldwide Farming group. To us these principles flow out of a desire to be good stewards, and they are all interlinked as shown in the picture.*



> *We were the first to build free stall barns in Southland to reduce outside crop wintering and we were the first (and only) ones to feed fresh grass to our cows in winter to reduce silage making losses and runoff. In 2013 we were supreme winners of the Southland Ballance Farm Environment Awards.*
>
> *Ever since we came to New Zealand we have been trying to improve the sustainability of our farms with a long decision-making horizon and an innovative mind-set. We have now come to a point in our farming career where we wish to cap our growth ambitions and truly focus on environmental sustainability. Keeping our stock off wet soils in winter is pivotal in this endeavour. We aim to have all our adult stock from all our farms indoors within five years (and work on housing all young stock after that). We believe wintering animals outside on wet soils is very damaging for the following reasons:*

- *Nitrogen is lost because it is deposited on the ground (in the mud) when there are no plants actively taking it up and locking it in.*
- *Sediment and top soil are displaced because of the following reasons:*
    - *The ground is disturbed when it is wet*
    - *Root structures are destroyed*
    - *Overland flow (of Phosphate, sediment, bacteria) increases due to soil compaction*

  - *Rain events during cropping season when soils are worked up fine and crops have not yet established can be very risky*
- *Lots of chemicals are used in the cultivation of winter crops*
- *It takes 85 m of wrap to produce a bale of baleage and we want to reduce our reliance on this*

We are convinced that 90 % of the environmental issues caused by farming in Southland stem from the 10 % of ground that is winter cropped. Just because something is common practice does not mean that the effects are acceptable. It is time to change this!

It needs to be kept in mind though that land- previously used for winter cropping- is vacated under our new plans and a small increase of stock numbers is needed to make up for that.

Our passionate desire is to go beyond compliance and to produce top quality food with a reduced environmental footprint. And that is the mindset behind this application.

Application history

In 2017, WTL was granted consent for expanded dairy farming. This involved the addition of new land previously used for dairy support (i.e. SH96 and Marcel blocks) into the milking platform. In parallel with this, some land was removed from WTL's milking platform to be added to WOL's milking platform. WTL cow numbers did not increase as part of the dairy expansion; they remained at 800. The SH96/Marcel support block, which came into WTL's milking platform as part of the expansion, had been used to graze young stock, winter graze cows/heifers on fodder crop and grow supplement (pasture silage). The discharge permit was replaced to allow for the new boundary, effluent discharge area and an increase in the size of a wintering barn. WTL's water permit was also replaced in 2017.

Agricultural effluent from WTL is discharged at low depth at the dairy farm and at the Horner Block, located to the south west. Agricultural effluent from WOL is discharged at low depth at the dairy farm, and at the Horner Block. The Horner Block is a cut and carry block, used to grow grass to supply dairy farms, and receives slurry effluent from WOL, WTL and the Woldwide Three dairy farm (which is not included in this application). The Horner Block does not graze stock.

In 2017, an application for expanded dairy farming at WOL was submitted to Environment Southland (ES), which for reasons not explained here was publicly notified. During the notification process, the decisions version of the proposed Southland Water and Land Plan (2018) was released. Following discussions and advice from stakeholders based on many factors including how best to model pre-expansion land use, the applicants put WOL's application on hold and opted to submit a new application. The new application was submitted to ES in August 2018 and aimed to bring the WOL and WTL dairy farms under a single land use consent for dairy farming. The application was accepted by ES, with extensive information provided under s92 (1), at several meetings and at a site visit.

For reasons not explained here, WOL/WTL's 2018 consent application was publicly notified by ES. An error was made during the notification process, which made the notification illegal according to legal opinion. In view of the ES error resulting in illegal public notification and following collaborative discussions with ES on the best way forward, the applicants agreed to withdraw the consent application, address certain issues identified by ES in the s95 report and resubmit the application. This application aims to bring the WOL and WTL dairy platforms under a single land use consent for dairy farming and to resolve certain issues identified by ES with the 2018 application.

As is explained in section 2.1, the name of the new consent holder on the land use consent for dairy farming, the discharge and water permits will be "Woldwide One Limited and Woldwide Two Limited."

Request for public notification of application

Based on the application's history, the applicants hereby request that the consent authority publicly notify this application in accordance with s95A of the Act.

Landholding

Due to the definition of a "landholding" in the pSWLP (2018) and legal opinion provided to Environment Southland in 2018 by Wynn Williams, the applicants believe that the landholding only includes land at the proposed Woldwide 1&2 dairy platform, as described in table 1.1.

Legal opinion clarified that the Horner Block is not considered to form a "single operating unit" with Woldwide 1&2. Legal opinion concluded that the Horner Bock is not part of the same landholding as Woldwide 1&2 and therefore should not be included on the land use consent for farming. Adverse effects of the discharge activity at the Horner Block have been assessed regarding the use of that land in section 7.

Legal opinion did not specifically cover Woldwide Runoff (WR), which includes the Merrivale and Merriburn blocks and is used to graze young stock among other farming activities outlined below. Based on the LO, the applicants believe that Woldwide 1&2 is not utilising WR as part of a "single operating unit," and therefore WR is not part of the landholding for either Woldwide 1&2 (or unrelated to this application, Woldwide 4&5).

The applicants believe that WR is not central to the overall farming operation for any of the above mentioned Woldwide dairy farms. This statement is justified by the following three points, which are aligned with the justifications used to exclude Horner block in the LO provided to ES by Wynn Williams:

1. The grazing of young stock is the only aspect of 1&2's (and 4&5's) farming operations, which occurs at WR. No cows are sent from 1&2 (or 4&5) to WR for winter grazing, no sludge/effluent is exported from 1&2 (and 4&5) to WR.

2. WR is not central to the overall farming operations being carried out at 1&2 and 4&5. The only service that WR provides for the dairy farms (Woldwide 1&2, 3, 4 and 5) is the grazing of young stock. This is a service that can be provided by a third-party grazier, which is often the case in dairy farming in Southland. Another common practice in Southland is the purchasing of young stock independently. WR grazes approximately 330 R1 and 330 R2 heifers from Woldwide 1&2 annually; there are approximately 920 R1 and 920 R2s heifers at WR from <u>other</u> Woldwide dairy farms annually.

3. WR has other functions that are not directly related to Woldwide 1&2, Woldwide 4, and Woldwide 5.

For example, WR has an activity and income stream from forestry that is separate from dairy farming:

a. Approximately 100 hectares of land at WR is in a commercial pine plantation. The pine plantation at WR is registered for carbon credits and is pruned and maintained according to industry standards.
b. A further 60 hectares of land is beech forest. This is under a sustainable management plan.

For example, WR has an activity and income stream from rotten rock sales for forestry and roading that is separate from dairy farming. Rock from a quarry at WR is sold in partnership with DT Kings Transport Ltd.

CONSIDERATION OF EFFECTS AT WOLDWIDE RUNOFF

Despite not being part of Woldwide 1&2's landholding, the applicants accept that activities and effects at WR need to be described, assessed and fully considered. Activities and effects at WR are described in accompanying reports, including a qualitative assessment and an AEE specific to WR. A 17/18 year-end nutrient budget was prepared for WR to provide guidance for the AEE.

Current application

Land use consent for farming

It is proposed to replace WTL's land use consent for dairy expansion (20171278-03) with a land use consent for dairy farming to include the land areas contained by both WOL and WTL dairy platforms. The land area of the dairy platform is not increasing; all land was in the dairy platform prior to 3 June 2016 or was authorised for dairy farming at WTL in 2017; support land referred to as SH96/Marcel Block was consented for dairy farming at WTL in 2017. The proposed dairy platform will contain two milking sheds and two wintering barns. At an operational level, WOL and WTL will be run as individual dairy units.

An output-based land use consent is requested, which will specify a limit for nitrogen for the dairy platform that must not be exceeded annually. A year-end Overseer nutrient budget will be carried out based and reported to Environment Southland to demonstrate that nutrient limits have not been exceeded. Proposed conditions for the land use consent are included in the section 2.3.

It is proposed to increase cow numbers milked to 1,500. Currently a total of 1,340 cows are authorised; 540 at WOL and 800 at WTL. The proposed increase represents an increase of 160 milking cows or 11% overall. The increase will occur at the WOL unit where the herd size will go from 540 to 700. The WOL unit is increasing in area due to its obtaining land from the WTL milking platform area, which was freed up when the SH96 and Marcel blocks were added to WTL's milking platform area in 2017.

It is proposed to increase the maximum number of animals (cows/heifers) wintered in barns to 1,280. The proposed increase represents an increase of 240 animals and will occur at the WOL wintering barn, which will increase from 400 to 640 cow capacity. The barn and effluent system have already been upgraded to cater for the additional cows and effluent.

To allow for the proposed increase in cow numbers, resource consent is being sought under **Rule 20 e)** of the proposed Southland Water and Land Plan 2018 (hereafter referred to as "pSWLP"), for the ongoing use of the land for dairy farming including an increase in cow numbers. The expansion does not include an increase in the dairy platform's land area as all land was either within the dairy platform prior to 30 June 2016 or was authorised for dairy farming through a dairy expansion land use consent that was granted in 2017 (WTL). As is described in Section 2, this is a discretionary activity under Rule 20 due to the proposed increase in cow numbers.

The proposed activity has been considered in terms of key pSWLP policies and based on this assessment should be granted. Effects on the existing environment have been considered and are described in the assessment provided in Section 7 of the application. The assessment concludes that effects on receiving surfacewaters, groundwater and soils, including cumulatively, will be no more than minor due to the proposed activity.

Importantly, there will be no increase in contaminant loss nor in the export of nutrients off-site due to the expansion.

Overseer nutrient budgets

Overseer is a useful tool to be able to understand the nutrient interactions of a farm system based on soil properties, rainfall, drainage and feed requirements. The output from the model gives an indication of how much nutrient may be lost to the environment. Overseer nutrient budget analysis has been carried out using Overseer version 6.3.0 and using "Overseer Best Input Standards, March 2018." The increase in cow numbers will occur in parallel with significant land use changes, which act as key mitigation measures and are modelled in Overseer where possible.

NUTRIENT BUDGETS - WOL/WTL DAIRY PLATFORM AREA Four pre-expansion nutrient budgets were prepared and one proposed post-expansion nutrient budget for 1,500 cows. The pre-expansion nutrient budgets were derived by modelling the actual lawful use of land and not by modelling consented maximums. The inputs used in pre-expansion nutrient budgets are supported with evidence, which is appended to the nutrient budget analysis report. Where the analysis report states that the land area is being increased by bringing in support land, this refers to the SH96 and Marcel Blocks, which were authorised for dairy farming as parts of WTL's land use consent granted in 2017.

All nutrient budgets model the same land areas, i.e. former WOL and WTL milking platforms, SH96 and Marcel blocks.

The Overseer analysis demonstrates the effectiveness of key mitigation measures that will be implemented:

- The average N loss is predicted to decrease slightly from 41 kg/ha/year to 40 kg/ha/year, despite an increase in 160 cows;
- The average annual P loss is predicted to remain at 0.7 kg/ha post-expansion; and
- By using P loss as a proxy for sediment and microbial losses, there will be no increase in loss of sediment or microbes.

The applicants believe that over time there will be a cumulative reduction in contaminant loss due to the proposed land use changes, compared to continuing with the pre-expansion land use. The changes will see better nutrient management on farm, improved soil organic matter content, water holding capacity and soil structure, less N accumulation on soils at high risk times, and consequently less contaminant loss to water. Farm profitability will be maintained by grazing 160 additional cows on land previously available for activities such as winter grazing.

NUTRIENT BUDGETS - THE HORNER BLOCK Prior to obtaining legal opinion on the Horner Block, ES regarded the HB to be part of the landholding at WOL/WTL. Based on this, one pre-expansion nutrient budget and one proposed post-expansion nutrient were prepared for the Horner Block and submitted with the 2018 consent application. Legal opinion has since advised ES that the Horner Block is not part of the landholding at WOL/WTL and as such is not required to be included on the land use consent for farming. Since nutrient budgets were already prepared for the HB, they are included in this application as a useful source of information and are used appropriately.

NUTRIENT BUDGET – WORLDWIDE RUNOFF

A 17/18 year-end nutrient budget has been prepared for Woldwide Runoff and provides guidance regarding nutrient losses at WR in the 17/18 year.

Discharge and water permits

It is proposed to replace existing discharge permits (301663, 20171278-01) with a single discharge permit managing effluent from the WOL and WTL dairy units, and to replace existing water permits (301664, 20171278-02) with a single water permit for groundwater abstraction from both WOL and WTL. The proposed discharge permit will allow for the discharge of agricultural effluent (dairy shed, wintering barn, silage pad and underpass) to land from 1,500 cows. **It is proposed to include the current irrigation methods in the discharge permit, i.e. travelling irrigator, trailing shoe slurry tanker, umbilical system; as well as to future proof the discharge activity by also including low rate irrigation.** The proposed water permit will allow for groundwater abstraction for dairy shed and stock drinking water for 1,500 cows.

The Horner Block currently receives agricultural effluent from three dairy farms; WOL, WTL and Woldwide Three. It is proposed that Woldwide Three's FDE are at the Horner Bock will remain mutually exclusive. The FDE areas currently consented to receive effluent/slurry from WOL and WTL will be blocked as a single slurry receiving area. The Horner Block will continue to be run as a cut and carry, and slurry receiving area.

Land use consent for feed pad/lots - wintering barns

Under Rule 35A of the pSWLP, the use of land for two wintering barns at the dairy platform is a discretionary activity as at least one of the conditions of Rule 35A (a) is not met. The WOL barn is increasing in capacity from 400 to 640 cows. An application for consent for the use of land for two feed pad/lots will be submitted to Environment Southland in February 2019.

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1.2 Property Details

Note: Woldwide Runoff is described and assessed in a separate set of reports.

Overview

The landholding is an existing dairy farm with required dairy infrastructure and is located within both the Oreti River and Waimatuku Stream catchments at Hundred Line Road, Heddon Bush. It consists of 502 hectares of land, with an effective farm area of 479 hectares.

The slurry-receiving Horner Block is located within both the Waimatuku Stream and Aparima River catchments at Hundred Line Road, Heddon Bush and consists of 160 hectares of land, with an effective farm area of 155 hectares.

Within the last five years, the proposed dairy platform area was managed as two dairy units (WOL and WTL) and a support block (SH96 and Marcel Block). The SH96 and Marcel Block were authorised for dairy farming as part of WTL's land use consent for expanded dairy farming in October 2017. The Horner Block was used for winter grazing and heifer grazing in the past, but has been used for cut and carry, and as an FDE area in recent years.

It is proposed that two dairy units will continue to be operated within the landholding boundary; WOL and WTL. Cows will be milked for seasonal supply through two dairy sheds, 700 at WOL and 800 at WTL. All cows will be wintered in two existing wintering barns. The wintering barns will be used at times to house cows in the shoulders of the season and as stand-off pads during inclement weather throughout the year to reduce soil damage. The Horner Block will continue to be used as an area to discharge slurry from two effluent storage ponds at WOL and WTL. Pasture silage and fresh grass is harvested from the Horner Block and fed to cows at dairy farms, including but not limited to WOL and WTL.

Table 1.1 General property details

Property details	
Dairy platform - total farm area (ha)	502
Dairy platform - effective farm area (ha)	479
Dairy platform - size of effluent disposal area (ha)	c.400
Dairy platform - stocking rate (cows/ha)	3.1
Horner Block – total area (ha)	160
Horner Block – effective area (ha)	155
Horner Block – slurry effluent area (ha) for dairy platform (WOL/WTL only)	97

Legal descriptions – WOL/WTL landholding boundary	Part Lot 18 DP 942 Section 420 Taringatura SD Part Lot 1 DP 4092 Part Lot 18 DP 942 Part Lot 2 DP 4092 Part Lot 1 DP 4092 Part Section 417 Taringatura SD Section 418 Taringatura SD Section 419 Taringatura SD Lot 1 DP 9925* (leased - Gavin Andrew Dykes) Lot 1 DP 14660 Lot 1 DP 14661 Lot 1 DP 451158 (leased - John Desmoulins Pine & Christina Florence Pine) Lot 1 DP 13077 (leased - John Desmoulins Pine & Christina Florence Pine) Lot 1 DP 5610 Lot 3 DP 5610 Lot 1 DP 10885
Legal descriptions – Effluent discharge area at dairy platform and Horner Block	Part Lot 18 DP 942 Section 420 Taringatura SD Part Lot 1 DP 4092 Part Lot 18 DP 942 Part Lot 2 DP 4092 Part Lot 1 DP 4092 Part Section 417 Taringatura SD Section 418 Taringatura SD

	Section 419 Taringatura SD Lot 1 DP 14660 Lot 1 DP 14661 Lot 1 DP 5610 Lot 3 DP 5610 Lot 1 DP 10885 Lot 4 DP 399915 (Horner Block - effluent block only)

*Part of Lot 1 DP 9925 is leased by the applicants and is already within the boundary of the existing land use consent for dairy farming (see figure 1.1).

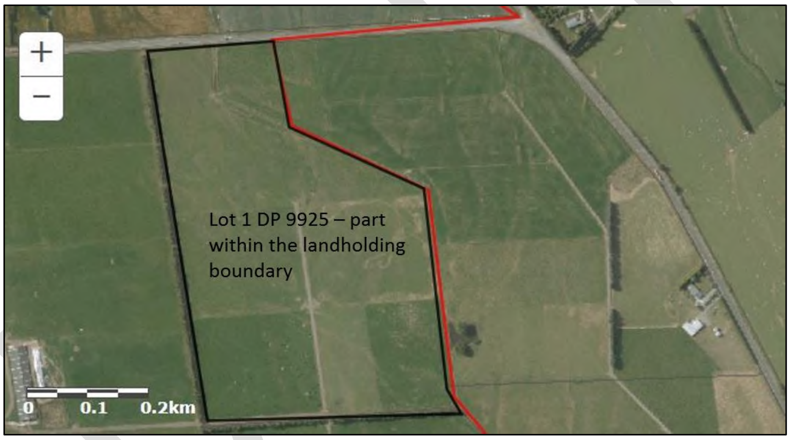

Figure 1.1 Part of Lot 1 DP 9925 within the landholding boundary at WOL/WTL.

Effluent

Existing discharge conditions

Agricultural effluent from WOL and WTL dairy operations are currently managed by way of two existing discharge permits **(301663, 20171278-01)**, which expire on the 9th of November 2027 and 18th October 2027 respectively. WOL's existing discharge consent is for a 540-cow herd milked twice a day and from herd home slurry from a maximum of 400 cows. WTL's existing discharge consent is for an 800-cow herd milked twice a day and from herd home slurry from a maximum of 640 cows. WTL's existing discharge permit also provides for effluent from an underpass and a silage pad.

The consented discharge method at WOL includes land disposal methods limited to maximum application depths of 10 mm and 5 mm per application. The consented discharge methods at WTL include a low depth travelling irrigator, umbilical system and slurry tanker with a trailing shoe. The travelling irrigator has a maximum application depth per application of 10 mm. The umbilical and trailing shoe slurry tanker systems have a maximum depth per application of 5 mm.

The existing operations do not involve winter milking.

Existing FDE areas

WTL's discharge area includes 194 hectares of land at WTL, and 42 hectares of land at the Horner Block. Liquid effluent is discharged at WTL and slurry effluent from WTL's wintering barn is discharged at the Horner Block. Council recommended buffers are implemented at WTL, except for a buffer of 100 metres from land known as Lot 3 DP237. WOL's discharge area includes most of the milking platform and another part of the Horner Block. Council recommended buffers are implemented when discharging liquid or slurry effluent at WOL.

Existing effluent storage infrastructure

WOL and WTL allow for deferred irrigation when soils are near or at field capacity by storing raw effluent (slurry) in two large effluent ponds, one for each operation. Both ponds receive dairy shed effluent when soil moisture conditions are unsuitable for irrigation, and wintering barn effluent from the barns. The WTL pond also receives silage leachate from WTL's concrete silage pad. The material in the ponds is a slurry due to the major contribution of dung and urine from the free stall wintering barns. Consequently, both ponds always have a crust.

WOL's storage pond was upgraded in autumn 2018 to increase its storage capacity and install a synthetic liner (1.5 mm HDPE), overlying a leak detection drain system. The specifications for the leak detection drain system were provided by a CPEng. The pond design was certified by a CPEng as meeting Practice Note 21 standards and completion of reconstruction work received CPEng sign off. The leak detection drain system terminates at a 400 mm diameter inspection well. The inspection well is monitored regularly with no effluent present in the inspection well to date, indicating that the pond is not leaking.

WTL's storage pond was drop tested in 2017 and passed the leakage test indicating that the pond is not leaking. The drop test met all criteria set out in Appendix P, except for the unavoidable presence of a crust on slurry. The drop test report is appended to this application. The characteristics of slurry and liquid effluent in storage systems are quite different. The viscosity of slurry is a lot lower than liquid effluent and as a result, slurry is self-sealing whereas liquid effluent is not. Also, the issue of wind-driven wave action causing bank erosion does not arise when storing slurry.

All effluent storage structures including ponds and various sumps have been visually assessed by a SQP and certified as showing no visible signs of cracks, holes or defects that would leak effluent.

Commented [AE1]: This is not in line with Appendix P, therefore does not meet the criteria for the PA rules. Further comment in email.

Commented [AE2]: What size are these sumps and have any been drop tested as per Rule 32D?

Proposed changes to effluent management and permit

It is proposed to replace existing discharge permits **(301663, 20171278-01)** with a single discharge permit covering effluent from WOL and WTL. The proposed discharge permit will allow for the discharge of agricultural effluent (dairy shed, wintering barn, silage pad and underpass) to land from 1,500 cows; 700 cows at WOL and 800 cows at WTL.

The proposed irrigation systems are described in table 1.2.

Table 1.2 Proposed effluent irrigation methods

Method	Usage	Conditions
Low depth travelling irrigator	Apply dairy shed effluent to land	A maximum depth per application of less than 10 mm
Low depth slurry tanker with a trailing shoe	Apply pond slurry to land	A maximum depth per application of 2.5 mm
Low depth umbilical system	Contingency measure – apply pond slurry to land	A maximum depth per application of 3.0 mm
Low rate pods	*Future proof - Apply dairy shed effluent to land	A maximum instantaneous rate of 10 mm/hour at a depth of less than 10 mm
Low rate cannon/rain gun	*Future proof - Apply dairy shed effluent to land	A maximum instantaneous rate of 10 mm/hour at a depth of less than 10 mm

*To future proof the discharge activity, it is proposed to include low rate irrigation methods as described in the above table. This will allow the applicants to upgrade their effluent system in the future without the need to vary the discharge permit.

The proposed effluent discharge area includes most of the WOL/WTL dairy platform and the existing area at the Horner Block that receives agricultural effluent from WOL and WTL, less standard buffers. *Significant areas of low risk soils are available.* Slurry from the ponds will be applied at very low depth via the trailing shoe slurry tanker or umbilical system at the Horner Block and at the dairy platform.

No affected party approvals are required.

No change in effluent storage is proposed. According to the Massey DESC, the 90% probability volume for 1,500 cows including wintering barn effluent from 1,280 cows and silage leachate is 6,460 m^3. The existing storage capacity is 8,032 m^3, so is sufficient to meet requirements.

Wintering

In the past, some cows and heifers have been intensively winter grazed on fodder crop (fodder beet) and heifers also have been grazed on pasture over winter at the property. More recently, cows have been wintered in barns, but heifers have been intensively winter grazed on crop or grazed on pasture over winter. It is proposed to cease the practice of intensive winter grazing and grazing stock on pasture over winter as a key mitigation measure. From June 2019, no animals will be winter grazed on fodder crop or grazed on pasture over winter at the WOL/WTL dairy platform. All cows will be wintered in two wintering barns on farm over June and July. All young stock will be grazed off farm from weaning until they return as in-calf R2 heifers for calving in August or return as in-calf R2 heifers in June to be wintered in barns.

From May 2019, cows will also be housed in wintering barns for part of May, August and September during inclement weather as required. Early calving cows will return to pasture in August, where they calve. Late calving cows remain in the wintering barns until they are ready to calve in September. Cows are fed freshly cut grass and pasture silage in barns, some of which is harvested at the Horner Block. The wintering barns are also used as stand-off pads during inclement weather during the milking season.

Commented [AE3]: This implies all cows (1500) will be housed over winter and no cows will be on pasture.

At the end of the season in May, the herd of 1,500 cows is culled. At WTL's wintering barn, a maximum of 640 cows are housed over winter. It is proposed to increase WOL's wintering barn authorised cow number to 640, to accommodate an additional 240 animals. WOL's wintering barn has already been upgraded and now has a capacity to house 640 cows. Effluent storage at WOL has been increased so can accommodate effluent from an additional 240 cows in the wintering barn. Generally, each barn will house 625 cows, leaving some stalls free to minimise cow stress.

Commented [AE4]: This does not equate to 1500 cows, therefore it appears not all cows will be housed in wintering barns.

In the 17/18 winter, WOL's barn housed 400 cows and was assessed as grade 1/fully compliant at an inspection by Environment Southland.

Cultivation

The WOL platform has been dairy farmed by the applicants since 1992, and most of the WTL platform has been dairy farmed by the applicants since 2003. Over this time soils have been developed sustainably, which is evident in fertiliser and agronomy reports for WOL, WTL and the Horner Block from the fertiliser supplier (Ravensdown). Please see the soil fertility trends reports in the Appendix. Summer and winter fodder crop cultivation has been carried out to provide feed for cows over summer dry periods and winter respectively. It is proposed to cease the practice of growing fodder crops at the property, as a key mitigation measure associated with an increase in cow numbers, instead wintering all cows inside in barns. The proposed re-grassing policy will be by direct grass to grass cultivation.

Commented [AE5]: Will this be done in accordance with Rule 25? What is the re-grassing policy?

Groundwater abstraction

Groundwater is abstracted from three bores for use at two dairy sheds and to supply stock drinking water to 1,500 cows. The maximum daily volume of groundwater abstracted to meet the needs of 1,500 cows is 180,000 litres.

At the WTL dairy platform, two bores supply groundwater. One bore (E45/0083) is located to the west of the dairy shed with a second bore (E45/0727) at the north of the block, close to Wreys Bush Highway. The maximum daily volume of groundwater supplied to WTL is 96,000 litres.

At the WOL dairy platform, the bore (E45/0071) is located to the west of the dairy shed and the maximum daily volume of groundwater supplied to WOL is 91,000 litres. This represents an increase of 31,000 litres compared to the existing water permit for WOL (#301664), which has a maximum daily take of 60,000 litres.

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Table 1.3 Physical properties and information of land and water at the WOL/WTL dairy platform and Horner Block.

Soils*	**Soil Type**	**Vulnerability Factors**		
		Structural Compaction	**Nutrient Leaching**	**Waterlogging**
	Braxton	Moderate	Slight	Severe
	Drummond	Minimal	Moderate	Slight
	Glenelg	Slight	Very severe	Nil
	Waiau	Moderate	Very severe	Nil
FDE Land Classification	A – artificial drainage or coarse soil structure E – other well drained but very stony flat land (Likely to be D – well drained flat land, but this is not mapped)			
Characteristics of FDE Classification	A - high risk to surface water, low risk to groundwater D, E – low risk to groundwater, low risk to surfacewater			
Topography	Flat			
Surfacewater management zone	Waimatuku, Oreti, Aparima			
Groundwater Zone	Waimatuku, Central Plains			
Groundwater Nitrate Levels	0.1 – > 11.3 mg/L A series of nitrate concentration bands are mapped across the property, with the lowest groundwater nitrate levels at the west of the property (0.1 – 0.4 mg/L) and the highest to the south east of the property (modelled >11.3 mg/L). Most groundwater underlying the property has nitrate levels of 3.5 – 8.5 mg/L, indicative of moderate to high land use impacts.			
FMU	Oreti, Aparima			

Commented [AE6]: This is high risk not low risk

Nearest downstream registered drinking water supply	Heddon Bush School 2.3 km to the south	
Downstream Regionally Significant Wetland/Sensitive Waterbody	Drummond Peat Swamp (>10 km to south east) Bayswater Bog (>10 km to south west)	
Physiographic Zones	**Zone**	**Contaminant pathways for Physiographic Zone**
	Central Plains	When wet soils are prone to waterlogging, resulting in the installation of extensive artificial drainage networks. When dry these soils are prone to shrinking and cracking, allowing drainage to bypass the soil to the underlying aquifer. Aquifers and streams in this zone are prone to contaminant build-up as they do not experience dilution by a major river.
	Oxidising	Soil water and groundwater are well aerated, which allows nitrogen to accumulate. Oxidised soils are good at absorbing and storing water and any nitrogen it contains. During drier months, nitrogen accumulates in soil to high levels. During winter when soils are wet, any nitrogen not used by plants leaches down into the underlying aquifer (deep drainage). Artificial drainage is used where soils have low subsoil permeability to help to reduce waterlogging. Contaminant loss through artificial drains to nearby streams can be high during wetter months.

*Soil mapping on Topoclimate appears to be incorrect compared to soil types found at the property. Topoclimate maps Braxton soils as the dominant soil type for most of the property, with Pukemutu being a minor soil type. Topoclimate maps an area of Glenelg at the south east end of the property.

A soil survey carried out in 2017 by Scandrett Rural Limited is described in Section 5 and a separate report. It maps two dominant soil types found at the property; Braxton soils are found on the mid-west side of the property and Drummond soils are found at the east. Drummond soils have intergrades of more shallow Glenelg soils in places.

2. Consents

The decisions version of the pSWLP was notified on 4 April 2018. In accordance with Section 86B(1)(a) and (3) of the Resource Management Act 1991, all provisions of the Proposed Plan have had legal effect since this date. Since the Regional Water Plan (2010) and Regional Effluent Land Application Plan are still operative, all provisions in both Plans have legal effect. The provisions of these plans therefore need to be considered alongside the provisions of the pSWLP.

Consent holder name

The existing consent holders, Woldwide One Limited, Woldwide Two Limited, have changed their name to "*Woldwide One Limited and Woldwide Two Limited*." In accordance with Section 124C of the RMA, Woldwide One Limited confirms in writing that they will not be making any future applications under as *Woldwide One Limited* on this property in accordance with Section 124C of the RMA. In accordance with Section 124C of the RMA, Woldwide Two Limited confirms in writing that they will not be making any future applications as *Woldwide Two Limited* on this property in accordance with Section 124C of the RMA. Future applications will be made on behalf of "*Woldwide One Limited and Woldwide Two Limited*."

2.1 Consents required

Table 2.1 provides a summary of proposed activities and whether resource consent is required or not. Further details are provided regarding the level of each activity in the following section.

Table 2.1

Proposed activity	Consent required	Activity level
Expansion of dairy farming through an increase in cow numbers	Yes - land use consent for farming	Discretionary activity
Effluent discharge	Yes - effluent discharge permit	Discretionary activity
Discharge of sludge	Yes - effluent discharge permit	Discretionary activity
Use of land for maintenance and use of existing effluent storage facilities	No	Permitted activity
Use of land for wintering barns	Yes - use of land for feed pad/lot	Discretionary activity
Use of land for silage storage facilities	No	Permitted activity
Silage leachate	No	Permitted activity

Commented [AE7]: Is there an application for this? If this is to be included in the main discharge permit, Horner Block will then fall into the landholding, in line with the legal opinion as it will not be operating separately.

Groundwater abstraction	Yes - water permit	Discretionary activity

Expansion of dairy farming

Rule 20 of the pSWLP manages farming activities, including new or expanded dairy farming of cows. The proposed activity does not meet Rule 20 (a) (ii) (2) since cow numbers are increasing beyond the maximum number specified in the dairy effluent discharge permit that existed on 3 June 2016. Rule 20 (a) (ii) (6) is met, however, as all land was either in the dairy platform prior to 3 June 2016 or was authorised for dairy farming in November 2017. Rules 20 (b) and (c) do not apply since the proposed activity does not include any intensive winter grazing nor will occur at greater than 800 metres above mean sea level.

The proposed activity meets the conditions described in Rule 20 (d) except for (d) (ii) (1), since the dairy platform's assessment provided reflects the annual amount of N, P, sediment and microbial contaminants lawfully discharged on average over four years prior to this application, instead of over five years. A high level of evidence of land use activities during the four-year period has been supplied with this application. As the application does not meet all the provisions of Rule 20 (d), then Rule 20 (e) applies; **the use of land for the proposed farming activity is a discretionary activity and resource consent is required**.

Discharge activity

Rule 35 of the pSWLP manages the discharge of agricultural effluent to land. In this case the discharge activity does not meet all conditions of Rule 35 (a). The discharge activity does not meet Rule 35 (b) (ii) since it is proposed to increase cow numbers above the maximum number specified on an existing discharge consent. The discharge activity meets all conditions described in Rule 35 (c) so is a discretionary activity.

Rule 50 of the RWP (2010) manages the discharge of agricultural effluent to land. In this case the discharge activity does not meet Rule 50 (a) or (b) of the RWP. It does not meet Rule 50 (c) since it is proposed to increase the scale of the discharge activity through an increase in cow numbers. However, except for an increase in cow numbers, the discharge activity meets Rule 50 (c) part (i) in that it includes high rate irrigation to soil landscape categories A, D and E. The discharge activity meets Rule 50 (d) as the scale of the activity is increasing with the increase in cow numbers and the discharge activity to soil/landscape categories A, E and D includes high rate irrigation by slurry tanker that does not exceed 5 mm depth per application. In fact, the discharge of effluent by slurry tanker does not exceed 2.5 mm depth per application. Rule 50 (d) does not specify a depth for high rate irrigation by travelling irrigator, so accordingly direction is taken from Policy 42 of the RWP. The discharge of effluent to category E land must be applied at less than or equal to 10 mm depth per application and at less than the soil infiltration rate. The discharge of effluent to category A or D land must be applied at a depth less than the soil water deficit and at less than the soil infiltration rate. The discharge of effluent to category E land is in line with Policy 42 of the RWP.

Rule 5.4.6 of the Regional Effluent Land Application Plan provides for the discharge as a **discretionary activity**.

The discharge activity is therefore assessed as being a discretionary activity.

Existing effluent storage facilities

Rule 32D of the pSWLP manages existing agricultural effluent storage facilities. Under Rule 32D (a) the use of land for the maintenance and use of existing agricultural effluent storage facilities that was authorised prior to Rule 32D taking legal effect, and any incidental discharge directly onto or into land from those storage facilities which are within the normal operating parameters of a leak detection system or the pond drop test criteria set out in Appendix P, are permitted activities provided the certain conditions are met.

Commented [AE8]: The conditions have not been met on WW2. On WW1, due to age of liner, that could come under the PA rules

WTL storage pond

WTL's storage pond stores slurry and does not have a leak detection system. It was drop tested in 2017 and a drop test report was submitted to Environment Southland who accepted that the pond was not leaking. The drop test met all criteria set out in Appendix P, except for the unavoidable presence of a crust on slurry. The drop test report is appended to this application. The characteristics of slurry and liquid effluent in storage systems are quite different. The viscosity of slurry is a lot lower than liquid effluent and as a result, slurry is self-sealing whereas liquid effluent is not. Also, the issue of wind-driven wave action causing bank erosion does not arise when storing slurry.

Commented [AE9]: Can we please define slurry?

Commented [AE10]: What evidence is there to confirm this?

WTL's storage pond meets Rule 32D (a) (i) (1) in that its construction was lawfully carried out without a consent. In accordance with Rule 32D (a) (ii) (2), a visual assessment of WTL's pond was carried out by a SQP in 2018. The assessment found that the pond shows no cracks, holes or defects that would allow effluent to leak. A report certifying WTL's pond by a SQP is appended to this application. In accordance with Rule 32D (a) (ii) (2) (b) the pond has been certified by a SQP as meeting the relevant drop test criteria in Appendix P except for having no crust on the pond surface during the test, which was unavoidable due to the storage of slurry.

In the absence of operating within the normal parameters of a leak detection system or all pond drop test criteria set out in Appendix P, Rule 32D does not provide another pathway to an activity level available for the use of land for the maintenance and use of an existing agricultural effluent storage facility.

Commented [AE11]: What is being proposed top bring it in line with an activity status within the rule?

WOL storage pond

WOL's effluent pond stores slurry and was lawfully upgraded in autumn 2018 to increase its storage capacity, install a synthetic liner and leak detection system. The liner is composed of 1.5 mm HDPE and overlies a leak detection drain system, the specification for which was provided by a CPEng. The pond design was certified by a CPEng as meeting Practice Note 21 standards. The leak detection system terminates at a 400 mm diameter inspection well. The liner supplier confirmed that the liner was correctly installed and is not leaking. The CPEng confirms that the pond is structurally sound following the upgrade. The CPEng report was submitted to Environment Southland as required in 2018.

WOL's pond is operating within the normal operating parameters of a leak detection system; there is no effluent leaking from the pond. The piezo has been inspected regularly when it either had no liquid or had liquid following heavy rainfall when the water table was high. By checking the liquid in the piezo for signs of effluent (i.e. odour and clarity), it has been confirmed that there is no effluent in the leak detection system and no effluent leaking from the pond. In accordance with Rule 32D (a) (ii) (2), a visual assessment of WOL's pond was carried out by a SQP in 2018. The assessment found that the pond shows no cracks, holes or defects that would allow effluent to leak. A report certifying WOL's pond by a SQP is appended to this application.

Commented [AE12]: Does this underlie the entire facility as required?

In accordance with Rule 32D of the pSWLP, the use of land for an existing effluent storage pond at WOL is a permitted activity; resource consent is not required.

Ancillary effluent structures at WOL and WTL

WOL has a sand trap and concrete effluent sump at the dairy shed and concrete collection sump at the wintering barn. These structures have been visually assessed by a SQP and certified as having no visible cracks, holes or defects that would allow effluent to leak. A report prepared by a SQP is appended to this application.

WTL has a sand trap and pump sump at the dairy shed and concrete collection sump at the wintering barn. These structures have been visually assessed by a SQP and certified as having no visible cracks, holes or defects that would allow effluent to leak. A report prepared by a SQP is appended to this application.

Feed pads/Lots

Rule 35A of the pSWLP manages the use of land for feed pads/lots including wintering barns. In this instance the use of land for two wintering barns at the dairy platform does not meet all conditions set out in Rule 35A (a) as each barn houses more than 120 cattle. The use of land for a feed pad/lot that does not meet one or more conditions of Rule 35A (a) is classed as a discretionary activity. Accordingly, resource consent application for the use of land for two wintering barns at WOL and WTL will be submitted to Environment Southland. The application for resource consent for the use of land for two wintering barns will be submitted separately in February 2018.

Silage storage - WOL

The use of land for a silage storage facility at WOL is a permitted activity as it meets all conditions specified in **Rule 40 (a)** of the pSWLP; resource consent is not required for the silage storage facility.

The use of land as a silage storage facility at WOL is a permitted activity as it meets all conditions specified in **Rule 51 (a)** of the RWP (2010); resource consent is not required for the silage storage facility.

Both rules are met as follows:

The silage pad is situated on a dry site; the underlying substrate is well compacted and sealed (see figures 6.4 and 6.5). There is no overland flow of stormwater into the silage pad and the silage pad is not situated within a critical source area. The silage pad is not located on land that is made permanently or intermittently wet by the presence of springs, seepage, high groundwater, ephemeral rivers or flows of stormwater other than from any cover of the silage.

No part of the silage pad is within 50 metres of a lake, river, artificial watercourse, modified watercourse (see figure 6.6), natural wetland or any potable water abstraction point. The nearest waterway is a fenced off open drain, which is approximately 60 metres to the east of the silage pad.

The silage pad is no within 100 metres of any dwelling or place of assembly, on another landholding.
The silage pad is not within 100 metres of the microbial health protection zone of a drinking water supply site identified in Appendix J of the pSWLP, or within 250 metres of the abstraction point of a drinking water supply site identified in Appendix J.

Cattle do not graze directly from the silage pad, rather silage is carted from the pad to cows in the wintering barn or on paddocks. The silage pad is not located on contaminated land.

Silage storage - WTL

The use of land for a silage storage facility at WTL meets the conditions stated in Rule 40 (a) of the pSWLP (2018), so is classed as a permitted activity and resource consent is not required. The use of land for a silage storage facility meets the conditions stated in Rule 51 (a) of the RWP (2010), so is classed as a permitted activity and resource consent is not required.

Silage leachate - WOL

The discharge of silage leachate onto or into land at WOL is a permitted activity as it meets all conditions specified in Rule 51 (d) of the Regional Water Plan (2010); resource consent is not required.

The activity meets Rule 41 (a) (iia), (iii) and (iv) of the pSWLP and is therefore a permitted activity and resource consent is not required. 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.

Silage leachate - WTL

In accordance with Rule 41 (a) of the pSWLP, the discharge of silage leachate onto or into land in circumstances where contaminants may enter water is a permitted activity since part (i) is met and resource consent is not required; the discharge is via an agricultural effluent discharge system authorised under Rule 35.

In accordance with Rule 50 (d) of the RWP (2010), the discharge of silage leachate at WTL is a permitted activity since all conditions set out in Rule 50 (d) are met; resource consent is not required.

Discharge of sludge

The discharge of pond sludge (also referred to as slurry) from the operations meets all provisions of Rule 38 of the pSWLP except for part (a) (iii). Although the maximum N loading will not exceed 150 kg N/ha/year at the dairy platform, it will exceed 150 kg N/ha/year at the Horner Block. A maximum N loading of 250 kg N/ha/year from sludge is proposed for the Horner Block, which is a cut and carry block and does not graze stock.

The discharge of sludge at the dairy platform is a permitted activity under Rule 38 of the pSWLP and does not require resource consent. The discharge of sludge at the Horner Block is not a permitted activity under Rule 38 of the pSWLP and requires resource consent.

Commented [AE13]: I do not believe the discharge of "slurry" as it is called meets the PA criteria for Rule 38, due to its high liquid content.

The discharge of sludge/slurry from the operations meets all provisions of Rule 5.3.1 of the Regional Effluent Land Application Plan (RELAP) arguably except for part (a). Under Rule 5.3.1 of the RELAP, the discharge of sludge is a permitted activity if it meets parts (a) to (g) of the rule. The discharge of sludge meets parts (b) to (g) of the rule, however, it is unclear whether it meets part (a) of the rule. Part (a) states that in order meet permitted activity rules:

> *"the sludge is discharged onto the same property as it was generated. If the sludge is not discharged onto the same property, then the property which receives that discharge may not accept more than one sludge discharge application during a 12 month period;"*

Sludge is discharged at the Horner Block at a rate of more than one application during a 12-month period. Legal opinion sought by Environment Southland has confirmed that the Horner Block is not part of the same landholding as the dairy platform [WOL and WTL]. The above rule refers to "property" rather than "landholding" making interpretation ambiguous.

Groundwater abstraction

Under Rule 54 (d) of the pSWLP, groundwater abstraction for 1,500 cows on the property is a discretionary activity as a maximum of 180,000 litres per day is abstracted. This allows for 120 litres per cow per day. Under Rule 23 (c) of the Regional Water Plan, a groundwater take of 180,000 litres per day is a restricted discretionary activity provided the rate of take is less than or equal to 2 L per second; resource consent is required. **The groundwater abstraction is assessed as a discretionary activity and resource consent is required.**

2.2 Duration

Consent durations of 15 years are proposed for all consents, which aligns with Woldwide One's discharge and water permit terms. Special consideration is given to Policy 40 of the pSWLP and Policies 14A and 43 of the Regional Water Plan in determining the duration. The duration sought is considered consistent with these policies given the replacement nature of consents for an activity that is already well established, has benefited from a significant degree of capital investment and is operating within limits established by its existing consents and associated conditions. Considerable investment in farm infrastructure has been made to take the final steps towards future proofing the dairying operation; eliminating winter grazing of adult cattle on beet crops altogether. The level of investment demonstrates the applicant's belief in and commitment to sustainable farming and land management. The applicants believe that their presence at this location since 1992 (over 25 years) has not had a detrimental effect on the local environment, and that the proposed changes will mean a further reduction of that impact. A 15-year consent term will mean that the management of the resources under the same proven stewardship will be ensured into the future.

2.3 Proposed consent conditions

The applicants propose to agree conditions once draft conditions are issued, including the conditioning of various mitigation measures where appropriate. They request that draft conditions recognise the following at a minimum:

Land use consent for farming

1. The land area only includes the proposed WOL/WTL dairy platform, as described in table 1.1, which the applicants believe is the landholding in its entirety;
2. That Woldwide Runoff (both Merrivale and Merriburn blocks) is not included since the applicants believe it is not part of the landholding at the proposed WOL/WTL dairy platform;

Commented [AE14]: These are not appropriate.

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3. That the land use consent is an output-based consent, using the N figure (x kg/ha/year) from Overseer for the proposed WOL/WTL dairy platform as a limit. The below example can be used as guidance.
4. To provide additional certainty over the scale of the activity, mitigations and effects that the following inputs are conditioned:
    a. Land area;
    b. Liquid effluent discharge area;
    c. Peak cow numbers milked; and
    d. Minimum and maximum number of cows housed in wintering barns.

5. The Consent Holder shall maintain records of the following for each year between 1 June and 31 May:
    a. Fertiliser application, including rates;
    b. Supplements imported;
    c. Types of crops and total area of cropping if any;
    d. Cultivation methods;
    e. Stock units by references to type, age and breed;
    f. Effluent application areas;
    g. All other inputs to the OVERSEER nutrient budgeting model.

6. Install a new monitoring bore in the same area as bore E45/0622, to monitor groundwater quality flowing in a southerly direction towards Heddon Bush School.

Example:

Nitrogen Loss Rate and Nutrient Budget

1. The Consent Holder shall ensure nitrogen losses from farming activities undertaken at the dairy platform are maintained at or below the following nitrogen loss rate of X kg/ha/yr, or as amended in accordance with Condition X.

Advice Note: *The nitrogen loss rates represent the modelled discharge of nitrogen below the root zone as modelled with OVERSEER version 6.3.0 in accordance with the OVERSEER Best Practice Input Standards as of 11 May 2018.*

The determination of whether the nitrogen loss rates have been met will be made using the nitrogen loss from the most recent year, modelling using the latest version of OVERSEER®.

2. The Consent Holder shall prepare an annual nutrient budget for the period of 1 June to 31 May for the subject land using OVERSEER in accordance with the OVERSEER Best Practice Input Standards, or an equivalent model approved by the Chief Executive of the Consent Authority.

3. The nutrient budget required by Condition 2 shall be accompanied by a report that includes:
   a. A review of the input data to ensure that the nutrient budget reflects the farming system;
   b. An explanation of any differences between the budgets of the previous year; and
   c. A comparison of the nitrogen loss from the current year with the nitrogen loss rates in Condition 2.

4. The nutrient budget and accompanying report shall be provided to the Consent Authority by 30 September each year.

5. The nutrient budget shall be prepared by a Certified Nutrient Advisor or the budget may be prepared by suitably experienced person and reviewed by a Certified Nutrient Advisor.

6. The nitrogen loss rates described in Condition 2 shall be amended following the release of a new version of OVERSEER or the Best Practice Data Input Standards. Following the update of the nitrogen loss rates, the Consent Holder shall provide the updated OVERSEER files to the Consent Authority with the report required by Condition 5.

Discharge permit

The following conditions are proposed:

1. *This consent shall be exercised in conjunction with Land Use Consent AUTH-X.*

(a) This consent authorises the discharge of dairy shed effluent, wintering barn effluent, silage pad effluent and underpass effluent ("agricultural effluent") onto land, via a land disposal system consisting of two effluent storage ponds, two sand traps, two dairy shed pump sumps, two wintering barn concrete collection sumps, low depth travelling irrigator, low rate (pods and/or rain-gun) irrigation, slurry tanker with a trailing shoe and umbilical system, as described in the application (X) for resource consent dated X 2018 and further information dated X.

The activity shall be limited to:

i. The discharge to land of agricultural effluent generated from milking of up to 1,500 cows milked twice daily;
ii. The discharge to land of agricultural effluent from the housing of up to 1,280 cows inside two purpose built barns;
iii. The discharge of agricultural effluent to land via low depth travelling irrigator, slurry tanker with a trailing shoe, umbilical system and low rate irrigation;
iv. The discharge of agricultural effluent to an area of no more than X hectares at the dairy platform as per the plan attached as Appendix 1;
v. The discharge of effluent slurry to an area of no more than 97 hectares at the block known as the "Horner Block" as per the plan attached as Appendix 1.
vi. The discharge of effluent from a 1,200 m^2 silage pad; and
vii. The discharge of effluent from a 200 m^2 underpass.

***Advice note**: "Effluent slurry" refers only to the contents of the effluent storage ponds. "Agricultural effluent" refers to effluent from all sources (the dairy shed, yard, barns, ponds, silage pad and underpass).*

(b) This consent excludes the discharge of effluent from winter milking from June 20 to July 20 (winter milking refers to cows milked to supply a winter milking contract), or from any feed pad/calving pad/structure not listed in condition 2(a).

2. *The discharge authorised by this consent shall not exceed the following rates at any time:*
   - *(a) For the travelling irrigator: A maximum depth of less than 10 millimetres for each individual application;*
   - *(b) For the slurry tanker with trailing shoe: A maximum depth of 2.5 millimetres for each individual application;*
   - *(c) For the umbilical system: A maximum depth of 3.0 millimetres for each individual application; and*
   - *(d) Low rate system: a maximum depth of 10 millimetres for each individual application, and an instantaneous rate of 10 millimetres per hour.*

3. *The maximum loading rate of nitrogen from effluent onto any land area as a result of the exercise of this consent shall not exceed:*
   - *(a) 150 kilograms of nitrogen per hectare per year at the dairy platform; and*
   - *(b) 250 kilograms of nitrogen per hectare per year at the Horner Block (Lot 4 DP 399915).*
     - *i.* ***The annual slurry volume applied at the Horner Block shall be recorded and reported to the Consent Authority upon request****.*

4. *The minimum return period for the discharge of effluent to land shall be no less than 28 days.*

5. *Effluent shall not be discharged within:*
   - *(a) 20 metres of any surface watercourse;*
   - *(b) 100 metres of any water abstraction point;*
   - *(c) 200 metres of any place of assembly or dwelling not on the subject property;*
   - *(d) 20 metres from any property boundaries.*

Where there is inconsistency between the plan attached as Appendix 1 and the conditions of this consent, the conditions of this consent shall prevail.

6. *The application of effluent to land shall not occur when:*
   - *(a) the moisture content of the soils is at or above field capacity,*
   - *(b) soils within the discharge area are 'cracked'; and*
   - *(c) during wind conditions that may result in odour or spray drift beyond the property boundary.*

Other conditions for land use, discharge and water consents – to be agreed with Consent Authority once draft conditions are issued.

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3. Statutory Considerations

3.1 Statutory considerations:

Environment Southland must consider the following matters when they consider an application. The application is consistent with all of these relevant plans and policies because effects on water quality and quantity and the soil resource should be less than minor.

Resource Management Act 1991:

- The provisions of section 104 of the Resource Management Act 1991;
- Part 2 of the Resource Management Act;
- The applicant's assessment of effects on the environment;
- The provisions of Sections 104B, 104C, 105 and 107 of the Resource Management Act 1991.

Schedule 4 of the RMA requires that an assessment of the activity against the matters set out in Part 2 and any documents referred to in Section 104. Sections 104B and 104D of the Act set out the matters that, subject to Part 2, the Consent Authority must have regard to when considering an application for discretionary activities. Sections 105 and 107 set out additional matters the Consent Authority must have regard to when considering applications to do something that would otherwise contravene Section 15. An assessment of each of these matters follows:

Part 2 of the RMA

The activity is considered to represent an efficient use of natural resources that will give rise to significant positive benefits in terms of providing for the social and economic wellbeing of the applicants and the wider regional economy. There is, however, the potential for adverse effects on the environment to arise, including on water quality. However, it is considered that the effects of the activities have been adequately identified and assessed in the Assessment of Environmental Effects in Section 7 below and that such effects will be no more than minor.

Section 6 of the RMA lists the matters of national importance that a Consent Authority shall recognise and provide for when considering applications for resource consent. The relevant matters under Section 6 to this proposal are considered to be:

(a) the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development:
(c) the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga:

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It is considered that the proposed activities do not impact directly on the coastal environment, wetlands, and lakes and rivers and their margins, although there is potential for adverse effects on the wider receiving environment which is inclusive of some of these features. However, as is discussed in Section 7 below, the actual and potential adverse effects of the activities are considered to be no more than minor.

Section 7 of the Act lists a number of other matters that a Consent Authority must have particular regard to when considering applications for resource consent. The matters in Section 7 that are considered relevant to this application are:

(a) kaitiakitanga:

(aa) the ethic of stewardship:

(b) the efficient use and development of natural and physical resources:

(c) the maintenance and enhancement of amenity values:

(d) intrinsic values of ecosystems:

(f) maintenance and enhancement of the quality of the environment:

(g) any finite characteristics of natural and physical resources:

(h) the protection of the habitat of trout and salmon:

For the reasons discussed in Section 7 of this report below, the proposal is considered consistent with relevant provisions of Section 7 of the RMA.

Section 8 sets out a Consent Authority's responsibilities in relation to the Treaty of Waitangi. The proposal is considered consistent with the provisions of all regional planning documents, including Te Tangi oTauira, and Sections 6(c) and 7(a) of the Act. Therefore, the proposal can also be considered consistent with Section 8 of the Act.

To avoid repetition, the following documents have been grouped together under common headings in the sections that follow.

The final part of this section of the application focuses on why the activity is consistent with key policies in the proposed Southland Water and Land Plan (2018).

Table 3.1: Ngai Tahu Values

Regulatory Document	Relevant Sections
National Policy Statement for Freshwater Management 2014	• Objectives C1, D1 • Policies C1, D1

Southland Regional Policy Statement 2017	• Objectives TW.2, TW.3, TW.4 and TW.5 • Policies TW.3, TW.4 and TW.5
Regional Water Plan 2010	• Objective 9C • Policy 1A
Regional Effluent Land Application Plan 1998	• Objectives 4.1.4, 4.1.5 • Policies 4.2.4, 4.2.7,4.2.8, 4.2.9
Proposed Southland Water and Land Plan 2018	• Objectives 3, 4, 5, 15 • Policies 1, 2, 3
Te Tangi a Tauira:	• Whole Document

Tangata Whenua values have been considered when preparing this application including reference to Te Tangi a Tauira (Iwi Management Plan). The principles of protection of the mauri of the water and mana of the land while minimising adverse effects on mahinga kai will continue to be recognised and have regard to in the exercise of the consents and the operation of the dairying activity. There are no known wahi tapu, ancestral sites, heritage sites or other taonga associated with the property.

Table 3.2 Water Quality

Regulatory Document	Relevant Sections
National Policy Statement for Freshwater Management 2014	• Objectives A1, A2, B1, B2, B3, B4, • Policies A3, A4, B5, B6, B7
Regional Policy Statement for Southland 2017	• Objectives WQUAL.1 and WQUAL.2 • Policies WQUAL.1, WQUAL.2, WQUAL.3, WQUAL.7, WQUAL.8, WQUAL.12
Regional Effluent Land Application Plan 1998	• Objectives 4.1.2 • Policies 4.2.3, • Rule 5.4.5

Regional Water Plan 2010	• Objectives 3,4,8 • Policies 1, 4, 6, 7, 13
Proposed Southland Water and Land Plan 2018	• Objectives 1, 2, 6, 7, 8, 9, 13, 18 • Policies 5, 10, 13, 14, 15, 16, 17, 18, 39A, 40
Te Tangi a Tauira	• Policies 1, 4, 5, 6, 11, 16, 17, 18

Dairy farming at the property is carried out following good management practices relevant to the physiographic zones present at the property (Oxidising and Central Plains). These practices are recommended by Council and are implemented on farm to mitigate the risk of adverse effects on water quality from contaminants transported via artificial drainage, deep drainage and overland flow where relevant. Deep drainage and artificial drainage are recognised by the applicants as key contaminant pathways and are managed as such. Good management practices and specific mitigation measures implemented on farm are described in Sections 6 and 7 of the application, and in the Appendix N Farm Environmental Plan.

There will be no increase in contaminant loss due to the proposed expansion of dairy farming in this instance. Neither will effects be exported off-site to another location. This expansion will be achieved through the implementation of key mitigation measures, alongside the implementation of a suite of good management practices.

The discharge is to land rather than water and is undertaken in a manner to minimise adverse effects on water quality. Good management practices for the management of the effluent system and mitigation measures have been included in the application and in the Farm Management Plan. By only irrigating FDE to land when ground conditions are less than field capacity, and by ensuring that irrigation of FDE to land does not result in the soils reaching field capacity, the risks of leaching through the soil profile or via overland flows are mitigated. The use of low depth irrigation, as discussed in the Section 7 AEE, should reduce the risk of exceeding a soil's infiltration rate, thus preventing ponding and surface runoff of freshly applied FDE. The recommended buffer zones from waterways are adhered to when applying effluent.

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Table 3.3 Water Quantity

Regulatory Document	Relevant Sections
National Policy Statement for Freshwater Management 2014	• Objectives A1, A2, B1, B2, B3, B4, • Policies A3, A4, B5, B6, B7
Southland Regional Policy Statement 2017	• Objectives WQUAN.1 and WQUAN.2 • Policies WQUAN.1, WQUAN.2, WQUAN.5, WQUAN.6, WQUAN.7 and WQUAN.8
Regional Water Plan 2010	• Objectives 5,7,8 and 9 • Policies 21, 22, 23, 28, 29, 30, 31, • Rules 16C, 23, 50
Proposed Southland Water and Land Plan 2018	• Objectives: 7, 9, 11, 12, 18 • Policies 20, 21, 22, 23, 25, 42
Te Tangi a Tauira:	• Policies 1, 4, 5, 6, 11, 16, 17, 18

The groundwater take reflects standard volumes for a dairy farm. The proposed volume of take is consistent with Environment Southland's guidelines of 120 litres per day per cow, which is considered reasonable for the intended end use. The maximum groundwater take is 180,000 litres per day, allowing for 120 litres per day per cow for 1,500 cows.

Groundwater is abstracted for dairy shed use and stock drinking water from three bores at the property. The rate of take does not exceed 2 L/sec and should not result in more than minimal stream depletion and interference effects.

Table 3.4 Soil Health and Effluent Management

Regulatory Document	Relevant Sections
Regional Policy Statement for Southland 2017	• Objectives WQUAL.1 and WQUAL.2 • Policies WQUAL.1, WQUAL.2, WQUAL.3, WQUAL.7, WQUAL.8, WQUAL.12
Regional Effluent Land Application Plan 1998	• Objectives 4.1.1 • Policies 4.2.1, 4.2.2
Regional Water Plan 2010	• Policy 41 • Rule 49

Proposed Southland Water and Land Plan 2018	• Objectives 13, 13A, 14, 15, 18 • Policies 5, 17, 33 • Rule 32D, 35, 40, 41
Te Tangi a Tauira	• Policies 4, 7, 8, 9, 11, 13, 14, 15

The applicants seek to ensure the life supporting capacity of the soil is safeguarded, along with the sustainability of the soil ecosystem by utilising land treatment of effluent without significant adverse effects. The soils are suitable for effluent irrigation and the discharge follows current good management practice, which is described in Section 6 of the application and in the Farm Environmental Management Plan. These include practices of a general nature and those specific to the key contaminant transport pathways for the physiographic zones found at the property.

Two existing storage ponds allows for deferred storage of dairy shed, wintering barn and silage pad effluent until the soil moisture content is suitable for irrigation for 1,500 milking cows on the farm. The land disposal area meets the best practice recommendation of 8 hectares per 100 cows. The nutrient loading of soils will not exceed 150 kg N/hectare at the dairy platform and 250 kg N/hectare at the Horner Block. The higher strength nature of slurry has been recognised and fully considered. Slurry from the ponds will be applied at a maximum depth of 2.5 millimetres per application. This system is sustainable in the long term and allows the effluent to be used both as a fertiliser and a soil conditioner.

In addition to the matters in Section 104 of the Act, when considering an application for a discharge permit a Consent Authority must also have regard to Section 105. As is discussed in the assessment under Section 7, it is considered that provided the discharge is undertaken in accordance with the conditions of the consent and the best practice management techniques outlined in Section 6 of the application and in the Farm Environmental Management Plan, the adverse effects of the activity should remain no more than minor. The best method for dealing with effluent from the dairy operation is considered to be discharging to land.

There are not considered to be any matters under Section 107 of the Act that would require the Consent Authority to decline the application for discharge permit.

3.2 Proposed Southland Water and Land Plan (2018)

The application meets the relevant objectives and policies described in the pSWLP (2018). The policies are numerous, however, the following policies are particularly relevant because of their focus on good practice management of land used for dairy farming in the appropriate physiographic zones; effects including cumulatively, on water quality and quantity, and the soil resource should be less than minor.

The discharge to land is carried out in a manner which should avoid adverse effects on the environment. The effluent discharge system follows the practices recommended by Council for the soil types and physiographic zone present on the property.

The groundwater abstraction is efficient, sustainable and reasonable.

Proposed Southland Water and Land Plan 2018 - Objectives and Policies relevant to land-use and discharges:

- **Objectives 6, 7, 8, 9, 13, 18**
- **Policies 5, 10, 11, 13, 14, 15, 16, 17, 18, 39A, 40**

Policies 5 and 10 are physiographic zone policies. Policy 5 gives direction on the land located in the Central Plains physiographic zone; Policy 10 gives direction on land located the Oxidising physiographic zone.

Under **Policy 5.1**, adverse effects on water quality from contaminant loss via artificial drainage and deep drainage in the Central Plain's physiographic zone must be avoided, remedied or mitigated by the implementation of good management practices. The Central Plain's physiographic zone is mapped as a major physiographic zone at the dairy platform and the Horner Block. The applicants implement good management practices to mitigate contaminant loss via artificial drainage and deep drainage when operating their dairy farm, which is demonstrated in their FEMP. They have been leaders in the dairy industry in Southland, being the first to build free wintering barn stalls to reduce outside crop-based wintering, and the first to feed fresh grass to cows in winter to reduce silage making losses and run-off. In parallel with the proposed increase in cow numbers, they will make other changes to their farming system. For example, they are proposing to remove all intensive winter grazing from the dairy platform. The proposed change is an example of good management practice in action, which should result is less adverse effects on water quality from contaminant loss via artificial drainage and deep drainage over time. It is noted that all cows will be wintered in two barns at the property, where nutrients are captured, stored and applied to land at very low depth at a time when plants are actively growing and taking up nutrients. Cows will not be exported off-farm, to be winter grazed on fodder crop at another location.

In order to meet **Policy 5.2,** this application and the accompanying FEMP have particular regard to adverse effects on water quality from contaminants transported via artificial drainage and deep drainage.

Policy 5.3 gives direction to decision makers on generally not granting resource consent for additional dairy farming of cows or additional winter grazing where contaminant losses will increase as a result of the proposed activity. *Note: Much of the following assessment also applies to Oxidising land also.* This application includes the phasing out of in-paddock winter grazing in parallel with an increase in cow numbers of 160. Overseer nutrient budget analysis has been carried out to determine pre-expansion nutrient N and P contaminant losses. In the absence of a suitable alternative method, P loss has been used as a proxy for sediment and microbial loss, as they generally move from land to water in a similar way (i.e. via overland flow, and via artificial drainage at times). The pre-expansion nutrient budget analysis has been prepared from four years of actual data (not consented) and is fully supported with evidence. The post-expansion nutrient budget includes an increase of 160 cows, from 1,340 to 1,500. Several key mitigation measures are included in the post-expansion nutrient budget, to ensure that nutrient losses (and by proxy sediment and microbial contaminants) will not increase post expansion. It has also been demonstrated that nutrient losses will not increase at the Horner Block. Mitigation measures will be implemented on farm, to ensure that contaminant losses do not increase and will lead to increased soil organic matter content, increase soil water holding capacity, improved soil structure and less accumulation of N on soils at high risk times. This should reduce the risk of contaminant loss to groundwater, including from deep cracks that potentially can form in Braxton soils due to swell/shrink properties, which is a risk not particularly addressed by Overseer. An investigation by Environment Southland in January 2018 showed that Braxton soils at the property may not in fact tend to form deep cracks, which reduces the background risk to groundwater to a degree. The applicants will provide Environment Southland with certainty that contaminant losses will not increase through the implementation of consent conditions and by submitting a year-end Overseer nutrient budget annually. As Overseer nutrient budget analysis has demonstrated that contaminant losses (N, P, and by proxy sediment and microbes) will not increase, in this instance the application for resource consent for additional dairy farming of cows should be granted.

Under **Policy 10**, adverse effects on water quality from contaminant loss via deep drainage, and via artificial drainage and overland flow where relevant, in the Oxidising physiographic zone must be avoided, remedied or mitigated by the implementation of good management practices. The Oxidising physiographic zone is mapped as a major physiographic zone at the property and the Horner Block with Oxidising areas generally found on the east side of the dairy platform where free draining soils are found. Due to the nature of its topography and soils, artificial drainage or overland flow pathways are not believed to be a particular risk for Oxidising areas at the property. In this instance, deep drainage of contaminants, particularly nitrate loss to groundwater, is a risk for Oxidising areas and must be managed under Policy 10. The assessment provided in Policy 5 relating to the management of the risk of contaminant loss via deep drainage to groundwater also applies to the management of Oxidising soils. Rather than repeating the policy assessment, please see the above assessment provided for Policy 5.1, 5.2 and 5.3. Better soil structure, better nutrient management and in particular less N accumulation on soils at high risk times will see less nitrate loss to groundwater via deep drainage in Oxidising areas. It is noted that Oxidising soils do not have similar swell/crack properties as Central Plain's soils, so the risk of deep crack formation and subsequent by-pass drainage to the underlying aquifer is not believed to be the case for Oxidising soils. As has been explained in Policy 5.3 above, the proposed increase in cow numbers in parallel with the implementation of several key mitigation measures will result in a small reduction in N and P loss according to Overseer analysis. The applicants will provide Environment Southland with certainty that contaminant losses will not increase through the implementation of consent conditions and by submitting a year-end Overseer nutrient budget annually. Under Policy 10, the proposed activity should be granted.

Policy 13 gives direction on the management of land use activities and discharges. In line with Policy 13.1 the proposed expansion will better enable the applicants to provide for their social, economic and cultural well-being. The increase in herd size of 160 cows, will allow changes in management practice to be made, whilst also operating a profitable and sustainable business model. The maintenance of a profitable and sustainable business model is central to the success the business, and provides social, economic and cultural benefits to the applicants, their employees, families and whanau, and to the wider community. In the context of an agricultural-based local economy, the use and development of the land and water resources at the property for primary production should be recognised. In line with Policy 13.2, land use activities and discharges (point source and non-point source) are managed to enable the achievement of Policies 15A, 15B and 15C.

In line with **Policy 14,** the discharge is to land and there is no discharge to water at the property.

Policy 16 gives direction on farming practices that affect water quality.

Policy 16.1 (a) discourages the establishment of new dairy farming of cows in close proximity to Regionally Significant Wetlands and Sensitive Waterbodies. The nearest Regionally Significant Wetland is Dunearn Wetland, located approximately 4 km to the north west of the property. As the direction of ground and surfacewater flow is to the south, there is no risk to water quality at Duneran Wetland from the proposed activity. Drummond Peat Swamp is located approximately 12 km to the south east of the property, and Bayswater Peat Bog is located approximately 10 km to the south west of the property. Neither Drummond Peat Swamp nor Bayswater Peat Bog are *in close proximity* to the dairy farm so have little or no risk from the proposed activity. Under Policy 16.1 (a) the proposed activity can be established.

Policy 16.1 (b) ensures that until the development of freshwater objectives under FMU processes, applications to establish new, or further intensify existing dairy farming of cows, or to intensify winter grazing activities will generally not be granted under certain situations. The situations relate to different effects on and measures of water quality. This application is for an increase of 160 cows (11%) on land that has been dairy farmed for between 17 and 26 years to date, or on land that has been used for dairy support and was consented for dairy farming in October 2017. As such this application is not to establish new dairy farming of cows but is to intensify through an increase in cow numbers.

In parallel with the increase in cow numbers, it proposed to implement many key mitigation measures, such as the removal of all winter and summer fodder cropping, removal of cows and heifers wintered outside on fodder crop or pasture, expansion of size and use of wintering barn facilities and more efficient use of N fertiliser. The cessation of winter grazing cows on fodder beet is an important mitigation measure associated with the increase in cow numbers. It is an activity that has relatively high nutrient losses as is demonstrated by Overseer analysis, especially where free draining soils are sown in fodder beet and subsequently grazed by cows in June and July. It is noted that winter grazing is specifically included in Policy 16 as an activity that affects water quality. The removal of this practice from the farming system means that cultivation practices will move to direct grass to grass methods, with less disturbance of soil structure and less mineralisation processes, which should further increase soil organic matter content and water holding capacity, and further reduce contaminant losses to ground and surfacewaters. Importantly, the effects of the expansion are not being exported off-site. Rather they are being contained on farm through greater use of wintering facilities and through slurry effluent application at the dairy platform and Horner Block. In line with a stable replacement rate no more calves will go to Woldwide Runoff (WR) than have been going there in recent years. Council will have assurance of this through the implementation of a proposed condition to cap stock numbers at WR at their current levels.

In summary, the application to further intensify existing dairy farming of cows through an increase of 160 cows (11%) is not for new dairy farming of land and will see the removal of intensive winter grazing from the farming system. It is explained in the following three paragraphs why the proposed further intensification of existing dairy farming through an increase in cow numbers should be granted in this instance.

Policy 16.1 (b) (i) gives direction on generally not granting further intensification of existing dairy farming of cows where the adverse effects, including cumulatively, on the quality of groundwater and receiving surface waterways such as rivers, wetlands and estuaries cannot be avoided or mitigated. Section 7 of the application provides an in-depth assessment of effects (AEE) of the proposed further intensification on groundwater and receiving surface waters. The AEE addresses the potential for adverse effects on already elevated groundwater to the south east of the property, on groundwater to the south of the property including at Heddon Bush School, which has a registered bore for drinking water supply and on receiving surfacewaters including the Waimatuku Stream, Lower Oreti and Aparima catchments. The assessment covers contaminants N, P, sediment and microbes, with P used as a proxy for sediment and microbes.

The assessment supports the conclusion that adverse effects, including cumulatively, due to further intensification of existing dairy farming through an increase in cow numbers will be mitigated in this instance. The Overseer modelling submitted with this application shows that the total modelled N and P losses for the proposed 1,500 cow scenario are no greater than for the pre-expansion system due to the implementation of several key mitigation measures. As is mentioned above, ceasing the practice of intensive winter grazing is one such measure and has relevance to Policy 16, where it is one of three activities specifically included as having effects on water quality. The effects of the expansion are not being exported off-site but are being transitioned inside to wintering in barns. Additional effluent from barns will be applied to land at very low depth (less than or equal to 2.5 mm per application) at the dairy platform and Horner Block. As adverse effects due to the proposed further intensification of existing dairy farming due to an increase in cow numbers will be mitigated in this instance, the activity should be granted.

Policy 16.1 (b) (ii) gives direction on generally not granting further intensification of existing dairy farming of cows where existing water quality is already degraded to the point of being over-allocated. It is recognised that there is a high degree of variation in existing groundwater quality in the area, with an area to the east and south east of the property showing high groundwater nitrate concentrations, above the New Zealand Drinking Water Standard of 11.3 ppm. In particular, groundwater at an ES monitoring bore at Boyle Road to the south east of the property has shown high nitrate concentrations, indicative of groundwater degradation due to land use effects in the area, such as intensive winter grazing practices on free draining soils. This matter is discussed in depth in the AEE provided in Section 7. Furthermore, it is noted that a predominant risk to water quality for the physiographic zones found at the property is contaminant loss (nitrate in particular) to groundwater. Based on the predominant direction of groundwater flow (south) and observed groundwater water quality results from bores at the property, it is concluded the proposed activity will not adversely affect groundwater quality to the south east of the property, where groundwater shows degradation.

Groundwater flow for most of the property is believed to be to the south (Hitchcock, 2014). Groundwater quality measured at the southernmost location at the property (E45/0622) shows relatively low levels of nitrate, as does a bore located ~2.3 km due south at Heddon Bush School (1.8 – 2.0 ppm in 2017/2018). Bore E45/0622 at the south end of the property is an indicator of groundwater quality at the bottom of the property. It should capture the cumulative effect of land use on water quality in the groundwater stream north of the bore, upstream of groundwater flow including some Braxton and Drummond soils. If deep cracks form in Braxton soils, then contaminants such as nitrate can bypass the soil matrix and move to groundwater or move

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via subsurface drains into surfacewaters. Water quality at bore E45/0622 does not show evidence of nitrate reaching groundwater via this process, as despite occasional well-head contamination issues, nitrate levels have been consistently low at the bore. In conjunction with the low nitrate levels measured at the Heddon Bush School bore, data from bore E45/0622 indicate that groundwater groundwater flowing south from the dairy platform is certainly not degraded to the point of being overallocated.

There is an increasing gradient in the nitrate concentration of groundwater from west to east towards Terrace Creek, which flows approximately north to south, and is located approximately 1 km beyond the eastern boundary of the property. This concentration gradient is reflected by data from other bores at the property (E45/0665 and E45/0727), where the increasing gradient corresponds to a transition from heavier to lighter soils towards the east. The average groundwater nitrate concentrations at these two bores are considerably lower than the concentrations seen further east and south east of the property. Due south of the property, groundwater nitrate levels are predominantly low for approximately 10 km, which includes the area around Heddon Bush School.

Based on the above factors in conjunction with changing on farm practices, it is proposed that under Policy 16.1 (b) (ii), the activity should be granted. The cumulative effect of changing on farm practices over time, should see a further reduction in nitrate loss to groundwater at the property. There will be no further sowing of summer and winter fodder crops, which is an activity that has high N loss on light soils at the east of the property in particular. No winter grazing of crops by cows or heifers, and no winter grazing of pastures are measures that will reduce N mineralisation and accumulation in soils at high risk times. There will also be increased use of wintering barn facilities, application of slurry at very low depth (less than or equal to 2.5 mm per application) and more efficient use of nitrogen fertiliser, all of which should see a cumulative reduction in N loss to groundwater. The applicants believe that farming under the current system, with a maximum of 1,340 cows but using practices such as intensive winter grazing causes more cumulative loss of N to groundwater due to increased N accumulation on soils, more mineralisation of N in soils and more soil damage. As has been already mentioned, they propose to install a new bore at the south of the property, which will be used to monitor groundwater quality over time. They are prepared to use data to inform decision making at the property. In this case, granting this application to increase cow numbers by 160 will allow the applicants to facilitate these management changes, which cumulatively should cause less N loss to groundwater and degradation of groundwater.

Policy 16.1 (c) gives direction on processes after the development of freshwater objectives under FMU processes. As freshwater objectives have not yet been developed, this policy does not apply at the present time.

Policy 16.2 gives direction on farming activities, including existing activities.

Under **part (a)**, all such activities are required to implement a farm environmental management plan (FEMP), as set out in Appendix N. The applicants implement an FEMP as set out in Appendix N, so meet part (a) of Policy 16.2.

Under **part (b)**, sediment run-off risk must be actively managed by identifying critical source areas (CSAs) and implementing practices such as setbacks from waterbodies, riparian planting, sediment traps, preventing stock from entering the beds of surface waterbodies and limiting the duration of exposed soils. The property is predominantly flat with minimal CSAs. Where CSAs are found close to where tiles have outfalls to surface drains, they have been mapped and are actively managed to minimise the risk of sediment loss. See the FEMP for locations of CSAs. Practices such as fencing off waterways are implemented at the property and have been for many years as part of the Dairy Accord. Stock do not have access to waterways at any time. Farm infrastructure such as tracks, lanes and sheds can act as critical source areas following periods of prolonged rainfall, where water can pool and move via overland flow to waterways, carrying contaminants such as sediment and microbes with it. Farm infrastructure is managed to ensure that surface drainage does not flow via overland flow directly into waterways, but is directed through pasture or riparian strips, where run-off is filtered, and sediment and microbes are trapped before reaching waterways. The applicants endeavour to limit the duration where soils are bare as much as possible. The proposed activity will bring about a change to the cultivation system whereby only grass to grass cultivation occurs, with no or minimal time duration where soils are bare. This will help to further reduce the risk of sediment run-off further.

Under part (c) of Policy 16.2, collected and diffuse run-off must be managed, as well as leaching of nutrients, microbial contaminants and sediment through the identification and management of CSAs *within individual properties*. The applicants manage their farm layout, infrastructure, soil types, drainage, CSAs and overall farming system to control and minimise collected and diffuse run-off, leaching of nutrients, microbial contaminants and sediment from such sources. These are explained in the FEMP. In particular, a lane adjacent to WOL's wintering barn has been identified as a potential CSA and is now being managed appropriately to avoid the runoff reaching a stream.

Policy 17 gives direction on agricultural effluent management.

In line with Policy 17, significant adverse effects on water quality from the operation of, and discharges from, the effluent management system at the dairy farm are avoided. Other adverse effects are also avoided, remedied or mitigated. The effluent management system, including storage ponds and low depth irrigation systems, follows best industry practice for effluent storage and discharge given the nature of soils and topography at the property. It has been designed, constructed and located in accordance with best industry practice including the relevant practice notes and guidelines, and the system is maintained and operated in accordance with best practice guidelines. By only irrigating effluent to land when ground conditions are at less than field capacity, and by ensuring that irrigation of effluent to land does not result in soils reaching field capacity, the risks of nutrient rich effluent leaching through the soil profile or moving via overland flow are mitigated.

The slurry tanker with the trailing shoe will apply slurry at depths of less than or equal to 2.5 mm per application to allow for the higher nutrient loading in slurry. It can apply slurry at depths as low as 1 mm per application, which further minimises the risk of adverse effects and increases the number of irrigation days available. It applies slurry directly on the ground, which minimises the risk of adverse odours. The recommended buffer zones from waterways are adhered to when applying effluent, effluent is not discharged

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over tile drains when the soil is at or near field capacity nor is effluent applied to areas where cracks in the top soil have formed. The effluent receiving area is sufficiently large to ensure that the N loading to land from dairy shed effluent and slurry does not exceed 150 kg N/hectare at the dairy farm, and that it does not exceed 250 kg N/hectare at the Horner Block. Slurry applied at the cut and carry Horner Block serves as a source of plant nutrient. In turn, pastures grown at the Horner Block are harvested and fed to cows in wintering barns at the dairy platform. In this way nutrients are recycled from animal feed to effluent, then back to animal feed etc.

In line with **Policy 18**, all stock is excluded from waterways at the property.

The range of the good management practices implemented on farm, result in improved integrated management of freshwater through good dairy farm land management practices. This is in line with **Policy 39A**.

In line with **Policy 40**, the applicants seek a term of 15 years for the activities, which aligns with Woldwide One's discharge and water permit terms. There is good certainty regarding the nature and scale of the activity going forward; there will be an increase in cow numbers as well as implementation of good management practices and specific mitigation measures to ensure that the activity is sustainable in the long term. Importantly the effects of the expansion have been carefully considered and will not be exported off-site but will be managed on farm. Considerable investment in farm infrastructure has been made to take the final steps towards future proofing the dairying operation; eliminating winter grazing of adult cattle on beet crops altogether. The level of investment demonstrates the applicant's belief in and commitment to sustainable farming and land management. The applicants believe that their presence at this location since 1992 (over 25 years) has not had a detrimental effect on the local environment, and that the proposed changes will mean a further reduction of that impact. A 15-year consent term will mean that the management of the resources under the same proven stewardship will be ensured into the future while allowing the applicants to operate a sustainable farming and business model. As 2013 supreme winners of the Southland Ballance Farm Environment Awards, their commitment to operating a sustainable farming model has been demonstrated.

Having assessed the matters above, it is considered that both the application for the expansion of dairy farming, the discharge and the water abstraction are generally in accordance with the relevant policies and objectives of the documents set out above, and having regard to Section 104, the proposal achieves the purpose of the RMA.

4. Notification

Section 95A of the Act requires that the Consent Authority must publicly notify an application if the applicant has requested that the application be publicly notified*. The applicant hereby requests that the application be publicly notified.*

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6. Proposal Details

6.1 Effluent

Overview of effluent discharge activity

Table 6.1

Effluent Discharge	
Replacement of consents	Replace 301663 and 20171278-01 with a single discharge permit
Duration of consent sought	15 years
Herd size	1,500 cows total: 800 cows at WTL 700 cows at WOL
Supplier number	WTL unit = 32651 WOL unit = 32650
Period of discharge	The cowsheds are generally operated from 1 August to 31 May each year, with a limited number of late calving cows milked until mid-June (15th). Effluent irrigation to the discharge areas will be carried out between August and May, and as ground conditions permit for June and July if deemed necessary.
Milking frequency	Twice per day
Winter milking	Not anticipated, seasonal supply only
Feed pad/wintering pad/stand-off pad	There are two wintering barns at the property with a total capacity to house 1,280 cows.
Other sources of effluent collected in main effluent system	Concrete area at two vat stands Silage pad (WTL)

Feed Pad/Wintering Pad/Stand-off Pads

There are two wintering barns at the property with a total capacity to house 1,280 cows. One barn is located on each dairy unit; both have capacity to house 640 cows although typically they will house about 625 cows each to minimise cow stress. The WOL barn has recently been upgraded to go from 400 to 640 cow capacity as has its effluent storage infrastructure.

The wintering barns are mainly used in May, June, July, August and September but can be used as stand-off pads at other times during inclement weather. The use of wintering barns as a stand-off pads varies from year to year dependent on weather. Cows are removed from the wintering barn for calving.

The wintering barns have a sealed concrete floor. Effluent from the wintering sheds is scraped into a concrete collection channel from where it is pumped to respective storage ponds, which also stores effluent from the dairy shed as required. The wintering barns have a small uncovered area, which has been included in the Massey DESC reports.

A rainwater diversion is used on the concrete areas during the off season.

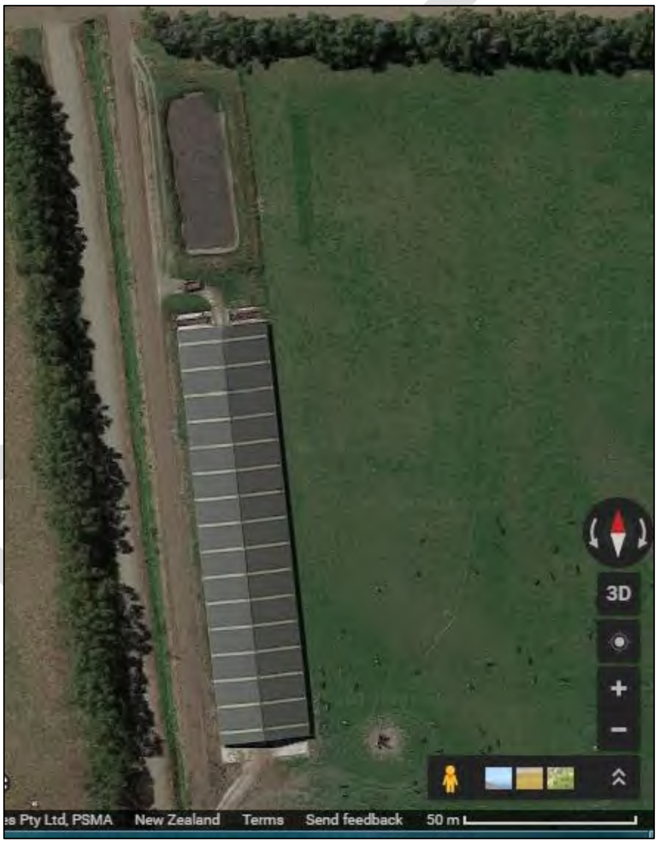

Figure 6.1 Wintering barn and effluent pond – WOL dairy unit.

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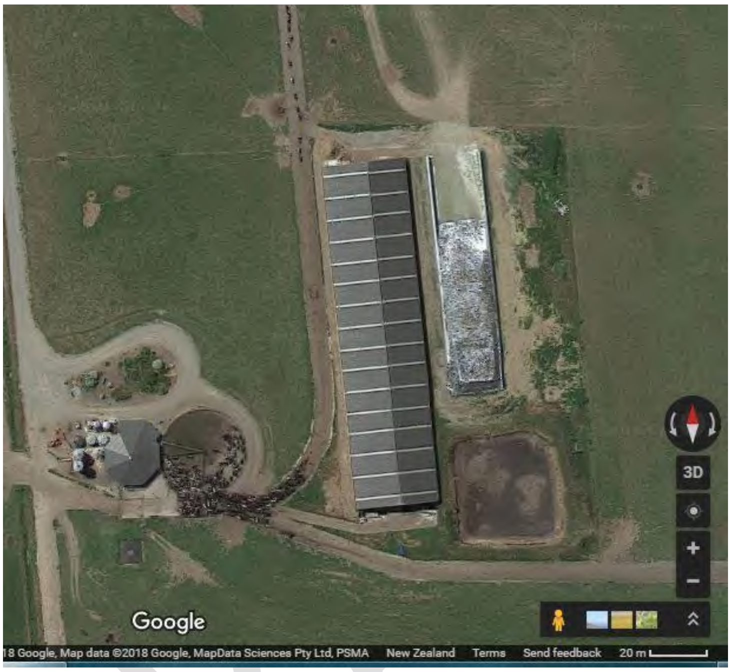

Figure 6.2 Wintering barn, silage pad, dairy shed and effluent pond – WTL dairy unit

WTL wintering barn – effluent volume

The total volume of effluent collected has been calculated based on approximately 50 litres per cow per 24-hour day. The volume has been calculated as follows:

May:

$$640 \; cows \; x \; 12 \; Hours/day \; x \; 50 \; l \frac{effluent}{24} Hours \;\; x \; 31 \; days = 496 \; cubic \; metres$$

June and July:

$$640 \; cows \; x \;\; 50 \; l \frac{effluent}{day} \; x \; 61 \; days = 1{,}952 \; cubic \; metres$$

August:

$$370\ cows\ x\ 23\ Hours/day\ x\ 50\ l\frac{effluent}{24}Hours\ \ x\ 31\ days = 550\ cubic\ metres$$

September:

$$75\ cows\ x\ 23\ Hours/day\ x\ 45\ l\frac{effluent}{24}Hours\ \ x\ 30\ days = \ 108\ cubic\ metres$$

Total

$$496\ m3 + 1{,}952\ m3 + 550\ m3 + 108\ \ = 3{,}106\ cubic\ metres$$

WOL wintering barn – effluent volume

The same calculation applies to WOL's wintering barn, which is estimated to be 3,106 m^3.

Wintering barns – total volume of effluent

The volume total of effluent collected from the wintering barns has been calculated as approximately 6,212 m^3/year.

Other sources of effluent

UNDERPASS

An underpass connects WTL blocks north and south of Wreys Bush Highway, which has a catchment of 200 m^2. The underpass has a concrete sump, from where rainfall and effluent is pumped to a dedicated sprinkler. The underpass has not been included in the Massey DESC report.

Rainfall site used in Massey DESC: Drummond Marson Road = 1.061 m per year
200 m^2 catchment X 1.061 m rainfall = 212 m^3 volume to discharge.

Underpass effluent is very dilute as it is primarily composed of rainwater. It is irrigated using a dedicated low rate sprinkler (less than 10 mm/hour and less than 10 mm depth per application).

The discharge is to paddocks close to the underpass (low risk soils). Underpass effluent is not discharged to a surface waterway either directly or by overland flow. There is no discharge of underpass effluent when the soil moisture exceeds field capacity.

The discharge of underpass effluent is:

- not within 20 metres of a surface waterway;
- not within 200 metres of a neighbouring dwelling;
- not within 20 metres of a boundary with another landholding; and

- not within 100 metres of a bore.

The maximum loading of N from underpass effluent does not exceed 150 kg N/hectare/year; it is very dilute. Due to its very small volume and highly dilute nature, the nutrient loadings and losses from underpass effluent are negligible compared to that from effluent, sludge and the overall farming activity. The extremely small quantity of nutrients that fall on the underpass and are discharged are accounted for in Overseer, through cow numbers, feed inputs and system losses. Underpasses are not modelled separately in Overseer due to the negligible contribution they make.

Figure 6.3 Aerial photograph of underpass.

SILAGE PAD - WTL

A concrete silage pad is located adjacent to the wintering barn at WTL. Its area is 1,200 m^2. It is constructed on a dry site. The silage pad has concrete walls and a dual drainage system; one for clean rainwater and one for silage leachate. Under the stack and immediately in front of it, the drains are opened into the leachate channel. This takes leachate to a sump from where it is pumped into the effluent storage pond and irrigated appropriately. The sumps in the rest of the pad are open to the farm drainage system so that clean rainwater can be diverted. Rain landing on the silage cover does not mix with leachate and is diverted to the farm drainage.

Only wilted silage is used to minimise the risk of creating leachate. The pad is empty for approximately 3-4 months per year. The silage pad catchment has been included in the Massey DESC report. Given the rainwater diversion in place when the pad is empty, and that rain landing on the cover does not mix with leachate so can be diverted to farm drainage, the silage pad leachate catchment is smaller than 1,200 m^2 for much of the year.

Good management practices for the concrete silage pad at WTL are:

1. Only wilted silage is stored on the pad to minimise leachate generation;

2. The bunker is filled to the top of the walls with silage and the silage cover hangs over the walls so that rain landing on the silage cover does not mix with leachate.

3. The silage pad is flanked by 1.8 m high sealed concrete walls to prevent leachate escaping;

4. A dual drainage system is operated inside the wall on the low side; one for clean rainwater and one for silage leachate. This ensures that only leachate is collected, stored and discharged to land appropriately:
    a. Drains at the front of the stack and underneath the stack are opened to the leachate channel. These drain leachate to a sump, from where it is pumped to WTL's effluent storage pond and irrigated appropriately. These areas capture no or minimal rainwater;
    b. The sumps in the rest of the pad are open to the farm drainage system so that clean rainwater can be diverted.

SILAGE PAD - WOL

The silage pad at WOL meets permitted activity rules both for the use of land and for leachate management. See Section 2 for details. No effluent is collected and pumped to the storage system.

Figure 6.4 Silage pad at WOL

Figure 6.5 Silage pad at WOL

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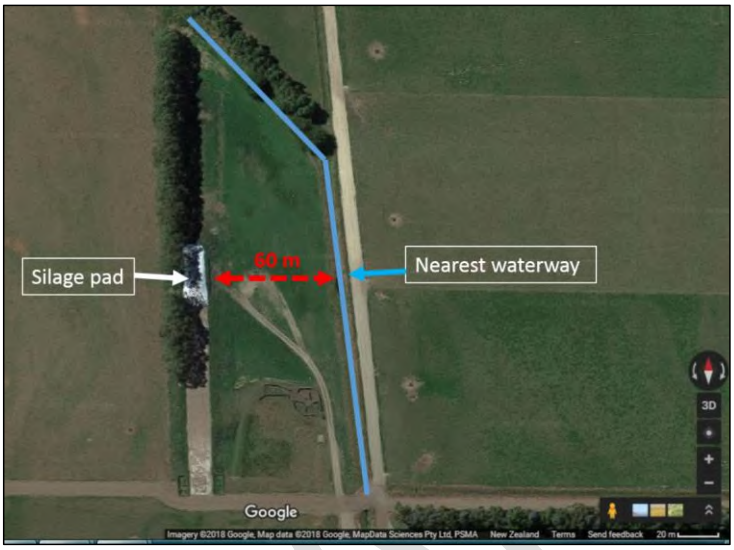

Figure 6.6 Location of the silage pad at WOL.

Effluent collection and storage system

WOL - DAIRY SHED

The maximum daily dairy shed effluent volume comprises 35 cubic metres of effluent plus any rainfall.

I. Raw effluent from the dairy shed gravity feeds to a pump sump.
II. When soils are below field capacity and have sufficient soil moisture deficit, raw effluent is pumped to a travelling irrigator, from where it is applied to land at low depth.
III. When soils are near or at field capacity, raw effluent is pumped to the buffer storage pond and there is enough storage in the pond so that irrigation is not required.
IV. When soil moisture conditions are suitable for irrigation, raw effluent (slurry) from the pond is applied at low depth to land using a slurry tanker with a trailing shoe or using an umbilical system.
V. An off-season diversion is put in place at the dairy shed.

WOL - WINTERING BARN

I. The effluent flows by gravity or is scraped to the concrete effluent collection sump, and then is pumped to the effluent storage pond.
II. The effluent is stored in the pond until soil moisture conditions allow for irrigation to occur.
III. The effluent is pumped from the pond to the slurry tanker with a trailing shoe or umbilical system and irrigated at very low depth to land; and

IV. A rainwater diversion is used in the off season.

WTL - DAIRY SHED

The maximum daily dairy shed effluent volume comprises 40 cubic metres of effluent plus any rainfall.

I. Raw effluent from the dairy shed gravity feeds to a pump sump.
II. When soils are below field capacity and have sufficient soil moisture deficit, raw effluent is pumped to a travelling irrigator, from where it is applied to land at low depth.
III. When soils are near or at field capacity, raw effluent is pumped to the buffer storage pond and there is enough storage in the pond so that irrigation is not required.
IV. When soil moisture conditions are suitable for irrigation, raw effluent from the pond is applied to land at very low depth using a slurry tanker with a trailing shoe or using an umbilical system.
V. An off-season diversion is put in place at the dairy shed.

WTL - WINTERING BARN

I. The effluent flows by gravity or is scraped to the effluent sump, and then is pumped to the effluent storage pond.
II. The effluent is stored in the pond until soil moisture conditions allow for irrigation to occur.
III. The effluent is pumped from the pond to the slurry tanker or umbilical system and irrigated at very low depth to land; and
IV. A rainwater diversion is used in the off season.

WTL – SILAGE PAD

I. Drains at the front and underneath the stack are opened to the leachate channel. These drain leachate to a sump, from where it is pumped to WTL's effluent storage pond and irrigated appropriately.

Storage capacity

WOL – EFFLUENT STORAGE

The pond was upgraded in autumn 2018. As part of its upgrade the storage volume was increased and a synthetic liner (1.5 mm HDPE) was installed, overlying a leak detection system. The pond design was certified by a CPEng as meeting Practice Note 21 standards. The leak detection system terminates at a 400 mm diameter inspection well. The storage capacity of the pond is 4,281 metres cubed. The Massey Dairy Effluent Storage Calculator 90% storage probability volume for WOL is 3,257 metres cubed, so has sufficient storage for 700 cows plus wintering barn effluent. See Appendix for the Massey DESC report.

WOL - DESC PARAMETERS

- 700 cows milked at peak
- Milking season is 1 Aug – 15 June
- Yard is diverted from 16 June to 31 Aug

- Yard area – 553 m^2
- Milking shed roof area diverted.
- Up to 640 cows wintered on a covered feedpad that includes an uncovered area of 170 m^2 that is not diverted.
- A winter/spring irrigation depth of 2 mm has been used. This reflects the predominant use of the trailing shoe slurry tanker to discharge slurry effluent from the storage pond, which can apply effluent to a depth of 1 mm if required. By applying effluent 20 m^3/hectare the slurry tanker applies slurry effluent to a depth of 2 mm. A low depth travelling irrigator is used to apply dairy shed effluent when there is sufficient soil moisture deficit.
- FDE area is split to reflect Drummond/Glenelg (low risk) and Braxton (high risk) soils at the milking platform and the Horner Block. Conservatively 50 hectares of low risk soils has been entered.

Note: if the dairy shed is upgraded/replaced in the future, additional storage is available in WOL's pond to allow for a larger yard catchment.

WTL – EFFLUENT STORAGE

The storage capacity of the pond is 3,751 metres cubed. The Massey Dairy Effluent Storage Calculator 90% storage probability volume for WOL is 3,203 metres cubed, so has sufficient storage for effluent from 800 cows, wintering barn effluent and silage pad leachate. See Appendix for the Massey DESC report.

WTL - DESC PARAMETERS

- 800 cows milked at peak
- Milking season is 1 Aug – 15 June
- Yard is diverted from 16 June to 31 Aug
- Yard area – 1,126 m^2
- Milking shed roof diverted
- 640 cows wintered on a covered feedpad that has an uncovered area of 170 m^2 that is not diverted.
- A silage pad catchment of 800 m^2 is entered under "Other catchments."
- A winter/spring irrigation depth of 2 mm has been used. This reflects the predominant use of the trailing shoe slurry tanker to discharge slurry effluent from the storage pond, which can apply effluent to a depth of 1 mm if required. By applying effluent 20 m^3/hectare the slurry tanker applies slurry effluent to a depth of 2 mm. It is noted that a low depth travelling irrigator is also used to apply dairy shed effluent when there is sufficient soil moisture deficit.
- FDE area is split to reflect Drummond/Glenelg (low risk) and Braxton (high risk) soils at the milking platform and the Horner Block. Conservatively 50 hectares of low risk soils has been entered.

WOL and WTL - Effluent irrigation

Primary irrigation methods – low depth travelling irrigator

A low depth travelling irrigator system is used to apply dairy shed effluent to land at a depth of less than 10 mm per application. Two travelling irrigator systems are on farm, with one connected to each dairy shed. Both have been tested as per consent conditions and apply effluent at a depth of < 10 mm per application. See the Appendix for reports from testing each travelling irrigator.

The travelling irrigator systems have a safety system, which automatically switches the system off in the event of an effluent system failure, such as irrigator stoppage or breakdown.

Primary irrigation methods – low depth slurry tanker with a trailing shoe

A low depth slurry tanker with a trailing shoe is used to apply pond slurry at a maximum depth of 2.5 mm per application. 2.5 mm is the maximum depth proposed as a consent condition.

It can apply slurry to depths as low as 1 mm depending on tractor speed. The applicants own a slurry tanker with a trailing shoe, which has a GPS system. The area and travel speed are monitored using the on-board GPS system. At a travel speed of 8-9 km/hour, the per hectare loading is 20 m^3, which gives a depth of 2 mm. By speeding up the tractor speed, the application depth of lowered further. The capacity of the slurry tanker is 24 metres cubed.

The trailing shoe part of the slurry tanker sits on the ground. It applies sludge at ground level and generates minimal aerosol and odour. It was invented in Europe to reduce adverse odours from the application of slurry/sludge to land, which is standard practice due to the housing of cows in barns over winter. It is regarded to be an effective odour minimisation technology and is best practice for slurry/sludge application. Its use will help to avoid adverse odour effects on neighbouring properties.

Contingency method – umbilical system

An umbilical system is used as a contingency irrigation method, with a maximum depth per application of pond slurry of 3.0 mm.

Future proof – low rate irrigation

It is proposed to future proof the discharge activity by including low rate irrigation. The applicants may install a low rate system such as pods or a cannon/rain-gun system in the future. Both systems will apply dairy shed effluent at a maximum rate of 10 mm/hour and a maximum depth of 10 mm per application.

By including both systems in the permit, the applicants will have flexibility when deciding which system is most suitable, while at the same time being able to assure Environment Southland via consent conditions that the new system will discharge effluent at low rate (< 10 mm/hour).

The system will only be plumbed to land authorised to receive liquid effluent (a.k.a. dairy shed effluent) on the discharge permit/Appendix 1 Discharge Map. If installed, the applicants intend to use a low rate system at times when the soil moisture deficit is too low to safely use the travelling irrigators. E.g. in the shoulders of the season, or in June and August if conditions are suitable/there is sufficient soil moisture deficit to irrigate at depths of 3 – 5 millimetres. The travelling irrigators would still be used over summer/early autumn when the soil moisture deficit is generally greater and irrigation of effluent at depths of less than 10 millimetres can be carried out without risk of drainage.

Note: The nutrient budgeting, proposal details and AEE used the high rate travelling irrigator as the primary irrigation system for dairy shed effluent. The low rate systems are regarded as best practice by Environment Southland, and as such will have similar or lesser effects as the high rate travelling irrigator system.

Other conditions

- A minimum return period of 28 days between applications;
- A maximum of 150 kg of N/hectare from effluent (dairy shed and pond slurry) applied at the dairy farm (WOL and WTL units).
- A maximum of 250 kg of N/hectare from effluent (pond slurry) is applied at the Horner Block.
- A maximum combined depth of application of 25 mm per year for dairy shed effluent to any land area, and
- A minimum land area of 8 hectares/100 cows for the dairy shed effluent.

WOL and WTL - Contingency measures

The aim is to operate the irrigation systems to always ensure there is buffer storage available. This allows a contingency for wet weather or pump failure.

The umbilical system may be used as a contingency irrigation method. The umbilical system will apply effluent at a maximum depth of application of 3 mm for each individual application.

Should the irrigation pump at either the WOL or WTL dairy sheds fail, a replacement pump is available within 12 hours. Alternately a petrol motor-driven or tractor driven pump could be hired. There is adequate storage to allow time for pump replacement.

Nutrient content of effluent

Dairy shed effluent

The nutrient content of dairy shed effluent has not been tested but is expected to be in line with typical dairy shed effluent (Longhurst, Rajendram, Miller and Dexter (2017)). An estimate for nutrient content of typical dairy shed effluent based on the above reference is as follows:

- 250 g/m^3 N
- 30 g/m^3 P
- 300 g/m^3 K
- 15 g/m^3 S

Discharging dairy shed effluent at a depth of 10 mm applies 25 kg of N/hectare, and 30 kg of K/hectare. Where the application depth is 9 mm, approximately 22.5 kg of N is applied per hectare.

Table 6.1. N loading from dairy shed effluent

	Dairy Shed
Number of cows	1,500
Nitrogen collected based on 50 L effluent per cow per day	0.013 kg N/cow/day
Daily nitrogen produced	19.5 kg N/day
Maximum days used per year	300
Annual nitrogen produced	5,850 kg N/year
Minimum annual size of discharge area (ha)	220 ha (WOL + WTL)
Annual nitrogen loading rate	26.6 kg N/ha

Wintering barn effluent

The nutrient concentration of wintering barn effluent is higher than dairy shed effluent due to lack of dilution and the housing of cows in the barns for up 24 hours per day. Slurry effluent in the ponds is predominantly composed of wintering barn effluent, with minor dilution from rain falling on the pond and dairy shed effluent, which is diverted to the ponds when ground conditions are unsuitable for irrigation.

The nutrient content of pond effluent (slurry) was tested as part of a 2011 AgResearch study "Characterising dairy manures and slurries – Case study 15." The nutrient content of slurry at the applicant's pond was measured at:

- 3,200 g/m^3 N
- 800 g/m^3 P
- 4,400 g/m^3 K
- 400 g/m^3 S

Applying 15.2 m^3/hectare applies slurry effluent at a depth of 1.5 mm. Discharging slurry effluent at 15.2 m^3/hectare applies:

- 49 kg of N;
- 12 kg of P;
- 69 kg of K; and
- 6 kg of S.

Slurry effluent is applied at the Horner Block and at the dairy platform.

The Horner Block is a cut and carry block used to grow feed for cows. Given the use of the Horner Block for grass harvesting, slurry effluent from WOL and WTL is applied at very low depth as fertiliser, and grass is harvested and fed to cows at WOL and WTL. Cows are not grazed at the Horner Block, so a higher slurry loading can be applied without the potential risk of adverse animal health effects due to excessive K levels. Nitrogen fertiliser is reduced accordingly at both the Horner Block and at the dairy platform to account for the N loading from slurry. Adverse N-related environmental effects are further avoided through the application of pond slurry at very low depths (less than or equal to 2.5 mm per application and typically at 1.5 – 2.0 mm depth per application).

E.g. Slurry effluent applied at 1.5 mm depth by applying 15.2 m^3/hectare, will apply 49 kg of N/hectare. Four further applications at 1.5 mm depth more than 28 days apart will apply a further 196 kg of N/hectare. Five applications at 1.5 mm depth each will apply a total of 243 kg N/hectare, which is less than the 250 kg N/hectare proposed limit for the Horner Block.

One application of slurry effluent at a similar depth and rate per hectare is also applied at the dairy platform.

Slurry volume

Slurry volume is estimated based on the volume of wintering barn effluent (6,212 m^3), rainwater on the ponds' surface (606 m^3 for WOL, 912 m^3 for WTL) and an allowance for dairy shed effluent diverted to the ponds (2,400 m^3) given the presence of low risk soils and use of very low depth application using the slurry tanker/trailing shoe, which results in a large number of irrigation days available. The area available at the Horner Block (97 ha) and dairy platform (> 180 ha) is sufficiently large to receive the volume of slurry.

Effluent discharge and receiving area

See table 1.1 for details of land areas within the FDE area.

Effluent irrigation to the discharge areas is carried out between August and May, and if ground conditions permit in June and July as necessary. As per existing consents, the effluent receiving area encompasses most of the dairy farm and the part of the Horner support block (c.97 hectares), less Council required buffers around waterways, bores, neighbouring dwellings, boundaries etc.:

- 20 metres from any surface watercourse;
- 100 metres from any potable water abstraction point;

- 20 metres from any property boundary (unless the adjoining landowner's consent is obtained to do otherwise);
- 200 metres from any residential dwelling other than residential dwellings on the property;
- Dairy shed effluent shall not be discharged onto any land area that has been grazed within the previous 5 – 10 days;
- Effluent shall not be discharged to leased land described as Lot 1 DP 451158, Lot 1 DP 13077 and Lot 1 DP 9925;
- Effluent shall not be discharged where the soil has cracked, and
- Effluent shall not be discharged over tiles or mole drains when the soil is at field capacity.

Allowing for the above buffers, a conservative estimate for the size of the effluent discharge area is c.350 hectares at WOL and WTL, and c.97 hectares at the Horner Block, which gives a total FDE area of 447 hectares. Given the presence of Drummond and Glenelg soils, there are significant areas of low risk (for FDE) soils.

At an operational level:

- Dairy shed effluent from WOL and WTL units will continue to be discharged via travelling irrigator at low depth at the WOL and WTL platforms, in the future a low rate irrigation system may be installed;
- Slurry effluent will be discharged at very low depth via slurry tanker (or umbilical system) at the WOL and WTL dairy platform. This includes land referred to as the SH96/Marcel Block. A maximum of 150 kg N/ha/year from effluent (slurry and dairy shed) will be applied at the dairy platform;
- Slurry effluent will be carted via slurry tanker and discharged at low depth at the Horner Block. Approximately 97 hectares is available at the Horner Block for this purpose (see figure 6.7). A maximum of 250 kg N/ha/year from effluent (slurry) will be applied at the Horner Block.
- The slurry effluent areas at the milking platform (WOL and WTL) and at the Horner Block are sufficiently large to receive both the volume and N loading from the effluent ponds.
- Effluent will not be discharged at times where there is snow on the ground or when rainwater/irrigation water has ponded on the land surface.
- Effluent will also not be discharged when soil conditions are considered unsuitable i.e. when soil temperature is at or below 5 degrees Celsius or when the soil moisture deficit is insufficient. Environment Southland's Beacon website will be consulted as a guide to soil moisture levels.

Figure 6.7 Horner support block with slurry effluent area annotated in purple.

Horner Block – slurry receiving area

Land use

The land is used as for cut and carry, and to discharge slurry effluent. No stock is grazed at the block so there is no nutrient loss from urine patches. Cut and carry block are used to grow grass only with typically 4 cuts per season. Relatively high N inputs are required to achieve this. In this case fertiliser and slurry provide N. Cut and carry blocks are efficient at utilising N and generally have low N loss to water despite relatively high N inputs.

The block (160 ha) will continue to be managed as it has been managed in recent years. A general description of how the block will be managed is as follows:

Cut and carry

- Pasture renewal - the pasture renewal programme is by grass to grass cultivation. Approximately 5% is re-grassed each year.
- Grass (approximately 17 t DM/ha) is harvested and is purchased by dairy farms in the Woldwide Farming Group (including WOL and WTL). Some grass harvested is fed fresh or is stored as silage and fed to cows at wintering barns at WOL and WTL.

Slurry

WOL/WTL slurry receiving area: 97 hectares

WOL/WTL N loading: 5 applications of slurry at 15.2 m^3 per hectare per application = 243 kg N/ha from slurry

Woldwide Three: 57.5 hectares (not part of this application)

General fertiliser use

For a detailed fertiliser programme, please see the nutrient budget inputs. N, P, K and S are applied as follows:

- N (207 kg/ha – split applications, little and often)
- P (10 kg/ha)
- K (0)

Fertiliser is applied outside high risk months (i.e. May – July). If ground conditions are suitable and there is minimal risk of drainage, fertiliser can be applied in August.

Downstream users of groundwater

- Farmland is found due south of the HB. Downstream users of groundwater are farms (sheep, dairy and cropping).
- Drummond Township is located ~ 9 km to the south east of the HB so has domestic users of groundwater including Drummond Primary School and Drummond Kindergarten. Both are located at the south of the township.

6.3 Water Take

Groundwater is abstracted from three bores on the property for use at the dairy sheds and to supply stock drinking water. The bores are over 100 metres apart. Two bores supply groundwater to the WTL dairy platform, one bore supplies groundwater to the WOL platform. **The maximum volume of groundwater abstracted for 1,500 cows will be 180 meters cubed per day.** This is abstracted as follows:

> **WOL -**The bore (well ID E45/0071) is located to the west of the dairy shed and supplies water via a submersible pump to three tanks (3 x 30,000 litres) at the dairy shed for stock drinking water and dairy shed use. The abstraction for WOL is currently managed under Water Permit 301664. **It is proposed to increase the groundwater take to meet the needs of 700 cows milked through the WOL dairy shed.** The proposed groundwater take at the WOL dairy platform is 84,000 litres per day.
>
> **WTL** - Two bores (well ID E45/0727 and E45/0083) supply groundwater for dairy use; one is adjacent to Wreys Bush Highway north of the dairy shed, and the other is on the west side of the dairy shed. The two bores supply water via submersible pumps to three tanks (3 x 30,000 litres) at the dairy shed for stock drinking water and dairy shed use. The abstraction for WTL is currently managed under Water Permit 20171278-02. **The proposed groundwater take at WTL will continue to meet the needs of 800 cows milked through the dairy shed.** The proposed groundwater take at WTL dairy platform is remaining at 96,000 litres per day.

Groundwater use equates to 120 litres per cow per day and is in line with the Council's standard estimate for water usage (i.e. 70 litres per cow per day for drinking water and 50 litres per cow per day for dairy shed washdown).

Water requirements

Season

During the milking season (twice per day milking), requirements are 70 l/cow/day for drinking water and 50 l/cow/day for dairy shed wash down water:

1,500 cows x 120 l/day = 180,000 litres per day

180,000 litres per day is split between the WOL (84,000 litres per day) and WTL (96,000 litres per day) dairy units.

An average lactation length is 280 days.

280 days x 180,000 litres per day = 50,400,000 litres

Off season

Cows remain on-farm over winter when they are housed in two wintering barns. An average lactation length for cows is 280 days, which leaves an average of 85 days when cows are dry. A drinking water allowance for dry cows is 45 l/cow/day. On average 1,280 cows require drinking water in the off season for 85 days:

1,280 cows x 45 l/day x 85 days = 4,896,000 litres for the off season.

Total volume of groundwater required
55,296,000 litres or 55,296 metres cubed

Extraction

Groundwater is abstracted from three bores over 50 metres apart from each other, which ensures that the abstraction rate will be less than 2 L/sec.

Average daily rate of take (WOL)	0.97	litres per second
Average daily rate of take (WTL)	1.11	litres per second
Maximum daily rate of take	2.0	litres per second
Maximum daily volume	180	cubic metres per day
Maximum weekly volume	1,260	cubic metres per week
Maximum monthly volume	5,400	cubic metres per month (30-day month)
Maximum annual volume	55,296	cubic meters

The bores are over 50 metres apart from each other. The bores are not within 700 metres of a neighbouring bore or groundwater take.

The dairy supply bore map references (NZTM2000) are:

E45/0083	E1225011	N4889693
E45/0727	E1225014	N4890268
E45/0071	E1225145	N4888768

Water storage
Three water storage tanks (3 x 30,000 L) are utilised at WOL's dairy shed to ensure that the rate of take is less than 2 L/sec.

Three water storage tanks (3 x 30,000 L) are utilised at WTL's dairy shed to ensure that the rate of take is less than 2 L/sec.

6.4 Land-use – Dairy farming

Land use activities – dairy platform

Land use

The land is used as a pasture based dairy farm. Calving officially starts on 1 August and cows are typically milked from 1 August to 31 May, with late calving cows milked until 15 June. Cows (Friesan) are milked twice per day.

A general description of proposed dairy management system follows:

Stock management

- Up to 1,500 cows (i.e. mixed age cows and replacements) are calved each year. The milking herd peaks in October/November at 1,500. It drops slightly over consecutive months depending on seasonal variation in pasture production; approximately 1,380 cows are milked in March. Cows are dried off in May and June. Approximately 270-330 cows are culled and replaced each year.
- Median calving date is 20 August with approximately 330 heifer calves kept as replacements. Calves are on farm for August, September and October. Weaned R1 heifer calves go to Woldwide Runoff.
- Approximately 300 in-calf R2 heifer replacements return to the farm for calving each year. Replacements calve in August, September and October and join the milking herd.
- Approximately 15 bulls are grazed on farm and used as part of the mating programme each year.

*Woldwide Runoff comprises the Merrivale and Merriburn blocks and is described in an accompanying report. A replacement rate of 22 – 25 % is maintained.

Wintering, cropping, grazing and supplements

- Wintering – all cows are wintered on farm where they are housed in two wintering barns over June and July. Cows are housed in wintering barns during May, August and September as required also.
- Fodder crop – no fodder crops (brassica or beet) are sown. Animals are not wintered on crop nor grazed in paddocks on fodder crop at any other time.
- Pasture renewal - the pasture renewal programme is by grass to grass cultivation. Approximately 5% of the farm is re-grassed each year.
- Grazing – cows are grazed on pasture throughout the season. The wintering barns are used to stand cows off paddocks during high risk inclement weather events.
- Supplements made – If there is a surplus, silage may be harvested at the dairy farm. There is no dedicated silage block, however, and in general silage is imported.
- Supplements imported – barley, molasses, PKE and grass silage (see nutrient budget inputs)

General fertiliser use

For a detailed fertiliser programme, please see the nutrient budget inputs. N, P, K and S are applied as follows:

Effluent block:

- N (139 kg/ha – split applications, little and often)
- P (25 kg/ha)
- K (0)

Slurry receiving area:

- N (179 kg/ha – split applications, little and often)
- P (22 kg/ha)
- K (0)

Non-effluent blocks:

- N (209 kg/ha – split applications, little and often)
- P (34 kg/ha)
- K (28 kg K/ha)

Fertiliser is applied outside high risk months (i.e. May – July). If ground conditions are suitable and there is minimal risk of drainage, fertiliser is applied in split applications from August to April.

Good Management Practices

Good management practices (GMPs) implemented on farm are also described in the FEMP. A general strategy of good management practice is undertaken on farm. Details are described in table 6.2 below. Key mitigation measures (distinct from GMPS) are described in table 6.5.

Evidence of sustainable soil and nutrient management is clear in trends in soil testing across the property over many years. See the Appendix for reports from Ravendown supporting good practice management of farm soils and farm fertility.

Table 6.2 General Good Management Practices

Strategy Type	Summary of Management Practices
Operational	Utilising a nutrient management plan; Soil testing is carried out each year to inform on decision making regarding fertiliser application; Trends in soil testing are evaluated and used to inform on decision making regarding soil health, fertiliser and agronomy plans; Surface waterways are fully fenced and with good grass cover, fencing is maintained and stock are excluded from the riparian areas; Wide riparian buffers are maintained; All surface waterways are culverted; Sufficient land area is available for the dairy operation; Young stock is grazed off farm from weaning; Cows are wintered in barns over June and July; Good winter grazing management practice of R2 heifers is implemented*; Tracks and lanes predominantly sited away from streams; Lane runoff diverted to land; Good management practice of the silage pad is implemented; Restricted grazing of draining pastures in autumn/spring; Specialist machinery is used to harvest grass to minimise the risk of soil compaction; Care in irrigation of FDE, especially when the ground is near or at field capacity;

A large land application area is available to ensure N & K returns are not excessive, taking into account the higher strength nature of slurry effluent;

Effluent volumes are minimized at source through efficient water use;

Appropriate application depths for effluent and slurry are used;

Appropriate FDE storage volume to allow for deferred irrigation for FDE;

All data and maps are kept up to date and all staff are trained and informed of any changes;

Programmed maintenance is done in and around FDE, and piping infrastructure around the dairy shed, silage bunkers, cow yards etc.;

*Winter grazing of R2 heifers at the WOL/WTL dairy platform will no longer occur from June 2019 as a mitigation measure.

Commented [AE1]: Are you proposing high rate on high risk such as Category E soils?

Good Management Practices for Key Transport Pathways

See table 6.3 below for a summary of physiographic zones and key transport pathways of contaminants.

Table 6.3 Physiographic zones and key transport pathways

Physiographic Zone	Variant	Key Transport Pathways
Central Plains	n/a	Artificial drainage, deep drainage
Oxidising	n/a	Deep drainage

The dairy farm is classed in the Oxidising and Central Plains physiographic zones. The Horner support block also is classed both in the Oxidising and Central Plains physiographic zones.

Both physiographic types are susceptible to nitrate accumulation in soils and aquifers. Nitrates are transported to the underlying aquifer via deep drainage. Central Plain's type soils (Braxton) have risk of nitrate and contaminant (pathogen) loss to groundwater via deep cracks that can form in silty clay soils over extended dry summer periods. Subsequent heavy rainfall can transport nitrate or microbes down to the underlying aquifer. There is risk of contaminant loss (nutrients N and P, sediment and microbes) to surfacewaters via artificial drainage in Central Plain's type soils following heavy or prolonged rainfall.

Given the very flat topography and the tendency of soils to have good phosphorous retention, there is low risk of contaminant loss to surface waters via overland flow. Any risk of contaminant loss to surface waters from tracks and lanes via overland flow is mitigated by good management of areas where tracks and lanes are close to surface waters.

Recommendations described on Good Practice Management factsheets issues by Environment are implemented where practical. These measures will be reviewed annually with the inclusion of new measures where appropriate. Table 6.4 describes good management practices, which have been implemented on-farm through most recent annual cycle to mitigate the risk of contaminant loss to water (N, P, sediment and microbes).

Reference factsheets: Artificial drainage; Deep drainage; Overland flow

Table 6.4 Good management practices implemented on farm and further explanations.

Transport Pathway	Mitigation Measure	Summary of Management Practices
Artificial drainage, Overland flow	Protect soil structure (especially near streams)	Match stock management to land use capability, e.g. avoid grazing cows on more vulnerable soils, especially when wet. Fence off waterways. Stock will not graze riparian strips. Riparian strips are large and well vegetated; Cows are wintered off paddocks in wintering barns; When appropriate use minimum or no-till cultivation practices such as direct drilling; Use best practice winter grazing (young stock)*; Re-sow areas of bare or damaged soil as soon as is practical;
Artificial drainage, Overland flow	Reduce P use or loss	Prepare a nutrient budget; Soil test regularly; Maintain Olsen P values at agronomic optimum and no higher; Apply P fertiliser outside of high-risk months in autumn and winter; Manage CSAs close to surface drains appropriately; Where winter grazing occurs (young stock), implement best practice management*;
Artificial drainage, Deep drainage	Reduce accumulation of surplus N in the soil, particularly during autumn and winter	Maintain sustainable stocking rate; Reduce inputs of N where possible through optimal fertilizer application on farm, use little and often approach; Cows are wintered off paddocks in wintering barns;

Commented [AE2]: What size are the buffer zones?

Commented [AE3]: All cows or just some?

Commented [AE4]: What best practice measures will be employed. Will these also meet the requirements of Rule 20?

Commented [AE5]: How/ what will be done?

Commented [AE6]: What is a sustainable stocking rate?

		Where winter grazing occurs, implement best practice management; Optimize timing and amounts of effluent irrigation input applications, accounting for higher strength nature of slurry effluent; Substitute autumn diets with low-N feed when practical; Time N application to meet pasture demand using split applications and when pastures are actively growing (>6 degrees Celsius); Control the duration of grazing pastures; Cut and carry feed where practical;
Artificial Drainage Deep drainage	Avoid preferential flow of effluent through drains or soil cracks	Defer irrigation to effluent storage ponds when soil conditions are unsuitable; Very low depth slurry application is implemented; Low depth dairy shed effluent application is implemented; Avoid applying slurry or dairy shed effluent where soils are cracked; A sufficiently large FDE area is available for effluent; Observe buffer zones and placement guideline;s Observe discharge consent conditions;
Overland flow	Manage CSAs; low areas overlying tiles close to outfalls at surface drains	Restrict grazing of pasture CSAs when soils are near saturation; Avoid working pasture CSAs and their margins; Move troughs and gateways away from water flow paths; Reduce runoff from tracks and races;
Deep drainage	Avoid loss of contaminants (nitrate and faecal microbes) to	Monitor paddocks for deep cracks in summer/autumn. If and where they form, avoid grazing the area and irrigating effluent to the area;

Commented [AE7]: Is there IWG or are the cows housed in barns, or is this referring to young stock only?

	groundwater via deep cracks formed in summer dry periods in Braxton soil types.	Avoid deep crack formation by maintaining good soil structure and good pasture cover;

*Winter grazing of R2 heifers at the WOL/WTL dairy platform will no longer occur from June 2019 as a mitigation measure.

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Specific Mitigation Measures – Expansion

As is described in the nutrient budget section, the change to the 1,500-cow system in conjunction with the implementation of key mitigation measures is predicted to result in a small decrease in average annual N and P losses to water for the WOL/WTL dairy platform. Some key mitigation measures are not recognised by Overseer so will further reduce N and P loss, although this is not recognised by Overseer. P loss is used as a proxy for sediment and microbial loss.

Key mitigation measures are described in table 6.5, along with their effectiveness and level of effectiveness.

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Table 6.5 Specific mitigation measures proposed for the dairy farming activity, their effectiveness and assessed level of effectiveness.

No.	Specific mitigation measures proposed for N, P, sediment and microbial contaminant loss.	Effectiveness of mitigation measure	Level of effectiveness
1	Continued development of soils and pastures through grass to grass cultivation methods and a focus on sustainable agronomy;	Over time this leads to increased soil organic matter content, water holding capacity and improved soil structure and consequently less N, P, sediment and microbial contaminant loss in artificial drainage, runoff and less N loss to groundwater.	High – this measure mitigates N, P, sediment and microbial contaminant loss and is implemented across the entire dairy farm.
2	No land cultivated into fodder crop and intensively winter/summer grazed;	Nutrient (N and P) loss from fodder crop blocks is high due to mineralisation processes in soils and inputs of nutrients from animal dung and urine. Eliminating these practices is effective at reducing nutrient losses via deep drainage, artificial drainage and to less of an extent, overland flow pathways in the future. Sediment and microbial contaminant loss from fodder crop blocks is high due to soil compaction, pugging and breakdown of the soil structure, and inputs of faecal microbes from animal dung and urine. Eliminating these practices is effective at reducing nutrient losses via artificial drainage and to less of an extent, overland flow pathways in the future.	High – where intensive winter grazing is carried out on free draining soils, N loss to groundwater is high. P, sediment and microbial contaminant loss is also high where soils are pugged.
3	Expansion of the size and use of the wintering barn facilities	An additional 225-240 animals (cows/R2 heifers) will be wintered in the WOL wintering barn. Both barns will be used more in the shoulders of the season (May, August and September) than they have been in the past. This is effective as effluent that would otherwise be deposited on paddocks at high risk times is captured and stored; less pugging of soils and accumulation of N in soils at high risk times occurs. The barns will be	High – reduces both N and P loss. Also reduces sediment and microbial contaminant loss.

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		also used to stand cows off during inclement weather events during the season, which will also reduce soil damage.	
4	More efficient use of N fertiliser, e.g. effluent block will have less N fertiliser applied than non-effluent block;	This is effective at reducing N loss to water in drainage events following fertiliser application.	Moderate – the reduction in N loss will be seen across part of the dairy platform
5	Increasing the N loading from slurry to the cut and carry Horner Block (HB) to 250 kg N/ha/year;	The use of the wintering barns generates a high volume of nutrient rich slurry. Increasing the N loading from slurry at the HB allows nutrients in slurry to be used efficiently as fertiliser with low risk of N loss to groundwater. Plants take up N efficiently from slurry applied at very low depth while N fertiliser application is reduced accordingly to ensure the input of N overall is sustainable. Since there is no grazing of stock at the HB there are no urine patches, which otherwise leach N at high rates from urine, slurry and fertiliser. Grass harvested at the HB is fed to cows at WOL/WTL.	Moderate – reduces both N and P loss and microbial contaminant loss at the WOL/WTL dairy platform
6	Conditioning very low depth application of slurry with the trailing shoe slurry tanker;	In recognition of the high strength nature of slurry and avoiding the overloading soils with N and microbes from slurry, this is effective at providing Environment Southland with certainty that slurry will be applied at less than or equal to 2.5 millimetres depth per application. In practice, an application depth of 1.5-2.0 millimetres per application will be used when applying slurry with the slurry tanker with the trailing shoe.	Moderate – reduces both N and P loss, and microbial contaminant loss
7	Lane CSA adjacent to WOL wintering barn to be assessed and remedial work carried out *see below for further details	The cow lane in between WOL's wintering barn and a stream will be assessed for risk of runoff from the lane to the stream. Where necessary the lane will be reshaped so that it will drain away from	Moderate – this measure will prevent a potential point source discharge of

Commented [AE8]: Have fertiliser loadings reduced on this block with the increase of nitrogen from effluent?

		the stream towards the free stall barn. A large quantity of gravel is on-hand to use for lane re-shaping if necessary.	nutrients N and P to surfacewater
8	Eliminate direct contamination of house bore (45/0622), which is also used by ES at a monitoring bore;	Measures to eliminate contamination of the bore will be implemented: the casing will be extended far enough above ground level to ensure stormwater cannot enter the well. A sloping concrete pad will be placed around the casing. Any holes in the well liner will be sealed, the piping and fittings will be serviced, and any leaks will be repaired.	Minor – this will prevent localised contamination of groundwater with N and P;
9	Olsen P levels are slightly below optimum level. Once target Olsen P levels are achieved, P fertiliser will be applied to maintain Olsen P levels within optimum range. Target Olsen P levels are 30.	This will avoid the loss of excess P to water in artificial drainage and runoff following prolonged wet periods	Moderately effective for mitigating P loss across farm.
10	Tracks/lanes managed to reduce runoff to streams;	Overseer assumes that 30% of P that lands on all tracks/lanes ends up in waterways. Given the farm layout (many tracks and lanes do not run close/adjacent to waterways) and management of track/lanes and associated buffers, P loss as assumed by Overseer is reduced. The farm has been operated as a dairy farm for many years. No new lane development is required to allow for expansion.	Highly effective for mitigating P, sediment and microbial contaminant loss.

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FURTHER INFORMATION REGARDING MITIGATION MEASURE #7

Two lanes lie adjacent to a stream close to the WOL wintering barn (see figure 6.7). Only one of these lanes (i.e. the east side lane), however, is used for cow traffic to the milking shed. The other one (i.e. west side lane) is solely used to truck silage in and for truck access to the cattle yards to load and unload stock. Cows do not use the west side lane so it only collects rainwater. Since there is no cow traffic on the west side lane, there is no risk of runoff of contaminants (containing phosphorous) from dung or urine to the stream.

Figure 6.7 Aerial photo of stream flanked by two lanes at WOL, close to wintering barn and north of milking shed.

The lane east of the stream has cow traffic, as seen in figures 6.8 – 6.10 below. The stream has wide buffers and is flanked on both sides by long grass. The water flowing in the stream appears clear, which is noteworthy as the photos were taken after 40 mm of rainfall in the previous week. The wide and well vegetated riparian buffers will filter run-off, trapping contaminants such as phosphorous and microbes, thereby helping to mitigate the risk of any contaminants reaching the stream via overland flow.

Additional mitigation due to increased cow numbers: The east lane will be visually assessed for risk of runoff from the lane to the stream. Where necessary the lane will be reshaped so that it will drain away from the stream, towards the free stall barn. A large quantity of gravel is on hand, which will be used for lane reshaping if necessary. This mitigation strategy will be incorporated into the FEMP as a good management practice for this location, following review of the FEMP at the end of the 18/19 season.

Commented [AE9]: How wide is the buffer? Is the slope of the buffer not too steep, or in periods of high rainfall will overland flow occur and run-off into the waterway?

Commented [AE10]: I am not sure this is a mitigation. If the lane is going to be an issue, steps need to be taken to address that (such as nibbing the lane or shifting the lane) in order to mitigate losses.

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Figure 6.8 Stream flanked by two lanes. Wide buffers with long grass flanking the stream are present on both sides of stream. Note that photo was taken from the north/facing south.

Figure 6.9 Cows walking to milking shed on lane <u>east</u> of stream. Clean unused lane visible on <u>west</u> side of stream. Note that photo was taken from the north/facing south.

Figure 6.10 Cows crossing waterway over culvert to walk to the dairy shed on the east lane. Please note the wide buffers with long grass flanking the stream on both sides.

N loss – as predicted by Overseer

The key drivers of the small decrease in N loss are as summarised follows:

- Removal of summer and winter crop;
- Removal of cows wintered outside on crop or grass;
- Expansion of size and use of wintering barn facilities;
- More efficient use of N fertiliser.

N losses from crop blocks are driven by fertiliser and effluent application, as well as mineralization processes associated with cropping. The proposed 1,500 cow system has no fodder crops grown annually going forward. The effect of this is to reduce the average N loss slightly, despite increasing cow numbers by 160.

P loss – as predicted by Overseer

The key drivers of the small decrease in P loss are summarised as follows:

- Decrease in winter crop area;
- Maintaining Olsen P at target level of 30;
- Expansion of size and use of wintering barn facilities.

The average annual P loss is predicted to decrease slightly despite an increase of 160 cows. The key measures that will mitigate P loss also will help to mitigate the loss of sediment and microbial contaminants to water, as they are generally transported to water via artificial drainage and overland flow also.

Other mitigation measure for P loss

There are other measures that mitigate P, sediment and microbial contaminant loss that are not modelled by Overseer; preventing overland flow from critical infrastructure to surface waterways following periods of heavy rainfall, greatly reduces the propensity of a pathway that transports P (and sediment and microbes) directly to surface waterways. P remains on lanes and/or is returned to adjacent paddocks. These measures include:

- Only a small proportion of lanes run parallel to or close to waterways. This greatly reduces the risk of runoff from tracks and lanes into waterways. Overseer does not take the layout of individual farms into account, however.
- Herd movement is managed to minimise the time cows spend on lanes and other tracks, especially where there is a risk of runoff to waterways;
- Minimise the number of culvert/bridge crossings of waterways, where run-off from tracks and lanes can reach surface waterways. Any locations where run-off could potentially occur are identified as CSAs and managed to minimise the risk of runoff occurring. Track shaping and cutting is carried out to direct surface drainage at such locations to paddocks and away from waterways. If necessary, nib boarding is put in place. Runoff is filtered before draining to waterways.

Due to the suite of measures mentioned above, there will be less soil disturbance and pugging, and less runoff from lanes, tracks etc. to waterways; less P, sediment and microbial loss to receiving surface waters will occur. Potential losses associated with the expansion are fully mitigated in line with Policies 5, 10 and 16 of the pSWLP.

Review

A review of good management practices and mitigation measures will be carried out annually. Practices undertaken in the previous 1 June to 31 May period will be reviewed and practices will be implemented over the following 1 June to 31 May as appropriate.

Nutrient budgets

Seven nutrient budgets (NBs) have been prepared:

- Four pre-expansion nutrient budgets have been prepared based on actual figures for 2013/2014, 2014/2015, 2015/2016 and 2016/2017 years. A high level of evidence has been provided to support inputs used for all year end nutrient budgets.
- One nutrient budget has been prepared to reflect the proposed 1,500 cow dairy farm.
- Two nutrient budgets for the Horner Block (one current and one proposed).
    - Environment Southland have since been advised via a legal opinion that the Horner Block is not required to be on the land use consent for farming; as such nutrient budgets are not needed. Since nutrient budgets were already prepared for the Horner Block, they will be used to inform of the effect of the proposed activity.

Cain Duncan (CNMA) from Farm Source Sustainable Dairying carried out all Overseer work in May/June/July 2018. Soil nutrient test data, the latest version of the Overseer model (ver. 6.3.0) and Overseer Best Practice Data Input Standards from March 2018 were used. Associated XML files have been submitted electronically.

Table 6.6 Overseer files

Number	Year	XML file name
1	2013/2014	Ovr-Woldwide 1,2 & 96 13_14.xml
2	2014/2015	Ovr-Woldwide 1,2 & 96 14_15.xml
3	2015/2016	Ovr-Woldwide 1,2 & 96 15_16.xml
4	2016/2017	Ovr-Woldwide 1,2 & 96 16_17.xml
5	Proposed dairy platform	Ovr-Woldwide 1&2 Proposed (Mitigations & Slurry).xml
6	Current use - Horner Block	Ovr-Horner Block –Current.xml
7	Proposed use - Horner Block	Ovr-Horner Block – Proposed.xml

Mr. Duncan also prepared an in-depth nutrient budget analysis report, which is submitted with this application. Rather than duplicate material, please refer to the appended nutrient budget analysis report for assumptions and a summary of inputs for each nutrient budget:

- Assumptions: Sections 5, 6 and 7
- Inputs: Section 9, 12

Nutrient budgets 1 – 7 from the above table contain the same land areas: former WOL milking platform, former WTL milking platform, Marcel Block and SH96 block.

It is noted that where the nutrient budget report by Mr. Duncan states that the land area is being increased by bringing in support land, this refers to the SH96 and Marcel Blocks, which were consented for dairy farming as parts of WTL's land use consent issued in 2017.

Mr. Duncan has also prepared detailed maps and a summary for each individual nutrient budget as part of the report.

Potential Nutrient Losses as Modelled by Overseer

PRE-EXPANSION

Table 6.7 Modelled nutrient losses for pre-expansion year end nutrient budgets (source: Nutrient Budget Analysis Report).

	13/14	**14/15**	**15/16**	**16/17**	**Average**
Total N Loss (kg)	19053	23016	19111	20723	20476
N Loss/ha (kg)	40 (15)	46	38	41	41
N Concentration in Drainage (ppm)	7.3 - 12.9 (Pastoral) 16.4 - 27.1 (Crops) 5.9 – 12.5 (Silage/WGYS)	9.9 – 15.7 (Pastoral) 13.5 - 17.6 (Crops) 5.9 – 9.5 (Silage/WGYS)	7.3 – 14.3 (Pastoral) 13.1 - 18.8 (Crops) 4.0 – 9.8 (Silage/WGYS)	8.5 – 15.3 (Pastoral) 18.0 - 23.8 (Crops) 2.9 – 7.5 (Silage)	
Total P Loss (kg)	345	374	362	357	360
P Loss/ha (kg)	0.7 (0.2)	0.7	0.7	0.7	0.7
Pasture Grown Kg/DM/ha/yr (Dairy Platforms)	15,003	15,483	15,089	15,909	15,371

POST-EXPANSION

Table 6.7 Modelled nutrient losses for post-expansion nutrient budget (Source: nutrient budget analysis report).

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Total N Loss (kg)	20,205
N Loss/ha (kg)	40
N Concentration in Drainage (ppm)	Pastoral – 7.7 to 17.1 ppm
Total P Loss (kg)	356
P loss/ha (kg)	0.7
Pasture Grown Kg/DM/ha/yr	15,391

Discussion – nutrient losses predicted by nutrient budget analysis:

N LOSS – DAIRY PLATFORM

The pre-expansion average annual N loss based on four years of supported data and analysis is 20,476 kg/year. The proposed 1,500 cow dairy farm is predicted by Overseer to have an average N loss of 20,205 kg/year. Overseer predicts an average reduction in N loss of 271 kg/year with the change to the proposed system. The N loss per hectare value for the proposed 1,500 cow farm (40 kg/year) is predicted to reduce slightly relative to the pre-expansion land use (41 kg/year).

This decrease is mainly driven by the removal of forage brassica and beet winter and summer crops, and their associated grazing, the removal of pasture grazing in winter, greater use of the wintering barns and more efficient fertiliser use. Soil aggregates are broken up and mixed when cultivated for cropping. This results in a high rate of N mineralisation through accelerated microbial decomposition of soil organic matter and subsequent rapid nitrification, which produces large quantities of nitrate. Dung and urine are deposited in relatively high volumes on winter crop ground, further driving losses of N. Greater use of the wintering barn facilities allows the collection and storage of nutrients in dung and urine, some of which were previously deposited on winter crop and grass paddocks as they were grazed. Because of significant changes in management practices, the proposed 1,500 cow system is predicted to have slightly less average annual N loss than the pre-expansion system despite an increase of 160 cows.

It is noted that pasture production is similar for both the pre-expansion system (15,371 kg DM/ha/year) and the proposed 1,500 cow farm (15,391 kg DM/ha/year).

P LOSS – DAIRY PLATFORM

The pre-expansion average annual P loss is based on four years of supported data and analysis is 360 kg/year. The proposed 1,500 cow dairy farm is predicted by Overseer to have an average P loss of 356 kg/year. Overseer predicts an average reduction in P loss of 4 kg/year with the change to the proposed system, which is essentially no change. The per hectare P loss value for the proposed 1,500 cow farm (0.7 kg/year) is predicted to remain as for the pre-expansion land use (0.7 kg/year). For both the pre-expansion and proposed 1,500 cow dairy farm, the risk of P loss from effluent is classed by Overseer as low for all blocks. The risk of P loss from soil and fertiliser is classed as low for all soil type blocks.

The key drivers of the stable predicted P loss are the removal of forage brassica and beet winter and summer crops, and their associated grazing, the maintenance of Olsen P at a target of 30, and the expansion in size and use of the wintering barns.

As already explained, effective measures to mitigate P loss that are not detected by Overseer will also be implemented on farm.

NUTRIENT LOSS – HORNER BLOCK

The current nutrient budget represents a conservative approach to modelling the existing nitrogen and phosphorus losses on the HB.

Under both current and proposed land use, the Horner Block has very low nutrient losses. The current use is predicted to have an annual average N loss of 20 kg/hectare; the proposed has N loss of 19 kg/hectare. The current use is predicted to have an average P loss of 0.1 kg/hectare; the proposed has P loss of 0.1 kg/hectare.

Discussion – effects of losses

Please see Section 7 (AEE) for a discussion on the effects of predicted nutrient losses.

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1. Assessment of Environmental Effects/Mitigations

7.1 Effluent

Odour

Adverse effects from odour can occur due to the discharge of farm dairy effluent where it may be encountered beyond the boundary of the site. There is also the potential for adverse odour effects from the discharge of slurry. The applicants have proposed the continued use of very low depth and low depth application technology, which coupled with the proposed effluent discharge buffers means there is little risk of adverse effects from odour and spray drift on surrounding land owners and occupiers. They irrigate according to wind direction and risk, which helps to avoid adverse odour effects.

Slurry is applied a very low depth using the slurry tanker with the trailing shoe. The trailing shoe part of the slurry tanker sits on the ground. It applies sludge at ground level and generates minimal aerosol and odour. It was invented in Europe to reduce adverse odours from the application of slurry/sludge to land, which is standard practice due to the housing of cows in barns over winter. It is regarded to be an effective odour minimisation technology and is best practice for slurry/sludge application. Its use will help to avoid adverse odour effects on neighbouring properties. The discharge of slurry at the dairy platform is a permitted activity, as such its effects, including odour effects, are expected to be less than minor.

Risks to surfacewaters from effluent discharge

Adverse effects on surface water can occur from the discharge of farm dairy effluent where contaminants present in effluent such as nutrients N and P, organic matter and microbes reach receiving surface waters such as streams, rivers and estuaries. Effects such as nutrient enrichment of surface waters *are cumulative*, and can lead to algal blooms including slime, and promote nuisance aquatic plant growth. The collection of plants and animals that inhabit receiving waters are adversely affected by nuisance plant growth, as well as in-stream values such as biodiversity and ecosystem services. Values associated with surfacewater streams and coastal waters are many and relate to the landscape, biodiversity, history and people living in the catchment. These values include maintaining the health of water bodies both in-stream and coastal, protecting biodiversity and ecosystems, protecting recreational activities such as fishing, walking and boating; protecting human and animal health, maintaining sustainable farming practices and the socioeconomic well-being of people through preserving values that relate to inshore fishing, farming and tourism. Iwi/cultural values include the principles of protection or kaitiakitanga of the mauri of the water and mana of the land, while minimising adverse effects on taonga and mahinga kai.

As is described in Section 5, receiving surface waters predominantly lie in the Waimatuku Stream catchment, Waimatuku Estuary and coastal waters. Receiving surface waters also lie in the Oreti River, New River Estuary, Aparima River, Jacobs River Estuary and coastal waters. These are considered sensitive environments due to the accumulation of nutrients, sediment and microbes. Receiving waters show evidence of land use impacts, with elevated levels of nutrients, sediment and algal blooms at times. The Waimatuku Stream catchment shows higher levels of nutrients than the Aparima River or Oreti River catchments. As is described in Sections

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5 and 6, artificial drainage is a contaminant pathway at the property, in particular subsurface drainage channels installed in silty clay Braxton soil types. Artificial drainage transports contaminants via bypass drainage to receiving surfacewaters during and following periods of heavy rainfall. Parts of the FDE area with Braxton soils types at both the dairy farm and the Horner Block are high risk for effluent discharge and require appropriate management of effluent discharge to mitigate the risk of contaminant loss to surfacewaters. It is noted that Braxton soils at the property are located in the Waimatuku catchment. Shallow groundwater in the Waimatuku catchment is understood to discharge to the local stream network and can potentially contribute cumulatively to adverse effects on surfacewaters.

Risks to Drummond Peat Swamp and Bayswater Bog are described and effects are assessed in section 5.

Risks to groundwater from effluent discharge

Adverse effects on groundwater can occur from the discharge of farm dairy effluent where contaminants present in effluent such as nutrients N (nitrate) and microbes (pathogens such as campylobacter) reach receiving groundwaters via leaching/deep drainage pathways. A major risk of elevated nitrate levels in groundwater is to users (consumers) of groundwater as nitrate becomes toxic to living organisms such as humans, animals and fish at high levels. The New Zealand Drinking Water Standard maximum allowable value for nitrate is 11.3 ppm. Another risk is to consumers of groundwater is waterborne gastroenteritis through the ingestion of groundwater contaminated with pathogens such as campylobacter. This was demonstrated in Havelock North in 2016, when over 5,000 people became ill with camplyobacteriosis. Adverse effects on other users of groundwater such as other farms, small industries, schools or settlements/domestic users are possible and need to be avoided. In particular, any risk from the discharge activity to the drinking water supply at Heddon Bush School 2.3 km south of the property needs to be avoided. *E.coli* is widely used as an indicator of faecal microbial contamination of water, including groundwater.

As is described in Section 5, the dairy farm property predominantly overlies the Waimatuku Groundwater Zone. The eastern part of the property overlies the Central Plains Groundwater Zone. The eastern part of the Horner Block overlies the Waimatuku Groundwater Zone and the western part overlies the Upper Aparima Groundwater Zone. Heddon Bush School also overlies the Waimatuku Groundwater Zone. Although Drummond and Glenlg soil types have risk of contaminant loss via deep drainage to underlying aquifers, they are low risk for effluent discharge due to their physical properties (and drainage properties), and due to the nature of the discharge activity. FDE applied at low depth and very low depth when sufficient soil moisture deficit exists, moves through the soil profile via matrix flow, allowing effluent to remain in the root zone as plant available water and allowing nutrients in effluent to be taken up by plants.

Braxton soil types have swell/crack characteristics that can allow contaminants in effluent to be washed down to the underlying groundwater resource via deep cracks that can form during prolonged dry summer conditions. Parts of the FDE area with Braxton soils types at both the dairy farm and the Horner Block are high risk for effluent discharge and require appropriate management of effluent discharge to mitigate the risk of contaminant loss to groundwater if and where deep cracks are formed. A site investigation by Environment Southland in January 2018 did not find evidence of deep cracks on Braxton type soils, however, leading to a conclusion Braxton soil types at the property may not form deep cracks and are therefore unlikely to provide a pathway for contaminants in effluent to reach groundwater. The risk to groundwater from effluent discharge to Braxton soil types is likely to be lower than previously believed.

Mitigation of adverse effects due to effluent discharge

Adverse effects, *including cumulative effects*, due to the discharge of agricultural effluent (dairy shed effluent and pond slurry) are either avoided, remedied or mitigated at the dairy platform and Horner Block through the implementation of good effluent management practice and mitigation measures. Contaminants present is effluent (N, P, microbes) are held in the root zone, adsorbed by plants or are filtered/adsorbed by soil particles.

Due to its nature and scale, there will be little or no effect on receiving ground and surface waters *including cumulatively*, from the effluent discharge activity in this instance. The discharge system meets industry best practice standards for farm dairy effluent discharge by using buffer storage and low depth application. The use of best practice effluent application should avoid adverse effects on the environment. This principle is well documented in various scientific reports prepared for Environment Southland during the process of setting policies and rules around effluent discharge to land. A 2009 Houlbrooke and Monaghan report provides context and background to the principle that best practice effluent application should not cause adverse effects on water quality. The graph below is taken from the 2009 Houlbrooke and Monaghan report to illustrate that nutrient loss from FDE application is minor if undertaken using best practice. In this example, less than 1% of nutrients applied in effluent reached drainage water on tile and mole drained soil. These soils are considered high risk relative to some of the soils available for effluent discharge at the dairy farm and Horner Block.

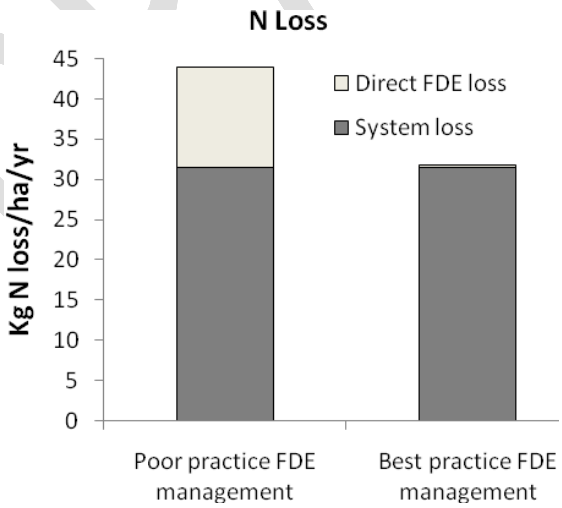

Figure 7.1. Houlbrooke and Monaghan (2009)

The applicants intend to apply effluent in accordance with best practice at all times to avoid adverse or *cumulative effects* on the receiving environment. Houlbrooke and Monaghan (2009) explain that if effluent is applied to soil when a soil moisture deficit exists then the effluent preferentially remains in the soil's root zone as plant available water or is adsorbed onto soil particles. The soluble nutrients in the effluent can then be taken up by the plant and used in nutrient cycling. Microbes can be filtered and held by soil particles until they are no longer viable. The applicants use the closest Environment Southland soil moisture monitoring site, which is available on the ES website, to determine whether a suitable soil moisture deficit exists for each of the irrigation systems. Effluent application, including both dairy shed effluent and slurry, is deferred if soil moisture levels are too high to safely and correctly apply effluent. Effluent is only applied when there is a ground moisture deficit and when effluent application will not induce drainage.

Deferred irrigation

The dairy platform currently has a total storage capacity of 8,032 m³ in two effluent storage ponds, which provides for deferred irrigation for effluent from 1,500 cows at the dairy sheds, 1,280 cows at the wintering barns, and silage leachate according to the Massey Dairy Effluent Storage Calculator. 6,460 m^3 is the 90% probability volume according to the Massey DESC. The ability to defer irrigation during marginal times means that effluent will only be applied when a soil moisture deficit occurs. By deferring irrigation when ground conditions are unsuitable, losses to drainage water should be considerably less than the 1.1% of the total nutrients applied in the effluent experienced in the above-mentioned trial. When soils are near or at field capacity and there is risk of contaminant loss via artificial drainage (or overland flow when soils are saturated) to receiving surfacewaters, or risk of contaminant loss via cracks in Braxton soil types to groundwater, irrigation is deferred by storing effluent in the two storage ponds. The risk of contaminant loss from effluent discharge via artificial drainage, overland flow or deep drainage is in this way mitigated.

Low depth irrigation

Low depth irrigation is defined as an application depth of less than 10 mm per application. Two low depth methods are utilised at the property and Horner Block; a travelling irrigator for dairy shed effluent and the slurry tanker with the trailing shoe for slurry. Both systems can apply effluent at low depths; less than 10 mm per application for the travelling irrigators and a maximum of 2.5 mm per application of pond slurry for the trailing shoe slurry tanker.

By discharging 15.2 m^3/hectare, the slurry tanker system applies effluent at a depth of 1.5 mm and can apply effluent at lower depths (e.g. 1 mm) by speeding up the tractor travel speed. The use of very low depth irrigation using the slurry tanker with a trailing shoe increases the frequency by which it is safe to apply effluent because a lower soil moisture deficit is required prior to irrigation. A slurry tanker with a trailing shoe is available to use at the property, as and when required. The travelling irrigators have been tested and found to apply effluent to a depth of less than 10 millimetres each (see Appendix for reports). The travelling irrigators are only used when a greater soil moisture deficit exists and no rain is forecasted for the following 24 hours.

Where insufficient soil moisture deficit exists, dairy shed effluent irrigation is deferred and diverted to the ponds for storage.

The application of effluent (both dairy shed and slurry) in this manner should reduce the risk of exceeding a soil's infiltration rate, thus preventing ponding and surface runoff of freshly applied FDE. A low application depth also increases the likelihood of retaining the applied nutrients in the root zone. This decreases the likelihood of preferential flow and allows a greater volume of applied FDE to move through smaller soil pores via matrix flow, thus allowing for greater attenuation of effluent contaminants (Houlbrooke et al. 2006, McLeod et al. 1998). This is of importance where subsurface drainage has been installed.

Best practice irrigation minimises the risk of contaminant loss via pathways relevant to the Central Plains and Oxidising physiographic zones; subsurface drainage (tiles) when wet in winter/spring and deep drainage when cracks are present or when soils are saturated. Effluent is not applied over low points, where tile drains have been installed, when soils are near or at field capacity. In addition to this, buffer distances from discharge area to surface waterways are maintained minimising the risk of effluent reaching surface waters directly via overland flow or spray.

Future proof

The applicants may install a low rate irrigation system in the future, such a pods or a cannon/rain-gun travelling irrigator system. They have already demonstrated a willingness to invest, upgrade and innovate, which is evident in their recent investment in wintering barns. They will consider upgrading the dairy shed irrigation system as part of future developments once the current round of investment and expansion has been completed. The proposed system is described in section 6. Low rate irrigation is considered as best practice by Environment Southland, as such it will have effects that are the same or less than low depth irrigation.

Effluent receiving areas and nutrient loading

The effluent receiving area is large and comprises a combination of low and high-risk soils at both the dairy platform and Horner Block. The presence of low risk soils for effluent discharge reduces the risk of contaminant loss to ground and surfacewaters from effluent discharge as it reduces the risk of preferential flow of effluent through drainage channels. It allows higher risk areas to be avoided when there is risk of drainage to receiving ground and surfacewaters.

The N loading of soils from effluent is described in the nutrient budget analysis report and in section 6 of the application where it is demonstrated that the FDE area at the Horner Block and milking platform is sufficiently large to receive both the N loading from slurry effluent and volume of slurry effluent from the storage ponds. The higher strength nature of slurry effluent has been accounted for in calculating the N loading per hectare from slurry effluent.

A maximum of 150 kg N/hectare from dairy shed effluent and slurry will be applied at the dairy platform. The 150 kg N/hectare limit will be adhered to at the dairy platform, which is the standard limit placed on farm dairy effluent discharge activities on milking platforms by Environment Southland.

The scale of the discharge activity allows for the sustainable use of land to receive farm dairy effluent. The consented discharge area is large and has a ratio of over 30 hectares per 100 cows, which is well above the Council recommended ratio of 8 hectares per 100 cows. As is modelled in Overseer, where effluent or slurry is applied to land, fertiliser is reduced accordingly, which mitigates the risk of overloading soils with nutrients such as N and P causing loss to water.

Horner Block – slurry receiving area

A maximum of 250 kg N/hectare will be applied from slurry at the cut and carry Horner Block (97 ha). The block is used to grow grass to feed cows at milking platforms and is not used to graze cows directly. Typically, there will be 4 cuts per season. Cows were grazed at the Horner Block in the past but are no longer grazed there. Urine patches are a major source of N leached to groundwater from pastoral farming. Since no stock are grazed at the Horner Block there are no recent/new urine patches, which greatly reduces the risk of N loss. Cut and carry blocks are efficient at utilising N and generally have low N loss to water despite high N inputs; this is supported by Overseer analysis. Overseer modelled the application of 243 kg N from slurry and predicts low average annual N loss for the HB (i.e. 19 kg N/hectare going forward). This supports a conclusion that the risk of nitrate loss to groundwater underlying the HB is very low. The potential issue of cracking in Braxton soils (arguably not covered by Overseer) is mitigated by monitoring and avoiding areas if and where this occurs.

As is shown in the proposed nutrient budget for the Horner Block, a limit of 250 kg N/hectare will be applied at very low depth at the Horner Block. According, less fertiliser N to be applied than would other be applied for pasture production to ensure that N inputs are not excessive. Overall (from both slurry and fertiliser), no additional N will be applied compared to what has been applied previously.

It is unlikely that the discharge of slurry at the Horner Block will result in elevated groundwater nitrate levels. Due to soil types (Drummond and Waiau) and their drainage properties (matrix flow), much of the HB classed as low risk for effluent discharge. So long as slurry is applied at a depth lower than the soil moisture deficit, there is little or no risk of nitrate loss to groundwater from low risk soils, as supported by Houlbrooke et al. (2006).

Where high risk soils are found (Braxton), there is a potential pathway for nitrate to reach groundwater via deep cracks that can form due to swell/crack properties of these soils. The east of the HB where Braxton soils are found, is monitored for evidence of cracking at high risk times (summer/autumn); slurry will not be discharged to areas where cracks form. Good soil management practices, as shown in the soil test trends appended to the application, mean that deep cracks are unlikely to form. Good pasture cover (and plant root structure) is always maintained, again minimising the risk of cracks to groundwater forming in the soil profile.

Downstream users of groundwater are dairy, sheep and cropping farms. These will not be adversely affected by the N loading of soils from slurry at the HB, as little or no N applied in slurry will be lost to groundwater; it will be taken up by plants and harvested as part of the cut and carry operation. Similarly, Drummond Township, Primary School and Kindergarten will not be affected by the N loading of soils from slurry at the HB. Groundwater nitrate levels in the vicinity and south of the HB are in the range of 1.0 – 8.5 g/m^3, so are below the NZ Drinking Water MAV of 11.3 g/m^3. The cumulative effect on groundwater nitrate levels from the N loading from slurry at the HB will extremely low due to the above reasons. The effects of the N loading from slurry effluent on groundwater will be less than minor, and much lower than when the HB was used in the past to winter graze cows on fodder crop.

Summary of mitigations for HB

- Slurry is applied at very low depth using slurry tanker with trailing shoe (less than or equal to 2.5 millimetres per application), when there is sufficient soil moisture deficit and nil risk of drainage;
- Soils are monitored for evidence of cracking; if and where this occurs slurry is not discharged;
- N loading is to a cut and carry block, so uses relatively high N inputs to grow grass. N is utilised efficiently to grow grass resulting in low N loss below the root zone;
- A maximum of 250 kg N/hectare will be applied from slurry annually;
- Recommended buffers will be adhered to when discharging slurry.

Summary of surfacewater mitigations for effluent discharge

Due to the implementation of good management practices and mitigation measures, there will be minimal risk to receiving surfacewaters in the Waimatuku, Oreti and Aparima catchments, the Waimatuku, Jacobs Riverand New River Estuaries, coastal waters and their values from the discharge activity. ***Effects on receiving surfacewaters due to the proposed activity will be no more than minor.***

- Irrigation of FDE is deferred when there is insufficient soil moisture deficit to safely apply effluent or when there is risk of drainage following irrigation of effluent. Effluent is stored in two large effluent ponds, which have sufficient storage for proposed activity according to the Massey DESC. This is effective at avoiding the risk of contaminant loss to surfacewaters from effluent when soils are at or above field capacity.

- Low depth irrigation methods are used to apply effluent to land. A slurry tanker with a trailing shoe is always available and can apply slurry effluent to depths as low as 1 mm per application, and always applies slurry at no more than 2.5 mm per application, which increases the number of irrigation days when effluent can safely be applied to land without risk of drainage. The travelling irrigators apply effluent to depths of less than 10 mm per application. Irrigation using the travelling irrigators is deferred by diverting effluent to the storage ponds unless there is sufficient soil moisture deficit. There is minimal to receiving surfacewaters when irrigating using these methods where there is sufficient soil moisture deficit. A low rate system may be installed in the future.

- Recommended buffers to waterways are implemented, mitigating the risk of contaminants present in effluent (i.e. N, P, microbes) reaching surfacewaters via overland flow. Effluent is not applied over tile drains when there is risk of preferential flow via drains to surfacewaters, mitigating the risk of the same contaminants present in effluent reaching surfacewaters via artificial drainage.

- The discharge area is sufficiently large both in terms of the area (ha) per 100 cows, and the N loading from effluent to effectively mitigate the risk of contaminant loss from effluent to surfacewaters. The dairy platform application rate will not exceed 150 kg/hectare from effluent, and the Horner Block will not exceed 250 kg N/hectare from effluent. The high strength nature of slurry effluent has been allowed for in calculating the N loading from slurry effluent. The on-site slurry tanker allows for very low application depths, which effectively controls the N loading per hectare from slurry and minimises the risk of contaminants present in effluent being lost to receiving surfacewaters.

Groundwater – mitigation of effects

Many good management practices and mitigation measures for effluent discharge described above also apply to avoiding, remedying and mitigating adverse effects on groundwater. These practices and measures are not repeated here; please refer to above. Whilst the effects of the discharge and dairy farming activities on groundwater are assessed separately in Section 7.1 and 7.3 respectively, it is difficult to separate these effects in practice.

The major contaminants present in effluent that are of risk to groundwater are nitrate and faecal microbes, with *E.coli* used as an indicator of faecal contamination of groundwater. As is described in Section 5, groundwater flow for much of the property is predominantly to the south (Waimatuku Zone). The east of the property overlies the Central Plains Zone, where groundwater may flow to the south/south east. Heddon Bush School due south of the discharge area also overlies the Waimatuku Groundwater Zone. Braxton soil types have swell/crack characteristics that can allow contaminants in effluent to be washed down to the underlying groundwater resource via deep cracks that can form during prolonged dry summer conditions. These soils require appropriate effluent management to avoid the loss of contaminants in effluent to groundwater via cracks. As already mentioned, an on-site investigation by Environment Southland in January 2018 found no evidence of deep cracking of Braxton soil types. A conclusion drawn was that Braxton soils at the dairy platform and Horner Block may not in fact be prone to deep cracking. Drummond and Glenlg soil types are low risk for effluent discharge due to their physical properties (and drainage properties), and due to the nature of the discharge activity.

Nitrate in groundwater due to the discharge activity:

Nitrate levels in groundwater are described in depth in Section 5. Given the nature of effluent management at the property and Horner Block, in addition to the scale of the discharge activity including the N loading of soils from effluent (dairy shed and slurry), it is very unlikely that the discharge of effluent at the property and the Horner Block will adversely affect water quality through an increase in groundwater nitrate concentrations from effluent.

Despite its tendency to suffer from localised contamination, the bore at the south end of the property (E45/0622) has demonstrated relatively low groundwater nitrate concentrations over the last five years (1.0 – 3.5 g/m^3), albeit with evidence of wellhead contamination due to its design, and therefore elevated nitrate levels at times. These localised events should not adversely affect groundwater quality beyond the zone of reasonable mixing. A monitoring bore located mid-farm/east on lighter soils and in a different groundwater zone (E45/0665) shows higher levels of groundwater nitrate over the last three years, indicative of moderate to high land use impacts (3.5 – 8.5 g/m^3), but much lower than at an ES monitoring bore located at Boyle Road to the south east of the property, where groundwater nitrate levels are at or above the NZ Drinking Water Standards MAV of 11.3 g/m^3. Bores located to the east show evidence of higher groundwater nitrate levels than at the dairy platform. Given that groundwater nitrate levels are lower at the WOL/WTL dairy platform it is unlikely that the discharge of effluent at the property and the Horner Block is adversely affecting water quality, *including cumulatively*, through an increase in groundwater nitrate concentrations from effluent discharge. Groundwater nitrate levels underlying the property have been reasonably stable since bore testing began. The "farming" effect on free draining soils is likely to have a greater effect on groundwater nitrate levels than effluent discharge on low risk soils. For instance, farming practices such as growing fodder beet/winter grazing of cows on free draining soils are expected to have a greater cumulative effect on groundwater quality and moving away from this practice should see an improvement for groundwater quality, although it may be difficult to detect this due to effects from other properties and activities in the area.

There is little or no risk to the registered bore for drinking water supply at Heddon Bush School from the discharge of effluent (dairy shed and slurry) at the dairy platform and the Horner Block. The bore for school water supply (E45/0718) was recently tested (2017/2018) and returned nitrate concentrations in the range of 1.8 – 2.0 g/m^3. Given the following factors, adverse effects from the discharge activity such as an increase in groundwater nitrate levels would have been seen for some time in the vicinity of the school *if they were present*:

- the proximity of the school;
- land use in the area since the 1980s including cereal cropping, sheep farming and intensive winter grazing;
- the length of time that the property has been used for farming;
- the southerly direction of groundwater flow;
- the estimated lag time for nitrate at the surface to reach the water table and the underlying groundwater stream, and
- the estimated velocity of groundwater flow.

The evidence so far does not indicate that the discharge activity at the dairy platform and the Horner Block is having an adverse effect on the Heddon Bush School water supply through an increase in groundwater nitrate levels. The depth of the school bore further helps to protect it from land-use effects. The proposed activity is the same in nature and is of slightly increased scale compared to the existing discharge activity; there will be little or no increase in groundwater nitrate related adverse effects at Heddon Bush School.

The bore located at the south of the property (E45/0622) has been described above and is believed to be in the same "stream" of groundwater flow as the Heddon Bush groundwater supply. Its nitrate levels are generally low, with the already described localised contamination events due to poor well design. The applicants are proposing to install a new monitoring bore using industry best practice methods, which should not have issues with wellhead contamination. The new bore will be located at the south of the property, in

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the groundwater "stream" believed to flow towards Heddon Bush School. Water quality results from the bore will be monitored by the applicants and used to inform decision making at the property relating to the management of the discharge activity.

Shallow groundwater in the Waimatuku Catchment is understood to discharge to the local stream network. An effect of groundwater nitrate could be a very small increase in nitrate levels in downstream receiving waters such as shallow streams (connected to groundwaters), the Waimatuku Stream and eventually coastal waters. The risk of nitrates in effluent reaching groundwater is mitigated through using deferred storage and low depth irrigation. There is minimal risk to receiving surfacewaters through the discharge of groundwater from the discharge activity.

Faecal contamination of groundwater due to the discharge activity

If faecal microbes from the discharge activity are/have been reaching groundwater, the testing of groundwater in the vicinity of the property, especially from bores located in the south, could reveal this to be the case. Section 5 describes data from bores at the property and bores, and the previous section of this section (7.1) describes and assesses the risk of adverse effects on groundwater due to nitrate from effluent discharge. Much of these processes and potential effects directly apply to microbes also.

Groundwater testing of bores at and at the property are generally negative for *E.coli*, but at times return positive results with general low counts. As has already been explained, the south bore at the property (E45/0622) experiences localised contamination due to its design, which makes it unsuitable for use a monitoring bore and makes interpretation of *E.coli* data from the bore questionable; *E.coli* data from the WOL bore are corrupted by localised contamination. Following the zone of reasonable mixing, there is likely to be minimal adverse effect on the wider groundwater resource from this localised source. It is proposed to install a new monitoring bore at the south of the farm, which should eliminate the issue of localised contamination and provide a valid source of reliable groundwater data going forward.

The mid-farm/east monitoring bore (E45/0665) has generally been negative for *E.coli* since it was installed in 2015. It has returned three positive *E.coli* results in that time. The relatively high result in November 2017 is an outlier in the dataset and was likely to have been due to recent prolonged heavy rainfall, which occurred between November 3rd and 12th, and resulted in a high level and rate of drainage and the observed *E.coli* result (see figure 7.2). The subsequent test in April 2018 was negative for *E.coli* (<1 MPN/100 ml). It is noted that the ES monitoring bore at Boyle Road, which is southeast of the WTL bore and in the same groundwater zone, is tested every three months, has consistently been negative for *E.coli* in recent years with the exception of December 2017 (5 MPN/100 ml). It too was subsequently negative for *E.coli* in March 2018 (<1 MPN/100 ml). This indicates that if groundwater contamination occurs due to very high rainfall events and subsequent rapid drainage, it is relatively short lived, which is in line with the length of time that *E.coli* and similar microbes are believed to remain viable in groundwater (three months or less).

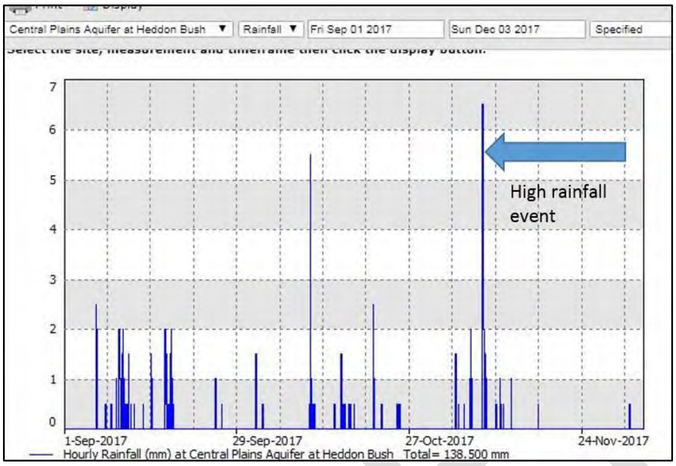

Figure 7.2. Rainfall at Central Plains Aquifer at Heddon Bush.

Slurry effluent is high strength in nature, including its microbial content. Applying slurry effluent at a low depth when there is sufficient soil moisture deficit (e.g. 2 mm depth per application) at the dairy platform and the Horner Block, ensures that the microbial loading of soils is low enough to allow soils to filter microbes, allowing them to be retained in the topsoil sufficiently long for microbes to die off and become unviable. U.V. radiation also plays a role in this process. The N loading limits of 150 kg/hectare and 250 kg/hectare at the dairy platform and Horner Block respectively, will allow for control on the soil loading of microbes from effluent by proxy. So long as effluent irrigation is deferred as required and does not induce drainage, microbes will be filtered and adsorb onto soil particles without leaching and will die off. Irrigation is deferred when soil conditions are unsuitable, which helps to mitigate an increased risk from a higher water table during wetter periods.

The same potential cracking process described for Braxton soils for nitrate contamination also applies to microbes. On-site investigation found that the risk of Braxton soils at the property and Horner Block cracking is lower than previously thought. So long as best practice effluent management is followed and soils are monitored for cracking, then there is minimal risk of microbes being transported to groundwater.

In summary the effect from the discharge of effluent (dairy shed and slurry) at the dairy farm and Horner Block in terms of microbial contamination of groundwater will be no more than minor.

There is little or no risk of microbial contamination of the registered bore for drinking water supply at Heddon Bush School from the discharge of effluent (dairy shed and slurry) at the dairy platform and the Horner Block. The bore has been tested quarterly since it was drilled and has consistently returned negative *E.coli* results (<1 MPN/100 ml). Given the factors listed on page 130, as well as the lifetime of *E.coli* in the environment (up to 3 months according to Edberg et al. 2000), adverse effects from the discharge activity such as microbial

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contamination would have been seen for some time in the vicinity of the school *if they were present*. The evidence so far does not indicate that the discharge activity at the dairy farm property and the Horner Block is having an adverse effect on the Heddon Bush School water supply through faecal contamination of groundwater. The proposed discharge activity is the same in nature and is of slightly increased scale compared to the existing discharge activity; there will be little or no increase in faecal microbes due to the proposed activity. It is noted that the depth of the school bore further helps to protect it from land-use effects, as does the presence of an ozone purification treatment system.

The bore located at the south of the property (E45/0622) has been described above and is believed to be in the same "stream" of groundwater flow as the Heddon Bush groundwater supply. It is unsuitable for use as a monitoring bore as it suffers from localised contamination due to its design. The applicants are proposing to install a new monitoring bore using industry best practice methods, which should not have issues with localised contamination. The new bore will be located at the south of the property, in the groundwater "stream" believed to flow towards Heddon Bush School. *E. coli* results from the bore will be monitored by the applicants and used to inform decision making at the property.

In conclusion there is minimal risk that consumers of groundwater, including at Heddon Bush School, will develop gastroenteritis due to faecal contamination of groundwater from the discharge activity. Good well-head maintenance at a new monitoring bore will help to ensure that there is no localised faecal contamination of groundwater to the discharge of effluent at the property.

Summary of mitigations for groundwater

Due to the implementation of good management practices and mitigation measures, there will be minimal risk to underlying groundwater resources, including the Waimatuku, Central Plains and Upper Aparima Groundwater Zones due to the discharge of effluent at the property and Horner support block. ***Effects on groundwater due to the proposed discharge activity will be no more than minor.***

- Irrigation of FDE is deferred when there is insufficient soil moisture deficit to safely apply effluent or when there is risk of drainage following irrigation of effluent. Effluent is stored in two large effluent ponds, which have sufficient storage for effluent from the proposed activity according to the Massey DESC.

- Low depth irrigation methods are used to apply effluent to land. A slurry tanker with a trailing shoe is always available and can apply slurry effluent to depths as low as 1 mm per application, and typically applies effluent to depths of 1.5 mm per application, which increases the number of irrigation days when effluent can safely be applied to land without risk of drainage. The travelling irrigators apply effluent to depths of less than 10 mm per application. There is little or no risk to receiving groundwater when irrigating using these methods where there is sufficient soil moisture deficit. A low rate irrigation system may be installed in the future.

- Soils are monitored for the formation of cracks. Effluent is not applied on Braxton type soils, if and where cracks form following extended summer dry periods. This mitigates the risk of effluent loss via preferential flow down deep cracks to shallow groundwater.

- The discharge area is sufficiently large both in terms of the area (ha) per 100 cows, and the N loading from effluent. The high strength nature of slurry effluent has been allowed for in calculating the N loading from slurry effluent. The on-site slurry tanker allows for very low application depths, which effectively controls the N loading per hectare from slurry. Slurry is typically applied at depths of 1.5 – 2.0 mm per application, which minimises the risk of contaminants present in effluent being lost to groundwater during drainage events. The slurry tanker application depth allows for effective control of N loading and microbial loading of soils, which allows microbes to be retained in the topsoil, filtered and attenuated until they become unviable.

- Installation of a new monitoring bore is proposed at the south of the dairy farm property to eliminate issues relating to localised contamination of the shallow E45/0622 bore. The bore will be used to monitor groundwater quality flowing south, in the predominant direction of groundwater flow at the property and in the direction of Heddon Bush School. Data collected from monitoring groundwater quality will be used to inform on decision making at the property, including effluent management.

Soil health

There is little or no risk to the life supporting capacity of soils due to the effluent discharge activity. The utilisation of land treatment for effluent allows for the sustainability of the soil ecosystem. The soils are suitable for effluent irrigation and the discharge follows current good management practice, which is described in Section 6 of the application and the FEMP. These include practices of a general nature and those specific to the contaminant transport pathway for the physiographic zones at the property (artificial drainage, deep drainage).

The existing storage ponds allows for deferred storage until the soil moisture content is suitable for irrigation for 1,500 cows on the farm. The land disposal area is larger than the best practice recommendation of 8 hectare per 100 cows. The land disposal at the Horner Block and dairy platform is sufficiently large to receive slurry effluent from the ponds, without exceeding the 250 kg N/hectare limit for the Horner Block, and 150 kg N/hectare for the dairy platform. The quantity of N spread from dairy shed effluent and slurry effluent over the proposed discharge area at the dairy platform is below the recommended restriction of 150 kg N typically placed on discharge permits by Environment Southland. This system is sustainable in the long term as it allows the effluent to be used both as a fertiliser and a soil conditioner, which improve the soil's health.

An ongoing soil monitoring programme is carried by the applicants and their fertiliser supplier (Ravensdown) at the dairy platform and Horner Block. Trends in soil tests are evaluated and used to inform on decision making, including effluent management. See the appended reports from Ravensdown for the WOL and WLD dairy units and the Horner Block. Good nutrient management is evident in soil fertility trends and is indicative of healthy soils. ***Effects on the soil resource due to the proposed effluent discharge activity will be no more than minor.***

Effluent storage and infrastructure

The effluent system is described in detail in Section 6 and meets the needs of 1,500 cows, including a maximum of 1,280 cows in the wintering barns, according to the Massey DESC.

WTL's storage pond stores slurry and does not have a leak detection system. It was drop tested in 2017 and a drop test report was submitted to Environment Southland who accepted that the pond was not leaking. The drop test met all criteria set out in Appendix P, except for the unavoidable presence of a crust on slurry. The drop test report is appended to this application. The characteristics of slurry and liquid effluent in storage systems are quite different. The viscosity of slurry is a lot lower than liquid effluent and as a result, slurry is self-sealing whereas liquid effluent is not. Also, the issue of wind-driven wave action causing bank erosion does not arise when storing slurry.

WOL' storage pond was upgraded in autumn 2018, when its storage capacity was increased and a synthetic liner (1.5 mm HDPE) was installed. The liner overlies a leak detection drain system, the specification for which was provided by a CPEng. The pond design was certified by a CPEng as meeting Practice Note 21 standards. CPEng sign off for the pond was submitted to Council as required. The leak detection system terminates at a 400 mm diameter inspection well. The leak detection inspection well has been inspected and either had no liquid or had liquid when the water table was high. The liquid had was clear and had no odour. There is therefore no evidence of leakage from the pond.

A visual inspection report prepared by a SQP for the ponds and ancillary storage structures was be completed and is appended to this application.

Two low depth travelling irrigation systems used at the dairy platform have been tested as per consent conditions and found to meet the required depth of less than 10 mm/application (see Appendix). The slurry tanker with the trailing shoe has been tested in the past and shown to achieve very low application depths; it can be retested if necessary. A low rate system such as pods or a cannon/rain-gun system may be installed in the future, once the current round of investment and expansion has been completed.

Summary

It is reasonable to conclude that there will be little or no risk to groundwater or surface waters including cumulatively, or to the soil resource by granting replacement of the existing discharge permit to allow for the discharge of effluent from 1,500 cows at the Woldwide One and Woldwide Two dairy platform, and at the Horner Block. The effects of the activity have been considered and are no more than minor.

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Alternatives to effluent discharge methods

The irrigation systems in place are designed to meet best practice guidelines – specifically the use of very low depth, low depth irrigation and deferred storage of effluent. The applicants believe their system is both cost-effective and easy to manage.

An umbilical system has been included in the discharge permit because it provides a method of discharging large volumes of effluent at very low depths to different parts of the effluent discharge area. The umbilical system will be used as a potential back up to the low depth travelling irrigator irrigation system and low depth slurry tanker.

The umbilical system is a high rate/low depth application method. The depth of application is closely controlled by tractor speed. Typically, the depth of application will not exceed 3 mm for the umbilical system and can apply slurry at lower depths (e.g. 2 mm) by increasing the tractor travel speed. At this depth it poses no more potential for adverse effects on the receiving environment as the low depth irrigation systems.

Low rate irrigation has been included in the discharge permit because it is a best practice management irrigation method. A low rate pod or cannon/rain-gun irrigation system may be installed and used to complement the low depth travelling irrigator irrigation system and low depth slurry tanker.

The pods and cannon travelling irrigator systems are low rate/low depth application methods. They pose no more potential for adverse effects on the receiving environment as the low depth irrigation systems.

7.2 Water Take

The water take is from the Waimatuku Groundwater Zone, which is described in Section 5.

The abstraction should have a less than minor effect on aquifer sustainability and water availability. The Waimatuku Groundwater Zone has low allocation status and the proposed take is moderate, although it is increasing relative to applicant's existing take. The applicants seek a maximum abstraction of 180,000 litres of groundwater per day. This is consistent with a total of 120 L/cow/day by allocating 70 L for stock drinking water and 50 L for shed wash down water for 1,500 cows. This equates to an annual take of 55,296 m^3 based on seasonal milk supply and a winter take for drinking water for stock in wintering barns. The take is considered reasonable in terms of Policy 21 of the Regional Water Plan. Based on the estimated recharge rate to the Waimatuku Groundwater Zone (Lincoln Environmental, 2003), annual recharge of the aquifer underlying the property is approximately 2,344,340 m^3. The annual water take is 2.4% of this volume.

Groundwater is abstracted from three bores at the property for dairy shed supply and stock drinking water, and bores are over 50 metres apart. The rate of take from individual bores does not exceed 2 L/sec and should not cause stream depletion effects on adjacent water bodies. Three water storage tanks are utilised at each dairy shed to ensure that the rate of take does not exceed 2 L/sec. The nearest neighbouring bore is over 700 m from the abstraction point and should not experience drawdown effects due to the take. There will be little or no effect on other water uses due to the water take.

Water efficiency will be a key focus on farm. Simple tasks such as keeping water reticulation systems and dairy shed plumbing in a good state of repair will prevent water leaks and reduce water wastage. Water metering devices have been installed to ensure the water use is monitored via a standard cumulative water meter and will allow the data to be supplied to Council as per the consent conditions.

Overall the abstraction should have a less than minor effect on water availability, other water users or the Waimatuku Groundwater Zone.

Assessment of Alternatives for Water Supply

There have not been any improvements in technology, which would achieve a better environmental result than the current groundwater supply to the farm. Effects on bore yields on neighbouring bores are expected to be no more than minor; the proposed groundwater take is greater than the existing take, but is still low relative to recharge rates in the groundwater zone. There is no surface water take. There will be no effect due to this activity on in-stream life, wetlands, recreational activities or marginal strips.

7.3 Dairy Farming – Land Use

Overseer is used to understand the nutrient interactions of a farm system based on soil properties, rainfall, drainage and feed requirements. The output from Overseer gives an indication of how much nutrient may be lost to the environment but it does not describe what the environmental impact of these losses is likely to be. Assessing the environmental effect of modelled nutrient losses from individual properties is complex because nutrients travel via different pathways through the receiving environment undergoing attenuation, processing, mixing, dilution and dispersion processes which can significantly change the quantity and nature of these nutrients in the receiving water bodies. The assessment provided here attempts to assess the effect of the proposed dairy farming activity in the receiving environment and the likelihood of effects, and explain what mitigation measures to be implemented in order to avoid or mitigate effects. The AEE is split into groundwater and surfacewater receiving environments.

Notes:

1. *Land referred to as Marcel/SH96 is included in this AEE, along with the former WOL and WTL dairy platforms. Land referred to as Marcel/SH96 is not assessed/considered separately as it is authorised under the land use consent for dairy farming #20171278-03 and is part of the existing environment. The application and nutrient budgets were structured to reflect this, with the discharge and farming activities on land referred to as Marcel/SH96 assessed and considered as part of the proposed dairy platform.*

2. *Environment Southland received legal opinion regarding the Horner Block. Based on the LO, the Horner Block is not part of the landholding at WOL/WTL dairy platform. It is not included in this AEE for the dairy farming activity.*

3. *Woldwide Runoff is not included in this AEE for the dairy farming activity. An AEE for Woldwide Runoff is provided in a separate report.*

Groundwater - AEE including cumulative effects of activity and mitigations

Table 7.1 summarises potential effects, likelihood of effects and mitigations. Table 7.1 links to table 6.5, which describes specific mitigation measures in detail.

Adverse effects on groundwater can occur from the expanded dairy farm activity where contaminants present in dung, urine, effluent, fertiliser and silage pad leachate, such as nutrients N (nitrate) and microbes (pathogens such as campylobacter) reach groundwater via leaching/deep drainage pathways. A major risk of elevated nitrate levels in groundwater is to users (consumers) of groundwater as nitrate becomes toxic to living organisms such as humans, animals and fish at high levels. The New Zealand Drinking Water Standard maximum allowable value for nitrate is 11.3 ppm. Another risk is to consumers of groundwater is waterborne gastroenteritis through the ingestion of groundwater contaminated with pathogens such as campylobacter. This was demonstrated in Havelock North in 2016, when over 5,000 people became ill with campylobacteriosis. Adverse effects on other users of groundwater such as Heddon Bush School, other farms, small industries or settlements/domestic users can occur and need to be avoided or mitigated.

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Table 7.1 Risk of adverse effects from the proposed dairy farming activity due to contaminants N and microbes in groundwater. This table links to table 6.5 (mitigation measures).

Potential effect of N in groundwater	Related effects	Specific mitigations proposed at the dairy farm	Likelihood of effect due to proposed dairy farming activity	Risk of effect due to proposed dairy farming activity
Human health effects (methemoglobinemia) from groundwater consumption at Heddon Bush School if groundwater nitrate concentrations are at or above the NZDWS MAV of 11.3 ppm	n/a	See table 6.5 for explanations of effectiveness of mitigation measures. Measures #1, 2, 3, 4, 5, 6	Low likelihood due to the: nature and scale of activity; evidence of low groundwater nitrate levels at the south of the property and at Heddon Bush School in 17/18; and implementation of migration measures.	No more than minor
Human health effects (methemoglobinemia) on groundwater consumers in the Central Plains groundwater zone to the south east when groundwater nitrate concentrations are at or above the NZDWS MAV of 11.3 ppm	n/a	See table 6.5 for explanations of effectiveness of mitigation measures. Measures #1, 2, 3, 4, 5, 6	Low likelihood due to the: nature and scale of activity; evidence of groundwater nitrate levels at the east of the property between 3.5-8.5 ppm; and implementation of migration measures (particularly, the removal of fodder beet cropping/winter grazing from the north east of the property where lighter/more leaky soils are found).	No more than minor

Ecological effects due to discharge of groundwater with elevated nitrate to shallow streams in Waitmatuku catchment	Fish kills in Waimatuku Stream due to nitrate toxicity; Eutrophication of receiving surfacewaters (Waimatuku); Recreational effects; fishing in Waimatuku is reduced;	See table 6.5 for explanations of effectiveness of mitigation measures. Measures #1, 2, 3, 4, 5, 6	Low likelihood since N concentration in receiving waters is lower than toxicity level, and the nature and scale of the activity and implementation of proposed migration measures further reduce the likelihood of the effect occurring. See table 6.5 for explanations of effectiveness of mitigation measures.	No more than minor
Human health effects due to faecal contamination of groundwater	Gastroenteritis such as camplyobacteriosis by consuming contaminated groundwater, including at Heddon Bush School	As per table 6.5 Measures #1, 2, 3, 5, 6, 7, 10	Low likelihood due to: implementation of mitigation measures; monitoring for soil cracks and avoidance of cracks when grazing stock or discharging effluent or slurry; limited viability of microbes in groundwater; and use of an ozone purification system at Heddon Bush School.	No more than minor

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Soil type and groundwater

There is risk to groundwater at the dairy platform from two soil processes:

1. Drummond/Glenelg soils are free draining and therefore have risk of contaminant loss via deep drainage to underlying aquifers due to their physical properties. Approximately 378 hectares (or 79%) of the dairy platform has Drummond and Glenelg soil types.
2. Braxton soil types have swell/crack characteristics that can allow contaminants present in dung and urine to be washed down to the underlying groundwater resource via deep cracks that can form during prolonged dry summer conditions. Parts of the property with Braxton soils types (approximately 100.5 hectares or 21%) require appropriate management to mitigate the risk of contaminant loss to groundwater if and where deep cracks form.

Nitrate loss to groundwater

Braxton soil types are believed to have a lower risk of deep cracking than previously thought and therefore also a lower risk of nitrate reaching groundwater via bypass drainage. They also have some denitrification potential. They have higher risk of N loss to surfacewaters via artificial drainage. These properties are reflected in low groundwater nitrate levels at the south and to the south, which is in the direction of groundwater flow for much of the property, including Braxton areas. *Despite this, Braxton soils need to be monitored at high risk times for the presence of deep cracks and managed appropriately.*

Drummond and Glenelg soils have low denitrificiation potential and are classed as Oxidising. Some N lost to water below the root zone in Drummond and Glenelg soils (i.e. 12 – 17 ppm estimate according to Overseer), is likely to reach the groundwater resource. It is not practical to quantify how much nitrate is reaching groundwater, given tools available/present day science. Nonetheless, a moderate loss of N to the groundwater resource will contribute to the N loading of groundwater underlying Oxidising soils, which cumulatively gives a concentration of between than 3.5 – 8.5 ppm for the Oxidising area (according to ES modelling). This is supported by bore testing at the property.

As has already been discussed, groundwater nitrate levels increase to the east of the dairy platform, as soils become progressively lighter and there is a transition to the Central Plains Groundwater Zone. A nitrogen hotspot is found to the south east of the property in the Central Plains Zone, where nitrate levels are frequently in excess of the NZ Drinking Water Standards (>11.3 ppm). Testing of a monitoring bore at the east side of the dairy platform (also found on Drummond soils and in the Central Plains Groundwater Zone) had a mean of 8.1 (range +/- 1.9) ppm in recent years. This is lower than at the Boyle Road/Heenan's Corner area, where the hotspot is centred.

Water percolating through to the underlying aquifer undergoes mixing and nutrients are diluted. As is explained in section 5, land use nitrate effects on groundwater in the area start to be seen within a year, and certainly are evident within three years. Since much of the wider area has been used for dairy farming, cereal cropping, winter grazing and sheep farming for many decades, effects on groundwater have been present for decades. The hotspot to the southeast is likely to reflect this. In terms of the proposed dairy expansion, there will be extensive mixing within a large aquifer and some dilution thereafter, which will change background N concentrations by a small degree, and cumulatively will give a concentration of no more than 1.0 – 8.5 ppm for the majority of the dairy platform.

Although the proposed activity represents an expansion of dairying through an increase in cow numbers, there will be less N lost to water due to the implementation of mitigation measures and good management practices, and therefore less effect on the groundwater resource and its associated values relative to the pre-expansion system. These help to reduce the accumulation of N in soils, particularly from mineralisation processes associated with forage brassica/beet fodder cropping, and grazing of fodder crops, particularly during winter and spring. Since less N accumulates in soils, then less N is lost to groundwater (and surfacewaters).

Groundwater nitrate effects

As is explained above, the main risk of elevated nitrate levels in groundwater is to users (consumers) of groundwater as nitrate becomes toxic to living organisms such as humans, animals and fish at high levels. Nitrate levels are likely to be maintained in the receiving groundwater resource between 1.0 – 8.5 ppm due to the proposed dairy farm activity. This is supported by bore data at the dairy platform. This will not result in adverse effects on other users of groundwater such as other farms, small industries, schools or settlements/domestic users; values of bore users in the groundwater zone will not be adversely affected. Values such as the protection of human health, animal health, sustainable farming and economic wellbeing will not be adversely affected by groundwater nitrate levels of 1.0 – 8.5 ppm, which are below the NZDWS maximum allowable value of 11.3 ppm.

The risk due to the proposed expansion to the bore water supply at Heddon Bush School needs to be carefully assessed. Groundwater underlying much of the dairy platform, flows south in the direction of the school. As is already described, groundwater nitrate levels at the south of the property are consistently low (despite an issue with localised well contamination). Given the following factors, adverse effects from the dairy farming activity such as an increase in groundwater nitrate levels, would have been seen for some time in the vicinity of the school *if they were present*:

- the proximity of the school;
- land use in the area since the 1980s including cereal cropping, sheep farming and intensive winter grazing;
- the length of time that the property has been used for dairy farming;
- the southerly direction of groundwater flow;
- the estimated lag time for nitrate at the surface to reach the water table and the underlying groundwater stream, and
- the estimated velocity of groundwater flow.

Sampling of the school bore over three dates in late 2017 and early 2018 returned a mean nitrate concentration of 1.9 ppm. This indicates that groundwater nitrate levels at the school are low and pose minimal risk to health. It also indicates that there are minimal effects on groundwater quality at the school from the dairy farm 2.3 km north of the school. Finally, it is unlikely that there will be any increase in adverse effects due to the proposed expansion. It is noted that the school bore is drilled to a depth of over 14 metres, which further reduces any potential risk.

Microbial loss to groundwater

If faecal microbes are/have been reaching groundwater, the testing of groundwater in the vicinity of the property, could reveal this to be the case. Groundwater testing of bores at the dairy platform are generally negative for *E.coli*, but at times return positive results with generally low counts. As has already been explained, the south bore at the dairy platform (E45/0622) suffers from localised contamination due to its design. This is reflected in the positive *E. coli* results for that bore, which corrupt the dataset making the bore unsuitable for monitoring purposes. Following the zone of reasonable mixing, there is likely to be minimal adverse effect on the wider groundwater resource from this localised source. *It is proposed to install a new monitoring bore at the south of the farm, which will eliminate the issue of localised contamination, making E.coli results valid, reliable and an important information source.*

The mid-farm/east monitoring bore (E45/0665) has generally been negative for *E.coli* since it was installed in 2015. It has returned some positive results (three) in that time, with one result likely to be an outlier in the dataset. The relatively high result in November 2017 was likely to be due to recent heavy rainfall that occurred between November 3rd and 12thand resulted in a very high level of drainage and the observed positive *E. coli* result (see figure 7.2). The subsequent test in April 2018 was negative for *E.coli* (<1 MPN/100 ml). It is noted that the ES monitoring bore at Boyle Road, which is southeast of the WTL bore and in the same groundwater zone, has consistently been negative for *E.coli* in recent years with the exception of December 2017. It too was subsequently negative for *E.coli* in March 2018 (<1 MPN/100 ml). This indicates that if groundwater contamination occurs due to very high level and rate of drainage, it is relatively short lived, which is in line with the length of time that *E.coli* and similar microbes are believed to remain viable in groundwater (three months or less). Land immediately south of the dairy platform is agricultural (dairying and dry stock) so there is minimal risk to human health from groundwater in the area. Heddon Bush school is further south and is assessed in a following section.

There is minimal risk of microbial contamination of the registered bore for drinking water supply at Heddon Bush School from the proposed dairy farming activity. According to the school principal, the bore has been tested quarterly since it was drilled and has consistently returned negative *E.coli* results (<1 MPN/100 ml). Given the bullets points summarised on the previous page as well as the lifetime of *E.coli* in the environment (up to 3 months according to Edberg et al. 2000), adverse microbial effects on the school bore should have been detected if they were present. The evidence so far does not indicate that dairy farming activity is having an adverse effect on the Heddon Bush School water supply through faecal contamination of groundwater. The proposed 1,500 cow activity is similar in nature (with some beneficial mitigation measures that will maintain good soil structure and health, and reduce microbial accumulation at high risk times), and is of slightly increased scale compared to the pre-expansion land use; there will be no increase in faecal microbes reaching groundwater due to the proposed activity. *Furthermore, the depth of the school bore further helps to protect it from land-use effects, as does the presence of an ozone water purification treatment system.*

The new monitoring bore will be located at the south of the property, in the groundwater "stream" believed to flow towards Heddon Bush School. *E. coli* results from the bore will be monitored by the applicants and used to inform decision making at the property. In conclusion there is minimal risk that consumers of groundwater, including at Heddon Bush School, will develop gastroenteritis due to the dairy farming activity. Good well-head maintenance at a new monitoring bore will help to ensure that there is no localised faecal contamination of groundwater.

Based on the above assessment, the effects of the proposed dairy farming activity on groundwater will be no more than minor.

Surfacewater - AEE including cumulative effects of activity and mitigations

Artificial drainage and overland flow are pathways by which contaminants (nutrients N and P, sediment and microbes) present in dung, urine, effluent and silage leactate may reach receiving waters such as surfacewater streams, the Waimatuku Stream, Waimatuku Estuary, the Oreti River, New River Estuary, Aparima River, Jacobs River Estuary and coastal waters. The major risk to surface waters is from contaminant loss via subsurface drainage channels that occurs following periods of heavy rain, when the soil's field capacity is exceeded and bypass drainage events occur; nutrients N and P, sediment and microbes are transported via subsurface drainage to streams. Due to its very flat topography, overland flow is not a particular risk to surfacewater quality at the property. There are, however, low points close to tile outfalls that can act as CSAs at times, where water can pond following intense rainfall. Runoff from tracks and lanes to surface waterways can occur risk close to and at culvert crossings following intense rainfall.

At the farm scale it is very difficult to quantify contaminants being lost to surfacewaters and their contribution to cumulative effects on receiving waters; there will be much seasonal and spatial variation in this. Furthermore, measuring the volume of drainage water leaving a sub-catchment and the concentration of nutrients in drainage water would require expensive equipment as well as long term monitoring to allow for temporal and spatial variation; this is not practical given available scientific methods. For these reasons, Overseer predictions are used along with knowledge of soils, rainfall infiltration and receiving waters.

Notes:

1. *The below calculations are carried out using values for N and P loss for the dairy platform only, as per Overseer nutrient budget analyses for the proposed 1,500 cow scenario. P loss is used as a proxy for sediment and microbial loss.*

2. *Drummond and Glenelg soils are free draining and do not pose a risk to surfacewaters via artificial drainage channels. The mid-west part of the dairy platform (approximately 100.5 hectares or 21%) has Braxton type soils; these have subsurface drainage installed and drain to the Waimatuku Stream catchment.* ***Since the major surfacewater risk is from Braxton soil types that drain to the Waimatuku Stream catchment, the focus of the AEE on surfacewaters is to the Waimatuku Stream catchment.***

Table 7.2 Effects of N and P in surfacewaters, predominantly including streams in the Waimatuku catchment, Waimatuku Stream, Waimatuku Estuary and coastal waters. Some of these effects may be seen in the Oreti catchment (shallow streams, Oreti River, New River Estuary) due to the discharge of groundwater to shallow streams in the Oreti catchment. P is understood to act as a proxy for sediment and microbes. This table links to table 6.5 (mitigation measures).

Contaminant	Potential effect in receiving surfacewaters	Related effects	Specific mitigations proposed at the dairy farm	Likelihood of effect due to proposed dairy farming activity	Risk of effect due to proposed dairy farming activity
N, P	Increased algal growth in the water column, especially when flows are low and/or temperatures are elevated in shallow streams and the Waimatuku Stream: • Degrades water quality and blocks light (increases turbidity and reduces clarity)	Ecological: exclusion of macrophytes, reduced visibility for fish and other aquatic organisms, loss of habitat, decreased suitability for recreational activity	As per table 6.5. Measures mitigating N loss are #1, 2, 3, 4, 5 and 6; Measures for mitigating P loss are #1, 2, 3, 5, 6, 7, 9, 10	Low likelihood due to the nature and scale of activity and implementation of migration measures	No more than minor
N, P	Increased algal growth in the water column: • Potentially increasing BOD	Ecological: reduced DO causing stress on aquatic organisms, loss of species and habitat	As per above	Very low likelihood since point source discharges affect BOD rather than diffuse sources (i.e. the proposed dairy farming activity). Although the discharge of FDE is a point source discharge, it is to land rather than water is managed appropriately.	Less than minor – point source discharges affect BOD rather than diffuse sources
N, P	Increased periphyton growth on stream beds, especially in smaller streams (Waimatuku)	Ecological: loss of habitat, effects on invertebrates and organisms in associated food webs, reduced biodiversity	As per above	Low likelihood due to the nature and scale of activity and implementation of migration measures	No more than minor

	when temperatures are elevated or flows are low: • Smother streambed				
N, P	Increased periphyton growth, especially in streams and rivers when temperatures are elevated or flows are low: • Promote the growth of toxic matts of cyanobacteria (blue green algae)	Toxic effects on biota including domestic animals. Also, people using waterways for recreational activities are at risk of adverse health effects	As per above	Low likelihood due to the natures and scale of activity and implementation of migration measures	No more than minor
N	N toxicity effects if N concentration is high enough, particularly in the Waimatuku Stream	Ecological: loss of habitat, fish kills Animal and human health due to nitrate toxicity	As per above for N loss mitigation	Low likelihood since N concentration in receiving waters is lower than toxicity level and encouragingly N levels have decreased over the last two consecutive years in the Waimatuku Stream. The scale of the activity and implementation of proposed migration measures further reduce the likelihood of the effect occurring.	Less than minor

P	Increased nuisance plant growth on estuaries (Waimatuku and/or New River): P sorbed to soil particles following runoff is deposited in sediment and then released from bed into the water column	Weed-driven habitat modification and loss; effects on invertebrates and organisms in associated food webs leading to reduced biodiversity	As per above for P loss mitigation	Low likelihood due to nature and scale of activity and implementation of proposed migration measures	No more than minor
Sediment	Following runoff, increased turbidity and reduced water quality in Waimatuku Streams, Oreti River and respective estuaries.	Ecological: exclusion of macrophytes, reduced visibility for fish and other aquatic organisms, loss of habitat, decreased suitability for recreational activity	As per table 1. Measures 1, 2, 3, 5, 6, 7, 10 are the main mitigation measures for sediment loss.	Low likelihood due to nature and scale of activity and implementation of proposed migration measures	No more than minor
Sediment	Following runoff, increased deposition of sediment in Waimatuku Streams, Oreti River and respective estuaries. • Smother streambed	Ecological: loss of habitat and increased anoxic conditions (estuaries), effects on invertebrates and organisms in associated food webs, reduced biodiversity	As per above	Low likelihood due to nature and scale of activity and implementation of proposed migration measures	No more than minor
Microbial contaminants	Following run-off, elevated levels of microbial contaminants in streams,	People using waterways for recreational activities and food gathering are at risk of	As per above	Low likelihood due to nature and scale of activity and implementation of	No more than minor

	Waimatuku Stream, Oreti River and respective estuaries: • Exposure to pathogens	adverse health effects (gastroenteritis)		proposed migration measures

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Nitrogen

PROPOSED 1,500 COW SCENARIO – N CONCENTRATION IN SURFACE DRAINAGE WATER

A conservative estimate for N loss to surfacewaters is calculated below. For the purpose of the calculations, the average annual N loss figure from Braxton soils from Overseer was used. The mean annual land surface recharge rate was used to calculate an estimate of drainage volume to surfacewaters.

100 ha = 1,000,000 m^2

Recharge rate estimate (Lincoln Environmental, 2003) = 0.467 m

(1) *Area (m^2) X drainage (m) = drainage volume (m^3)*

Approximate drainage volume annually = 1,000,000 m^2 x 0.467 m = 467,000 m^3

If all 2,671 kg of N lost to water annually from the Braxton block according to Overseer, is transported via subsurface/artificial drainage channels and overland flow to surfacewaters, then the N concentration of water draining directly to surfacewaters is:

2,671 kg/467,000 m^3 = 5.7 g/m^3 = 5.7 ppm*

5.7 ppm is a conservative estimate as it assumes all N lost below the root zone ends up in surface drainage water. In fact some N will be lost below the root zone to the atmosphere via denitrification processes in soils, and a very quantity of N may be lost to groundwater. ***As such 5.7 ppm N reflects a "worst case scenario" for the 1,500 cow scenario.***

On average the concentration of N in water draining to surfacewaters will be less than 5.7 ppm. Furthermore, water reaching the receiving surfacewaters undergoes mixing and nutrients are diluted. Due to mixing and some dilution thereafter, it is reasonable to assume that this will change background N concentrations by some degree, and cumulatively will give a concentration of no more than 3.65 ppm for the Waimatuku Stream catchment (Median Total Nitrogen for SOE site at Waimatuku Stream at Lornville Riverton Highway).

Losses to the Lower Oreti receiving waters will be minimal due to the free draining nature of soils on that part of the dairy platform, and cumulatively will give a concentration of no more than 1.06 ppm for the Lower Oreti catchment (Median Total Nitrogen at SOE site at Oreti River at Wallace Town).

PRE-EXPANSION - N CONCENTRATION IN SURFACE DRAINAGE WATER

The pre-expansion land use based on four years of data is predicted by Overseer to have had slightly greater N loss to water than the proposed 1,500 cow scenario. Using the same process, the N concentration of water draining to surface waters would be predicted to be slightly higher than for the proposed scenario. It is reasonable to assume that there will be no increase in N related effects in receiving surfacewaters due to the 1,500-cow farm, relative to the pre-expansion land use, which included fodder cropping and associated grazing at the dairy platform. In a catchment where N levels are elevated (i.e. the Waimatuku in particular), any reduction in N loss is environmentally favourable, even where the decrease is a small one.

Some N that accumulates in Braxton type soils will reach surfacewaters following high rainfall events via artificial drainage, with a minor contribution from overland flow, particularly in the late autumn, winter and early spring. Although it is possible to estimate the "worst case scenario" concentration for N in surfacewater drainage from the dairy platform, estimating the N load of drainage water to the Waimatuku Stream catchment is unfeasible without knowing the flow rate of surfacewater leaving the dairy platform. Again, the Waimatuku Stream catchment is the focus due to its risk from artificial drainage of contaminants.

N LOAD - WAIMATUKU STREAM

The Waimatuku Stream at Lorneville Riverton Highway SOE site was used as a reference for this calculation.

Total nitrogen median** concentration = 3.65 g/m^3.

The average flow from 2013 – 2017 of the Waimatuku Stream at Township Road (1 km south of SOE site) = 2.13 m^3/s

(2) Load (g/s) = concentration (g/m^3) x flow (m^3/s)

N load in lower catchment Waimatuku Stream at Waimatuku township = 3.65 g/ m^3 x 2.13 m^3/s = **7.77 g/s**

**The median was used instead of the mean when the mean value was unavailable.

In order to quantify the contribution from the proposed activity to the N load of the Waimatuku Stream, the flow rate of surface water drainage from the dairy platform to the catchment is required. Given available tools and information, the flow rate of surfacewater drainage is unknown. It can reasonably be assumed, that the N loading to the Waimatuku Stream from the proposed activity will cumulatively contribute, with the loading from all other activities in the catchments, to the lower catchment N loading of c.7.77 g/s for the Waimatuku Stream. The contribution to the N loading from the proposed 1,500 cow activity is slightly less than the pre-expansion activity, which has slightly greater average annual N loss according to Overseer (i.e. 0.27 t N/year greater).

EFFECT OF N LOSS IN THE RECEIVING ENVIRONMENT – INCLUDING CUMULATIVELY

Potential effects of N in receiving surfacewaters are summarised and evaluated in table 7.2.

N is a plant macronutrient in aquatic systems. Excess N contributes cumulatively to the eutrophication of receiving waters and promotes nuisance plant growth in the form of algal blooms or slime. This has knock-on effects on the biota that inhabit aquatic ecosystems, and other associated values. The median Total Oxidised Nitrogen concentration for the Waimatuku Stream at Lorneville Riverton SOE site (3.30 mg/L) is well above the ANZECC Guideline of 0.44 mg/L but has an improving trend over ten years. Similarly, the median Total Nitrogen concentration for the Waimatuku Stream at Lorneville Riverton SOE site (3.65 mg/L) is well above the ANZECC Guideline of 0.614 mg/L but has an improving trend over ten years. This indicates that N levels in the Waimatuku Catchment are high enough to cause stress on sensitive species such as fish, as well as cause other adverse effects such as nuisance plant growth. Recently the ten-year trend for N in the Waimatuku Stream catchment has shown improvement, with a reduction in both the median concentration for Total Oxidised N and Total N over the last two consecutive years. The continuation of this trend can be achieved through improved land management in the catchment. The changes in land use at the dairy platform will see an improvement in land management and less mineralisation of N, which cumulatively should see less N loss in surfacewater drainage to the Waimatuku Stream in the long term.

As is described in Section 5, the Waimatuku Estuary is a sensitive environment that is adversely affected by nutrients, sediment and microbial contaminants from land use in the catchment, such as dairy farming. N loss to receiving surfacewaters such as the Waimatuku Stream and Estuary and coastal waters (and to a minor degree the Lower Oreti, and New River Estuary) will be low and slightly reduced compared to the pre-expansion situation due to many key mitigations that reduce N accumulation, N mineralisation processes and protect soil structure. These are summarised in table 6.5. These measures are complemented by the general strategy of good nutrient and soil management as demonstrated in the soil fertility trend reports from Ravensdown.

Phosphorous, sediment and microbial contaminants

The major pathway for P loss (and by proxy sediment and microbes) is artificial drainage following major drainage events. This process pertains to Braxton soil types in particular. Drummond and Glenelg soils have low risk of P loss. There is some risk of overland flow from the dairy platform from CSAs near tile outfalls and where tracks and lanes cross surface waterways. Following intense rainfall water can drain into waterways, carrying P, sediment and microbes with it.

Overseer predicts low average P losses of 0.7 kg/ha/year or 356 kg/year due to the proposed dairying activity (1,500 cows). Overseer predicts an average P loss of 0.4 kg/ha/year for Braxton type soils due to the proposed activity. P loss is split between “Other Sources,” which is loss from tracks, lanes and infrastructure to waterways via overland flow, and “Blocks,” which is P loss from paddocks due to dairy farming. “Other sources” P loss is estimated by Overseer to be 256 kg/year, with “Block” loss estimated to be 100 kg/year. “Other sources” P loss is calculated by a sub-model in Overseer, which assumes that 30% of P that lands on tracks, lanes, yards and other infrastructure, ends up in waterways (Gray, Wheeler and McDowell, 2016). Overseer does not account for the individual layout of dairy farms, however. In this case, tracks and lanes for the most part do not run close to or parallel to waterways, which reduces the risk of runoff from tracks and lanes to waterways significantly. By managing locations where overland flow from tracks and lanes etc. can potentially reach waterways (such as adjacent to the wintering barn at WOL), loss of “Other sources” P can be greatly reduced although Overseer does not recognise this. This will help to reduce P loss (and other contaminants such as sediment and microbes), by filtering runoff as it drains to waterways from paddocks. With management of such locations, the average annual P loss from the property, as predicted by Overseer, can be reduced. Given available tools, it is not possible to quantify this reduction.

As is described in Section 6, Overseer predicts that there will be no change in P loss with the increase in cow numbers. As such, the P related effects of the expansion, and by proxy sediment and microbes, will be minimal.

EFFECT OF P LOSS IN RECEIVING ENVIRONMENT– INCLUDING CUMULATIVELY

Potential effects of P in receiving surfacewaters are summarised and evaluated in table 7.2.

Due to physical and chemical interactions, P tends to be adsorbed by soil particles in surfacewaters and is taken out of solution to a large extent. A small portion of P, however, will remain soluble and available for uptake by aquatic plants in receiving water bodies. Some P will subsequently be released from sediments as soluble P and can then be taken up by plants. P is a plant macronutrient, which is often a growth limiting factor in aquatic systems. Excess P can contribute cumulatively to the eutrophication of receiving waters and promote nuisance plant growth in the form of algal blooms or slime. This has knock-on effects on biota that inhabit aquatic systems and associated values.

The median DRP concentration for the Waimatuku Stream at Lorneville Riverton (SOE) site (0.042 mg/L) is above the ANZECC Guideline of 0.01 mg/L and has a degrading trend over ten years. This indicates that the Waimatuku Catchment has elevated and increasing levels soluble P, which can lead to the adverse environmental effects described above and in table 7.2. In order to improve water quality, a reduction in soluble P in waterways needs to occur and the ten-year trend needs to be show improvement. This can be achieved through improved land management in the catchment.

Due to mitigations summarised in table 6.5, the loading of P (and sediment and microbial contaminants) to receiving surfacewaters such as the Waimatuku Stream, Waimatuku Estuary and coastal waters (and to a very minor degree the Lower Oreti and New River Estuary) from the dairy platform will be low and will not increase. Particularly, practices that reduce soil pugging and improve soil structure are effective at reducing the risk of P, sediment and microbial losses to surfacewaters as they allow for P to be held in the soil, and for microbes to be filtered and held in the soil profile until they become unviable. The careful management of soil fertility through sustainable fertiliser and effluent application are also key mitigations for minimising P loss and are evident in the soil fertility trend reports for the dairy platform (see Appendix). Management of riparian areas and closely associated CSAs is an important mitigation for P loss and is taken seriously at the dairy platform. Collectively these measures mitigate P loss (and by proxy sediment and microbes), including cumulatively, to receiving surfacewaters.

Drainage waters mix with receiving waters and are diluted. Given mixing and dilution of drainage and receiving waters annually, the proposed activity will contribute an immeasurably small amount to the P load of receiving waters, and there will be no increase in the P load of receiving waters relative to the pre-expansion land use. Similarly, there will be minimal change in sediment and microbial contaminant levels of receiving waters due to the proposed activity.

Summary – AEE on surfacewaters

Although the proposed activity represents an expansion of dairying, there will be slightly less N and P lost to receiving surfacewaters due to the implementation of mitigation measures, and therefore slightly less effect on receiving surfacewaters and associated values compared to the pre-expansion system.

Values associated with surfacewater streams, rivers and coastal waters are many and relate to the landscape, biodiversity, history and people living in the catchment. These values include maintaining the health of water bodies both in-stream and coastal, protecting biodiversity and ecosystems, protecting recreational activities such as fishing, walking and boating; protecting human and animal health, maintaining sustainable farming practices and the socioeconomic well-being of people through preserving values that relate to inshore fishing, farming and tourism. Iwi/cultural values include the principles of protection or kaitiakitanga of the mauri of the water and mana of the land, while minimising adverse effects on taonga and mahinga kai. Contaminant losses from the proposed activity will be low and will not adversely affect these values. There will be no increase in adverse effects on any of the above values from the proposed activity.

***Based on the above assessment, the effects of the proposed dairy farming activity on receiving surfacewaters will be no more than minor*.**

Biodiversity of surfacewaters

Nutrient enrichment (by N and P) and sedimentation of the Waimatuku Stream, Waimatuku Estuary, Oreti River, New River Estuary and coastal waters result in nuisance plant growth such as slime (cyanobacteria), algal blooms, the choking of waterways by macrophytes (weeds) and the smothering of stream beds. The collection of plants and animals that inhabit receiving waters are adversely affected, as well as in-stream values such as biodiversity.

As is outlined in Section 5, effects such as macroalgal blooms are frequently seen in at the Waimatuku Estuary over the summer period, when temperatures are elevated. These effects are complex and relate to many interacting factors, e.g. physical factors such as flow rates and temperature, as well as chemical and biological factors. Ecological data from a lower catchment site (close to the estuary), as described in Section 5, are indicative of land use effects on aquatic biota living in the Stream. The Waimatuku Stream and Estuary are used for the recreational fishing of trout and whitebait. Trout and native fish species such as short and long fin eels and galaxids, are found in the Stream and Estuary.

New River Estuary catchment is also described in Section 5, with some parts being identified as being highly muddy and anoxic, eutrophic and having associated nuisance algal growth. Poorly flushed parts of the estuary have been identified as eutrophic areas. The Oreti River and New River Estuary are used for the recreational fishing. Trout and native fish species such as short and long fin eels and galaxids, are found in the river and estuary.

There will be minimal effect on biodiversity due to the proposed activity due to the implementation of mitigation measures on farm. These set out to reduce contaminant loss relative to the pre-expansion situation. Implementation of several measures will cumulatively reduce nutrient, sediment and microbial loss from the activity over time, which reduces any potential adverse impacts on the biodiversity of the Waimatuku Stream and Estuary, Oreti River and New River Estuary, and coastal waters.

Winter Grazing

No further winter grazing of cows or heifers on pasture or winter/summer crop will occur at the WOL/WTL dairy platform. Instead all animals wintered at WOL/WTL will be wintered in barns. No AEE for winter grazing is required as this activity will not be carried out.

Consideration of alternatives for land use at the property

The land has been developed and used for dairy farming for many decades. Through their investment and experience farming the property, the applicants have developed a sustainable dairy farming model to suit the property. The proposed intensification is increasing the herd size by 160 cows, however, the proposed system will result in slightly less N loss to water than the existing situation, through the implementation of mitigation measures. The pre-expansion land use would not achieve a better environmental result than the proposed 1,500 cow dairy platform.

8. Consultation

The applicants have farmed the property as a dairy farm for many decades, starting in 1992 when they converted the WOL unit, with full dairy infrastructure on site. The irrigation systems are low depth with minimal visual or olfactory impact. Two large barns house cows over winter, which removes the practice of intensive winter grazing of beet crops. The proposed changes include an increase in cow numbers but are of similar nature as existing activities and land use at the property. Good management practices are in place and mitigation measures will be implemented. Environmental effects are expected to reduce with the proposed changes. For these reasons, no potentially affected parties are anticipated.

9. Conclusion

The applicants seek replacement consents for their current land use consent for expanded dairy farming, effluent discharge to land and groundwater take for a 1,500-cow dairy operation. The expansion is due to an increase of 160 cows to a maximum of 1,500 cows. The expansion will occur in parallel with key changes to the existing farm system; these changes result in a system with slightly lower average N and P loss annually according to Overseer. The effects of the expansion are not being exported elsewhere, but are being contained and managed appropriately at the land holding.

The application includes a policy assessment, an assessment of environmental effects and Farm Environmental Management Plan that demonstrate that the expected, actual or potential adverse effects generated by the continuation of the proposed activities on the environment can be avoided, remedied or mitigated to the extent that they are considered to be no more than minor.

The key concern with the expansion and effluent discharge is the potential for the activities to have adverse effects on groundwater and surface water quality, and on soils. Provided any consent conditions imposed by the Council are adhered to, and management practices are implemented in line with the attached Farm Environmental Management Plan, the activities should have little adverse effect on the environment.

The water take is should have little adverse effect on neighbours' bores, and a less than minor effect on aquifer sustainability, current allocation and stream depletion.

Overall the proposal is considered consistent with the purpose of the Resource Management Act 1991, and does not conflict with the purpose of the Act, or with Council policy. The adverse effects of the dairy farm activity, the water take and the discharge of dairy shed effluent onto land should be no more than minor provided that the applicants adhere to the attached Farm Environmental Management Plan.

11. References

Edberg, Rice, Karlin and Allen (2000). ***Escherichia coli*: the best biological drinking water indicator for public health protection.** Journal of Applied Microbiology 2000, 88, 106S – 116S.

Gray, Wheeler and McDowell (2016). **Review of Phosphorous submodel in Overseer**. Report prepared for AgResearch.

Hitchcock (2014). **Characterising the surface and groundwater interactions in the Waimatuku Stream, Southland.** MSc Thesis. University of Otago.

Houlbrooke, Longhurst, Orchiston and Muirhead (2011). **Characterising dairy manures and slurries**. AgResearch Report.

Houlbrooke & Monaghan (2009). **The influence of soil drainage characteristics on contaminant leakage risk associated with the land application of farm dairy effluent**. Report prepared for Environment Southland.

Longhurst, Rajendram, Miller and Dexter (2017). **Nutrient content of liquid and solid effluents on NZ dairy cow farms**. Science and Policy: nutrient management challenges for the next generation. Occasional Report No. 30.

Wilson, Chanut, Rissman & Ledgard (2014). **Estimating time lags for nitrate response in shallow Southland groundwater.** Technical report prepared for Environment Southland.

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STATEMENT

Date: 30-November-2017

Debtor No 1184641.01

GST Reg No. 11-006-124

Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD 3
WINTON 9783

DATE	INVOICE NO.	DESCRIPTION	AMOUNT	BALANCE
10/11/2017	124035	MONITORING COSTS FOR: AUTH-300626-V2 Dsn - 32651 - Discharge Permit - To Land - To Discharge Dairy Shed Effluent From Up To 800 Cows And Wintering Pad Effluent From Up To 600 Cows To Land At State Highway 99 Winton By Travelling Irrigator And Slurry Tanker (Inspection/Report Date - 03-08-2017)	385.00	385.00

4 Month +	3 Month	2 Month	1 Month	Current
0.00	0.00	0.00	0.00	385.00

Payment can be direct credited to ANZ - 01-0961-0018998-00
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TOTAL	$385.00

REMITTANCE ADVICE SLIP (Please return this slip with your payment)

From:
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dairy2@woldwide.nz
104 Shaws Trees Road
RD 3

Amount Due : **$ 385.00**

Debtor No 1184641.01

Nar Number 318464

PAYMENT DUE DATE
20-December-2017

Amount Paid :

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Date: 31-December-2017
Debtor No 1184641.01

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DATE	INVOICE NO.	DESCRIPTION	AMOUNT	BALANCE
10/11/2017	124035	MONITORING COSTS FOR: AUTH-300626-V2 Dsn - 32651 - Discharge Permit - To Land - To Discharge Dairy Shed Effluent From Up To 800 Cows And Wintering Pad Effluent From Up To 600 Cows To Land At State Highway 99 Winton By Travelling Irrigator And Slurry Tanker (Inspection/Report Date - 03-08-2017)	385.00	0.00
		20/12/2017 1Receipt - 293507	-385.00	
13/12/2017	124392	MONITORING COSTS FOR: AUTH-300626-V2 Dsn - 32651 - Discharge Permit - To Land - To Discharge Dairy Shed Effluent From Up To 800 Cows And Wintering Pad Effluent From Up To 600 Cows To Land At State Highway 99 Winton By Travelling Irrigator And Slurry Tanker (Inspection/Report Date - 09-11-2017)	260.72	260.72

4 Month +	3 Month	2 Month	1 Month	*Current*
0.00	0.00	0.00	0.00	260.72

Payment can be direct credited to ANZ - 01-0961-0018998-00
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TOTAL	$260.72

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Amount Due : **$ 260.72**
Debtor No. 1184641.01
Nar Number **318464**

PAYMENT DUE DATE
20-January-2018

Amount Paid :
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INVOICE No.	125502
Debtor Acc.	1184641.01
Date:	28/03/2018
Due Date:	20/04/2018
Nar Number	**318464**

GST Reg No: 11-006-124

DESCRIPTION	AMOUNT
Monitoring Costs for: AUTH-300626-V2 **DSN - 32651 - Discharge Permit - To Land - To discharge dairy shed effluent from up to 800 cows and wintering pad effluent from up to 600 cows to land at State Highway 99 Winton by travelling irrigator and slurry tanker** **(Inspection/Report Date - 23-03-2018)**	
Aerial Inspection	385.00
Total value non-taxable supply(s)	0.00
Total value taxable supply(s) excluding GST	334.78
Total GST payable	50.22

Payment can be direct credited to ANZ - 01-0961-0018998-00
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TOTAL $385.00

ENVIRONMENT SOUTHLAND - REMITTANCE ADVICE SLIP

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From:

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dairy2@woldwide.nz
104 Shaws Trees Road
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WINTON 9783

DEBTOR ACCOUNT No.	1184641.01	AMOUNT DUE:	385.00
DUE DATE:	20-Apr-2018	INVOICE No.	125502
Bill Ref :	118464101	**Nar Number**	**318464**
		Amount Paid:	$

Paid by: Chq / Cash / Eftpos / Credit Card

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STATEMENT

Date: 31-May-2018

Debtor No 1184641.01

GST Reg No. 11-006-124

Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD 3
WINTON 9783

DATE	INVOICE NO.	DESCRIPTION	AMOUNT	BALANCE
18/05/2018	125985	MONITORING COSTS FOR: AUTH-300626-V2 Dsn - 32651 - Discharge Permit - To Land - To Discharge Dairy Shed Effluent From Up To 800 Cows And Wintering Pad Effluent From Up To 600 Cows To Land At State Highway 99 Winton By Travelling Irrigator And Slurry Tanker (Inspection/Report Date - 26-04-2018)	260.72	260.72

4 Month +	3 Month	2 Month	1 Month	*Current*
0.00	0.00	0.00	0.00	260.72

Payment can be direct credited to ANZ - 01-0961-0018998-00
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TOTAL	**$260.72**

REMITTANCE ADVICE SLIP **(Please return this slip with your payment)**

From:
Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD 3

Amount Due : **$ 260.72**

Debtor No. 1184641.01

Nar Number **318464**

PAYMENT DUE DATE
20-June-2018

Amount Paid :

$

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INVOICE No.	125985
Debtor Acc.	1184641.01
Date:	18/05/2018
Due Date:	20/06/2018
Nar Number	**318464**

GST Reg No: 11-006-124

DESCRIPTION	AMOUNT
Monitoring Costs for: AUTH-300626-V2 DSN - 32651 - Discharge Permit - To Land - To discharge dairy shed effluent from up to 800 cows and wintering pad effluent from up to 600 cows to land at State Highway 99 Winton by travelling irrigator and slurry tanker (Inspection/Report Date - 26-04-2018)	
Ground Water Sampling Fee - Sample Taken	210.00
Lab Costs	50.72
Total value non-taxable supply(s)	0.00
Total value taxable supply(s) excluding GST	226.71
Total GST payable	34.01

Payment can be direct credited to ANZ - 01-0961-0018998-00
Please use your Debtor no. as reference for payment

TOTAL $260.72

ENVIRONMENT SOUTHLAND - REMITTANCE ADVICE SLIP

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From:

Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD 3
WINTON 9783

DEBTOR ACCOUNT No.	1184641.01	AMOUNT DUE:	260.72
DUE DATE:	20-Jun-2018	INVOICE No.	125985
Bill Ref :	118464101	**Nar Number**	**318464**
		Amount Paid:	$

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Date: 31-July-2018
Debtor No 1184641.01

GST Reg No. 11-006-124

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DATE	INVOICE NO.	DESCRIPTION	AMOUNT	BALANCE
19/07/2018	126855	MONITORING COSTS FOR: AUTH-300626-V2 Dsn - 32651 - Discharge Permit - To Land - To Discharge Dairy Shed Effluent From Up To 800 Cows And Wintering Pad Effluent From Up To 600 Cows To Land Via Travelling Irrigator And Slurry Tanker At State Highway 99 Winton. (Inspection/Report Date - 18-07-2018)	415.00	415.00

4 Month +	3 Month	2 Month	1 Month	*Current*
0.00	0.00	0.00	0.00	415.00

Payment can be direct credited to ANZ - 01-0961-0018998-00
Please use your Debtor no. as reference for payment

TOTAL	$415.00

REMITTANCE ADVICE SLIP **(Please return this slip with your payment)**

From:
Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD 3

Amount Due : **$ 415.00**
Debtor No. **1184641.01**

PAYMENT DUE DATE
20-August-2018

Amount Paid :
$

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INVOICE No.	126855
Debtor Acc.	1184641.01
Date:	19/07/2018
Due Date:	20/08/2018
Nar Number	**318464**

GST Reg No: 11-006-124

DESCRIPTION	AMOUNT
Monitoring Costs for: AUTH-300626-V2 DSN - 32651 - Discharge Permit - To Land - To discharge dairy shed effluent from up to 800 cows and wintering pad effluent from up to 600 cows to land via travelling irrigator and slurry tanker at State Highway 99 Winton. (Inspection/Report Date - 18-07-2018)	
Wintering Pad Inspection	415.00
Total value non-taxable supply(s)	0.00
Total value taxable supply(s) excluding GST	360.87
Total GST payable	54.13

Payment can be direct credited to ANZ - 01-0961-0018998-00
Please use your Debtor no. as reference for payment

TOTAL **$415.00**

ENVIRONMENT SOUTHLAND - REMITTANCE ADVICE SLIP

(Please return this slip with your payment-If account is in credit, no payment required)

From:

Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD 3
WINTON 9783

DEBTOR ACCOUNT No.	1184641.01	AMOUNT DUE:	415.00
DUE DATE:	20-Aug-2018	INVOICE No.	126855
Bill Ref :	118464101	**Nar Number**	**318464**
		Amount Paid:	$

Paid by: Chq / Cash / Eftpos / Credit Card

Physical Address
Corner of North Road and Price Street
Invercargill 9810
Postal Address
Private Bag 90116
Invercargill 9840
Phone Numbers
0800 377 2837
P: (03) 211 5115
F: (03) 211 5252
www.es.govt.nz

TAX INVOICE/CREDIT NOTE

Please direct all emails to: accounts@es.govt.nz

To: Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD 3
WINTON 9783

INVOICE No.	128093
Debtor Acc.	1184641.01
Date:	21/08/2018
Due Date:	20/09/2018

GST Reg No: 11-006-124

DESCRIPTION	AMOUNT
Annual Charges for 1 July 2018 to 30 June 2019 AUTH-300626-V2 To discharge dairy shed effluent from up to 800 cows and wintering pad effluent from up to 600 cows to land via travelling irrigator and slurry tanker at State Highway 99 Winton.	
Consent Administration Charge	190.00
Water research and management charge - Discharge to Land	250.00
Total value non-taxable supply(s)	0.00
Total value taxable supply(s) excluding GST	382.61
Total GST payable	57.39

Payment can be direct credited to ANZ - 01-0961-0018998-00
Please use your Debtor no. as reference for payment

TOTAL $440.00

ENVIRONMENT SOUTHLAND - REMITTANCE ADVICE SLIP

(Please return this slip with your payment-If account is in credit, no payment required)

From:
Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD 3
WINTON 9783

DEBTOR ACCOUNT No.	1184641.01	AMOUNT DUE:	440.00
DUE DATE:	20-Sep-2018	INVOICE No.	128093

Amount Paid: $ ____________

Paid by: Chq / Cash / Eftpos / Credit Card

environment SOUTHLAND
REGIONAL COUNCIL
Te Taiao Tonga

Physical Address
Corner of North Road and Price Street
Invercargill 9810
Postal Address
Private Bag 90116
Invercargill 9840
Phone Numbers
0800 377 2837
P: (03) 211 5115
F: (03) 211 5252
www.es.govt.nz

TAX INVOICE/CREDIT NOTE

Please direct all emails to: accounts@es.govt.nz

To: Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD 3
WINTON 9783

INVOICE No.	128094
Debtor Acc.	1184641.01
Date:	21/08/2018
Due Date:	20/09/2018

GST Reg No: 11-006-124

DESCRIPTION	AMOUNT
Annual Charges for 1 July 2018 to 30 June 2019 AUTH-300627-V1 To abstract up to 80 000 l/day of groundwater from bore E45/0083 for a dairy operation at State Highway 99 Heddon Bush	
Consent Administration Charge	50.00
Water research and management charge- Groundwater take (minimum charge)	162.00
Receipt and processing of small to medium volume irrigation/water take data.	150.00
Total value non-taxable supply(s)	0.00
Total value taxable supply(s) excluding GST	314.78
Total GST payable	47.22

Payment can be direct credited to ANZ - 01-0961-0018998-00
Please use your Debtor no. as reference for payment

TOTAL $362.00

ENVIRONMENT SOUTHLAND - REMITTANCE ADVICE SLIP

(Please return this slip with your payment-If account is in credit, no payment required)

From:
Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD 3
WINTON 9783

DEBTOR ACCOUNT No.	1184641.01	AMOUNT DUE:	362.00
DUE DATE:	20-Sep-2018	INVOICE No.	128094

Amount Paid: $ ____________

Paid by: Chq / Cash / Eftpos / Credit Card

environment SOUTHLAND
REGIONAL COUNCIL
Te Taiao Tonga

Physical Address
Corner of North Road and Price Street
Invercargill 9810
Postal Address
Private Bag 90116
Invercargill 9840
Phone Numbers
0800 377 2837
P: (03) 211 5115
F: (03) 211 5252
www.es.govt.nz

TAX INVOICE/CREDIT NOTE

Please direct all emails to: accounts@es.govt.nz

To: Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD 3
WINTON 9783

INVOICE No.	132437
Debtor Acc.	1184641.01
Date:	24/01/2019
Due Date:	20/02/2019

GST Reg No: 11-006-124

DESCRIPTION	AMOUNT
Monitoring Costs for: AUTH-300626-V2 DSN - 32651 - Discharge Permit - To Land - To discharge dairy shed effluent from up to 800 cows and wintering pad effluent from up to 600 cows to land via travelling irrigator and slurry tanker at State Highway 99 Winton. (Inspection/Report Date - 29-11-2018)	
Ground Water Sampling Fee - Sample Taken	240.00
Lab Costs	50.72
Total value non-taxable supply(s)	0.00
Total value taxable supply(s) excluding GST	252.80
Total GST payable	37.92
TOTAL	**$290.72**

Payment can be direct credited to ANZ - 01-0961-0018998-00
Please use your Debtor no. as reference for payment

ENVIRONMENT SOUTHLAND - REMITTANCE ADVICE SLIP

(Please return this slip with your payment-If account is in credit, no payment required)

From:
Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD 3
WINTON 9783

DEBTOR ACCOUNT No.	1184641.01	AMOUNT DUE:	290.72
DUE DATE:	20-Feb-2019	INVOICE No.	132437

Amount Paid: $ ____________

Paid by: Chq / Cash / Eftpos / Credit Card

environment SOUTHLAND
REGIONAL COUNCIL
Te Taiao Tonga

Physical Address
Corner of North Road and Price Street
Invercargill 9810
Postal Address
Private Bag 90116
Invercargill 9840
Phone Numbers
0800 377 2837
P: (03) 211 5115
F: (03) 211 5252
www.es.govt.nz

TAX INVOICE/CREDIT NOTE

Please direct all emails to: accounts@es.govt.nz

To: Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD 3
WINTON 9783

INVOICE No.	133145
Debtor Acc.	1184641.01
Date:	15/04/2019
Due Date:	20/05/2019

GST Reg No: 11-006-124

DESCRIPTION	AMOUNT
Monitoring Costs for: AUTH-300626-V2 DSN - 32651 - Discharge Permit - To Land - To discharge dairy shed effluent from up to 800 cows and wintering pad effluent from up to 600 cows to land via travelling irrigator and slurry tanker at State Highway 99 Winton. (Inspection/Report Date - 03-04-2019)	
Routine Inspection	415.00
Total value non-taxable supply(s)	0.00
Total value taxable supply(s) excluding GST	360.87
Total GST payable	54.13
TOTAL	**$415.00**

Payment can be direct credited to ANZ - 01-0961-0018998-00
Please use your Debtor no. as reference for payment

ENVIRONMENT SOUTHLAND - REMITTANCE ADVICE SLIP

(Please return this slip with your payment-If account is in credit, no payment required)

From:

Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD 3
WINTON 9783

DEBTOR ACCOUNT No.	1184641.01	AMOUNT DUE:	415.00
DUE DATE:	20-May-2019	INVOICE No.	133145

Amount Paid: $ ____________

Paid by: Chq / Cash / Eftpos / Credit Card

environment SOUTHLAND
REGIONAL COUNCIL
Te Taiao Tonga

Physical Address
Corner of North Road and Price Street
Invercargill 9810
Postal Address
Private Bag 90116
Invercargill 9840
Phone Numbers
0800 377 2837
P: (03) 211 5115
F: (03) 211 5252
www.es.govt.nz

STATEMENT

Date: 30-June-2019
Debtor No 1184641.01

GST Reg No. 11-006-124

Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD 3
WINTON 9783

DATE	INVOICE NO.	DESCRIPTION	AMOUNT	BALANCE
13/06/2019	133652	MONITORING COSTS FOR: AUTH-300626-V2 Dsn - 32651 - Discharge Permit - To Land - To Discharge Dairy Shed Effluent From Up To 800 Cows And Wintering Pad Effluent From Up To 600 Cows To Land Via Travelling Irrigator And Slurry Tanker At State Highway 99 Winton. (Inspection/Report Date - 12-06-2019)	415.00	415.00

4 Month +	3 Month	2 Month	1 Month	Current
0.00	0.00	0.00	0.00	415.00

Payment can be direct credited to ANZ - 01-0961-0018998-00
Please use your Debtor no. as reference for payment

TOTAL **$415.00**

REMITTANCE ADVICE SLIP **(Please return this slip with your payment)**

From:
Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD 3

Amount Due : **$ 415.00**

Debtor No. **1184641.01**

PAYMENT DUE DATE
20-July-2019

Amount Paid :
$

CHQ / CASH / EFT

Please direct all emails to: accounts@es.govt.nz

Physical Address
Corner of North Road and Price Street
Invercargill 9810
Postal Address
Private Bag 90116
Invercargill 9840
Phone Numbers
0800 377 2837
P: (03) 211 5115
F: (03) 211 5252
www.es.govt.nz

TAX INVOICE/CREDIT NOTE

Please direct all emails to: accounts@es.govt.nz

To: Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD 3
WINTON 9783

INVOICE No.	133652
Debtor Acc.	1184641.01
Date:	13/06/2019
Due Date:	20/07/2019

GST Reg No: 11-006-124

DESCRIPTION	AMOUNT
Monitoring Costs for: AUTH-300626-V2 **DSN - 32651 - Discharge Permit - To Land - To discharge dairy shed effluent from up to 800 cows and wintering pad effluent from up to 600 cows to land via travelling irrigator and slurry tanker at State Highway 99 Winton.** **(Inspection/Report Date - 12-06-2019)**	
Routine Inspection	415.00
Total value non-taxable supply(s)	0.00
Total value taxable supply(s) excluding GST	360.87
Total GST payable	54.13

Payment can be direct credited to ANZ - 01-0961-0018998-00
Please use your Debtor no. as reference for payment

TOTAL **$415.00**

ENVIRONMENT SOUTHLAND - REMITTANCE ADVICE SLIP

(Please return this slip with your payment-If account is in credit, no payment required)

From:
Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD 3
WINTON 9783

DEBTOR ACCOUNT No.	1184641.01	AMOUNT DUE:	415.00
DUE DATE:	20-Jul-2019	INVOICE No.	133652

Amount Paid: $

Paid by: Chq / Cash / Eftpos / Credit Card

environment SOUTHLAND
REGIONAL COUNCIL
Te Taiao Tonga

Cnr North Road and Price Street
Invercargill 9810
Private Bag 90116
Invercargill 9840
0800 377 283
(03) 211 5115

www.es.govt.nz

TAX INVOICE

Please direct all emails to: accounts@es.govt.nz

To: Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD 3
WINTON 9783

INVOICE No.	135271
Debtor No.	1184641.01
Date:	27/08/2019
Due Date:	20/09/2019

GST Reg No: 11-006-124

DESCRIPTION	AMOUNT
Annual Charges for 1 July 2019 to 30 June 2020 AUTH-300626-V2 To discharge dairy shed effluent from up to 800 cows and wintering pad effluent from up to 600 cows to land via travelling irrigator and slurry tanker at State Highway 99 Winton.	
Consent Administration Charge	194.00
Water research and management charge - Discharge to Land	256.00

Payment can be direct credited to ANZ - 01-0961-0018998-00
Please use your Debtor No. as reference for payment
or payment can be made by credit card online.

TOTAL (GST Inc) $450.00

ENVIRONMENT SOUTHLAND - REMITTANCE ADVICE SLIP

(Please return this slip with your payment)

From:
Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD 3
WINTON 9783

Debtor No.	1184641.01	Amount Due:	450.00
Due Date:	20-Sep-2019	INVOICE No.	135271
		Amount Paid:	$ ________

Paid by: Chq / Cash / Eftpos / Credit Card

environment SOUTHLAND
REGIONAL COUNCIL
Te Taiao Tonga

Cnr North Road and Price Street
Invercargill 9810
Private Bag 90116
Invercargill 9840
0800 377 283
(03) 211 5115

www.es.govt.nz

TAX INVOICE

Please direct all emails to: accounts@es.govt.nz

To: Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD 3
WINTON 9783

INVOICE No.	135272
Debtor No.	1184641.01
Date:	27/08/2019
Due Date:	20/09/2019

GST Reg No: 11-006-124

DESCRIPTION	AMOUNT
Annual Charges for 1 July 2019 to 30 June 2020 AUTH-300627-V1 To abstract up to 80 000 l/day of groundwater from bore E45/0083 for a dairy operation at State Highway 99 Heddon Bush	
Consent Administration Charge	51.00
Water research and management charge - Groundwater take (minimum charge)	162.00
Receipt and processing of small to medium volume irrigation/water take data	153.00

Payment can be direct credited to ANZ - 01-0961-0018998-00
Please use your Debtor No. as reference for payment
or payment can be made by credit card online.

TOTAL (GST Inc) **$366.00**

ENVIRONMENT SOUTHLAND - REMITTANCE ADVICE SLIP
(Please return this slip with your payment)

From:
Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD 3
WINTON 9783

Debtor No.	1184641.01	Amount Due:	366.00
Due Date:	20-Sep-2019	INVOICE No.	135272

Amount Paid: $ ____________

Paid by: Chq / Cash / Eftpos / Credit Card

environment SOUTHLAND
REGIONAL COUNCIL
Te Taiao Tonga

Physical Address
Corner of North Road and Price Street
Invercargill 9810
Postal Address
Private Bag 90116
Invercargill 9840
Phone Numbers
Rates: 0800 768 845
P: (03) 211 5115 F: (03) 211 5252
www.es.govt.nz

STATEMENT

Date: 30-November-2017

Debtor No 1184641.07

GST Reg No. 11-006-124

Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD 3
WINTON 9783

DATE	INVOICE NO.	DESCRIPTION	AMOUNT	BALANCE
27/11/2017	124240	PROCESSING CONSENT APP-20171278 To Discharge Dairy Shed Effluent From Up To 800 Cows And Wintering Pad Effluent From Up To 640 Cows To Land To Take Groundwater And To Expand An Existing Dairy Farm At State Highway 99 Winton	5,200.57	5,200.57

4 Month +	3 Month	2 Month	1 Month	*Current*
0.00	0.00	0.00	0.00	5,200.57

Payment can be direct credited to ANZ - 01-0961-0018998-00
Please use your Debtor no. as reference for payment

TOTAL **$5,200.57**

REMITTANCE ADVICE SLIP **(Please return this slip with your payment)**

From:
Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD 3

Amount Due : **$ 5,200.57**
Debtor No. 1184641.07
Nar Number **318464**

PAYMENT DUE DATE
20-December-2017

Amount Paid :
$

CHQ / CASH / EFT

Please direct all emails to: service@es.govt.nz

environment SOUTHLAND
REGIONAL COUNCIL
Te Taiao Tonga

Physical Address
Corner of North Road and Price Street
Invercargill 9810
Postal Address
Private Bag 90116
Invercargill 9840
Phone Numbers
0800 377 2837
P: (03) 211 5115
F: (03) 211 5252
www.es.govt.nz

TAX INVOICE/CREDIT NOTE

Please direct all emails to: accounts@es.govt.nz

To: Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD 3
WINTON 9783

INVOICE No.	128090
Debtor Acc.	1184641.01
Date:	21/08/2018
Due Date:	20/09/2018

GST Reg No: 11-006-124

DESCRIPTION	AMOUNT
Annual Charges for 1 July 2018 to 30 June 2019 **AUTH-20171278-01 To discharge dairy shed effluent to land from 800 cows and wintering pad effluent to land from 640 cows via travelling irrigator and slurry tanker at State Highway 99 Winton**	
Consent Administration Charge	190.00
Water research and management charge - Discharge to Land	250.00
Total value non-taxable supply(s)	0.00
Total value taxable supply(s) excluding GST	382.61
Total GST payable	57.39

Payment can be direct credited to ANZ - 01-0961-0018998-00
Please use your Debtor no. as reference for payment

TOTAL **$440.00**

ENVIRONMENT SOUTHLAND - REMITTANCE ADVICE SLIP

(Please return this slip with your payment-If account is in credit, no payment required)

From:

Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD 3
WINTON 9783

DEBTOR ACCOUNT No.	1184641.01	AMOUNT DUE:	440.00
DUE DATE:	20-Sep-2018	INVOICE No.	128090

Amount Paid: $ ________

Paid by: Chq / Cash / Eftpos / Credit Card

environment SOUTHLAND
REGIONAL COUNCIL
Te Taiao Tonga

Physical Address
Corner of North Road and Price Street
Invercargill 9810
Postal Address
Private Bag 90116
Invercargill 9840
Phone Numbers
0800 377 2837
P: (03) 211 5115
F: (03) 211 5252
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TAX INVOICE/CREDIT NOTE

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To: Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD 3
WINTON 9783

INVOICE No.	128091
Debtor Acc.	1184641.01
Date:	21/08/2018
Due Date:	20/09/2018

GST Reg No: 11-006-124

DESCRIPTION	AMOUNT
Annual Charges for 1 July 2018 to 30 June 2019 AUTH-20171278-02 To abstract 96 000 l/day of groundwater from two bores for the purpose of a dairy operation at State Highway 99 Heddon Bush	
Consent Administration Charge	50.00
Total value non-taxable supply(s)	0.00
Total value taxable supply(s) excluding GST	43.48
Total GST payable	6.52

Payment can be direct credited to ANZ - 01-0961-0018998-00
Please use your Debtor no. as reference for payment

TOTAL **$50.00**

ENVIRONMENT SOUTHLAND - REMITTANCE ADVICE SLIP

(Please return this slip with your payment-If account is in credit, no payment required)

From:
Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD 3
WINTON 9783

DEBTOR ACCOUNT No.	1184641.01	AMOUNT DUE:	50.00
DUE DATE:	20-Sep-2018	INVOICE No.	128091

Amount Paid: $ ____________

Paid by: Chq / Cash / Eftpos / Credit Card

Environment SOUTHLAND
REGIONAL COUNCIL
Te Taiao Tonga

Physical Address
Corner of North Road and Price Street
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Postal Address
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www.es.govt.nz

TAX INVOICE/CREDIT NOTE

Please direct all emails to: accounts@es.govt.nz

To: Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD3
WINTON 9783

INVOICE No.	128092
Debtor Acc.	1184641.01
Date:	21/08/2018
Due Date:	20/09/2018

GST Reg No: 11-006-124

DESCRIPTION	AMOUNT
Annual Charges for 1 July 2018 to 30 June 2019 **AUTH-20171278-03 To use land for an expanded existing dairy farm at State Highway 99 Winton**	
Consent Administration Charge	190.00
Total value non-taxable supply(s)	0.00
Total value taxable supply(s) excluding GST	165.22
Total GST payable	24.78
TOTAL	**$190.00**

Payment can be direct credited to ANZ - 01-0961-0018998-00
Please use your Debtor no. as reference for payment

ENVIRONMENT SOUTHLAND - REMITTANCE ADVICE SLIP

(Please return this slip with your payment-If account is in credit, no payment required)

From:

Woldwide Two Ltd
dairy2@woldwide.nz
104 Shaws Trees Road
RD 3
WINTON 9783

DEBTOR ACCOUNT No.	1184641.01	AMOUNT DUE:	190.00
DUE DATE:	20-Sep-2018	INVOICE No.	128092

Amount Paid: $ ________

Paid by: Chq / Cash / Eftpos / Credit Card

environment SOUTHLAND
REGIONAL COUNCIL
Te Taiao Tonga

09 March 2017

Aqualinc Research Limited
C/- Nicole Matheson
PO Box 20-462
Christchurch 8543

Our Reference: APP-20171118

Enquiries to:
Danielle.Petricevich@es.govt.nz

Dear Nicole

Return of Incomplete Application - Woldwide Two Limited

I am unable to accept your application on behalf of Woldwide Two Limited, to discharge dairy shed effluent from up to 800 cows and wintering pad effluent from up to 640 cows to land and to take groundwater for a dairy operation at State Highway 99, Winton.

It is returned[1] in accordance with Section 88(3A) of the Resource Management Act.

I am returning your application because it is incomplete and it does not contain information required by the 4th Schedule of the RMA, the Regional Water Plan for Southland and the proposed Southland Water and Land Plan.

The following information needs to be included in the application before it can be considered complete:

Effluent Discharge Activity

- Effluent storage details including the age and type of effluent storage on the property. If the storage is an effluent pond this should include the type of liner and whether or not the pond has any leak detection or whether a drop test and structurally sound has been completed on the pond and when

- Details regarding the wintering barn and how effluent is dealt with in this area. For example does the barn just have a concrete floor, or is their some type of media (straw, bark chip etc.) that will reduce the amount of effluent going into the pond

- An assessment of effects of the discharge activity on the receiving environment. Including the risk considerations in the Regional Water Plan this being Farm Dairy Effluent Risk Categories, and in the proposed Southland Water and Land Plan this being Physiographic Zones. These risk areas are described in the application but the effects of the activity on the receiving environment relating to contaminant pathways has not been assessed

- An explanation as to why mitigation measures/GMP's have/haven't been proposed in the application including what effects they specifically are mitigating

- A policy assessment of the activity against the relevant policies in the Regional Water Plan (specifically Policy 42) and the proposed Southland Water and Land Plan (specifically Policies 15 and 17)

Land Use for Dairy Farming Activity

- A detailed discussion of the receiving environment. This discussion should address the current state of the receiving environment (ground and surface water quality as well as soil types) and the sensitivity of the receiving environment to adverse effects resulting from the proposed dairy farming activities

- A description of the farming activity to be undertaken on the property, this should include at a minimum:
  - Number of dairy cows and other stock
  - Farm area (effective and non-effective areas)
  - Stocking rate
  - Management of calves, young stock, replacements and any other stock
  - Wintering, cropping and grazing
  - General types of fertilisers used, including proposed application rates and times (this should match what is included in the OVERSEER budgets included with the application)

- An assessment of environmental effects in such details that corresponds to the scale and significance of the effects of the activity on the environment. This assessment must, at a minimum, analyse the effect of the change in land use on the receiving environment. This must include, but is not limited to:
  - A description of the receiving environment
    - Assessment of local groundwater and surface water quality;
    - Assessments of soil types and physiographic zones across to the property.
    - An assessment of the sensitivity of the receiving environment to adverse effects resulting from the proposed dairy farming activity

  - As assessment of the cumulative effects of the activity on the receiving environment. This needs to be put into the context of the net effect of the changes within the receiving environment
    - A description of how effects will be monitored and by whom

  - Identification of the persons affected by the proposal
    - Consultation undertaken
    - Response to the views of any person consulted

- A nutrient management plan that contains:
  - Modelling of nutrient losses from the site as a result of the proposed intensification or expansion
  - A comparison of this with nutrient losses from the site from current farming operation. Any reporting using Overseer must be undertaken by a user who has successfully completed the Advanced SNM course
- An assessment of the effects of the modelled losses on the receiving environment. This must be included even if the Overseer modelling shows no change in losses
- A description of the mitigation measures and good management practices to be undertaken over the course of the consent and the upcoming season and how these relate to the risks of the physiographic zones
- A description of any possible alternatives to activity

- An assessment of the activity against Part 2 of the RMA and the relevant objectives and polices of the following documents:
  - National Policy Statement on Freshwater Management
  - Operative and Proposed Regional Policy Statements
  - Proposed Southland Water and Land Plan – specifically policies 15 and 16
  - Te Tangi – Iwi Management Plan

- A Management Plan that is developed in accordance with Appendix N of the proposed Southland Water and Land Plan. This must include but is not limited to:
  - A site map showing the location of:
    - Critical source areas
    - Effluent disposal area
    - Farm infrastructure including the dairy shed and stand off pads
    - Physiographic zones
    - Permanent or intermittent rivers, streams, lake, drains, ponds or wetlands
    - where known the location and depth of any subsurface drainage systems including outlets
    - Riparian vegetation and fences adjacent to waterways
    - Stock access points across waterways
  - Good management practices for the site which will be undertaken on the farm over the period of 1 June to 31 May each year.
    - A riparian management plan.
    - Details of winter grazing management
    - A cultivation map showing waterbodies, where cultivation is planned for the proceeding 1 June to 30 May and proposed good management practices

- o A nutrient budget of the proposed farming scenario prepared by a certified nutrient advisor using OVERSEER in accordance with OVERSEER Best Practice Data Input Standards
    - Records of the input data used to prepare the nutrient budgets.

This information is required in order for your application to be considered complete in accordance with section 88(2) of the Resource Management Act.

Further information on the assessment of environmental effects can be found on the Environment Southland website: http://www.es.govt.nz/resource-consent/the-process/effects-assessment/.

You may find it beneficial to schedule a pre-application meeting. A pre-application meeting can help to ensure that all of the necessary information is considered in your consent application prior to lodgement. If you would like to arrange a pre-application meeting please contact me.

After you have the above information you can then re-lodge the application.

If a deposit was lodged with the application, this will be retained by Council for two weeks. If the application is not re-lodged before **23 March 2017**, it will be returned to you less any costs incurred to date.

Yours sincerely

D Petricevich

Danielle Petricevich
Consents Officer

Encl:

- Part A Form
- Part B Forms – Water Permit, Discharge Permit
- Application Guide – Expansion of a Dairy Farm

[1] Under Section 357 of the Resource Management Act, any person who has had an application returned as incomplete under section 88(3), has a right of objection to the appropriate consent authority in respect of that requirement. Any such objection shall be made by notice in writing to the consent authority or local authority, setting out the reasons for the objection, within 15 working days after the decision or requirement being notified to that person, or within such further time as may in any case be allowed by the consent authority or local authority.

From: Nicole Matheson <n.matheson@aqualinc.co.nz>
Sent: Friday, 24 March 2017 3:00 p.m.
To: Danielle Petricevich
Cc: Scandrett Rural
Subject: RE: Information for Consent Application

Hi Danielle,

For the Woldwide 2 proposal will a separate consent be issued for the consent to use land for dairy farming? If so can you please send through some example consent conditions that I can use as proposed conditions in the consent application?

Kind Regards,

Nicole Matheson
RESOURCE MANAGEMENT CONSULTANT | n.matheson@aqualinc.co.nz

Aqualinc Research Ltd
DDI +64 3 964 6522 | General +64 3 964 6521
Aviation House, Unit 3, 12 Orchard Road, Burnside, Christchurch 8053
PO Box 20462, Bishopdale, Christchurch 8543
www.aqualinc.com | myirrigation.info

From: Danielle Petricevich [mailto:danielle.petricevich@es.govt.nz]
Sent: Thursday, 16 March 2017 2:44 p.m.
To: 'John Scandrett (scandrettrural@xtra.co.nz)' <scandrettrural@xtra.co.nz>
Cc: 'abe@woldwide.nz' <abe@woldwide.nz>; Nicole Matheson <n.matheson@aqualinc.co.nz>
Subject: Information for Consent Application

Good Afternoon,

As requested in the meeting we had on Tuesday, attached is an application we have previously received for a Rule 22 application, and the groundwater monitoring results that I could find for your current permit.
Please note that further information was still requested for the attached application to clarify points, and this application should only be used as a guide. Also this should be used in combination with the return letter I sent to make sure all points are covered.
In addition to this please be aware (as mentioned in our meeting) in addition to the AEE, the analysis of policy and its wording is key to understanding the level of effects that are acceptable or not.

I was unable to find a substantial amount of information in the original application for this property and the discharge permit. Abe if you could remind me what information was in the application that may be helpful for this application, it may make it easier for me to find.

Also if you want any further information about groundwater/surface water quality in the area then it would be best to contact the science team, as Mike mentioned in the meeting.

If you have any questions, please let me know.

Regards,

Danielle

Danielle Petricevich
Consents Officer | Environment Southland

My days of work are Monday, Tuesday, Wednesday and Thursday.

P +64 3 2115 115 | E:danielle.petricevich@es.govt.nz |
Web: www.es.govt.nz | www.facebook.com/environmentsouthland |
Corner Price Street and North Road, Private Bag 90116, Invercargill 9840 |

From: Nicole Matheson <n.matheson@aqualinc.co.nz>
Sent: Monday, 15 May 2017 3:04 p.m.
To: abe@woldwide.nz
Cc: 'John Scandrett (scandrettrural@xtra.co.nz)'
Subject: Woldwide Two
Attachments: Exisitng milking platform.pdf; C14114_Woldwide Two_Section88_15May2017.pdf

Hi Abe and John,

Please find attached the updated application.

There seems to be discrepancies in the areas between what I have been given and what Cain has included in the Overseer modelling, I have highlighted in the application all mention of areas so they can please be checked.

I have attached the plan which was included in the previous application which shows the effluent discharge area. From this it seems there is 37 ha at the top of the farm being added to the farm is this correct? Cain has indicated there is 92 ha being added to the dairy farm....

We need to be sure that the areas match between the application and Overseer so that Environment Southland don't question later on.

Please let me know if you are happy with the rest of the application or if you would like any changes to be made.

Kind Regards,

Nicole Matheson
RESOURCE MANAGEMENT CONSULTANT | n.matheson@aqualinc.co.nz

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PO Box 20462, Bishopdale, Christchurch 8543
www.aqualinc.com | myirrigation.info

Scandrett Rural

From:	Nicole Matheson <n.matheson@aqualinc.co.nz>
Sent:	Monday, 22 May 2017 3:32 p.m.
To:	Danielle Petricevich
Cc:	'Abe de Wolde'; Scandrett Rural
Subject:	RE: Woldwide Consent Application
Attachments:	C14114_Woldwide Two_Section88_22May2017.pdf

Hi Danielle,

Please find attached the resubmitted application for Woldwide Two Limited.

Kind Regards,

Nicole Matheson
RESOURCE MANAGEMENT CONSULTANT | n.matheson@aqualinc.co.nz

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DDI +64 3 964 6522 | General +64 3 964 6521
Aviation House, Unit 3, 12 Orchard Road, Burnside, Christchurch 8053
PO Box 20462, Bishopdale, Christchurch 8543
www.aqualinc.com | myirrigation.info

From: Danielle Petricevich [mailto:danielle.petricevich@es.govt.nz]
Sent: Thursday, 9 March 2017 12:38 p.m.
To: Nicole Matheson <n.matheson@aqualinc.co.nz>
Cc: 'abe@woldwide.nz' <abe@woldwide.nz>
Subject: Woldwide Consent Application

Good Afternoon,

Thank you for your application. As discussed on the phone with Nicole yesterday, this consent application is being returned under s88 of the RMA as the information required to ensure the application is complete is too great for a request under Section 92(1).
The return letter and relevant documents are attached, including the consent application. These are also in the post (excluding a copy of the application).

Please do not hesitate to call or email me if you have any questions, or arrange a meeting with the duty consents officer for a pre-application meeting.

Regards,

Danielle

Danielle Petricevich

29 May 2017

Aqualinc Research Limited
C/- Nicole Matheson
PO Box 20-462
Christchurch 8543

Our Reference: APP-20171278
Enquiries to: Alexandra.King@es.govt.nz

environment SOUTHLAND
Te Taiao Tonga

Cnr North Rd & Price St
Waikiwi
Invercargill 9810
DX No. YX20175
Private Bag 90116
Invercargill 9840
New Zealand

Phone 03 211 5115
Fax 03 211 5252
Tollfree (Southland only)
0800 76 88 45
Email service@es.govt.nz
Website www.es.govt.nz

Dear Nicole,

Request for Further Information under Section 92(1) of the Resource Management Act 1991 - Application by Woldwide Two Limited

Thank you for your application to discharge dairy shed effluent from up to 800 cows and wintering pad effluent from up to 640 cows to land, to take groundwater, and to expand an existing dairy farm, at State Highway 99, Heddon Bush.

I require further information before a determination can be made on your application. Please provide[1], in accordance with Section 92(1) of the Resource Management Act, the following information:

An application specific policy assessment

- The policy assessment included in the application is general and not application or site specific. A more detailed assessment of the provisions of the proposed plan needs to be undertaken, in particular Policies 13, 15, 16, and the physiographic specific policies. Links between the policies, the effects of the activities, and the mitigation measures and good practices employed should also be made.

An assessment of environmental effects

- This assessment is not a description. It must, at a minimum, analyse the effect of the proposed change on the receiving environment, and correspond to the scale and significance of the effects of the activity on the environment. Your revised AEE should include:
    - An assessment of the effect of the proposed discharge combined with other discharges on the property. Namely the FDE discharge under AUTH-301665-V1, and whey discharge under AUTH-20146925-V3; and
    - An assessment of the positive, negative, temporary, permanent, future and cumulative effects *(s3)*. A cumulative effect is an effect which, when combined with other effects is significant; and

[1] Under Section 92(1) of the Resource Management Act 1991 (RMA) the Council may, at any time before the hearing of an application, or if no hearing is to be held, before the decision to grant or refuse the application is made, request in writing that the applicant provide further information relating to the application

- Reference to the FDE Risk Categories and Physiographic Zones, in understanding the contaminant pathways for nutrients to the receiving environment. Further information about Physiographic Zones can be found in the proposed Southland Water and Land Plan and on Environment Southland's website at http://waterandland.es.govt.nz/southland-science/physiographic-zones; and
- Assess the values associated with the receiving environment and the actual and potential effects on these values; and
- Assess how the modelled nutrient loss will actually or potentially affect the receiving environment, in context of the sensitivity of the receiving environment and values associated with it; and
- Discuss the limitations of the OVERSEER model in regards to this location.

- A detailed discussion of the receiving environment: This discussion should address the current state of the receiving environment (ground and surface water quality, at the site and downstream), and the sensitivity of the receiving environment to adverse effects resulting from the proposed dairy farming activities. This should include (but not be limited to) an assessment of Registered Drinking Water sites in the vicinity. *(Schedule 4, 6(1)(d))*

- A discussion of how effective the proposed mitigation measures and good management practices will be at mitigating the effects of the proposal, and how these will ensure that effects will be 'fully mitigated' as per Policy 16 of the proposed Southland Water and Land Plan. Please discuss why some would be employed over others. Mitigation measures and good management practises are detailed on Environment Southland's website at http://waterandland.es.govt.nz/water-and-land-plan/good-management-practices
(Schedule 4, 6(1)(e))

- Reasons for the proposed effluent discharge buffer distances (described in the proposed Discharge Permit conditions). The buffer distances are smaller than that listed in both Rule 50 of the operative Regional Water Plan, and Rule 35 of the proposed Southland Water and Land Plan.

- A description of how effects will be monitored and by whom. *(Schedule 4, 6(1)(g))*

Other information required

- A detailed site plan: This must show the location of all surface water courses, surface drains, bores, the effluent disposal area, the area receiving other discharges (FDE and whey) and any dwellings not on the subject property within 200 metres of the proposed discharge area.

- A description of any other activities that are part of the proposal, including any permitted activities or activities addressed by other authorities or under other legislation. This may include (but not be limited to), FDE discharge under AUTH-301665-V1 and whey discharge under AUTH-20146925-V3, and silage and underpass effluent. *(Schedule 4, 3(a))*

- Confirmation of whether an application rate test has been carried out on the irrigator. If this has been done within the last season, please provide these results. If this has not been done, please propose a date when this would be completed by.

- A copy of the Appendix N Plan referred to in Sections 6.1 and 7.23.6 of the application.

- Clarification of winter milking proposed. The application states that no winter milking is proposed, yet notes that some cows are not dried off until mid June.

This information is required in order for your application to be considered complete in accordance with section 88(2) of the Resource Management Act.

Further information on the assessment of environmental effects can be found on the Environment Southland website:
http://www.es.govt.nz/resource-consent/the-process/effects-assessment/

Determination of your application is postponed until receipt of this information. Under Section 92A of the RMA you have until 15 working days from the date of this request, which we calculate to be 19 June 2017, to either provide the information, tell the Council, in writing, whether you agree to provide the information, or that you refuse to provide the information.

If you refuse to provide the information requested, or if you do not respond to this request, the Council may decline the application on the grounds that it has inadequate information to determine the application.

Please contact me once you have read this letter, so that I can answer any questions you may have.

Yours sincerely

Alexandra King

Alexandra King
Consents Officer

CC: Woldwide Two Limited, C/- A & J J de Wolde, 104 Shaws Trees Road, RD 3, Winton 9783

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[1] Under Section 357 of the Resource Management Act, any person who has had an application returned as incomplete under section 88(3), has a right of objection to the appropriate consent authority in respect of that requirement. Any such objection shall be made by notice in writing to the consent

BEFORE THE HEARING PANEL OF SOUTHLAND REGIONAL COUNCIL

In the matter of sections 88 to 115 of the Resource Management Act 1991

And

In the matter Applications for resource consents by:

WOLDWIDE ONE LIMITED, WOLDWIDE TWO LIMITED,
Applicants

BRIEF OF EVIDENCE OF JANITA AND ALBERT DE WOLDE

8 October 2019

INTRODUCTION

1 Our full names are Janita Julia de Wolde and Albert (Abe) de Wolde. We are authorised by both Woldwide One Ltd (**WW1**) and Woldwide Two Ltd (**WW2**), to provide this evidence on behalf of these companies, the joint applicants for land use consents, discharge permits and water permits. This brief has been prepared by us jointly, (as husband and wife) because it covers issues in which we are jointly involved as a team. We are fellow directors, and shareholders.

2 We had a plan to lease the Merriburn block, to increase cow numbers slightly on WW1 and WW2, and to cease Intensive Winter Grazing (**IWG**) on the land opposite WW2.

3 This brief of evidence has been specifically provided as a timeline of events that show the position we currently find ourselves in and to provide evidence for the Submissions of Counsel as to Existing Environment, dated 10 October 2019.

TIMELINE

September 2016

4 We made an appointment with Environment Southland (**ES**) consents officers for September 2016. It is some time ago, but I do have a diary entry recording that a Courtney was one of the officers. At this meeting, we discussed the entire proposal for WW1 and 2 as one overall project, including the increase in cow numbers. We were told by an ES officer that the consent would be easy to get. In response to this, we accepted the lease on the Merriburn block which then began on 14 October 2016.

October 2016

5 The lease over began Merriburn Block began on 14 October 2016. When we accepted the 380 ha lease block, we incurred running and lease costs from that moment onwards, and we had to structure the farm management around the extra feed coming in and the extra work that needed to be done.

6 We employed extra people, purchased extra farm machinery and harvested a lot of extra feed that we have no use for if stock numbers do not increase. Conserved feed has a limited life span.

7 In October 2016 we reduced the IWG on WW2 with the expectation of an increasing of our WW1 consent from 540 to 800 cows. This was consistent with the proposal we made to ES staff and the recommendations they offered in our meeting of September 2016.

8 An application for land use consent was triggered because of the increase in cow numbers. The improvements across the two properties required a reconfiguration of land, so that 54ha previously operated as part of the WW2 property is now to be operated as part of the WW1 property. For reasons explained below the applications were lodged a few months apart.

May 2017

9 We had engaged Scandrett Rural to prepare and lodge the applications for WW1 and WW2. They were prepared more or less at the same time. Scandrett Rural had sub-contracted the expert planning work to Acqualink, as a result of which Ms Matheson did much of the preparation of the applications. They were prepared at the same time, but that for WW2 was submitted first, so that it could effectively be copied for WW1 once successfully lodged. This was done because of the newly notified PSWLP and the uncertainty as to what would be involved.

10 The first iteration was rejected under s88(3) for a wide range of reasons. The planning team decided to resolve those before lodging WW1. WW2 was resubmitted in May 2017 and not returned, but was then subject to a number of requests for further information. I **enclose** as **Appendix A** a copy of the correspondence surrounding this. We were therefore happy she knew these were all one and the same project. Once these were answered, the WW1 application was also lodged, with all the information that had been required for the WW2 application through the rejection and then further information requests.

August 2017

11 By August 2017 ES therefore had both the applications in what they appeared then to consider to be a complete format before them.

12 It seems a key error was made when doing that, because the processing officer failed to note that 54ha of the land that had been farmed as part of WW2 was to be farmed as part of the WW1 operation under the new arrangement and that the WW2 applications did not seek to authorise activities on that 54ha.

13 The nutrient loss for the existing use of land for the farming of cows on the land subject to the WW2 application was therefore seriously over assessed, as the land subject to the WW2 application was incorrectly assessed as having an existing nutrient loss that included the loss from that 54ha, which did not form part of that application. That nutrient loss has to remain with that 54ha, meaning it has to be removed from WW2 because that block is not part of the proposed WW2 operation, as per the application. See **Appendix 1** for visual evidence of this.

14 Additionally, errors with the WW2 consent made it unworkable. Those being;

14.1 The boundary on WW2 2017's Appendix 1 Discharge Map is incorrect, leaving out some paddocks (c.6 ha) from *Lot 1 DP 9925* that are adjacent to Wreys Bush Highway. See **attached Appendix 1A** for a visual of those paddocks left out.

14.2 *Part Section 417 Taringatura SD* is not listed in the Legal Description WW2's 2017 land use consent for dairy farming or discharge map.

February 2018

15 We added extensions to our free stall barns February 2018 to be ready for winter (June) 2018. We had no staged approach to consents, so we had to have them ready – this was done by accepting and trusting the (new) advice given by ES staff.

16 The applications were publicly notified because ES had formed the view that the 54ha we had intended to form part of WW1 had effectively been withdrawn from farming by the WW2 application and so its inclusion made the effects more than minor. We engaged Mr Van der Wal of Duncan Cotterill to assist us with the hearing. We got to the point where our evidence had already been provided. The brief of evidence of our planner at the time, Ms Nicole Matheson, had identified clearly the problem with the processing of the 2017 consents. A copy of that brief is **attached** as **Appendix 1B**

23 March 2018

17 On 23 March 2018 Mr Van der Wal applied to have the processing of the WW1 application suspended because of the serious error in the processing of the WW2 applications. A copy of the application for suspension is **attached** as **Appendix 2**. On the same day the suspension application was actioned by the Council. A copy of an email string confirming that is **attached** as **Appendix 3**. Mr Van der Wal had advised that it may well be simpler not to do anything with the 2017 consents, but simply start again with a fresh joint application for both WW1 and WW2, but this time explicitly as a joint application.

18 This was because the WW1 application had been notified on the basis of the mistake, so the Council could not turn it back with this application, but could rectify it if we stopped with this application and started again. His advice to us was that as long as we did not surrender the 2011 consent for WW2 and did nothing with the 2017 consent we could simply put the 2017 mistakes to one side. This was because 2011 consent and the permitted activity rules remained in place, so we could compare the new applications with what we could do under the 2011 and 2012 consents for WW2 and WW1 and the permitted activity rules. He did say that it was important to check with the Council that this would work before abandoning the hearing.

19 He advised that we should approach the Council on a without prejudice basis, as this was more likely to result in an open and constructive dialogue with the Council. A lot of his advice

was verbal, so I do not have copies of it. Some of it was simply attaching draft without prejudice correspondence to the Council explaining the proposed way forward and asking us to approve that. We approved the approach and the correspondence, but we are told that we cannot attach it because it is affected by the without prejudice status. We would be happy to waive the without prejudice status for a particular letter that we think would be really helpful, but Mr Van der Wal informs us that the Council will not agree to that.

20 The without prejudice communications with the Council resulted in a without prejudice meeting with the Council on 11 April 2018. I am not able to say what was discussed, but can only say that after this meeting, WW1 decided not to continue with the processing of its application, but to join with WW2 in seeking a joint application. This was specifically to fix the problems with the 2017 consents by starting again.

21 At that stage we formed the view that because we had found a way around the mistakes made in the 2017 consents, namely by starting from scratch with a joint application for WW1 and WW2, we did not need to keep involving Mr Van der Wal. The costs were mounting then already, so we were happy not to have to keep incurring legal costs as well.

22 As a result Mr Van der Wal and Duncan Cotterill had no involvement until we contacted Mr Van der Wal on 12 June 2019. He was about to go overseas, so he only really became involved on 8 July 2019, after his return. In the interim we had had no legal advice, because we thought we were moving towards a solution.

25 June 2018

23 Our consultants attended a meeting on 25 June 2018 at ES regarding the upcoming application for WW1 and WW2 combined.

24 At this meeting, they were told by the ES officers that the approach of a combined consent was much clearer and more effective. As seen in **Appendix 4 -** Summary of the Meeting. It was also attended by Courtney Guise, Cain Duncan and Ms Nessa Legg. By this time Ms Matheson was no longer involved, because she had left Aqualink, which had been sub-contracted by Scandrett Rural to do the planning assessment. Following her departure Ms Legg had been employed by Scandrett Rural, so she took over from Ms Matheson as the planner for the project and she submitted the fresh applications. It seems that the background planning information was all sitting with Aqualink and not with Scandrett Rural, which is why Ms Legg was able to make the mistake of assuming the 2017 consent was being used. We did not see that mistake and only became aware of it when Ms Grant pointed it out in August 2019.

December 2018

25 When notified, the new (combined) application contained errors and material inaccuracies. This made the public notices ineffective and void. **Appendix 5** sets out the legal advice that ES received on this matter.

26 **Appendix 6** also sets out the email communications that refer to the inaccuracies.

3 December 2018

27 We received an email from Mike Durand and Ms Grant reflecting on a meeting we had with them earlier that day. Here, they apologised for the factual and material errors in the public notices and referred to the advice they received of 30 November 2018. They also noted some agreed upon points that we were to incorporate or adjust in our new application. A copy of this email is attached as **Appendix 7.**

4 December 2019

28 Ms Legg and Ms Grant corresponded via email regarding those matters that were discussed at the meeting of 3 December 2018. Ms Legg had written a summary of what was discussed and Ms Grant responded in an email at 12.08pm that Ms Legg's summary of the matters discussed and agreed upon in the meeting "looks good to me". A copy of this email chain can be referred to as **Appendix 8.**

29 We were of the understanding that everyone was on the same page regarding those matters that needed adjusting.

5 December 2018

30 In email correspondence dated 5 December 2018, Ms Grant made assurances that the new application would be able to "proceed relatively easily" provided we included those details in the application that had been agreed upon in our meeting of 3 December (and noted in email correspondence from Ms Grant on 3 December). A copy of an email string confirming this is **attached** as **Appendix 8.**

31 We were also assured in this email that "nothing new should crop up" and that we had a good chance to get everything granted if we went for a hearing. This is also made apparent in **Appendix 8.**

19 January 2019

32 Ms Legg shared a draft application for WW1 and WW2 with Ms Grant for review. The changes were based on those matters discussed in the meeting of 3 December 2019 (referred to above

as **Appendix 8)** and further noted and agreed upon by Ms Legg and Ms Grant in email correspondence of 4 December 2019 (also within **Appendix 8).**

33 When proposing the draft, Ms Legg listed the changes that had been made and understood that this covered those basis that had been agreed upon in December meetings and correspondence. A copy of this correspondence is shown **attached** in **Appendix 9.**

28 January 2019

34 We received a response from Ms Grant in relation to our draft application. It became clear that different issues to those set out in the earlier meetings and emails were beginning to arise. This included land holding issues and the fact that Ponds were no longer okay. A copy of this correspondence is shown **attached** in **Appendix 10.**

35 **Appendix 11** and **Appendix 12** were attached to Ms Grant's email of 28 January 2019. These were 'tracked change' versions of the draft application that was sent by Ms Legg for review. The comments throughout, mirrored those introduced in her email and reflect expectations that were over and above those changes that had been agreed upon and further confirmed (as reflected in the email correspondence of **Appendix 9**).

36 Effectively, the changes required went quite a way beyond what we agreed. Ms Grant and Ms Legg worked back and forth from January 2019 to March 2019 with draft applications, whereby Ms Grant gave feedback.

23 March 2019

37 The final application was lodged on March 23. This is not that fault of anyone, but is a reflection of the level of changes that were required; being over and above those that we seemed to have originally agreed upon.

38 Once the application was lodged, it was notified immediately.

39 Then began the difficulties over securing a hearing date (19 Aug), changes we made to the application, new hearing date (30 Sept).

Overall

40 We have not set out the full timeline between 23 March 2019 and the convening of the hearing on 30 September, because the Commissioners have first hand knowledge of most of what happened.

41 They are aware of the 9 August 2019 meeting. That meeting and the approach were very different from the pre-lodgement meetings we had had. It was at this meeting that the 2017 consents issue was raised by Ms Grant. If we are honest it did not feel like a meeting to clarify

points about the applications, but more like one designed to try and get concessions from us that would mean our applications could not succeed. We were that worried about it that we got Mr Van der Wal to write to the Commissioners and Ms Grant on 22 August and 3 September. We understand that the Commissioners have copies of those letters.

42 We had understood that the hearing would be the end point, where the disagreements would be decided, but this has not been the case. The cost and effort spent on the consents has grown disproportionate to the size of the project. These prolonged delays and the uncertainty that they have developed have made business difficult and it near impossible to make important decisions.

43 The initial application was for 1600 cows and a new milking shed on WW1. The money intended for the new shed has now been spent on the efforts to get the applications in line with what the officers led us to believe was necessary.

44 This was meant to be a relatively small increase in cows to pay for better environmental mitigation. The only reason we started down this track was because of the positive feedback given by Environment Southland officers back in 2016. Had anyone from ES said then that there was an organisational bottom line of no more cows, we would not have started in the first place. Had we been able to foresee the repeated errors and changes of rules and approaches by ES we certainly would not have started.

45 At each error we took the approach that everyone makes mistakes, so let's just move forward, because the ES officers seemed committed to making things work. Had we been given a reasonable expectation that ES would say the joint applications would not be able to solve the mistakes with the 2017 applications we would definitely not have stopped the hearing for the 2017 WW1 application and started again with these applications. We would not have poured all the money we have into getting to where we are now.

46 By the 9 August 2019 meeting we were so far down the road and had poured so much money into something that we were led to believe would provide the solution, that we could not stop then.

47 We have been cooperative and have helped to seek a way forward with ES in a constructive way. Every time when we have re- submitted we have incurred new costs (on both sides) and the conditions were stricter- the goalposts kept changing.

48 With all the mistakes made, the changes in the rules and the fact that our expectations as to how things would run were repeatedly not met, it is quite possible that some things happened that ES can point to try and say that WW2 has exercised the 2017 consents. We want to confirm that whatever was done on any of the properties was never done because they had the 2017 consents and they allowed them to do things they could not do without them. The opposite is true. WW2 has gone out of its way not to move milking cows to pasture that is

available only under the WW2 2017 consents. This has cost it a lot of lost earnings. What is most difficult of all for us is the fact that the ES officers are effectively saying that we are lying when we say we did not exercise the 2017 consents. We confirm we are not. We did not do any of the things they say we did in reliance on those consents for that reason; the only reason we did them was in anticipation of getting these consents.

49 For example, the connection of the silage pad to the system that feeds any leachate that might come from it was absolutely not done because WW2 had the 2017 consents. It is one of the mitigation measures proposed for this set of applications. I (Abe) made it clear that I did not believe there was any leachate coming from it, but if I am wrong, then I certainly did not think that we could connect because of the 2017 consents, because we never surrendered the 2011 consents. Also, we believe that collecting runoff from a silage pad and directing any that might have gone through silage on the pad to the pond rather than allowing it to run off was a good thing. We really find it difficult to see how this could mean that we cannot get this new set of consents.

50 Although we hope our word about not having exercised the 2017 consents is good enough, we list a few things that we hope will show that we are being truthful:

50.1 We genuinely believed that we could not rely on the 2017 consents, because of the mistakes made in granting them;

50.2 We knew we could not exercise them unless we had surrendered the 2011 consents. While through the confusion and constant changes some minor compliance issues slipped through the cracks (as we both admitted in our evidence), this requirement was so obvious that we would never have started to rely on the 2017 consents without first surrendering the 2011 consent;

50.3 Once we agreed to treat WW1 and WW2 as one landholding, the 2017 consents were useless anyway, as they treated WW2 as a separate landholding and did not include the WW1 component at all. The whole project needed WW1 and WW2 to go ahead together the same time, which is why we had started from scratch with the joint application.

50.4 We kept being invoiced for the 2011 consent monitoring costs. I **attach** as **Appendix 13 and 13A** a copy of the latest invoice. There is no way we would have paid these if we thought that the 2011 consent no longer existed, but we were under the 2017 consents;

50.5 If we had thought we were under the 2017 consents, we would have done a lot more than only connect the silage pad to the pond. WW2 would have maxed those consents out in a way that would have left no doubt as to what was happening (in for a penny in for a pound);

50.6 Most importantly, we would never have spent the hundreds of thousands of Dollars we have incurred by now on progressing these applications. The reason we did that was because the 2017 consents were just too problematic to use and ES had gone along with our attempts to use these applications to solve the problems.

51 We really hope that this helps in clarifying everything so that we can move ahead as we had envisaged, based on how we had been working with ES to implement the environmental improvements we were led to believe they thought were a good idea.

Dated 10 October 2019

Albert and Janita de Wolde

From: Hans van der Wal <hans.vanderwal@duncancotterill.com>
Sent: Friday, 23 March 2018 11:21 a.m.
To: Christine Stenning
Subject: RE: APP-20171445 Application Under s91A to Suspend Processing [DC-Documents.FID2483570]

Hi, Christine

We have no direct idea at present, but indicate that it is likely to be more than days or weeks. An April hearing seems highly unlikely. If we consider that the termination of the suspension is imminent, we shall endeavour to provide adequate notice to enable re-scheduling of the hearing.

Sorry I couldn't be more specific, but at present we just don't know what we don't know.

Kind regards

Hans van der Wal
Special Counsel

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Duncan Cotterill Plaza 148 Victoria Street
PO Box 5 Christchurch 8140 New Zealand

Click here for office directions

Duncan Cotterill

From: Christine Stenning [mailto:Christine.Stenning@es.govt.nz]
Sent: Friday, 23 March 2018 11:15 AM
To: Hans van der Wal
Subject: RE: APP-20171445 Application Under s91A to Suspend Processing [DC-Documents.FID2483570]

Hi Hans

Thank you for your email.
The Commissioners have been notified of the suspension of this application and have asked for an indication of how much time you may require?
Could you please let me know as soon as possible so that all parties can be notified.

Regards, Christine

Christine Stenning
Consents & Compliance Administrator
Environment Southland *Te Taiao Tonga*

P 03 211 5115 | M
Cnr Price St & North Rd, Private Bag 90116, Invercargill 9840
Christine.Stenning@es.govt.nz | www.es.govt.nz | facebook.com/environmentsouthland

From: Hans van der Wal [mailto:hans.vanderwal@duncancotterill.com]
Sent: Friday, 23 March 2018 10:31 a.m.
To: Christine Stenning
Cc: abe@woldwide.nz; 'Anita' (anita@woldwide.nz); n.matheson@aqualinc.co.nz; 'Scandrett Rural' (scandrettrural@xtra.co.nz); Cain Duncan (Cain.Duncan@fonterra.com); Michael Durand
Subject: APP-20171445 Application Under s91A to Suspend Processing [DC-Documents.FID2483570]
Importance: High

Hi, Christine

Please find by way of lodgement an application under s91A to suspend the processing of application **APP-20171445**. We look forward to the earliest notification of suspension in accordance with s91A(5). We also request that this notice is actioned as soon as possible, to ensure no further processing costs are incurred after the receipt of this application.

Many thanks.

Hans van der Wal
Special Counsel

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PO Box 5 Christchurch 8140 New Zealand

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From: Nessa Legg <nessa.dgl@xtra.co.nz>
Sent: Wednesday, 28 November 2018 10:19 a.m.
To: Aurora Grant
Cc: abe@woldwide.nz; 'Anita De Wolde'; 'Scandrett Rural'; 'Tanya Copeland'; Courtney Guise; Michael Durand
Subject: RE: Woldwide 1&2

Thanks for the update Aurora.

Page 7 – 4th row of table
Page 9 – First line of section 3.3.2(A)

Regards,
Nessa

From: Aurora Grant <Aurora.Grant@es.govt.nz>
Sent: Wednesday, 28 November 2018 10:14 a.m.
To: 'Nessa Legg' <nessa.dgl@xtra.co.nz>; Courtney Guise <Courtney.Guise@es.govt.nz>
Cc: 'abe@woldwide.nz' <abe@woldwide.nz>; 'Anita De Wolde' <anita@woldwide.nz>; 'Scandrett Rural' <scandrettrural@xtra.co.nz>; 'Tanya Copeland' <tanya@landpro.co.nz>; Courtney Guise <Courtney.Guise@es.govt.nz>; Michael Durand <Michael.Durand@es.govt.nz>
Subject: RE: Woldwide 1&2

Hi everyone,

Just an update on this – I have reviewed all of the requested changes to Woldwide 4&5, and am now completing 1&2. I've written a memo for each application with recommendations and this will be forwarded to the lawyers for a legal recommendation. Once I get the recommendation back I'll circulate this to everyone.
We hope to have a way forward by the end of the week.
Nessa, I have one question on your requested changes – could you please advise what page of the report the claim that the effluent discharge area is decreasing appears on.

Kind regards,

Aurora

From: Nessa Legg <nessa.dgl@xtra.co.nz>
Sent: Sunday, 25 November 2018 1:52 PM
To: Aurora Grant <Aurora.Grant@es.govt.nz>; Courtney Guise <Courtney.Guise@es.govt.nz>
Cc: abe@woldwide.nz; 'Anita De Wolde' <anita@woldwide.nz>; 'Scandrett Rural' <scandrettrural@xtra.co.nz>; 'Tanya Copeland' <tanya@landpro.co.nz>
Subject: FW: Woldwide 1&2

Hi Aurora and Courtney,

We have another concern with the s95/report not listed in my previous email – apologies for sending it to you now. It is something that will come up during the hearing process but it may worth reviewing at this point in time – see what you think anyway.

Page 13/s95 report

RE: technical comment on groundwater flow rate towards Heddon Bush School bore/effects yet to be seen

In the report, the timeframe calculated for groundwater underlying 1&2 to reach the Heddon Bush School is 15 years, i.e. from when *"the farms began operating together 5,475 days ago"*. Woldwide One is there since 1992, which works out at 25 years/9125 days up to 2017. Also other farming activities (such as intensive winter grazing of cows) were carried out in the area over that time.

Nitrate signals at the school bore due to Woldwide One and other farming activities in the area (since 1992 = 25 years) would have been seen for some time if they were present. Nitrate levels of 1.8 – 2.0 g/m3 at the school bore in 17/18 do not support a claim of adverse effects yet to be seen. If you look at the bore at the south end of Woldwide 1 (**E45/0622**), it generally has low nitrate levels (e.g. 2.0 g/m3 in 2018) – see the fig 5.22 on page 62 of the application. Again these data do not support the claim regarding effects on groundwater that are yet reach the school bore.

Regards,
Nessa

Hi Aurora,

I have compiled everything in a list. Please get in touch if you have questions.

Notice – public notification

Slurry tanker

Please describe as "slurry tanker with a trailing shoe."

Land classification

Drummond soils are Category D. landscape categories should include category A, D and E.

Mention of additional winter grazing in reasons for public notification – this is misleading

All cows will be wintered in barns so there is no additional intensive winter grazing. It could easily be misunderstood that additional intensive winter grazing has been applied for.

Claim that *the discharge of high rate methods to Category E land is inappropriate as outlined by policy.*

This is incorrect. The discharge via high rate methods to Category E land is appropriate, so long as the application depth is less than or equal to 10 mm and less than 50% of PAW. The instantaneous application rate does not apply to Category E land. The average application rate should be less than the soil infiltration rate.

S95 Report for 1&2

Total landholding area error

Total area is incorrect.

Page 7 – should be 502 ha for 1&2
Not sure if you are counting Runoff too?

Claim that the effluent discharge area is decreasing

We don't really understand this but it may not that important overall

Explanation about the discharge on page 4 is muddled

To clarify:

Travelling irrigator is used to discharge liquid effluent from dairy sheds
Slurry tanker with trailing shoe is used to apply pond slurry (aka sludge)

Incorrect figure for N loading at Horner Block

Page 2 -

Nitrogen loadings to the Horner Block from the discharge of sludge from the effluent ponds is in excess of the standard loading limit of 250 kg nitrogen per hectare per year.
This should read:
Nitrogen loadings to the Horner Block from the discharge of sludge from the effluent ponds is in excess of the standard loading limit of 150 kg nitrogen per hectare per year.

Page 29 –
Nitrogen loadings to the Horner Block from the discharge of sludge from the effluent ponds is in excess of the standard loading limit of 250 kg nitrogen per hectare per year.
Again this should read 150 kg

Policy 42 of RWP mistake RE Category E land

As submitted in the RFI, the travelling irrigators have been tested and apply effluent at less than 10 millimetres depth per application. The effluent depth via high rate travelling irrigator to Category E land is consistent with policy 42 of the RWP. The below conclusions about adverse effects due to inconsistency with Policy 42 are therefore unjustified.

Page 2 –
The effluent discharge depth on Category E land may have significant adverse effects on the environment.
Page 5 –
Effluent discharge depth is inconsistent with policy in the Regional Water Plan – so the environmental effects of FDE irrigation may not be acceptable;
Page 21 -
In addition, the applicant will use high rate irrigation methods to land classified as Category E land (Glenelg, Drummond and Waiau soils). Best practise guidelines identify that this land shouldn't receive effluent application depth of more than 10 mm depth[2,3] as effluent can seep out of the root zone and has a higher risk of contaminating groundwater. I consider the discharge of effluent to land at this depth is likely to cause adverse effects on the environment which more than minor.
Page 29 -
The effluent discharge depth is not consistent with policy in the RWP to Category E land. This signals that the activity may have significant adverse effects on the environment.

Slurry application depth misrepresented as 5 mm per application

Throughout the s95 report, the slurry tanker application depth is referenced as 5 mm per application "sludge will be applied at 5 mm per application."
In the application the max depth of 5 mm was referenced as a standard condition on discharge permits. See 1&2 application pages 77, 78, 80, 103, 105 and 111 where depths of 1 – 2 millimetres were described for the slurry tanker, as well as how the applicants achieve this.
See main RFI page 27 - this was further clarified and the distinction was made between the standard condition (5 mm depth) and what the applicants actually do in practice (1.5 – 2 mm).
It is erroneous to repeatedly state that slurry will be applied at 5 mm depth per application, therefore potentially overloading soils/causing N leakage.

Page 21 – *Because there will be very high loadings of nitrogen discharged to this land, and the soils have severe and very severe nutrient leaching characteristics, the discharge of sludge is likely to have adverse effects on the environment at the Horner Block ~~which will to be minor~~.* This does not read right but based on the first part of the sentence I assume it should read "more than minor?" Conclusions about effects at the Horner Block need to be reviewed since slurry will be applied at very low depths (1.5-2 mm) specifically to prevent N overloading of soils/leakage of N.

Possible error about a stream flowing through Drummond Peat Swamp that originates at 1&2

I have searched and re-searched Topomap this morning. As per the page 15 of the main RFI (question 14), "an un-named tributary of Middle Creek flows from the property to within 330 metres (west) of Drummond Swamp, where it flows along Kennedy Road." I cannot find any steams that flow from the property through Drummond Peat Swamp.

Page 9 of the s95 report – it states *There is a regionally significant wetland about 14 kilometres downstream of the southern boundary of the dairy platform, Drummond Peat Swamp. A tributary which begins within the dairy platform flows through the swamp.*

Error about company structure
Page 3 – a new company has not been formed. The consents will be held by two companies; Woldwide One Limited and Woldwide Two Limited

Not accepting John Scandrett as a SQP based on lack of information
Information was supplied on John's qualifications and training the RFI. See page 2
https://www.es.govt.nz/services/consents-and-compliance/notified-consents/Documents/2018/Woldwide%20One%20Ltd%20and%20Woldwide%20Two%20Ltd/09-01%20Soil%20Type%20Assessment%20-%20Letter.pdf

Soil mapping data not used in assessment
Info was provided to Courtney on John's soil mapping but she said she had already submitted the s95 report. We understand that Council cannot adopt our soil remapping data (without further work) but we believed that they would be used in the assessment. They were not used – only Topoclimate mapping was used (with no test holes at 1&2 farm), which we know to be incorrect. John's work shows 28 test holes dug and other work done. See attached. This may change how effects (perceived Braxton related risks) are assessed.

Land classification
Due to presence of Drummond soils, category D land should be added to the report.

Cheers,
Nessa

From: Aurora Grant <Aurora.Grant@es.govt.nz>
Sent: Friday, 23 November 2018 11:08 a.m.
To: 'Nessa Legg' <nessa.dgl@xtra.co.nz>
Cc: 'abe@woldwide.nz' <abe@woldwide.nz>; 'Anita De Wolde' <anita@woldwide.nz>; 'Tanya Copeland' <tanya@landpro.co.nz>; Courtney Guise <Courtney.Guise@es.govt.nz>; Michael Durand <Michael.Durand@es.govt.nz>
Subject: RE: Woldwide 1&2

Thanks Nessa,

As I have pointed out to Tanya I'll be working over the weekend to review the matters you have raised, however there is a lot of information to recheck, including all the various information requests and meetings that have occurred over the course of these applications where various clarifications have been made to the applications. We aim to have a response to you by next week but to make it quicker would it be possible for you to put all your points of contention into one email, and in a short bullet pointed format (Tanya has done this for WW4&5) and then I have everything that needs to address in one list.

Kind regards,

Aurora

From: Nessa Legg <nessa.dgl@xtra.co.nz>
Sent: Friday, 23 November 2018 10:43 AM

To: Aurora Grant <Aurora.Grant@es.govt.nz>
Cc: abe@woldwide.nz; 'Anita De Wolde' <anita@woldwide.nz>; 'Tanya Copeland' <tanya@landpro.co.nz>
Subject: RE: Woldwide 1&2

Hi Aurora,

Thanks for getting back to me. I was at the meeting yesterday with Abe, Anita, Mike and co. so was part of the discussion. It is imperative that the s95 report contains correct information and we urge that the review/corrections occur as soon as possible.

Michael asked yesterday that we confirm whether there errors/corrections to be made to the notification notice. I have reviewed the notice posted online at https://www.es.govt.nz/services/consents-and-compliance/notified-consents/Pages/Woldwide-One-Ltd-and-Woldwide-Two-Ltd.aspx
Please see the attached doc where I have highlighted in red where there are errors, omissions or misleading information.

Otherwise:
Page 9 of the s95 report – it states *There is a regionally significant wetland about 14 kilometres downstream of the southern boundary of the dairy platform, Drummond Peat Swamp. A tributary which begins within the dairy platform flows through the swamp*. I have searched and re-searched Topomap this morning. As per the page 15 of the main RFI (question 14), "an un-named tributary of Middle Creek flows from the property to within 330 metres (west) of Drummond Swamp, where it flows along Kennedy Road." I cannot find any steams that flow from the property through Drummond Peat Swamp.

Many thanks,
Nessa

From: Aurora Grant <Aurora.Grant@es.govt.nz>
Sent: Thursday, 22 November 2018 4:51 p.m.
To: 'Nessa Legg' <nessa.dgl@xtra.co.nz>; Courtney Guise <Courtney.Guise@es.govt.nz>
Cc: 'abe@woldwide.nz' <abe@woldwide.nz>; 'Anita De Wolde' <anita@woldwide.nz>; 'Tanya Copeland' <tanya@landpro.co.nz>; Michael Durand <Michael.Durand@es.govt.nz>
Subject: RE: Woldwide 1&2

Hi Nessa,

I can confirm we have received your request. I understand Mike met with Abe and various others today to discuss the applications.
Over the next few days we will be reviewing the report in its entirety against the applications and information provided throughout the process, and if corrections are required we will need to decide how to address this depending on the scale of any possible corrections.

Kind regards,

Aurora

Aurora Grant
Team Leader - Consents
Environment Southland *Te Taiao Tongo*

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From: Nessa Legg <nessa.dgl@xtra.co.nz>
Sent: Wednesday, 21 November 2018 10:17 PM
To: Courtney Guise <Courtney.Guise@es.govt.nz>
Cc: Aurora Grant <Aurora.Grant@es.govt.nz>; abe@woldwide.nz; 'Anita De Wolde' <anita@woldwide.nz>; 'Tanya Copeland' <tanya@landpro.co.nz>
Subject: RE: Woldwide 1&2

Hi Courtney,

Aurora/I have copied you on this because I am aware that Courtney is out of the office and may not get to this until next week.

I have re-read the s95 report and have identified some factual mistakes that I respectfully request are corrected immediately. The mistakes I am referring to have formed part of the basis for public notification. They are likely to erroneously raise concern in the public, will be addressed in the hearing process and ultimately paid for by the applicants. While there are other errors and we contend other parts of the report, these particular mistakes misrepresent the applicants, the application and need to be corrected please.

Page 2 -
Nitrogen loadings to the Horner Block from the discharge of sludge from the effluent ponds is in excess of the standard loading limit of 250 kg nitrogen per hectare per year.
This should read:
Nitrogen loadings to the Horner Block from the discharge of sludge from the effluent ponds is in excess of the standard loading limit of 150 kg nitrogen per hectare per year.
Also see page 29 –
Nitrogen loadings to the Horner Block from the discharge of sludge from the effluent ponds is in excess of the standard loading limit of 250 kg nitrogen per hectare per year. While this is mainly set to ensure animal health, the discharge is occurring on soils with very severe nutrient leaching characteristics and modelled losses may have been underestimated.
Again this should read <u>150 kg</u>

Page 2 –
The effluent discharge depth on Category E land may have significant adverse effects on the environment.
This ties in with page 5 –
Effluent discharge depth is inconsistent with policy in the Regional Water Plan – so the environmental effects of FDE irrigation may not be acceptable;
Also ties in with page 21 –
In addition, the applicant will use high rate irrigation methods to land classified as Category E land (Glenelg, Drummond and Waiau soils). Best practise guidelines identify that this land shouldn't receive effluent application depth of more than 10 mm depth[2,3] *as effluent can seep out of the root zone and has a higher risk of contaminating groundwater. I consider the discharge of effluent to land at this depth is likely to cause adverse effects on the environment which more than minor.*
Also see page 29 –
The effluent discharge depth is not consistent with policy in the RWP to Category E land. This signals that the activity may have significant adverse effects on the environment.
See Policy 42 of the RWP – Category E land. As submitted in the RFI, the travelling irrigators have been tested and apply effluent at less than 10 millimetres depth per application. The effluent depth to category E land is consistent with policy 42 of the RWP. The conclusions about adverse effects are therefore unjustified.

Throughout the s95 report, the slurry tanker application depth is referenced as 5 mm per application. In the application the max depth of 5 mm was referenced as it is a standard condition on discharge permits (e.g. the current permits specify it). On pages 77, 78, 80, 103, 105 and 111 of the application, depths of 1 – 2 millimetres were described for the slurry tanker, as well as how the applicants achieve this. On page 27 of the RFI this was further clarified and the distinction was made between the standard condition (5 mm depth) and what the applicants actually do in practice (1.5 – 2 mm). It is erroneous to repeatedly state that slurry will be applied at 5 mm depth per application, therefore overloading soils with N.

I ask that the above corrections are made to the s95 report, so that the public are provided with correct information.

Many thanks,
Nessa

From: Courtney Guise <Courtney.Guise@es.govt.nz>
Sent: Tuesday, 20 November 2018 9:15 a.m.
To: 'Nessa Legg' <nessa.dgl@xtra.co.nz>
Cc: 'abe' <abe@woldwide.nz>; 'Anita De Wolde' <anita@woldwide.nz>
Subject: RE: Woldwide 1&2?

Morning Nessa,

Thanks you for your email below. I'm out of the office for the rest of the week but will work on this when I am able to. Most of the information I got from the application / further information so I'll go through and check what the application etc said.

I'm sorry – I thought I had corrected the WOL & WTL company error before sending the Section 95 through, but I must have missed this one.

I'll be in touch as to whether the Section 95 is corrected or if we issue a correction memorandum outlining what errors were made in the Section 95 Memo.

Thanks again, I appreciate your eagle-eye.
Courtney

From: Nessa Legg [mailto:nessa.dgl@xtra.co.nz]
Sent: Monday, 19 November 2018 1:23 PM
To: Courtney Guise <Courtney.Guise@es.govt.nz>
Cc: 'abe' <abe@woldwide.nz>; 'Anita De Wolde' <anita@woldwide.nz>
Subject: RE: Woldwide 1&2?

Hi Courtney,

I have had a quick read through your s95 report and there are some factual errors that need to be corrected.

Factual errors:
Page 3 – a new company has not been formed. The consents will be held by two companies; Woldwide One Limited and Woldwide Two Limited

Page 4 – sludge will be discharged at less than 5 millimetres depth. This is important as it is a mitigation tool to keep the N loading from slurry low. 5 millimetres is simply the standard depth for slurry tankers on discharge permits.

Page 4 - A slurry tanker with trailing shoe is also used to apply slurry/sludge from the effluent ponds. There is no other effluent in the ponds, only slurry/sludge.

Page 7 – Total landholding area is incorrect. WOL&WTL = 502 ha

Page 21 – *"In addition, the applicant will use high rate irrigation methods to land classified as Categary E land (Glenelg, Drummond and Waiau soils). Best practise guidelines identify that this land shouldn't receive effluent application depth of mare than 10 mm depth2,3 as effluent can seep out of the root zone and has a higher risk of contaminating groundwater. I consider the discharge of effluent to land at this depth is likely to cause adverse effects on the environment which mare than minor."* The effluent application depths for the travelling irrigators were tested, with reports submitted as part of the RFI. Application depths are < 10 mm for both travelling irrigators.

Page 21 – Your comment that *"The sludge will be discharged via a slurry tanker or umbilical system at a depth of 5 mm per application"* is incorrect. Sludge will be discharged at depths less than 5 mm per application. Depths of 1.5 – 2 mm for the discharge of sludge were frequently referenced in the application to allow for the high N loading.

Page 21 – Please clarify the statement *"Because there will be very high loadings of nitrogen discharged to this land, and the soils have severe and very severe nutrient leaching characteristics, the discharge of sludge is likely to have adverse effects on the environment at the Horner Block which will to be minor."* Is there an error (underlined part)?

Page 22 – Again, sludge will be discharged at a depth of less than 5 mm per application.

Is it possible to correct the changes? If not can they be noted and attached to the report please?

Regards,
Nessa

From: Courtney Guise <Courtney.Guise@es.govt.nz>
Sent: Monday, 19 November 2018 11:14 a.m.
To: 'Nessa Legg' <nessa.dgl@xtra.co.nz>
Cc: 'abe@woldwide.nz' <abe@woldwide.nz>
Subject: RE: Woldwide 1&2?

Morning Nessa,

I apologise for not having this through sooner. It's been a bit of a rush to get all of the documentation done within timeframes.

Please see the attached copy of the Section notification memorandum which outlines that the application will be publicly notified. Please also see the attached letter which has the public notice in it.

I'm in the office this morning and tomorrow morning until 9.30am and then will be out the rest of the week. I'll be available on email intermittently.

Kind regards

Courtney Guise
Senior Consents Officer
Environment Southland *Te Taiao Tonga*

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Courtney.Guise@es.govt.nz | www.es.govt.nz | facebook.com/environmentsouthland

From: Nessa Legg [mailto:nessa.dgl@xtra.co.nz]
Sent: Monday, 19 November 2018 10:45 AM

To: Courtney Guise <Courtney.Guise@es.govt.nz>
Subject: Woldwide 1&2?

Hi Courtney,

Hope all is well. I was wondering when we can expect a decision regarding notification for Woldwide 1&2's application?

Thanks,
Nessa

Nessa Legg
Dairy Green Ltd
PO Box 5003, Waikiwi, Invercargill
Phone 03 215 4381 (office)
03 2255277 (home office)
Mobile 021 1165106
Email nessa.dgl@xtra.co.nz

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From:	Hans van der Wal <hans.vanderwal@duncancotterill.com>
Sent:	Friday, 23 March 2018 11:21 a.m.
To:	Christine Stenning
Subject:	RE: APP-20171445 Application Under s91A to Suspend Processing [DC-Documents.FID2483570]

Hi, Christine

We have no direct idea at present, but indicate that it is likely to be more than days or weeks. An April hearing seems highly unlikely. If we consider that the termination of the suspension is imminent, we shall endeavour to provide adequate notice to enable re-scheduling of the hearing.

Sorry I couldn't be more specific, but at present we just don't know what we don't know.

Kind regards

Hans van der Wal
Special Counsel

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Duncan Cotterill Plaza 148 Victoria Street
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Duncan Cotterill

From: Christine Stenning [mailto:Christine.Stenning@es.govt.nz]
Sent: Friday, 23 March 2018 11:15 AM
To: Hans van der Wal
Subject: RE: APP-20171445 Application Under s91A to Suspend Processing [DC-Documents.FID2483570]

Hi Hans

Thank you for your email.
The Commissioners have been notified of the suspension of this application and have asked for an indication of how much time you may require?
Could you please let me know as soon as possible so that all parties can be notified.

Regards, Christine

Christine Stenning
Consents & Compliance Administrator
Environment Southland *Te Taiao Tonga*

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Cnr Price St & North Rd, Private Bag 90116, Invercargill 9840
Christine.Stenning@es.govt.nz | www.es.govt.nz | facebook.com/environmentsouthland

From: Hans van der Wal [mailto:hans.vanderwal@duncancotterill.com]
Sent: Friday, 23 March 2018 10:31 a.m.
To: Christine Stenning
Cc: abe@woldwide.nz; 'Anita' (anita@woldwide.nz); n.matheson@aqualinc.co.nz; 'Scandrett Rural' (scandrettrural@xtra.co.nz); Cain Duncan (Cain.Duncan@fonterra.com); Michael Durand
Subject: APP-20171445 Application Under s91A to Suspend Processing [DC-Documents.FID2483570]
Importance: High

Hi, Christine

Please find by way of lodgement an application under s91A to suspend the processing of application **APP-20171445**. We look forward to the earliest notification of suspension in accordance with s91A(5). We also request that this notice is actioned as soon as possible, to ensure no further processing costs are incurred after the receipt of this application.

Many thanks.

Hans van der Wal
Special Counsel

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Duncan Cotterill

30 November 2018

Attention: Michael Durand and Aurora Grant

Environment Southland
Corner of North Road & Price Street
Waikiwi
INVERCARGILL 9810

By email to: michael.durand@es.govt.nz and aurora.grant@es.govt.nz

RESOURCE CONSENT APPLICATIONS BY WOLDWIDE COMPANIES - NOTIFICATION

1. In August 2018, companies associated with the de Wolde family (**Applicant**) lodged applications with Southland Regional Council (**Council**) seeking resource consents to expand and operate dairy farming activities (and associated discharges and water takes).

2. Two separate applications were lodged: one by Woldwide One Limited and Woldwide Two Limited (**WW 1 & 2 Application**); the other by Woldwide Four Limited and Woldwide Five Limited (**WW 4 & 5 Application**).

3. On 14 and 15 November 2018, the Council decided to publicly notify the WW 4 & 5 and WW 1 & 2 Applications. Public notification of the Applications was published on or about 16 and 20 November 2018.

4. The Applicants have raised concerns that the notification decisions and public notices do not reflect their current operation or their proposal. They have requested a number of changes to the notification decisions and public notices.

5. The Council's Team Leader Consents has undertaken a review of the notification decisions, public notices and requested changes. The Team Leader Consents has concluded that:

    a. there are some errors in the notification decisions, however, while some should be corrected or clarified prior to the hearing, they are not material to the decisions;

    b. the public notices contain material inaccuracies: both public notices summarise the reasons for notification and incorrectly refer to "an increase of intensive winter grazing" where they should refer to "additional dairy farming".

6. The Team Leader Consents' memorandum for the WW 4 & 5 Application identifies a further issue. The WW 4 & 5 Application is based on an effects assessment that relies on a resource consent that has been surrendered. As this was identified post-notification, the Applicants have not been given an opportunity to address this.

7. You have asked for our opinion on the feasibility of re-notifying the applications.

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CHRISTCHURCH Wynn Williams House, Level 5, 47 Hereford Street, Christchurch | PO Box 4341, DX WX11179, Christchurch 8140, New Zealand

Executive summary

8. We agree with the Team Leader Consents that while the notification decisions contain some errors, the errors are not fatal to the notification decisions. The Council can issue errata notices to correct the errors in the reports.

9. We also agree with the Team Leader Consents that the public notices contain material inaccuracies. As a result, in our opinion the public notices are defective and are void. In other words, in effect, the Council has not yet given valid public notice of the Applications. Accordingly, the Council can amend and reissue the public notices with the material inaccuracies (and any minor errors) corrected.

10. In respect of the WW 4 & 5 Application and the surrendered consent, we agree that the issue should be raised with the Applicants and they should be given an opportunity to respond.

11. An alternative, pragmatic solution exists. The Council could engage with the Applicants and request that they withdraw and relodge the Applications. The if the Applicants agree to do so, the Council could issue new, corrected, notification decisions and public notices for the new Applications.

Analysis

12. We have reviewed the notification decisions, public notices, Applicants' comments and proposed amendments, and the Team Leader Consents' assessment and recommendations. Our analysis and advice is provided below.

Notification decisions

13. We agree with the Team Leader Consents' assessment and recommendations in respect of the notification decisions.

14. While the notification decisions contain some errors, the errors are typographical (eg referring to the wrong block name as an apparent "copy and paste error") or minor (eg mis-summarising where winter grazing occurs or is to occur).

15. In our opinion, the errors identified are immaterial to the reasons why the Council decided to notify the Applications (for example, the potential environmental effects from additional dairy farming on Braxton Soils and in the Central Plains Zone, nitrogen loading in excess of standard limits and the depth of effluent discharge on Class E land). There is therefore no need to reconsider the notification decision.

16. Despite the above, the Council may wish to amend the notification decisions to correct the errors it has identified (in particular, the more obvious errors identified with the notification decision on the WW 1 & 2 Application). Section 13 of the Interpretation Act 1999 provides the Council with limited powers to correct errors or omissions. Given the nature of the errors identified, we consider that the Council can correct those errors by errata notices, in reliance on the Interpretation Act.

Public notices

17. We agree with the Team Leader Consents that the public notices contain material inaccuracies.

18. Both public notices provide summaries of the reasons for the decision to publicly notify the Application. Both notices refer to Policy 16 of the Proposed Southland Water and Land Plan as providing context to the effects of the activity. However, rather than referring to additional dairy farming the notices incorrectly reference the part of Policy 16 on intensive winter grazing (which is not the activity for which land use consents are sought).

19. The Environment Court has outlined the relevant considerations for determining whether deficiencies in a public notice are such that it should be set aside:[1]

> In summary the relevant considerations are an approach to substance, not a technical approach; having regard to the purpose of the legislation and the importance of the particular provision; the degree or extent of non-compliance; the actual effect of non-compliance on third parties; the overall circumstances, including other publicity; and prejudice to the applicants weighed against the nature and consequence of the defects.

20. In our opinion, because the public notices reference the wrong part of Policy 16, both notices (considered in their entirety) mischaracterise the activity for which resource consent is sought. The effect is that the public may not properly understand the notice and that the application may draw irrelevant submissions or cause otherwise interested parties not to submit. When all the factors are weighed, we consider that the public notices are defective.

21. Given our conclusion that the public notices are defective, they should be treated as void, as if the Council had never published the notices. To remedy this, the Council should amend the public notices to correct the material inaccuracies (and any minor errors) and reissue the notices. The normal notification process should be followed, as it was the first time the Applications were notified.

22. As the public notices will be reissued outside the 20 working days allowed by section 95(2)(b), the Council will also need to extend that timeframe under section 37 of the RMA.

23. In practical terms, when the Council reissues the public notices, we recommend that it also provide a short explanation as to why it has reissued the notices, rather than leaving it to the public to identify the reasons for the change. If the Council sent the original public notices to any potentially affected persons when it notified the Applications, we recommend that the reissued notices be sent to those same people, also with a short explanation of the change.

Surrendered consent

24. The WW 4 & 5 Application refers to a resource consent granted in 2015 for the conversion of Collie's Block from sheep to dairy. The Application confirms that Collie's Block is still used as a sheep farm, but in reliance on the 2015 resource consent has assessed the Application as if the block were being used for dairy farming. However, the notification decision identifies that the 2015 resource consent was surrendered in 2016 (this is confirmed in the Team Leader Consents' memorandum).

25. Given the 2015 resource consent has been surrendered, the effects of dairy farming on Collie's Block cannot be disregarded as if they are already occurring. As the Application does not seek to authorise dairy farming on Collie's Block, we consider the approach taken by the notification decision (to neither disregard nor assess the effects of dairy farming on Collie's Block) is appropriate.

26. We agree with the suggestion in the Team Leader Consents' memorandum that this issue should be raised with the Applicant, who should be given an opportunity to respond. However, rather than amending the assessment of environmental effects (which the notification decision is based on), the Applicants should be invited to provide further information to inform the Council's processing in advance of the

1 *Australian Conference Assn v Auckland City Council* (1994) 3 ELRNZ 49, referred to in *Vodafone (NZ) Ltd v Manukau City Council* (2000) EnvC A101/2000, at [25].

section 42A report. We note that if the Applicants wish to convert Collie's Block to a dairy farm, resource consent may be required under rule 20 of the Proposed Southland Water and Land Plan.

Recommendations

27. We recommend that the Council:

    a. engage with the Applicants to confirm that it does not oppose the Council's proposal to reissue the public notices;

    b. update the notification decisions and public notices to correct the errors it has identified (in particular, the errors in the public notices) and reissue the public notices;

    c. explain the issue with the WW 4 & 5 Application and Collie's Block to the Applicants and provide an opportunity for the Applicants to respond.

28. As an alternative, the Council could engage with the Applicants and offer a pragmatic solution. If the Applicants withdraw the Applications and relodge them with the Council, the Council could begin processing the Applications afresh and issue new, corrected notification decisions and public notices. There is no legal impediment to this option, provided that the Applicants agree to it.

29. As a related point, in future, the Council may wish to consider the level of detail it provides when publicly notifying resource consent applications. The RMA and associated Regulations[2] do not require that notices include a summary of the reasons for public notification – only the bare requirements in Form 12 of the Regulations are necessary.

30. Please let us know if you would like to discuss any of the above.

Yours faithfully
Wynn Williams

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2 Resource Management (Forms, Fees, and Procedure) Regulations 2003, Form 12.

environment SOUTHLAND
REGIONAL COUNCIL
Te Taiao Tonga

Response to requested corrections in notification decision APP-20181619

2018

Applicant: Woldwide One Limited and Woldwide Two Limited

Purpose: Response to requested corrections to Public notice and S95 notification report

Recommendation: Factual errors are corrected and the application re-notified if legally possible

➢ Main issues

- The public notice does not reflect all reasons for the notification
- The public notice incorrectly identifies increased winter grazing as a key reason for notification instead of intensification of dairy farming

➢ Background

The consent application and notification

Woldwide One Limited and Woldwide Two Limited applied for land use consent to increase cow numbers and combine two dairy properties discharge permits and water permits on 9 August 2018. Related companies Woldwide four & Woldwide Five also lodged an application to expand. While the companies are all related with the same directors, the two applications are separate. On 15th November 2018 the decision was made to publically notify the application because:

- The application is to expand an existing dairy operation by adding cows;
- Braxton soils (Central Plains Physiographic Zone) are not well modelled in Overseer. Cracks in these soils when present will allow some faeces, urine and irrigated effluent to bypass the soil profile. There is a high likelihood that Overseer has under-reported the likely losses as a result.
- Nitrogen loadings to the Horner Block from the discharge of sludge from the effluent ponds is in excess of the standard loading limit of 250 kg nitrogen per hectare per year.
- The effluent discharge depth on Category E land may have significant adverse effects on the environment.
- The cumulative effects of the intensification of the farm and discharge activities are difficult to determine.
- Adverse effects on the environment will be or are likely to be are likely to be more than minor.

The applicant raised concern that what has been notified does not reflect their farming operation or proposal. They are concerned that the content of the report may result in submitters basing a submission on false information.

The following reasons were contained in the public notice:

- Policy in the relevant regional plans requires Council to generally not grant resource consent applications for additional intensive winter grazing where contaminant losses will increase in the Central Plains and Oxidising physiographic zones or where the adverse effects, including cumulatively, cannot be avoided or mitigated. Policy also sets expected effluent discharge application rates and depths for each land category, for example, Category E land (other well drained but very stony flat land);

- The application is for an expansion of a dairy farm by increasing the cow numbers on the Central Plains and Oxidising Physiographic Zones;

- A precautionary approach has been taken as Braxton soils are not well modelled in the Overseer modelling software which shows nil increase in losses of contaminants over the whole farm due to additional mitigation measures which have been proposed;

- The discharge of high rate methods to Category E land is inappropriate as outlined by policy. The expected nitrogen loading per hectare from effluent discharge is 150 kg of nitrogen per hectare per year. This is standards for dairy farms. However up to 250 kg nitrogen per hectare per year will be discharged to the slurry block. Discharge is occurring to soils which have very severe nutrient leaching and severe waterlogging characteristics;

- The activity is likely to have potential adverse effects on the environment which are more than minor.

➢ Purpose of review and scope for change

The review was undertaken to assess the applicants requested corrections against what was notified, and the information that was contained in the original applications, further information responses, information gathered at the site visit and various correspondence from the processing to date.
The scope for this review, and any required subsequent changes or outcomes are restricted to only factual matters when assessed against the matters above and what was notified.

➢ Requested corrections to S95 notification report

On 22 November 2018 the applicants met with Environment Southland senior staff members, the Chairman Nicol Horrel and Cr Lloyd McCallum. The meeting was to discuss what the applicants perceive to be factually incorrect or misleading statements in the notification report and the public notice.

A list of requested corrections was received and I have reviewed these against the information contained in the S95 report.

Requested correction of S95 notification report	**Is the information contained in the report factually incorrect?**	**Does the correction change the scope of what was notified?**	**Recommendation**
Pg 7 – Total landholding area error Landholding should be 502ha of 1&2	No	No	Table in the s95 report details total amount of land over the entire landholding, including the runoff blocks. No change is necessary.
Claim that the effluent discharge area is decreasing	Yes	Yes	The notification decision must be made on what the applicant has applied to do. The application does not state that the effluent disposal area will be decreasing, and no further information request from the processing officer was made on this point. Stating that the disposal area is decreasing implies potentially different environmental effects. I recommend this is corrected.
Pg 4 – Explanation about the discharge is 'muddled'. Applicant would like it clarified to: • Travelling irrigator is used to discharge liquid effluent from dairy sheds • Slurry tanker with trailing shoe is used to apply pond slurry	No	No	The report is factually correct. The applicant utilises storage ponds which store both DSE and wintering barn effluent. There is not separate ponds for the different sources. This means that both irrigation methods will essentially apply both, however for thicker effluent slurry the slurry tanker will be used. I recommend that no change is made.
Pg 2 & Pg 29 – incorrect figure for N loading at Horner Block Page 2 -	Yes	Yes	The loading rates should read 150kg of N for loading rates on the dairy platforms. The application is applying for a loading of 250kg of N per ha on the Horner block, which exceeds the 150kg of N limit in the regional rule. The applicant's requested correction is accurate and a correction is required.

Nitrogen loadings to the Horner Block from the discharge of sludge from the effluent ponds is in excess of the standard loading limit of 250 kg nitrogen per hectare per year. This should read: *Nitrogen loadings to the Horner Block from the discharge of sludge from the effluent ponds is in excess of the standard loading limit of <u>150 kg</u> nitrogen per hectare per year.* Page 29 – *Nitrogen loadings to the Horner Block from the discharge of sludge from the effluent ponds is in excess of the standard loading limit of <u>250 kg</u> nitrogen per hectare per year.* Again this should read <u>150 kg</u>			
Policy 42 of RWP mistake regarding category E land: As submitted in the RFI, the travelling irrigators have been tested and apply	No	No	The application states that the proposal is to apply at depths up to 10mm, and this is also the depth requested in the conditions proposed by the applicant.

effluent at less than 10 millimetres depth per application. The effluent depth via high rate travelling irrigator to Category E land is consistent with policy 42 of the RWP. The below conclusions about adverse effects due to inconsistency with Policy 42 are therefore unjustified. Page 2 – *The effluent discharge depth on Category E land may have significant adverse effects on the environment.* Page 5 – *Effluent discharge depth is inconsistent with policy in the Regional Water Plan – so the environmental effects of FDE irrigation may not be acceptable;* Page 21 - *In addition, the applicant will use high rate irrigation methods to land classified as Category E land (Glenelg, Drummond and Waiau soils). Best practise guidelines identify that this land shouldn't receive effluent application depth of more than 10 mm depth[2,3] as*			

effluent can seep out of the root zone and has a higher risk of contaminating groundwater. I consider the discharge of effluent to land at this depth is likely to cause adverse effects on the environment which more than minor. Page 29 - *The effluent discharge depth is not consistent with policy in the RWP to Category E land. This signals that the activity may have significant adverse effects on the environment.*			
Slurry application depth misrepresented as 5 mm per application Throughout the s95 report, the slurry tanker application depth is referenced as 5 mm per application "sludge will be applied at 5 mm per application." In the application the max depth of 5 mm was referenced as a standard condition on discharge permits. See 1&2 application pages 77, 78, 80, 103, 105 and 111 where depths of 1 – 2 millimetres were described	No	No	As above, this is what has been applied for by the applicant, and what has been proposed in the conditions offered by the applicant. The application does state that lower rates are achievable, but the assessment must be done on the maximum that the applicant has applied for. If the applicant wished to only apply for depths of 1-2mm, then this would need to be applied for, not the higher depth.

for the slurry tanker, as well as how the applicants achieve this. See main RFI page 27 - this was further clarified and the distinction was made between the standard condition (5 mm depth) and what the applicants actually do in practice (1.5 – 2 mm). It is erroneous to repeatedly state that slurry will be applied at 5 mm depth per application, therefore potentially overloading soils/causing N leakage. Page 21 – *Because there will be very high loadings of nitrogen discharged to this land, and the soils have severe and very severe nutrient leaching characteristics, the discharge of sludge is likely to have adverse effects on the environment at the Horner Block <u>which will to be minor</u>*. This does not read right but based on the first part of the sentence I assume it should read "more than minor?" Conclusions about effects at the Horner Block need to be reviewed since slurry will be applied at very low			

depths (1.5-2 mm) specifically to prevent N overloading of soils/leakage of N.			
Possible error about a stream flowing through Drummond Peat Swamp that originates at 1&2 I have searched and re-searched Topomap this morning. As per the page 15 of the main RFI (question 14), "an un-named tributary of Middle Creek flows from the property to within 330 metres (west) of Drummond Swamp, where it flows along Kennedy Road." I cannot find any steams that flow from the property <u>through</u> Drummond Peat Swamp. Page 9 of the s95 report – it states *There is a regionally significant wetland about 14 kilometres downstream of the southern boundary of the dairy platform, Drummond Peat Swamp. A tributary which begins within the dairy platform <u>flows through the swamp</u>.*	Yes	Yes	The report is incorrect and there is no tributary that runs through the property to the wetland. The mistake does not directly relate to the reasons published in the public notice but will have some minor bearing on the officers thinking regarding possible P loss effecting the wetland. I recommend this is corrected.
Error about company structure Page 3 – a new company has not been formed. The consents will be held by two	Yes	No	The notification report incorrectly states that a new company has been formed, however I checked the companies register and this is not the correct (see snip below from the companies register website). I was also not able to find anywhere in the application that states this has occurred, the application states that the consents will

<table>
<tr><td>companies; Woldwide One Limited and Woldwide Two Limited</td><td></td><td></td><td>be held jointly by both WW1&2 as separate companies. I recommend this is corrected to represent the actual company structure, however it does not change the key matters that the application was notified on.
<table>
<tr><th>Company name</th><th>NZBN</th><th>Company #</th><th>Status</th></tr>
<tr><td>WOLDWIDE FARM LIMITED</td><td>9429039079978</td><td>516389</td><td></td></tr>
<tr><td>WOLDWIDE FIVE LIMITED</td><td>9429033039503</td><td>2054205</td><td></td></tr>
<tr><td>WOLDWIDE FOUR LIMITED</td><td>9429041748022</td><td>5696915</td><td></td></tr>
<tr><td>WOLDWIDE ONE LIMITED</td><td>9429032629682</td><td>2158688</td><td></td></tr>
<tr><td>WOLDWIDE THREE LIMITED</td><td>9429032430844</td><td>2200651</td><td></td></tr>
<tr><td>WOLDWIDE TWO LIMITED</td><td>9429032432329</td><td>2200670</td><td></td></tr>
<tr><td>WOLDWIDE RUN-OFF LIMITED</td><td>9429032432213</td><td>2200669</td><td></td></tr>
</table></td></tr>
<tr><td>Not accepting John Scandrett as a SQP based on lack of information

Information was supplied on John's qualifications and training the RFI. See page 2</td><td>No</td><td>No</td><td>The PSWALP plan does not define a SQP requirement for soil investigations. The RWP appendix A suggests a soil map "may" be submitted by a SQP. In this case the council has used its discretion and not adopted the findings of John Scandrett over the information held by the council on the soil types.</td></tr>
<tr><td>Soil mapping data not used in assessment

Info was provided to Courtney on John's soil mapping but she said she had already submitted the s95 report. We understand that Council cannot adopt our soil remapping data (without further work) but we believed that they would be used in the assessment. They were not used – only Topoclimate mapping was used (with no test holes at 1&2 farm), which we know to be incorrect. John's work shows 28 test</td><td>No</td><td>No</td><td>As above</td></tr>
</table>

holes dug and other work done. See attached. This may change how effects (perceived Braxton related risks) are assessed.			
Land classification Due to presence of Drummond soils, category D land should be added to the report.	Yes	No	Category D has been missed off the land classification table in the S95 report, although Drummond soils are detailed. This omission has no bearing on the main reasons for notification.
technical comment on groundwater flow rate towards Heddon Bush School bore/effects yet to be seen In the report, the timeframe calculated for groundwater underlying 1&2 to reach the Heddon Bush School is 15 years, i.e. from when "*the farms began operating <u>together</u> 5,475 days ago*". Woldwide One is there since 1992, which works out at 25 years/9125 days up to 2017. Also other farming activities (such as intensive winter grazing of cows) were carried out in the area over that time. Nitrate signals at the school bore due to Woldwide One and other farming activities in the area (since 1992 = 25 years) would have been seen for some time if they were	No	No	The technical comment is based on scientific calculation completed by ES's inhouse groundwater specialist. His determination has been made on the time the two properties have both been in existence. In the report ES has adopted his comment on this matter over the applicant.

present. Nitrate levels of 1.8 – 2.0 g/m3 at the school bore in 17/18 do not support a claim of adverse effects yet to be seen. If you look at the bore at the south end of Woldwide 1 (**E45/0622**), it generally has low nitrate levels (e.g. 2.0 g/m3 in 2018) – see the fig 5.22 on page 62 of the application. Again these data do not support the claim regarding effects on groundwater that are yet reach the school bore.			

➢ Requested corrections to public notice

The applicants have identified a number of alleged mistakes or inaccuracies in the public notice, which they have requested be rectified in order to better reflect their proposal. I have reviewed these requested corrections or wording changes against what was notified. Scope for any changes is limited to factual errors only. A copy of the requested changes in full is appendixes to this report.

Requested correction to public notice	Is the information contained in the notice incorrect?	Does the information misrepresent what has been applied for?	Recommendation
Slurry tanker Please describe as "slurry tanker with a trailing shoe."	No	No	This level of detail is not required in the public notice and the requested correction does not have a bearing on the reasons for notification
Land classification Drummond soils are Category D. landscape categories should include category A, D and E.	No	No	The notice uses E classification as an example and doesn't list all soil types
Mention of additional winter grazing in reasons for public notification – this is misleading All cows will be wintered in barns so there is no additional intensive winter grazing. It could easily be misunderstood that additional intensive winter grazing has been applied for.	Yes	Yes	The incorrect part of the policy has been pulled into the notice and "an increase of intensive winter grazing" has been used instead of "for additional dairy farming". This is misleading and incorrect.
Claim that *the discharge of high rate methods to Category E land is inappropriate as outlined by policy.* This is incorrect. The discharge via high rate methods to Category E land	No	No	On page 12 of the applicants application they state that effluent will be applied up to 10mm depth. This is inconsistent with Policy 42 of the RWP due to the Category E land.

is appropriate, so long as the application depth is less than or equal to 10 mm and less than 50% of PAW. The instantaneous application rate does not apply to Category E land. The average application rate should be less than the soil infiltration rate.			

➢ Other matters

- The description of the discharge in the public notice contradicts the S95 report – the public notice correctly states that N loading will not exceed 150kg per ha/year however the report states 250kg N per ha/year.
- The public notice incorrectly includes a policy assessment in the reasons for notification.

➢ Overall recommendation

I recommend that a legal opinion is sought on the feasibility of re-notifying the application based on the inaccuracies found in the report and notice. I also recommend that if re-notification is to occur, the applicant is given the opportunity to remedy the AEE to assess the actual effects of the proposal.

Aurora Grant
Team Leader Consents

➢ Appendix 1 –Corrections requested to public notice/ S95

Notice – public notification

Slurry tanker

Please describe as "slurry tanker with a trailing shoe."

Land classification

Drummond soils are Category D. landscape categories should include category A, D and E.

Mention of additional winter grazing in reasons for public notification – this is misleading

All cows will be wintered in barns so there is no additional intensive winter grazing. It could easily be misunderstood that additional intensive winter grazing has been applied for.

Claim that *the discharge of high rate methods to Category E land is inappropriate as outlined by policy.*

This is incorrect. The discharge via high rate methods to Category E land is appropriate, so long as the application depth is less than or equal to 10 mm and less than 50% of PAW. The instantaneous application rate does not apply to Category E land. The average application rate should be less than the soil infiltration rate.

S95 Report for 1&2

Total landholding area error

Total area is incorrect.

Page 7 – should be 502 ha for 1&2

Not sure if you are counting Runoff too?

Claim that the effluent discharge area is decreasing

We don't really understand this but it may not that important overall

Explanation about the discharge on page 4 is muddled

To clarify:

Travelling irrigator is used to discharge liquid effluent from dairy sheds

Slurry tanker with trailing shoe is used to apply pond slurry (aka sludge)

Incorrect figure for N loading at Horner Block

Page 2 -

Nitrogen loadings to the Horner Block from the discharge of sludge from the effluent ponds is in excess of the standard loading limit of 250 kg nitrogen per hectare per year.

This should read:

Nitrogen loadings to the Horner Block from the discharge of sludge from the effluent ponds is in excess of the standard loading limit of 150 kg nitrogen per hectare per year.

Page 29 –

Nitrogen loadings to the Horner Block from the discharge of sludge from the effluent ponds is in excess of the standard loading limit of 250 kg nitrogen per hectare per year.

Again this should read 150 kg

Policy 42 of RWP mistake RE Category E land

As submitted in the RFI, the travelling irrigators have been tested and apply effluent at less than 10 millimetres depth per application. The effluent depth via high rate travelling irrigator to Category E land is consistent with policy 42 of the RWP. The below conclusions about adverse effects due to inconsistency with Policy 42 are therefore unjustified.

Page 2 –

The effluent discharge depth on Category E land may have significant adverse effects on the environment.

Page 5 –

Effluent discharge depth is inconsistent with policy in the Regional Water Plan – so the environmental effects of FDE irrigation may not be acceptable;

Page 21 -

In addition, the applicant will use high rate irrigation methods to land classified as Category E land (Glenelg, Drummond and Waiau soils). Best practise guidelines identify that this land shouldn't receive effluent application depth of more than 10 mm depth[2,3] as effluent can seep out of the root zone and has a higher risk of contaminating groundwater. I consider the discharge of effluent to land at this depth is likely to cause adverse effects on the environment which more than minor.

Page 29 -

The effluent discharge depth is not consistent with policy in the RWP to Category E land. This signals that the activity may have significant adverse effects on the environment.

Slurry application depth misrepresented as 5 mm per application

Throughout the s95 report, the slurry tanker application depth is referenced as 5 mm per application "sludge will be applied at 5 mm per application."

In the application the max depth of 5 mm was referenced as a standard condition on discharge permits. See 1&2 application pages 77, 78, 80, 103, 105 and 111 where depths of 1 – 2 millimetres were described for the slurry tanker, as well as how the applicants achieve this.

See main RFI page 27 - this was further clarified and the distinction was made between the standard condition (5 mm depth) and what the applicants actually do in practice (1.5 – 2 mm).

It is erroneous to repeatedly state that slurry will be applied at 5 mm depth per application, therefore potentially overloading soils/causing N leakage.

> Page 21 – *Because there will be very high loadings of nitrogen discharged to this land, and the soils have severe and very severe nutrient leaching characteristics, the discharge of sludge is likely to have adverse effects on the environment at the Horner Block <u>which will to be minor</u>*. This does not read right but based on the first part of the sentence I assume it should read "more than minor?" Conclusions about effects at the Horner Block need to be reviewed since slurry will be applied at very low depths (1.5-2 mm) specifically to prevent N overloading of soils/leakage of N.

Possible error about a stream flowing through Drummond Peat Swamp that originates at 1&2

I have searched and re-searched Topomap this morning. As per the page 15 of the main RFI (question 14), "an un-named tributary of Middle Creek flows from the property to within 330 metres (west) of Drummond Swamp, where it flows along Kennedy Road." I cannot find any steams that flow from the property <u>through</u> Drummond Peat Swamp.

> Page 9 of the s95 report – it states *There is a regionally significant wetland about 14 kilometres downstream of the southern boundary of the dairy platform, Drummond Peat Swamp. A tributary which begins within the dairy platform <u>flows through the swamp</u>.*

Error about company structure

Page 3 – a new company has not been formed. The consents will be held by two companies; Woldwide One Limited and Woldwide Two Limited

Not accepting John Scandrett as a SQP based on lack of information

Information was supplied on John's qualifications and training the RFI. See page 2

https://www.es.govt.nz/services/consents-and-compliance/notified-consents/Documents/2018/Woldwide%20One%20Ltd%20and%20Woldwide%20Two%20Ltd/09-01%20Soil%20Type%20Assessment%20-%20Letter.pdf

Soil mapping data not used in assessment

Info was provided to Courtney on John's soil mapping but she said she had already submitted the s95 report. We understand that Council cannot adopt our soil remapping data (without further work) but we believed that they would be used in the assessment. They were not used – only Topoclimate mapping was used (with no test holes at 1&2 farm), which we know to be incorrect. John's work shows 28 test holes dug and other work done. See attached. This may change how effects (perceived Braxton related risks) are assessed.

Land classification

Due to presence of Drummond soils, category D land should be added to the report.

Response to requested corrections in notification decision APP-20181620 & APP-20181621

2018

Applicant: Woldwide 4 Limited and Woldwide 5 Limited

Purpose: Response to requested corrections to Public notice and S95 notification report

Recommendation: The application is re- notified if legally possible, and the applicant is given the opportunity to rectify issues surrounding the existing environment.

➢ Main issues

- The public notice does not reflect all reasons for the notification
- The public notice incorrectly identifies increased winter grazing as a key reason for notification instead of intensification of dairy farming
- The application provided an AEE which assesses the existing environment based on a consented activity which was surrendered in 2016 and no longer exists.

➢ Background

The consent application and notification

Woldwide 4 Limited and Woldwide 5 Limited applied for land use consent to expand an existing dairy farm on 9 August 2018. Related companies Woldwide One Limited and Woldwide Two Limited also lodged an application to expand. While the companies are all related with the same directors, the two applications are separate. On the 13 November the decision was made to publically notify the application because:

- The application is for an expansion of an existing dairy farm with a change in land use on an existing sheep farm to a dairy farm with winter grazing.
- The aquifer below the farms has elevated nitrate-nitrogen.
- The land to be added to the existing farms is subject to water logging and cracking and preferential flow paths exist for water carrying contaminants and for urine and effluent (Braxton soils).
- Preferential flow paths mean the adverse effects (including cumulative) will be more than minor on the land to be added.

- Overall contaminant losses have been modelled to remain the same due to the implementation of farm-wide mitigation measures, however, losses over the land to be converted are likely to increase from their current levels.

The applicant raised concern that what has been notified does not reflect their farming operation or proposal. They are concerned that the content of the report may result in submitters basing a submission on false information.

The following reasons were contained in the public notice:

- Context provided by the plan is important when considering the significance of additional adverse effects arising from this application. Policy in the relevant regional plan requires Council to generally not grant resource consent applications for additional intensive winter grazing where contaminant losses will increase in the Central Plains, Oxidising and Riverine physiographic zones. Policy also provides direction to generally not grant resource consent applications for intensive winter grazing activities where the adverse effects, including cumulatively, cannot be avoided or mitigated;
- The application is for an expansion and will change the land use from a sheep farm to a dairy farm on the Central Plains, Riverine and Oxidising physiographic zones, with winter grazing of cows occurring on the additional land. Contaminant losses over the whole farm will remain the same due to the implementation of farm-wide mitigation measures. However, losses over the new land to be used for farming will increase due to the change in farming type and the use of the land for winter grazing; and

- Due to the above reasons the activity is likely to have adverse effects on the environment which are more than minor

The application bases the Assessment of Environmental Effects on a conversion consent granted in 2015 for the new sheep block (Collies block) as being part of the existing environment. This consent was actually surrendered by Abe de Wold in 2016 accompanied by a letter stating that all work required by the conversion permit had been undertaken, however the consent conditions required ongoing monitoring and should not have been surrendered. This review will also cover this aspect of the application and notification.

➢ Purpose of review and scope for change

The review was undertaken to assess the applicants requested corrections against what was notified, and the information that was contained in the original applications, further information responses, information gathered at the site visit and various correspondence from the processing to date.
The scope for this review, and any required subsequent changes or outcomes are restricted to only factual matters when assessed against the matters above and what was notified.

➢ Requested corrections to S95 notification report

On 22 November 2018 the applicants met with Environment Southland senior staff members, the Chairman Nicol Horrel and Cr Lloyd McCallum. The meeting was to discuss what the applicants perceive to be factually incorrect or misleading statements in the notification report and the public notice.

A list of requested corrections was received and I have reviewed these against the information contained in the S95 report.

Requested correction of S95 notification report	**Is the information contained in the report factually incorrect?**	**Does the correction change the scope of what was notified?**	**Recommendation**
Pg7 – refers to Marcel block which is part of the WW1&2 application not WW4&5	Yes – an incorrect block name has been used. This appears to be a copy and paste error from the WW1&2 application.	No	Paragraph 1 of pg 7 should state that the support block is "Gladfield" rather than "(Marcel/ State highway 96)". I recommend the mistake is noted but as the table detailing the losses is correct, and the support block is described at length on page the accidental use of the wrong block has no bearing on the scope of the notification.
Pg 8 – states that young stock are sent to WRO for wintering. Calves leave the various platforms at weaning and return in May as in-calf heifers. R2's are then wintered on either Gladfield or WW5.	Possible error – depending on if the nutrient budgets or the Woldwide runoff assessment is assessed.	No change in scope but could be considered misleading.	Paragraph 2 of pg 8 should be worded to reflect that R2 cows are returned from the WRO in May to winter before calving. The various locations for wintering of cows is set out in the nutrient budgets, and the returning of R2's was explained at the site visit. The wintering of R2's done at either Gladfield or WW5 currently will be undertaken on the new sheep block for pasture renewal. Despite this information being set out in the nutrient budgets, the "Woldwide Runoff – Qualitative assessment of activities" does not mention the return of R2's to WW5 and Gladfield for wintering and the two documents appear to contradict one another. In several emails from the consultant they have stated that all young stock grazing is done at WRO and did not define the returning of the R2's to winter on Gladfield or WW5 (see email 4/10/2018 from Tanya Copland), however the nutrient

			budgets do show that returning R2's is what has been modelled. I recommend this is clarified prior to the hearing as it is important to understand the extent of winter grazing at each location but it does not make a material difference to the concerns on what the application was notified on.
Pg8 – refers to Marcel block which is part of the WW1&2 application not WW4&5	Yes – an incorrect block name has been used. This appears to be a copy and paste error from the WW1&2 application.	No	Paragraph 1 of pg 7 should state that the support block is "Gladfield" rather than "(Marcel/ State highway 96)". I recommend the mistake is noted but as the table detailing the losses is correct, and the support block is described at length on page the accidental use of the wrong block has no bearing on the scope of the notification.
Pg 10 – Outline's what the processing officer considers to be the "existing environment". The applicant requests that a note be added that explains the assessment differs to the applicant's assessment of the existing environment in the application.	No	No	This is a matter to be raised at the hearing if the applicant has a differing view to the existing environment. What is detailed in the report is not incorrect from the Councils point of view, and by entering into the process the applicant is required to assess all effects from the "farming" activity, regardless of if they are in the existing environment or not.
Page 11 – Provide references to back up the information in the report detailing groundwater quality beneath the property as being between 8.5 and 11.3mg/L.	No – however the applicant is correct in noting the report does not include a reference.	No	The nitrate levels were gathered from the councils mapping layer which details regional groundwater levels. This is standard practice when assessing applications but the report should have referenced where the information was sourced from. I recommend the matter is addressed in the reporting officers S42A report to provide clarification to the hearing panel. The lack of reference in the report does not change the scope of the notification decision.
Page 12 –states 70ha goes to WW4. This should be WW5	Yes	No	WW4 was used in the paragraph rather than WW5. This makes no material difference to what was notified and does not change

			the scope. It is clear to see that this is a mistake, as all the information in this paragraph refers to WW5.
Page 12 – I may have missed something or have terrible maths, but where do you get the additional 85ha calculation from?			
Page 14 – under WRO heading. Incorrect as mentioned above, young stock do not go there for winter.	No	No	R2 cows are returned from the WRO in May to winter before calving. The various locations for wintering of cows is set out in the nutrient budgets, and the returning of R2's was explained at the site visit. The wintering of R2's done at either Gladfield or WW5 currently will be undertaken on the new sheep block for pasture renewal. Despite this information being set out in the nutrient budgets, the "Woldwide Runoff – Qualitative assessment of activities" does not mention the return of R2's to WW5 and Gladfield for wintering and the two documents appear to contradict one another. All other young stock are raised on WRO. I recommend this is clarified prior to the hearing as it is important to understand the extent of winter grazing at each location but it does not make a material difference to the concerns on what the application was notified on.
Page 14 – Incorrect – WW5 utilizes the entire WRO not just the Merrivale portion.	Partially	No	The application has unhelpfully assessed only one portion of a two part runoff block. Wording in the application explains that effects have not been assessed on the leased portion of the operation but stock movement is fluid between the two. The officer has mistakenly deemed that due to this only the owned portion of the block is used for WW4&5 due to an absence in an assessment of effects. This could potentially be considered misleading but does not change the scope of what was notified. The lack of assessment

			of effects will make the decision recommendation difficult to quantify.
Page 19 – The first bullet point doesn't read properly. Please also add the use of standoff pads to this list of mitigation measures for WW5.	Yes	No	Typo – not material to the concerns that were notified.
Page 20 – Provide justification for the comment that there will be an initial increase in losses when the land is converted. How was this assessed and quantified?	No	No	It is common sense that a change of land use from low intensity sheep farming to dairy farming will cause an increase in losses over the transition period and in future, especially given the applicant specifies that cropping and intensive wintering will be undertaken on the new block for pasture renewal. The current losses on the sheep block are low – as can be seen in the nutrient budget. The applicant has not provided a budget which separates out the new sheep block future losses, but if they had it would show higher losses. This has been admitted by the applicant on a number of occasions throughout the process. There is nothing incorrect about the statement in the report, and I would expect it will be quantified in more detail in the officers S42A report.
Page 20 – State that actual adverse effects and cumulative effects may be higher than modelled. The applicant believed it would fairer to also state that they could be lower than modelled as well, in the interests of having balance in the statement about uncertainty.	No	No	Based on the information provided on soil types, physiographic zones and the receiving environment coupled with a conversion of sheep farm to a dairy operation the council is not of the opinion that the adverse and cumulative effects will be less than minor, hence the decision to publically notify.
Page 21 – Concludes that the " Overall, the wide-spread adverse effects on water quality from the expansion should be minor, however the localised adverse effects on Cochran's block when changing from sheep to	No	No	See above points on this matter

dairy farming is likely to be more than minor." You might need to clarify what you mean by "changing". Earlier in the report you allude, without justification or reasoning, to the transition period resulting in an increase in losses which will stabilize under our proposal. Is this what you are referring to here in this sentence also? Or are you referring to the long term conversion from sheep to dairy farming?			

➢ Requested corrections to public notice

The applicants have identified a number of alleged mistakes or inaccuracies in the public notice, which they have requested be rectified in order to better reflect their proposal. I have reviewed these requested corrections or wording changes against what was notified. Scope for any changes is limited to factual errors only. A copy of the requested changes in full is appendixes to this report.

Requested correction to public notice	**Is the information contained in the notice incorrect?**	**Does the information misrepresent what has been applied for?**	**Recommendation**
Wording changes for the description of the land use consent	No	No	The wording used in the notice is not misleading and I do not recommend it is changed to the wording suggested by the applicant as it will not help to clarify the situation.
Change the legal description of the property and landholding description to remove "wintering blocks".	No	No	The applicant has requested that the word winter blocks is removed from the description of what is considered the landholding. The use of the sentence "This includes support blocks and winter blocks" is representative of the application's farm system. Wintering is done on this block.
Change "wintering block" title of the legal description to "Gladfield".	No	No	Wintering and support is undertaken on the block labelled "wintering block". This could have been clearer and been labelled "wintering/support", however being labelled "wintering" is not factually incorrect.
Change reasons for public notification detail which states the application is for an increase of intensive winter grazing	Yes	Yes	The incorrect part of the policy has been pulled into the notice and "an increase of intensive winter grazing" has been used instead of "for additional dairy farming". This is misleading and incorrect. New winter grazing on the additional sheep block will be undertaken under the proposal, however this does not equate to an increase in intensive winter grazing.
Change the wording of the first bullet point under the reasons for notification	No	No	The wording used reflects what the councils concerns with the proposals are and factually represents the proposal.

➢ Other matters

The application bases the Assessment of Environmental Effects on a conversion consent granted in 2015 for the new sheep block as being part of the existing environment. Because the application was prepared on the basis that this consent was in place, the applicant believed that the effects of converting the sheep block from sheep to dairy had already been assessed through this consent and was legally allowed to occur. This consent was actually surrendered by Abe de Wold in 2016 accompanied by a letter stating that all work required by the conversion permit had been undertaken, however the consent conditions detailed requirements that were to occur after the sheep block had been purchased and should not have been surrendered.

The processing officer failed to identify this until writing the notification recommendation and the applicant was not given a chance to address this.

Due to this, the application that has been notified is factually incorrect and does not represent what the existing environment is.

➢ Overall recommendation

I recommend that a legal opinion is sought on the feasibility of re-notifying the application based on the inaccuracies found in the report and notice. I also recommend that if re-notification is to occur, the applicant is given the opportunity to remedy the AEE to reflect the surrendered permit.

Aurora Grant
Team Leader Consents

➢ Appendix 1 –Corrections requested to public notice

Woldwide Four Ltd and Woldwide Five Ltd

Public notice is hereby given pursuant to S.95A Resource Management Act 1991 that the following application for resource consent has been received by Environment Southland.

Woldwide Four Limited, and Woldwide Five Limited; Bayswater, Otautau

Application APP-20181620 and APP-20181621

Land use consent to change an existing sheep farm into dairy farming by incorporating 63.3 hectares (ha) into the dairy platform of Woldwide Four Limited and 70 ha into the dairy platform of Woldwide Five Limited. The proposal is a discretionary activity under Rule 20(e) of the proposed Southland Water and Land Plan (2018 decisions version).

The existing dairy farm platforms for Woldwide Four Ltd and Woldwide Five Ltd are located at Bayswater. Woldwide Four Limited utilizes a support block for the wintering of the herd and the growing of supplement which is located at Gladfield. Both Woldwide Four Ltd and Woldwide Five Ltd use a runoff for the grazing of young stock located in Merrivale and comprised of two blocks; Merrivale and Merriburn. (I have re-worded this slightly for clarity and to better describe Gladfield block which isn't just a wintering block)

Purpose: Dairy farming operation

Location: Woldwide Four Limited: NZTM 2000: 1221173E 4884494N

Woldwide Five Limited: NZTM 2000: 1220657E 4885096N

Legal Description of Property: The application includes the whole landholding for each dairy farm. This includes support blocks ~~and winter blocks.~~ (The application doesn't refer to "winter blocks" and this is misrepresentative because there are no blocks used solely for wintering as they contain other activities also. It is also confusing because all of the other documents including ES notification report refer to this block as Gladfield.

The landholding for Woldwide Four Limited includes the dairy platform, which now includes the additional land, the ~~wintering block~~ Gladfield block and the run off block. These are:

- *Dairy platform*: Part Lot 2 DP 4262, Lot 7 DP 152, Lot 12 DP 152, Lot 11 DP 152, Lot 10 DP 152 and Lot 7 DP 238.
- *~~Wintering block~~ Gladfield block :* Lot 24 DP 21
- *Run off block:* Lot 1 DP 302409, Part Section 7 Block XII Waiau SD, Part Section 7 Block XII Waiau SD, Lot 1 DP 3537 and Part Section 7 Block XII Waiau SD

The landholding for Woldwide Five Limited includes the dairy platform, which now includes the additional land, a block of land which is not owned by the applicant and had a conversion permit which was ~~has now been~~ surrendered, and the run off block. These are:

- *Dairy platform:* Lot 3 DP 478843, Lot 1 DP 478843, Lot 2 DP 478843, Part Lot 12 DP 238, Lot 1 DP 12253, Lot 1 DP 344176, Lot 2 DP 344176, Lot 1 DP 310140, Lot 2 DP 310140 and Lot 7 DP 238.
- *Run off block*: Lot 1 DP 302409, Part Section 7 Block XII Waiau SD, Part Section 7 Block XII Waiau SD, Lot 1 DP 3537 and Part Section 7 Block XII Waiau SD

Reasons for public notification: The Council must publicly notify an application if the activity will have, or is likely to have adverse effects on the environment that are more than minor. It is considered that the effects on the environment will be more than minor for the following key reasons:

Context provided by the plan is important when considering the significance of additional adverse effects arising from this application. Policy in the relevant regional plan requires Council to generally not grant resource consent applications for ~~additional intensive winter grazing~~ This is a factual error. Our proposal does not propose an increase of intensive winter grazing. where contaminant losses will increase in the Central Plains, Oxidising and Riverine physiographic zones. Policy also provides direction to generally not grant resource consent applications for intensive winter grazing activities where the adverse effects, including cumulatively, cannot be avoided or mitigated.; Considering that we are not increasing intensive winter grazing this reason might need to be completely revised.

- The application is for an expansion and will change the land use from a sheep farm to a dairy farm on the Central Plains, Riverine and Oxidising physiographic zones, with the additional land being used as dairy platform and for the winter grazing of cows ~~occurring on the additional land~~. Contaminant losses over the whole landholding are modelled to remain the same due to the implementation of farm-wide mitigation measures. However, losses over the new land to be used for farming will increase due to the change in farming type and the use of the land for winter grazing; and

- Due to the above reasons the activity is likely to have adverse effects on the environment which are more than minor.

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

Full details of this application are also available for inspection at Environment Southland, corner of Price Street and North Road, Waikiwi, Invercargill during working hours (8.00 am to 5.00 pm). Enquiries may be directed to Courtney Guise by phone to (03) 211 5115 or by email to Courtney.Guise@es.govt.nz.

Submissions on the above application must be received by Environment Southland **no later than 5 pm 14 December 2018**. A submission form is available for download below. Submissions may also be forwarded by email to service@es.govt.nz or esconsents@es.govt.nz

➢ Appendix 2 – Requested changes to S95 report

1. Page 7 – you incorrectly refer to the Marcel block which is not part of our application.
2. Page 8 – Young stock are not sent to WRO for wintering as you state. Calves leave the various platforms at weaning and return in May as in-calf heifers. The R2's are therefore wintered on either Gladfield or WW5 as per the nutrient budgets for the winter prior to them being incorporated into the milking herd

3. Page 8 – again you incorrectly refer to the Marcel block
4. Page 10 – you clearly outline what you consider to be the "existing environment". I think that a note needs to be added here that your assessment differs to our assessment of the existing environment in the application. We determined, under ES's guidance that the "existing environment" did not include consented levels of milking cows and we based our assessment of the existing environment as the actual cows milked. This fundamental difference in the assessments concerns me as we are not starting at the same point or assessing the same change in activity?
5. Page 11 – Please provide references where you refer to groundwater quality beneath the property as being between 8.5 and 11.3mg/L. Our report always provides references to the information we include and with all of the scientific reports I have available to me, I cannot find anywhere that maps groundwater quality under the properties at this level.
6. Page 12 – Please correct where you state 70ha goes to WW4. This should be WW5
7. Page 12 – I may have missed something or have terrible maths, but where do you get the additional 85ha calculation from?
8. Page 14 – under WRO heading. Incorrect as mentioned above, young stock do not go there for winter.
9. Page 14 – Incorrect – WW5 utilizes the entire WRO not just the Merrivale portion.
10. Page 19 – Your first bullet point doesn't read properly. Please also add the use of standoff pads to this list of mitigation measures for WW5.
11. Page 20 – Can you please provide some kind of justification for your comment that there will be an initial increase in losses when the land is converted. How have you assessed and quantified this? It is a very strong and bold statement to make, which has huge bearing on the application without any kind of evidence to back up.
12. Page 20 – where you state that actual adverse effects and cumulative effects may be higher than modelled. I think it is fairer to also state that they could be lower than modelled as well, in the interests of having balance in your statement about uncertainty.
13. Page 21 – you conclude that the " Overall, the wide-spread adverse effects on water quality from the expansion should be minor, however the localised adverse effects on Cochran's block when changing from sheep to dairy farming is likely to be more than minor." You might need to clarify what you mean by "changing". Earlier in the report you allude, without justification or reasoning, to the transition period resulting in an increase in losses which will stabilize under our proposal. Is this what you are referring to here in this sentence also? Or are you referring to the long term conversion from sheep to dairy farming?

From: Aurora Grant
Sent: Wednesday, 5 December 2018 8:46 a.m.
To: 'Nessa Legg'
Cc: abe@woldwide.nz; 'Anita De Wolde'
Subject: RE: Quick check

Good morning Nessa,

I can understand why you are concerned about that. Having reviewed the proposal I am quite comfortable in saying that nothing new should crop up with it, there may be some minor technical details that will need worked out, and as I mentioned in the meeting I would like to have a better understanding of the effects before heading into a hearing to make the process easier. If it comes to it I may need to do this by commissioning an expert to tell us about it but it depends on what is put in the application if you choose to re-submit.
Please take this email as an assurance that I am confident that, provided the details we agreed on are included in a new application, we will be able to proceed relatively easily.

Kind regards,

Aurora

From: Nessa Legg <nessa.dgl@xtra.co.nz>
Sent: Wednesday, 5 December 2018 8:36 AM
To: Aurora Grant <Aurora.Grant@es.govt.nz>
Cc: abe@woldwide.nz; 'Anita De Wolde' <anita@woldwide.nz>
Subject: Quick check

Thanks Aurora.

In view of this application (WW1 part) already having been withdrawn and resubmitted once, do you think you could provide us with an assurance that if we withdraw and resubmit making the minor changes we agreed yesterday, that nothing else will crop up causing something similar? I understand you cannot provide a guarantee but we would really appreciate an assurance from you on this. We want to be confident of where we are going and what the pathway will be, especially in light of the long history of this application.

Regards,
Nessa

From: Aurora Grant <Aurora.Grant@es.govt.nz>
Sent: Tuesday, 4 December 2018 12:08 p.m.
To: 'Nessa Legg' <nessa.dgl@xtra.co.nz>
Subject: RE: Quick check

Looks good to me, thanks heaps

From: Nessa Legg <nessa.dgl@xtra.co.nz>
Sent: Tuesday, 4 December 2018 11:59 AM
To: Aurora Grant <Aurora.Grant@es.govt.nz>
Subject: RE: Quick check

Sorry here it is.

From: Aurora Grant <Aurora.Grant@es.govt.nz>
Sent: Tuesday, 4 December 2018 11:40 a.m.
To: 'Nessa Legg' <nessa.dgl@xtra.co.nz>
Subject: RE: Quick check

Yes no problem – I think you forgot to attach though

Aurora Grant
Team Leader - Consents
Environment Southland *Te Taiao Tonga*

P 03 211 5115
Cnr Price St & North Rd, Private Bag 90116, Invercargill 9840
Aurora.Grant@es.govt.nz | www.es.govt.nz | facebook.com/environmentsouthland

From: Nessa Legg <nessa.dgl@xtra.co.nz>
Sent: Tuesday, 4 December 2018 11:39 AM
To: Aurora Grant <Aurora.Grant@es.govt.nz>
Subject: Quick check

Hi Aurora,

Thanks for the meeting earlier. I have written a short summary of what we discussed. Could you please check it over and make changes/add anything I have missed?

Cheers,
Nessa

Nessa Legg
Dairy Green Ltd
PO Box 5003, Waikiwi, Invercargill
Phone 03 215 4381 (office)
03 2255277 (home office)
Mobile 021 1165106
Email nessa.dgl@xtra.co.nz

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From:	Nessa Legg <nessa.dgl@xtra.co.nz>
Sent:	Saturday, 19 January 2019 10:20 p.m.
To:	Aurora Grant
Cc:	abe@woldwide.nz; 'Anita De Wolde'
Subject:	Woldwide 1&2 application - draft for review
Attachments:	WW1 and WW2 - consent application - 2019 - ver3 - for review.pdf

Hi Aurora,

Hope all is well.

Please find attached a draft application for Woldwide 1&2, with changes made as best I could following our meeting. Can you please review it and get back to me with feedback? It is a draft so I am happy to make further changes based on your comments. I kept the discharge, water and dairy farming AEEs separate as per the August 2018 application. I incorporated as much of the RFI stuff as I could into the application. Anything that is left out will be appended to the official application. John's soil investigation will be described in one report (work in progress) and appended to the official application.

There are a couple of further changes from the August 2018 application that we didn't discuss at our meeting because they have come up since then:

1. Abe and Anita are likely to request that the application be publicly notified under s95A. This is not 100% decided yet but just to make you aware of it;
2. Based on the LO that was provided for the Horner Block, we believe that Woldwide Runoff is not part of the landholding at 1&2 (or 4 and 5) and the draft application reflects this. That said, the same high level of information on WR will be provided in accompanying reports as part of the official application, so that activities and effects at WR will be fully considered.

I am away this week so look forward to your feedback when I get back.
Cheers,
Nessa

Nessa Legg
Dairy Green Ltd
PO Box 5003, Waikiwi, Invercargill
Phone 03 215 4381 (office)
03 2255277 (home office)
Mobile 021 1165106
Email nessa.dgl@xtra.co.nz

Dairy Green Ltd

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Woldwide Farming Group:

Woldwide One Limited and Woldwide Two Limited

/1/2019

Application for:

- Land Use Consent for Use of Land for Dairy Farming – Replacement of **20171278-03**
- Discharge Permit – Replacement of **301663** and **20171278-01** under one discharge permit
- Water Permit – Replacement of **301664** and **20171278-02** under one water permit

Farm Location: Heddon Bush

Application prepared on behalf of applicant by Dairy Green Ltd.

Table of Contents:

10 Kinloch Street, PO Box 5003, Waikiwi, Invercargill 9843

Phone 03 215 4381

Email: dairygreenltd@xtra.co.nz

10 Kinloch Street, PO Box 5003, Waikiwi, Invercargill 9843

Phone 03 215 4381

Email: dairygreenltd@xtra.co.nz

Key

ES	Environment Southland
HB	Horner Block – cut and carry/slurry receiving
pSWLP	proposed Southland Water and Land Plan (2018)
PZ	Physiographic Zone
WOL	Woldwide One Limited
WOL/WTL	Woldwide One and Woldwide Two dairy platform
WR	Woldwide Runoff – Merrivale and Merriburn blocks
WTL	Woldwide Two Limited

1. Overview

1.1 Background

Background

Woldwide One Limited (WOL) and Woldwide Two Limited (WTL) operate two adjoining dairy farms situated at Heddon Bush. Both dairy farms are under the same ownership structure.

WOL currently operates under an effluent discharge permit (AUTH-301663) and water permit (AUTH-301664). Both consents were granted a 15-year term and expire in 2027.

WTL currently operates under a land use consent for expanded dairy farming (AUTH-20171278-03), effluent discharge permit (AUTH-20171278-01) and water permit (AUTH-20171278-02). All were granted a ten-year term and expire in 2027.

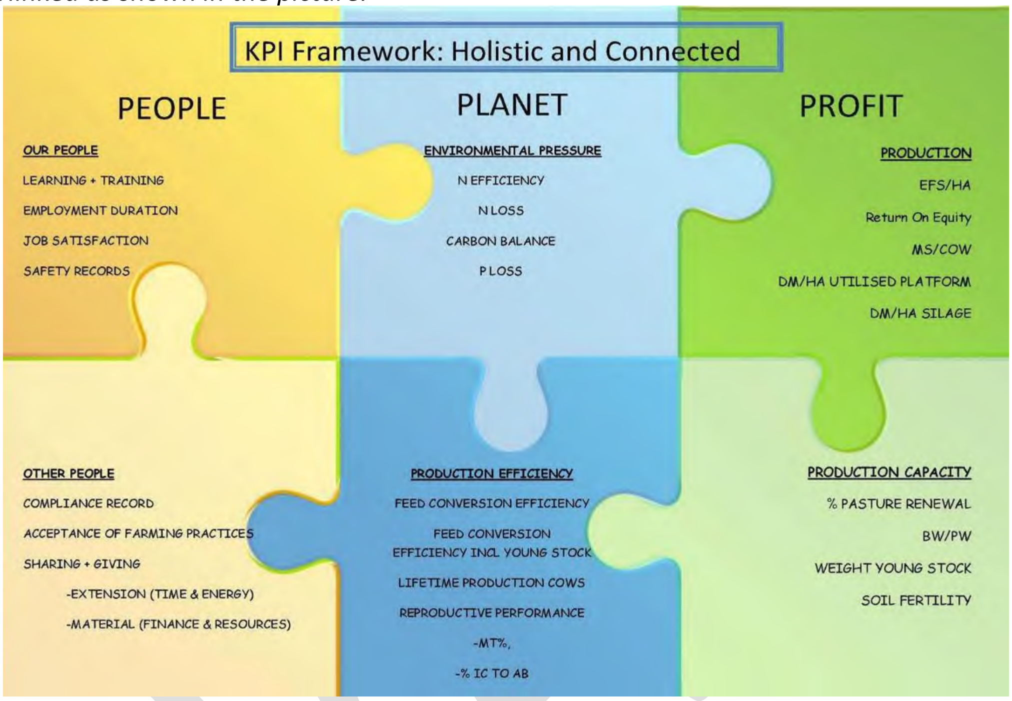
Both WOL and WTL utilise a nearby support block (Horner Block) for cut and carry and to discharge pond slurry. The Horner Block is under separate ownership to the dairy platforms at WOL and WTL and is not part of either dairy platform. The discharge of agricultural effluent at the HB is authorised under respective effluent discharge permits for WOL and WTL.

Both the WOL and WTL dairy platforms graze young stock at Woldwide Runoff (WR), which comprises the Merrivale and Merriburn blocks in the Merrivale area. WR is under separate ownership to the dairy platforms at WOL and WTL and is not part of either dairy platform.

Applicant's philosophy

In the words Abe and Anita de Wolde from the Woldwide Farming Group:

Sustainability (environmental, economic and social) has been at the core of all we do at Woldwide Farming group. To us these principles flow out of a desire to be good stewards, and they are all interlinked as shown in the picture.



We were the first to build free stall barns in Southland to reduce outside crop wintering and we were the first (and only) ones to feed fresh grass to our cows in winter to reduce silage making losses and runoff. In 2013 we were supreme winners of the Southland Ballance Farm Environment Awards.

Ever since we came to New Zealand we have been trying to improve the sustainability of our farms with a long decision-making horizon and an innovative mind-set. We have now come to a point in our farming career where we wish to cap our growth ambitions and truly focus on environmental sustainability. Keeping our stock off wet soils in winter is pivotal in this endeavour. We aim to have all our adult stock from all our farms indoors within five years (and work on housing all young stock after that). We believe wintering animals outside on wet soils is very damaging for the following reasons:

- *Nitrogen is lost because it is deposited on the ground (in the mud) when there are no plants actively taking it up and locking it in.*
- *Sediment and top soil are displaced because of the following reasons:*
  - *The ground is disturbed when it is wet*
  - *Root structures are destroyed*
  - *Overland flow (of Phosphate, sediment, bacteria) increases due to soil compaction*
  - *Rain events during cropping season when soils are worked up fine and crops have not yet established can be very risky*

- *Lots of chemicals are used in the cultivation of winter crops*
- *It takes 85 m of wrap to produce a bale of baleage and we want to reduce our reliance on this*

We are convinced that 90 % of the environmental issues caused by farming in Southland stem from the 10 % of ground that is winter cropped. Just because something is common practice does not mean that the effects are acceptable. It is time to change this!

It needs to be kept in mind though that land- previously used for winter cropping- is vacated under our new plans and a small increase of stock numbers is needed to make up for that.

Our passionate desire is to go beyond compliance and to produce top quality food with a reduced environmental footprint. And that is the mindset behind this application.

Application history

In 2017, WTL was granted consent for expanded dairy farming. This involved the addition of new land previously used for dairy support (i.e. SH96 and Marcel blocks) into the milking platform. In parallel with this, some land was removed from WTL's milking platform to be added to WOL's milking platform. WTL cow numbers did not increase as part of the dairy expansion; they remained at 800. The SH96/Marcel support block, which came into WTL's milking platform as part of the expansion, had been used to graze young stock, winter graze cows/heifers on fodder crop and grow supplement (pasture silage). The discharge permit was replaced to allow for the new boundary, effluent discharge area and an increase in the size of a wintering barn. WTL's water permit was also replaced in 2017.

Agricultural effluent from WTL is discharged at low depth at the dairy farm and at the Horner Block, located to the south west. Agricultural effluent from WOL is discharged at low depth at the dairy farm, and at the Horner Block. The Horner Block is a cut and carry block, used to grow grass to supply dairy farms, and receives slurry effluent from WOL, WTL and the Woldwide Three dairy farm (which is not included in this application). The Horner Block does not graze stock.

In 2017, an application for expanded dairy farming at WOL was submitted to Environment Southland (ES), which for reasons not explained here was publicly notified. During the notification process, the decisions version of the proposed Southland Water and Land Plan (2018) was released. Following discussions and advice from stakeholders based on many factors including how best to model pre-expansion land use, the applicants put WOL's application on hold and opted to submit a new application. The new application was submitted to ES in August 2018 and aimed to bring the WOL and WTL dairy farms under a single land use consent for dairy farming. The application was accepted by ES, with extensive information provided under s92 (1), at several meetings and at a site visit.

For reasons not explained here, WOL/WTL's 2018 consent application was publicly notified by ES. An error was made during the notification process, which made the notification illegal according to legal opinion. In view of the ES error resulting in illegal public notification and following collaborative discussions with ES on the best way forward, the applicants agreed to withdraw the consent application, address certain issues identified by ES in the s95 report and resubmit the application. This application aims to bring the WOL and WTL dairy platforms under a single land use consent for dairy farming and to resolve certain issues identified by ES with the 2018 application.

As is explained in section 2.1, the name of the new consent holder on the land use consent for dairy farming, the discharge and water permits will be "Woldwide One Limited and Woldwide Two Limited."

Request for public notification of application

Based on the application's history, the applicants hereby request that the consent authority publicly notify this application in accordance with s95A of the Act.

Landholding

Due to the definition of a "landholding" in the pSWLP (2018) and legal opinion provided to Environment Southland in 2018 by Wynn Williams, the applicants believe that the landholding only includes land at the proposed Woldwide 1&2 dairy platform, as described in table 1.1.

Legal opinion clarified that the Horner Block is not considered to form a "single operating unit" with Woldwide 1&2. Legal opinion concluded that the Horner Bock is not part of the same landholding as Woldwide 1&2 and therefore should not be included on the land use consent for farming. Adverse effects of the discharge activity at the Horner Block have been assessed regarding the use of that land in section 7.

Legal opinion did not specifically cover Woldwide Runoff (WR), which includes the Merrivale and Merriburn blocks and is used to graze young stock among other farming activities outlined below. Based on the LO, the applicants believe that Woldwide 1&2 is not utilising WR as part of a "single operating unit," and therefore WR is not part of the landholding for either Woldwide 1&2 (or unrelated to this application, Woldwide 4&5).

The applicants believe that WR is not central to the overall farming operation for any of the above mentioned Woldwide dairy farms. This statement is justified by the following three points, which are aligned with the justifications used to exclude Horner block in the LO provided to ES by Wynn Williams:

1. The grazing of young stock is the only aspect of 1&2's (and 4&5's) farming operations, which occurs at WR. No cows are sent from 1&2 (or 4&5) to WR for winter grazing, no sludge/effluent is exported from 1&2 (and 4&5) to WR.

2. WR is not central to the overall farming operations being carried out at 1&2 and 4&5. The only service that WR provides for the dairy farms (Woldwide 1&2, 3, 4 and 5) is the grazing of young stock. This is a service that can be provided by a third-party grazier, which is often the case in dairy farming in Southland. Another common practice in Southland is the purchasing of young stock independently. WR grazes approximately 330 R1 and 330 R2 heifers from Woldwide 1&2 annually; there are approximately 920 R1 and 920 R2s heifers at WR from <u>other</u> Woldwide dairy farms annually.

3. WR has other functions that are not directly related to Woldwide 1&2, Woldwide 4, and Woldwide 5.
   <u>For example</u>, WR has an activity and income stream from forestry that is separate from dairy farming:

a. Approximately 100 hectares of land at WR is in a commercial pine plantation. The pine plantation at WR is registered for carbon credits and is pruned and maintained according to industry standards.
b. A further 60 hectares of land is beech forest. This is under a sustainable management plan.

For example, WR has an activity and income stream from rotten rock sales for forestry and roading that is separate from dairy farming. Rock from a quarry at WR is sold in partnership with DT Kings Transport Ltd.

CONSIDERATION OF EFFECTS AT WOLDWIDE RUNOFF

Despite not being part of Woldwide 1&2's landholding, the applicants accept that activities and effects at WR need to be described, assessed and fully considered. Activities and effects at WR are described in accompanying reports, including a qualitative assessment and an AEE specific to WR. A 17/18 year-end nutrient budget was prepared for WR to provide guidance for the AEE.

Current application

Land use consent for farming

It is proposed to replace WTL's land use consent for dairy expansion (20171278-03) with a land use consent for dairy farming to include the land areas contained by both WOL and WTL dairy platforms. The land area of the dairy platform is not increasing; all land was in the dairy platform prior to 3 June 2016 or was authorised for dairy farming at WTL in 2017; support land referred to as SH96/Marcel Block was consented for dairy farming at WTL in 2017. The proposed dairy platform will contain two milking sheds and two wintering barns. At an operational level, WOL and WTL will be run as individual dairy units.

An output-based land use consent is requested, which will specify a limit for nitrogen for the dairy platform that must not be exceeded annually. A year-end Overseer nutrient budget will be carried out based and reported to Environment Southland to demonstrate that nutrient limits have not been exceeded. Proposed conditions for the land use consent are included in the section 2.3.

It is proposed to increase cow numbers milked to 1,500. Currently a total of 1,340 cows are authorised; 540 at WOL and 800 at WTL. The proposed increase represents an increase of 160 milking cows or 11% overall. The increase will occur at the WOL unit where the herd size will go from 540 to 700. The WOL unit is increasing in area due to its obtaining land from the WTL milking platform area, which was freed up when the SH96 and Marcel blocks were added to WTL's milking platform area in 2017.

It is proposed to increase the maximum number of animals (cows/heifers) wintered in barns to 1,280. The proposed increase represents an increase of 240 animals and will occur at the WOL wintering barn, which will increase from 400 to 640 cow capacity. The barn and effluent system have already been upgraded to cater for the additional cows and effluent.

To allow for the proposed increase in cow numbers, resource consent is being sought under **Rule 20 e)** of the proposed Southland Water and Land Plan 2018 (hereafter referred to as "pSWLP"), for the ongoing use of the land for dairy farming including an increase in cow numbers. The expansion does not include an increase in the dairy platform's land area as all land was either within the dairy platform prior to 30 June 2016 or was authorised for dairy farming through a dairy expansion land use consent that was granted in 2017 (WTL). As is described in Section 2, this is a discretionary activity under Rule 20 due to the proposed increase in cow numbers.

The proposed activity has been considered in terms of key pSWLP policies and based on this assessment should be granted. Effects on the existing environment have been considered and are described in the assessment provided in Section 7 of the application. The assessment concludes that effects on receiving surfacewaters, groundwater and soils, including cumulatively, will be no more than minor due to the proposed activity.

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Importantly, there will be no increase in contaminant loss nor in the export of nutrients off-site due to the expansion.

Overseer nutrient budgets

Overseer is a useful tool to be able to understand the nutrient interactions of a farm system based on soil properties, rainfall, drainage and feed requirements. The output from the model gives an indication of how much nutrient may be lost to the environment. Overseer nutrient budget analysis has been carried out using Overseer version 6.3.0 and using "Overseer Best Input Standards, March 2018." The increase in cow numbers will occur in parallel with significant land use changes, which act as key mitigation measures and are modelled in Overseer where possible.

NUTRIENT BUDGETS - WOL/WTL DAIRY PLATFORM AREA Four pre-expansion nutrient budgets were prepared and one proposed post-expansion nutrient budget for 1,500 cows. The pre-expansion nutrient budgets were derived by modelling the actual lawful use of land and not by modelling consented maximums. The inputs used in pre-expansion nutrient budgets are supported with evidence, which is appended to the nutrient budget analysis report. Where the analysis report states that the land area is being increased by bringing in support land, this refers to the SH96 and Marcel Blocks, which were authorised for dairy farming as parts of WTL's land use consent granted in 2017.

All nutrient budgets model the same land areas, i.e. former WOL and WTL milking platforms, SH96 and Marcel blocks.

The Overseer analysis demonstrates the effectiveness of key mitigation measures that will be implemented:

- The average N loss is predicted to decrease slightly from 41 kg/ha/year to 40 kg/ha/year, despite an increase in 160 cows;
- The average annual P loss is predicted to remain at 0.7 kg/ha post-expansion; and
- By using P loss as a proxy for sediment and microbial losses, there will be no increase in loss of sediment or microbes.

The applicants believe that over time there will be a cumulative reduction in contaminant loss due to the proposed land use changes, compared to continuing with the pre-expansion land use. The changes will see better nutrient management on farm, improved soil organic matter content, water holding capacity and soil structure, less N accumulation on soils at high risk times, and consequently less contaminant loss to water. Farm profitability will be maintained by grazing 160 additional cows on land previously available for activities such as winter grazing.

NUTRIENT BUDGETS - THE HORNER BLOCK Prior to obtaining legal opinion on the Horner Block, ES regarded the HB to be part of the landholding at WOL/WTL. Based on this, one pre-expansion nutrient budget and one proposed post-expansion nutrient were prepared for the Horner Block and submitted with the 2018 consent application. Legal opinion has since advised ES that the Horner Block is not part of the landholding at

WOL/WTL and as such is not required to be included on the land use consent for farming. Since nutrient budgets were already prepared for the HB, they are included in this application as a useful source of information and are used appropriately.

NUTRIENT BUDGET – WORLDWIDE RUNOFF

A 17/18 year-end nutrient budget has been prepared for Woldwide Runoff and provides guidance regarding nutrient losses at WR in the 17/18 year.

Discharge and water permits

It is proposed to replace existing discharge permits (301663, 20171278-01) with a single discharge permit managing effluent from the WOL and WTL dairy units, and to replace existing water permits (301664, 20171278-02) with a single water permit for groundwater abstraction from both WOL and WTL. The proposed discharge permit will allow for the discharge of agricultural effluent (dairy shed, wintering barn, silage pad and underpass) to land from 1,500 cows. **It is proposed to include the current irrigation methods in the discharge permit, i.e. travelling irrigator, trailing shoe slurry tanker, umbilical system; as well as to future proof the discharge activity by also including low rate irrigation.** The proposed water permit will allow for groundwater abstraction for dairy shed and stock drinking water for 1,500 cows.

The Horner Block currently receives agricultural effluent from three dairy farms; WOL, WTL and Woldwide Three. It is proposed that Woldwide Three's FDE are at the Horner Bock will remain mutually exclusive. The FDE areas currently consented to receive effluent/slurry from WOL and WTL will be blocked as a single slurry receiving area. The Horner Block will continue to be run as a cut and carry, and slurry receiving area.

Land use consent for feed pad/lots - wintering barns

Under Rule 35A of the pSWLP, the use of land for two wintering barns at the dairy platform is a discretionary activity as at least one of the conditions of Rule 35A (a) is not met. The WOL barn is increasing in capacity from 400 to 640 cows. An application for consent for the use of land for two feed pad/lots will be submitted to Environment Southland in February 2019.

1.2 Property Details

Note: Woldwide Runoff is described and assessed in a separate set of reports.

Overview

The landholding is an existing dairy farm with required dairy infrastructure and is located within both the Oreti River and Waimatuku Stream catchments at Hundred Line Road, Heddon Bush. It consists of 502 hectares of land, with an effective farm area of 479 hectares.

The slurry-receiving Horner Block is located within both the Waimatuku Stream and Aparima River catchments at Hundred Line Road, Heddon Bush and consists of 160 hectares of land, with an effective farm area of 155 hectares.

Within the last five years, the proposed dairy platform area was managed as two dairy units (WOL and WTL) and a support block (SH96 and Marcel Block). The SH96 and Marcel Block were authorised for dairy farming as part of WTL's land use consent for expanded dairy farming in October 2017. The Horner Block was used for winter grazing and heifer grazing in the past, but has been used for cut and carry, and as an FDE area in recent years.

It is proposed that two dairy units will continue to be operated within the landholding boundary; WOL and WTL. Cows will be milked for seasonal supply through two dairy sheds, 700 at WOL and 800 at WTL. All cows will be wintered in two existing wintering barns. The wintering barns will be used at times to house cows in the shoulders of the season and as stand-off pads during inclement weather throughout the year to reduce soil damage. The Horner Block will continue to be used as an area to discharge slurry from two effluent storage ponds at WOL and WTL. Pasture silage and fresh grass is harvested from the Horner Block and fed to cows at dairy farms, including but not limited to WOL and WTL.

Table 1.1 General property details

Property details	
Dairy platform - total farm area (ha)	502
Dairy platform - effective farm area (ha)	479
Dairy platform - size of effluent disposal area (ha)	c.400
Dairy platform - stocking rate (cows/ha)	3.1
Horner Block – total area (ha)	160
Horner Block – effective area (ha)	155
Horner Block – slurry effluent area (ha) for dairy platform (WOL/WTL only)	97
Legal descriptions – WOL/WTL landholding boundary	Part Lot 18 DP 942

	Section 420 Taringatura SD Part Lot 1 DP 4092 Part Lot 18 DP 942 Part Lot 2 DP 4092 Part Lot 1 DP 4092 Part Section 417 Taringatura SD Section 418 Taringatura SD Section 419 Taringatura SD Lot 1 DP 9925* (leased - Gavin Andrew Dykes) Lot 1 DP 14660 Lot 1 DP 14661 Lot 1 DP 451158 (leased - John Desmoulins Pine & Christina Florence Pine) Lot 1 DP 13077 (leased - John Desmoulins Pine & Christina Florence Pine) Lot 1 DP 5610 Lot 3 DP 5610 Lot 1 DP 10885
Legal descriptions – Effluent discharge area at dairy platform and Horner Block	Part Lot 18 DP 942 Section 420 Taringatura SD Part Lot 1 DP 4092 Part Lot 18 DP 942 Part Lot 2 DP 4092 Part Lot 1 DP 4092 Part Section 417 Taringatura SD Section 418 Taringatura SD Section 419 Taringatura SD Lot 1 DP 14660

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	Lot 1 DP 14661 Lot 1 DP 5610 Lot 3 DP 5610 Lot 1 DP 10885 Lot 4 DP 399915 (Horner Block - effluent block only)

*Part of Lot 1 DP 9925 is leased by the applicants and is already within the boundary of the existing land use consent for dairy farming (see figure 1.1).

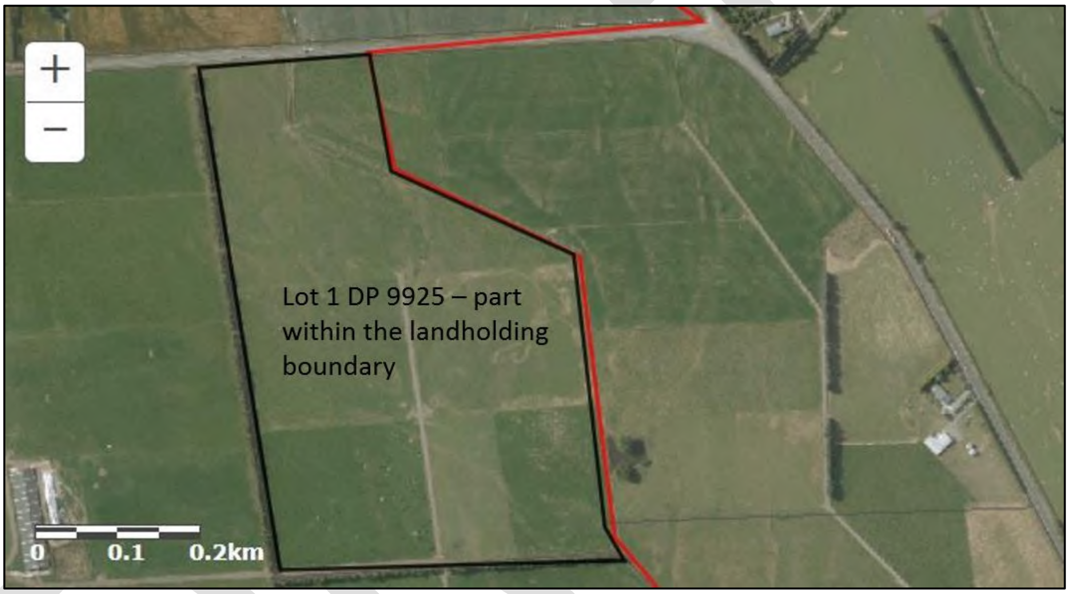

Figure 1.1 Part of Lot 1 DP 9925 within the landholding boundary at WOL/WTL.

Effluent

Existing discharge conditions

Agricultural effluent from WOL and WTL dairy operations are currently managed by way of two existing discharge permits **(301663, 20171278-01)**, which expire on the 9th of November 2027 and 18th October 2027 respectively. WOL's existing discharge consent is for a 540-cow herd milked twice a day and from herd home slurry from a maximum of 400 cows. WTL's existing discharge consent is for an 800-cow herd milked twice a day and from herd home slurry from a maximum of 640 cows. WTL's existing discharge permit also provides for effluent from an underpass and a silage pad.

The consented discharge method at WOL includes land disposal methods limited to maximum application depths of 10 mm and 5 mm per application. The consented discharge methods at WTL include a low depth travelling irrigator, umbilical system and slurry tanker with a trailing shoe. The travelling irrigator has a maximum application depth per application of 10 mm. The umbilical and trailing shoe slurry tanker systems have a maximum depth per application of 5 mm.

The existing operations do not involve winter milking.

Existing FDE areas

WTL's discharge area includes 194 hectares of land at WTL, and 42 hectares of land at the Horner Block. Liquid effluent is discharged at WTL and slurry effluent from WTL's wintering barn is discharged at the Horner Block. Council recommended buffers are implemented at WTL, except for a buffer of 100 metres from land known as Lot 3 DP237. WOL's discharge area includes most of the milking platform and another part of the Horner Block. Council recommended buffers are implemented when discharging liquid or slurry effluent at WOL.

Existing effluent storage infrastructure

WOL and WTL allow for deferred irrigation when soils are near or at field capacity by storing raw effluent (slurry) in two large effluent ponds, one for each operation. Both ponds receive dairy shed effluent when soil moisture conditions are unsuitable for irrigation, and wintering barn effluent from the barns. The WTL pond also receives silage leachate from WTL's concrete silage pad. The material in the ponds is a slurry due to the major contribution of dung and urine from the free stall wintering barns. Consequently, both ponds always have a crust.

WOL's storage pond was upgraded in autumn 2018 to increase its storage capacity and install a synthetic liner (1.5 mm HDPE), overlying a leak detection drain system. The specifications for the leak detection drain system were provided by a CPEng. The pond design was certified by a CPEng as meeting Practice Note 21 standards and completion of reconstruction work received CPEng sign off. The leak detection drain system terminates at a 400 mm diameter inspection well. The inspection well is monitored regularly with no effluent present in the inspection well to date, indicating that the pond is not leaking.

WTL's storage pond was drop tested in 2017 and passed the leakage test indicating that the pond is not leaking. The drop test met all criteria set out in Appendix P, except for the unavoidable presence of a crust on slurry. The drop test report is appended to this application. The characteristics of slurry and liquid effluent in storage systems are quite different. The viscosity of slurry is a lot lower than liquid effluent and as a result, slurry is self-sealing whereas liquid effluent is not. Also, the issue of wind-driven wave action causing bank erosion does not arise when storing slurry.

All effluent storage structures including ponds and various sumps have been visually assessed by a SQP and certified as showing no visible signs of cracks, holes or defects that would leak effluent.

Proposed changes to effluent management and permit

It is proposed to replace existing discharge permits **(301663, 20171278-01)** with a single discharge permit covering effluent from WOL and WTL. The proposed discharge permit will allow for the discharge of agricultural effluent (dairy shed, wintering barn, silage pad and underpass) to land from 1,500 cows; 700 cows at WOL and 800 cows at WTL.

The proposed irrigation systems are described in table 1.2.

Table 1.2 Proposed effluent irrigation methods

Method	Usage	Conditions
Low depth travelling irrigator	Apply dairy shed effluent to land	A maximum depth per application of less than 10 mm
Low depth slurry tanker with a trailing shoe	Apply pond slurry to land	A maximum depth per application of 2.5 mm
Low depth umbilical system	Contingency measure – apply pond slurry to land	A maximum depth per application of 3.0 mm
Low rate pods	*Future proof - Apply dairy shed effluent to land	A maximum instantaneous rate of 10 mm/hour at a depth of less than 10 mm
Low rate cannon/rain gun	*Future proof - Apply dairy shed effluent to land	A maximum instantaneous rate of 10 mm/hour at a depth of less than 10 mm

*To future proof the discharge activity, it is proposed to include low rate irrigation methods as described in the above table. This will allow the applicants to upgrade their effluent system in the future without the need to vary the discharge permit.

The proposed effluent discharge area includes most of the WOL/WTL dairy platform and the existing area at the Horner Block that receives agricultural effluent from WOL and WTL, less standard buffers. *Significant areas of low risk soils are available.* Slurry from the ponds will be applied at very low depth via the trailing shoe slurry tanker or umbilical system at the Horner Block and at the dairy platform.

No affected party approvals are required.

No change in effluent storage is proposed. According to the Massey DESC, the 90% probability volume for 1,500 cows including wintering barn effluent from 1,280 cows and silage leachate is 6,460 m^3. The existing storage capacity is 8,032 m^3, so is sufficient to meet requirements.

Wintering

In the past, some cows and heifers have been intensively winter grazed on fodder crop (fodder beet) and heifers also have been grazed on pasture over winter at the property. More recently, cows have been wintered in barns, but heifers have been intensively winter grazed on crop or grazed on pasture over winter. It is proposed to cease the practice of intensive winter grazing and grazing stock on pasture over winter as a key mitigation measure. From June 2019, no animals will be winter grazed on fodder crop or grazed on pasture over winter at the WOL/WTL dairy platform. All cows will be wintered in two wintering barns on farm over June and July. All young stock will be grazed off farm from weaning until they return as in-calf R2 heifers for calving in August or return as in-calf R2 heifers in June to be wintered in barns.

From May 2019, cows will also be housed in wintering barns for part of May, August and September during inclement weather as required. Early calving cows will return to pasture in August, where they calve. Late calving cows remain in the wintering barns until they are ready to calve in September. Cows are fed freshly cut grass and pasture silage in barns, some of which is harvested at the Horner Block. The wintering barns are also used as stand-off pads during inclement weather during the milking season.

At the end of the season in May, the herd of 1,500 cows is culled. At WTL's wintering barn, a maximum of 640 cows are housed over winter. It is proposed to increase WOL's wintering barn authorised cow number to 640, to accommodate an additional 240 animals. WOL's wintering barn has already been upgraded and now has a capacity to house 640 cows. Effluent storage at WOL has been increased so can accommodate effluent from an additional 240 cows in the wintering barn. Generally, each barn will house 625 cows, leaving some stalls free to minimise cow stress.

In the 17/18 winter, WOL's barn housed 400 cows and was assessed as grade 1/fully compliant at an inspection by Environment Southland.

Cultivation

The WOL platform has been dairy farmed by the applicants since 1992, and most of the WTL platform has been dairy farmed by the applicants since 2003. Over this time soils have been developed sustainably, which is evident in fertiliser and agronomy reports for WOL, WTL and the Horner Block from the fertiliser supplier (Ravensdown). Please see the soil fertility trends reports in the Appendix. Summer and winter fodder crop cultivation has been carried out to provide feed for cows over summer dry periods and winter respectively. It is proposed to cease the practice of growing fodder crops at the property, as a key mitigation measure associated with an increase in cow numbers, instead wintering all cows inside in barns. The proposed re-grassing policy will be by direct grass to grass cultivation.

Groundwater abstraction

Groundwater is abstracted from three bores for use at two dairy sheds and to supply stock drinking water to 1,500 cows. The maximum daily volume of groundwater abstracted to meet the needs of 1,500 cows is 180,000 litres.

At the WTL dairy platform, two bores supply groundwater. One bore (E45/0083) is located to the west of the dairy shed with a second bore (E45/0727) at the north of the block, close to Wreys Bush Highway. The maximum daily volume of groundwater supplied to WTL is 96,000 litres.

At the WOL dairy platform, the bore (E45/0071) is located to the west of the dairy shed and the maximum daily volume of groundwater supplied to WOL is 91,000 litres. This represents an increase of 31,000 litres compared to the existing water permit for WOL (#301664), which has a maximum daily take of 60,000 litres.

Table 1.3 Physical properties and information of land and water at the WOL/WTL dairy platform and Horner Block.

<table>
<tr><td rowspan="7">Soils*</td><td rowspan="2">Soil Type</td><td colspan="3">Vulnerability Factors</td></tr>
<tr><td>Structural Compaction</td><td>Nutrient Leaching</td><td>Waterlogging</td></tr>
<tr><td>Braxton</td><td>Moderate</td><td>Slight</td><td>Severe</td></tr>
<tr><td>Drummond</td><td>Minimal</td><td>Moderate</td><td>Slight</td></tr>
<tr><td>Glenelg</td><td>Slight</td><td>Very severe</td><td>Nil</td></tr>
<tr><td>Waiau</td><td>Moderate</td><td>Very severe</td><td>Nil</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td>FDE Land Classification</td><td colspan="4">A – artificial drainage or coarse soil structure
E – other well drained but very stony flat land
(Likely to be D – well drained flat land, but this is not mapped)</td></tr>
<tr><td>Characteristics of FDE Classification</td><td colspan="4">A - high risk to surface water, low risk to groundwater
D, E – low risk to groundwater, low risk to surfacewater</td></tr>
<tr><td>Topography</td><td colspan="4">Flat</td></tr>
<tr><td>Surfacewater management zone</td><td colspan="4">Waimatuku, Oreti, Aparima</td></tr>
<tr><td>Groundwater Zone</td><td colspan="4">Waimatuku, Central Plains</td></tr>
<tr><td>Groundwater Nitrate Levels</td><td colspan="4">0.1 – > 11.3 mg/L
A series of nitrate concentration bands are mapped across the property, with the lowest groundwater nitrate levels at the west of the property (0.1 – 0.4 mg/L) and the highest to the south east of the property (modelled >11.3 mg/L). Most groundwater underlying the property has nitrate levels of 3.5 – 8.5 mg/L, indicative of moderate to high land use impacts.</td></tr>
<tr><td>FMU</td><td colspan="4">Oreti, Aparima</td></tr>
</table>

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Nearest downstream registered drinking water supply	Heddon Bush School 2.3 km to the south	
Downstream Regionally Significant Wetland/Sensitive Waterbody	Drummond Peat Swamp (>10 km to south east) Bayswater Bog (>10 km to south west)	
Physiographic Zones	**Zone**	**Contaminant pathways for Physiographic Zone**
	Central Plains	When wet soils are prone to waterlogging, resulting in the installation of extensive artificial drainage networks. When dry these soils are prone to shrinking and cracking, allowing drainage to bypass the soil to the underlying aquifer. Aquifers and streams in this zone are prone to contaminant build-up as they do not experience dilution by a major river.
	Oxidising	Soil water and groundwater are well aerated, which allows nitrogen to accumulate. Oxidised soils are good at absorbing and storing water and any nitrogen it contains. During drier months, nitrogen accumulates in soil to high levels. During winter when soils are wet, any nitrogen not used by plants leaches down into the underlying aquifer (deep drainage). Artificial drainage is used where soils have low subsoil permeability to help to reduce waterlogging. Contaminant loss through artificial drains to nearby streams can be high during wetter months.

*Soil mapping on Topoclimate appears to be incorrect compared to soil types found at the property. Topoclimate maps Braxton soils as the dominant soil type for most of the property, with Pukemutu being a minor soil type. Topoclimate maps an area of Glenelg at the south east end of the property.

A soil survey carried out in 2017 by Scandrett Rural Limited is described in Section 5 and a separate report. It maps two dominant soil types found at the property; Braxton soils are found on the mid-west side of the property and Drummond soils are found at the east. Drummond soils have intergrades of more shallow Glenelg soils in places.

2. Consents

The decisions version of the pSWLP was notified on 4 April 2018. In accordance with Section 86B(1)(a) and (3) of the Resource Management Act 1991, all provisions of the Proposed Plan have had legal effect since this date. Since the Regional Water Plan (2010) and Regional Effluent Land Application Plan are still operative, all provisions in both Plans have legal effect. The provisions of these plans therefore need to be considered alongside the provisions of the pSWLP.

Consent holder name

The existing consent holders, Woldwide One Limited, Woldwide Two Limited, have changed their name to "*Woldwide One Limited and Woldwide Two Limited*." In accordance with Section 124C of the RMA, Woldwide One Limited confirms in writing that they will not be making any future applications under as *Woldwide One Limited* on this property in accordance with Section 124C of the RMA. In accordance with Section 124C of the RMA, Woldwide Two Limited confirms in writing that they will not be making any future applications as *Woldwide Two Limited* on this property in accordance with Section 124C of the RMA. Future applications will be made on behalf of "*Woldwide One Limited and Woldwide Two Limited*."

2.1 Consents required

Table 2.1 provides a summary of proposed activities and whether resource consent is required or not. Further details are provided regarding the level of each activity in the following section.

Table 2.1

Proposed activity	Consent required	Activity level
Expansion of dairy farming through an increase in cow numbers	Yes - land use consent for farming	Discretionary activity
Effluent discharge	Yes - effluent discharge permit	Discretionary activity
Discharge of sludge	Yes - effluent discharge permit	Discretionary activity
Use of land for maintenance and use of existing effluent storage facilities	No	Permitted activity
Use of land for wintering barns	Yes - use of land for feed pad/lot	Discretionary activity
Use of land for silage storage facilities	No	Permitted activity
Silage leachate	No	Permitted activity
Groundwater abstraction	Yes - water permit	Discretionary activity

Expansion of dairy farming

Rule 20 of the pSWLP manages farming activities, including new or expanded dairy farming of cows. The proposed activity does not meet Rule 20 (a) (ii) (2) since cow numbers are increasing beyond the maximum number specified in the dairy effluent discharge permit that existed on 3 June 2016. Rule 20 (a) (ii) (6) is met, however, as all land was either in the dairy platform prior to 3 June 2016 or was authorised for dairy farming in November 2017. Rules 20 (b) and (c) do not apply since the proposed activity does not include any intensive winter grazing nor will occur at greater than 800 metres above mean sea level.

The proposed activity meets the conditions described in Rule 20 (d) except for (d) (ii) (1), since the dairy platform's assessment provided reflects the annual amount of N, P, sediment and microbial contaminants lawfully discharged on average over four years prior to this application, instead of over five years. A high level of evidence of land use activities during the four-year period has been supplied with this application. As the application does not meet all the provisions of Rule 20 (d), then Rule 20 (e) applies; **the use of land for the proposed farming activity is a discretionary activity and resource consent is required**.

Discharge activity

Rule 35 of the pSWLP manages the discharge of agricultural effluent to land. In this case the discharge activity does not meet all conditions of Rule 35 (a). The discharge activity does not meet Rule 35 (b) (ii) since it is proposed to increase cow numbers above the maximum number specified on an existing discharge consent. The discharge activity meets all conditions described in Rule 35 (c) so is a discretionary activity.

Rule 50 of the RWP (2010) manages the discharge of agricultural effluent to land. In this case the discharge activity does not meet Rule 50 (a) or (b) of the RWP. It does not meet Rule 50 (c) since it is proposed to increase the scale of the discharge activity through an increase in cow numbers. However, except for an increase in cow numbers, the discharge activity meets Rule 50 (c) part (i) in that it includes high rate irrigation to soil landscape categories A, D and E. The discharge activity meets Rule 50 (d) as the scale of the activity is increasing with the increase in cow numbers and the discharge activity to soil/landscape categories A, E and D includes high rate irrigation by slurry tanker that does not exceed 5 mm depth per application. In fact, the discharge of effluent by slurry tanker does not exceed 2.5 mm depth per application. Rule 50 (d) does not specify a depth for high rate irrigation by travelling irrigator, so accordingly direction is taken from Policy 42 of the RWP. The discharge of effluent to category E land must be applied at less than or equal to 10 mm depth per application and at less than the soil infiltration rate. The discharge of effluent to category A or D land must be applied at a depth less than the soil water deficit and at less than the soil infiltration rate. The discharge of effluent to category E land is in line with Policy 42 of the RWP.

Rule 5.4.6 of the Regional Effluent Land Application Plan provides for the discharge as a **discretionary activity**.

The discharge activity is therefore assessed as being a discretionary activity.

Existing effluent storage facilities

Rule 32D of the pSWLP manages existing agricultural effluent storage facilities. Under Rule 32D (a) the use of land for the maintenance and use of existing agricultural effluent storage facilities that was authorised prior to Rule 32D taking legal effect, and any incidental discharge directly onto or into land from those storage facilities which are within the normal operating parameters of a leak detection system or the pond drop test criteria set out in Appendix P, are permitted activities provided the certain conditions are met.

WTL storage pond

WTL's storage pond stores slurry and does not have a leak detection system. It was drop tested in 2017 and a drop test report was submitted to Environment Southland who accepted that the pond was not leaking. The drop test met all criteria set out in Appendix P, except for the unavoidable presence of a crust on slurry. The drop test report is appended to this application. The characteristics of slurry and liquid effluent in storage systems are quite different. The viscosity of slurry is a lot lower than liquid effluent and as a result, slurry is self-sealing whereas liquid effluent is not. Also, the issue of wind-driven wave action causing bank erosion does not arise when storing slurry.

WTL's storage pond meets Rule 32D (a) (i) (1) in that its construction was lawfully carried out without a consent. In accordance with Rule 32D (a) (ii) (2), a visual assessment of WTL's pond was carried out by a SQP in 2018. The assessment found that the pond shows no cracks, holes or defects that would allow effluent to leak. A report certifying WTL's pond by a SQP is appended to this application. In accordance with Rule 32D (a) (ii) (2) (b) the pond has been certified by a SQP as meeting the relevant drop test criteria in Appendix P except for having no crust on the pond surface during the test, which was unavoidable due to the storage of slurry.

In the absence of operating within the normal parameters of a leak detection system or all pond drop test criteria set out in Appendix P, Rule 32D does not provide another pathway to an activity level available for the use of land for the maintenance and use of an existing agricultural effluent storage facility.

WOL storage pond

WOL's effluent pond stores slurry and was lawfully upgraded in autumn 2018 to increase its storage capacity, install a synthetic liner and leak detection system. The liner is composed of 1.5 mm HDPE and overlies a leak detection drain system, the specification for which was provided by a CPEng. The pond design was certified by a CPEng as meeting Practice Note 21 standards. The leak detection system terminates at a 400 mm diameter inspection well. The liner supplier confirmed that the liner was correctly installed and is not leaking. The CPEng confirms that the pond is structurally sound following the upgrade. The CPEng report was submitted to Environment Southland as required in 2018.

WOL's pond is operating within the normal operating parameters of a leak detection system; there is no effluent leaking from the pond. The piezo has been inspected regularly when it either had no liquid or had liquid following heavy rainfall when the water table was high. By checking the liquid in the piezo for signs of effluent (i.e. odour and clarity), it has been confirmed that there is no effluent in the leak detection system and no effluent leaking from the pond. In accordance with Rule 32D (a) (ii) (2), a visual assessment of WOL's pond was carried out by a SQP in 2018. The assessment found that the pond shows no cracks, holes or defects that would allow effluent to leak. A report certifying WOL's pond by a SQP is appended to this application.

In accordance with Rule 32D of the pSWLP, the use of land for an existing effluent storage pond at WOL is a permitted activity; resource consent is not required.

Ancillary effluent structures at WOL and WTL

WOL has a sand trap and concrete effluent sump at the dairy shed and concrete collection sump at the wintering barn. These structures have been visually assessed by a SQP and certified as having no visible cracks, holes or defects that would allow effluent to leak. A report prepared by a SQP is appended to this application.

WTL has a sand trap and pump sump at the dairy shed and concrete collection sump at the wintering barn. These structures have been visually assessed by a SQP and certified as having no visible cracks, holes or defects that would allow effluent to leak. A report prepared by a SQP is appended to this application.

Feed pads/Lots

Rule 35A of the pSWLP manages the use of land for feed pads/lots including wintering barns. In this instance the use of land for two wintering barns at the dairy platform does not meet all conditions set out in Rule 35A (a) as each barn houses more than 120 cattle. The use of land for a feed pad/lot that does not meet one or more conditions of Rule 35A (a) is classed as a discretionary activity. Accordingly, resource consent application for the use of land for two wintering barns at WOL and WTL will be submitted to Environment Southland. The application for resource consent for the use of land for two wintering barns will be submitted separately in February 2018.

Silage storage - WOL

The use of land for a silage storage facility at WOL is a permitted activity as it meets all conditions specified in **Rule 40 (a)** of the pSWLP; resource consent is not required for the silage storage facility.

The use of land as a silage storage facility at WOL is a permitted activity as it meets all conditions specified in **Rule 51 (a)** of the RWP (2010); resource consent is not required for the silage storage facility.

Both rules are met as follows:

The silage pad is situated on a dry site; the underlying substrate is well compacted and sealed (see figures 6.4 and 6.5). There is no overland flow of stormwater into the silage pad and the silage pad is not situated within a critical source area. The silage pad is not located on land that is made permanently or intermittently wet by the presence of springs, seepage, high groundwater, ephemeral rivers or flows of stormwater other than from any cover of the silage.

No part of the silage pad is within 50 metres of a lake, river, artificial watercourse, modified watercourse (see figure 6.6), natural wetland or any potable water abstraction point. The nearest waterway is a fenced off open drain, which is approximately 60 metres to the east of the silage pad.

The silage pad is no within 100 metres of any dwelling or place of assembly, on another landholding.
The silage pad is not within 100 metres of the microbial health protection zone of a drinking water supply site identified in Appendix J of the pSWLP, or within 250 metres of the abstraction point of a drinking water supply site identified in Appendix J.

Cattle do not graze directly from the silage pad, rather silage is carted from the pad to cows in the wintering barn or on paddocks. The silage pad is not located on contaminated land.

Silage storage - WTL

The use of land for a silage storage facility at WTL meets the conditions stated in Rule 40 (a) of the pSWLP (2018), so is classed as a permitted activity and resource consent is not required. The use of land for a silage storage facility meets the conditions stated in Rule 51 (a) of the RWP (2010), so is classed as a permitted activity and resource consent is not required.

Silage leachate - WOL

The discharge of silage leachate onto or into land at WOL is a permitted activity as it meets all conditions specified in Rule 51 (d) of the Regional Water Plan (2010); resource consent is not required.

The activity meets Rule 41 (a) (iia), (iii) and (iv) of the pSWLP and is therefore a permitted activity and resource consent is not required. 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.

Silage leachate - WTL

In accordance with Rule 41 (a) of the pSWLP, the discharge of silage leachate onto or into land in circumstances where contaminants may enter water is a permitted activity since part (i) is met and resource consent is not required; the discharge is via an agricultural effluent discharge system authorised under Rule 35.

In accordance with Rule 50 (d) of the RWP (2010), the discharge of silage leachate at WTL is a permitted activity since all conditions set out in Rule 50 (d) are met; resource consent is not required.

Discharge of sludge

The discharge of pond sludge (also referred to as slurry) from the operations meets all provisions of Rule 38 of the pSWLP except for part (a) (iii). Although the maximum N loading will not exceed 150 kg N/ha/year at the dairy platform, it will exceed 150 kg N/ha/year at the Horner Block. A maximum N loading of 250 kg N/ha/year from sludge is proposed for the Horner Block, which is a cut and carry block and does not graze stock.

The discharge of sludge at the dairy platform is a permitted activity under Rule 38 of the pSWLP and does not require resource consent. The discharge of sludge at the Horner Block is not a permitted activity under Rule 38 of the pSWLP and requires resource consent.

The discharge of sludge/slurry from the operations meets all provisions of Rule 5.3.1 of the Regional Effluent Land Application Plan (RELAP) arguably except for part (a). Under Rule 5.3.1 of the RELAP, the discharge of sludge is a permitted activity if it meets parts (a) to (g) of the rule. The discharge of sludge meets parts (b) to (g) of the rule, however, it is unclear whether it meets part (a) of the rule. Part (a) states that in order meet permitted activity rules:

> *"the sludge is discharged onto the same property as it was generated. If the sludge is not discharged onto the same property, then the property which receives that discharge may not accept more than one sludge discharge application during a 12 month period;"*

Sludge is discharged at the Horner Block at a rate of more than one application during a 12-month period. Legal opinion sought by Environment Southland has confirmed that the Horner Block is not part of the same landholding as the dairy platform [WOL and WTL]. The above rule refers to "property" rather than "landholding" making interpretation ambiguous.

Groundwater abstraction

Under Rule 54 (d) of the pSWLP, groundwater abstraction for 1,500 cows on the property is a discretionary activity as a maximum of 180,000 litres per day is abstracted. This allows for 120 litres per cow per day. Under Rule 23 (c) of the Regional Water Plan, a groundwater take of 180,000 litres per day is a restricted discretionary activity provided the rate of take is less than or equal to 2 L per second; resource consent is required. **The groundwater abstraction is assessed as a discretionary activity and resource consent is required.**

2.2 Duration

Consent durations of 15 years are proposed for all consents, which aligns with Woldwide One's discharge and water permit terms. Special consideration is given to Policy 40 of the pSWLP and Policies 14A and 43 of the Regional Water Plan in determining the duration. The duration sought is considered consistent with these policies given the replacement nature of consents for an activity that is already well established, has benefited from a significant degree of capital investment and is operating within limits established by its existing consents and associated conditions. Considerable investment in farm infrastructure has been made to take the final steps towards future proofing the dairying operation; eliminating winter grazing of adult cattle on beet crops altogether. The level of investment demonstrates the applicant's belief in and commitment to sustainable farming and land management. The applicants believe that their presence at this location since 1992 (over 25 years) has not had a detrimental effect on the local environment, and that the proposed changes will mean a further reduction of that impact. A 15-year consent term will mean that the management of the resources under the same proven stewardship will be ensured into the future.

2.3 Proposed consent conditions

The applicants propose to agree conditions once draft conditions are issued, including the conditioning of various mitigation measures where appropriate. They request that draft conditions recognise the following at a minimum:

Land use consent for farming

1. The land area only includes the proposed WOL/WTL dairy platform, as described in table 1.1, which the applicants believe is the landholding in its entirety;
2. That Woldwide Runoff (both Merrivale and Merriburn blocks) is not included since the applicants believe it is not part of the landholding at the proposed WOL/WTL dairy platform;
3. That the land use consent is an output-based consent, using the N figure (x kg/ha/year) from Overseer for the proposed WOL/WTL dairy platform as a limit. The below example can be used as guidance.
4. To provide additional certainty over the scale of the activity, mitigations and effects that the following inputs are conditioned:
    a. Land area;

b. Liquid effluent discharge area;
c. Peak cow numbers milked; and
d. Minimum and maximum number of cows housed in wintering barns.

5. The Consent Holder shall maintain records of the following for each year between 1 June and 31 May:
   a. Fertiliser application, including rates;
   b. Supplements imported;
   c. Types of crops and total area of cropping if any;
   d. Cultivation methods;
   e. Stock units by references to type, age and breed;
   f. Effluent application areas;
   g. All other inputs to the OVERSEER nutrient budgeting model.

6. Install a new monitoring bore in the same area as bore E45/0622, to monitor groundwater quality flowing in a southerly direction towards Heddon Bush School.

Example:

Nitrogen Loss Rate and Nutrient Budget

1. *The Consent Holder shall ensure nitrogen losses from farming activities undertaken at the dairy platform are maintained at or below the following nitrogen loss rate of X kg/ha/yr, or as amended in accordance with Condition X.*

Advice Note: *The nitrogen loss rates represent the modelled discharge of nitrogen below the root zone as modelled with OVERSEER version 6.3.0 in accordance with the OVERSEER Best Practice Input Standards as of 11 May 2018.*

The determination of whether the nitrogen loss rates have been met will be made using the nitrogen loss from the most recent year, modelling using the latest version of OVERSEER®.

2. *The Consent Holder shall prepare an annual nutrient budget for the period of 1 June to 31 May for the subject land using OVERSEER in accordance with the OVERSEER Best Practice Input Standards, or an equivalent model approved by the Chief Executive of the Consent Authority.*

3. *The nutrient budget required by Condition 2 shall be accompanied by a report that includes:*
   a. *A review of the input data to ensure that the nutrient budget reflects the farming system;*
   b. *An explanation of any differences between the budgets of the previous year; and*
   c. *A comparison of the nitrogen loss from the current year with the nitrogen loss rates in Condition 2.*

4. *The nutrient budget and accompanying report shall be provided to the Consent Authority by 30 September each year.*

5. *The nutrient budget shall be prepared by a Certified Nutrient Advisor or the budget may be prepared by suitably experienced person and reviewed by a Certified Nutrient Advisor.*

6. *The nitrogen loss rates described in Condition 2 shall be amended following the release of a new version of OVERSEER or the Best Practice Data Input Standards. Following the update of the nitrogen loss rates, the Consent Holder shall provide the updated OVERSEER files to the Consent Authority with the report required by Condition 5.*

Discharge permit

The following conditions are proposed:

1. *This consent shall be exercised in conjunction with Land Use Consent AUTH-X.*

   (a) This consent authorises the discharge of dairy shed effluent, wintering barn effluent, silage pad effluent and underpass effluent ("agricultural effluent") onto land, via a land disposal system consisting of two effluent storage ponds, two sand traps, two dairy shed pump sumps, two wintering barn concrete collection sumps, low depth travelling irrigator, low rate (pods and/or rain-gun) irrigation, slurry tanker with a trailing shoe and umbilical system, as described in the application (X) for resource consent dated X 2018 and further information dated X.

   The activity shall be limited to:

   i. The discharge to land of agricultural effluent generated from milking of up to 1,500 cows milked twice daily;
   ii. The discharge to land of agricultural effluent from the housing of up to 1,280 cows inside two purpose built barns;
   iii. The discharge of agricultural effluent to land via low depth travelling irrigator, slurry tanker with a trailing shoe, umbilical system and low rate irrigation;
   iv. The discharge of agricultural effluent to an area of no more than X hectares at the dairy platform as per the plan attached as Appendix 1;
   v. The discharge of effluent slurry to an area of no more than 97 hectares at the block known as the "Horner Block" as per the plan attached as Appendix 1.
   vi. The discharge of effluent from a 1,200 m^2 silage pad; and
   vii. The discharge of effluent from a 200 m^2 underpass.

   ***Advice note**: "Effluent slurry" refers only to the contents of the effluent storage ponds. "Agricultural effluent" refers to effluent from all sources (the dairy shed, yard, barns, ponds, silage pad and underpass).*

   (b) This consent excludes the discharge of effluent from winter milking from June 20 to July 20 (winter milking refers to cows milked to supply a winter milking contract), or from any feed pad/calving pad/structure not listed in condition 2(a).

2. *The discharge authorised by this consent shall not exceed the following rates at any time:*

   (a) For the travelling irrigator: A maximum depth of less than 10 millimetres for each individual application;
   (b) For the slurry tanker with trailing shoe: A maximum depth of 2.5 millimetres for each individual application;

- *(c)* *For the umbilical system: A maximum depth of 3.0 millimetres for each individual application; and*
- *(d)* *Low rate system: a maximum depth of 10 millimetres for each individual application, and an instantaneous rate of 10 millimetres per hour.*

3. *The maximum loading rate of nitrogen from effluent onto any land area as a result of the exercise of this consent shall not exceed:*
   - *(a)* *150 kilograms of nitrogen per hectare per year at the dairy platform; and*
   - *(b)* *250 kilograms of nitrogen per hectare per year at the Horner Block (Lot 4 DP 399915).*
     - *i.* ***The annual slurry volume applied at the Horner Block shall be recorded and reported to the Consent Authority upon request****.*

4. *The minimum return period for the discharge of effluent to land shall be no less than 28 days.*

5. *Effluent shall not be discharged within:*
   - *(a)* *20 metres of any surface watercourse;*
   - *(b)* *100 metres of any water abstraction point;*
   - *(c)* *200 metres of any place of assembly or dwelling not on the subject property;*
   - *(d)* *20 metres from any property boundaries.*

Where there is inconsistency between the plan attached as Appendix 1 and the conditions of this consent, the conditions of this consent shall prevail.

6. *The application of effluent to land shall not occur when:*
   - *(a)* *the moisture content of the soils is at or above field capacity,*
   - *(b)* *soils within the discharge area are 'cracked'; and*
   - *(c)* *during wind conditions that may result in odour or spray drift beyond the property boundary.*

Other conditions for land use, discharge and water consents – to be agreed with Consent Authority once draft conditions are issued.

3. Statutory Considerations

3.1 Statutory considerations:

Environment Southland must consider the following matters when they consider an application. The application is consistent with all of these relevant plans and policies because effects on water quality and quantity and the soil resource should be less than minor.

Resource Management Act 1991:

- The provisions of section 104 of the Resource Management Act 1991;
- Part 2 of the Resource Management Act;
- The applicant's assessment of effects on the environment;
- The provisions of Sections 104B, 104C, 105 and 107 of the Resource Management Act 1991.

Schedule 4 of the RMA requires that an assessment of the activity against the matters set out in Part 2 and any documents referred to in Section 104. Sections 104B and 104D of the Act set out the matters that, subject to Part 2, the Consent Authority must have regard to when considering an application for discretionary activities. Sections 105 and 107 set out additional matters the Consent Authority must have regard to when considering applications to do something that would otherwise contravene Section 15. An assessment of each of these matters follows:

Part 2 of the RMA

The activity is considered to represent an efficient use of natural resources that will give rise to significant positive benefits in terms of providing for the social and economic wellbeing of the applicants and the wider regional economy. There is, however, the potential for adverse effects on the environment to arise, including on water quality. However, it is considered that the effects of the activities have been adequately identified and assessed in the Assessment of Environmental Effects in Section 7 below and that such effects will be no more than minor.

Section 6 of the RMA lists the matters of national importance that a Consent Authority shall recognise and provide for when considering applications for resource consent. The relevant matters under Section 6 to this proposal are considered to be:

(a) the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development:

(c) the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga:

It is considered that the proposed activities do not impact directly on the coastal environment, wetlands, and lakes and rivers and their margins, although there is potential for adverse effects on the wider receiving

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environment which is inclusive of some of these features. However, as is discussed in Section 7 below, the actual and potential adverse effects of the activities are considered to be no more than minor.

Section 7 of the Act lists a number of other matters that a Consent Authority must have particular regard to when considering applications for resource consent. The matters in Section 7 that are considered relevant to this application are:

(a) kaitiakitanga:

(aa) the ethic of stewardship:

(b) the efficient use and development of natural and physical resources:

(c) the maintenance and enhancement of amenity values:

(d) intrinsic values of ecosystems:

(f) maintenance and enhancement of the quality of the environment:

(g) any finite characteristics of natural and physical resources:

(h) the protection of the habitat of trout and salmon:

For the reasons discussed in Section 7 of this report below, the proposal is considered consistent with relevant provisions of Section 7 of the RMA.

Section 8 sets out a Consent Authority's responsibilities in relation to the Treaty of Waitangi. The proposal is considered consistent with the provisions of all regional planning documents, including Te Tangi oTauira, and Sections 6(c) and 7(a) of the Act. Therefore, the proposal can also be considered consistent with Section 8 of the Act.

To avoid repetition, the following documents have been grouped together under common headings in the sections that follow.

The final part of this section of the application focuses on why the activity is consistent with key policies in the proposed Southland Water and Land Plan (2018).

Table 3.1: Ngai Tahu Values

Regulatory Document	Relevant Sections
National Policy Statement for Freshwater Management 2014	• Objectives C1, D1 • Policies C1, D1

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Southland Regional Policy Statement 2017	• Objectives TW.2, TW.3, TW.4 and TW.5 • Policies TW.3, TW.4 and TW.5
Regional Water Plan 2010	• Objective 9C • Policy 1A
Regional Effluent Land Application Plan 1998	• Objectives 4.1.4, 4.1.5 • Policies 4.2.4, 4.2.7,4.2.8, 4.2.9
Proposed Southland Water and Land Plan 2018	• Objectives 3, 4, 5, 15 • Policies 1, 2, 3
Te Tangi a Tauira:	• Whole Document

Tangata Whenua values have been considered when preparing this application including reference to Te Tangi a Tauira (Iwi Management Plan). The principles of protection of the mauri of the water and mana of the land while minimising adverse effects on mahinga kai will continue to be recognised and have regard to in the exercise of the consents and the operation of the dairying activity. There are no known wahi tapu, ancestral sites, heritage sites or other taonga associated with the property.

Table 3.2 Water Quality

Regulatory Document	Relevant Sections
National Policy Statement for Freshwater Management 2014	• Objectives A1, A2, B1, B2, B3, B4, • Policies A3, A4, B5, B6, B7
Regional Policy Statement for Southland 2017	• Objectives WQUAL.1 and WQUAL.2 • Policies WQUAL.1, WQUAL.2, WQUAL.3, WQUAL.7, WQUAL.8, WQUAL.12
Regional Effluent Land Application Plan 1998	• Objectives 4.1.2 • Policies 4.2.3, • Rule 5.4.5
Regional Water Plan 2010	• Objectives 3,4,8 • Policies 1, 4, 6, 7, 13

Proposed Southland Water and Land Plan 2018	• Objectives 1, 2, 6, 7, 8, 9, 13, 18 • Policies 5, 10, 13, 14, 15, 16, 17, 18, 39A, 40
Te Tangi a Tauira	• Policies 1, 4, 5, 6, 11, 16, 17, 18

Dairy farming at the property is carried out following good management practices relevant to the physiographic zones present at the property (Oxidising and Central Plains). These practices are recommended by Council and are implemented on farm to mitigate the risk of adverse effects on water quality from contaminants transported via artificial drainage, deep drainage and overland flow where relevant. Deep drainage and artificial drainage are recognised by the applicants as key contaminant pathways and are managed as such. Good management practices and specific mitigation measures implemented on farm are described in Sections 6 and 7 of the application, and in the Appendix N Farm Environmental Plan.

There will be no increase in contaminant loss due to the proposed expansion of dairy farming in this instance. Neither will effects be exported off-site to another location. This expansion will be achieved through the implementation of key mitigation measures, alongside the implementation of a suite of good management practices.

The discharge is to land rather than water and is undertaken in a manner to minimise adverse effects on water quality. Good management practices for the management of the effluent system and mitigation measures have been included in the application and in the Farm Management Plan. By only irrigating FDE to land when ground conditions are less than field capacity, and by ensuring that irrigation of FDE to land does not result in the soils reaching field capacity, the risks of leaching through the soil profile or via overland flows are mitigated. The use of low depth irrigation, as discussed in the Section 7 AEE, should reduce the risk of exceeding a soil's infiltration rate, thus preventing ponding and surface runoff of freshly applied FDE. The recommended buffer zones from waterways are adhered to when applying effluent.

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Table 3.3 Water Quantity

Regulatory Document	Relevant Sections
National Policy Statement for Freshwater Management 2014	• Objectives A1, A2, B1, B2, B3, B4, • Policies A3, A4, B5, B6, B7
Southland Regional Policy Statement 2017	• Objectives WQUAN.1 and WQUAN.2 • Policies WQUAN.1, WQUAN.2, WQUAN.5, WQUAN.6, WQUAN.7 and WQUAN.8
Regional Water Plan 2010	• Objectives 5,7,8 and 9 • Policies 21, 22, 23, 28, 29, 30, 31, • Rules 16C, 23, 50
Proposed Southland Water and Land Plan 2018	• Objectives: 7, 9, 11, 12, 18 • Policies 20, 21, 22, 23, 25, 42
Te Tangi a Tauira:	• Policies 1, 4, 5, 6, 11, 16, 17, 18

The groundwater take reflects standard volumes for a dairy farm. The proposed volume of take is consistent with Environment Southland's guidelines of 120 litres per day per cow, which is considered reasonable for the intended end use. The maximum groundwater take is 180,000 litres per day, allowing for 120 litres per day per cow for 1,500 cows.

Groundwater is abstracted for dairy shed use and stock drinking water from three bores at the property. The rate of take does not exceed 2 L/sec and should not result in more than minimal stream depletion and interference effects.

Table 3.4 Soil Health and Effluent Management

Regulatory Document	Relevant Sections
Regional Policy Statement for Southland 2017	• Objectives WQUAL.1 and WQUAL.2 • Policies WQUAL.1, WQUAL.2, WQUAL.3, WQUAL.7, WQUAL.8, WQUAL.12
Regional Effluent Land Application Plan 1998	• Objectives 4.1.1 • Policies 4.2.1, 4.2.2
Regional Water Plan 2010	• Policy 41 • Rule 49

Proposed Southland Water and Land Plan 2018	• Objectives 13, 13A, 14, 15, 18 • Policies 5, 17, 33 • Rule 32D, 35, 40, 41
Te Tangi a Tauira	• Policies 4, 7, 8, 9, 11, 13, 14, 15

The applicants seek to ensure the life supporting capacity of the soil is safeguarded, along with the sustainability of the soil ecosystem by utilising land treatment of effluent without significant adverse effects. The soils are suitable for effluent irrigation and the discharge follows current good management practice, which is described in Section 6 of the application and in the Farm Environmental Management Plan. These include practices of a general nature and those specific to the key contaminant transport pathways for the physiographic zones found at the property.

Two existing storage ponds allows for deferred storage of dairy shed, wintering barn and silage pad effluent until the soil moisture content is suitable for irrigation for 1,500 milking cows on the farm. The land disposal area meets the best practice recommendation of 8 hectares per 100 cows. The nutrient loading of soils will not exceed 150 kg N/hectare at the dairy platform and 250 kg N/hectare at the Horner Block. The higher strength nature of slurry has been recognised and fully considered. Slurry from the ponds will be applied at a maximum depth of 2.5 millimetres per application. This system is sustainable in the long term and allows the effluent to be used both as a fertiliser and a soil conditioner.

In addition to the matters in Section 104 of the Act, when considering an application for a discharge permit a Consent Authority must also have regard to Section 105. As is discussed in the assessment under Section 7, it is considered that provided the discharge is undertaken in accordance with the conditions of the consent and the best practice management techniques outlined in Section 6 of the application and in the Farm Environmental Management Plan, the adverse effects of the activity should remain no more than minor. The best method for dealing with effluent from the dairy operation is considered to be discharging to land.

There are not considered to be any matters under Section 107 of the Act that would require the Consent Authority to decline the application for discharge permit.

3.2 Proposed Southland Water and Land Plan (2018)

The application meets the relevant objectives and policies described in the pSWLP (2018). The policies are numerous, however, the following policies are particularly relevant because of their focus on good practice management of land used for dairy farming in the appropriate physiographic zones; effects including cumulatively, on water quality and quantity, and the soil resource should be less than minor.

The discharge to land is carried out in a manner which should avoid adverse effects on the environment. The effluent discharge system follows the practices recommended by Council for the soil types and physiographic zone present on the property.

The groundwater abstraction is efficient, sustainable and reasonable.

Proposed Southland Water and Land Plan 2018 - Objectives and Policies relevant to land-use and discharges:

- **Objectives 6, 7, 8, 9, 13, 18**
- **Policies 5, 10, 11, 13, 14, 15, 16, 17, 18, 39A, 40**

Policies 5 and 10 are physiographic zone policies. Policy 5 gives direction on the land located in the Central Plains physiographic zone; Policy 10 gives direction on land located the Oxidising physiographic zone.

Under **Policy 5.1**, adverse effects on water quality from contaminant loss via artificial drainage and deep drainage in the Central Plain's physiographic zone must be avoided, remedied or mitigated by the implementation of good management practices. The Central Plain's physiographic zone is mapped as a major physiographic zone at the dairy platform and the Horner Block. The applicants implement good management practices to mitigate contaminant loss via artificial drainage and deep drainage when operating their dairy farm, which is demonstrated in their FEMP. They have been leaders in the dairy industry in Southland, being the first to build free wintering barn stalls to reduce outside crop-based wintering, and the first to feed fresh grass to cows in winter to reduce silage making losses and run-off. In parallel with the proposed increase in cow numbers, they will make other changes to their farming system. For example, they are proposing to remove all intensive winter grazing from the dairy platform. The proposed change is an example of good management practice in action, which should result is less adverse effects on water quality from contaminant loss via artificial drainage and deep drainage over time. It is noted that all cows will be wintered in two barns at the property, where nutrients are captured, stored and applied to land at very low depth at a time when plants are actively growing and taking up nutrients. Cows will not be exported off-farm, to be winter grazed on fodder crop at another location.

In order to meet **Policy 5.2,** this application and the accompanying FEMP have particular regard to adverse effects on water quality from contaminants transported via artificial drainage and deep drainage.

Policy 5.3 gives direction to decision makers on generally not granting resource consent for additional dairy farming of cows or additional winter grazing where contaminant losses will increase as a result of the proposed activity. *Note: Much of the following assessment also applies to Oxidising land also.* This application includes the phasing out of in-paddock winter grazing in parallel with an increase in cow numbers of 160. Overseer nutrient budget analysis has been carried out to determine pre-expansion nutrient N and P contaminant losses. In the absence of a suitable alternative method, P loss has been used as a proxy for sediment and microbial loss, as they generally move from land to water in a similar way (i.e. via overland flow, and via artificial drainage at times). The pre-expansion nutrient budget analysis has been prepared from four years of actual data (not consented) and is fully supported with evidence. The post-expansion nutrient budget includes an increase of 160 cows, from 1,340 to 1,500. Several key mitigation measures are included in the post-expansion nutrient budget, to ensure that nutrient losses (and by proxy sediment and microbial contaminants) will not increase post expansion. It has also been demonstrated that nutrient losses will not increase at the Horner Block. Mitigation measures will be implemented on farm, to ensure that contaminant losses do not increase and will lead to increased soil organic matter content, increase soil water holding capacity, improved soil structure and less accumulation of N on soils at high risk times. This should reduce the risk of contaminant loss to groundwater, including from deep cracks that potentially can form in Braxton soils due to swell/shrink properties, which is a risk not particularly addressed by Overseer. An investigation by Environment Southland in January 2018 showed that Braxton soils at the property may not in fact tend to form deep cracks, which reduces the background risk to groundwater to a degree. The applicants will provide Environment Southland with certainty that contaminant losses will not increase through the implementation of consent conditions and by submitting a year-end Overseer nutrient budget annually. As Overseer nutrient budget analysis has demonstrated that contaminant losses (N, P, and by proxy sediment and microbes) will not increase, in this instance the application for resource consent for additional dairy farming of cows should be granted.

Under **Policy 10**, adverse effects on water quality from contaminant loss via deep drainage, and via artificial drainage and overland flow where relevant, in the Oxidising physiographic zone must be avoided, remedied or mitigated by the implementation of good management practices. The Oxidising physiographic zone is mapped as a major physiographic zone at the property and the Horner Block with Oxidising areas generally found on the east side of the dairy platform where free draining soils are found. Due to the nature of its topography and soils, artificial drainage or overland flow pathways are not believed to be a particular risk for Oxidising areas at the property. In this instance, deep drainage of contaminants, particularly nitrate loss to groundwater, is a risk for Oxidising areas and must be managed under Policy 10. The assessment provided in Policy 5 relating to the management of the risk of contaminant loss via deep drainage to groundwater also applies to the management of Oxidising soils. Rather than repeating the policy assessment, please see the above assessment provided for Policy 5.1, 5.2 and 5.3. Better soil structure, better nutrient management and in particular less N accumulation on soils at high risk times will see less nitrate loss to groundwater via deep drainage in Oxidising areas. It is noted that Oxidising soils do not have similar swell/crack properties as Central Plain's soils, so the risk of deep crack formation and subsequent by-pass drainage to the underlying aquifer is not believed to be the case for Oxidising soils. As has been explained in Policy 5.3 above, the proposed increase in cow numbers in parallel with the implementation of several key mitigation measures will result in a small reduction in N and P loss according to Overseer analysis. The applicants will provide Environment Southland with certainty that contaminant losses will not increase through the implementation of consent conditions and by submitting a year-end Overseer nutrient budget annually. Under Policy 10, the proposed activity should be granted.

Policy 13 gives direction on the management of land use activities and discharges. In line with Policy 13.1 the proposed expansion will better enable the applicants to provide for their social, economic and cultural well-being. The increase in herd size of 160 cows, will allow changes in management practice to be made, whilst also operating a profitable and sustainable business model. The maintenance of a profitable and sustainable business model is central to the success the business, and provides social, economic and cultural benefits to the applicants, their employees, families and whanau, and to the wider community. In the context of an agricultural-based local economy, the use and development of the land and water resources at the property for primary production should be recognised. In line with Policy 13.2, land use activities and discharges (point source and non-point source) are managed to enable the achievement of Policies 15A, 15B and 15C.

In line with **Policy 14,** the discharge is to land and there is no discharge to water at the property.

Policy 16 gives direction on farming practices that affect water quality.

Policy 16.1 (a) discourages the establishment of new dairy farming of cows in close proximity to Regionally Significant Wetlands and Sensitive Waterbodies. The nearest Regionally Significant Wetland is Dunearn Wetland, located approximately 4 km to the north west of the property. As the direction of ground and surfacewater flow is to the south, there is no risk to water quality at Duneran Wetland from the proposed activity. Drummond Peat Swamp is located approximately 12 km to the south east of the property, and Bayswater Peat Bog is located approximately 10 km to the south west of the property. Neither Drummond Peat Swamp nor Bayswater Peat Bog are *in close proximity* to the dairy farm so have little or no risk from the proposed activity. Under Policy 16.1 (a) the proposed activity can be established.

Policy 16.1 (b) ensures that until the development of freshwater objectives under FMU processes, applications to establish new, or further intensify existing dairy farming of cows, or to intensify winter grazing activities will generally not be granted under certain situations. The situations relate to different effects on and measures of water quality. This application is for an increase of 160 cows (11%) on land that has been dairy farmed for between 17 and 26 years to date, or on land that has been used for dairy support and was consented for dairy farming in October 2017. As such this application is not to establish new dairy farming of cows but is to intensify through an increase in cow numbers.

In parallel with the increase in cow numbers, it proposed to implement many key mitigation measures, such as the removal of all winter and summer fodder cropping, removal of cows and heifers wintered outside on fodder crop or pasture, expansion of size and use of wintering barn facilities and more efficient use of N fertiliser. The cessation of winter grazing cows on fodder beet is an important mitigation measure associated with the increase in cow numbers. It is an activity that has relatively high nutrient losses as is demonstrated by Overseer analysis, especially where free draining soils are sown in fodder beet and subsequently grazed by cows in June and July. It is noted that winter grazing is specifically included in Policy 16 as an activity that affects water quality. The removal of this practice from the farming system means that cultivation practices will move to direct grass to grass methods, with less disturbance of soil structure and less mineralisation processes, which should further increase soil organic matter content and water holding capacity, and further reduce contaminant losses to ground and surfacewaters. Importantly, the effects of the expansion are not being exported off-site. Rather they are being contained on farm through greater use of wintering facilities and through slurry effluent application at the dairy platform and Horner Block. In line with a stable replacement rate no more calves will go to Woldwide Runoff (WR) than have been going there in recent years. Council will have assurance of this through the implementation of a proposed condition to cap stock numbers at WR at their current levels.

In summary, the application to further intensify existing dairy farming of cows through an increase of 160 cows (11%) is not for new dairy farming of land and will see the removal of intensive winter grazing from the farming system. It is explained in the following three paragraphs why the proposed further intensification of existing dairy farming through an increase in cow numbers should be granted in this instance.

Policy 16.1 (b) (i) gives direction on generally not granting further intensification of existing dairy farming of cows where the adverse effects, including cumulatively, on the quality of groundwater and receiving surface waterways such as rivers, wetlands and estuaries cannot be avoided or mitigated. Section 7 of the application provides an in-depth assessment of effects (AEE) of the proposed further intensification on groundwater and receiving surface waters. The AEE addresses the potential for adverse effects on already elevated groundwater to the south east of the property, on groundwater to the south of the property including at Heddon Bush School, which has a registered bore for drinking water supply and on receiving surfacewaters including the Waimatuku Stream, Lower Oreti and Aparima catchments. The assessment covers contaminants N, P, sediment and microbes, with P used as a proxy for sediment and microbes.

The assessment supports the conclusion that adverse effects, including cumulatively, due to further intensification of existing dairy farming through an increase in cow numbers will be mitigated in this instance. The Overseer modelling submitted with this application shows that the total modelled N and P losses for the proposed 1,500 cow scenario are no greater than for the pre-expansion system due to the implementation of several key mitigation measures. As is mentioned above, ceasing the practice of intensive winter grazing is one such measure and has relevance to Policy 16, where it is one of three activities specifically included as having effects on water quality. The effects of the expansion are not being exported off-site but are being transitioned inside to wintering in barns. Additional effluent from barns will be applied to land at very low depth (less than or equal to 2.5 mm per application) at the dairy platform and Horner Block. As adverse effects due to the proposed further intensification of existing dairy farming due to an increase in cow numbers will be mitigated in this instance, the activity should be granted.

Policy 16.1 (b) (ii) gives direction on generally not granting further intensification of existing dairy farming of cows where existing water quality is already degraded to the point of being over-allocated. It is recognised that there is a high degree of variation in existing groundwater quality in the area, with an area to the east and south east of the property showing high groundwater nitrate concentrations, above the New Zealand Drinking Water Standard of 11.3 ppm. In particular, groundwater at an ES monitoring bore at Boyle Road to the south east of the property has shown high nitrate concentrations, indicative of groundwater degradation due to land use effects in the area, such as intensive winter grazing practices on free draining soils. This matter is discussed in depth in the AEE provided in Section 7. Furthermore, it is noted that a predominant risk to water quality for the physiographic zones found at the property is contaminant loss (nitrate in particular) to groundwater. Based on the predominant direction of groundwater flow (south) and observed groundwater water quality results from bores at the property, it is concluded the proposed activity will not adversely affect groundwater quality to the south east of the property, where groundwater shows degradation.

Groundwater flow for most of the property is believed to be to the south (Hitchcock, 2014). Groundwater quality measured at the southernmost location at the property (E45/0622) shows relatively low levels of nitrate, as does a bore located ~2.3 km due south at Heddon Bush School (1.8 – 2.0 ppm in 2017/2018). Bore E45/0622 at the south end of the property is an indicator of groundwater quality at the bottom of the property. It should capture the cumulative effect of land use on water quality in the groundwater stream north of the bore, upstream of groundwater flow including some Braxton and Drummond soils. If deep cracks form in Braxton soils, then contaminants such as nitrate can bypass the soil matrix and move to groundwater or move via subsurface drains into surfacewaters. Water quality at bore E45/0622 does not show evidence of nitrate reaching groundwater via this process, as despite occasional well-head contamination issues, nitrate levels have been consistently low at the bore. In conjunction with the low nitrate levels measured at the Heddon Bush School bore, data from bore E45/0622 indicate that groundwater groundwater flowing south from the dairy platform is certainly not degraded to the point of being overallocated.

There is an increasing gradient in the nitrate concentration of groundwater from west to east towards Terrace Creek, which flows approximately north to south, and is located approximately 1 km beyond the eastern boundary of the property. This concentration gradient is reflected by data from other bores at the property (E45/0665 and E45/0727), where the increasing gradient corresponds to a transition from heavier to lighter soils towards the east. The average groundwater nitrate concentrations at these two bores are considerably lower than the concentrations seen further east and south east of the property. Due south of the property, groundwater nitrate levels are predominantly low for approximately 10 km, which includes the area around Heddon Bush School.

Based on the above factors in conjunction with changing on farm practices, it is proposed that under Policy 16.1 (b) (ii), the activity should be granted. The cumulative effect of changing on farm practices over time, should see a further reduction in nitrate loss to groundwater at the property. There will be no further sowing of summer and winter fodder crops, which is an activity that has high N loss on light soils at the east of the property in particular. No winter grazing of crops by cows or heifers, and no winter grazing of pastures are measures that will reduce N mineralisation and accumulation in soils at high risk times. There will also be increased use of wintering barn facilities, application of slurry at very low depth (less than or equal to 2.5 mm per application) and more efficient use of nitrogen fertiliser, all of which should see a cumulative reduction in N loss to groundwater. The applicants believe that farming under the current system, with a maximum of 1,340 cows but using practices such as intensive winter grazing causes more cumulative loss of N to groundwater due to increased N accumulation on soils, more mineralisation of N in soils and more soil damage. As has been already mentioned, they propose to install a new bore at the south of the property, which will be used to monitor groundwater quality over time. They are prepared to use data to inform decision making at the property. In this case, granting this application to increase cow numbers by 160 will allow the applicants to facilitate these management changes, which cumulatively should cause less N loss to groundwater and degradation of groundwater.

Policy 16.1 (c) gives direction on processes after the development of freshwater objectives under FMU processes. As freshwater objectives have not yet been developed, this policy does not apply at the present time.

Policy 16.2 gives direction on farming activities, including existing activities.

Under **part (a)**, all such activities are required to implement a farm environmental management plan (FEMP), as set out in Appendix N. The applicants implement an FEMP as set out in Appendix N, so meet part (a) of Policy 16.2.

Under **part (b)**, sediment run-off risk must be actively managed by identifying critical source areas (CSAs) and implementing practices such as setbacks from waterbodies, riparian planting, sediment traps, preventing stock from entering the beds of surface waterbodies and limiting the duration of exposed soils. The property is predominantly flat with minimal CSAs. Where CSAs are found close to where tiles have outfalls to surface drains, they have been mapped and are actively managed to minimise the risk of sediment loss. See the FEMP for locations of CSAs. Practices such as fencing off waterways are implemented at the property and have been

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for many years as part of the Dairy Accord. Stock do not have access to waterways at any time. Farm infrastructure such as tracks, lanes and sheds can act as critical source areas following periods of prolonged rainfall, where water can pool and move via overland flow to waterways, carrying contaminants such as sediment and microbes with it. Farm infrastructure is managed to ensure that surface drainage does not flow via overland flow directly into waterways, but is directed through pasture or riparian strips, where run-off is filtered, and sediment and microbes are trapped before reaching waterways. The applicants endeavour to limit the duration where soils are bare as much as possible. The proposed activity will bring about a change to the cultivation system whereby only grass to grass cultivation occurs, with no or minimal time duration where soils are bare. This will help to further reduce the risk of sediment run-off further.

Under part (c) of Policy 16.2, collected and diffuse run-off must be managed, as well as leaching of nutrients, microbial contaminants and sediment through the identification and management of CSAs *within individual properties*. The applicants manage their farm layout, infrastructure, soil types, drainage, CSAs and overall farming system to control and minimise collected and diffuse run-off, leaching of nutrients, microbial contaminants and sediment from such sources. These are explained in the FEMP. In particular, a lane adjacent to WOL's wintering barn has been identified as a potential CSA and is now being managed appropriately to avoid the runoff reaching a stream.

Policy 17 gives direction on agricultural effluent management.

In line with Policy 17, significant adverse effects on water quality from the operation of, and discharges from, the effluent management system at the dairy farm are avoided. Other adverse effects are also avoided, remedied or mitigated. The effluent management system, including storage ponds and low depth irrigation systems, follows best industry practice for effluent storage and discharge given the nature of soils and topography at the property. It has been designed, constructed and located in accordance with best industry practice including the relevant practice notes and guidelines, and the system is maintained and operated in accordance with best practice guidelines. By only irrigating effluent to land when ground conditions are at less than field capacity, and by ensuring that irrigation of effluent to land does not result in soils reaching field capacity, the risks of nutrient rich effluent leaching through the soil profile or moving via overland flow are mitigated.

The slurry tanker with the trailing shoe will apply slurry at depths of less than or equal to 2.5 mm per application to allow for the higher nutrient loading in slurry. It can apply slurry at depths as low as 1 mm per application, which further minimises the risk of adverse effects and increases the number of irrigation days available. It applies slurry directly on the ground, which minimises the risk of adverse odours. The recommended buffer zones from waterways are adhered to when applying effluent, effluent is not discharged over tile drains when the soil is at or near field capacity nor is effluent applied to areas where cracks in the top soil have formed. The effluent receiving area is sufficiently large to ensure that the N loading to land from dairy shed effluent and slurry does not exceed 150 kg N/hectare at the dairy farm, and that it does not exceed 250 kg N/hectare at the Horner Block. Slurry applied at the cut and carry Horner Block serves as a source of plant nutrient. In turn, pastures grown at the Horner Block are harvested and fed to cows in wintering barns at the dairy platform. In this way nutrients are recycled from animal feed to effluent, then back to animal feed etc.

In line with **Policy 18**, all stock is excluded from waterways at the property.

The range of the good management practices implemented on farm, result in improved integrated management of freshwater through good dairy farm land management practices. This is in line with **Policy 39A**.

In line with **Policy 40**, the applicants seek a term of 15 years for the activities, which aligns with Woldwide One's discharge and water permit terms. There is good certainty regarding the nature and scale of the activity going forward; there will be an increase in cow numbers as well as implementation of good management practices and specific mitigation measures to ensure that the activity is sustainable in the long term. Importantly the effects of the expansion have been carefully considered and will not be exported off-site but will be managed on farm. Considerable investment in farm infrastructure has been made to take the final steps towards future proofing the dairying operation; eliminating winter grazing of adult cattle on beet crops altogether. The level of investment demonstrates the applicant's belief in and commitment to sustainable farming and land management. The applicants believe that their presence at this location since 1992 (over 25 years) has not had a detrimental effect on the local environment, and that the proposed changes will mean a further reduction of that impact. A 15-year consent term will mean that the management of the resources under the same proven stewardship will be ensured into the future while allowing the applicants to operate a sustainable farming and business model. As 2013 supreme winners of the Southland Ballance Farm Environment Awards, their commitment to operating a sustainable farming model has been demonstrated.

Having assessed the matters above, it is considered that both the application for the expansion of dairy farming, the discharge and the water abstraction are generally in accordance with the relevant policies and objectives of the documents set out above, and having regard to Section 104, the proposal achieves the purpose of the RMA.

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4. Notification

Section 95A of the Act requires that the Consent Authority must publicly notify an application if the applicant has requested that the application be publicly notified. *The applicant hereby requests that the application be publicly notified.*

5. Receiving Environment

5.1 Soils

Dairy platform - soils

Topoclimate soil data shows the dairy platform primarily overlies Braxton soils, with intergrades of Pukemutu soils in places. Topoclimate maps some areas of shallow stony Glenelg soils on the east side of the property.

Topoclimate mapping of soils types for the dairy platform appears to be incorrect. Mr. John Scandrett (Scandrett Rural Limited) carried out a field investigation and has mapped soils at the Woldwide 1&2 dairy platform. Please refer to the appended report prepared by Mr. Scandrett for methodology, results and conclusions from the soil type and boundary field investigation. Mr. Scandrett dug at total of 28 test holes during his investigation. No test holes were dug at the Woldwide 1&2 dairy platform during the Topoclimate field work.

Mr. Scandrett reports that the west of the property overlies predominantly Braxton soils, and mid to east of the property predominantly overlies Drummond soils. This is shown in figures 5.1, 5.2-5.4. Glenlg soils are found at the north east of the property, north of Wreys Bush Highway.

The findings from the field investigation are supported by on-farm observations by the applicants, who report a lack subsurface drainage at the mid-east of the property. Soils found mid-east of the WOL and WTL dairy platform are free-draining, which is characteristic of Drummond and Glenelg soil types and not of Braxton soils, which have been mapped by Topoclimate for much of the area. ***Braxton soils are less extensive than mapped on Topoclimate.***

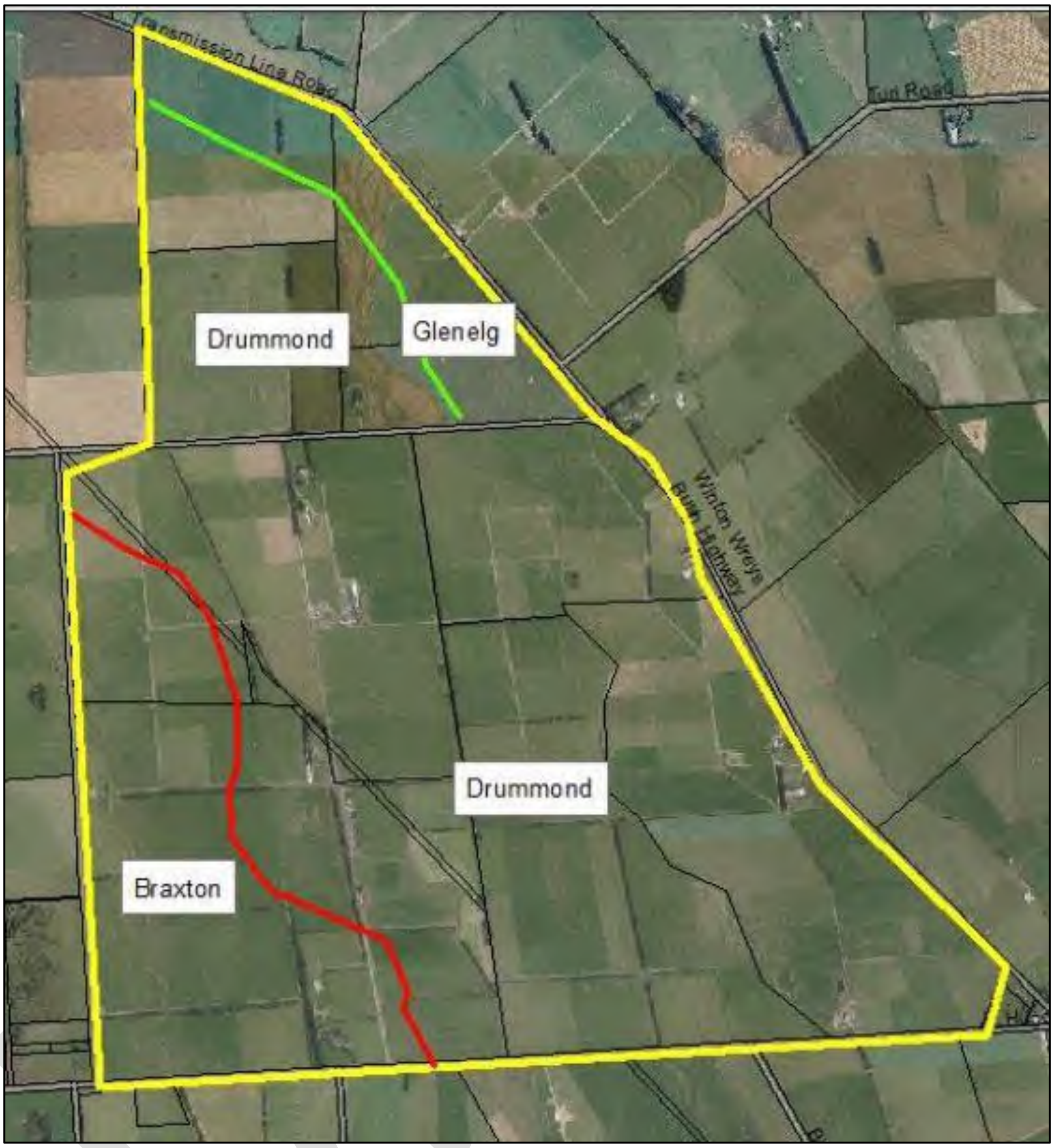

Figure x. Soil types and boundaries at the WOL/WTL dairy platform according to field investigation by J. Scandrett, January 2017. Map sourced from Environment Southland.

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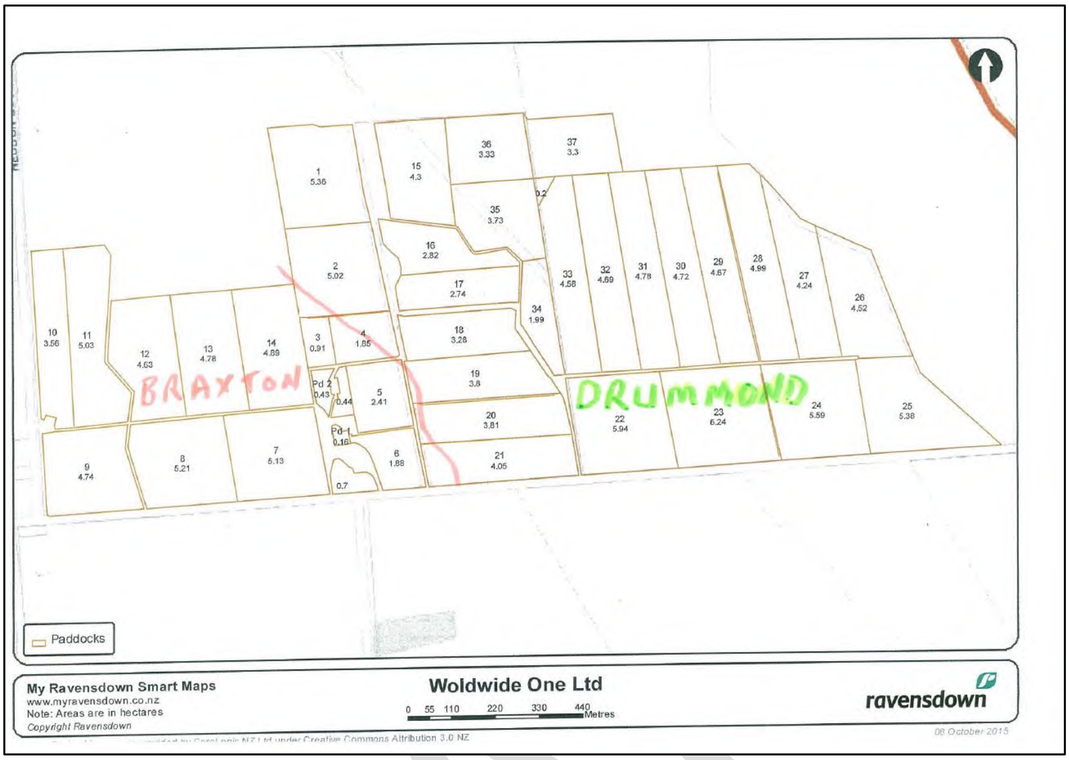

Figure 5.2 Soil mapping of WOL area (note: this is an historic farm map).

Figure 5.3 Soil mapping of WTL area (note: this is an historic farm map).

Figure 5.4 Soil mapping of former SH96 and Marcel blocks, now part of the WOL/WTL dairy platform (note: this is an historic map).

Soil vulnerability factors

Braxton soils have moderate risk of structural compaction, slight risk of nutrient leaching and severe risk of waterlogging. Drummond soils have minimal risk of structural compaction, moderate risk of nutrient leaching and slight risk of waterlogging. Glenlg soils have slight risk of structural compaction, very severe risk of nutrient leaching and nil risk of waterlogging.

Braxton soils types – swell/crack characteristics

Braxton soils have swell/crack properties. They can become waterlogged in wet conditions so tend to have subsurface drainage installed. They can crack during dry summer conditions. Deep cracks can provide a pathway for contaminants to reach groundwater via bypass drainage to the underlying aquifer. A site investigation of cracking soils was carried out in January 2018 by Environment Southland. The report by Michael Killick is appended to this application. Several sites were investigated, with some soils showing cracks (10 mm wide or less, with most cracks in the range of 2 – 4 mm wide) and others showing no cracks. The investigation occurred during a prolonged drought, with relatively high temperatures so if large/deep cracks were to form, they would have been expected to form in January 2018. Mr. Killick concluded:

> *It seems reasonable to conclude that the occurrence of very large cracks such as feature in some anecdotes about the soils (e.g. 'to reach your arm into') would now be rare in the soils observed for this investigation, and might not occur. Continued development or changes in management of the soils e.g. the ongoing effects of drainage, or conversion from sheep to dairy, may have influenced the historical pattern of soil behaviour. Or it may be that occurrences of Braxton soils other than those described here, crack more.*

Horner Block – soils

Topoclimate mapping of soils at the Horner Block shows that Braxton/Pukemutu soils are found on the east side, Drummond/Glenelg soils are found mid farm, and Waiau/Tuatapere soils are found on the west side towards the Aparima River. See figure 5.5 for Topoclimate mapping of soils at the Horner Block.

Braxton and Drummond soil properties are described in the previous paragraph. Pukemutu soils have very severe risk of structural compaction, slight risk of nutrient leaching and severe risk of waterlogging. Waiau soils have moderate risk of structural compaction, very severe risk of nutrient leaching and nil risk of waterlogging.

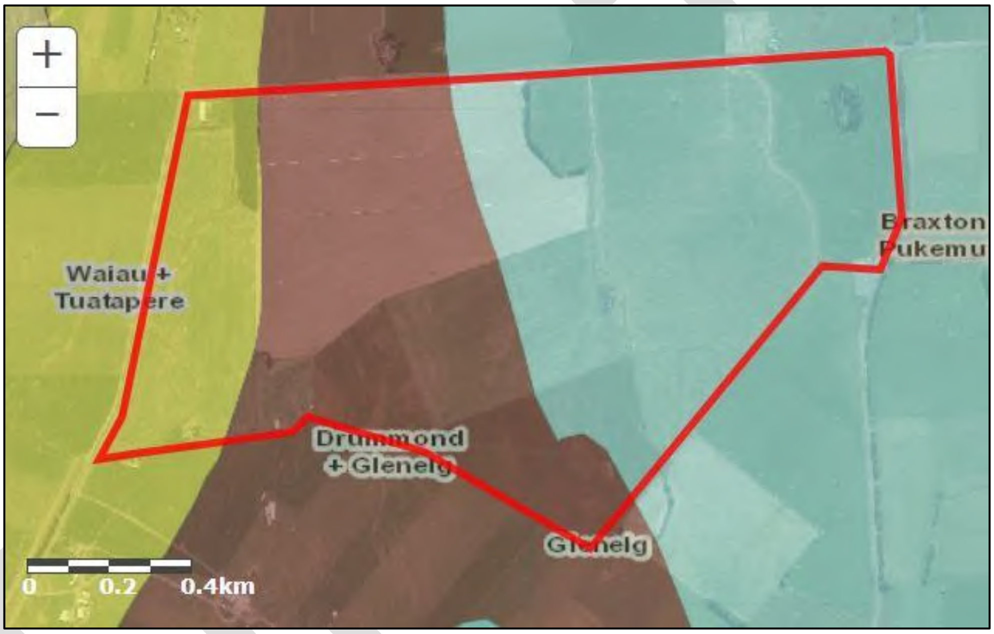

Figure 5.5 Topoclimate mapping of soils at the Horner Block (approximate boundary is outlined in red).

FDE risk

According to Beacon, the soil FDE Risk categories for the property comprise both Category A (artificial drainage/coarse soil structure) and Category E (other well drained but very stony flat land). See figure 5.6 for Beacon mapping of soils FDE risk at the dairy platform. Braxton soils are classed as Category A land and Glenelg soils are classed as Category E land.

Given the presence of Drummond soils, there are likely to be areas of Category D (well drained flat land) land, although these are not mapped on Beacon. Since Braxton soils are less extensive than mapped on Topoclimate, there is in fact less area of Category A land and more area of Category E and D land than mapped on Beacon.

The Horner Block comprises both Category A soils and Category E soils (see figure 5.6).

The soil FDE risk for the property and the Horner Block comprise areas of both low and high risk for effluent discharge. These soils are suitable for dairy farming and receiving effluent provided that their vulnerabilities are recognised and that they are managed appropriately.

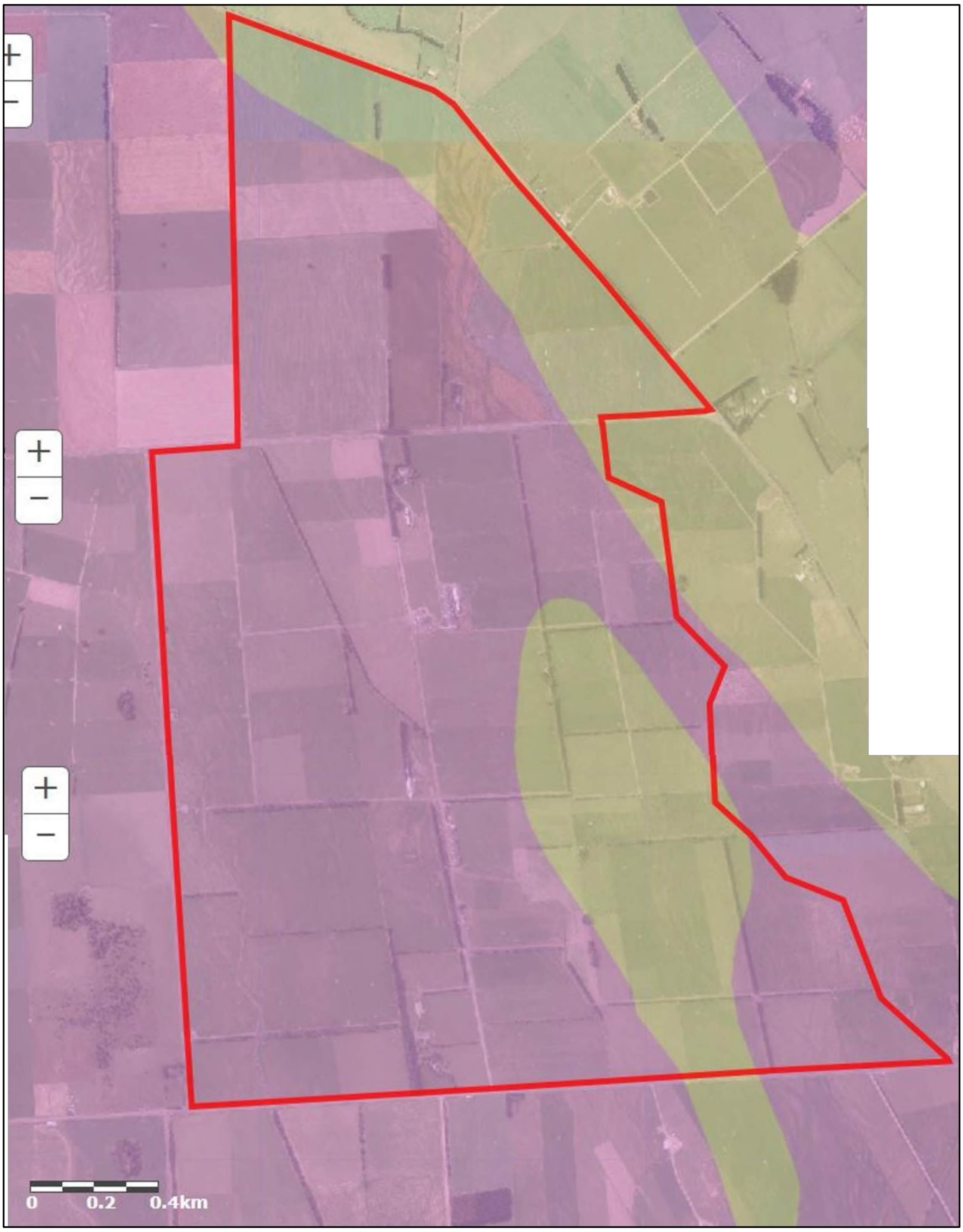

Figure 5.6 Soil FDE risk for the property (approximate boundary is outlined in red).

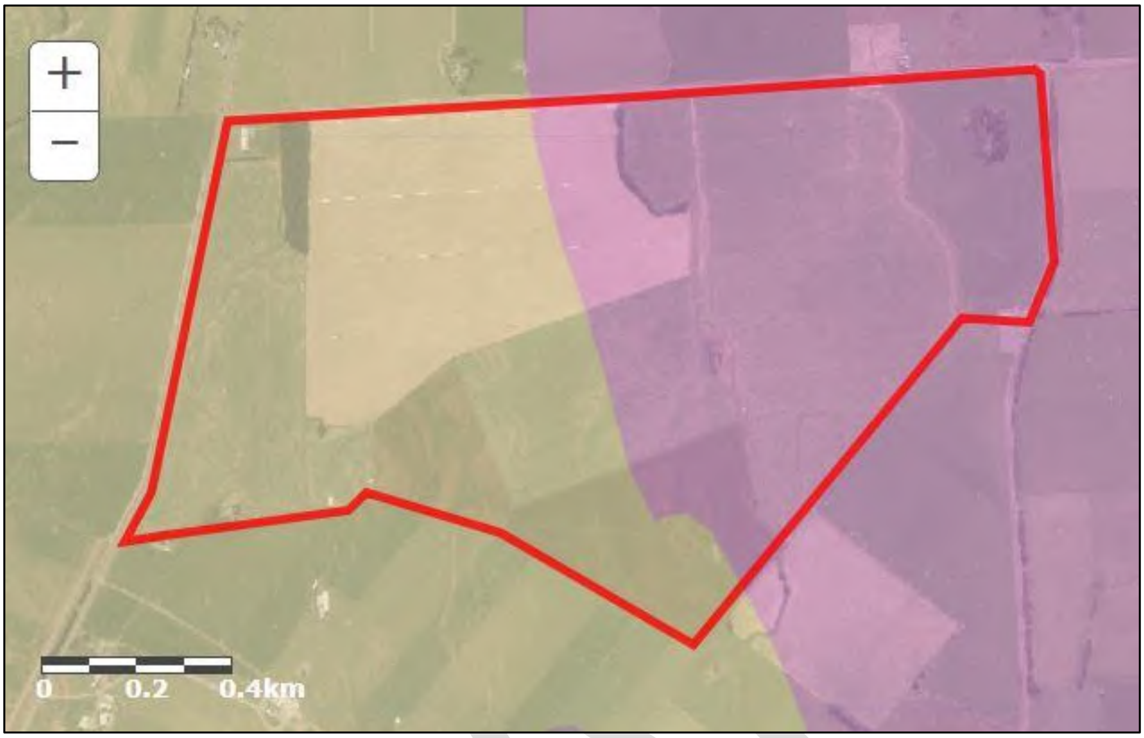

Figure 5.7 Soil FDE risk for the Horner Block (approximate boundary outlined in red).

Table 5.1. Physical properties of soils.

Soil type	Profile drainage	Plant readily available water	Potential rooting depth	Rooting restriction
Braxton	Poor	High	Deep	Limited subsoil aeration during sustained wet periods
Drummond	Well drained	High	Deep	No significant restriction
Glenelg	Well drained	Moderate-low	Shallow	Gravelly and cemented subsoil
Waiau	Well drained	Moderate	Slightly deep	Extremely gravelly subsoil

5.2 Surface water

The dairy platform lies in both the Waimatuku Stream and Oreti River catchments (see figure 5.7). The Horner Block lies predominantly in the Waimatuku Stream catchment, with its westernmost area lying in the Aparima River catchment (see figure 5.8).

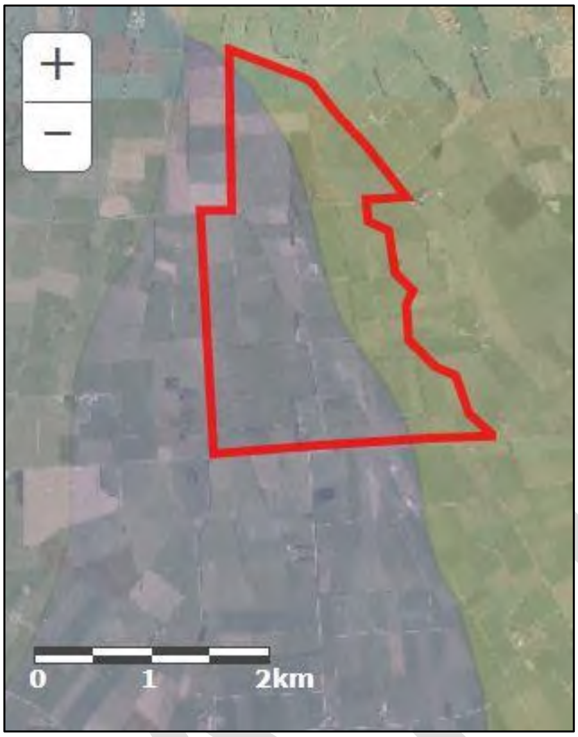

Figure 5.8 Major catchments: Waimatuku (mid-west) and Lower Oreti (east); approximate boundary is outlined in red.

Figure 5.9 Horner Block; Waimatuku Stream (mid-east), Aparima (west); approximate boundary outlined in red.

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Minor catchments

Minor catchments for the dairy platform are Terrace Creek, Oreti River and Middle Creek. Minor catchments for the Horner Block are Middle Creek and the Waimatuku River. Waterways are best described as surface drains. Riparian buffers are fenced off and vegetated with good grass cover.

See the accompanying FEMPs for the location of major tiles at the property.

Dairy platform -surfacewater

Waterways generally flow in a north to south/southeast direction (see figure 5.10), are fully fenced off and culverted (see figure 5.11). One waterway flows along the eastern boundary, on to Terrace Creek to the south east and eventually to the Oreti River. Two waterways flow through the centre of the property, on to Middle Creek and eventually the Waimatuku Stream to the south.

Subsurface drainage is installed at the west with outfall to surface drains. Subsurface drainage is only installed in heavier Braxton type soils except for one tile drain at the north east of Wreys Bush Highway. Subsurface drains (tiles) generally underlie hollows, which may act as critical source areas close to surface drains in times of prolonged heavy rainfall.

Horner Block

One waterway bisects and flows to Middle Creek to the south.

There is one swale at the Horner Block, which is found in a paddock that is not grazed by stock.

Figure 5.11 Waterway at the WOL dairy unit.

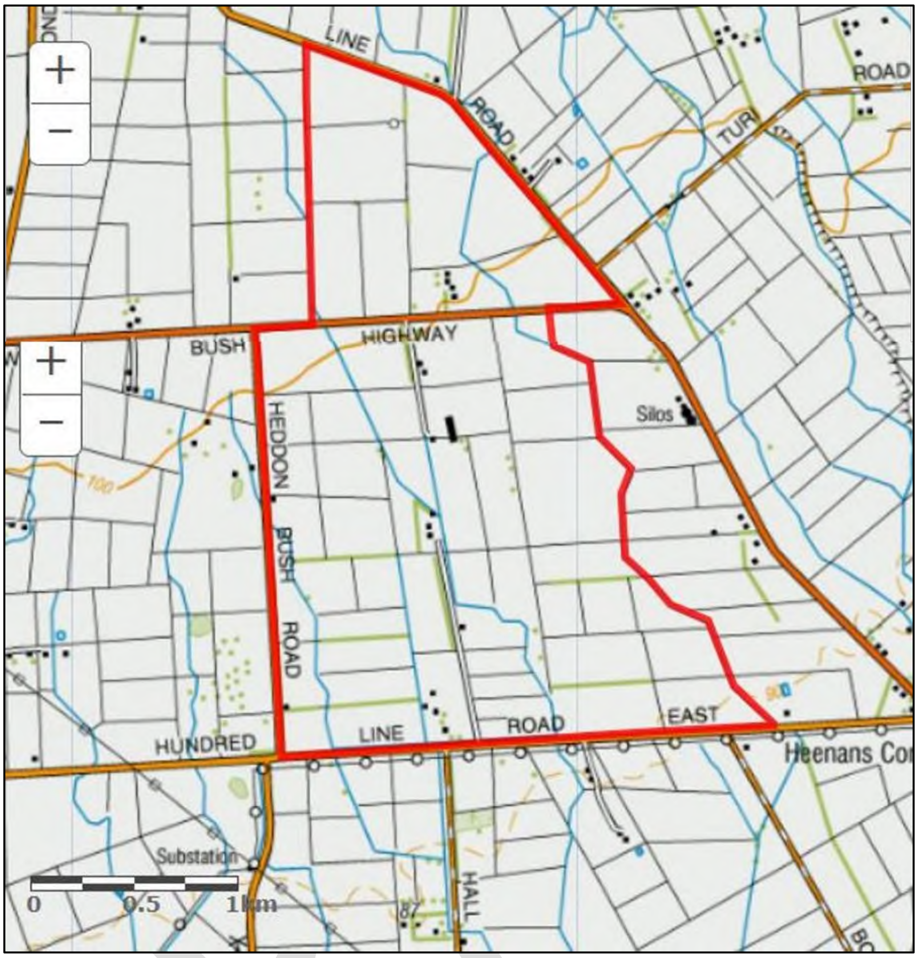

Figure 5.10 Topomap (with approximate boundary outlined in red).

Waimatuku Stream catchment

Most of the dairy farm and Horner Block are located at the northern most end of the Waimatuku Stream catchment according to Beacon. The Waimatuku Stream flows into the sea at Waimatuku Estuary in the Oreti Beach embayment. The Waimatuku Stream is located between the Oreti and Aparima catchments. Its headwaters are fed by a large swamp area (the Bayswater Peat Bog) with small springs in the Drummond district also contributing to the base flow. The catchment contains a variety of land uses including dairy farming, and dry stock farming. According to LAWA, the Waimatuku Stream was channelised in the 1920s. It typically has moderate flows, with few flood or extreme low flow events because of base flow contributions from swamp and spring areas.

SOE monitoring – Lower Waimatuku Stream

The closest downstream SOE water quality monitoring site for which data could be obtained in the Waimatuku catchment is the Waimatuku Stream at Lorneville Riverton Highway so it has been used as a reference. The Lorneville Riverton SOE monitoring site is classified as a lowland rural site. It is a lower-catchment site so captures the entire Waimatuku Stream catchment above Waimatuku Township.

Data obtained from The Land and Water website show evidence of cumulative effects on water quality for the Waimatuku Stream at the Lorneville Riverton site. The 5-year median black disc value is in the worst 50% of like sites. The 5-year median *E. coli* value of 450 n/100 ml is in the worst 25% of like sites with a very likely improving ten-year trend. When assessed against the National Objective's Framework (NOF), the 5-year median *E coli* score is ranked in Band E. 5-year median concentrations for both Total Nitrogen and Total Oxidised Nitrogen are in the worst 25% of like sites, **however, both have a very likely improving ten-year trend.** The Total N 5-year median concentration is 3.65 g/m^3, which is above the ANZECC guideline of 0.614 g/m^3. The Total Oxidised N 5-year median concentration is 3.0 g/m^3, which is above the ANZECC Guideline value of 0.44 g/m^3 but below New Zealand Drinking Standards Maximum Acceptable Level (MAV) of 11.3 g/m^3 for nitrate nitrogen. When assessed against the NOF, the Total Oxidised Nitrogen value is classed in Band C; water quality at this site is considered "suitable for the designated use," but there may be effects on growth of up to "20% of species, mainly sensitive species such as fish." The 5-year median is below the National Bottom Line median of 6.9 g/m^3 for nitrate. The 5-year median DRP value shows meaningful degradation over ten years, with a value of 0.0425 g/m^3 is in the worst 25% of like sites. Total P shows a likely improving ten-year trend, however.

The closest downstream SOE site for which ecological data could be obtained in the Waimatuku catchment is the Waimatuku Stream at Rance Road. This SOE monitoring site is downstream of the water quality monitoring site at Lornville Riverton Highway and is close to the Waimatuku Estuary. The 5-year median MCI score was classed as fair, although there is evidence of a decreasing trend in recent years. The 5-year median Taxonomic Richness score was 20, with evidence of a slight increasing trend in more recent years. The median %EPT score was 40% over the same five-year period, with a slight drop in later years.

The nearest National Objectives Framework (NOF) site is the *Waimatuku Stream at Lorneville Riverton Highway* site. NOF water quality indicators show that generally water quality is fair to poor at the site (see figure 5.12 below). The MCI score is fair. Slime algae/periphyton is indicative of high nutrient levels or significant natural flow/habitat disruption at the site. The *E. coli* score indicates "low risk of infection (less than 1% risk) from contact with water during activities with occasional immersion (such as wading and boating)." The Total Oxidised Nitrogen score indicates that there may be an impact "on the 20% most sensitive species."

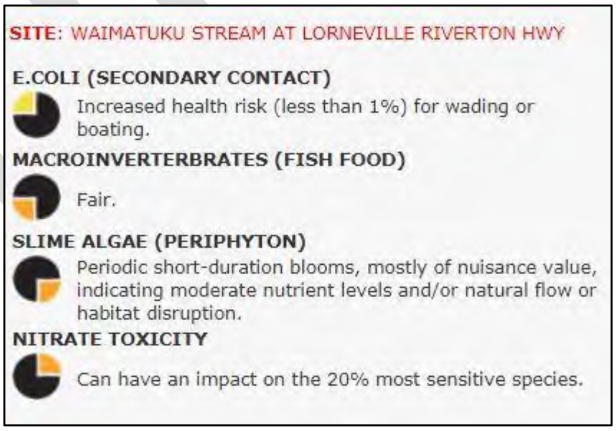

Figure 5.12 NOF indicators for *Waimatuku Stream at Lorneville Riverton Highway* site.

The lower catchment SOE site for the Waimatuku Stream shows evidence of land use in the catchment with high levels nutrients and contaminants dominating. This relates to the intensity of land use in the catchment, local hydrology and the physiographic land types found in the catchment. Artificial drainage and deep drainage to shallow aquifers, as well as the low to moderate denitrification potential of some soils and aquifers, and the lack of a major river for diluting contaminants are factors that combine to produce this outcome. ***It is noted that the Waimatuku catchment has shown recent improvement for nutrient N, with the 5-year median concentration for both Total N and Total Oxidised N decreasing over the last two reporting years.*** This is significant as it indicates that N losses in the catchment may recently have started to decrease.

Waimatuku Estuary

Coastal waters (the Waimatuku Estuary and coastal waters at the Oreti Beach Embayment) are the receiving environments for the Waimatuku Stream and catchment. The Waimatuku Estuary is a small, shallow, "tidal river mouth" estuary that drains to the sea through a sand dominated barrier beach and modified marram grass duneland. It has relatively small intertidal flats, while the estuary mouth periodically constricts, naturally reducing flushing. According to a 2012 Fine Scale Habitat Mapping study by Stevens and Robertson, "very elevated nutrient inputs make the estuary highly susceptible to eutrophication as the assimilative capacity of the estuary is very quickly exceeded when the mouth is constricted. Currently, despite most catchment inputs flowing directly to the sea, nuisance macroalgal growths (e.g. *Ulva intestinalis*) are common, particularly in summer in the middle estuary, while algal blooms also occur at the mouth and along Oreti Beach." The major threat to the estuary is eutrophication due to elevated nutrient inputs, exacerbated by periodic mouth constriction to the sea and consequent restricted flushing.

Lower Oreti catchment

The easternmost part of the property is found in the Lower Oreti Catchment. Surfacewater drainage from the eastern side of the property flows via Terrance Creek to the Lower Oreti River below the Oreti Plains. The Oreti catchment is Southland Region's third largest. It runs from the Thomson Mountains in the north of the region to the New River Estuary. The upper catchment maintains much of its natural qualities and is internationally renowned for its trophy brown trout fishing. The mid and lower reaches of the Oreti catchment have been substantially modified for drainage, flood control and channel clearance work. Oreti River tributaries, such as the Winton and Waikiwi Streams and the Makarewa River, are each subject to point-source discharges of effluent from industry and municipal sewage treatment. Potential impacts to water quality may also arise through tile drain and non-point source discharges. In addition, stock access to waterways, drainage maintenance and gravel extraction activities can adversely affect water quality in the Oreti River.

SOE monitoring – Lower Oreti River

The closest current SOE water quality monitoring site downstream of the property is at the Oreti River at Wallacetown. This SOE monitoring site is classified as a lowland rural site with a gravel bed and is the lowest SOE site in the Aparima River catchment. It is a lower-catchment site so captures the entire Oreti River catchment above Wallacetown Township.

Data obtained from LAWA's website show evidence of cumulative effects on water quality for the Oreti River at the Wallacetown site. The median black disc value (1.815 m) is in the best 50% of like sites with an indeterminate ten-year trend. The 5-year median *E. coli* value of 130 n/100 ml is in the worst 50% of like sites with a likely improving ten-year trend. When assessed against the National Objective's Framework (NOF), the 5-year median *E coli* score is ranked in Band D. Median concentrations for both Total Nitrogen and Total Oxidised Nitrogen are in the worst 25% of like sites, however, trend analysis is unavailable for both N parameters. The Total N median concentration is 1.13 g/m^3, which is above the ANZECC guideline of 0.614 g/m^3. The Total Oxidised N median concentration is 0.94 g/m^3, which is above the ANZECC Guideline value of 0.44 g/m^3 but well below New Zealand Drinking Standards Maximum Acceptable Level (MAV) of 11.3 g/m^3 for nitrate nitrogen. When assessed against the NOF, the annual median Total Oxidised Nitrogen value is classed in Band B; water quality at this site is considered "suitable for the designated use," and is regarded to have high conservation values; it is likely to have some effect on growth of up to 5% of species. The annual median DRP value of 0.006 g/m^3 is in the best 50% of like sites, however no trend analysis is available.

The closest downstream SOE site for which ecological data could be obtained in the Oreti River catchment is the *Oreti River at Wallacetown*. The 5-year median MCI score (95) was classed as fair. The 5-year median Taxonomic Richness score was 21. The 5-year median %EPT score was 40%.

The nearest National Objectives Framework (NOF) site is the *Oreti River at Wallacetown* site. NOF water quality indicators show that generally water quality is reasonable to fair at the site (see figure 5.13 below). The MCI score is fair. Slime algae/periphyton is indicative of high nutrient levels or significant natural flow/habitat disruption at the site. The *E. coli* score indicates "minimal risk of infection for wading or boating." The Total Oxidised Nitrogen score indicates that there may be an impact "on the 5% most sensitive species."

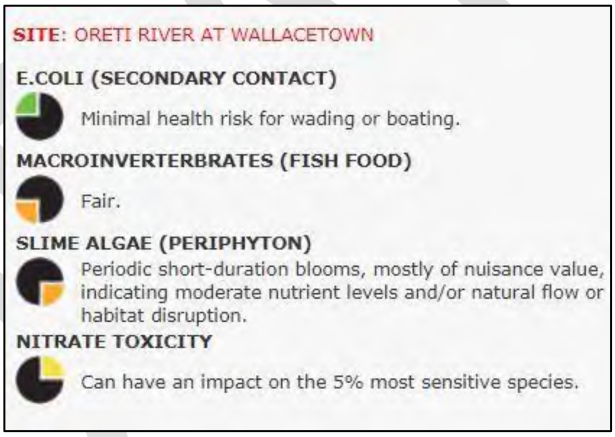

Figure 5.13 NOF indicators for *Oreti River at Wallacetown* site.

The lower catchment Oreti River shows evidence of land use in the catchment with elevated nutrients and contaminants dominating, as well as impacts on biological indicators. This relates to the some point source discharges from sewage treatment plants and industry, the intensity of land use in the catchment, local hydrology and the physiographic land types found in the catchment. Artificial drainage and deep drainage to shallow aquifers, as well as the low to moderate denitrification potential of some soils and aquifers are factors that combine to produce this outcome.

New River Estuary

The New River Estuary and coastal waters are receiving environments for the Oreti River and catchment. New River Estuary is a relatively large estuary, which receives the Oreti and Waihopai Rivers, and their tributaries.

According to a 2012 Fine Scale Habitat Mapping study by Stevens and Robertson, "eutrophication and sedimentation have been identified as a major issue since at least 2007-8." The major threats to the estuary are eutrophication due to elevated nutrient inputs and elevated sediment inputs. Eutrophication triggers nuisance micro and macro algal growth. Conditions in the well flushed central basin and lower estuary are reasonable, however, gross nuisance algal conditions and sulphide rich sediments are causing problems in more sheltered, poorly flushed areas. It is noted that New River Estuary is the receiving environment for Invercargill City, which includes waste and storm water discharges.

Aparima River catchment

The westernmost part of the Horner Block is found in the Aparima River Catchment. The Aparima River is the smallest of Southland's four main catchments. It extends from the Takitimu Mountains west of Mossburn to the Jacobs River Estuary at Riverton and the headwaters drain alpine, native tussock and forested land. According to LAWA, the upper Aparima catchment maintains much of its natural qualities, whereas the mid and lower reaches have been substantially modified for drainage, flood control and channel clearance work. The catchment contains a variety of land uses including dairy farming, and dry stock farming. Major tributaries include the Hamilton Burn in the upper reaches and the Otautau Stream in the lower reaches, which is known to have poor water quality. According to LAWA, the main pressures on water quality in the Aparima catchment are due to dairy farm intensification as drain networks in the lower catchment can discharge degraded water to receiving streams. Overland flow and nutrient loss from wintering practices contribute significantly, particularly when soils are saturated. Flood and drainage works also potentially impact water quality in the Aparima catchment.

SOE monitoring – Lower Aparima River

The closest current SOE water quality monitoring site is at the Aparima River at Thornbury. This SOE monitoring site is classified as a deep, fast flowing lowland rural site with a gravel bed and is the lowest SOE site in the Oreti River catchment.

As is evident on LAWA's website, key SOE indicators for the Aparima River at Thornbury indicate that the lower catchment river is in reasonable health with trends for most indicators showing improvement. This includes trends for visual clarity, E.coli, nitrogen and phosphorous. The 5-year median turbidity and black disc visibility values are in the best 50% of like sites. The 5-year median *E. coli* value is 130 n/100 ml and is in the worst 50% of all lowland rural sites. *E coli* is classed in band D for the National Objectives Framework (NOF). The 5-year median Total Phosphorous concentration was 0.014 g/m^3, which is below the ANZECC Guideline value of 0.033 g/m^3. It is in the best 50% of all lowland rural sites. Dissolved Reactive Phosphorous (DRP) median concentration was 0.006 g/m^3 and is below the ANZECC Guideline value of 0.01 g/m^3. It is in the best 50% of all lowland rural sites. The median Total Nitrogen concentration was 0.91 g/m^3 putting it in the worst 50% of all lowland rural sites and slightly above the ANZECC Guideline value of 0.641 g/m^3 for this indicator. The Total Oxidised Nitrogen median concentration was 0.665 g/m^3 putting it in the worst 50% of like sites. It is slightly above the ANZECC Guideline value of 0.444 g/m^3 for nitrate nitrogen. Total Oxidised Nitrogen is classed in band B for the National Objectives Framework (NOF), and is assessed as being "suitable for designated use" but there may be growth effects on up to 5% of species. No ecological data for the Aparima River at Thornbury SOE site were available at the time of writing.

The closest downstream SOE site for which ecological data could be obtained in the Aparima River catchment is the *Aparima River at Thornbury*. The 5-year median MCI score (100) was classed as good. The 5-year median Taxonomic Richness score was 16. The 5-year median %EPT score was 43.8%.

The nearest National Objectives Framework (NOF) site is the *Aparima River at Thornbury* site. NOF water quality indicators show that generally water quality is reasonable to fair at the site (see figure 5.14 below). The MCI score is fair. Slime algae/periphyton is indicative of high nutrient levels or significant natural flow/habitat disruption at the site. The *E. coli* score indicates “minimal risk of infection for wading or boating.” The Total Oxidised Nitrogen score indicates that there may be an impact “on the 5% most sensitive species.”

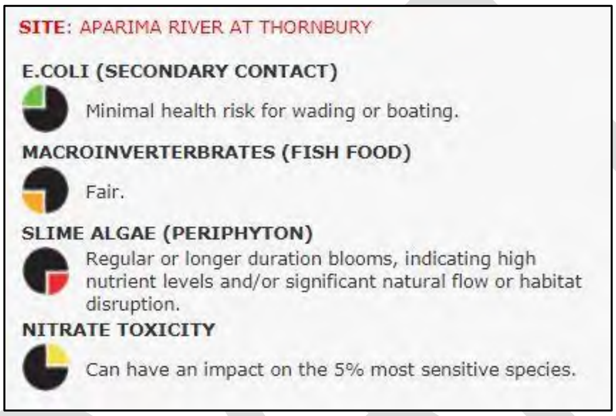

Figure 5.14 NOF indicators for *Aparima River at Thornbury* site.

The lower catchment SOE site for the Aparima River shows evidence of land use in the catchment with slightly elevated levels of N and some contaminants present. This relates to the intensity of land use, local hydrology and the physiographic land types found in the catchment. Artificial drainage and overland flow, as well as the low to moderate denitrification potential of some soils and aquifers are factors that combine to produce this outcome. Wintering practices in the wider catchment have also been identified as a factor for the Aparima River catchment.

Jacobs River Estuary

The Aparima River is part of the Jacobs River Estuary catchment, which is considered a sensitive environment due to the accumulation of nutrients and sediment. Jacobs River Estuary is a medium-sized (720 ha) tidal lagoon estuary near Riverton. Broad scale and fine scale monitoring studies (Stevens & Robertson 2003, 2007-2011, 2013) have indicated variable levels of eutrophication and sedimentation across the estuary, with some parts being highly muddy and anoxic, eutrophic and having associated nuisance algal growth. The most recent study in 2013 revealed that “although large sections of the lower estuary remain in good condition, there has been a significant decline in estuary quality since 2003, and especially over the past five years. In particular, the poorly flushed parts of the Aparima and Pourakino arms were excessively muddy, had high nuisance macroalgal growths, and contained poorly oxygenated sediments with toxic sulphides. These gross eutrophic areas are displacing high value seagrass beds and stressing saltmarsh habitat.” Other values that were identified in the study as being adversely affected by the degrading estuary were biodiversity, aesthetic, amenity and recreational values.

Regionally Significant Wetlands

There is one Regionally Significant Wetland in the vicinity of the property; Dunearn Wetland is approximately 4 km to the north east of the property. Given drainage from the property is in a southerly direction, no further description of Dunearn Wetland is required.

Two Regionally Significant Wetlands lie south of the property; Bayswater Peat Bog lies approximately 10 km to the south west of the property, and Drummond Peat Swap lies approximately 12 km to the south east of the property. Both are remnant peat bogs, which once had a much greater extent in Southland.

Bayswater Peat Bog

According to Clarkson (2003), the Bayswater Peat Bog is classified as a “lowland rushland shrubland on peat domes” peatland and is representative of peatland ecosystems, which formerly had a much greater extent in Southland. Raised bogs such as the Bayswater Bog are rainfed, i.e. they derive their water and nutrients solely from rainfall. They are characterised by plants and animals adapted to the waterlogged and nutrient-poor conditions. On the Southland Plains they are dominated by peat-forming species such as *Empodisma minus* (wire rush) and Sphagnum moss species, which are characteristic of the flat, poorly drained areas.

AEE on Bayswater Peat Bog

Surfacewater drainage from the property is in a southerly direction towards Middle Creek (and Terrace Creek further east). Bayswater Peat Bog lies to the south west of the property. Middle Creek flows approximately 5 kilometres to the east of Bayswater Peat Bog (see figure 5.15). As surfacewater drainage from the property does not flow in the direction of Bayswater Peat Bog, the risk of adverse effects on Bayswater Peat Bog from the proposed activities (land and discharge) is considered to be less than minor.

Furthermore, water at the 210-hectare raised bog is only derived from rainfall. As such the risk to water quality at the Bayswater Bay is further lowered. Surfacewater drainage in the vicinity of the Bog, drains through land <u>surrounding</u> the Bog, and on to the Waimatuku Stream; it does not drain through the Bog itself.

Groundwater flow underlying part of the discharge area in the Waimatuku Groundwater Zone is due south (Hitchcock, 2014). Groundwater underlying the discharge area does not flow towards Bayswater Peat Bog but flows in a southerly direction to the east of the Bog. Furthermore, Hitchcock refers to a report by Robertson (1983), “*previous analysis of groundwater levels in the bog concluded that the water table domes with the bog but is a separate system is probably fed by rainfall*.” Hitchcock found that that groundwater in the Waimatuku GW zone is recharged from the Bog. The risk of adverse effects related to groundwater on Bayswater Peat Bog from the proposed activities (land and discharge) is considered to be less than minor.

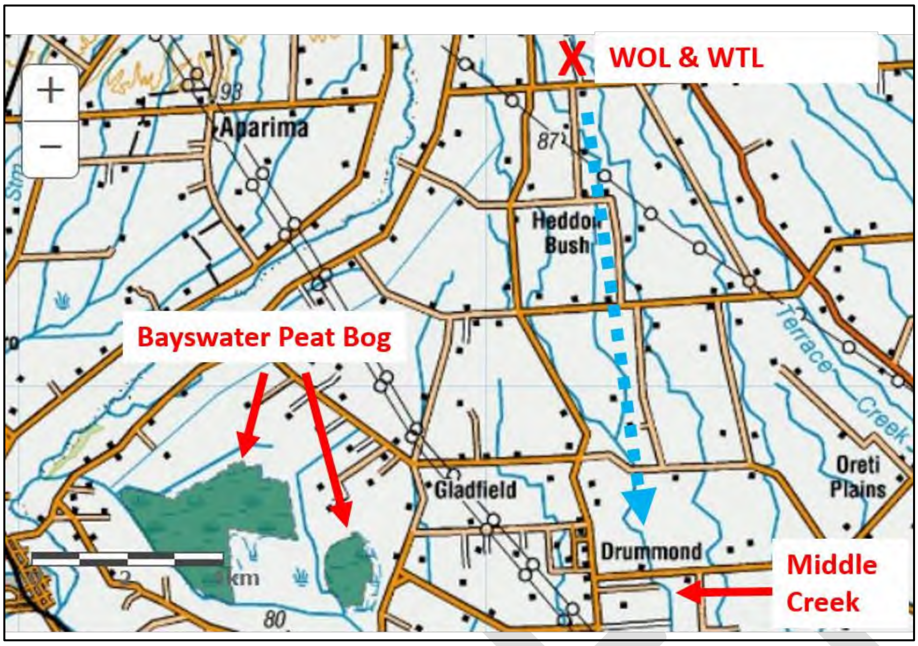

Figure 5.15 Topomap showing location of Bayswater Peat Bog, Middle Creek, property location and direction of surfacewater drainage from property (indicated by blue hatched line).

Drummond Swamp

According to Rance (2008), "Drummond Swamp is classified as a Wildlife Management Reserve and is located c.4 km south-east of Drummond. Drummond Swamp is one of the larger reserves on the Southland Plains (256.42ha). It is one of only two peatland reserves on the Southland Plains." The wetland is intact and has a modified central area due to a former gull colony. The major management challenge is weed control, with several weeds present; gorse, grey willow, silver birch, service berry, rowan and blackberry are examples of weed species present. The peatland plant community is dominated by wirerush (*Empodisma minus*), as well as tangle fern (*Gleichenia dicarpa*), sphagnum moss (*Sphagnum cristatum*) and swamp inaka (*Dracophyllum oliveri)*.

AEE on Drummond Swamp

Surfacewater drainage from the property is in a southerly direction towards Middle Creek (and Terrace Creek further east). Drummond Swamp lies to the south east of the property (see figure 14.16). Middle Creek flows approximately 1 kilometre to the west of Drummond Swamp. An un-named tributary of Middle Creek flows from the property to within 330 metres (west) of Drummond Swamp, where it flows along Kennedy Road (see figure 14.17). As surfacewater drainage from the property flows close to but not through Drummond Swamp, the risk of adverse effects relating to surfacewater on Drummond Swamp from the proposed activities (land and discharge) approximately 12 kilometres to the north west is considered to be minor.

Drummond Swamp is also a peat bog, and on that basis is expected to derive its water from rainfall. This further lowers the risk to Drummond Swamp from surfacewater drainage from surrounding land use as drainage does not flow through the Swamp itself. It is noted that Rance (2008) discusses pest plants, pest animals and fire as risks to Drummond Swamp.

There is a lack of specific information available on groundwater interactions at Drummond Swamp. Groundwater underlying the discharge area is unlikely to flow to the Swamp, however, there is some uncertainly around this given the location of the Swamp and discharge area, and the lack of information of groundwater interactions at the Swamp. A study by Hitchcock (2014) on the Bayswater Bog referred to a study by Robertson (1983) and reported that *"previous analysis of groundwater levels in the bog concluded that the water table domes with the bog but is a separate system is probably fed by rainfall."* Since Drummond Swamp is a similar system and is partly in the same groundwater zone, it is reasonable to draw a similar conclusion. Hitchcock found that groundwater in the wider aquifer is recharged from the Bog. It is likely to also be the case for Drummond Swamp, i.e. Drummond Swamp discharges to the wider groundwater resource. The effect on Drummond Swamp due to groundwater related effects from the proposed activities (land and discharge) is minor.

Figure 5.16 Topomap showing location of Drummond Swamp, Middle Creek, property location and direction of surfacewater drainage from property (indicated by blue hatched line). Se figure 5.17 for area around Drummond Peat Swamp.

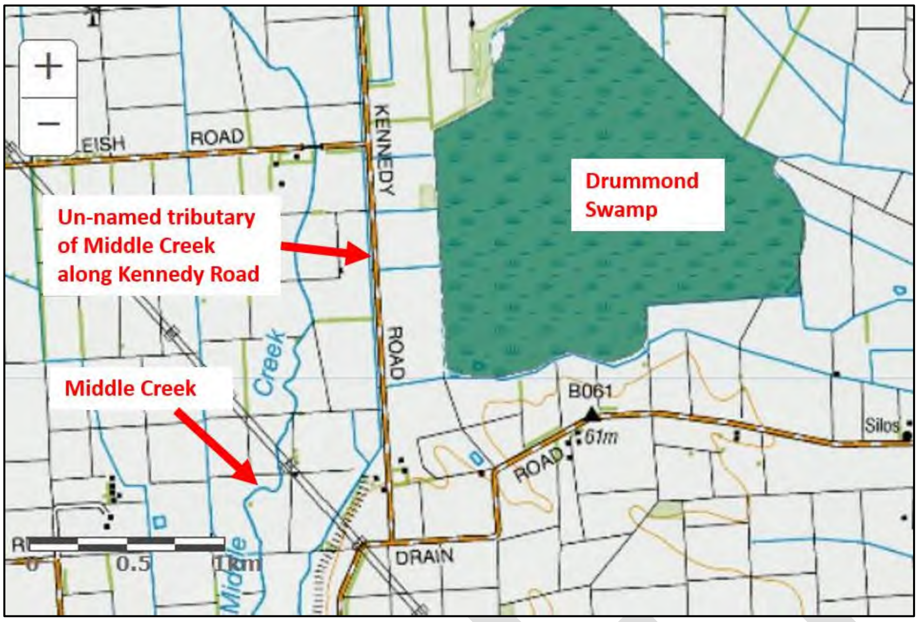

Figure 5.17 Topomap showing location of Drummond Swamp, Middle Creek and un-named tributary of Middle Creek adjacent to Kennedy Road.

5.3 Groundwater

Most of the property and Horner Block overlie the Waimatuku Groundwater Zone. Heddon Bush School 2.3 kilometres to the south also overlies the Waimatuku Groundwater Zone. The eastern part of the property overlies the Central Plains Groundwater Zone. The western part of the Horner Block overlies the Upper Aparima Groundwater Zone.

In this section, all three groundwater zones are firstly described. Following this, groundwater nitrate and groundwater microbial contaminants in the vicinity of the property and Horner Block are described.

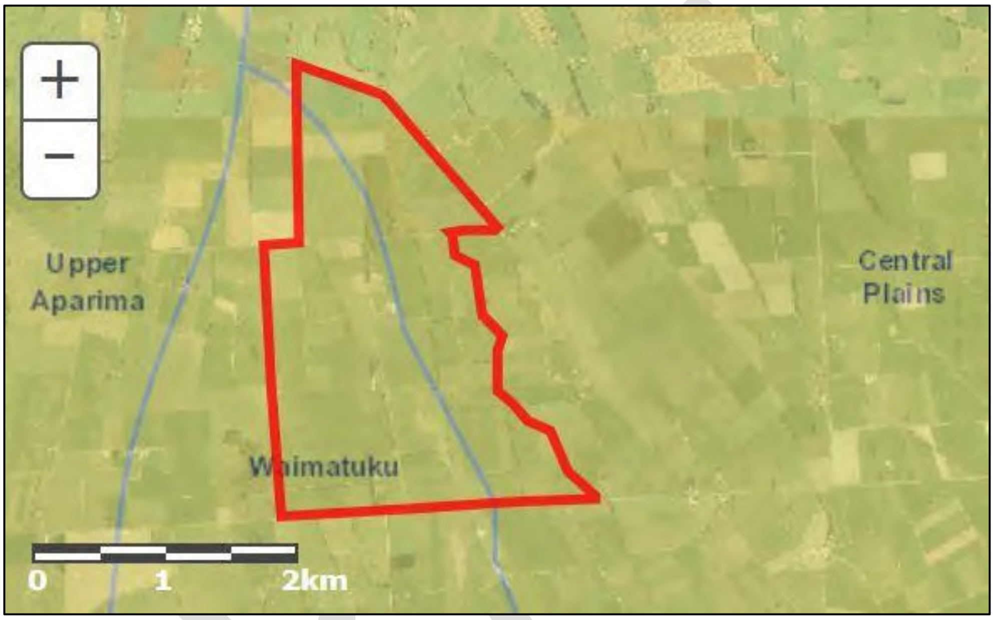

Figure 5.18 Groundwater zones in the vicinity of the WOL/WTL dairy platform (approximate boundary is outlined in red).

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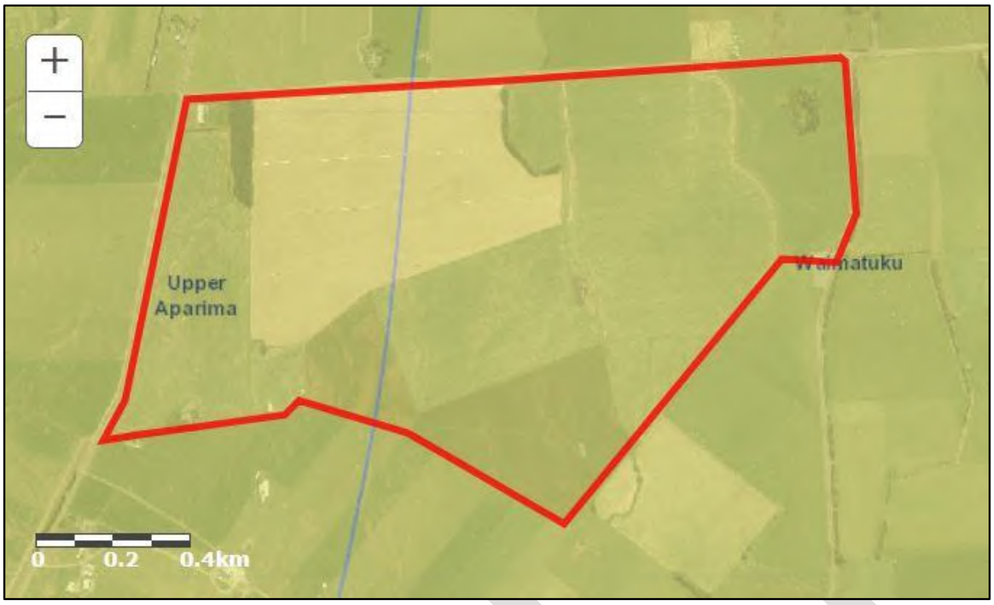

Figure 5.19 Groundwater Zones at Horner Block (approximate boundary outlined in red).

The Waimatuku Groundwater Zone

The Waimatuku Groundwater Zone is classified as a lowland aquifer type according to Environment Southland's Information Sheet and has low allocation status. The diagram below gives a schematic cross section of the Waimatuku Groundwater Zone; recharge to the Waimatuku groundwater zone is principally derived from rainfall recharge. Annual land surface recharge is estimated to be 467 mm/year. According to Environment Southland, available flow gauging and water quality information suggest that shallow groundwater makes a significant contribution to baseflow discharge in the Waimatuku catchment with recharge circulating relatively rapidly through upper levels of the unconfined aquifer and discharging via the local stream network. Groundwater circulation through deeper levels of the aquifer system is likely to be relatively slow and follow the more general southward topographic gradient.

According to Environment Southland's Information Sheet, groundwater quality in the Waimatuku Groundwater Zone is generally good, although it does vary according to source aquifer and location. Some areas of elevated nitrate concentrations are observed in shallow groundwater reflecting infiltration from surrounding land use.

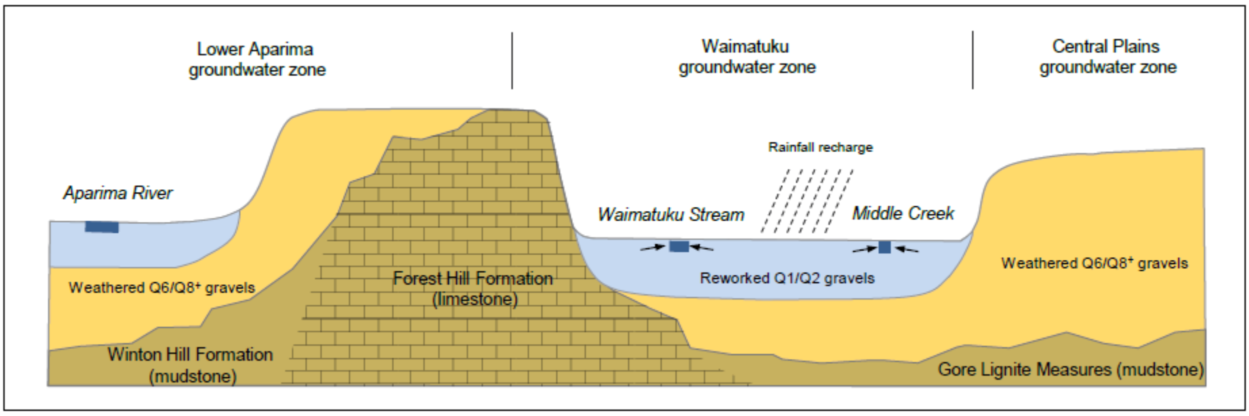

Figure 5.20 Schematic cross-section of the Waimatuku Groundwater Zone (Waimatuku Groundwater Zone Information Sheet, n.d.)

Groundwater flow

A 2014 study by Hitchcock characterised surface and groundwater interactions in the Waimatuku Stream catchment. The study reported that from Wreys Bush down to Drummond “groundwater flow is from north to south down the catchment.” See figure 4.7 from Hitchcock (2014) for a map depicting groundwater flow in the Waimatuku Catchment. Heddon Bush School, which has a bore for drinking water supply (HED001), is c.2.3 km due south of the WOL/WTL dairy platform (see figure 5.21) and lies in the Waimatuku Groundwater Zone. Based on Hitchcock’s report, groundwater underlying much of the property flows south, so flows in the direction of Heddon Bush School.

An estimate of the average linear velocity of groundwater moving south was calculated by hydrologist Mark Flintoft from Aqualinc Limited. Using a porosity of 0.3, K of either 26 or 2,600 m/day, an average linear velocity of 0.5 to 40 m/day was estimated. Mr. Flintoft has stated that the figure provided is an approximation of linear velocity. In the absence of other references for the velocity of groundwater in the area, this estimate can be used to approximate groundwater movement.

Land use in wider area since 1980s

The WOL dairy unit was established in 1992 and the WTL dairy unit was officially established in 2003. Land use activities in the wider area since the 1980s (if not before) include sheep farming, dairy farming, intensive winter grazing of dairy stock, and sheep farming/cereal cropping. Dairy farming has expanded since the mid-2000s. In line with land use activity in the Central Southland area, cereal cropping was formerly a significant activity with cereal crops (barely/grain) typically being grown and harvested annually. Sheep farming and cereal cropping often went together on individual farms. Cereal cropping reduces soil organic matter content and water holding capacity so has relatively high N loss to water. Intensive winter grazing of fodder crops also has relatively high N loss to water. The presence of these activities in the area during the 1980s, 1990s and beyond is of note when considering N loss to groundwater, lag times and groundwater flow. Over decades, these activities can be expected to have lost N to groundwater where free draining soils are found or where there is an alternative pathway to groundwater (e.g. bypass drainage via deep cracks in Braxton soils). N signals in groundwater from these activities would be expected to have been seen for some time if they were present.

The land did not operate in a nitrogen "vacuum" prior to the official establishment of the WOL and WTL dairy platforms.

Using the estimate for groundwater movement of 0.5 to 40 m/day, land use effects on groundwater due to the WOL and WTL dairy platforms and prior activities such as intensive winter grazing and cereal cropping, if they are present will have been seen at the Heddon Bush School area for some time.

Figure 5.21 Topomap showing groundwater zones and location of Heddon Bush School (approximate property boundary outlined in red).

Central Plains Groundwater Zone

The Central Plains Groundwater Zone is classified as a lowland aquifer type according to Environment Southland's Information Sheet and has low allocation status. The diagram below gives a schematic geologic cross section of the Groundwater Zone. Recharge to the underlying groundwater zone is primarily via rainfall infiltration with some infiltration of runoff along the lower slopes of the Tauringatura Hills. Mean annual land surface recharge in the Groundwater Zone is estimated to be 470 mm/year. According to Environment Southland's Information Sheet, groundwater quality in the Central Plains Groundwater Zone is generally good, although it does vary according to source aquifer and location. There are some "hotspot" areas where nitrate values are particularly high.

There are no Central Plains Groundwater Zone registered drinking water supplies within 10 kilometres of the property.

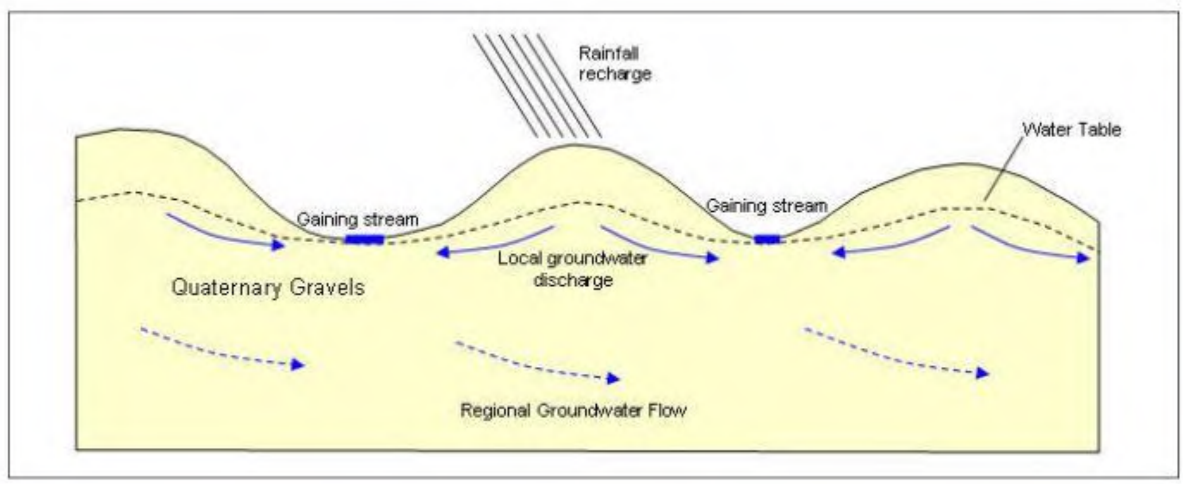

Figure 5.22 Schematic cross-section of the Central Plains Groundwater Zone (Central Plains Information Sheet, n.d.)

Upper Aparima Groundwater Zone

The Upper Aparima Groundwater Zone encompasses the flat-lying portion of the Upper Aparima River catchment. It is a terrace aquifer type and according to Environment Southland's Information Sheet, has low allocation status. Terrace aquifers are recharged by direct rainfall recharge and infiltration of runoff from the surrounding hills and streams, which drain the hills. There is limited riparian recharge from the Aparima River except along the riparian margins. Mean annual land surface recharge in the Aparima groundwater zone is estimated at 417 mm/year. Groundwater is discharged into the Aparima River via spring-fed streams or throughflow through the unconfined aquifer along the riparian margin of the river. The Aparima River is largely influent over much of the reach upstream of Wreys Bush, reflecting drainage of groundwater from the surrounding terrace aquifers. Groundwater quality is generally good, although it does vary according to source aquifer and location. There are minimal "hotspot" areas where nitrate values are particularly high.

There are no Upper Aparima Groundwater Zone registered drinking water supplies located within 35 kilometres of the property.

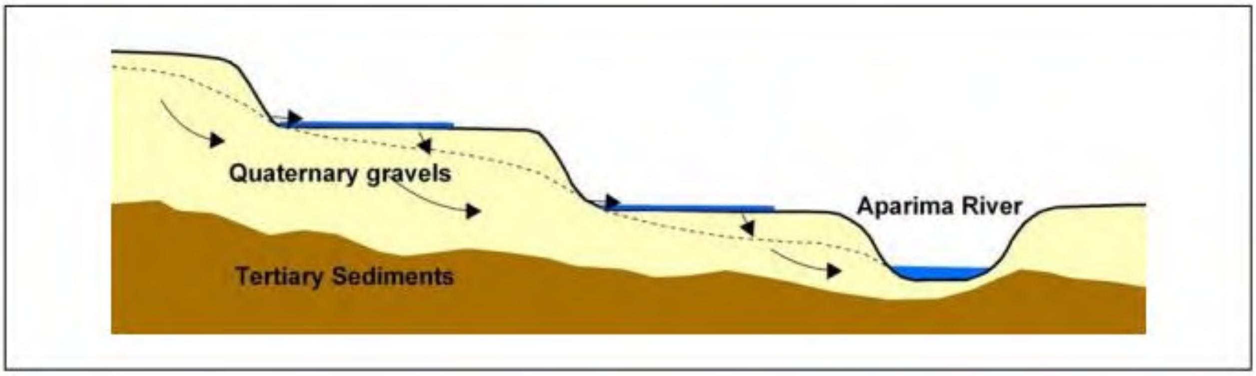

Figure 5.23 Schematic cross section of The Upper Aparima Groundwater Zone.

Groundwater lag times

Shallow groundwater lag times for nitrate response in Southland were estimated in a 2014 study by Wilson, Chanut, Rissman and Ledgard. 0 – 1 years was reported as an estimate of the time taken for the percolation of water through the unsaturated zone and reach the water table. The study reports that localised nitrate effects on groundwater can be expected within one year in the vicinity of the property. 3 - 5 years was reported as the "total lag time" in the area where the property is located (see figure 12 of report). 2.5 – 3 years was reported as an estimate for the time taken for a year of rainfall recharge to mix with the shallow aquifer.

Groundwater Nitrate – dairy platform

Groundwater in gravel deposits is susceptible to nitrate leaching. This reflected in the observed gradient in groundwater nitrate concentrations; groundwater nitrate concentrations are low at the west (0.4 – 3.5 g/m^3) and increase towards the east (3.5 – modelled >11.3 g/m^3) where lighter soils are found. See figure 5.24. Most of the property is modelled as having groundwater nitrate levels in the range of 1.0 – 8.5 g/m^3, indicative of minor, moderate to high land use impacts.

Groundwater nitrate levels south of the property, overlying the Waimatuku Groundwater Zone, are generally low, in the range of 0.01 – 8.5 g/m^3.

There is a nitrogen "hotspot," where groundwater nitrate levels regularly exceed New Zealand Drinking Water Standard's MAV of 11.3 ppm centred at Boyle Road/Heenans Corner immediately to the south east of the property and overlying the Central Plains Groundwater Zone (see figures 5.24, 5.26, 5.27).

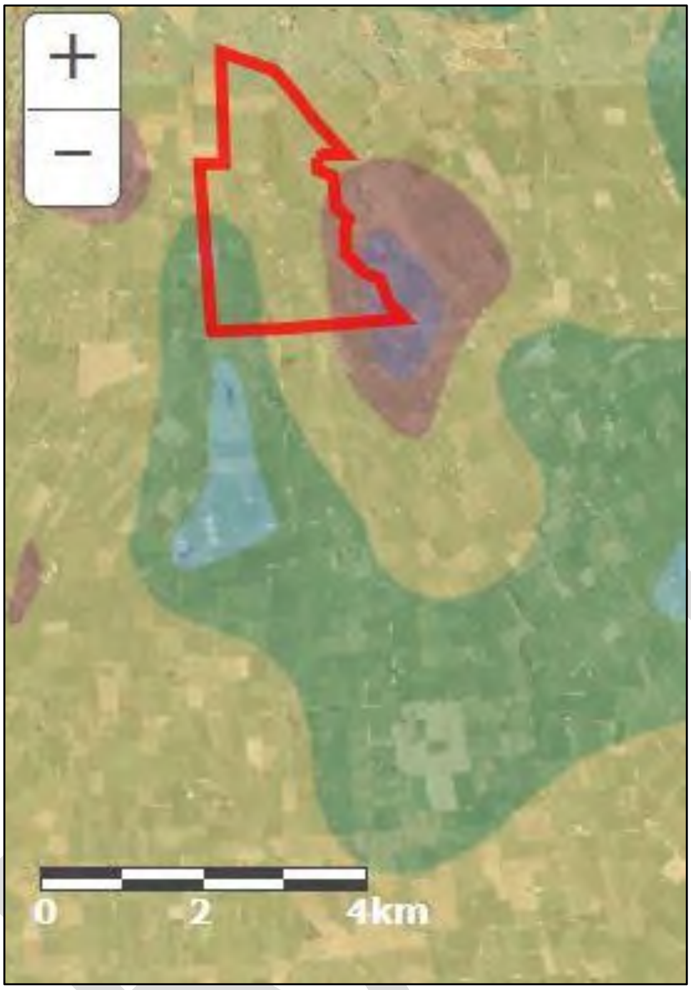

Figure 5.24 Groundwater nitrate levels in the vicinity of the WOL/WTL dairy platform (approximate boundary is outlined in red).

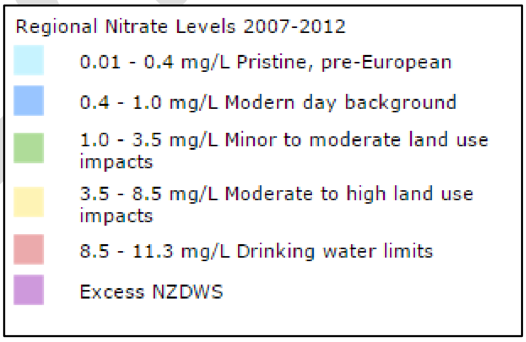

Figure 5.25 Key to groundwater nitrate levels

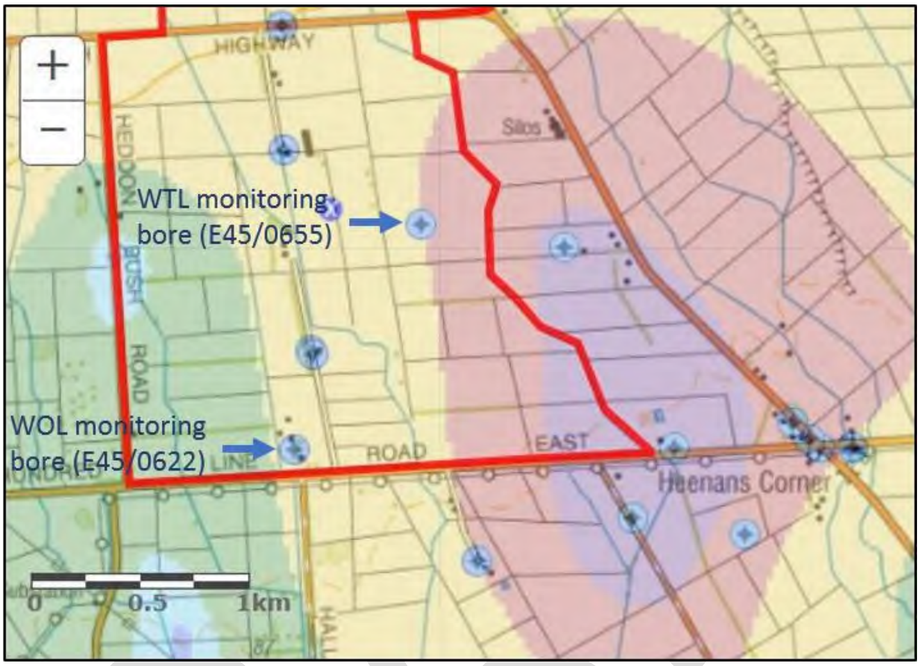

Figure 5.26 Topomap with groundwater nitrate levels showing low levels at the west and the hotspot centred at Heenans Corner to the east. The location of two bores used for monitoring are also shown.

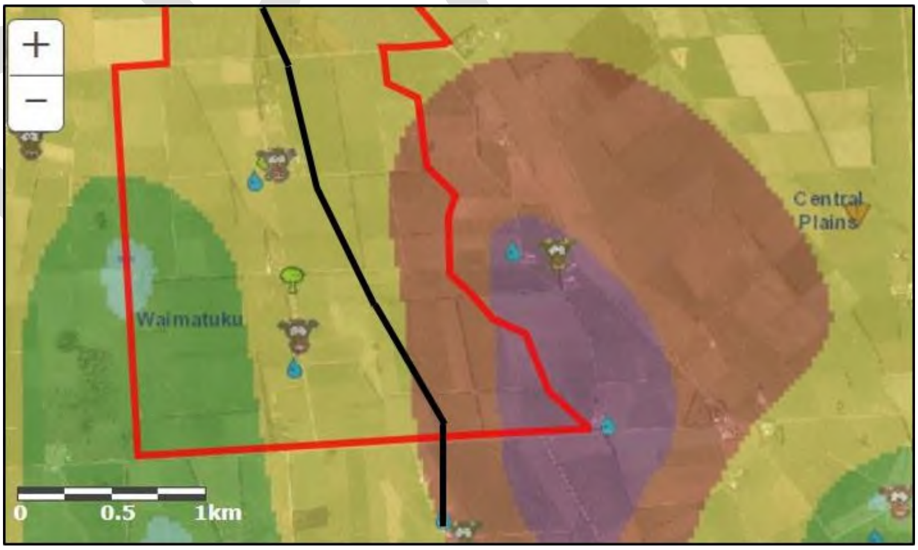

Figure 5.27 Aerial photo with groundwater nitrate levels and groundwater zones (black line indicates boundary between groundwater zones). The nitrate hotspot is in the Central Plains Groundwater Zone.

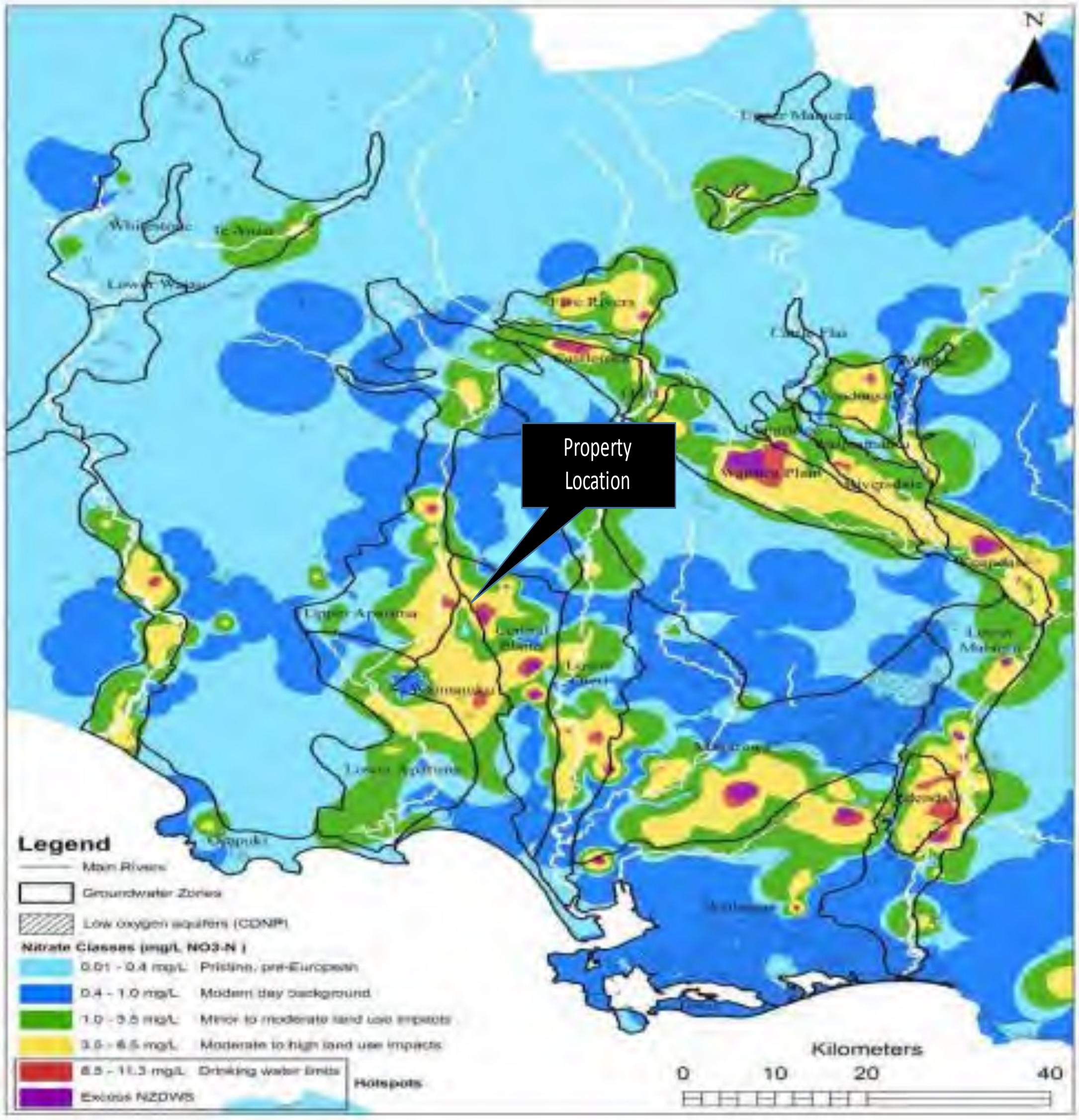

Figure 5.28 Classed NO3-N map for Southland's managed groundwater zones (Rissmann, 2012)

Monitoring bores

Two bores located at the property are monitored by Environment Southland for water quality; one at the south of the WOL dairy unit (E45/0622)/Waimatuku Groundwater Zone, and one at the south east of the WTL dairy unit (E45/0665)/Central Plains Groundwater Zone. See figure 5.26 for the location of the bores.

WOL BORE (E45/0622)

The WOL bore is mapped on Beacon in the Waimatuku Groundwater Zone. The bore used to monitor WOL's groundwater quality was not drilled as a monitoring bore; it is an old domestic well. It comprises a 90 cm vertical concrete pipe with a hole in the side to let the alkathene through. It is possible for birds or rodents to enter the well along the pipe, fall in and drown, which has happened in the past. Furthermore, the well's top pipe is flush with ground level, and soil in the vicinity has high organic matter content from long grass and woody shrubs in the area. Due to its design and unprotected nature, it is likely to experience frequent localised contamination especially during/following heavy rainfall, as surfacewater can flow down into the wellhead carrying organic material with it. If decaying birds (starlings) or rodents are in the well, these also will cause localised contamination. Given these factors, ***the WOL bore is unsuitable for use as a monitoring bore,*** and data collected from the well may be unlikely to reflect wider groundwater quality. This is particularly the case for *E.coli* data, which will be more corrupted than nitrate data from localised contamination.

Figure 5.29 WOL bore (E45/0622) used for groundwater quality monitoring.

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WTL MONITORING BORE (E45/0622)

The WTL bore was drilled as a monitoring bore and is mapped on Beacon in the Central Plains Groundwater Zone.

NITRATE TRENDS FOR BORES MONITORED AT DAIRY PLATFORM

The WOL bore (E45/0622) has been sampled by Environment Southland twice per year since 2013 and the WTL bore (E45/0665) has been sampled by Environment Southland twice per year since 2015 (see figure 5.30 below). Despite the unsuitability of the WOL well for use as a monitoring bore, it has been included in the following analysis for nitrate.

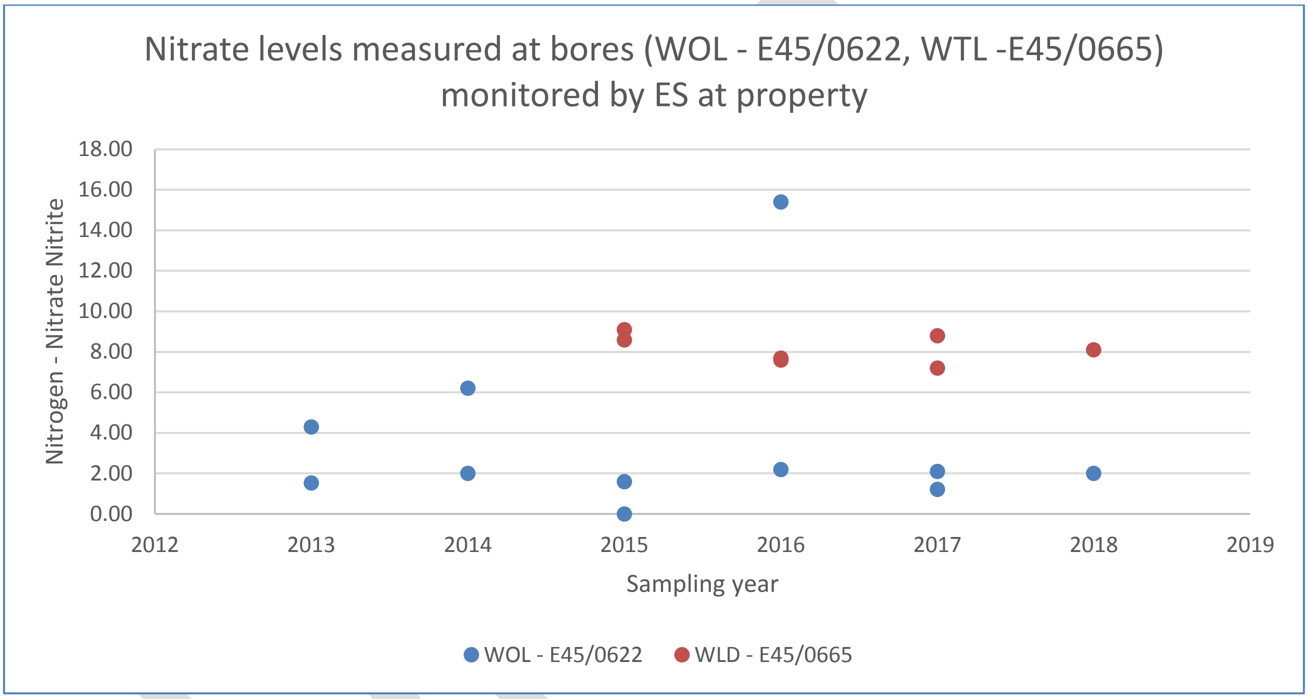

Figure 5.30 Groundwater nitrate concentrations at two bores monitored by Environment Southland at the property.

Except for one outlying result, groundwater nitrate levels at the WOL bore (E45/0622) are generally low (< 3.5 g/m^3) since 2015. Given its position as an outlier in the dataset, the high 2016 result is likely to have been due to localised contamination of the bore. Bore E45/0622 is a shallow bore (3 m deep) and except for localised contamination issues, should indicate recent land use effects including cumulative effects on upstream groundwater. Groundwater nitrate levels sampled at the bore generally are low and indicate minor to moderate land use effects. Results in 2017/2018 were less than or equal to 2.1 g/m^3.

Groundwater nitrate levels measured at the WTL monitoring bore (E45/0665) are more elevated, with a mean value of 8.16 g/m^3 (range +/-1.9 g/m^3) over the sampling period. This reflects a general trend in the area, with higher groundwater nitrate concentrations found progressively towards the east in the Central Plains Groundwater Zone, underlying lighter soils. Longitudinal datasets for a limited number of bores located to the east and north east of the property on lighter soils show this trend. The WTL monitoring bore has a depth of 6.5 metres and is found in the Central Plains Groundwater Zone.

ENVIRONMENT SOUTHLAND MONITORING BORE AT BOYLE ROAD

An Environment Southland monitoring bore is located on Boyle Road to the south east of the property and in the Central Plains Groundwater Zone.

Groundwater is monitored at different depths (3 m, 6 m, 9 m, 12 m, 15 m). Well ID E45/0768 measures water quality at 3 metres depth and well ID E45/0771 measures water quality at 12 metres depth. Longitudinal datasets are available for both well IDs, starting in 2005 until the present (2018). Data, albeit limited in cases, are available for other bores in the vicinity of the property.

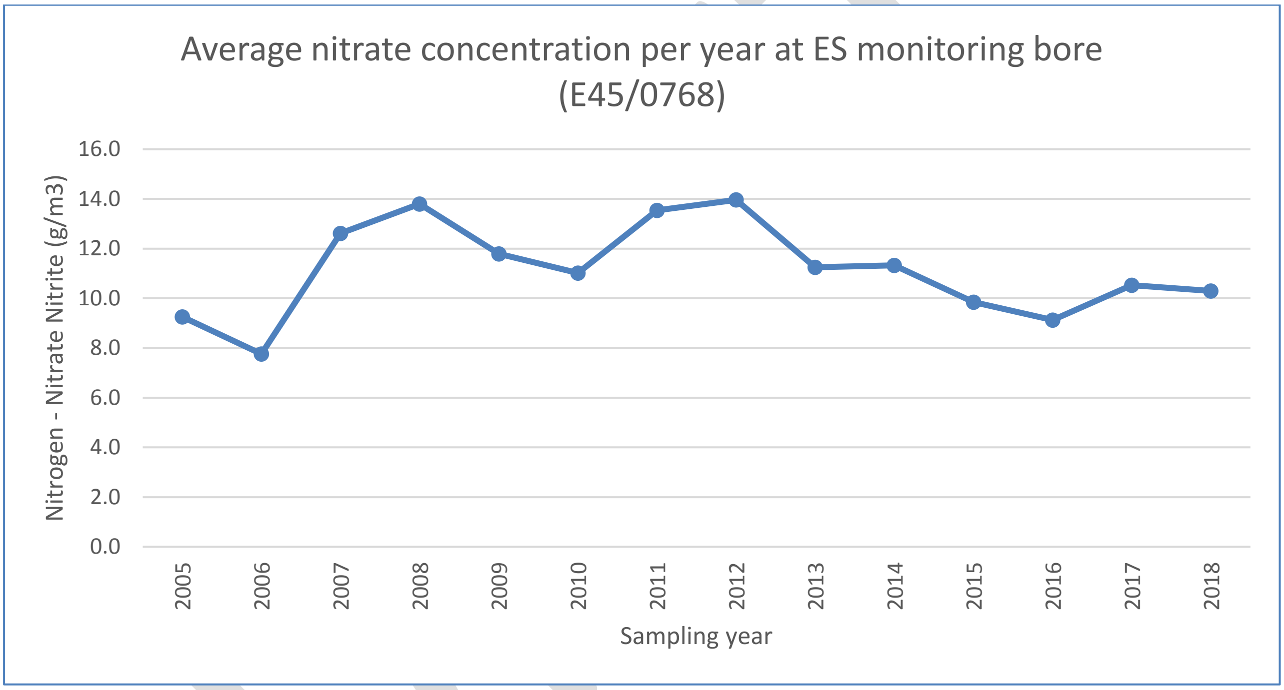

Figure 5.31 Groundwater nitrate concentrations at the ES monitoring bore (E45/0768) at Boyle Road to the south east of the property and in the Central Plains Groundwater Zone.

Groundwater nitrate levels at the Environment Southland's Boyle Road bore are generally at or above the New Zealand Drinking Waters MAV of 11.3 ppm. As this bore is also a shallow bore (3 metres depth), it is an indicator of recent land use effects and has been included here (rather than the 12 metre depth bore at the same site). Nitrate levels at the bore should be indicative of the cumulative effect of recent land use activities on upstream groundwater, which includes dairy, sheep and beef and cropping activities at numerous properties.

Comparatively groundwater nitrate levels at the two monitoring bores at the property are lower than at the Boyle Road bore, with the WOL data being distinctly lower and likely to reflect a different groundwater stream in the Waimatuku Groundwater Zone. The WTL data are indicative of moderate to high land use effects in the Central Plains Groundwater Zone but are lower than the shallow bore data from the ES Boyle Road monitoring bore. The WTL monitoring bore is likely to measure shallow groundwater quality underlying free draining soils at the east side of the property, which is in the Central Plains Groundwater Zone.

Nitrate at registered drinking water supply – Heddon Bush School

Heddon Bush School overlies that Waimatuku Groundwater Zone. The bore for water supply at Heddon Bush School (E45/0718) was drilled in 2017 to a depth of 14.9 metres. It has been tested for nitrate levels since it was drilled although no recent nitrate* testing has been carried out by the school. Heddon Bush School bore testing carried out by Dairy Green Limited in December 2017, January and March 2018, returned nitrate concentrations of 1.8 – 2.0 ppm, which are indicative of minor to moderate land use effects and are well below the NZ Drinking Water Standards MAV for nitrate of 11.3 ppm. See the Appendix for laboratory results from the testing of Heddon Bush School bore by Dairy Green Limited.

*Note: The bore supply at Heddon Bush School is tested for microbial contaminants four times per year.

Groundwater Nitrate – Horner Block

Groundwater nitrate levels in the vicinity of the Horner Block are lower on the east side (1.0 – 3.5 g/m^3) and higher on the west side (3.5 – 8.5 g/m^3) towards the Aparima River (see figure 5.31). This corresponds with the heavier soil types found on the east side and lighter soils found on the west side respectively.

Figure 5.31 Groundwater nitrate levels in the vicinity of the Horner Block (approximate boundary is outlined in red).

Microbial contamination of groundwater

E.coli is widely used as an indicator of faecal contamination of water, including groundwater. *E.coli* is believed remain viable for up to three months in groundwater (Edberg et al., 2000). Groundwater sampling in the vicinity of the property, including at the WOL, WTL and ES Boyle Road bores, have generally been negative for *E.coli* (<1 MPN/100 ml). At times there have been positive *E.coli* results (1 or >1 MPN/100 ml), however.

The *E.coli* data from the WOL bore (E45/0622) are flawed due to localised contamination relating to poor well design; this may have been the case for some other bores in the area also. In these situations, rainfall washes organic material including microbes, close to the bore site down into the well. This causes localised contamination and disappears beyond the zone of reasonable mixing. In the case of the WOL bore, some decaying birds/rodents in the well may also be responsible for some contamination, which has been observed by the applicants in the past. Since the WOL bore is likely to suffer frequent localised microbial contamination, *E. coli* data from samples collected at the well are dubious and unlikely to reflect wider groundwater quality. For that reason the WOL bore has been excluded form figure 5.32.

Where positive *E.coli* results are not due to contamination/poor wellhead design, they are an indicator of the presence of faecal microbes in groundwater from drainage events, albeit to a low level and relatively short lived generally.

Figure 5.32 plots *E.coli* results from the WTL bore from 2015 to 2018. *E.coli* results fluctuate between negative for E.coli (<1 MPN/100 ml) and 548 MPN/100 ml. It is noted that the ES Boyle Road bore was positive for *E.coli* in November 2017 (5 MPN/100 ml) but was negative on other sampling dates.

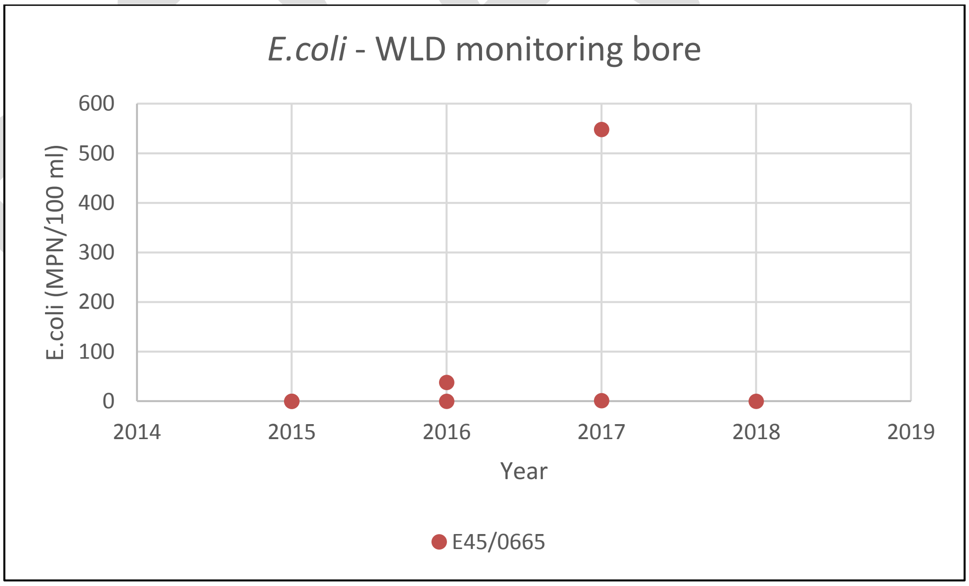

Figure 5.32 *E. coli* sampling at WTL monitoring bore.

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The ES monitoring bore at Boyle Road had some relatively high *E.coli* counts between 2006 and 2008 (e.g. 80 MPN/100 ml in April 2008) as well as many negative results (<1 MPN/100 ml). It was generally negative for *E.coli* in 2009 (< 1 MPN). There was a lack regular *E. coli* testing between 2010 and 2012. Quarterly testing by ES began in 2013, with all tests being negative for *E.coli* (<1 MPN/100 ml) with the exception of March 2014 and December 2017, which had 2 MPN/100 ml and 5 MPN/100 respectively.

No *E.coli* data are available for bores in the vicinity of the Horner Block within the last ten years.

According to school principal, Ms. E Hamilton, the bore at Heddon Bush School (E45/0718) is tested every three months since and has consistently been negative for *E.coli* (counts of <1 MPN/100 ml). Recent test results for the bore are included in the Appendix. Results show no evidence of faecal contamination of the registered drinking water supply at Heddon Bush School.

5.4 Physiographics

Both the dairy farm and Horner Block are identified as being located primarily within the Central Plains and Oxidising physiographic zones. Given the remapping of soil types at the dairy farm following a site investigation, it is likely that the area of Oxidising soils is greater than is mapped by Beacon and that the Central Plains area is reduced. The main contaminant pathways for the Central Plains zoned land are artificial drainage and deep drainage. The main contaminant pathway for Oxidising zoned land is deep drainage.

Oxidising

For the Oxidising zone, nitrogen accumulation is expected, particularly during drier months, with excess nitrogen and other contaminants then leaching into underlying aquifers following periods of heavy rainfall over winter and spring. Oxidising soils (Drummond and Glenelg) at the property are free draining so do not have artificial drainage installed.

Central Plains

Central Plain's zoned land is prone to waterlogging, resulting in the installation of artificial drainage and the potential loss of contaminants (N, P, sediment and microbes) to streams and rivers. It is also believed to have risk of contaminant loss via deep drainage, which relates to swell/crack properties of Braxton type soils. Deep cracks can form in soils during dry summer periods. Subsequent rainfall can transport contaminants via bypass drainage to the underlying aquifer.

Figure 5.33 Physiographic zones (approximate dairy farm boundary is outlined in red).

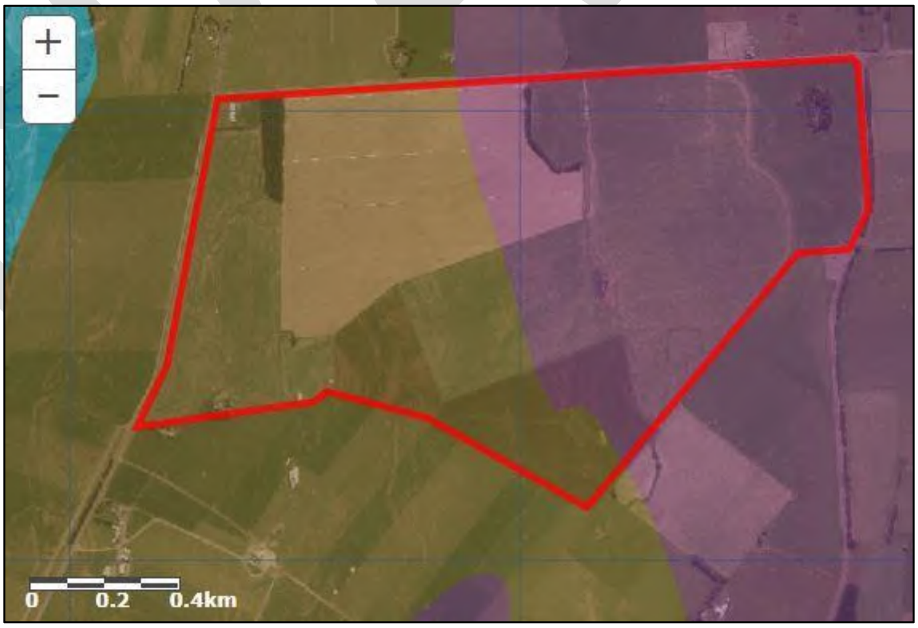

Figure 5.34 Physiographic zones in vicinity of Horner Block.

Figure 5.35 Key to physiographic zones

5.5 Topography

The topography found at the property is very flat. See figures 5.36 and 5.37 below. Slight hollow and low points in the flat terrain are generally underlain by subsurface drainage on the west side of the property.

Figure 5.29. Photograph of flat topography found at the property.

Figure 5.29. Photograph of flat topography found at the property.

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6. Proposal Details

6.1 Effluent

Overview of effluent discharge activity

Table 6.1

Effluent Discharge	
Replacement of consents	Replace 301663 and 20171278-01 with a single discharge permit
Duration of consent sought	15 years
Herd size	1,500 cows total: 800 cows at WTL 700 cows at WOL
Supplier number	WTL unit = 32651 WOL unit = 32650
Period of discharge	The cowsheds are generally operated from 1 August to 31 May each year, with a limited number of late calving cows milked until mid-June (15th). Effluent irrigation to the discharge areas will be carried out between August and May, and as ground conditions permit for June and July if deemed necessary.
Milking frequency	Twice per day
Winter milking	Not anticipated, seasonal supply only
Feed pad/wintering pad/stand-off pad	There are two wintering barns at the property with a total capacity to house 1,280 cows.
Other sources of effluent collected in main effluent system	Concrete area at two vat stands Silage pad (WTL)

Feed Pad/Wintering Pad/Stand-off Pads

There are two wintering barns at the property with a total capacity to house 1,280 cows. One barn is located on each dairy unit; both have capacity to house 640 cows although typically they will house about 625 cows each to minimise cow stress. The WOL barn has recently been upgraded to go from 400 to 640 cow capacity as has its effluent storage infrastructure.

The wintering barns are mainly used in May, June, July, August and September but can be used as stand-off pads at other times during inclement weather. The use of wintering barns as a stand-off pads varies from year to year dependent on weather. Cows are removed from the wintering barn for calving.

The wintering barns have a sealed concrete floor. Effluent from the wintering sheds is scraped into a concrete collection channel from where it is pumped to respective storage ponds, which also stores effluent from the dairy shed as required. The wintering barns have a small uncovered area, which has been included in the Massey DESC reports.

A rainwater diversion is used on the concrete areas during the off season.

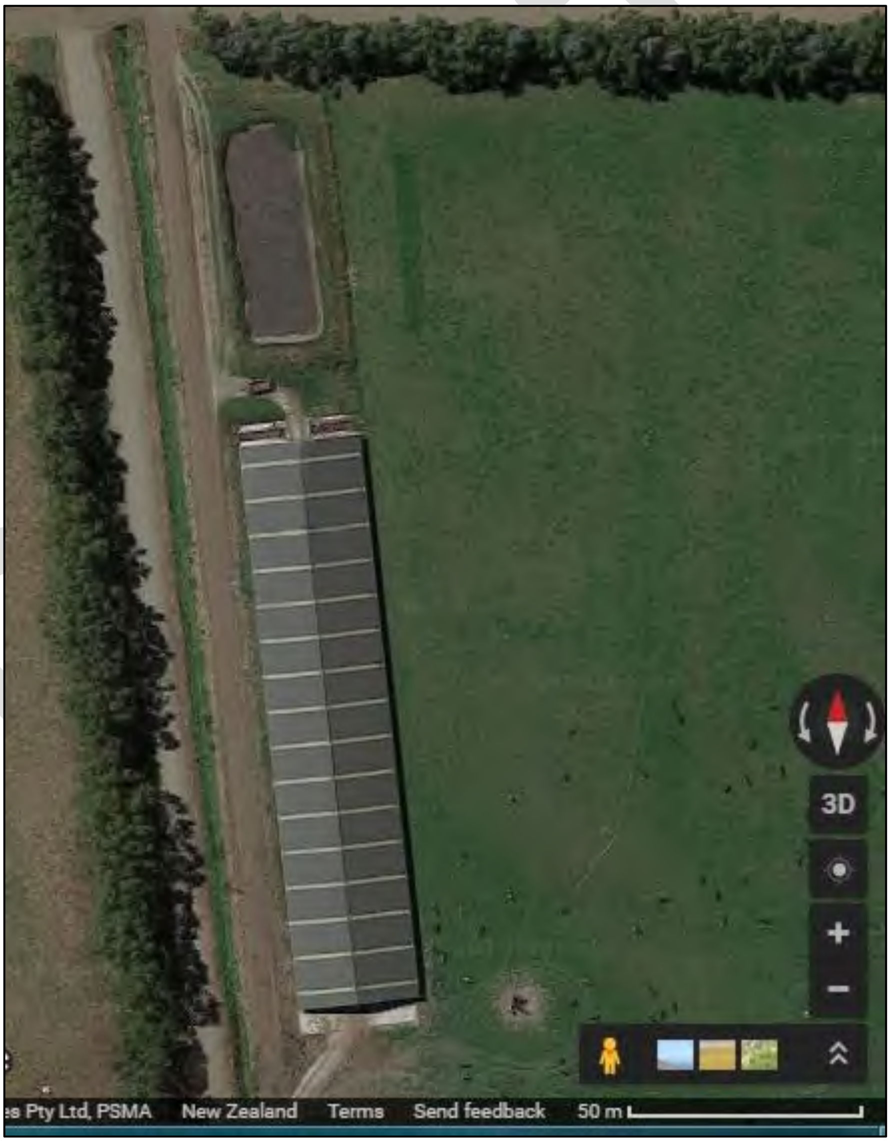

Figure 6.1 Wintering barn and effluent pond – WOL dairy unit.

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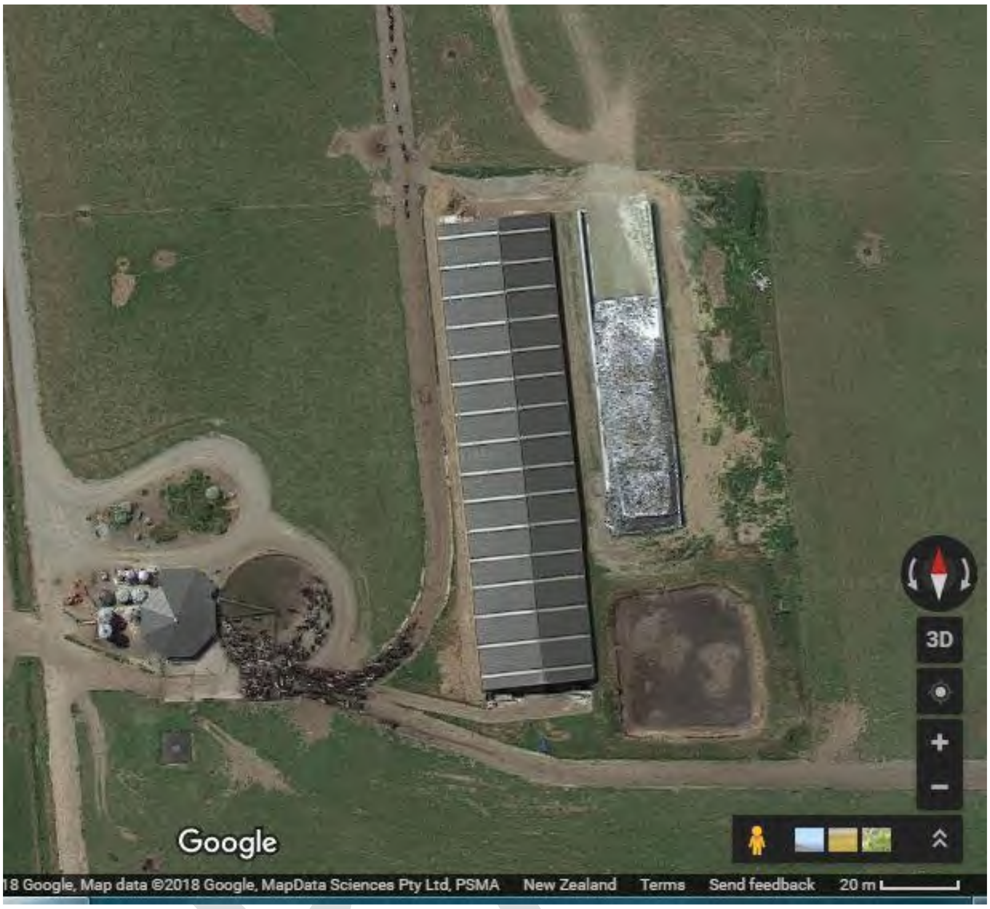

Figure 6.2 Wintering barn, silage pad, dairy shed and effluent pond – WTL dairy unit

WTL wintering barn – effluent volume

The total volume of effluent collected has been calculated based on approximately 50 litres per cow per 24-hour day. The volume has been calculated as follows:

May:

$$640\ cows\ x\ 12\ Hours/day\ x\ 50\ l\frac{effluent}{24}Hours\ \ x\ 31\ days = 496\ cubic\ metres$$

June and July:

$$640\ cows\ x\ \ 50\ l\frac{effluent}{day}\ x\ 61\ days = 1{,}952\ cubic\ metres$$

August:

$$370\ cows\ x\ 23\ Hours/day\ x\ 50\ l\frac{effluent}{24}Hours\ \ x\ 31\ days = 550\ cubic\ metres$$

September:

$$75\ cows\ x\ 23\ Hours/day\ x\ 45\ l\frac{effluent}{24}Hours\ \ x\ 30\ days =\ 108\ cubic\ metres$$

Total

$$496\ m3 + 1{,}952\ m3 + 550\ m3 + 108\ \ = 3{,}106\ cubic\ metres$$

WOL wintering barn – effluent volume

The same calculation applies to WOL's wintering barn, which is estimated to be 3,106 m^3.

Wintering barns – total volume of effluent

The volume total of effluent collected from the wintering barns has been calculated as approximately 6,212 m^3/year.

Other sources of effluent

UNDERPASS

An underpass connects WTL blocks north and south of Wreys Bush Highway, which has a catchment of 200 m^2. The underpass has a concrete sump, from where rainfall and effluent is pumped to a dedicated sprinkler. The underpass has not been included in the Massey DESC report.

Rainfall site used in Massey DESC: Drummond Marson Road = 1.061 m per year
200 m^2 catchment X 1.061 m rainfall = 212 m^3 volume to discharge.

Underpass effluent is very dilute as it is primarily composed of rainwater. It is irrigated using a dedicated low rate sprinkler (less than 10 mm/hour and less than 10 mm depth per application).

The discharge is to paddocks close to the underpass (low risk soils). Underpass effluent is not discharged to a surface waterway either directly or by overland flow. There is no discharge of underpass effluent when the soil moisture exceeds field capacity.

The discharge of underpass effluent is:

- not within 20 metres of a surface waterway;
- not within 200 metres of a neighbouring dwelling;
- not within 20 metres of a boundary with another landholding; and
- not within 100 metres of a bore.

The maximum loading of N from underpass effluent does not exceed 150 kg N/hectare/year; it is very dilute. Due to its very small volume and highly dilute nature, the nutrient loadings and losses from underpass effluent are negligible compared to that from effluent, sludge and the overall farming activity. The extremely small quantity of nutrients that fall on the underpass and are discharged are accounted for in Overseer, through cow numbers, feed inputs and system losses. Underpasses are not modelled separately in Overseer due to the negligible contribution they make.

Figure 6.3 Aerial photograph of underpass.

SILAGE PAD - WTL

A concrete silage pad is located adjacent to the wintering barn at WTL. Its area is 1,200 m^2. It is constructed on a dry site. The silage pad has concrete walls and a dual drainage system; one for clean rainwater and one for silage leachate. Under the stack and immediately in front of it, the drains are opened into the leachate channel. This takes leachate to a sump from where it is pumped into the effluent storage pond and irrigated appropriately. The sumps in the rest of the pad are open to the farm drainage system so that clean rainwater can be diverted. Rain landing on the silage cover does not mix with leachate and is diverted to the farm drainage.

Only wilted silage is used to minimise the risk of creating leachate. The pad is empty for approximately 3-4 months per year. The silage pad catchment has been included in the Massey DESC report. Given the rainwater diversion in place when the pad is empty, and that rain landing on the cover does not mix with leachate so can be diverted to farm drainage, the silage pad leachate catchment is smaller than 1,200 m^2 for much of the year.

Good management practices for the concrete silage pad at WTL are:

1. Only wilted silage is stored on the pad to minimise leachate generation;

2. The bunker is filled to the top of the walls with silage and the silage cover hangs over the walls so that rain landing on the silage cover does not mix with leachate.

3. The silage pad is flanked by 1.8 m high sealed concrete walls to prevent leachate escaping;

4. A dual drainage system is operated inside the wall on the low side; one for clean rainwater and one for silage leachate. This ensures that only leachate is collected, stored and discharged to land appropriately:
    a. Drains at the front of the stack and underneath the stack are opened to the leachate channel. These drain leachate to a sump, from where it is pumped to WTL's effluent storage pond and irrigated appropriately. These areas capture no or minimal rainwater;
    b. The sumps in the rest of the pad are open to the farm drainage system so that clean rainwater can be diverted.

SILAGE PAD - WOL

The silage pad at WOL meets permitted activity rules both for the use of land and for leachate management. See Section 2 for details. No effluent is collected and pumped to the storage system.

Figure 6.4 Silage pad at WOL

Figure 6.5 Silage pad at WOL

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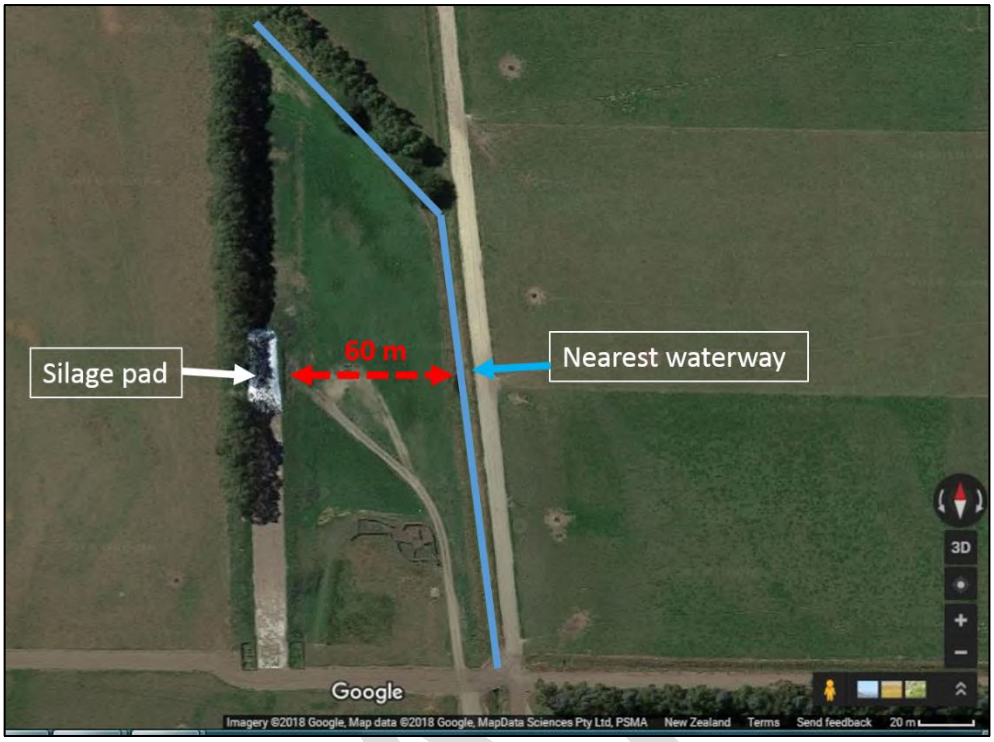

Figure 6.6 Location of the silage pad at WOL.

Effluent collection and storage system

WOL - DAIRY SHED

The maximum daily dairy shed effluent volume comprises 35 cubic metres of effluent plus any rainfall.

I. Raw effluent from the dairy shed gravity feeds to a pump sump.
II. When soils are below field capacity and have sufficient soil moisture deficit, raw effluent is pumped to a travelling irrigator, from where it is applied to land at low depth.
III. When soils are near or at field capacity, raw effluent is pumped to the buffer storage pond and there is enough storage in the pond so that irrigation is not required.
IV. When soil moisture conditions are suitable for irrigation, raw effluent (slurry) from the pond is applied at low depth to land using a slurry tanker with a trailing shoe or using an umbilical system.
V. An off-season diversion is put in place at the dairy shed.

WOL - WINTERING BARN

I. The effluent flows by gravity or is scraped to the concrete effluent collection sump, and then is pumped to the effluent storage pond.
II. The effluent is stored in the pond until soil moisture conditions allow for irrigation to occur.
III. The effluent is pumped from the pond to the slurry tanker with a trailing shoe or umbilical system and irrigated at very low depth to land; and
IV. A rainwater diversion is used in the off season.

WTL - DAIRY SHED

The maximum daily dairy shed effluent volume comprises 40 cubic metres of effluent plus any rainfall.

I. Raw effluent from the dairy shed gravity feeds to a pump sump.
II. When soils are below field capacity and have sufficient soil moisture deficit, raw effluent is pumped to a travelling irrigator, from where it is applied to land at low depth.
III. When soils are near or at field capacity, raw effluent is pumped to the buffer storage pond and there is enough storage in the pond so that irrigation is not required.
IV. When soil moisture conditions are suitable for irrigation, raw effluent from the pond is applied to land at very low depth using a slurry tanker with a trailing shoe or using an umbilical system.
V. An off-season diversion is put in place at the dairy shed.

WTL - WINTERING BARN

I. The effluent flows by gravity or is scraped to the effluent sump, and then is pumped to the effluent storage pond.
II. The effluent is stored in the pond until soil moisture conditions allow for irrigation to occur.
III. The effluent is pumped from the pond to the slurry tanker or umbilical system and irrigated at very low depth to land; and
IV. A rainwater diversion is used in the off season.

WTL – SILAGE PAD

I. Drains at the front and underneath the stack are opened to the leachate channel. These drain leachate to a sump, from where it is pumped to WTL's effluent storage pond and irrigated appropriately.

Storage capacity

WOL – EFFLUENT STORAGE

The pond was upgraded in autumn 2018. As part of its upgrade the storage volume was increased and a synthetic liner (1.5 mm HDPE) was installed, overlying a leak detection system. The pond design was certified by a CPEng as meeting Practice Note 21 standards. The leak detection system terminates at a 400 mm diameter inspection well. The storage capacity of the pond is 4,281 metres cubed. The Massey Dairy Effluent Storage Calculator 90% storage probability volume for WOL is 3,257 metres cubed, so has sufficient storage for 700 cows plus wintering barn effluent. See Appendix for the Massey DESC report.

WOL - DESC PARAMETERS

- 700 cows milked at peak
- Milking season is 1 Aug – 15 June
- Yard is diverted from 16 June to 31 Aug
- Yard area – 553 m^2
- Milking shed roof area diverted.

- Up to 640 cows wintered on a covered feedpad that includes an uncovered area of 170 m^2 that is not diverted.
- A winter/spring irrigation depth of 2 mm has been used. This reflects the predominant use of the trailing shoe slurry tanker to discharge slurry effluent from the storage pond, which can apply effluent to a depth of 1 mm if required. By applying effluent 20 m^3/hectare the slurry tanker applies slurry effluent to a depth of 2 mm. A low depth travelling irrigator is used to apply dairy shed effluent when there is sufficient soil moisture deficit.
- FDE area is split to reflect Drummond/Glenelg (low risk) and Braxton (high risk) soils at the milking platform and the Horner Block. Conservatively 50 hectares of low risk soils has been entered.

Note: if the dairy shed is upgraded/replaced in the future, additional storage is available in WOL's pond to allow for a larger yard catchment.

WTL – EFFLUENT STORAGE

The storage capacity of the pond is 3,751 metres cubed. The Massey Dairy Effluent Storage Calculator 90% storage probability volume for WOL is 3,203 metres cubed, so has sufficient storage for effluent from 800 cows, wintering barn effluent and silage pad leachate. See Appendix for the Massey DESC report.

WTL - DESC PARAMETERS

- 800 cows milked at peak
- Milking season is 1 Aug – 15 June
- Yard is diverted from 16 June to 31 Aug
- Yard area – 1,126 m^2
- Milking shed roof diverted
- 640 cows wintered on a covered feedpad that has an uncovered area of 170 m^2 that is not diverted.
- A silage pad catchment of 800 m^2 is entered under "Other catchments."
- A winter/spring irrigation depth of 2 mm has been used. This reflects the predominant use of the trailing shoe slurry tanker to discharge slurry effluent from the storage pond, which can apply effluent to a depth of 1 mm if required. By applying effluent 20 m^3/hectare the slurry tanker applies slurry effluent to a depth of 2 mm. It is noted that a low depth travelling irrigator is also used to apply dairy shed effluent when there is sufficient soil moisture deficit.
- FDE area is split to reflect Drummond/Glenelg (low risk) and Braxton (high risk) soils at the milking platform and the Horner Block. Conservatively 50 hectares of low risk soils has been entered.

WOL and WTL - Effluent irrigation

Primary irrigation methods – low depth travelling irrigator

A low depth travelling irrigator system is used to apply dairy shed effluent to land at a depth of less than 10 mm per application. Two travelling irrigator systems are on farm, with one connected to each dairy shed. Both have been tested as per consent conditions and apply effluent at a depth of < 10 mm per application. See the Appendix for reports from testing each travelling irrigator.

The travelling irrigator systems have a safety system, which automatically switches the system off in the event of an effluent system failure, such as irrigator stoppage or breakdown.

Primary irrigation methods – low depth slurry tanker with a trailing shoe

A low depth slurry tanker with a trailing shoe is used to apply pond slurry at a maximum depth of 2.5 mm per application. 2.5 mm is the maximum depth proposed as a consent condition.

It can apply slurry to depths as low as 1 mm depending on tractor speed. The applicants own a slurry tanker with a trailing shoe, which has a GPS system. The area and travel speed are monitored using the on-board GPS system. At a travel speed of 8-9 km/hour, the per hectare loading is 20 m^3, which gives a depth of 2 mm. By speeding up the tractor speed, the application depth of lowered further. The capacity of the slurry tanker is 24 metres cubed.

The trailing shoe part of the slurry tanker sits on the ground. It applies sludge at ground level and generates minimal aerosol and odour. It was invented in Europe to reduce adverse odours from the application of slurry/sludge to land, which is standard practice due to the housing of cows in barns over winter. It is regarded to be an effective odour minimisation technology and is best practice for slurry/sludge application. Its use will help to avoid adverse odour effects on neighbouring properties.

Contingency method – umbilical system

An umbilical system is used as a contingency irrigation method, with a maximum depth per application of pond slurry of 3.0 mm.

Future proof – low rate irrigation

It is proposed to future proof the discharge activity by including low rate irrigation. The applicants may install a low rate system such as pods or a cannon/rain-gun system in the future. Both systems will apply dairy shed effluent at a maximum rate of 10 mm/hour and a maximum depth of 10 mm per application.

By including both systems in the permit, the applicants will have flexibility when deciding which system is most suitable, while at the same time being able to assure Environment Southland via consent conditions that the new system will discharge effluent at low rate (< 10 mm/hour).

The system will only be plumbed to land authorised to receive liquid effluent (a.k.a. dairy shed effluent) on the discharge permit/Appendix 1 Discharge Map. If installed, the applicants intend to use a low rate system at times when the soil moisture deficit is too low to safely use the travelling irrigators. E.g. in the shoulders of the season, or in June and August if conditions are suitable/there is sufficient soil moisture deficit to irrigate at depths of 3 – 5 millimetres. The travelling irrigators would still be used over summer/early autumn when the soil moisture deficit is generally greater and irrigation of effluent at depths of less than 10 millimetres can be carried out without risk of drainage.

Note: The nutrient budgeting, proposal details and AEE used the high rate travelling irrigator as the primary irrigation system for dairy shed effluent. The low rate systems are regarded as best practice by Environment Southland, and as such will have similar or lesser effects as the high rate travelling irrigator system.

Other conditions

- A minimum return period of 28 days between applications;
- A maximum of 150 kg of N/hectare from effluent (dairy shed and pond slurry) applied at the dairy farm (WOL and WTL units).
- A maximum of 250 kg of N/hectare from effluent (pond slurry) is applied at the Horner Block.
- A maximum combined depth of application of 25 mm per year for dairy shed effluent to any land area, and
- A minimum land area of 8 hectares/100 cows for the dairy shed effluent.

WOL and WTL - Contingency measures

The aim is to operate the irrigation systems to always ensure there is buffer storage available. This allows a contingency for wet weather or pump failure.

The umbilical system may be used as a contingency irrigation method. The umbilical system will apply effluent at a maximum depth of application of 3 mm for each individual application.

Should the irrigation pump at either the WOL or WTL dairy sheds fail, a replacement pump is available within 12 hours. Alternately a petrol motor-driven or tractor driven pump could be hired. There is adequate storage to allow time for pump replacement.

Nutrient content of effluent

Dairy shed effluent

The nutrient content of dairy shed effluent has not been tested but is expected to be in line with typical dairy shed effluent (Longhurst, Rajendram, Miller and Dexter (2017)). An estimate for nutrient content of typical dairy shed effluent based on the above reference is as follows:

- 250 g/m^3 N
- 30 g/m^3 P
- 300 g/m^3 K
- 15 g/m^3 S

Discharging dairy shed effluent at a depth of 10 mm applies 25 kg of N/hectare, and 30 kg of K/hectare. Where the application depth is 9 mm, approximately 22.5 kg of N is applied per hectare.

Table 6.1. N loading from dairy shed effluent

	Dairy Shed
Number of cows	1,500
Nitrogen collected based on 50 L effluent per cow per day	0.013 kg N/cow/day
Daily nitrogen produced	19.5 kg N/day
Maximum days used per year	300
Annual nitrogen produced	5,850 kg N/year
Minimum annual size of discharge area (ha)	220 ha (WOL + WTL)
Annual nitrogen loading rate	26.6 kg N/ha

Wintering barn effluent

The nutrient concentration of wintering barn effluent is higher than dairy shed effluent due to lack of dilution and the housing of cows in the barns for up 24 hours per day. Slurry effluent in the ponds is predominantly composed of wintering barn effluent, with minor dilution from rain falling on the pond and dairy shed effluent, which is diverted to the ponds when ground conditions are unsuitable for irrigation.

The nutrient content of pond effluent (slurry) was tested as part of a 2011 AgResearch study "Characterising dairy manures and slurries – Case study 15." The nutrient content of slurry at the applicant's pond was measured at:

- 3,200 g/m^3 N
- 800 g/m^3 P
- 4,400 g/m^3 K
- 400 g/m^3 S

Applying 15.2 m^3/hectare applies slurry effluent at a depth of 1.5 mm. Discharging slurry effluent at 15.2 m^3/hectare applies:

- 49 kg of N;
- 12 kg of P;
- 69 kg of K; and
- 6 kg of S.

Slurry effluent is applied at the Horner Block and at the dairy platform.

The Horner Block is a cut and carry block used to grow feed for cows. Given the use of the Horner Block for grass harvesting, slurry effluent from WOL and WTL is applied at very low depth as fertiliser, and grass is harvested and fed to cows at WOL and WTL. Cows are not grazed at the Horner Block, so a higher slurry loading can be applied without the potential risk of adverse animal health effects due to excessive K levels. Nitrogen fertiliser is reduced accordingly at both the Horner Block and at the dairy platform to account for the N loading from slurry. Adverse N-related environmental effects are further avoided through the application of pond slurry at very low depths (less than or equal to 2.5 mm per application and typically at 1.5 – 2.0 mm depth per application).

E.g. Slurry effluent applied at 1.5 mm depth by applying 15.2 m^3/hectare, will apply 49 kg of N/hectare. Four further applications at 1.5 mm depth more than 28 days apart will apply a further 196 kg of N/hectare. Five applications at 1.5 mm depth each will apply a total of 243 kg N/hectare, which is less than the 250 kg N/hectare proposed limit for the Horner Block.

One application of slurry effluent at a similar depth and rate per hectare is also applied at the dairy platform.

Slurry volume

Slurry volume is estimated based on the volume of wintering barn effluent (6,212 m^3), rainwater on the ponds' surface (606 m^3 for WOL, 912 m^3 for WTL) and an allowance for dairy shed effluent diverted to the ponds (2,400 m^3) given the presence of low risk soils and use of very low depth application using the slurry tanker/trailing shoe, which results in a large number of irrigation days available. The area available at the Horner Block (97 ha) and dairy platform (> 180 ha) is sufficiently large to receive the volume of slurry.

Effluent discharge and receiving area

See table 1.1 for details of land areas within the FDE area.

Effluent irrigation to the discharge areas is carried out between August and May, and if ground conditions permit in June and July as necessary. As per existing consents, the effluent receiving area encompasses most of the dairy farm and the part of the Horner support block (c.97 hectares), less Council required buffers around waterways, bores, neighbouring dwellings, boundaries etc.:

- 20 metres from any surface watercourse;
- 100 metres from any potable water abstraction point;
- 20 metres from any property boundary (unless the adjoining landowner's consent is obtained to do otherwise);
- 200 metres from any residential dwelling other than residential dwellings on the property;
- Dairy shed effluent shall not be discharged onto any land area that has been grazed within the previous 5 – 10 days;
- Effluent shall not be discharged to leased land described as Lot 1 DP 451158, Lot 1 DP 13077 and Lot 1 DP 9925;

- Effluent shall not be discharged where the soil has cracked, and
- Effluent shall not be discharged over tiles or mole drains when the soil is at field capacity.

Allowing for the above buffers, a conservative estimate for the size of the effluent discharge area is c.350 hectares at WOL and WTL, and c.97 hectares at the Horner Block, which gives a total FDE area of 447 hectares. Given the presence of Drummond and Glenelg soils, there are significant areas of low risk (for FDE) soils.

At an operational level:

- Dairy shed effluent from WOL and WTL units will continue to be discharged via travelling irrigator at low depth at the WOL and WTL platforms, in the future a low rate irrigation system may be installed;
- Slurry effluent will be discharged at very low depth via slurry tanker (or umbilical system) at the WOL and WTL dairy platform. This includes land referred to as the SH96/Marcel Block. A maximum of 150 kg N/ha/year from effluent (slurry and dairy shed) will be applied at the dairy platform;
- Slurry effluent will be carted via slurry tanker and discharged at low depth at the Horner Block. Approximately 97 hectares is available at the Horner Block for this purpose (see figure 6.7). A maximum of 250 kg N/ha/year from effluent (slurry) will be applied at the Horner Block.
- The slurry effluent areas at the milking platform (WOL and WTL) and at the Horner Block are sufficiently large to receive both the volume and N loading from the effluent ponds.
- Effluent will not be discharged at times where there is snow on the ground or when rainwater/irrigation water has ponded on the land surface.
- Effluent will also not be discharged when soil conditions are considered unsuitable i.e. when soil temperature is at or below 5 degrees Celsius or when the soil moisture deficit is insufficient. Environment Southland's Beacon website will be consulted as a guide to soil moisture levels.

Figure 6.7 Horner support block with slurry effluent area annotated in purple.

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Horner Block – slurry receiving area

Land use

The land is used as for cut and carry, and to discharge slurry effluent. No stock is grazed at the block so there is no nutrient loss from urine patches. Cut and carry block are used to grow grass only with typically 4 cuts per season. Relatively high N inputs are required to achieve this. In this case fertiliser and slurry provide N. Cut and carry blocks are efficient at utilising N and generally have low N loss to water despite relatively high N inputs.

The block (160 ha) will continue to be managed as it has been managed in recent years. A general description of how the block will be managed is as follows:

Cut and carry

- Pasture renewal - the pasture renewal programme is by grass to grass cultivation. Approximately 5% is re-grassed each year.
- Grass (approximately 17 t DM/ha) is harvested and is purchased by dairy farms in the Woldwide Farming Group (including WOL and WTL). Some grass harvested is fed fresh or is stored as silage and fed to cows at wintering barns at WOL and WTL.

Slurry

WOL/WTL slurry receiving area: 97 hectares

WOL/WTL N loading: 5 applications of slurry at 15.2 m^3 per hectare per application = 243 kg N/ha from slurry

Woldwide Three: 57.5 hectares (not part of this application)

General fertiliser use

For a detailed fertiliser programme, please see the nutrient budget inputs. N, P, K and S are applied as follows:

- N (207 kg/ha – split applications, little and often)
- P (10 kg/ha)
- K (0)

Fertiliser is applied outside high risk months (i.e. May – July). If ground conditions are suitable and there is minimal risk of drainage, fertiliser can be applied in August.

Downstream users of groundwater

- Farmland is found due south of the HB. Downstream users of groundwater are farms (sheep, dairy and cropping).
- Drummond Township is located ~ 9 km to the south east of the HB so has domestic users of groundwater including Drummond Primary School and Drummond Kindergarten. Both are located at the south of the township.

6.3 Water Take

Groundwater is abstracted from three bores on the property for use at the dairy sheds and to supply stock drinking water. The bores are over 100 metres apart. Two bores supply groundwater to the WTL dairy platform, one bore supplies groundwater to the WOL platform. **The maximum volume of groundwater abstracted for 1,500 cows will be 180 meters cubed per day.** This is abstracted as follows:

> **WOL -**The bore (well ID E45/0071) is located to the west of the dairy shed and supplies water via a submersible pump to three tanks (3 x 30,000 litres) at the dairy shed for stock drinking water and dairy shed use. The abstraction for WOL is currently managed under Water Permit 301664. **It is proposed to increase the groundwater take to meet the needs of 700 cows milked through the WOL dairy shed.** The proposed groundwater take at the WOL dairy platform is 84,000 litres per day.
>
> **WTL** - Two bores (well ID E45/0727 and E45/0083) supply groundwater for dairy use; one is adjacent to Wreys Bush Highway north of the dairy shed, and the other is on the west side of the dairy shed. The two bores supply water via submersible pumps to three tanks (3 x 30,000 litres) at the dairy shed for stock drinking water and dairy shed use. The abstraction for WTL is currently managed under Water Permit 20171278-02. **The proposed groundwater take at WTL will continue to meet the needs of 800 cows milked through the dairy shed.** The proposed groundwater take at WTL dairy platform is remaining at 96,000 litres per day.

Groundwater use equates to 120 litres per cow per day and is in line with the Council's standard estimate for water usage (i.e. 70 litres per cow per day for drinking water and 50 litres per cow per day for dairy shed washdown).

Water requirements

Season

During the milking season (twice per day milking), requirements are 70 l/cow/day for drinking water and 50 l/cow/day for dairy shed wash down water:

1,500 cows x 120 l/day = 180,000 litres per day

180,000 litres per day is split between the WOL (84,000 litres per day) and WTL (96,000 litres per day) dairy units.

An average lactation length is 280 days.

280 days x 180,000 litres per day = 50,400,000 litres

Off season

Cows remain on-farm over winter when they are housed in two wintering barns. An average lactation length for cows is 280 days, which leaves an average of 85 days when cows are dry. A drinking water allowance for dry cows is 45 l/cow/day. On average 1,280 cows require drinking water in the off season for 85 days:

1,280 cows x 45 l/day x 85 days = 4,896,000 litres for the off season.

Total volume of groundwater required

55,296,000 litres or 55,296 metres cubed

Extraction

Groundwater is abstracted from three bores over 50 metres apart from each other, which ensures that the abstraction rate will be less than 2 L/sec.

Average daily rate of take (WOL)	0.97	litres per second
Average daily rate of take (WTL)	1.11	litres per second
Maximum daily rate of take	2.0	litres per second
Maximum daily volume	180	cubic metres per day
Maximum weekly volume	1,260	cubic metres per week
Maximum monthly volume	5,400	cubic metres per month (30-day month)
Maximum annual volume	55,296	cubic meters

The bores are over 50 metres apart from each other. The bores are not within 700 metres of a neighbouring bore or groundwater take.

The dairy supply bore map references (NZTM2000) are:

E45/0083	E1225011	N4889693
E45/0727	E1225014	N4890268
E45/0071	E1225145	N4888768

Water storage

Three water storage tanks (3 x 30,000 L) are utilised at WOL's dairy shed to ensure that the rate of take is less than 2 L/sec.

Three water storage tanks (3 x 30,000 L) are utilised at WTL's dairy shed to ensure that the rate of take is less than 2 L/sec.

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6.4 Land-use – Dairy farming

Land use activities – dairy platform

Land use

The land is used as a pasture based dairy farm. Calving officially starts on 1 August and cows are typically milked from 1 August to 31 May, with late calving cows milked until 15 June. Cows (Friesan) are milked twice per day.

A general description of proposed dairy management system follows:

Stock management

- Up to 1,500 cows (i.e. mixed age cows and replacements) are calved each year. The milking herd peaks in October/November at 1,500. It drops slightly over consecutive months depending on seasonal variation in pasture production; approximately 1,380 cows are milked in March. Cows are dried off in May and June. Approximately 270-330 cows are culled and replaced each year.
- Median calving date is 20 August with approximately 330 heifer calves kept as replacements. Calves are on farm for August, September and October. Weaned R1 heifer calves go to Woldwide Runoff.
- Approximately 300 in-calf R2 heifer replacements return to the farm for calving each year. Replacements calve in August, September and October and join the milking herd.
- Approximately 15 bulls are grazed on farm and used as part of the mating programme each year.

*Woldwide Runoff comprises the Merrivale and Merriburn blocks and is described in an accompanying report. A replacement rate of 22 – 25 % is maintained.

Wintering, cropping, grazing and supplements

- Wintering – all cows are wintered on farm where they are housed in two wintering barns over June and July. Cows are housed in wintering barns during May, August and September as required also.
- Fodder crop – no fodder crops (brassica or beet) are sown. Animals are not wintered on crop nor grazed in paddocks on fodder crop at any other time.
- Pasture renewal - the pasture renewal programme is by grass to grass cultivation. Approximately 5% of the farm is re-grassed each year.
- Grazing – cows are grazed on pasture throughout the season. The wintering barns are used to stand cows off paddocks during high risk inclement weather events.
- Supplements made – If there is a surplus, silage may be harvested at the dairy farm. There is no dedicated silage block, however, and in general silage is imported.
- Supplements imported – barley, molasses, PKE and grass silage (see nutrient budget inputs)

General fertiliser use

For a detailed fertiliser programme, please see the nutrient budget inputs. N, P, K and S are applied as follows:

Effluent block:

- N (139 kg/ha – split applications, little and often)

- P (25 kg/ha)
- K (0)

Slurry receiving area:

- N (179 kg/ha – split applications, little and often)
- P (22 kg/ha)
- K (0)

Non-effluent blocks:

- N (209 kg/ha – split applications, little and often)
- P (34 kg/ha)
- K (28 kg K/ha)

Fertiliser is applied outside high risk months (i.e. May – July). If ground conditions are suitable and there is minimal risk of drainage, fertiliser is applied in split applications from August to April.

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Good Management Practices

Good management practices (GMPs) implemented on farm are also described in the FEMP. A general strategy of good management practice is undertaken on farm. Details are described in table 6.2 below. Key mitigation measures (distinct from GMPS) are described in table 6.5.

Evidence of sustainable soil and nutrient management is clear in trends in soil testing across the property over many years. See the Appendix for reports from Ravendown supporting good practice management of farm soils and farm fertility.

Table 6.2 General Good Management Practices

Strategy Type	Summary of Management Practices
Operational	Utilising a nutrient management plan; Soil testing is carried out each year to inform on decision making regarding fertiliser application; Trends in soil testing are evaluated and used to inform on decision making regarding soil health, fertiliser and agronomy plans; Surface waterways are fully fenced and with good grass cover, fencing is maintained and stock are excluded from the riparian areas; Wide riparian buffers are maintained; All surface waterways are culverted; Sufficient land area is available for the dairy operation; Young stock is grazed off farm from weaning; Cows are wintered in barns over June and July; Good winter grazing management practice of R2 heifers is implemented*; Tracks and lanes predominantly sited away from streams; Lane runoff diverted to land; Good management practice of the silage pad is implemented; Restricted grazing of draining pastures in autumn/spring; Specialist machinery is used to harvest grass to minimise the risk of soil compaction; Care in irrigation of FDE, especially when the ground is near or at field capacity; A large land application area is available to ensure N & K returns are not excessive, taking into account the higher strength nature of slurry effluent;

	Effluent volumes are minimized at source through efficient water use; Appropriate application depths for effluent and slurry are used; Appropriate FDE storage volume to allow for deferred irrigation for FDE; All data and maps are kept up to date and all staff are trained and informed of any changes; Programmed maintenance is done in and around FDE, and piping infrastructure around the dairy shed, silage bunkers, cow yards etc.;

*Winter grazing of R2 heifers at the WOL/WTL dairy platform will no longer occur from June 2019 as a mitigation measure.

Good Management Practices for Key Transport Pathways

See table 6.3 below for a summary of physiographic zones and key transport pathways of contaminants.

Table 6.3 Physiographic zones and key transport pathways

Physiographic Zone	Variant	Key Transport Pathways
Central Plains	n/a	Artificial drainage, deep drainage
Oxidising	n/a	Deep drainage

The dairy farm is classed in the Oxidising and Central Plains physiographic zones. The Horner support block also is classed both in the Oxidising and Central Plains physiographic zones.

Both physiographic types are susceptible to nitrate accumulation in soils and aquifers. Nitrates are transported to the underlying aquifer via deep drainage. Central Plain's type soils (Braxton) have risk of nitrate and contaminant (pathogen) loss to groundwater via deep cracks that can form in silty clay soils over extended dry summer periods. Subsequent heavy rainfall can transport nitrate or microbes down to the underlying aquifer. There is risk of contaminant loss (nutrients N and P, sediment and microbes) to surfacewaters via artificial drainage in Central Plain's type soils following heavy or prolonged rainfall.

Given the very flat topography and the tendency of soils to have good phosphorous retention, there is low risk of contaminant loss to surface waters via overland flow. Any risk of contaminant loss to surface waters from tracks and lanes via overland flow is mitigated by good management of areas where tracks and lanes are close to surface waters.

Recommendations described on Good Practice Management factsheets issues by Environment are implemented where practical. These measures will be reviewed annually with the inclusion of new measures where appropriate. Table 6.4 describes good management practices, which have been implemented on-farm through most recent annual cycle to mitigate the risk of contaminant loss to water (N, P, sediment and microbes).

Reference factsheets: Artificial drainage; Deep drainage; Overland flow

Table 6.4 Good management practices implemented on farm and further explanations.

Transport Pathway	Mitigation Measure	Summary of Management Practices
Artificial drainage, Overland flow	Protect soil structure (especially near streams)	Match stock management to land use capability, e.g. avoid grazing cows on more vulnerable soils, especially when wet. Fence off waterways. Stock will not graze riparian strips. Riparian strips are large and well vegetated; Cows are wintered off paddocks in wintering barns; When appropriate use minimum or no-till cultivation practices such as direct drilling; Use best practice winter grazing (young stock)*; Re-sow areas of bare or damaged soil as soon as is practical;
Artificial drainage, Overland flow	Reduce P use or loss	Prepare a nutrient budget; Soil test regularly; Maintain Olsen P values at agronomic optimum and no higher; Apply P fertiliser outside of high-risk months in autumn and winter; Manage CSAs close to surface drains appropriately; Where winter grazing occurs (young stock), implement best practice management*;
Artificial drainage, Deep drainage	Reduce accumulation of surplus N in the soil, particularly during autumn and winter	Maintain sustainable stocking rate; Reduce inputs of N where possible through optimal fertilizer application on farm, use little and often approach; Cows are wintered off paddocks in wintering barns; Where winter grazing occurs, implement best practice management;

		Optimize timing and amounts of effluent irrigation input applications, accounting for higher strength nature of slurry effluent; Substitute autumn diets with low-N feed when practical; Time N application to meet pasture demand using split applications and when pastures are actively growing (>6 degrees Celsius); Control the duration of grazing pastures; Cut and carry feed where practical;
Artificial Drainage Deep drainage	Avoid preferential flow of effluent through drains or soil cracks	Defer irrigation to effluent storage ponds when soil conditions are unsuitable; Very low depth slurry application is implemented; Low depth dairy shed effluent application is implemented; Avoid applying slurry or dairy shed effluent where soils are cracked; A sufficiently large FDE area is available for effluent; Observe buffer zones and placement guideline;s Observe discharge consent conditions;
Overland flow	Manage CSAs; low areas overlying tiles close to outfalls at surface drains	Restrict grazing of pasture CSAs when soils are near saturation; Avoid working pasture CSAs and their margins; Move troughs and gateways away from water flow paths; Reduce runoff from tracks and races;
Deep drainage	Avoid loss of contaminants (nitrate and faecal microbes) to groundwater via deep cracks formed in summer dry	Monitor paddocks for deep cracks in summer/autumn. If and where they form, avoid grazing the area and irrigating effluent to the area; Avoid deep crack formation by maintaining good soil structure and good pasture cover;

	periods in Braxton soil types.

*Winter grazing of R2 heifers at the WOL/WTL dairy platform will no longer occur from June 2019 as a mitigation measure.

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Specific Mitigation Measures – Expansion

As is described in the nutrient budget section, the change to the 1,500-cow system in conjunction with the implementation of key mitigation measures is predicted to result in a small decrease in average annual N and P losses to water for the WOL/WTL dairy platform. Some key mitigation measures are not recognised by Overseer so will further reduce N and P loss, although this is not recognised by Overseer. P loss is used as a proxy for sediment and microbial loss.

Key mitigation measures are described in table 6.5, along with their effectiveness and level of effectiveness.

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Table 6.5 Specific mitigation measures proposed for the dairy farming activity, their effectiveness and assessed level of effectiveness.

No.	Specific mitigation measures proposed for N, P, sediment and microbial contaminant loss.	Effectiveness of mitigation measure	Level of effectiveness
1	Continued development of soils and pastures through grass to grass cultivation methods and a focus on sustainable agronomy;	Over time this leads to increased soil organic matter content, water holding capacity and improved soil structure and consequently less N, P, sediment and microbial contaminant loss in artificial drainage, runoff and less N loss to groundwater.	High – this measure mitigates N, P, sediment and microbial contaminant loss and is implemented across the entire dairy farm.
2	No land cultivated into fodder crop and intensively winter/summer grazed;	Nutrient (N and P) loss from fodder crop blocks is high due to mineralisation processes in soils and inputs of nutrients from animal dung and urine. Eliminating these practices is effective at reducing nutrient losses via deep drainage, artificial drainage and to less of an extent, overland flow pathways in the future. Sediment and microbial contaminant loss from fodder crop blocks is high due to soil compaction, pugging and breakdown of the soil structure, and inputs of faecal microbes from animal dung and urine. Eliminating these practices is effective at reducing nutrient losses via artificial drainage and to less of an extent, overland flow pathways in the future.	High – where intensive winter grazing is carried out on free draining soils, N loss to groundwater is high. P, sediment and microbial contaminant loss is also high where soils are pugged.
3	Expansion of the size and use of the wintering barn facilities	An additional 225-240 animals (cows/R2 heifers) will be wintered in the WOL wintering barn. Both barns will be used more in the shoulders of the season (May, August and September) than they have been in the past. This is effective as effluent that would otherwise be deposited on paddocks at high risk times is captured and stored; less pugging of soils and accumulation of N in soils at high risk times occurs. The barns will be also used to stand cows off during inclement weather events during the season, which will also reduce soil damage.	High – reduces both N and P loss. Also reduces sediment and microbial contaminant loss.

4	More efficient use of N fertiliser, e.g. effluent block will have less N fertiliser applied than non-effluent block;	This is effective at reducing N loss to water in drainage events following fertiliser application.	Moderate – the reduction in N loss will be seen across part of the dairy platform
5	Increasing the N loading from slurry to the cut and carry Horner Block (HB) to 250 kg N/ha/year;	The use of the wintering barns generates a high volume of nutrient rich slurry. Increasing the N loading from slurry at the HB allows nutrients in slurry to be used efficiently as fertiliser with low risk of N loss to groundwater. Plants take up N efficiently from slurry applied at very low depth while N fertiliser application is reduced accordingly to ensure the input of N overall is sustainable. Since there is no grazing of stock at the HB there are no urine patches, which otherwise leach N at high rates from urine, slurry and fertiliser. Grass harvested at the HB is fed to cows at WOL/WTL.	Moderate – reduces both N and P loss and microbial contaminant loss at the WOL/WTL dairy platform
6	Conditioning very low depth application of slurry with the trailing shoe slurry tanker;	In recognition of the high strength nature of slurry and avoiding the overloading soils with N and microbes from slurry, this is effective at providing Environment Southland with certainty that slurry will be applied at less than or equal to 2.5 millimetres depth per application. In practice, an application depth of 1.5-2.0 millimetres per application will be used when applying slurry with the slurry tanker with the trailing shoe.	Moderate – reduces both N and P loss, and microbial contaminant loss
7	Lane CSA adjacent to WOL wintering barn to be assessed and remedial work carried out *see below for further details	The cow lane in between WOL's wintering barn and a stream will be assessed for risk of runoff from the lane to the stream. Where necessary the lane will be reshaped so that it will drain away from the stream towards the free stall barn. A large quantity of gravel is on-hand to use for lane re-shaping if necessary.	Moderate – this measure will prevent a potential point source discharge of nutrients N and P to surfacewater

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8	Eliminate direct contamination of house bore (45/0622), which is also used by ES at a monitoring bore;	Measures to eliminate contamination of the bore will be implemented: the casing will be extended far enough above ground level to ensure stormwater cannot enter the well. A sloping concrete pad will be placed around the casing. Any holes in the well liner will be sealed, the piping and fittings will be serviced, and any leaks will be repaired.	Minor – this will prevent localised contamination of groundwater with N and P;
9	Olsen P levels are slightly below optimum level. Once target Olsen P levels are achieved, P fertiliser will be applied to maintain Olsen P levels within optimum range. Target Olsen P levels are 30.	This will avoid the loss of excess P to water in artificial drainage and runoff following prolonged wet periods	Moderately effective for mitigating P loss across farm.
10	Tracks/lanes managed to reduce runoff to streams;	Overseer assumes that 30% of P that lands on all tracks/lanes ends up in waterways. Given the farm layout (many tracks and lanes do not run close/adjacent to waterways) and management of track/lanes and associated buffers, P loss as assumed by Overseer is reduced. The farm has been operated as a dairy farm for many years. No new lane development is required to allow for expansion.	Highly effective for mitigating P, sediment and microbial contaminant loss.

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FURTHER INFORMATION REGARDING MITIGATION MEASURE #7

Two lanes lie adjacent to a stream close to the WOL wintering barn (see figure 6.7). Only one of these lanes (i.e. the east side lane), however, is used for cow traffic to the milking shed. The other one (i.e. west side lane) is solely used to truck silage in and for truck access to the cattle yards to load and unload stock. Cows do not use the west side lane so it only collects rainwater. Since there is no cow traffic on the west side lane, there is no risk of runoff of contaminants (containing phosphorous) from dung or urine to the stream.

Figure 6.7 Aerial photo of stream flanked by two lanes at WOL, close to wintering barn and north of milking shed.

The lane east of the stream has cow traffic, as seen in figures 6.8 – 6.10 below. The stream has wide buffers and is flanked on both sides by long grass. The water flowing in the stream appears clear, which is noteworthy as the photos were taken after 40 mm of rainfall in the previous week. The wide and well vegetated riparian buffers will filter run-off, trapping contaminants such as phosphorous and microbes, thereby helping to mitigate the risk of any contaminants reaching the stream via overland flow.

Additional mitigation due to increased cow numbers: The east lane will be visually assessed for risk of runoff from the lane to the stream. Where necessary the lane will be reshaped so that it will drain away from the stream, towards the free stall barn. A large quantity of gravel is on hand, which will be used for lane reshaping if necessary. This mitigation strategy will be incorporated into the FEMP as a good management practice for this location, following review of the FEMP at the end of the 18/19 season.

Figure 6.8 Stream flanked by two lanes. Wide buffers with long grass flanking the stream are present on both sides of stream. Note that photo was taken from the north/facing south.

Figure 6.9 Cows walking to milking shed on lane east of stream. Clean unused lane visible on west side of stream. Note that photo was taken from the north/facing south.

Figure 6.10 Cows crossing waterway over culvert to walk to the dairy shed on the east lane. Please note the wide buffers with long grass flanking the stream on both sides.

N loss – as predicted by Overseer

The key drivers of the small decrease in N loss are as summarised follows:

- Removal of summer and winter crop;
- Removal of cows wintered outside on crop or grass;
- Expansion of size and use of wintering barn facilities;
- More efficient use of N fertiliser.

N losses from crop blocks are driven by fertiliser and effluent application, as well as mineralization processes associated with cropping. The proposed 1,500 cow system has no fodder crops grown annually going forward. The effect of this is to reduce the average N loss slightly, despite increasing cow numbers by 160.

P loss – as predicted by Overseer

The key drivers of the small decrease in P loss are summarised as follows:

- Decrease in winter crop area;
- Maintaining Olsen P at target level of 30;
- Expansion of size and use of wintering barn facilities.

The average annual P loss is predicted to decrease slightly despite an increase of 160 cows. The key measures that will mitigate P loss also will help to mitigate the loss of sediment and microbial contaminants to water, as they are generally transported to water via artificial drainage and overland flow also.

Other mitigation measure for P loss

There are other measures that mitigate P, sediment and microbial contaminant loss that are not modelled by Overseer; preventing overland flow from critical infrastructure to surface waterways following periods of heavy rainfall, greatly reduces the propensity of a pathway that transports P (and sediment and microbes) directly to surface waterways. P remains on lanes and/or is returned to adjacent paddocks. These measures include:

- Only a small proportion of lanes run parallel to or close to waterways. This greatly reduces the risk of runoff from tracks and lanes into waterways. Overseer does not take the layout of individual farms into account, however.
- Herd movement is managed to minimise the time cows spend on lanes and other tracks, especially where there is a risk of runoff to waterways;
- Minimise the number of culvert/bridge crossings of waterways, where run-off from tracks and lanes can reach surface waterways. Any locations where run-off could potentially occur are identified as CSAs and managed to minimise the risk of runoff occurring. Track shaping and cutting is carried out to direct surface drainage at such locations to paddocks and away from waterways. If necessary, nib boarding is put in place. Runoff is filtered before draining to waterways.

Due to the suite of measures mentioned above, there will be less soil disturbance and pugging, and less runoff from lanes, tracks etc. to waterways; less P, sediment and microbial loss to receiving surface waters will occur. Potential losses associated with the expansion are fully mitigated in line with Policies 5, 10 and 16 of the pSWLP.

Review

A review of good management practices and mitigation measures will be carried out annually. Practices undertaken in the previous 1 June to 31 May period will be reviewed and practices will be implemented over the following 1 June to 31 May as appropriate.

Nutrient budgets

Seven nutrient budgets (NBs) have been prepared:

- Four pre-expansion nutrient budgets have been prepared based on actual figures for 2013/2014, 2014/2015, 2015/2016 and 2016/2017 years. A high level of evidence has been provided to support inputs used for all year end nutrient budgets.
- One nutrient budget has been prepared to reflect the proposed 1,500 cow dairy farm.
- Two nutrient budgets for the Horner Block (one current and one proposed).
    - Environment Southland have since been advised via a legal opinion that the Horner Block is not required to be on the land use consent for farming; as such nutrient budgets are not needed. Since nutrient budgets were already prepared for the Horner Block, they will be used to inform of the effect of the proposed activity.

Cain Duncan (CNMA) from Farm Source Sustainable Dairying carried out all Overseer work in May/June/July 2018. Soil nutrient test data, the latest version of the Overseer model (ver. 6.3.0) and Overseer Best Practice Data Input Standards from March 2018 were used. Associated XML files have been submitted electronically.

Table 6.6 Overseer files

Number	Year	XML file name
1	2013/2014	Ovr-Woldwide 1,2 & 96 13_14.xml
2	2014/2015	Ovr-Woldwide 1,2 & 96 14_15.xml
3	2015/2016	Ovr-Woldwide 1,2 & 96 15_16.xml
4	2016/2017	Ovr-Woldwide 1,2 & 96 16_17.xml
5	Proposed dairy platform	Ovr-Woldwide 1&2 Proposed (Mitigations & Slurry).xml
6	Current use - Horner Block	Ovr-Horner Block –Current.xml
7	Proposed use - Horner Block	Ovr-Horner Block – Proposed.xml

Mr. Duncan also prepared an in-depth nutrient budget analysis report, which is submitted with this application. Rather than duplicate material, please refer to the appended nutrient budget analysis report for assumptions and a summary of inputs for each nutrient budget:

- Assumptions: Sections 5, 6 and 7
- Inputs: Section 9, 12

Nutrient budgets 1 – 7 from the above table contain the same land areas: former WOL milking platform, former WTL milking platform, Marcel Block and SH96 block.

It is noted that where the nutrient budget report by Mr. Duncan states that the land area is being increased by bringing in support land, this refers to the SH96 and Marcel Blocks, which were consented for dairy farming as parts of WTL's land use consent issued in 2017.

Mr. Duncan has also prepared detailed maps and a summary for each individual nutrient budget as part of the report.

Potential Nutrient Losses as Modelled by Overseer

PRE-EXPANSION

Table 6.7 Modelled nutrient losses for pre-expansion year end nutrient budgets (source: Nutrient Budget Analysis Report).

	13/14	**14/15**	**15/16**	**16/17**	**Average**
Total N Loss (kg)	19053	23016	19111	20723	20476
N Loss/ha (kg)	40 (15)	46	38	41	41
N Concentration in Drainage (ppm)	7.3 - 12.9 (Pastoral) 16.4 - 27.1 (Crops) 5.9 – 12.5 (Silage/WGYS)	9.9 – 15.7 (Pastoral) 13.5 - 17.6 (Crops) 5.9 – 9.5 (Silage/WGYS)	7.3 – 14.3 (Pastoral) 13.1 - 18.8 (Crops) 4.0 – 9.8 (Silage/WGYS)	8.5 – 15.3 (Pastoral) 18.0 - 23.8 (Crops) 2.9 – 7.5 (Silage)	
Total P Loss (kg)	345	374	362	357	360
P Loss/ha (kg)	0.7 (0.2)	0.7	0.7	0.7	0.7
Pasture Grown Kg/DM/ha/yr (Dairy Platforms)	15,003	15,483	15,089	15,909	15,371

POST-EXPANSION

Table 6.7 Modelled nutrient losses for post-expansion nutrient budget (Source: nutrient budget analysis report).

	Proposed Dairy Unit

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Total N Loss (kg)	20,205
N Loss/ha (kg)	40
N Concentration in Drainage (ppm)	Pastoral – 7.7 to 17.1 ppm
Total P Loss (kg)	356
P loss/ha (kg)	0.7
Pasture Grown Kg/DM/ha/yr	15,391

Discussion – nutrient losses predicted by nutrient budget analysis:

N LOSS – DAIRY PLATFORM

The pre-expansion average annual N loss based on four years of supported data and analysis is 20,476 kg/year. The proposed 1,500 cow dairy farm is predicted by Overseer to have an average N loss of 20,205 kg/year. Overseer predicts an average reduction in N loss of 271 kg/year with the change to the proposed system. The N loss per hectare value for the proposed 1,500 cow farm (40 kg/year) is predicted to reduce slightly relative to the pre-expansion land use (41 kg/year).

This decrease is mainly driven by the removal of forage brassica and beet winter and summer crops, and their associated grazing, the removal of pasture grazing in winter, greater use of the wintering barns and more efficient fertiliser use. Soil aggregates are broken up and mixed when cultivated for cropping. This results in a high rate of N mineralisation through accelerated microbial decomposition of soil organic matter and subsequent rapid nitrification, which produces large quantities of nitrate. Dung and urine are deposited in relatively high volumes on winter crop ground, further driving losses of N. Greater use of the wintering barn facilities allows the collection and storage of nutrients in dung and urine, some of which were previously deposited on winter crop and grass paddocks as they were grazed. Because of significant changes in management practices, the proposed 1,500 cow system is predicted to have slightly less average annual N loss than the pre-expansion system despite an increase of 160 cows.

It is noted that pasture production is similar for both the pre-expansion system (15,371 kg DM/ha/year) and the proposed 1,500 cow farm (15,391 kg DM/ha/year).

P LOSS – DAIRY PLATFORM

The pre-expansion average annual P loss is based on four years of supported data and analysis is 360 kg/year. The proposed 1,500 cow dairy farm is predicted by Overseer to have an average P loss of 356 kg/year. Overseer predicts an average reduction in P loss of 4 kg/year with the change to the proposed system, which is essentially no change. The per hectare P loss value for the proposed 1,500 cow farm (0.7 kg/year) is predicted to remain as for the pre-expansion land use (0.7 kg/year). For both the pre-expansion and proposed 1,500 cow dairy farm, the risk of P loss from effluent is classed by Overseer as low for all blocks. The risk of P loss from soil and fertiliser is classed as low for all soil type blocks.

The key drivers of the stable predicted P loss are the removal of forage brassica and beet winter and summer crops, and their associated grazing, the maintenance of Olsen P at a target of 30, and the expansion in size and use of the wintering barns.

As already explained, effective measures to mitigate P loss that are not detected by Overseer will also be implemented on farm.

NUTRIENT LOSS – HORNER BLOCK

The current nutrient budget represents a conservative approach to modelling the existing nitrogen and phosphorus losses on the HB.

Under both current and proposed land use, the Horner Block has very low nutrient losses. The current use is predicted to have an annual average N loss of 20 kg/hectare; the proposed has N loss of 19 kg/hectare. The current use is predicted to have an average P loss of 0.1 kg/hectare; the proposed has P loss of 0.1 kg/hectare.

Discussion – effects of losses

Please see Section 7 (AEE) for a discussion on the effects of predicted nutrient losses.

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7. Assessment of Environmental Effects/Mitigations

7.1 Effluent

Odour

Adverse effects from odour can occur due to the discharge of farm dairy effluent where it may be encountered beyond the boundary of the site. There is also the potential for adverse odour effects from the discharge of slurry. The applicants have proposed the continued use of very low depth and low depth application technology, which coupled with the proposed effluent discharge buffers means there is little risk of adverse effects from odour and spray drift on surrounding land owners and occupiers. They irrigate according to wind direction and risk, which helps to avoid adverse odour effects.

Slurry is applied a very low depth using the slurry tanker with the trailing shoe. The trailing shoe part of the slurry tanker sits on the ground. It applies sludge at ground level and generates minimal aerosol and odour. It was invented in Europe to reduce adverse odours from the application of slurry/sludge to land, which is standard practice due to the housing of cows in barns over winter. It is regarded to be an effective odour minimisation technology and is best practice for slurry/sludge application. Its use will help to avoid adverse odour effects on neighbouring properties. The discharge of slurry at the dairy platform is a permitted activity, as such its effects, including odour effects, are expected to be less than minor.

Risks to surfacewaters from effluent discharge

Adverse effects on surface water can occur from the discharge of farm dairy effluent where contaminants present in effluent such as nutrients N and P, organic matter and microbes reach receiving surface waters such as streams, rivers and estuaries. Effects such as nutrient enrichment of surface waters *are cumulative*, and can lead to algal blooms including slime, and promote nuisance aquatic plant growth. The collection of plants and animals that inhabit receiving waters are adversely affected by nuisance plant growth, as well as in-stream values such as biodiversity and ecosystem services. Values associated with surfacewater streams and coastal waters are many and relate to the landscape, biodiversity, history and people living in the catchment. These values include maintaining the health of water bodies both in-stream and coastal, protecting biodiversity and ecosystems, protecting recreational activities such as fishing, walking and boating; protecting human and animal health, maintaining sustainable farming practices and the socioeconomic well-being of people through preserving values that relate to inshore fishing, farming and tourism. Iwi/cultural values include the principles of protection or kaitiakitanga of the mauri of the water and mana of the land, while minimising adverse effects on taonga and mahinga kai.

As is described in Section 5, receiving surface waters predominantly lie in the Waimatuku Stream catchment, Waimatuku Estuary and coastal waters. Receiving surface waters also lie in the Oreti River, New River Estuary, Aparima River, Jacobs River Estuary and coastal waters. These are considered sensitive environments due to the accumulation of nutrients, sediment and microbes. Receiving waters show evidence of land use impacts, with elevated levels of nutrients, sediment and algal blooms at times. The Waimatuku Stream catchment shows higher levels of nutrients than the Aparima River or Oreti River catchments. As is described in Sections 5 and 6, artificial drainage is a contaminant pathway at the property, in particular subsurface drainage channels installed in silty clay Braxton soil types. Artificial drainage transports contaminants via bypass drainage to receiving surfacewaters during and following periods of heavy rainfall. Parts of the FDE area with Braxton soils types at both the dairy farm and the Horner Block are high risk for effluent discharge and require appropriate management of effluent discharge to mitigate the risk of contaminant loss to surfacewaters. It is noted that Braxton soils at the property are located in the Waimatuku catchment. Shallow groundwater in the Waimatuku catchment is understood to discharge to the local stream network and can potentially contribute cumulatively to adverse effects on surfacewaters.

Risks to Drummond Peat Swamp and Bayswater Bog are described and effects are assessed in section 5.

Risks to groundwater from effluent discharge

Adverse effects on groundwater can occur from the discharge of farm dairy effluent where contaminants present in effluent such as nutrients N (nitrate) and microbes (pathogens such as campylobacter) reach receiving groundwaters via leaching/deep drainage pathways. A major risk of elevated nitrate levels in groundwater is to users (consumers) of groundwater as nitrate becomes toxic to living organisms such as humans, animals and fish at high levels. The New Zealand Drinking Water Standard maximum allowable value for nitrate is 11.3 ppm. Another risk is to consumers of groundwater is waterborne gastroenteritis through the ingestion of groundwater contaminated with pathogens such as campylobacter. This was demonstrated in Havelock North in 2016, when over 5,000 people became ill with camplyobacteriosis. Adverse effects on other users of groundwater such as other farms, small industries, schools or settlements/domestic users are possible and need to be avoided. In particular, any risk from the discharge activity to the drinking water supply at Heddon Bush School 2.3 km south of the property needs to be avoided. *E.coli* is widely used as an indicator of faecal microbial contamination of water, including groundwater.

As is described in Section 5, the dairy farm property predominantly overlies the Waimatuku Groundwater Zone. The eastern part of the property overlies the Central Plains Groundwater Zone. The eastern part of the Horner Block overlies the Waimatuku Groundwater Zone and the western part overlies the Upper Aparima Groundwater Zone. Heddon Bush School also overlies the Waimatuku Groundwater Zone. Although Drummond and Glenlg soil types have risk of contaminant loss via deep drainage to underlying aquifers, they are low risk for effluent discharge due to their physical properties (and drainage properties), and due to the nature of the discharge activity. FDE applied at low depth and very low depth when sufficient soil moisture deficit exists, moves through the soil profile via matrix flow, allowing effluent to remain in the root zone as plant available water and allowing nutrients in effluent to be taken up by plants.

Braxton soil types have swell/crack characteristics that can allow contaminants in effluent to be washed down to the underlying groundwater resource via deep cracks that can form during prolonged dry summer conditions. Parts of the FDE area with Braxton soils types at both the dairy farm and the Horner Block are high risk for effluent discharge and require appropriate management of effluent discharge to mitigate the risk of contaminant loss to groundwater if and where deep cracks are formed. A site investigation by Environment Southland in January 2018 did not find evidence of deep cracks on Braxton type soils, however, leading to a conclusion Braxton soil types at the property may not form deep cracks and are therefore unlikely to provide a pathway for contaminants in effluent to reach groundwater. The risk to groundwater from effluent discharge to Braxton soil types is likely to be lower than previously believed.

Mitigation of adverse effects due to effluent discharge

Adverse effects, *including cumulative effects*, due to the discharge of agricultural effluent (dairy shed effluent and pond slurry) are either avoided, remedied or mitigated at the dairy platform and Horner Block through the implementation of good effluent management practice and mitigation measures. Contaminants present is effluent (N, P, microbes) are held in the root zone, adsorbed by plants or are filtered/adsorbed by soil particles.

Due to its nature and scale, there will be little or no effect on receiving ground and surface waters *including cumulatively*, from the effluent discharge activity in this instance. The discharge system meets industry best practice standards for farm dairy effluent discharge by using buffer storage and low depth application. The use of best practice effluent application should avoid adverse effects on the environment. This principle is well documented in various scientific reports prepared for Environment Southland during the process of setting policies and rules around effluent discharge to land. A 2009 Houlbrooke and Monaghan report provides context and background to the principle that best practice effluent application should not cause adverse effects on water quality. The graph below is taken from the 2009 Houlbrooke and Monaghan report to illustrate that nutrient loss from FDE application is minor if undertaken using best practice. In this example, less than 1% of nutrients applied in effluent reached drainage water on tile and mole drained soil. These soils are considered high risk relative to some of the soils available for effluent discharge at the dairy farm and Horner Block.

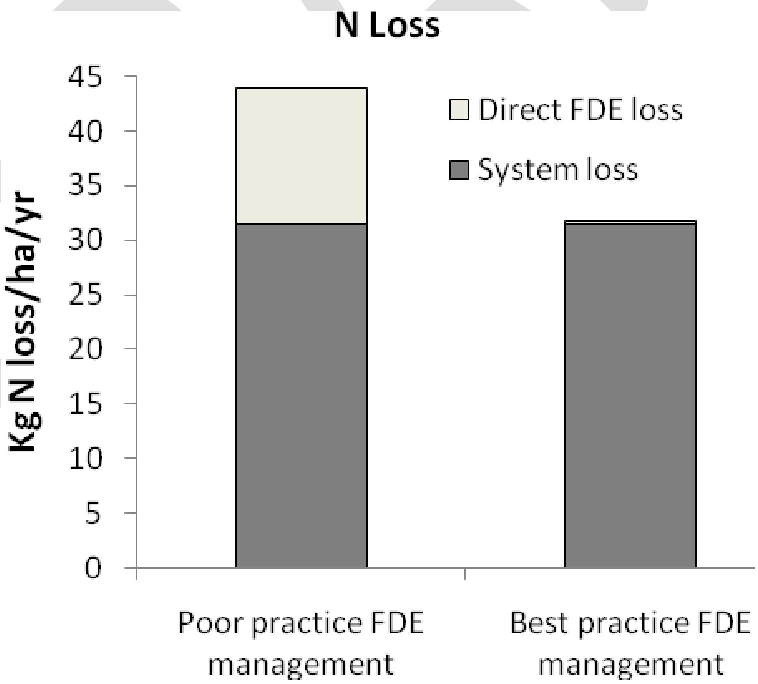

Figure 7.1. Houlbrooke and Monaghan (2009)

The applicants intend to apply effluent in accordance with best practice at all times to avoid adverse or *cumulative effects* on the receiving environment. Houlbrooke and Monaghan (2009) explain that if effluent is applied to soil when a soil moisture deficit exists then the effluent preferentially remains in the soil's root zone as plant available water or is adsorbed onto soil particles. The soluble nutrients in the effluent can then be taken up by the plant and used in nutrient cycling. Microbes can be filtered and held by soil particles until they are no longer viable. The applicants use the closest Environment Southland soil moisture monitoring site, which is available on the ES website, to determine whether a suitable soil moisture deficit exists for each of the irrigation systems. Effluent application, including both dairy shed effluent and slurry, is deferred if soil moisture levels are too high to safely and correctly apply effluent. Effluent is only applied when there is a ground moisture deficit and when effluent application will not induce drainage.

Deferred irrigation

The dairy platform currently has a total storage capacity of 8,032 m³ in two effluent storage ponds, which provides for deferred irrigation for effluent from 1,500 cows at the dairy sheds, 1,280 cows at the wintering barns, and silage leachate according to the Massey Dairy Effluent Storage Calculator. 6,460 m^3 is the 90% probability volume according to the Massey DESC. The ability to defer irrigation during marginal times means that effluent will only be applied when a soil moisture deficit occurs. By deferring irrigation when ground conditions are unsuitable, losses to drainage water should be considerably less than the 1.1% of the total nutrients applied in the effluent experienced in the above-mentioned trial. When soils are near or at field capacity and there is risk of contaminant loss via artificial drainage (or overland flow when soils are saturated) to receiving surfacewaters, or risk of contaminant loss via cracks in Braxton soil types to groundwater, irrigation is deferred by storing effluent in the two storage ponds. The risk of contaminant loss from effluent discharge via artificial drainage, overland flow or deep drainage is in this way mitigated.

Low depth irrigation

Low depth irrigation is defined as an application depth of less than 10 mm per application. Two low depth methods are utilised at the property and Horner Block; a travelling irrigator for dairy shed effluent and the slurry tanker with the trailing shoe for slurry. Both systems can apply effluent at low depths; less than 10 mm per application for the travelling irrigators and a maximum of 2.5 mm per application of pond slurry for the trailing shoe slurry tanker.

By discharging 15.2 m^3/hectare, the slurry tanker system applies effluent at a depth of 1.5 mm and can apply effluent at lower depths (e.g. 1 mm) by speeding up the tractor travel speed. The use of very low depth irrigation using the slurry tanker with a trailing shoe increases the frequency by which it is safe to apply effluent because a lower soil moisture deficit is required prior to irrigation. A slurry tanker with a trailing shoe is available to use at the property, as and when required. The travelling irrigators have been tested and found to apply effluent to a depth of less than 10 millimetres each (see Appendix for reports). The travelling irrigators are only used when a greater soil moisture deficit exists and no rain is forecasted for the following 24 hours. Where insufficient soil moisture deficit exists, dairy shed effluent irrigation is deferred and diverted to the ponds for storage.

The application of effluent (both dairy shed and slurry) in this manner should reduce the risk of exceeding a soil's infiltration rate, thus preventing ponding and surface runoff of freshly applied FDE. A low application depth also increases the likelihood of retaining the applied nutrients in the root zone. This decreases the likelihood of preferential flow and allows a greater volume of applied FDE to move through smaller soil pores via matrix flow, thus allowing for greater attenuation of effluent contaminants (Houlbrooke et al. 2006, McLeod et al. 1998). This is of importance where subsurface drainage has been installed.

Best practice irrigation minimises the risk of contaminant loss via pathways relevant to the Central Plains and Oxidising physiographic zones; subsurface drainage (tiles) when wet in winter/spring and deep drainage when cracks are present or when soils are saturated. Effluent is not applied over low points, where tile drains have been installed, when soils are near or at field capacity. In addition to this, buffer distances from discharge area to surface waterways are maintained minimising the risk of effluent reaching surface waters directly via overland flow or spray.

Future proof

The applicants may install a low rate irrigation system in the future, such a pods or a cannon/rain-gun travelling irrigator system. They have already demonstrated a willingness to invest, upgrade and innovate, which is evident in their recent investment in wintering barns. They will consider upgrading the dairy shed irrigation system as part of future developments once the current round of investment and expansion has been completed. The proposed system is described in section 6. Low rate irrigation is considered as best practice by Environment Southland, as such it will have effects that are the same or less than low depth irrigation.

Effluent receiving areas and nutrient loading

The effluent receiving area is large and comprises a combination of low and high-risk soils at both the dairy platform and Horner Block. The presence of low risk soils for effluent discharge reduces the risk of contaminant loss to ground and surfacewaters from effluent discharge as it reduces the risk of preferential flow of effluent through drainage channels. It allows higher risk areas to be avoided when there is risk of drainage to receiving ground and surfacewaters.

The N loading of soils from effluent is described in the nutrient budget analysis report and in section 6 of the application where it is demonstrated that the FDE area at the Horner Block and milking platform is sufficiently large to receive both the N loading from slurry effluent and volume of slurry effluent from the storage ponds. The higher strength nature of slurry effluent has been accounted for in calculating the N loading per hectare from slurry effluent.

A maximum of 150 kg N/hectare from dairy shed effluent and slurry will be applied at the dairy platform. The 150 kg N/hectare limit will be adhered to at the dairy platform, which is the standard limit placed on farm dairy effluent discharge activities on milking platforms by Environment Southland.

The scale of the discharge activity allows for the sustainable use of land to receive farm dairy effluent. The consented discharge area is large and has a ratio of over 30 hectares per 100 cows, which is well above the Council recommended ratio of 8 hectares per 100 cows. As is modelled in Overseer, where effluent or slurry is applied to land, fertiliser is reduced accordingly, which mitigates the risk of overloading soils with nutrients such as N and P causing loss to water.

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Horner Block – slurry receiving area

A maximum of 250 kg N/hectare will be applied from slurry at the cut and carry Horner Block (97 ha). The block is used to grow grass to feed cows at milking platforms and is not used to graze cows directly. Typically, there will be 4 cuts per season. Cows were grazed at the Horner Block in the past but are no longer grazed there. Urine patches are a major source of N leached to groundwater from pastoral farming. Since no stock are grazed at the Horner Block there are no recent/new urine patches, which greatly reduces the risk of N loss. Cut and carry blocks are efficient at utilising N and generally have low N loss to water despite high N inputs; this is supported by Overseer analysis. Overseer modelled the application of 243 kg N from slurry and predicts low average annual N loss for the HB (i.e. 19 kg N/hectare going forward). This supports a conclusion that the risk of nitrate loss to groundwater underlying the HB is very low. The potential issue of cracking in Braxton soils (arguably not covered by Overseer) is mitigated by monitoring and avoiding areas if and where this occurs.

As is shown in the proposed nutrient budget for the Horner Block, a limit of 250 kg N/hectare will be applied at very low depth at the Horner Block. According, less fertiliser N to be applied than would other be applied for pasture production to ensure that N inputs are not excessive. Overall (from both slurry and fertiliser), no additional N will be applied compared to what has been applied previously.

It is unlikely that the discharge of slurry at the Horner Block will result in elevated groundwater nitrate levels. Due to soil types (Drummond and Waiau) and their drainage properties (matrix flow), much of the HB classed as low risk for effluent discharge. So long as slurry is applied at a depth lower than the soil moisture deficit, there is little or no risk of nitrate loss to groundwater from low risk soils, as supported by Houlbrooke et al. (2006).

Where high risk soils are found (Braxton), there is a potential pathway for nitrate to reach groundwater via deep cracks that can form due to swell/crack properties of these soils. The east of the HB where Braxton soils are found, is monitored for evidence of cracking at high risk times (summer/autumn); slurry will not be discharged to areas where cracks form. Good soil management practices, as shown in the soil test trends appended to the application, mean that deep cracks are unlikely to form. Good pasture cover (and plant root structure) is always maintained, again minimising the risk of cracks to groundwater forming in the soil profile.

Downstream users of groundwater are dairy, sheep and cropping farms. These will not be adversely affected by the N loading of soils from slurry at the HB, as little or no N applied in slurry will be lost to groundwater; it will be taken up by plants and harvested as part of the cut and carry operation. Similarly, Drummond Township, Primary School and Kindergarten will not be affected by the N loading of soils from slurry at the HB. Groundwater nitrate levels in the vicinity and south of the HB are in the range of 1.0 – 8.5 g/m^3, so are below the NZ Drinking Water MAV of 11.3 g/m^3. The cumulative effect on groundwater nitrate levels from the N loading from slurry at the HB will extremely low due to the above reasons. The effects of the N loading from slurry effluent on groundwater will be less than minor, and much lower than when the HB was used in the past to winter graze cows on fodder crop.

Summary of mitigations for HB

- Slurry is applied at very low depth using slurry tanker with trailing shoe (less than or equal to 2.5 millimetres per application), when there is sufficient soil moisture deficit and nil risk of drainage;
- Soils are monitored for evidence of cracking; if and where this occurs slurry is not discharged;

- N loading is to a cut and carry block, so uses relatively high N inputs to grow grass. N is utilised efficiently to grow grass resulting in low N loss below the root zone;
- A maximum of 250 kg N/hectare will be applied from slurry annually;
- Recommended buffers will be adhered to when discharging slurry.

Summary of surfacewater mitigations for effluent discharge

Due to the implementation of good management practices and mitigation measures, there will be minimal risk to receiving surfacewaters in the Waimatuku, Oreti and Aparima catchments, the Waimatuku, Jacobs Riverand New River Estuaries, coastal waters and their values from the discharge activity. ***Effects on receiving surfacewaters due to the proposed activity will be no more than minor.***

- Irrigation of FDE is deferred when there is insufficient soil moisture deficit to safely apply effluent or when there is risk of drainage following irrigation of effluent. Effluent is stored in two large effluent ponds, which have sufficient storage for proposed activity according to the Massey DESC. This is effective at avoiding the risk of contaminant loss to surfacewaters from effluent when soils are at or above field capacity.

- Low depth irrigation methods are used to apply effluent to land. A slurry tanker with a trailing shoe is always available and can apply slurry effluent to depths as low as 1 mm per application, and always applies slurry at no more than 2.5 mm per application, which increases the number of irrigation days when effluent can safely be applied to land without risk of drainage. The travelling irrigators apply effluent to depths of less than 10 mm per application. Irrigation using the travelling irrigators is deferred by diverting effluent to the storage ponds unless there is sufficient soil moisture deficit. There is minimal to receiving surfacewaters when irrigating using these methods where there is sufficient soil moisture deficit. A low rate system may be installed in the future.

- Recommended buffers to waterways are implemented, mitigating the risk of contaminants present in effluent (i.e. N, P, microbes) reaching surfacewaters via overland flow. Effluent is not applied over tile drains when there is risk of preferential flow via drains to surfacewaters, mitigating the risk of the same contaminants present in effluent reaching surfacewaters via artificial drainage.

- The discharge area is sufficiently large both in terms of the area (ha) per 100 cows, and the N loading from effluent to effectively mitigate the risk of contaminant loss from effluent to surfacewaters. The dairy platform application rate will not exceed 150 kg/hectare from effluent, and the Horner Block will not exceed 250 kg N/hectare from effluent. The high strength nature of slurry effluent has been allowed for in calculating the N loading from slurry effluent. The on-site slurry tanker allows for very low application depths, which effectively controls the N loading per hectare from slurry and minimises the risk of contaminants present in effluent being lost to receiving surfacewaters.

Groundwater – mitigation of effects

Many good management practices and mitigation measures for effluent discharge described above also apply to avoiding, remedying and mitigating adverse effects on groundwater. These practices and measures are not repeated here; please refer to above. Whilst the effects of the discharge and dairy farming activities on groundwater are assessed separately in Section 7.1 and 7.3 respectively, it is difficult to separate these effects in practice.

The major contaminants present in effluent that are of risk to groundwater are nitrate and faecal microbes, with *E.coli* used as an indicator of faecal contamination of groundwater. As is described in Section 5, groundwater flow for much of the property is predominantly to the south (Waimatuku Zone). The east of the property overlies the Central Plains Zone, where groundwater may flow to the south/south east. Heddon Bush School due south of the discharge area also overlies the Waimatuku Groundwater Zone. Braxton soil types have swell/crack characteristics that can allow contaminants in effluent to be washed down to the underlying groundwater resource via deep cracks that can form during prolonged dry summer conditions. These soils require appropriate effluent management to avoid the loss of contaminants in effluent to groundwater via cracks. As already mentioned, an on-site investigation by Environment Southland in January 2018 found no evidence of deep cracking of Braxton soil types. A conclusion drawn was that Braxton soils at the dairy platform and Horner Block may not in fact be prone to deep cracking. Drummond and Glenlg soil types are low risk for effluent discharge due to their physical properties (and drainage properties), and due to the nature of the discharge activity.

Nitrate in groundwater due to the discharge activity:

Nitrate levels in groundwater are described in depth in Section 5. Given the nature of effluent management at the property and Horner Block, in addition to the scale of the discharge activity including the N loading of soils from effluent (dairy shed and slurry), it is very unlikely that the discharge of effluent at the property and the Horner Block will adversely affect water quality through an increase in groundwater nitrate concentrations from effluent.

Despite its tendency to suffer from localised contamination, the bore at the south end of the property (E45/0622) has demonstrated relatively low groundwater nitrate concentrations over the last five years (1.0 – 3.5 g/m^3), albeit with evidence of wellhead contamination due to its design, and therefore elevated nitrate levels at times. These localised events should not adversely affect groundwater quality beyond the zone of reasonable mixing. A monitoring bore located mid-farm/east on lighter soils and in a different groundwater zone (E45/0665) shows higher levels of groundwater nitrate over the last three years, indicative of moderate to high land use impacts (3.5 – 8.5 g/m^3), but much lower than at an ES monitoring bore located at Boyle Road to the south east of the property, where groundwater nitrate levels are at or above the NZ Drinking Water Standards MAV of 11.3 g/m^3. Bores located to the east show evidence of higher groundwater nitrate levels than at the dairy platform. Given that groundwater nitrate levels are lower at the WOL/WTL dairy platform it is unlikely that the discharge of effluent at the property and the Horner Block is adversely affecting water quality, *including cumulatively*, through an increase in groundwater nitrate concentrations from effluent discharge. Groundwater nitrate levels underlying the property have been reasonably stable since bore testing began. The "farming" effect on free draining soils is likely to have a greater effect on groundwater nitrate levels than effluent discharge on low risk soils. For instance, farming practices such as growing fodder beet/winter grazing of cows on free draining soils are expected to have a greater cumulative effect on groundwater quality and moving away from this practice should see an improvement for groundwater quality, although it may be difficult to detect this due to effects from other properties and activities in the area.

There is little or no risk to the registered bore for drinking water supply at Heddon Bush School from the discharge of effluent (dairy shed and slurry) at the dairy platform and the Horner Block. The bore for school water supply (E45/0718) was recently tested (2017/2018) and returned nitrate concentrations in the range of 1.8 – 2.0 g/m^3. Given the following factors, adverse effects from the discharge activity such as an increase in groundwater nitrate levels would have been seen for some time in the vicinity of the school *if they were present*:

- the proximity of the school;
- land use in the area since the 1980s including cereal cropping, sheep farming and intensive winter grazing;
- the length of time that the property has been used for farming;
- the southerly direction of groundwater flow;
- the estimated lag time for nitrate at the surface to reach the water table and the underlying groundwater stream, and
- the estimated velocity of groundwater flow.

The evidence so far does not indicate that the discharge activity at the dairy platform and the Horner Block is having an adverse effect on the Heddon Bush School water supply through an increase in groundwater nitrate levels. The depth of the school bore further helps to protect it from land-use effects. The proposed activity is the same in nature and is of slightly increased scale compared to the existing discharge activity; there will be little or no increase in groundwater nitrate related adverse effects at Heddon Bush School.

The bore located at the south of the property (E45/0622) has been described above and is believed to be in the same "stream" of groundwater flow as the Heddon Bush groundwater supply. Its nitrate levels are generally low, with the already described localised contamination events due to poor well design. The applicants are proposing to install a new monitoring bore using industry best practice methods, which should not have issues with wellhead contamination. The new bore will be located at the south of the property, in the groundwater "stream" believed to flow towards Heddon Bush School. Water quality results from the bore will be monitored by the applicants and used to inform decision making at the property relating to the management of the discharge activity.

Shallow groundwater in the Waimatuku Catchment is understood to discharge to the local stream network. An effect of groundwater nitrate could be a very small increase in nitrate levels in downstream receiving waters such as shallow streams (connected to groundwaters), the Waimatuku Stream and eventually coastal waters. The risk of nitrates in effluent reaching groundwater is mitigated through using deferred storage and low depth irrigation. There is minimal risk to receiving surfacewaters through the discharge of groundwater from the discharge activity.

Faecal contamination of groundwater due to the discharge activity

If faecal microbes from the discharge activity are/have been reaching groundwater, the testing of groundwater in the vicinity of the property, especially from bores located in the south, could reveal this to be the case. Section 5 describes data from bores at the property and bores, and the previous section of this section (7.1) describes and assesses the risk of adverse effects on groundwater due to nitrate from effluent discharge. Much of these processes and potential effects directly apply to microbes also.

Groundwater testing of bores at and at the property are generally negative for *E.coli*, but at times return positive results with general low counts. As has already been explained, the south bore at the property (E45/0622) experiences localised contamination due to its design, which makes it unsuitable for use a monitoring bore and makes interpretation of *E.coli* data from the bore questionable; *E.coli* data from the WOL bore are corrupted by localised contamination. Following the zone of reasonable mixing, there is likely to be minimal adverse effect on the wider groundwater resource from this localised source. It is proposed to install a new monitoring bore at the south of the farm, which should eliminate the issue of localised contamination and provide a valid source of reliable groundwater data going forward.

The mid-farm/east monitoring bore (E45/0665) has generally been negative for *E.coli* since it was installed in 2015. It has returned three positive *E.coli* results in that time. The relatively high result in November 2017 is an outlier in the dataset and was likely to have been due to recent prolonged heavy rainfall, which occurred between November 3rd and 12th, and resulted in a high level and rate of drainage and the observed *E.coli* result (see figure 7.2). The subsequent test in April 2018 was negative for *E.coli* (<1 MPN/100 ml). It is noted that the ES monitoring bore at Boyle Road, which is southeast of the WTL bore and in the same groundwater zone, is tested every three months, has consistently been negative for *E.coli* in recent years with the exception of December 2017 (5 MPN/100 ml). It too was subsequently negative for *E.coli* in March 2018 (<1 MPN/100 ml). This indicates that if groundwater contamination occurs due to very high rainfall events and subsequent rapid drainage, it is relatively short lived, which is in line with the length of time that *E.coli* and similar microbes are believed to remain viable in groundwater (three months or less).

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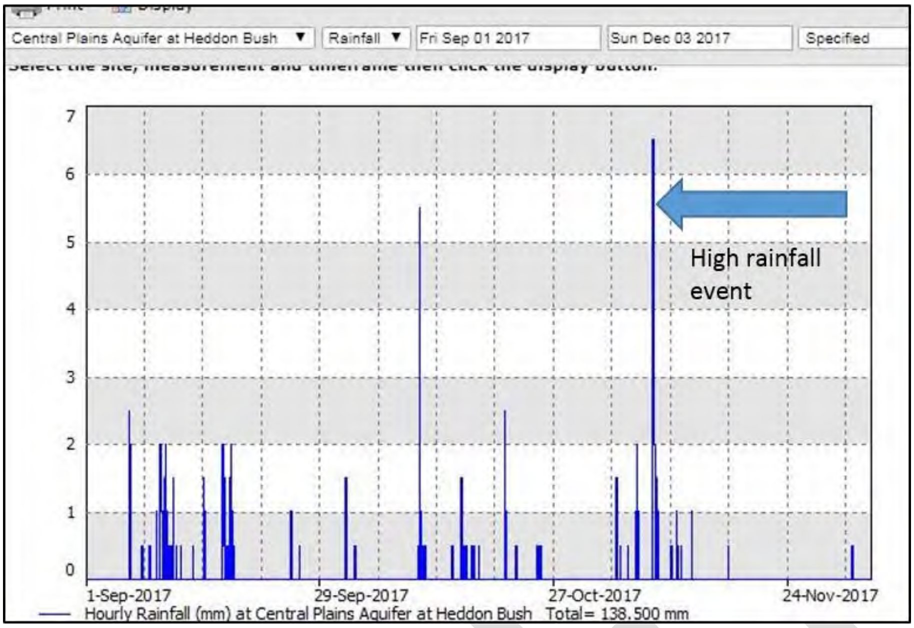

Figure 7.2. Rainfall at Central Plains Aquifer at Heddon Bush.

Slurry effluent is high strength in nature, including its microbial content. Applying slurry effluent at a low depth when there is sufficient soil moisture deficit (e.g. 2 mm depth per application) at the dairy platform and the Horner Block, ensures that the microbial loading of soils is low enough to allow soils to filter microbes, allowing them to be retained in the topsoil sufficiently long for microbes to die off and become unviable. U.V. radiation also plays a role in this process. The N loading limits of 150 kg/hectare and 250 kg/hectare at the dairy platform and Horner Block respectively, will allow for control on the soil loading of microbes from effluent by proxy. So long as effluent irrigation is deferred as required and does not induce drainage, microbes will be filtered and adsorb onto soil particles without leaching and will die off. Irrigation is deferred when soil conditions are unsuitable, which helps to mitigate an increased risk from a higher water table during wetter periods.

The same potential cracking process described for Braxton soils for nitrate contamination also applies to microbes. On-site investigation found that the risk of Braxton soils at the property and Horner Block cracking is lower than previously thought. So long as best practice effluent management is followed and soils are monitored for cracking, then there is minimal risk of microbes being transported to groundwater.

In summary the effect from the discharge of effluent (dairy shed and slurry) at the dairy farm and Horner Block in terms of microbial contamination of groundwater will be no more than minor.

There is little or no risk of microbial contamination of the registered bore for drinking water supply at Heddon Bush School from the discharge of effluent (dairy shed and slurry) at the dairy platform and the Horner Block. The bore has been tested quarterly since it was drilled and has consistently returned negative *E.coli* results (<1 MPN/100 ml). Given the factors listed on page 130, as well as the lifetime of *E.coli* in the environment (up to 3 months according to Edberg et al. 2000), adverse effects from the discharge activity such as microbial contamination would have been seen for some time in the vicinity of the school *if they were present*. The

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evidence so far does not indicate that the discharge activity at the dairy farm property and the Horner Block is having an adverse effect on the Heddon Bush School water supply through faecal contamination of groundwater. The proposed discharge activity is the same in nature and is of slightly increased scale compared to the existing discharge activity; there will be little or no increase in faecal microbes due to the proposed activity. It is noted that the depth of the school bore further helps to protect it from land-use effects, as does the presence of an ozone purification treatment system.

The bore located at the south of the property (E45/0622) has been described above and is believed to be in the same "stream" of groundwater flow as the Heddon Bush groundwater supply. It is unsuitable for use as a monitoring bore as it suffers from localised contamination due to its design. The applicants are proposing to install a new monitoring bore using industry best practice methods, which should not have issues with localised contamination. The new bore will be located at the south of the property, in the groundwater "stream" believed to flow towards Heddon Bush School. *E. coli* results from the bore will be monitored by the applicants and used to inform decision making at the property.

In conclusion there is minimal risk that consumers of groundwater, including at Heddon Bush School, will develop gastroenteritis due to faecal contamination of groundwater from the discharge activity. Good well-head maintenance at a new monitoring bore will help to ensure that there is no localised faecal contamination of groundwater to the discharge of effluent at the property.

Summary of mitigations for groundwater

Due to the implementation of good management practices and mitigation measures, there will be minimal risk to underlying groundwater resources, including the Waimatuku, Central Plains and Upper Aparima Groundwater Zones due to the discharge of effluent at the property and Horner support block. ***Effects on groundwater due to the proposed discharge activity will be no more than minor.***

- Irrigation of FDE is deferred when there is insufficient soil moisture deficit to safely apply effluent or when there is risk of drainage following irrigation of effluent. Effluent is stored in two large effluent ponds, which have sufficient storage for effluent from the proposed activity according to the Massey DESC.

- Low depth irrigation methods are used to apply effluent to land. A slurry tanker with a trailing shoe is always available and can apply slurry effluent to depths as low as 1 mm per application, and typically applies effluent to depths of 1.5 mm per application, which increases the number of irrigation days when effluent can safely be applied to land without risk of drainage. The travelling irrigators apply effluent to depths of less than 10 mm per application. There is little or no risk to receiving groundwater when irrigating using these methods where there is sufficient soil moisture deficit. A low rate irrigation system may be installed in the future.

- Soils are monitored for the formation of cracks. Effluent is not applied on Braxton type soils, if and where cracks form following extended summer dry periods. This mitigates the risk of effluent loss via preferential flow down deep cracks to shallow groundwater.

- The discharge area is sufficiently large both in terms of the area (ha) per 100 cows, and the N loading from effluent. The high strength nature of slurry effluent has been allowed for in calculating the N loading from slurry effluent. The on-site slurry tanker allows for very low application depths, which effectively controls the N loading per hectare from slurry. Slurry is typically applied at depths of 1.5 – 2.0 mm per application, which minimises the risk of contaminants present in effluent being lost to groundwater during drainage events. The slurry tanker application depth allows for effective control of N loading and microbial loading of soils, which allows microbes to be retained in the topsoil, filtered and attenuated until they become unviable.

- Installation of a new monitoring bore is proposed at the south of the dairy farm property to eliminate issues relating to localised contamination of the shallow E45/0622 bore. The bore will be used to monitor groundwater quality flowing south, in the predominant direction of groundwater flow at the property and in the direction of Heddon Bush School. Data collected from monitoring groundwater quality will be used to inform on decision making at the property, including effluent management.

Soil health

There is little or no risk to the life supporting capacity of soils due to the effluent discharge activity. The utilisation of land treatment for effluent allows for the sustainability of the soil ecosystem. The soils are suitable for effluent irrigation and the discharge follows current good management practice, which is described in Section 6 of the application and the FEMP. These include practices of a general nature and those specific to the contaminant transport pathway for the physiographic zones at the property (artificial drainage, deep drainage).

The existing storage ponds allows for deferred storage until the soil moisture content is suitable for irrigation for 1,500 cows on the farm. The land disposal area is larger than the best practice recommendation of 8 hectare per 100 cows. The land disposal at the Horner Block and dairy platform is sufficiently large to receive slurry effluent from the ponds, without exceeding the 250 kg N/hectare limit for the Horner Block, and 150 kg N/hectare for the dairy platform. The quantity of N spread from dairy shed effluent and slurry effluent over the proposed discharge area at the dairy platform is below the recommended restriction of 150 kg N typically placed on discharge permits by Environment Southland. This system is sustainable in the long term as it allows the effluent to be used both as a fertiliser and a soil conditioner, which improve the soil's health.

An ongoing soil monitoring programme is carried by the applicants and their fertiliser supplier (Ravensdown) at the dairy platform and Horner Block. Trends in soil tests are evaluated and used to inform on decision making, including effluent management. See the appended reports from Ravensdown for the WOL and WLD dairy units and the Horner Block. Good nutrient management is evident in soil fertility trends and is indicative of healthy soils. ***Effects on the soil resource due to the proposed effluent discharge activity will be no more than minor.***

Effluent storage and infrastructure

The effluent system is described in detail in Section 6 and meets the needs of 1,500 cows, including a maximum of 1,280 cows in the wintering barns, according to the Massey DESC.

WTL's storage pond stores slurry and does not have a leak detection system. It was drop tested in 2017 and a drop test report was submitted to Environment Southland who accepted that the pond was not leaking. The drop test met all criteria set out in Appendix P, except for the unavoidable presence of a crust on slurry. The drop test report is appended to this application. The characteristics of slurry and liquid effluent in storage systems are quite different. The viscosity of slurry is a lot lower than liquid effluent and as a result, slurry is self-sealing whereas liquid effluent is not. Also, the issue of wind-driven wave action causing bank erosion does not arise when storing slurry.

WOL' storage pond was upgraded in autumn 2018, when its storage capacity was increased and a synthetic liner (1.5 mm HDPE) was installed. The liner overlies a leak detection drain system, the specification for which was provided by a CPEng. The pond design was certified by a CPEng as meeting Practice Note 21 standards. CPEng sign off for the pond was submitted to Council as required. The leak detection system terminates at a 400 mm diameter inspection well. The leak detection inspection well has been inspected and either had no liquid or had liquid when the water table was high. The liquid had was clear and had no odour. There is therefore no evidence of leakage from the pond.

A visual inspection report prepared by a SQP for the ponds and ancillary storage structures was be completed and is appended to this application.

Two low depth travelling irrigation systems used at the dairy platform have been tested as per consent conditions and found to meet the required depth of less than 10 mm/application (see Appendix). The slurry tanker with the trailing shoe has been tested in the past and shown to achieve very low application depths; it can be retested if necessary. A low rate system such as pods or a cannon/rain-gun system may be installed in the future, once the current round of investment and expansion has been completed.

Summary

It is reasonable to conclude that there will be little or no risk to groundwater or surface waters including cumulatively, or to the soil resource by granting replacement of the existing discharge permit to allow for the discharge of effluent from 1,500 cows at the Woldwide One and Woldwide Two dairy platform, and at the Horner Block. The effects of the activity have been considered and are no more than minor.

Alternatives to effluent discharge methods

The irrigation systems in place are designed to meet best practice guidelines – specifically the use of very low depth, low depth irrigation and deferred storage of effluent. The applicants believe their system is both cost-effective and easy to manage.

An umbilical system has been included in the discharge permit because it provides a method of discharging large volumes of effluent at very low depths to different parts of the effluent discharge area. The umbilical system will be used as a potential back up to the low depth travelling irrigator irrigation system and low depth slurry tanker.

The umbilical system is a high rate/low depth application method. The depth of application is closely controlled by tractor speed. Typically, the depth of application will not exceed 3 mm for the umbilical system and can apply slurry at lower depths (e.g. 2 mm) by increasing the tractor travel speed. At this depth it poses no more potential for adverse effects on the receiving environment as the low depth irrigation systems.

Low rate irrigation has been included in the discharge permit because it is a best practice management irrigation method. A low rate pod or cannon/rain-gun irrigation system may be installed and used to complement the low depth travelling irrigator irrigation system and low depth slurry tanker.

The pods and cannon travelling irrigator systems are low rate/low depth application methods. They pose no more potential for adverse effects on the receiving environment as the low depth irrigation systems.

7.2 Water Take

The water take is from the Waimatuku Groundwater Zone, which is described in Section 5.

The abstraction should have a less than minor effect on aquifer sustainability and water availability. The Waimatuku Groundwater Zone has low allocation status and the proposed take is moderate, although it is increasing relative to applicant's existing take. The applicants seek a maximum abstraction of 180,000 litres of groundwater per day. This is consistent with a total of 120 L/cow/day by allocating 70 L for stock drinking water and 50 L for shed wash down water for 1,500 cows. This equates to an annual take of 55,296 m^3 based on seasonal milk supply and a winter take for drinking water for stock in wintering barns. The take is considered reasonable in terms of Policy 21 of the Regional Water Plan. Based on the estimated recharge rate to the Waimatuku Groundwater Zone (Lincoln Environmental, 2003), annual recharge of the aquifer underlying the property is approximately 2,344,340 m^3. The annual water take is 2.4% of this volume.

Groundwater is abstracted from three bores at the property for dairy shed supply and stock drinking water, and bores are over 50 metres apart. The rate of take from individual bores does not exceed 2 L/sec and should not cause stream depletion effects on adjacent water bodies. Three water storage tanks are utilised at each dairy shed to ensure that the rate of take does not exceed 2 L/sec. The nearest neighbouring bore is over 700 m from the abstraction point and should not experience drawdown effects due to the take. There will be little or no effect on other water uses due to the water take.

Water efficiency will be a key focus on farm. Simple tasks such as keeping water reticulation systems and dairy shed plumbing in a good state of repair will prevent water leaks and reduce water wastage. Water metering devices have been installed to ensure the water use is monitored via a standard cumulative water meter and will allow the data to be supplied to Council as per the consent conditions.

Overall the abstraction should have a less than minor effect on water availability, other water users or the Waimatuku Groundwater Zone.

Assessment of Alternatives for Water Supply

There have not been any improvements in technology, which would achieve a better environmental result than the current groundwater supply to the farm. Effects on bore yields on neighbouring bores are expected to be no more than minor; the proposed groundwater take is greater than the existing take, but is still low relative to recharge rates in the groundwater zone. There is no surface water take. There will be no effect due to this activity on in-stream life, wetlands, recreational activities or marginal strips.

7.3 Dairy Farming – Land Use

Overseer is used to understand the nutrient interactions of a farm system based on soil properties, rainfall, drainage and feed requirements. The output from Overseer gives an indication of how much nutrient may be lost to the environment but it does not describe what the environmental impact of these losses is likely to be. Assessing the environmental effect of modelled nutrient losses from individual properties is complex because nutrients travel via different pathways through the receiving environment undergoing attenuation, processing, mixing, dilution and dispersion processes which can significantly change the quantity and nature of these nutrients in the receiving water bodies. The assessment provided here attempts to assess the effect of the proposed dairy farming activity in the receiving environment and the likelihood of effects, and explain what mitigation measures to be implemented in order to avoid or mitigate effects. The AEE is split into groundwater and surfacewater receiving environments.

Notes:

1. *Land referred to as Marcel/SH96 is included in this AEE, along with the former WOL and WTL dairy platforms. Land referred to as Marcel/SH96 is not assessed/considered separately as it is authorised under the land use consent for dairy farming #20171278-03 and is part of the existing environment. The application and nutrient budgets were structured to reflect this, with the discharge and farming activities on land referred to as Marcel/SH96 assessed and considered as part of the proposed dairy platform.*

2. *Environment Southland received legal opinion regarding the Horner Block. Based on the LO, the Horner Block is not part of the landholding at WOL/WTL dairy platform. It is not included in this AEE for the dairy farming activity.*

3. *Woldwide Runoff is not included in this AEE for the dairy farming activity. An AEE for Woldwide Runoff is provided in a separate report.*

Groundwater - AEE including cumulative effects of activity and mitigations

Table 7.1 summarises potential effects, likelihood of effects and mitigations. Table 7.1 links to table 6.5, which describes specific mitigation measures in detail.

Adverse effects on groundwater can occur from the expanded dairy farm activity where contaminants present in dung, urine, effluent, fertiliser and silage pad leachate, such as nutrients N (nitrate) and microbes (pathogens such as campylobacter) reach groundwater via leaching/deep drainage pathways. A major risk of elevated nitrate levels in groundwater is to users (consumers) of groundwater as nitrate becomes toxic to living organisms such as humans, animals and fish at high levels. The New Zealand Drinking Water Standard maximum allowable value for nitrate is 11.3 ppm. Another risk is to consumers of groundwater is waterborne gastroenteritis through the ingestion of groundwater contaminated with pathogens such as campylobacter. This was demonstrated in Havelock North in 2016, when over 5,000 people became ill with campylobacteriosis. Adverse effects on other users of groundwater such as Heddon Bush School, other farms, small industries or settlements/domestic users can occur and need to be avoided or mitigated.

Table 7.1 Risk of adverse effects from the proposed dairy farming activity due to contaminants N and microbes in groundwater. This table links to table 6.5 (mitigation measures).

Potential effect of N in groundwater	Related effects	Specific mitigations proposed at the dairy farm	Likelihood of effect due to proposed dairy farming activity	Risk of effect due to proposed dairy farming activity
Human health effects (methemoglobinemia) from groundwater consumption at Heddon Bush School if groundwater nitrate concentrations are at or above the NZDWS MAV of 11.3 ppm	n/a	See table 6.5 for explanations of effectiveness of mitigation measures. Measures #1, 2, 3, 4, 5, 6	Low likelihood due to the: nature and scale of activity; evidence of low groundwater nitrate levels at the south of the property and at Heddon Bush School in 17/18; and implementation of migration measures.	No more than minor
Human health effects (methemoglobinemia) on groundwater consumers in the Central Plains groundwater zone to the south east when groundwater nitrate concentrations are at or above the NZDWS MAV of 11.3 ppm	n/a	See table 6.5 for explanations of effectiveness of mitigation measures. Measures #1, 2, 3, 4, 5, 6	Low likelihood due to the: nature and scale of activity; evidence of groundwater nitrate levels at the east of the property between 3.5-8.5 ppm; and implementation of migration measures (particularly, the removal of fodder beet cropping/winter grazing from the north east of the property where lighter/more leaky soils are found).	No more than minor

Ecological effects due to discharge of groundwater with elevated nitrate to shallow streams in Waitmatuku catchment	Fish kills in Waimatuku Stream due to nitrate toxicity; Eutrophication of receiving surfacewaters (Waimatuku); Recreational effects; fishing in Waimatuku is reduced;	See table 6.5 for explanations of effectiveness of mitigation measures. Measures #1, 2, 3, 4, 5, 6	Low likelihood since N concentration in receiving waters is lower than toxicity level, and the nature and scale of the activity and implementation of proposed migration measures further reduce the likelihood of the effect occurring. See table 6.5 for explanations of effectiveness of mitigation measures.	No more than minor
Human health effects due to faecal contamination of groundwater	Gastroenteritis such as camplyobacteriosis by consuming contaminated groundwater, including at Heddon Bush School	As per table 6.5 Measures #1, 2, 3, 5, 6, 7, 10	Low likelihood due to: implementation of mitigation measures; monitoring for soil cracks and avoidance of cracks when grazing stock or discharging effluent or slurry; limited viability of microbes in groundwater; and use of an ozone purification system at Heddon Bush School.	No more than minor

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Soil type and groundwater

There is risk to groundwater at the dairy platform from two soil processes:

1. Drummond/Glenelg soils are free draining and therefore have risk of contaminant loss via deep drainage to underlying aquifers due to their physical properties. Approximately 378 hectares (or 79%) of the dairy platform has Drummond and Glenelg soil types.
2. Braxton soil types have swell/crack characteristics that can allow contaminants present in dung and urine to be washed down to the underlying groundwater resource via deep cracks that can form during prolonged dry summer conditions. Parts of the property with Braxton soils types (approximately 100.5 hectares or 21%) require appropriate management to mitigate the risk of contaminant loss to groundwater if and where deep cracks form.

Nitrate loss to groundwater

Braxton soil types are believed to have a lower risk of deep cracking than previously thought and therefore also a lower risk of nitrate reaching groundwater via bypass drainage. They also have some denitrification potential. They have higher risk of N loss to surfacewaters via artificial drainage. These properties are reflected in low groundwater nitrate levels at the south and to the south, which is in the direction of groundwater flow for much of the property, including Braxton areas. *Despite this, Braxton soils need to be monitored at high risk times for the presence of deep cracks and managed appropriately.*

Drummond and Glenelg soils have low denitrificiation potential and are classed as Oxidising. Some N lost to water below the root zone in Drummond and Glenelg soils (i.e. 12 – 17 ppm estimate according to Overseer), is likely to reach the groundwater resource. It is not practical to quantify how much nitrate is reaching groundwater, given tools available/present day science. Nonetheless, a moderate loss of N to the groundwater resource will contribute to the N loading of groundwater underlying Oxidising soils, which cumulatively gives a concentration of between than 3.5 – 8.5 ppm for the Oxidising area (according to ES modelling). This is supported by bore testing at the property.

As has already been discussed, groundwater nitrate levels increase to the east of the dairy platform, as soils become progressively lighter and there is a transition to the Central Plains Groundwater Zone. A nitrogen hotspot is found to the south east of the property in the Central Plains Zone, where nitrate levels are frequently in excess of the NZ Drinking Water Standards (>11.3 ppm). Testing of a monitoring bore at the east side of the dairy platform (also found on Drummond soils and in the Central Plains Groundwater Zone) had a mean of 8.1 (range +/- 1.9) ppm in recent years. This is lower than at the Boyle Road/Heenan's Corner area, where the hotspot is centred.

Water percolating through to the underlying aquifer undergoes mixing and nutrients are diluted. As is explained in section 5, land use nitrate effects on groundwater in the area start to be seen within a year, and certainly are evident within three years. Since much of the wider area has been used for dairy farming, cereal cropping, winter grazing and sheep farming for many decades, effects on groundwater have been present for decades. The hotspot to the southeast is likely to reflect this. In terms of the proposed dairy expansion, there will be extensive mixing within a large aquifer and some dilution thereafter, which will change background N concentrations by a small degree, and cumulatively will give a concentration of no more than 1.0 – 8.5 ppm for the majority of the dairy platform.

Although the proposed activity represents an expansion of dairying through an increase in cow numbers, there will be less N lost to water due to the implementation of mitigation measures and good management practices, and therefore less effect on the groundwater resource and its associated values relative to the pre-expansion system. These help to reduce the accumulation of N in soils, particularly from mineralisation processes associated with forage brassica/beet fodder cropping, and grazing of fodder crops, particularly during winter and spring. Since less N accumulates in soils, then less N is lost to groundwater (and surfacewaters).

Groundwater nitrate effects

As is explained above, the main risk of elevated nitrate levels in groundwater is to users (consumers) of groundwater as nitrate becomes toxic to living organisms such as humans, animals and fish at high levels. Nitrate levels are likely to be maintained in the receiving groundwater resource between 1.0 – 8.5 ppm due to the proposed dairy farm activity. This is supported by bore data at the dairy platform. This will not result in adverse effects on other users of groundwater such as other farms, small industries, schools or settlements/domestic users; values of bore users in the groundwater zone will not be adversely affected. Values such as the protection of human health, animal health, sustainable farming and economic wellbeing will not be adversely affected by groundwater nitrate levels of 1.0 – 8.5 ppm, which are below the NZDWS maximum allowable value of 11.3 ppm.

The risk due to the proposed expansion to the bore water supply at Heddon Bush School needs to be carefully assessed. Groundwater underlying much of the dairy platform, flows south in the direction of the school. As is already described, groundwater nitrate levels at the south of the property are consistently low (despite an issue with localised well contamination). Given the following factors, adverse effects from the dairy farming activity such as an increase in groundwater nitrate levels, would have been seen for some time in the vicinity of the school *if they were present*:

- the proximity of the school;
- land use in the area since the 1980s including cereal cropping, sheep farming and intensive winter grazing;
- the length of time that the property has been used for dairy farming;
- the southerly direction of groundwater flow;
- the estimated lag time for nitrate at the surface to reach the water table and the underlying groundwater stream, and
- the estimated velocity of groundwater flow.

Sampling of the school bore over three dates in late 2017 and early 2018 returned a mean nitrate concentration of 1.9 ppm. This indicates that groundwater nitrate levels at the school are low and pose minimal risk to health. It also indicates that there are minimal effects on groundwater quality at the school from the dairy farm 2.3 km north of the school. Finally, it is unlikely that there will be any increase in adverse effects due to the proposed expansion. It is noted that the school bore is drilled to a depth of over 14 metres, which further reduces any potential risk.

Microbial loss to groundwater

If faecal microbes are/have been reaching groundwater, the testing of groundwater in the vicinity of the property, could reveal this to be the case. Groundwater testing of bores at the dairy platform are generally negative for *E.coli*, but at times return positive results with generally low counts. As has already been explained, the south bore at the dairy platform (E45/0622) suffers from localised contamination due to its design. This is reflected in the positive *E. coli* results for that bore, which corrupt the dataset making the bore unsuitable for monitoring purposes. Following the zone of reasonable mixing, there is likely to be minimal adverse effect on the wider groundwater resource from this localised source. *It is proposed to install a new* *monitoring bore at the south of the farm, which will eliminate the issue of localised contamination, making E.coli results valid, reliable and an important information source.*

The mid-farm/east monitoring bore (E45/0665) has generally been negative for *E.coli* since it was installed in 2015. It has returned some positive results (three) in that time, with one result likely to be an outlier in the dataset. The relatively high result in November 2017 was likely to be due to recent heavy rainfall that occurred between November 3rd and 12thand resulted in a very high level of drainage and the observed positive *E. coli* result (see figure 7.2). The subsequent test in April 2018 was negative for *E.coli* (<1 MPN/100 ml). It is noted that the ES monitoring bore at Boyle Road, which is southeast of the WTL bore and in the same groundwater zone, has consistently been negative for *E.coli* in recent years with the exception of December 2017. It too was subsequently negative for *E.coli* in March 2018 (<1 MPN/100 ml). This indicates that if groundwater contamination occurs due to very high level and rate of drainage, it is relatively short lived, which is in line with the length of time that *E.coli* and similar microbes are believed to remain viable in groundwater (three months or less). Land immediately south of the dairy platform is agricultural (dairying and dry stock) so there is minimal risk to human health from groundwater in the area. Heddon Bush school is further south and is assessed in a following section.

There is minimal risk of microbial contamination of the registered bore for drinking water supply at Heddon Bush School from the proposed dairy farming activity. According to the school principal, the bore has been tested quarterly since it was drilled and has consistently returned negative *E.coli* results (<1 MPN/100 ml). Given the bullets points summarised on the previous page as well as the lifetime of *E.coli* in the environment (up to 3 months according to Edberg et al. 2000), adverse microbial effects on the school bore should have been detected if they were present. The evidence so far does not indicate that dairy farming activity is having an adverse effect on the Heddon Bush School water supply through faecal contamination of groundwater. The proposed 1,500 cow activity is similar in nature (with some beneficial mitigation measures that will maintain good soil structure and health, and reduce microbial accumulation at high risk times), and is of slightly increased scale compared to the pre-expansion land use; there will be no increase in faecal microbes reaching groundwater due to the proposed activity. *Furthermore, the depth of the school bore further helps to protect it from land-use effects, as does the presence of an ozone water purification treatment system.*

The new monitoring bore will be located at the south of the property, in the groundwater "stream" believed to flow towards Heddon Bush School. *E. coli* results from the bore will be monitored by the applicants and used to inform decision making at the property. In conclusion there is minimal risk that consumers of groundwater, including at Heddon Bush School, will develop gastroenteritis due to the dairy farming activity. Good well-head maintenance at a new monitoring bore will help to ensure that there is no localised faecal contamination of groundwater.

Based on the above assessment, the effects of the proposed dairy farming activity on groundwater will be no more than minor.

Surfacewater - AEE including cumulative effects of activity and mitigations

Artificial drainage and overland flow are pathways by which contaminants (nutrients N and P, sediment and microbes) present in dung, urine, effluent and silage leactate may reach receiving waters such as surfacewater streams, the Waimatuku Stream, Waimatuku Estuary, the Oreti River, New River Estuary, Aparima River, Jacobs River Estuary and coastal waters. The major risk to surface waters is from contaminant loss via subsurface drainage channels that occurs following periods of heavy rain, when the soil's field capacity is exceeded and bypass drainage events occur; nutrients N and P, sediment and microbes are transported via subsurface drainage to streams. Due to its very flat topography, overland flow is not a particular risk to surfacewater quality at the property. There are, however, low points close to tile outfalls that can act as CSAs at times, where water can pond following intense rainfall. Runoff from tracks and lanes to surface waterways can occur risk close to and at culvert crossings following intense rainfall.

At the farm scale it is very difficult to quantify contaminants being lost to surfacewaters and their contribution to cumulative effects on receiving waters; there will be much seasonal and spatial variation in this. Furthermore, measuring the volume of drainage water leaving a sub-catchment and the concentration of nutrients in drainage water would require expensive equipment as well as long term monitoring to allow for temporal and spatial variation; this is not practical given available scientific methods. For these reasons, Overseer predictions are used along with knowledge of soils, rainfall infiltration and receiving waters.

Notes:

1. *The below calculations are carried out using values for N and P loss for the dairy platform only, as per Overseer nutrient budget analyses for the proposed 1,500 cow scenario. P loss is used as a proxy for sediment and microbial loss.*

2. *Drummond and Glenelg soils are free draining and do not pose a risk to surfacewaters via artificial drainage channels. The mid-west part of the dairy platform (approximately 100.5 hectares or 21%) has Braxton type soils; these have subsurface drainage installed and drain to the Waimatuku Stream catchment.* ***Since the major surfacewater risk is from Braxton soil types that drain to the Waimatuku Stream catchment, the focus of the AEE on surfacewaters is to the Waimatuku Stream catchment.***

Table 7.2 Effects of N and P in surfacewaters, predominantly including streams in the Waimatuku catchment, Waimatuku Stream, Waimatuku Estuary and coastal waters. Some of these effects may be seen in the Oreti catchment (shallow streams, Oreti River, New River Estuary) due to the discharge of groundwater to shallow streams in the Oreti catchment. P is understood to act as a proxy for sediment and microbes. This table links to table 6.5 (mitigation measures).

Contaminant	Potential effect in receiving surfacewaters	Related effects	Specific mitigations proposed at the dairy farm	Likelihood of effect due to proposed dairy farming activity	Risk of effect due to proposed dairy farming activity
N, P	Increased algal growth in the water column, especially when flows are low and/or temperatures are elevated in shallow streams and the Waimatuku Stream: • Degrades water quality and blocks light (increases turbidity and reduces clarity)	Ecological: exclusion of macrophytes, reduced visibility for fish and other aquatic organisms, loss of habitat, decreased suitability for recreational activity	As per table 6.5. Measures mitigating N loss are #1, 2, 3, 4, 5 and 6; Measures for mitigating P loss are #1, 2, 3, 5, 6, 7, 9, 10	Low likelihood due to the nature and scale of activity and implementation of migration measures	No more than minor
N, P	Increased algal growth in the water column: • Potentially increasing BOD	Ecological: reduced DO causing stress on aquatic organisms, loss of species and habitat	As per above	Very low likelihood since point source discharges affect BOD rather than diffuse sources (i.e. the proposed dairy farming activity). Although the discharge of FDE is a point source discharge, it is to land rather than water is managed appropriately.	Less than minor – point source discharges affect BOD rather than diffuse sources
N, P	Increased periphyton growth on stream beds, especially in smaller streams (Waimatuku) when temperatures are elevated or flows are low:	Ecological: loss of habitat, effects on invertebrates and organisms in associated food webs, reduced biodiversity	As per above	Low likelihood due to the nature and scale of activity and implementation of migration measures	No more than minor

	• Smother streambed				
N, P	Increased periphyton growth, especially in streams and rivers when temperatures are elevated or flows are low: • Promote the growth of toxic matts of cyanobacteria (blue green algae)	Toxic effects on biota including domestic animals. Also, people using waterways for recreational activities are at risk of adverse health effects	As per above	Low likelihood due to the natures and scale of activity and implementation of migration measures	No more than minor
N	N toxicity effects if N concentration is high enough, particularly in the Waimatuku Stream	Ecological: loss of habitat, fish kills Animal and human health due to nitrate toxicity	As per above for N loss mitigation	Low likelihood since N concentration in receiving waters is lower than toxicity level and encouragingly N levels have decreased over the last two consecutive years in the Waimatuku Stream. The scale of the activity and implementation of proposed migration measures further reduce the likelihood of the effect occurring.	Less than minor
P	Increased nuisance plant growth on estuaries (Waimatuku and/or New River): P sorbed to soil particles following runoff is	Weed-driven habitat modification and loss; effects on invertebrates and organisms in associated	As per above for P loss mitigation	Low likelihood due to nature and scale of activity and	No more than minor

	deposited in sediment and then released from bed into the water column	food webs leading to reduced biodiversity		implementation of proposed migration measures	
Sediment	Following runoff, increased turbidity and reduced water quality in Waimatuku Streams, Oreti River and respective estuaries.	Ecological: exclusion of macrophytes, reduced visibility for fish and other aquatic organisms, loss of habitat, decreased suitability for recreational activity	As per table 1. Measures 1, 2, 3, 5, 6, 7, 10 are the main mitigation measures for sediment loss.	Low likelihood due to nature and scale of activity and implementation of proposed migration measures	No more than minor
Sediment	Following runoff, increased deposition of sediment in Waimatuku Streams, Oreti River and respective estuaries. • Smother streambed	Ecological: loss of habitat and increased anoxic conditions (estuaries), effects on invertebrates and organisms in associated food webs, reduced biodiversity	As per above	Low likelihood due to nature and scale of activity and implementation of proposed migration measures	No more than minor
Microbial contaminants	Following run-off, elevated levels of microbial contaminants in streams, Waimatuku Stream, Oreti River and respective estuaries:	People using waterways for recreational activities and food gathering are at risk of adverse health effects (gastroenteritis)	As per above	Low likelihood due to nature and scale of activity and implementation of proposed migration measures	No more than minor

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Nitrogen

PROPOSED 1,500 COW SCENARIO – N CONCENTRATION IN SURFACE DRAINAGE WATER

A conservative estimate for N loss to surfacewaters is calculated below. For the purpose of the calculations, the average annual N loss figure from Braxton soils from Overseer was used. The mean annual land surface recharge rate was used to calculate an estimate of drainage volume to surfacewaters.

100 ha = 1,000,000 m^2

Recharge rate estimate (Lincoln Environmental, 2003) = 0.467 m

(1) *Area (m^2) X drainage (m) = drainage volume (m^3)*

Approximate drainage volume annually = 1,000,000 m^2 x 0.467 m = 467,000 m^3

If all 2,671 kg of N lost to water annually from the Braxton block according to Overseer, is transported via subsurface/artificial drainage channels and overland flow to surfacewaters, then the N concentration of water draining directly to surfacewaters is:

2,671 kg/467,000 m^3 = 5.7 g/m^3 = 5.7 ppm*

5.7 ppm is a conservative estimate as it assumes all N lost below the root zone ends up in surface drainage water. In fact some N will be lost below the root zone to the atmosphere via denitrification processes in soils, and a very quantity of N may be lost to groundwater. ***As such 5.7 ppm N reflects a "worst case scenario" for the 1,500 cow scenario.***

On average the concentration of N in water draining to surfacewaters will be less than 5.7 ppm. Furthermore, water reaching the receiving surfacewaters undergoes mixing and nutrients are diluted. Due to mixing and some dilution thereafter, it is reasonable to assume that this will change background N concentrations by some degree, and cumulatively will give a concentration of no more than 3.65 ppm for the Waimatuku Stream catchment (Median Total Nitrogen for SOE site at Waimatuku Stream at Lornville Riverton Highway).

Losses to the Lower Oreti receiving waters will be minimal due to the free draining nature of soils on that part of the dairy platform, and cumulatively will give a concentration of no more than 1.06 ppm for the Lower Oreti catchment (Median Total Nitrogen at SOE site at Oreti River at Wallace Town).

PRE-EXPANSION - N CONCENTRATION IN SURFACE DRAINAGE WATER

The pre-expansion land use based on four years of data is predicted by Overseer to have had slightly greater N loss to water than the proposed 1,500 cow scenario. Using the same process, the N concentration of water draining to surface waters would be predicted to be slightly higher than for the proposed scenario. It is reasonable to assume that there will be no increase in N related effects in receiving surfacewaters due to the 1,500-cow farm, relative to the pre-expansion land use, which included fodder cropping and associated grazing at the dairy platform. In a catchment where N levels are elevated (i.e. the Waimatuku in particular), any reduction in N loss is environmentally favourable, even where the decrease is a small one.

Some N that accumulates in Braxton type soils will reach surfacewaters following high rainfall events via artificial drainage, with a minor contribution from overland flow, particularly in the late autumn, winter and early spring. Although it is possible to estimate the "worst case scenario" concentration for N in surfacewater drainage from the dairy platform, estimating the N load of drainage water to the Waimatuku Stream catchment is unfeasible without knowing the flow rate of surfacewater leaving the dairy platform. Again, the Waimatuku Stream catchment is the focus due to its risk from artificial drainage of contaminants.

N LOAD - WAIMATUKU STREAM

The Waimatuku Stream at Lorneville Riverton Highway SOE site was used as a reference for this calculation.

Total nitrogen median** concentration = 3.65 g/m^3.

The average flow from 2013 – 2017 of the Waimatuku Stream at Township Road (1 km south of SOE site) = 2.13 m^3/s

(2) Load (g/s) = concentration (g/m^3) x flow (m^3/s)

N load in lower catchment Waimatuku Stream at Waimatuku township = 3.65 g/ m^3 x 2.13 m^3/s = **7.77 g/s**

**The median was used instead of the mean when the mean value was unavailable.

In order to quantify the contribution from the proposed activity to the N load of the Waimatuku Stream, the flow rate of surface water drainage from the dairy platform to the catchment is required. Given available tools and information, the flow rate of surfacewater drainage is unknown. It can reasonably be assumed, that the N loading to the Waimatuku Stream from the proposed activity will cumulatively contribute, with the loading from all other activities in the catchments, to the lower catchment N loading of c.7.77 g/s for the Waimatuku Stream. The contribution to the N loading from the proposed 1,500 cow activity is slightly less than the pre-expansion activity, which has slightly greater average annual N loss according to Overseer (i.e. 0.27 t N/year greater).

EFFECT OF N LOSS IN THE RECEIVING ENVIRONMENT – INCLUDING CUMULATIVELY

Potential effects of N in receiving surfacewaters are summarised and evaluated in table 7.2.

N is a plant macronutrient in aquatic systems. Excess N contributes cumulatively to the eutrophication of receiving waters and promotes nuisance plant growth in the form of algal blooms or slime. This has knock-on effects on the biota that inhabit aquatic ecosystems, and other associated values. The median Total Oxidised Nitrogen concentration for the Waimatuku Stream at Lorneville Riverton SOE site (3.30 mg/L) is well above the ANZECC Guideline of 0.44 mg/L but has an improving trend over ten years. Similarly, the median Total Nitrogen concentration for the Waimatuku Stream at Lorneville Riverton SOE site (3.65 mg/L) is well above the ANZECC Guideline of 0.614 mg/L but has an improving trend over ten years. This indicates that N levels in the Waimatuku Catchment are high enough to cause stress on sensitive species such as fish, as well as cause other adverse effects such as nuisance plant growth. Recently the ten-year trend for N in the Waimatuku Stream catchment has shown improvement, with a reduction in both the median concentration for Total Oxidised N and Total N over the last two consecutive years. The continuation of this trend can be achieved through improved land management in the catchment. The changes in land use at the dairy platform will see an improvement in land management and less mineralisation of N, which cumulatively should see less N loss in surfacewater drainage to the Waimatuku Stream in the long term.

As is described in Section 5, the Waimatuku Estuary is a sensitive environment that is adversely affected by nutrients, sediment and microbial contaminants from land use in the catchment, such as dairy farming. N loss to receiving surfacewaters such as the Waimatuku Stream and Estuary and coastal waters (and to a minor degree the Lower Oreti, and New River Estuary) will be low and slightly reduced compared to the pre-expansion situation due to many key mitigations that reduce N accumulation, N mineralisation processes and protect soil structure. These are summarised in table 6.5. These measures are complemented by the general strategy of good nutrient and soil management as demonstrated in the soil fertility trend reports from Ravensdown.

Phosphorous, sediment and microbial contaminants

The major pathway for P loss (and by proxy sediment and microbes) is artificial drainage following major drainage events. This process pertains to Braxton soil types in particular. Drummond and Glenelg soils have low risk of P loss. There is some risk of overland flow from the dairy platform from CSAs near tile outfalls and where tracks and lanes cross surface waterways. Following intense rainfall water can drain into waterways, carrying P, sediment and microbes with it.

Overseer predicts low average P losses of 0.7 kg/ha/year or 356 kg/year due to the proposed dairying activity (1,500 cows). Overseer predicts an average P loss of 0.4 kg/ha/year for Braxton type soils due to the proposed activity. P loss is split between "Other Sources," which is loss from tracks, lanes and infrastructure to waterways via overland flow, and "Blocks," which is P loss from paddocks due to dairy farming. "Other sources" P loss is estimated by Overseer to be 256 kg/year, with "Block" loss estimated to be 100 kg/year. "Other sources" P loss is calculated by a sub-model in Overseer, which assumes that 30% of P that lands on tracks, lanes, yards and other infrastructure, ends up in waterways (Gray, Wheeler and McDowell, 2016). Overseer does not account for the individual layout of dairy farms, however. In this case, tracks and lanes for the most part do not run close to or parallel to waterways, which reduces the risk of runoff from tracks and lanes to waterways significantly. By managing locations where overland flow from tracks and lanes etc. can potentially reach waterways (such as adjacent to the wintering barn at WOL), loss of "Other sources" P can be greatly reduced although Overseer does not recognise this. This will help to reduce P loss (and other contaminants such as sediment and microbes), by filtering runoff as it drains to waterways from paddocks. With management of such locations, the average annual P loss from the property, as predicted by Overseer, can be reduced. Given available tools, it is not possible to quantify this reduction.

As is described in Section 6, Overseer predicts that there will be no change in P loss with the increase in cow numbers. As such, the P related effects of the expansion, and by proxy sediment and microbes, will be minimal.

EFFECT OF P LOSS IN RECEIVING ENVIRONMENT– INCLUDING CUMULATIVELY

Potential effects of P in receiving surfacewaters are summarised and evaluated in table 7.2.

Due to physical and chemical interactions, P tends to be adsorbed by soil particles in surfacewaters and is taken out of solution to a large extent. A small portion of P, however, will remain soluble and available for uptake by aquatic plants in receiving water bodies. Some P will subsequently be released from sediments as soluble P and can then be taken up by plants. P is a plant macronutrient, which is often a growth limiting factor in aquatic systems. Excess P can contribute cumulatively to the eutrophication of receiving waters and promote nuisance plant growth in the form of algal blooms or slime. This has knock-on effects on biota that inhabit aquatic systems and associated values.

The median DRP concentration for the Waimatuku Stream at Lorneville Riverton (SOE) site (0.042 mg/L) is above the ANZECC Guideline of 0.01 mg/L and has a degrading trend over ten years. This indicates that the Waimatuku Catchment has elevated and increasing levels soluble P, which can lead to the adverse environmental effects described above and in table 7.2. In order to improve water quality, a reduction in soluble P in waterways needs to occur and the ten-year trend needs to be show improvement. This can be achieved through improved land management in the catchment.

Due to mitigations summarised in table 6.5, the loading of P (and sediment and microbial contaminants) to receiving surfacewaters such as the Waimatuku Stream, Waimatuku Estuary and coastal waters (and to a very minor degree the Lower Oreti and New River Estuary) from the dairy platform will be low and will not increase. Particularly, practices that reduce soil pugging and improve soil structure are effective at reducing the risk of P, sediment and microbial losses to surfacewaters as they allow for P to be held in the soil, and for microbes to be filtered and held in the soil profile until they become unviable. The careful management of soil fertility through sustainable fertiliser and effluent application are also key mitigations for minimising P loss and are evident in the soil fertility trend reports for the dairy platform (see Appendix). Management of riparian areas and closely associated CSAs is an important mitigation for P loss and is taken seriously at the dairy platform. Collectively these measures mitigate P loss (and by proxy sediment and microbes), including cumulatively, to receiving surfacewaters.

Drainage waters mix with receiving waters and are diluted. Given mixing and dilution of drainage and receiving waters annually, the proposed activity will contribute an immeasurably small amount to the P load of receiving waters, and there will be no increase in the P load of receiving waters relative to the pre-expansion land use. Similarly, there will be minimal change in sediment and microbial contaminant levels of receiving waters due to the proposed activity.

Summary – AEE on surfacewaters

Although the proposed activity represents an expansion of dairying, there will be slightly less N and P lost to receiving surfacewaters due to the implementation of mitigation measures, and therefore slightly less effect on receiving surfacewaters and associated values compared to the pre-expansion system.

Values associated with surfacewater streams, rivers and coastal waters are many and relate to the landscape, biodiversity, history and people living in the catchment. These values include maintaining the health of water bodies both in-stream and coastal, protecting biodiversity and ecosystems, protecting recreational activities such as fishing, walking and boating; protecting human and animal health, maintaining sustainable farming practices and the socioeconomic well-being of people through preserving values that relate to inshore fishing, farming and tourism. Iwi/cultural values include the principles of protection or kaitiakitanga of the mauri of the water and mana of the land, while minimising adverse effects on taonga and mahinga kai. Contaminant losses from the proposed activity will be low and will not adversely affect these values. There will be no increase in adverse effects on any of the above values from the proposed activity.

Based on the above assessment, the effects of the proposed dairy farming activity on receiving surfacewaters will be no more than minor.

Biodiversity of surfacewaters

Nutrient enrichment (by N and P) and sedimentation of the Waimatuku Stream, Waimatuku Estuary, Oreti River, New River Estuary and coastal waters result in nuisance plant growth such as slime (cyanobacteria), algal blooms, the choking of waterways by macrophytes (weeds) and the smothering of stream beds. The collection of plants and animals that inhabit receiving waters are adversely affected, as well as in-stream values such as biodiversity.

As is outlined in Section 5, effects such as macroalgal blooms are frequently seen in at the Waimatuku Estuary over the summer period, when temperatures are elevated. These effects are complex and relate to many interacting factors, e.g. physical factors such as flow rates and temperature, as well as chemical and biological factors. Ecological data from a lower catchment site (close to the estuary), as described in Section 5, are indicative of land use effects on aquatic biota living in the Stream. The Waimatuku Stream and Estuary are used for the recreational fishing of trout and whitebait. Trout and native fish species such as short and long fin eels and galaxids, are found in the Stream and Estuary.

New River Estuary catchment is also described in Section 5, with some parts being identified as being highly muddy and anoxic, eutrophic and having associated nuisance algal growth. Poorly flushed parts of the estuary have been identified as eutrophic areas. The Oreti River and New River Estuary are used for the recreational fishing. Trout and native fish species such as short and long fin eels and galaxids, are found in the river and estuary.

There will be minimal effect on biodiversity due to the proposed activity due to the implementation of mitigation measures on farm. These set out to reduce contaminant loss relative to the pre-expansion situation. Implementation of several measures will cumulatively reduce nutrient, sediment and microbial loss from the activity over time, which reduces any potential adverse impacts on the biodiversity of the Waimatuku Stream and Estuary, Oreti River and New River Estuary, and coastal waters.

Winter Grazing

No further winter grazing of cows or heifers on pasture or winter/summer crop will occur at the WOL/WTL dairy platform. Instead all animals wintered at WOL/WTL will be wintered in barns. No AEE for winter grazing is required as this activity will not be carried out.

Consideration of alternatives for land use at the property

The land has been developed and used for dairy farming for many decades. Through their investment and experience farming the property, the applicants have developed a sustainable dairy farming model to suit the property. The proposed intensification is increasing the herd size by 160 cows, however, the proposed system will result in slightly less N loss to water than the existing situation, through the implementation of mitigation measures. The pre-expansion land use would not achieve a better environmental result than the proposed 1,500 cow dairy platform.

8. Consultation

The applicants have farmed the property as a dairy farm for many decades, starting in 1992 when they converted the WOL unit, with full dairy infrastructure on site. The irrigation systems are low depth with minimal visual or olfactory impact. Two large barns house cows over winter, which removes the practice of intensive winter grazing of beet crops. The proposed changes include an increase in cow numbers but are of similar nature as existing activities and land use at the property. Good management practices are in place and mitigation measures will be implemented. Environmental effects are expected to reduce with the proposed changes. For these reasons, no potentially affected parties are anticipated.

9. Conclusion

The applicants seek replacement consents for their current land use consent for expanded dairy farming, effluent discharge to land and groundwater take for a 1,500-cow dairy operation. The expansion is due to an increase of 160 cows to a maximum of 1,500 cows. The expansion will occur in parallel with key changes to the existing farm system; these changes result in a system with slightly lower average N and P loss annually according to Overseer. The effects of the expansion are not being exported elsewhere, but are being contained and managed appropriately at the land holding.

The application includes a policy assessment, an assessment of environmental effects and Farm Environmental Management Plan that demonstrate that the expected, actual or potential adverse effects generated by the continuation of the proposed activities on the environment can be avoided, remedied or mitigated to the extent that they are considered to be no more than minor.

The key concern with the expansion and effluent discharge is the potential for the activities to have adverse effects on groundwater and surface water quality, and on soils. Provided any consent conditions imposed by the Council are adhered to, and management practices are implemented in line with the attached Farm Environmental Management Plan, the activities should have little adverse effect on the environment.

The water take is should have little adverse effect on neighbours' bores, and a less than minor effect on aquifer sustainability, current allocation and stream depletion.

Overall the proposal is considered consistent with the purpose of the Resource Management Act 1991, and does not conflict with the purpose of the Act, or with Council policy. The adverse effects of the dairy farm activity, the water take and the discharge of dairy shed effluent onto land should be no more than minor provided that the applicants adhere to the attached Farm Environmental Management Plan.

11. References

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Gray, Wheeler and McDowell (2016). **Review of Phosphorous submodel in Overseer**. Report prepared for AgResearch.

Hitchcock (2014). **Characterising the surface and groundwater interactions in the Waimatuku Stream, Southland.** MSc Thesis. University of Otago.

Houlbrooke, Longhurst, Orchiston and Muirhead (2011). **Characterising dairy manures and slurries**. AgResearch Report.

Houlbrooke & Monaghan (2009). **The influence of soil drainage characteristics on contaminant leakage risk associated with the land application of farm dairy effluent**. Report prepared for Environment Southland.

Longhurst, Rajendram, Miller and Dexter (2017). **Nutrient content of liquid and solid effluents on NZ dairy cow farms**. Science and Policy: nutrient management challenges for the next generation. Occasional Report No. 30.

Wilson, Chanut, Rissman & Ledgard (2014). **Estimating time lags for nitrate response in shallow Southland groundwater.** Technical report prepared for Environment Southland.

From: Aurora Grant
Sent: Monday, 28 January 2019 8:16 p.m.
To: 'Nessa Legg'
Cc: Alex Erceg; abe@woldwide.nz; 'Anita De Wolde'
Subject: RE: Woldwide 1&2 application - draft for review
Attachments: WW1 and WW2 - consent application - 2019 - ver3 - for review PART A1 - w....docx; WW1 and WW2 - consent application - 2019 - ver3 - for review PART B - wi....docx

Hi Nessa,

Below and on the attached word documents are our comments – sorry they are not all on the word document as we began reviewing before the word document was sent through.

- The application includes discharging "slurry" from WW1 and WW2 to the Horner Block, to be included in the one discharge permit. There are a couple of issues with this.
    1. You have indicated that the discharge to the Horner block will be used as a mitigation for the overall activity. This is a change from the original application that requested a separate discharge permit for this activity, and the legal opinion that excluded the Horner block from the "landholding" was based on that activity having a separate discharge permit on the separate property. By combining the discharge permit and using the slurry discharge as mitigation I think that this will then potentially bring the Horner block into the "landholding".
    2. I do not think that slurry is solid/ dry enough to fit purely under rule 38 and will also trigger the RELAP which is a discretionary activity. If the slurry is dry enough to fit under the solid waste rule in the pSWALP, please detail how it is dried.
    3. Please address how the increase in nitrogen loadings to 250 kg/ha/yr plus fertiliser application on the Horner block, which has high risk soils can be considered a mitigation.
    4. An AEE for the discharge of slurry to the Horner Block will need to be included – Regardless of if it is considered part of the landholding or not, and regardless of whether or not a discharge permit is required, the effects of the discharge still need to be assessed, as we need to assess **all** effects from the farming operation;

<u>Other matters to address:</u>

- An application for the use of the feed pads will need to be made at the time of lodging the other applications – as this is being used as a mitigation, consent will be required in order to accept it as a mitigation;
- Clarification of the numbers in the winter barn – you have applied for 1,280 but say only 1,250 will be in the barn, but as stated in the mitigations all cows will be housed in the barns over winter. If you stick with these numbers, then not all cows will be housed in the barns, and you will need to re-address the wording of their mitigation;
- An AEE for Intensive Winter Grazing – as not all cows appear to be proposed to be housed in the barns an AEE would be required unless you clear up the inconsistencies in the application surrounding this;
- Explanation of how the winter barn effluent meets Rule 38 – the effluent from the winter barn is consistently referred to as slurry, and in my opinion this would mean the effluent is not dry enough to be spread under Rule 38 (also applies to the above points regarding horner block;
- An AEE for the run-off block. As you are grazing young and replacement stock at the run-off, this activity makes up part of the overall farming unit and needs to be considered as part of the landholding in order to pass section 88;
- You need to further address the run-off from the "east dairy lane" and mitigations from this lane – You need to explain the size of the buffer zone, address the slope of the buffer and whether or not it will be successful in mitigating run-off and any other measures you wish to take to mitigate the run-off. Having gravel on hand to reshape the lane is not really providing a mitigation;

- As the run-off block is considered to be part of the landholding, legal descriptions and GPS coordinates are required;
- The pond drop test for Woldwide 2's pond is not in line with Appendix P, nor does it have a leak detection under the entire facility. The applicant also does not have s20 rights. The pond is therefore not in line with Rule 32D and is not a permitted activity nor any other activity status – please address this in the application;
- It is unclear as to whether or not the leak detection under Woldwide One's pond underlies the entire facility, therefore a determination cannot be made as to the whether or not the structure is in line with Rule 32D of the pSWLP;
- The treatment and ancillary structures have not been adequately described (i.e. no mention of size) and it is unclear if these are in line with the criteria of Rule 32D of the pSWLP;
- There are sumps on the silage pad on Woldwide Two that are "open to the farm drainage system" as well as a "dual drainage system". It is not clear how leachate is prevented from entering these sumps;
- Evidence to back up the claim that "slurry" is self-sealing and prevents wind driven erosion of effluent storage facilities and how this aligns with Rule 32D of the pSWLP.
- When processing rule 20 applications there are three broad questions we are looking for answers for. The questions are:
  1. What are the effects from the whole activity? Policy 39 directs us to not consider the farm activity as the permitted baseline when applicants are expanding their operation.
  2. What are the effects from the additional cows (or additional land) above what is already in place? This needs to be more than an Overseer modelling comparison.
  3. What are the cumulative effects from farming on the receiving environment (including surface, groundwater and the new river estuary)? This should include consideration for all farms in the catchment, and a discussion of other influences
- I do not believe the AEE answers the three questions we are looking at. The AEE provided seems more of a summary and does not directly address the effects of the three points individually. There is also no consideration of the effects of the proposed activity versus the activity not being there.

Apologies if some of these comments are quite direct. I'm happy to go over them with you and explain my thinking.

Cheers,

Aurora

Aurora Grant
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From: Nessa Legg <nessa.dgl@xtra.co.nz>
Sent: Saturday, 19 January 2019 10:20 PM
To: Aurora Grant <Aurora.Grant@es.govt.nz>
Cc: abe@woldwide.nz; 'Anita De Wolde' <anita@woldwide.nz>
Subject: Woldwide 1&2 application - draft for review

Hi Aurora,

Hope all is well.

Please find attached a draft application for Woldwide 1&2, with changes made as best I could following our meeting. Can you please review it and get back to me with feedback? It is a draft so I am happy to make further changes based on your comments. I kept the discharge, water and dairy farming AEEs separate as per the August 2018 application. I incorporated as much of the RFI stuff as I could into the application. Anything that is left out will be appended to the official application. John's soil investigation will be described in one report (work in progress) and appended to the official application.

There are a couple of further changes from the August 2018 application that we didn't discuss at our meeting because they have come up since then:

1. Abe and Anita are likely to request that the application be publicly notified under s95A. This is not 100% decided yet but just to make you aware of it;
2. Based on the LO that was provided for the Horner Block, we believe that Woldwide Runoff is not part of the landholding at 1&2 (or 4 and 5) and the draft application reflects this. That said, the same high level of information on WR will be provided in accompanying reports as part of the official application, so that activities and effects at WR will be fully considered.

I am away this week so look forward to your feedback when I get back.
Cheers,
Nessa

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Dairy Green Ltd

Practical Engineering Solutions

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Design through to Installation

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Woldwide Farming Group:

Woldwide One Limited and Woldwide Two Limited

/1/2019

Application for:

- Land Use Consent for Use of Land for Dairy Farming – Replacement of **20171278-03**
- Discharge Permit – Replacement of **301663** and **20171278-01** under one discharge permit
- Water Permit – Replacement of **301664** and **20171278-02** under one water permit

Farm Location: Heddon Bush

Application prepared on behalf of applicant by Dairy Green Ltd.

Table of Contents:

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Key

ES	Environment Southland
HB	Horner Block – cut and carry/slurry receiving
pSWLP	proposed Southland Water and Land Plan (2018)
PZ	Physiographic Zone
WOL	Woldwide One Limited
WOL/WTL	Woldwide One and Woldwide Two dairy platform
WR	Woldwide Runoff – Merrivale and Merriburn blocks
WTL	Woldwide Two Limited

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1. Overview

1.1 Background

Background

Woldwide One Limited (WOL) and Woldwide Two Limited (WTL) operate two adjoining dairy farms situated at Heddon Bush. Both dairy farms are under the same ownership structure.

WOL currently operates under an effluent discharge permit (AUTH-301663) and water permit (AUTH-301664). Both consents were granted a 15-year term and expire in 2027.

WTL currently operates under a land use consent for expanded dairy farming (AUTH-20171278-03), effluent discharge permit (AUTH-20171278-01) and water permit (AUTH-20171278-02). All were granted a ten-year term and expire in 2027.

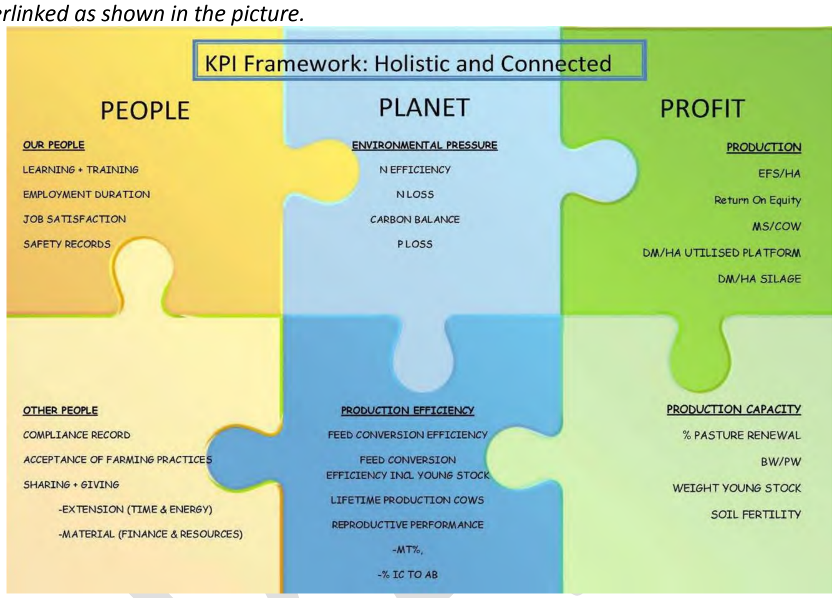
Both WOL and WTL utilise a nearby support block (Horner Block) for cut and carry and to discharge pond slurry. The Horner Block is under separate ownership to the dairy platforms at WOL and WTL and is not part of either dairy platform. The discharge of agricultural effluent at the HB is authorised under respective effluent discharge permits for WOL and WTL.

Both the WOL and WTL dairy platforms graze young stock at Woldwide Runoff (WR), which comprises the Merrivale and Merriburn blocks in the Merrivale area. WR is under separate ownership to the dairy platforms at WOL and WTL and is not part of either dairy platform.

Applicant's philosophy

In the words Abe and Anita de Wolde from the Woldwide Farming Group:

> *Sustainability (environmental, economic and social) has been at the core of all we do at Woldwide Farming group. To us these principles flow out of a desire to be good stewards, and they are all interlinked as shown in the picture.*



> *We were the first to build free stall barns in Southland to reduce outside crop wintering and we were the first (and only) ones to feed fresh grass to our cows in winter to reduce silage making losses and runoff. In 2013 we were supreme winners of the Southland Ballance Farm Environment Awards.*
>
> *Ever since we came to New Zealand we have been trying to improve the sustainability of our farms with a long decision-making horizon and an innovative mind-set. We have now come to a point in our farming career where we wish to cap our growth ambitions and truly focus on environmental sustainability. Keeping our stock off wet soils in winter is pivotal in this endeavour. We aim to have all our adult stock from all our farms indoors within five years (and work on housing all young stock after that). We believe wintering animals outside on wet soils is very damaging for the following reasons:*
>
> - *Nitrogen is lost because it is deposited on the ground (in the mud) when there are no plants actively taking it up and locking it in.*
> - *Sediment and top soil are displaced because of the following reasons:*
>   - *The ground is disturbed when it is wet*
>   - *Root structures are destroyed*
>   - *Overland flow (of Phosphate, sediment, bacteria) increases due to soil compaction*

  - *Rain events during cropping season when soils are worked up fine and crops have not yet established can be very risky*
- *Lots of chemicals are used in the cultivation of winter crops*
- *It takes 85 m of wrap to produce a bale of baleage and we want to reduce our reliance on this*

We are convinced that 90 % of the environmental issues caused by farming in Southland stem from the 10 % of ground that is winter cropped. Just because something is common practice does not mean that the effects are acceptable. It is time to change this!

It needs to be kept in mind though that land- previously used for winter cropping- is vacated under our new plans and a small increase of stock numbers is needed to make up for that.

Our passionate desire is to go beyond compliance and to produce top quality food with a reduced environmental footprint. And that is the mindset behind this application.

Application history

In 2017, WTL was granted consent for expanded dairy farming. This involved the addition of new land previously used for dairy support (i.e. SH96 and Marcel blocks) into the milking platform. In parallel with this, some land was removed from WTL's milking platform to be added to WOL's milking platform. WTL cow numbers did not increase as part of the dairy expansion; they remained at 800. The SH96/Marcel support block, which came into WTL's milking platform as part of the expansion, had been used to graze young stock, winter graze cows/heifers on fodder crop and grow supplement (pasture silage). The discharge permit was replaced to allow for the new boundary, effluent discharge area and an increase in the size of a wintering barn. WTL's water permit was also replaced in 2017.

Agricultural effluent from WTL is discharged at low depth at the dairy farm and at the Horner Block, located to the south west. Agricultural effluent from WOL is discharged at low depth at the dairy farm, and at the Horner Block. The Horner Block is a cut and carry block, used to grow grass to supply dairy farms, and receives slurry effluent from WOL, WTL and the Woldwide Three dairy farm (which is not included in this application). The Horner Block does not graze stock.

In 2017, an application for expanded dairy farming at WOL was submitted to Environment Southland (ES), which for reasons not explained here was publicly notified. During the notification process, the decisions version of the proposed Southland Water and Land Plan (2018) was released. Following discussions and advice from stakeholders based on many factors including how best to model pre-expansion land use, the applicants put WOL's application on hold and opted to submit a new application. The new application was submitted to ES in August 2018 and aimed to bring the WOL and WTL dairy farms under a single land use consent for dairy farming. The application was accepted by ES, with extensive information provided under s92 (1), at several meetings and at a site visit.

For reasons not explained here, WOL/WTL's 2018 consent application was publicly notified by ES. An error was made during the notification process, which made the notification illegal according to legal opinion. In view of the ES error resulting in illegal public notification and following collaborative discussions with ES on the best way forward, the applicants agreed to withdraw the consent application, address certain issues identified by ES in the s95 report and resubmit the application. This application aims to bring the WOL and

WTL dairy platforms under a single land use consent for dairy farming and to resolve certain issues identified by ES with the 2018 application.

As is explained in section 2.1, the name of the new consent holder on the land use consent for dairy farming, the discharge and water permits will be "Woldwide One Limited and Woldwide Two Limited."

Request for public notification of application

Based on the application's history, the applicants hereby request that the consent authority publicly notify this application in accordance with s95A of the Act.

Landholding

Due to the definition of a "landholding" in the pSWLP (2018) and legal opinion provided to Environment Southland in 2018 by Wynn Williams, the applicants believe that the landholding only includes land at the proposed Woldwide 1&2 dairy platform, as described in table 1.1.

Legal opinion clarified that the Horner Block is not considered to form a "single operating unit" with Woldwide 1&2. Legal opinion concluded that the Horner Bock is not part of the same landholding as Woldwide 1&2 and therefore should not be included on the land use consent for farming. Adverse effects of the discharge activity at the Horner Block have been assessed regarding the use of that land in section 7.

Legal opinion did not specifically cover Woldwide Runoff (WR), which includes the Merrivale and Merriburn blocks and is used to graze young stock among other farming activities outlined below. Based on the LO, the applicants believe that Woldwide 1&2 is not utilising WR as part of a "single operating unit," and therefore WR is not part of the landholding for either Woldwide 1&2 (or unrelated to this application, Woldwide 4&5).

The applicants believe that WR is not central to the overall farming operation for any of the above mentioned Woldwide dairy farms. This statement is justified by the following three points, which are aligned with the justifications used to exclude Horner block in the LO provided to ES by Wynn Williams:

1. The grazing of young stock is the only aspect of 1&2's (and 4&5's) farming operations, which occurs at WR. No cows are sent from 1&2 (or 4&5) to WR for winter grazing, no sludge/effluent is exported from 1&2 (and 4&5) to WR.

2. WR is not central to the overall farming operations being carried out at 1&2 and 4&5. The only service that WR provides for the dairy farms (Woldwide 1&2, 3, 4 and 5) is the grazing of young stock. This is a service that can be provided by a third-party grazier, which is often the case in dairy farming in Southland. Another common practice in Southland is the purchasing of young stock independently. WR grazes approximately 330 R1 and 330 R2 heifers from Woldwide 1&2 annually; there are approximately 920 R1 and 920 R2s heifers at WR from <u>other</u> Woldwide dairy farms annually.

3. WR has other functions that are not directly related to Woldwide 1&2, Woldwide 4, and Woldwide 5.

For example, WR has an activity and income stream from forestry that is separate from dairy farming:

a. Approximately 100 hectares of land at WR is in a commercial pine plantation. The pine plantation at WR is registered for carbon credits and is pruned and maintained according to industry standards.
b. A further 60 hectares of land is beech forest. This is under a sustainable management plan.

For example, WR has an activity and income stream from rotten rock sales for forestry and roading that is separate from dairy farming. Rock from a quarry at WR is sold in partnership with DT Kings Transport Ltd.

CONSIDERATION OF EFFECTS AT WOLDWIDE RUNOFF

Despite not being part of Woldwide 1&2's landholding, the applicants accept that activities and effects at WR need to be described, assessed and fully considered. Activities and effects at WR are described in accompanying reports, including a qualitative assessment and an AEE specific to WR. A 17/18 year-end nutrient budget was prepared for WR to provide guidance for the AEE.

Current application

Land use consent for farming

It is proposed to replace WTL's land use consent for dairy expansion (20171278-03) with a land use consent for dairy farming to include the land areas contained by both WOL and WTL dairy platforms. The land area of the dairy platform is not increasing; all land was in the dairy platform prior to 3 June 2016 or was authorised for dairy farming at WTL in 2017; support land referred to as SH96/Marcel Block was consented for dairy farming at WTL in 2017. The proposed dairy platform will contain two milking sheds and two wintering barns. At an operational level, WOL and WTL will be run as individual dairy units.

An output-based land use consent is requested, which will specify a limit for nitrogen for the dairy platform that must not be exceeded annually. A year-end Overseer nutrient budget will be carried out based and reported to Environment Southland to demonstrate that nutrient limits have not been exceeded. Proposed conditions for the land use consent are included in the section 2.3.

It is proposed to increase cow numbers milked to 1,500. Currently a total of 1,340 cows are authorised; 540 at WOL and 800 at WTL. The proposed increase represents an increase of 160 milking cows or 11% overall. The increase will occur at the WOL unit where the herd size will go from 540 to 700. The WOL unit is increasing in area due to its obtaining land from the WTL milking platform area, which was freed up when the SH96 and Marcel blocks were added to WTL's milking platform area in 2017.

It is proposed to increase the maximum number of animals (cows/heifers) wintered in barns to 1,280. The proposed increase represents an increase of 240 animals and will occur at the WOL wintering barn, which will increase from 400 to 640 cow capacity. The barn and effluent system have already been upgraded to cater for the additional cows and effluent.

To allow for the proposed increase in cow numbers, resource consent is being sought under **Rule 20 e)** of the proposed Southland Water and Land Plan 2018 (hereafter referred to as "pSWLP"), for the ongoing use of the land for dairy farming including an increase in cow numbers. The expansion does not include an increase in the dairy platform's land area as all land was either within the dairy platform prior to 30 June 2016 or was authorised for dairy farming through a dairy expansion land use consent that was granted in 2017 (WTL). As is described in Section 2, this is a discretionary activity under Rule 20 due to the proposed increase in cow numbers.

The proposed activity has been considered in terms of key pSWLP policies and based on this assessment should be granted. Effects on the existing environment have been considered and are described in the assessment provided in Section 7 of the application. The assessment concludes that effects on receiving surfacewaters, groundwater and soils, including cumulatively, will be no more than minor due to the proposed activity. Importantly, there will be no increase in contaminant loss nor in the export of nutrients off-site due to the expansion.

Overseer nutrient budgets

Overseer is a useful tool to be able to understand the nutrient interactions of a farm system based on soil properties, rainfall, drainage and feed requirements. The output from the model gives an indication of how much nutrient may be lost to the environment. Overseer nutrient budget analysis has been carried out using Overseer version 6.3.0 and using "Overseer Best Input Standards, March 2018." The increase in cow numbers will occur in parallel with significant land use changes, which act as key mitigation measures and are modelled in Overseer where possible.

NUTRIENT BUDGETS - WOL/WTL DAIRY PLATFORM AREA Four pre-expansion nutrient budgets were prepared and one proposed post-expansion nutrient budget for 1,500 cows. The pre-expansion nutrient budgets were derived by modelling the actual lawful use of land and not by modelling consented maximums. The inputs used in pre-expansion nutrient budgets are supported with evidence, which is appended to the nutrient budget analysis report. Where the analysis report states that the land area is being increased by bringing in support land, this refers to the SH96 and Marcel Blocks, which were authorised for dairy farming as parts of WTL's land use consent granted in 2017.

All nutrient budgets model the same land areas, i.e. former WOL and WTL milking platforms, SH96 and Marcel blocks.

The Overseer analysis demonstrates the effectiveness of key mitigation measures that will be implemented:

- The average N loss is predicted to decrease slightly from 41 kg/ha/year to 40 kg/ha/year, despite an increase in 160 cows;
- The average annual P loss is predicted to remain at 0.7 kg/ha post-expansion; and
- By using P loss as a proxy for sediment and microbial losses, there will be no increase in loss of sediment or microbes.

The applicants believe that over time there will be a cumulative reduction in contaminant loss due to the proposed land use changes, compared to continuing with the pre-expansion land use. The changes will see better nutrient management on farm, improved soil organic matter content, water holding capacity and soil structure, less N accumulation on soils at high risk times, and consequently less contaminant loss to water. Farm profitability will be maintained by grazing 160 additional cows on land previously available for activities such as winter grazing.

NUTRIENT BUDGETS - THE HORNER BLOCK Prior to obtaining legal opinion on the Horner Block, ES regarded the HB to be part of the landholding at WOL/WTL. Based on this, one pre-expansion nutrient budget and one proposed post-expansion nutrient were prepared for the Horner Block and submitted with the 2018 consent application. Legal opinion has since advised ES that the Horner Block is not part of the landholding at WOL/WTL and as such is not required to be included on the land use consent for farming. Since nutrient budgets were already prepared for the HB, they are included in this application as a useful source of information and are used appropriately.

NUTRIENT BUDGET – WORLDWIDE RUNOFF

A 17/18 year-end nutrient budget has been prepared for Woldwide Runoff and provides guidance regarding nutrient losses at WR in the 17/18 year.

Discharge and water permits

It is proposed to replace existing discharge permits (301663, 20171278-01) with a single discharge permit managing effluent from the WOL and WTL dairy units, and to replace existing water permits (301664, 20171278-02) with a single water permit for groundwater abstraction from both WOL and WTL. The proposed discharge permit will allow for the discharge of agricultural effluent (dairy shed, wintering barn, silage pad and underpass) to land from 1,500 cows. **It is proposed to include the current irrigation methods in the discharge permit, i.e. travelling irrigator, trailing shoe slurry tanker, umbilical system; as well as to future proof the discharge activity by also including low rate irrigation.** The proposed water permit will allow for groundwater abstraction for dairy shed and stock drinking water for 1,500 cows.

The Horner Block currently receives agricultural effluent from three dairy farms; WOL, WTL and Woldwide Three. It is proposed that Woldwide Three's FDE are at the Horner Bock will remain mutually exclusive. The FDE areas currently consented to receive effluent/slurry from WOL and WTL will be blocked as a single slurry receiving area. The Horner Block will continue to be run as a cut and carry, and slurry receiving area.

Land use consent for feed pad/lots - wintering barns

Under Rule 35A of the pSWLP, the use of land for two wintering barns at the dairy platform is a discretionary activity as at least one of the conditions of Rule 35A (a) is not met. The WOL barn is increasing in capacity from 400 to 640 cows. An application for consent for the use of land for two feed pad/lots will be submitted to Environment Southland in February 2019.

1.2 Property Details

Note: Woldwide Runoff is described and assessed in a separate set of reports.

Overview

The landholding is an existing dairy farm with required dairy infrastructure and is located within both the Oreti River and Waimatuku Stream catchments at Hundred Line Road, Heddon Bush. It consists of 502 hectares of land, with an effective farm area of 479 hectares.

The slurry-receiving Horner Block is located within both the Waimatuku Stream and Aparima River catchments at Hundred Line Road, Heddon Bush and consists of 160 hectares of land, with an effective farm area of 155 hectares.

Within the last five years, the proposed dairy platform area was managed as two dairy units (WOL and WTL) and a support block (SH96 and Marcel Block). The SH96 and Marcel Block were authorised for dairy farming as part of WTL's land use consent for expanded dairy farming in October 2017. The Horner Block was used for winter grazing and heifer grazing in the past, but has been used for cut and carry, and as an FDE area in recent years.

It is proposed that two dairy units will continue to be operated within the landholding boundary; WOL and WTL. Cows will be milked for seasonal supply through two dairy sheds, 700 at WOL and 800 at WTL. All cows will be wintered in two existing wintering barns. The wintering barns will be used at times to house cows in the shoulders of the season and as stand-off pads during inclement weather throughout the year to reduce soil damage. The Horner Block will continue to be used as an area to discharge slurry from two effluent storage ponds at WOL and WTL. Pasture silage and fresh grass is harvested from the Horner Block and fed to cows at dairy farms, including but not limited to WOL and WTL.

Table 1.1 General property details

Property details	
Dairy platform - total farm area (ha)	502
Dairy platform - effective farm area (ha)	479
Dairy platform - size of effluent disposal area (ha)	c.400
Dairy platform - stocking rate (cows/ha)	3.1
Horner Block – total area (ha)	160
Horner Block – effective area (ha)	155
Horner Block – slurry effluent area (ha) for dairy platform (WOL/WTL only)	97
Legal descriptions – WOL/WTL landholding boundary	Part Lot 18 DP 942

	Section 420 Taringatura SD Part Lot 1 DP 4092 Part Lot 18 DP 942 Part Lot 2 DP 4092 Part Lot 1 DP 4092 Part Section 417 Taringatura SD Section 418 Taringatura SD Section 419 Taringatura SD Lot 1 DP 9925* (leased - Gavin Andrew Dykes) Lot 1 DP 14660 Lot 1 DP 14661 Lot 1 DP 451158 (leased - John Desmoulins Pine & Christina Florence Pine) Lot 1 DP 13077 (leased - John Desmoulins Pine & Christina Florence Pine) Lot 1 DP 5610 Lot 3 DP 5610 Lot 1 DP 10885
Legal descriptions – Effluent discharge area at dairy platform and Horner Block	Part Lot 18 DP 942 Section 420 Taringatura SD Part Lot 1 DP 4092 Part Lot 18 DP 942 Part Lot 2 DP 4092 Part Lot 1 DP 4092 Part Section 417 Taringatura SD Section 418 Taringatura SD Section 419 Taringatura SD Lot 1 DP 14660

	Lot 1 DP 14661 Lot 1 DP 5610 Lot 3 DP 5610 Lot 1 DP 10885 Lot 4 DP 399915 (Horner Block - effluent block only)

*Part of Lot 1 DP 9925 is leased by the applicants and is already within the boundary of the existing land use consent for dairy farming (see figure 1.1).

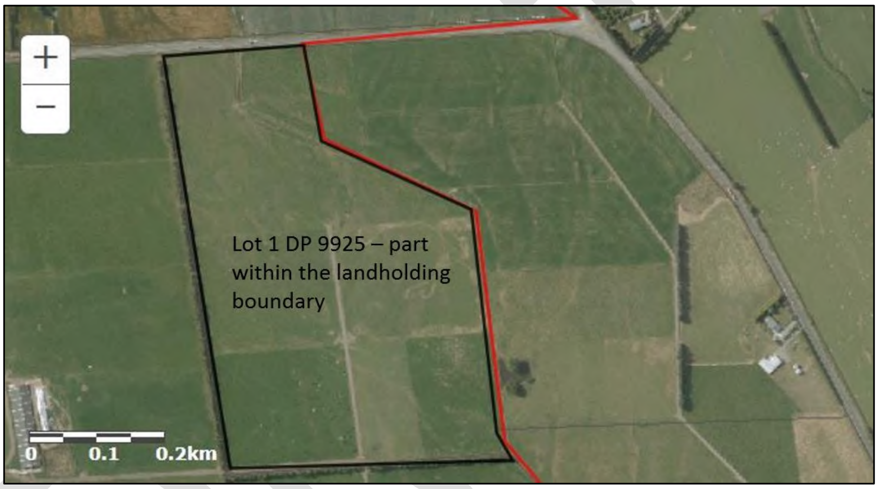


Figure 1.1 Part of Lot 1 DP 9925 within the landholding boundary at WOL/WTL.

Effluent

Existing discharge conditions

Agricultural effluent from WOL and WTL dairy operations are currently managed by way of two existing discharge permits **(301663, 20171278-01)**, which expire on the 9th of November 2027 and 18th October 2027 respectively. WOL's existing discharge consent is for a 540-cow herd milked twice a day and from herd home slurry from a maximum of 400 cows. WTL's existing discharge consent is for an 800-cow herd milked twice a day and from herd home slurry from a maximum of 640 cows. WTL's existing discharge permit also provides for effluent from an underpass and a silage pad.

The consented discharge method at WOL includes land disposal methods limited to maximum application depths of 10 mm and 5 mm per application. The consented discharge methods at WTL include a low depth travelling irrigator, umbilical system and slurry tanker with a trailing shoe. The travelling irrigator has a maximum application depth per application of 10 mm. The umbilical and trailing shoe slurry tanker systems have a maximum depth per application of 5 mm.

The existing operations do not involve winter milking.

Existing FDE areas

WTL's discharge area includes 194 hectares of land at WTL, and 42 hectares of land at the Horner Block. Liquid effluent is discharged at WTL and slurry effluent from WTL's wintering barn is discharged at the Horner Block. Council recommended buffers are implemented at WTL, except for a buffer of 100 metres from land known as Lot 3 DP237. WOL's discharge area includes most of the milking platform and another part of the Horner Block. Council recommended buffers are implemented when discharging liquid or slurry effluent at WOL.

Existing effluent storage infrastructure

WOL and WTL allow for deferred irrigation when soils are near or at field capacity by storing raw effluent (slurry) in two large effluent ponds, one for each operation. Both ponds receive dairy shed effluent when soil moisture conditions are unsuitable for irrigation, and wintering barn effluent from the barns. The WTL pond also receives silage leachate from WTL's concrete silage pad. The material in the ponds is a slurry due to the major contribution of dung and urine from the free stall wintering barns. Consequently, both ponds always have a crust.

WOL's storage pond was upgraded in autumn 2018 to increase its storage capacity and install a synthetic liner (1.5 mm HDPE), overlying a leak detection drain system. The specifications for the leak detection drain system were provided by a CPEng. The pond design was certified by a CPEng as meeting Practice Note 21 standards and completion of reconstruction work received CPEng sign off. The leak detection drain system terminates at a 400 mm diameter inspection well. The inspection well is monitored regularly with no effluent present in the inspection well to date, indicating that the pond is not leaking.

WTL's storage pond was drop tested in 2017 and passed the leakage test indicating that the pond is not leaking. The drop test met all criteria set out in Appendix P, except for the unavoidable presence of a crust on slurry. The drop test report is appended to this application. The characteristics of slurry and liquid effluent in storage systems are quite different. The viscosity of slurry is a lot lower than liquid effluent and as a result, slurry is self-sealing whereas liquid effluent is not. Also, the issue of wind-driven wave action causing bank erosion does not arise when storing slurry.

Comment [AE1]: This is not in line with Appendix P, therefore does not meet the criteria for the PA rules. Further comment in email.

All effluent storage structures including ponds and various sumps have been visually assessed by a SQP and certified as showing no visible signs of cracks, holes or defects that would leak effluent.

Comment [AE2]: What size are these sumps and have any been drop tested as per Rule 32D?

Proposed changes to effluent management and permit

It is proposed to replace existing discharge permits **(301663, 20171278-01)** with a single discharge permit covering effluent from WOL and WTL. The proposed discharge permit will allow for the discharge of agricultural effluent (dairy shed, wintering barn, silage pad and underpass) to land from 1,500 cows; 700 cows at WOL and 800 cows at WTL.

The proposed irrigation systems are described in table 1.2.

Table 1.2 Proposed effluent irrigation methods

Method	Usage	Conditions
Low depth travelling irrigator	Apply dairy shed effluent to land	A maximum depth per application of less than 10 mm
Low depth slurry tanker with a trailing shoe	Apply pond slurry to land	A maximum depth per application of 2.5 mm
Low depth umbilical system	Contingency measure – apply pond slurry to land	A maximum depth per application of 3.0 mm
Low rate pods	*Future proof - Apply dairy shed effluent to land	A maximum instantaneous rate of 10 mm/hour at a depth of less than 10 mm
Low rate cannon/rain gun	*Future proof - Apply dairy shed effluent to land	A maximum instantaneous rate of 10 mm/hour at a depth of less than 10 mm

*To future proof the discharge activity, it is proposed to include low rate irrigation methods as described in the above table. This will allow the applicants to upgrade their effluent system in the future without the need to vary the discharge permit.

The proposed effluent discharge area includes most of the WOL/WTL dairy platform and the existing area at the Horner Block that receives agricultural effluent from WOL and WTL, less standard buffers. *Significant areas of low risk soils are available.* Slurry from the ponds will be applied at very low depth via the trailing shoe slurry tanker or umbilical system at the Horner Block and at the dairy platform.

No affected party approvals are required.

No change in effluent storage is proposed. According to the Massey DESC, the 90% probability volume for 1,500 cows including wintering barn effluent from 1,280 cows and silage leachate is 6,460 m^3. The existing storage capacity is 8,032 m^3, so is sufficient to meet requirements.

Wintering

In the past, some cows and heifers have been intensively winter grazed on fodder crop (fodder beet) and heifers also have been grazed on pasture over winter at the property. More recently, cows have been wintered in barns, but heifers have been intensively winter grazed on crop or grazed on pasture over winter. It is proposed to cease the practice of intensive winter grazing and grazing stock on pasture over winter as a key mitigation measure. From June 2019, no animals will be winter grazed on fodder crop or grazed on pasture over winter at the WOL/WTL dairy platform. All cows will be wintered in two wintering barns on farm over June and July. All young stock will be grazed off farm from weaning until they return as in-calf R2 heifers for calving in August or return as in-calf R2 heifers in June to be wintered in barns.

From May 2019, cows will also be housed in wintering barns for part of May, August and September during inclement weather as required. Early calving cows will return to pasture in August, where they calve. Late calving cows remain in the wintering barns until they are ready to calve in September. Cows are fed freshly cut grass and pasture silage in barns, some of which is harvested at the Horner Block. The wintering barns are also used as stand-off pads during inclement weather during the milking season.

Comment [AE3]: This implies all cows (1500) will be housed over winter and no cows will be on pasture.

At the end of the season in May, the herd of 1,500 cows is culled. At WTL's wintering barn, a maximum of 640 cows are housed over winter. It is proposed to increase WOL's wintering barn authorised cow number to 640, to accommodate an additional 240 animals. WOL's wintering barn has already been upgraded and now has a capacity to house 640 cows. Effluent storage at WOL has been increased so can accommodate effluent from an additional 240 cows in the wintering barn. Generally, each barn will house 625 cows, leaving some stalls free to minimise cow stress.

Comment [AE4]: This does not equate to 1500 cows, therefore it appears not all cows will be housed in wintering barns.

In the 17/18 winter, WOL's barn housed 400 cows and was assessed as grade 1/fully compliant at an inspection by Environment Southland.

Cultivation

The WOL platform has been dairy farmed by the applicants since 1992, and most of the WTL platform has been dairy farmed by the applicants since 2003. Over this time soils have been developed sustainably, which is evident in fertiliser and agronomy reports for WOL, WTL and the Horner Block from the fertiliser supplier (Ravensdown). Please see the soil fertility trends reports in the Appendix. Summer and winter fodder crop cultivation has been carried out to provide feed for cows over summer dry periods and winter respectively. It is proposed to cease the practice of growing fodder crops at the property, as a key mitigation measure associated with an increase in cow numbers, instead wintering all cows inside in barns. The proposed re-grassing policy will be by direct grass to grass cultivation.

Comment [AE5]: Will this be done in accordance with Rule 25? What is the re-grassing policy?

Groundwater abstraction

Groundwater is abstracted from three bores for use at two dairy sheds and to supply stock drinking water to 1,500 cows. The maximum daily volume of groundwater abstracted to meet the needs of 1,500 cows is 180,000 litres.

At the WTL dairy platform, two bores supply groundwater. One bore (E45/0083) is located to the west of the dairy shed with a second bore (E45/0727) at the north of the block, close to Wreys Bush Highway. The maximum daily volume of groundwater supplied to WTL is 96,000 litres.

At the WOL dairy platform, the bore (E45/0071) is located to the west of the dairy shed and the maximum daily volume of groundwater supplied to WOL is 91,000 litres. This represents an increase of 31,000 litres compared to the existing water permit for WOL (#301664), which has a maximum daily take of 60,000 litres.

Table 1.3 Physical properties and information of land and water at the WOL/WTL dairy platform and Horner Block.

Soils*	**Soil Type**	**Vulnerability Factors**		
		Structural Compaction	**Nutrient Leaching**	**Waterlogging**
	Braxton	Moderate	Slight	Severe
	Drummond	Minimal	Moderate	Slight
	Glenelg	Slight	Very severe	Nil
	Waiau	Moderate	Very severe	Nil
FDE Land Classification	A – artificial drainage or coarse soil structure E – other well drained but very stony flat land (Likely to be D – well drained flat land, but this is not mapped)			
Characteristics of FDE Classification	A - high risk to surface water, low risk to groundwater D, E – low risk to groundwater, low risk to surfacewater			
Topography	Flat			
Surfacewater management zone	Waimatuku, Oreti, Aparima			
Groundwater Zone	Waimatuku, Central Plains			
Groundwater Nitrate Levels	0.1 – > 11.3 mg/L A series of nitrate concentration bands are mapped across the property, with the lowest groundwater nitrate levels at the west of the property (0.1 – 0.4 mg/L) and the highest to the south east of the property (modelled >11.3 mg/L). Most groundwater underlying the property has nitrate levels of 3.5 – 8.5 mg/L, indicative of moderate to high land use impacts.			
FMU	Oreti, Aparima			

Comment [AE6]: This is high risk not low risk

Nearest downstream registered drinking water supply	Heddon Bush School 2.3 km to the south	
Downstream Regionally Significant Wetland/Sensitive Waterbody	Drummond Peat Swamp (>10 km to south east) Bayswater Bog (>10 km to south west)	
Physiographic Zones	**Zone**	**Contaminant pathways for Physiographic Zone**
	Central Plains	When wet soils are prone to waterlogging, resulting in the installation of extensive artificial drainage networks. When dry these soils are prone to shrinking and cracking, allowing drainage to bypass the soil to the underlying aquifer. Aquifers and streams in this zone are prone to contaminant build-up as they do not experience dilution by a major river.
	Oxidising	Soil water and groundwater are well aerated, which allows nitrogen to accumulate. Oxidised soils are good at absorbing and storing water and any nitrogen it contains. During drier months, nitrogen accumulates in soil to high levels. During winter when soils are wet, any nitrogen not used by plants leaches down into the underlying aquifer (deep drainage). Artificial drainage is used where soils have low subsoil permeability to help to reduce waterlogging. Contaminant loss through artificial drains to nearby streams can be high during wetter months.

*Soil mapping on Topoclimate appears to be incorrect compared to soil types found at the property. Topoclimate maps Braxton soils as the dominant soil type for most of the property, with Pukemutu being a minor soil type. Topoclimate maps an area of Glenelg at the south east end of the property.

A soil survey carried out in 2017 by Scandrett Rural Limited is described in Section 5 and a separate report. It maps two dominant soil types found at the property; Braxton soils are found on the mid-west side of the property and Drummond soils are found at the east. Drummond soils have intergrades of more shallow Glenelg soils in places.

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2. Consents

The decisions version of the pSWLP was notified on 4 April 2018. In accordance with Section 86B(1)(a) and (3) of the Resource Management Act 1991, all provisions of the Proposed Plan have had legal effect since this date. Since the Regional Water Plan (2010) and Regional Effluent Land Application Plan are still operative, all provisions in both Plans have legal effect. The provisions of these plans therefore need to be considered alongside the provisions of the pSWLP.

Consent holder name

The existing consent holders, Woldwide One Limited, Woldwide Two Limited, have changed their name to "*Woldwide One Limited and Woldwide Two Limited*." In accordance with Section 124C of the RMA, Woldwide One Limited confirms in writing that they will not be making any future applications under as *Woldwide One Limited* on this property in accordance with Section 124C of the RMA. In accordance with Section 124C of the RMA, Woldwide Two Limited confirms in writing that they will not be making any future applications as *Woldwide Two Limited* on this property in accordance with Section 124C of the RMA. Future applications will be made on behalf of "*Woldwide One Limited and Woldwide Two Limited*."

2.1 Consents required

Table 2.1 provides a summary of proposed activities and whether resource consent is required or not. Further details are provided regarding the level of each activity in the following section.

Table 2.1

Proposed activity	Consent required	Activity level
Expansion of dairy farming through an increase in cow numbers	Yes - land use consent for farming	Discretionary activity
Effluent discharge	Yes - effluent discharge permit	Discretionary activity
Discharge of sludge	Yes - effluent discharge permit	Discretionary activity
Use of land for maintenance and use of existing effluent storage facilities	No	Permitted activity
Use of land for wintering barns	Yes - use of land for feed pad/lot	Discretionary activity
Use of land for silage storage facilities	No	Permitted activity
Silage leachate	No	Permitted activity
Groundwater abstraction	Yes - water permit	Discretionary activity

Comment [AE7]: Is there an application for this? If this is to be included in the main discharge permit, Horner Block will then fall into the landholding, in line with the legal opinion as it will not be operating separately.

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Expansion of dairy farming

Rule 20 of the pSWLP manages farming activities, including new or expanded dairy farming of cows. The proposed activity does not meet Rule 20 (a) (ii) (2) since cow numbers are increasing beyond the maximum number specified in the dairy effluent discharge permit that existed on 3 June 2016. Rule 20 (a) (ii) (6) is met, however, as all land was either in the dairy platform prior to 3 June 2016 or was authorised for dairy farming in November 2017. Rules 20 (b) and (c) do not apply since the proposed activity does not include any intensive winter grazing nor will occur at greater than 800 metres above mean sea level.

The proposed activity meets the conditions described in Rule 20 (d) except for (d) (ii) (1), since the dairy platform's assessment provided reflects the annual amount of N, P, sediment and microbial contaminants lawfully discharged on average over four years prior to this application, instead of over five years. A high level of evidence of land use activities during the four-year period has been supplied with this application. As the application does not meet all the provisions of Rule 20 (d), then Rule 20 (e) applies; **the use of land for the proposed farming activity is a discretionary activity and resource consent is required**.

Discharge activity

Rule 35 of the pSWLP manages the discharge of agricultural effluent to land. In this case the discharge activity does not meet all conditions of Rule 35 (a). The discharge activity does not meet Rule 35 (b) (ii) since it is proposed to increase cow numbers above the maximum number specified on an existing discharge consent. The discharge activity meets all conditions described in Rule 35 (c) so is a discretionary activity.

Rule 50 of the RWP (2010) manages the discharge of agricultural effluent to land. In this case the discharge activity does not meet Rule 50 (a) or (b) of the RWP. It does not meet Rule 50 (c) since it is proposed to increase the scale of the discharge activity through an increase in cow numbers. However, except for an increase in cow numbers, the discharge activity meets Rule 50 (c) part (i) in that it includes high rate irrigation to soil landscape categories A, D and E. The discharge activity meets Rule 50 (d) as the scale of the activity is increasing with the increase in cow numbers and the discharge activity to soil/landscape categories A, E and D includes high rate irrigation by slurry tanker that does not exceed 5 mm depth per application. In fact, the discharge of effluent by slurry tanker does not exceed 2.5 mm depth per application. Rule 50 (d) does not specify a depth for high rate irrigation by travelling irrigator, so accordingly direction is taken from Policy 42 of the RWP. The discharge of effluent to category E land must be applied at less than or equal to 10 mm depth per application and at less than the soil infiltration rate. The discharge of effluent to category A or D land must be applied at a depth less than the soil water deficit and at less than the soil infiltration rate. The discharge of effluent to category E land is in line with Policy 42 of the RWP.

Rule 5.4.6 of the Regional Effluent Land Application Plan provides for the discharge as a **discretionary activity**.

The discharge activity is therefore assessed as being a discretionary activity.

Existing effluent storage facilities

Rule 32D of the pSWLP manages existing agricultural effluent storage facilities. Under Rule 32D (a) the use of land for the maintenance and use of existing agricultural effluent storage facilities that was authorised prior to Rule 32D taking legal effect, and any incidental discharge directly onto or into land from those storage facilities which are within the normal operating parameters of a leak detection system or the pond drop test criteria set out in Appendix P, are permitted activities provided the certain conditions are met.

Comment [AE8]: The conditions have not been met on WW2. On WW1, due to age of liner, that could come under the PA rules

WTL storage pond

WTL's storage pond stores slurry and does not have a leak detection system. It was drop tested in 2017 and a drop test report was submitted to Environment Southland who accepted that the pond was not leaking. The drop test met all criteria set out in Appendix P, except for the unavoidable presence of a crust on slurry. The drop test report is appended to this application. The characteristics of slurry and liquid effluent in storage systems are quite different. The viscosity of slurry is a lot lower than liquid effluent and as a result, slurry is self-sealing whereas liquid effluent is not. Also, the issue of wind-driven wave action causing bank erosion does not arise when storing slurry.

Comment [AE9]: Can we please define slurry?

Comment [AE10]: What evidence is there to confirm this?

WTL's storage pond meets Rule 32D (a) (i) (1) in that its construction was lawfully carried out without a consent. In accordance with Rule 32D (a) (ii) (2), a visual assessment of WTL's pond was carried out by a SQP in 2018. The assessment found that the pond shows no cracks, holes or defects that would allow effluent to leak. A report certifying WTL's pond by a SQP is appended to this application. In accordance with Rule 32D (a) (ii) (2) (b) the pond has been certified by a SQP as meeting the relevant drop test criteria in Appendix P except for having no crust on the pond surface during the test, which was unavoidable due to the storage of slurry.

In the absence of operating within the normal parameters of a leak detection system or all pond drop test criteria set out in Appendix P, Rule 32D does not provide another pathway to an activity level available for the use of land for the maintenance and use of an existing agricultural effluent storage facility.

Comment [AE11]: What is being proposed top bring it in line with an activity status within the rule?

WOL storage pond

WOL's effluent pond stores slurry and was lawfully upgraded in autumn 2018 to increase its storage capacity, install a synthetic liner and leak detection system. The liner is composed of 1.5 mm HDPE and overlies a leak detection drain system, the specification for which was provided by a CPEng. The pond design was certified by a CPEng as meeting Practice Note 21 standards. The leak detection system terminates at a 400 mm diameter inspection well. The liner supplier confirmed that the liner was correctly installed and is not leaking. The CPEng confirms that the pond is structurally sound following the upgrade. The CPEng report was submitted to Environment Southland as required in 2018.

WOL's pond is operating within the normal operating parameters of a leak detection system; there is no effluent leaking from the pond. The piezo has been inspected regularly when it either had no liquid or had liquid following heavy rainfall when the water table was high. By checking the liquid in the piezo for signs of effluent (i.e. odour and clarity), it has been confirmed that there is no effluent in the leak detection system and no effluent leaking from the pond. In accordance with Rule 32D (a) (ii) (2), a visual assessment of WOL's pond was carried out by a SQP in 2018. The assessment found that the pond shows no cracks, holes or defects that would allow effluent to leak. A report certifying WOL's pond by a SQP is appended to this application.

Comment [AE12]: Does this underlie the entire facility as required?

In accordance with Rule 32D of the pSWLP, the use of land for an existing effluent storage pond at WOL is a permitted activity; resource consent is not required.

Ancillary effluent structures at WOL and WTL

WOL has a sand trap and concrete effluent sump at the dairy shed and concrete collection sump at the wintering barn. These structures have been visually assessed by a SQP and certified as having no visible cracks, holes or defects that would allow effluent to leak. A report prepared by a SQP is appended to this application.

WTL has a sand trap and pump sump at the dairy shed and concrete collection sump at the wintering barn. These structures have been visually assessed by a SQP and certified as having no visible cracks, holes or defects that would allow effluent to leak. A report prepared by a SQP is appended to this application.

Feed pads/Lots

Rule 35A of the pSWLP manages the use of land for feed pads/lots including wintering barns. In this instance the use of land for two wintering barns at the dairy platform does not meet all conditions set out in Rule 35A (a) as each barn houses more than 120 cattle. The use of land for a feed pad/lot that does not meet one or more conditions of Rule 35A (a) is classed as a discretionary activity. Accordingly, resource consent application for the use of land for two wintering barns at WOL and WTL will be submitted to Environment Southland. The application for resource consent for the use of land for two wintering barns will be submitted separately in February 2018.

Silage storage - WOL

The use of land for a silage storage facility at WOL is a permitted activity as it meets all conditions specified in **Rule 40 (a)** of the pSWLP; resource consent is not required for the silage storage facility.

The use of land as a silage storage facility at WOL is a permitted activity as it meets all conditions specified in **Rule 51 (a)** of the RWP (2010); resource consent is not required for the silage storage facility.

Both rules are met as follows:

The silage pad is situated on a dry site; the underlying substrate is well compacted and sealed (see figures 6.4 and 6.5). There is no overland flow of stormwater into the silage pad and the silage pad is not situated within a critical source area. The silage pad is not located on land that is made permanently or intermittently wet by the presence of springs, seepage, high groundwater, ephemeral rivers or flows of stormwater other than from any cover of the silage.

No part of the silage pad is within 50 metres of a lake, river, artificial watercourse, modified watercourse (see figure 6.6), natural wetland or any potable water abstraction point. The nearest waterway is a fenced off open drain, which is approximately 60 metres to the east of the silage pad.

The silage pad is no within 100 metres of any dwelling or place of assembly, on another landholding.
The silage pad is not within 100 metres of the microbial health protection zone of a drinking water supply site identified in Appendix J of the pSWLP, or within 250 metres of the abstraction point of a drinking water supply site identified in Appendix J.

Cattle do not graze directly from the silage pad, rather silage is carted from the pad to cows in the wintering barn or on paddocks. The silage pad is not located on contaminated land.

Silage storage - WTL

The use of land for a silage storage facility at WTL meets the conditions stated in Rule 40 (a) of the pSWLP (2018), so is classed as a permitted activity and resource consent is not required. The use of land for a silage storage facility meets the conditions stated in Rule 51 (a) of the RWP (2010), so is classed as a permitted activity and resource consent is not required.

Silage leachate - WOL

The discharge of silage leachate onto or into land at WOL is a permitted activity as it meets all conditions specified in Rule 51 (d) of the Regional Water Plan (2010); resource consent is not required.

The activity meets Rule 41 (a) (iia), (iii) and (iv) of the pSWLP and is therefore a permitted activity and resource consent is not required. 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.

Silage leachate - WTL

In accordance with Rule 41 (a) of the pSWLP, the discharge of silage leachate onto or into land in circumstances where contaminants may enter water is a permitted activity since part (i) is met and resource consent is not required; the discharge is via an agricultural effluent discharge system authorised under Rule 35.

In accordance with Rule 50 (d) of the RWP (2010), the discharge of silage leachate at WTL is a permitted activity since all conditions set out in Rule 50 (d) are met; resource consent is not required.

Discharge of sludge

The discharge of pond sludge (also referred to as slurry) from the operations meets all provisions of Rule 38 of the pSWLP except for part (a) (iii). Although the maximum N loading will not exceed 150 kg N/ha/year at the dairy platform, it will exceed 150 kg N/ha/year at the Horner Block. A maximum N loading of 250 kg N/ha/year from sludge is proposed for the Horner Block, which is a cut and carry block and does not graze stock.

The discharge of sludge at the dairy platform is a permitted activity under Rule 38 of the pSWLP and does not require resource consent. The discharge of sludge at the Horner Block is not a permitted activity under Rule 38 of the pSWLP and requires resource consent.

Comment [AE13]: I do not believe the discharge of "slurry" as it is called meets the PA criteria for Rule 38, due to its high liquid content.

The discharge of sludge/slurry from the operations meets all provisions of Rule 5.3.1 of the Regional Effluent Land Application Plan (RELAP) arguably except for part (a). Under Rule 5.3.1 of the RELAP, the discharge of sludge is a permitted activity if it meets parts (a) to (g) of the rule. The discharge of sludge meets parts (b) to (g) of the rule, however, it is unclear whether it meets part (a) of the rule. Part (a) states that in order meet permitted activity rules:

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> *"the sludge is discharged onto the same property as it was generated. If the sludge is not discharged onto the same property, then the property which receives that discharge may not accept more than one sludge discharge application during a 12 month period;"*

Sludge is discharged at the Horner Block at a rate of more than one application during a 12-month period. Legal opinion sought by Environment Southland has confirmed that the Horner Block is not part of the same landholding as the dairy platform [WOL and WTL]. The above rule refers to "property" rather than "landholding" making interpretation ambiguous.

Groundwater abstraction

Under Rule 54 (d) of the pSWLP, groundwater abstraction for 1,500 cows on the property is a discretionary activity as a maximum of 180,000 litres per day is abstracted. This allows for 120 litres per cow per day. Under Rule 23 (c) of the Regional Water Plan, a groundwater take of 180,000 litres per day is a restricted discretionary activity provided the rate of take is less than or equal to 2 L per second; resource consent is required. **The groundwater abstraction is assessed as a discretionary activity and resource consent is required.**

2.2 Duration

Consent durations of 15 years are proposed for all consents, which aligns with Woldwide One's discharge and water permit terms. Special consideration is given to Policy 40 of the pSWLP and Policies 14A and 43 of the Regional Water Plan in determining the duration. The duration sought is considered consistent with these policies given the replacement nature of consents for an activity that is already well established, has benefited from a significant degree of capital investment and is operating within limits established by its existing consents and associated conditions. Considerable investment in farm infrastructure has been made to take the final steps towards future proofing the dairying operation; eliminating winter grazing of adult cattle on beet crops altogether. The level of investment demonstrates the applicant's belief in and commitment to sustainable farming and land management. The applicants believe that their presence at this location since 1992 (over 25 years) has not had a detrimental effect on the local environment, and that the proposed changes will mean a further reduction of that impact. A 15-year consent term will mean that the management of the resources under the same proven stewardship will be ensured into the future.

2.3 Proposed consent conditions

The applicants propose to agree conditions once draft conditions are issued, including the conditioning of various mitigation measures where appropriate. They request that draft conditions recognise the following at a minimum:

Land use consent for farming

1. The land area only includes the proposed WOL/WTL dairy platform, as described in table 1.1, which the applicants believe is the landholding in its entirety;
2. That Woldwide Runoff (both Merrivale and Merriburn blocks) is not included since the applicants believe it is not part of the landholding at the proposed WOL/WTL dairy platform;

Comment [AE14]: These are not appropriate.

3. That the land use consent is an output-based consent, using the N figure (x kg/ha/year) from Overseer for the proposed WOL/WTL dairy platform as a limit. The below example can be used as guidance.
4. To provide additional certainty over the scale of the activity, mitigations and effects that the following inputs are conditioned:
    a. Land area;
    b. Liquid effluent discharge area;
    c. Peak cow numbers milked; and
    d. Minimum and maximum number of cows housed in wintering barns.
5. The Consent Holder shall maintain records of the following for each year between 1 June and 31 May:
    a. Fertiliser application, including rates;
    b. Supplements imported;
    c. Types of crops and total area of cropping if any;
    d. Cultivation methods;
    e. Stock units by references to type, age and breed;
    f. Effluent application areas;
    g. All other inputs to the OVERSEER nutrient budgeting model.
6. Install a new monitoring bore in the same area as bore E45/0622, to monitor groundwater quality flowing in a southerly direction towards Heddon Bush School.

Example:

Nitrogen Loss Rate and Nutrient Budget

1. *The Consent Holder shall ensure nitrogen losses from farming activities undertaken at the dairy platform are maintained at or below the following nitrogen loss rate of X kg/ha/yr, or as amended in accordance with Condition X.*

Advice Note: *The nitrogen loss rates represent the modelled discharge of nitrogen below the root zone as modelled with OVERSEER version 6.3.0 in accordance with the OVERSEER Best Practice Input Standards as of 11 May 2018.*

The determination of whether the nitrogen loss rates have been met will be made using the nitrogen loss from the most recent year, modelling using the latest version of OVERSEER®.

2. *The Consent Holder shall prepare an annual nutrient budget for the period of 1 June to 31 May for the subject land using OVERSEER in accordance with the OVERSEER Best Practice Input Standards, or an equivalent model approved by the Chief Executive of the Consent Authority.*

3. *The nutrient budget required by Condition 2 shall be accompanied by a report that includes:*
    a. *A review of the input data to ensure that the nutrient budget reflects the farming system;*
    b. *An explanation of any differences between the budgets of the previous year; and*
    c. *A comparison of the nitrogen loss from the current year with the nitrogen loss rates in Condition 2.*

4. *The nutrient budget and accompanying report shall be provided to the Consent Authority by 30 September each year.*

5. *The nutrient budget shall be prepared by a Certified Nutrient Advisor or the budget may be prepared by suitably experienced person and reviewed by a Certified Nutrient Advisor.*

6. *The nitrogen loss rates described in Condition 2 shall be amended following the release of a new version of OVERSEER or the Best Practice Data Input Standards. Following the update of the nitrogen loss rates, the Consent Holder shall provide the updated OVERSEER files to the Consent Authority with the report required by Condition 5.*

Discharge permit

The following conditions are proposed:

1. *This consent shall be exercised in conjunction with Land Use Consent AUTH-X.*

   (a) This consent authorises the discharge of dairy shed effluent, wintering barn effluent, silage pad effluent and underpass effluent ("agricultural effluent") onto land, via a land disposal system consisting of two effluent storage ponds, two sand traps, two dairy shed pump sumps, two wintering barn concrete collection sumps, low depth travelling irrigator, low rate (pods and/or rain-gun) irrigation, slurry tanker with a trailing shoe and umbilical system, as described in the application (X) for resource consent dated X 2018 and further information dated X.

   The activity shall be limited to:

   i. *The discharge to land of agricultural effluent generated from milking of up to 1,500 cows milked twice daily;*
   ii. *The discharge to land of agricultural effluent from the housing of up to 1,280 cows inside two purpose built barns;*
   iii. *The discharge of agricultural effluent to land via low depth travelling irrigator, slurry tanker with a trailing shoe, umbilical system and low rate irrigation;*
   iv. *The discharge of agricultural effluent to an area of no more than X hectares at the dairy platform as per the plan attached as Appendix 1;*
   v. *The discharge of effluent slurry to an area of no more than 97 hectares at the block known as the "Horner Block" as per the plan attached as Appendix 1.*
   vi. *The discharge of effluent from a 1,200 m^2 silage pad; and*
   vii. *The discharge of effluent from a 200 m^2 underpass.*

***Advice note**: "Effluent slurry" refers only to the contents of the effluent storage ponds. "Agricultural effluent" refers to effluent from all sources (the dairy shed, yard, barns, ponds, silage pad and underpass).*

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(b) This consent excludes the discharge of effluent from winter milking from June 20 to July 20 (winter milking refers to cows milked to supply a winter milking contract), or from any feed pad/calving pad/structure not listed in condition 2(a).

2. *The discharge authorised by this consent shall not exceed the following rates at any time:*
   - *(a) For the travelling irrigator: A maximum depth of less than 10 millimetres for each individual application;*
   - *(b) For the slurry tanker with trailing shoe: A maximum depth of 2.5 millimetres for each individual application;*
   - *(c) For the umbilical system: A maximum depth of 3.0 millimetres for each individual application; and*
   - *(d) Low rate system: a maximum depth of 10 millimetres for each individual application, and an instantaneous rate of 10 millimetres per hour.*

3. *The maximum loading rate of nitrogen from effluent onto any land area as a result of the exercise of this consent shall not exceed:*
   - *(a) 150 kilograms of nitrogen per hectare per year at the dairy platform; and*
   - *(b) 250 kilograms of nitrogen per hectare per year at the Horner Block (Lot 4 DP 399915).*
     - *i.* ***The annual slurry volume applied at the Horner Block shall be recorded and reported to the Consent Authority upon request****.*

4. *The minimum return period for the discharge of effluent to land shall be no less than 28 days.*

5. *Effluent shall not be discharged within:*
   - *(a) 20 metres of any surface watercourse;*
   - *(b) 100 metres of any water abstraction point;*
   - *(c) 200 metres of any place of assembly or dwelling not on the subject property;*
   - *(d) 20 metres from any property boundaries.*

Where there is inconsistency between the plan attached as Appendix 1 and the conditions of this consent, the conditions of this consent shall prevail.

6. *The application of effluent to land shall not occur when:*
   - *(a) the moisture content of the soils is at or above field capacity,*
   - *(b) soils within the discharge area are 'cracked'; and*
   - *(c) during wind conditions that may result in odour or spray drift beyond the property boundary.*

Other conditions for land use, discharge and water consents – to be agreed with Consent Authority once draft conditions are issued.

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3. Statutory Considerations

3.1 Statutory considerations:

Environment Southland must consider the following matters when they consider an application. The application is consistent with all of these relevant plans and policies because effects on water quality and quantity and the soil resource should be less than minor.

Resource Management Act 1991:

- The provisions of section 104 of the Resource Management Act 1991;
- Part 2 of the Resource Management Act;
- The applicant's assessment of effects on the environment;
- The provisions of Sections 104B, 104C, 105 and 107 of the Resource Management Act 1991.

Schedule 4 of the RMA requires that an assessment of the activity against the matters set out in Part 2 and any documents referred to in Section 104. Sections 104B and 104D of the Act set out the matters that, subject to Part 2, the Consent Authority must have regard to when considering an application for discretionary activities. Sections 105 and 107 set out additional matters the Consent Authority must have regard to when considering applications to do something that would otherwise contravene Section 15. An assessment of each of these matters follows:

Part 2 of the RMA

The activity is considered to represent an efficient use of natural resources that will give rise to significant positive benefits in terms of providing for the social and economic wellbeing of the applicants and the wider regional economy. There is, however, the potential for adverse effects on the environment to arise, including on water quality. However, it is considered that the effects of the activities have been adequately identified and assessed in the Assessment of Environmental Effects in Section 7 below and that such effects will be no more than minor.

Section 6 of the RMA lists the matters of national importance that a Consent Authority shall recognise and provide for when considering applications for resource consent. The relevant matters under Section 6 to this proposal are considered to be:

(a) the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development:

(c) the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga:

It is considered that the proposed activities do not impact directly on the coastal environment, wetlands, and lakes and rivers and their margins, although there is potential for adverse effects on the wider receiving environment which is inclusive of some of these features. However, as is discussed in Section 7 below, the actual and potential adverse effects of the activities are considered to be no more than minor.

Section 7 of the Act lists a number of other matters that a Consent Authority must have particular regard to when considering applications for resource consent. The matters in Section 7 that are considered relevant to this application are:

(a) kaitiakitanga:

(aa) the ethic of stewardship:

(b) the efficient use and development of natural and physical resources:

(c) the maintenance and enhancement of amenity values:

(d) intrinsic values of ecosystems:

(f) maintenance and enhancement of the quality of the environment:

(g) any finite characteristics of natural and physical resources:

(h) the protection of the habitat of trout and salmon:

For the reasons discussed in Section 7 of this report below, the proposal is considered consistent with relevant provisions of Section 7 of the RMA.

Section 8 sets out a Consent Authority's responsibilities in relation to the Treaty of Waitangi. The proposal is considered consistent with the provisions of all regional planning documents, including Te Tangi oTauira, and Sections 6(c) and 7(a) of the Act. Therefore, the proposal can also be considered consistent with Section 8 of the Act.

To avoid repetition, the following documents have been grouped together under common headings in the sections that follow.

The final part of this section of the application focuses on why the activity is consistent with key policies in the proposed Southland Water and Land Plan (2018).

Table 3.1: Ngai Tahu Values

Regulatory Document	Relevant Sections
National Policy Statement for Freshwater Management 2014	• Objectives C1, D1 • Policies C1, D1

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Southland Regional Policy Statement 2017	• Objectives TW.2, TW.3, TW.4 and TW.5 • Policies TW.3, TW.4 and TW.5
Regional Water Plan 2010	• Objective 9C • Policy 1A
Regional Effluent Land Application Plan 1998	• Objectives 4.1.4, 4.1.5 • Policies 4.2.4, 4.2.7,4.2.8, 4.2.9
Proposed Southland Water and Land Plan 2018	• Objectives 3, 4, 5, 15 • Policies 1, 2, 3
Te Tangi a Tauira:	• Whole Document

Tangata Whenua values have been considered when preparing this application including reference to Te Tangi a Tauira (Iwi Management Plan). The principles of protection of the mauri of the water and mana of the land while minimising adverse effects on mahinga kai will continue to be recognised and have regard to in the exercise of the consents and the operation of the dairying activity. There are no known wahi tapu, ancestral sites, heritage sites or other taonga associated with the property.

Table 3.2 Water Quality

Regulatory Document	Relevant Sections
National Policy Statement for Freshwater Management 2014	• Objectives A1, A2, B1, B2, B3, B4, • Policies A3, A4, B5, B6, B7
Regional Policy Statement for Southland 2017	• Objectives WQUAL.1 and WQUAL.2 • Policies WQUAL.1, WQUAL.2, WQUAL.3, WQUAL.7, WQUAL.8, WQUAL.12
Regional Effluent Land Application Plan 1998	• Objectives 4.1.2 • Policies 4.2.3, • Rule 5.4.5
Regional Water Plan 2010	• Objectives 3,4,8 • Policies 1, 4, 6, 7, 13

Proposed Southland Water and Land Plan 2018	• Objectives 1, 2, 6, 7, 8, 9, 13, 18 • Policies 5, 10, 13, 14, 15, 16, 17, 18, 39A, 40
Te Tangi a Tauira	• Policies 1, 4, 5, 6, 11, 16, 17, 18

Dairy farming at the property is carried out following good management practices relevant to the physiographic zones present at the property (Oxidising and Central Plains). These practices are recommended by Council and are implemented on farm to mitigate the risk of adverse effects on water quality from contaminants transported via artificial drainage, deep drainage and overland flow where relevant. Deep drainage and artificial drainage are recognised by the applicants as key contaminant pathways and are managed as such. Good management practices and specific mitigation measures implemented on farm are described in Sections 6 and 7 of the application, and in the Appendix N Farm Environmental Plan.

There will be no increase in contaminant loss due to the proposed expansion of dairy farming in this instance. Neither will effects be exported off-site to another location. This expansion will be achieved through the implementation of key mitigation measures, alongside the implementation of a suite of good management practices.

The discharge is to land rather than water and is undertaken in a manner to minimise adverse effects on water quality. Good management practices for the management of the effluent system and mitigation measures have been included in the application and in the Farm Management Plan. By only irrigating FDE to land when ground conditions are less than field capacity, and by ensuring that irrigation of FDE to land does not result in the soils reaching field capacity, the risks of leaching through the soil profile or via overland flows are mitigated. The use of low depth irrigation, as discussed in the Section 7 AEE, should reduce the risk of exceeding a soil's infiltration rate, thus preventing ponding and surface runoff of freshly applied FDE. The recommended buffer zones from waterways are adhered to when applying effluent.

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Table 3.3 Water Quantity

Regulatory Document	Relevant Sections
National Policy Statement for Freshwater Management 2014	• Objectives A1, A2, B1, B2, B3, B4, • Policies A3, A4, B5, B6, B7
Southland Regional Policy Statement 2017	• Objectives WQUAN.1 and WQUAN.2 • Policies WQUAN.1, WQUAN.2, WQUAN.5, WQUAN.6, WQUAN.7 and WQUAN.8
Regional Water Plan 2010	• Objectives 5,7,8 and 9 • Policies 21, 22, 23, 28, 29, 30, 31, • Rules 16C, 23, 50
Proposed Southland Water and Land Plan 2018	• Objectives: 7, 9, 11, 12, 18 • Policies 20, 21, 22, 23, 25, 42
Te Tangi a Tauira:	• Policies 1, 4, 5, 6, 11, 16, 17, 18

The groundwater take reflects standard volumes for a dairy farm. The proposed volume of take is consistent with Environment Southland's guidelines of 120 litres per day per cow, which is considered reasonable for the intended end use. The maximum groundwater take is 180,000 litres per day, allowing for 120 litres per day per cow for 1,500 cows.

Groundwater is abstracted for dairy shed use and stock drinking water from three bores at the property. The rate of take does not exceed 2 L/sec and should not result in more than minimal stream depletion and interference effects.

Table 3.4 Soil Health and Effluent Management

Regulatory Document	Relevant Sections
Regional Policy Statement for Southland 2017	• Objectives WQUAL.1 and WQUAL.2 • Policies WQUAL.1, WQUAL.2, WQUAL.3, WQUAL.7, WQUAL.8, WQUAL.12
Regional Effluent Land Application Plan 1998	• Objectives 4.1.1 • Policies 4.2.1, 4.2.2
Regional Water Plan 2010	• Policy 41 • Rule 49

Proposed Southland Water and Land Plan 2018	• Objectives 13, 13A, 14, 15, 18 • Policies 5, 17, 33 • Rule 32D, 35, 40, 41
Te Tangi a Tauira	• Policies 4, 7, 8, 9, 11, 13, 14, 15

The applicants seek to ensure the life supporting capacity of the soil is safeguarded, along with the sustainability of the soil ecosystem by utilising land treatment of effluent without significant adverse effects. The soils are suitable for effluent irrigation and the discharge follows current good management practice, which is described in Section 6 of the application and in the Farm Environmental Management Plan. These include practices of a general nature and those specific to the key contaminant transport pathways for the physiographic zones found at the property.

Two existing storage ponds allows for deferred storage of dairy shed, wintering barn and silage pad effluent until the soil moisture content is suitable for irrigation for 1,500 milking cows on the farm. The land disposal area meets the best practice recommendation of 8 hectares per 100 cows. The nutrient loading of soils will not exceed 150 kg N/hectare at the dairy platform and 250 kg N/hectare at the Horner Block. The higher strength nature of slurry has been recognised and fully considered. Slurry from the ponds will be applied at a maximum depth of 2.5 millimetres per application. This system is sustainable in the long term and allows the effluent to be used both as a fertiliser and a soil conditioner.

In addition to the matters in Section 104 of the Act, when considering an application for a discharge permit a Consent Authority must also have regard to Section 105. As is discussed in the assessment under Section 7, it is considered that provided the discharge is undertaken in accordance with the conditions of the consent and the best practice management techniques outlined in Section 6 of the application and in the Farm Environmental Management Plan, the adverse effects of the activity should remain no more than minor. The best method for dealing with effluent from the dairy operation is considered to be discharging to land.

There are not considered to be any matters under Section 107 of the Act that would require the Consent Authority to decline the application for discharge permit.

3.2 Proposed Southland Water and Land Plan (2018)

The application meets the relevant objectives and policies described in the pSWLP (2018). The policies are numerous, however, the following policies are particularly relevant because of their focus on good practice management of land used for dairy farming in the appropriate physiographic zones; effects including cumulatively, on water quality and quantity, and the soil resource should be less than minor.

The discharge to land is carried out in a manner which should avoid adverse effects on the environment. The effluent discharge system follows the practices recommended by Council for the soil types and physiographic zone present on the property.

The groundwater abstraction is efficient, sustainable and reasonable.

Proposed Southland Water and Land Plan 2018 - Objectives and Policies relevant to land-use and discharges:

- **Objectives 6, 7, 8, 9, 13, 18**
- **Policies 5, 10, 11, 13, 14, 15, 16, 17, 18, 39A, 40**

Policies 5 and 10 are physiographic zone policies. Policy 5 gives direction on the land located in the Central Plains physiographic zone; Policy 10 gives direction on land located the Oxidising physiographic zone.

Under **Policy 5.1**, adverse effects on water quality from contaminant loss via artificial drainage and deep drainage in the Central Plain's physiographic zone must be avoided, remedied or mitigated by the implementation of good management practices. The Central Plain's physiographic zone is mapped as a major physiographic zone at the dairy platform and the Horner Block. The applicants implement good management practices to mitigate contaminant loss via artificial drainage and deep drainage when operating their dairy farm, which is demonstrated in their FEMP. They have been leaders in the dairy industry in Southland, being the first to build free wintering barn stalls to reduce outside crop-based wintering, and the first to feed fresh grass to cows in winter to reduce silage making losses and run-off. In parallel with the proposed increase in cow numbers, they will make other changes to their farming system. For example, they are proposing to remove all intensive winter grazing from the dairy platform. The proposed change is an example of good management practice in action, which should result is less adverse effects on water quality from contaminant loss via artificial drainage and deep drainage over time. It is noted that all cows will be wintered in two barns at the property, where nutrients are captured, stored and applied to land at very low depth at a time when plants are actively growing and taking up nutrients. Cows will not be exported off-farm, to be winter grazed on fodder crop at another location.

In order to meet **Policy 5.2,** this application and the accompanying FEMP have particular regard to adverse effects on water quality from contaminants transported via artificial drainage and deep drainage.

Policy 5.3 gives direction to decision makers on generally not granting resource consent for additional dairy farming of cows or additional winter grazing where contaminant losses will increase as a result of the proposed activity. *Note: Much of the following assessment also applies to Oxidising land also.* This application includes the phasing out of in-paddock winter grazing in parallel with an increase in cow numbers of 160. Overseer nutrient budget analysis has been carried out to determine pre-expansion nutrient N and P contaminant losses. In the absence of a suitable alternative method, P loss has been used as a proxy for sediment and microbial loss, as they generally move from land to water in a similar way (i.e. via overland flow, and via artificial drainage at times). The pre-expansion nutrient budget analysis has been prepared from four years of actual data (not consented) and is fully supported with evidence. The post-expansion nutrient budget includes an increase of 160 cows, from 1,340 to 1,500. Several key mitigation measures are included in the post-expansion nutrient budget, to ensure that nutrient losses (and by proxy sediment and microbial contaminants) will not increase post expansion. It has also been demonstrated that nutrient losses will not increase at the Horner Block. Mitigation measures will be implemented on farm, to ensure that contaminant losses do not increase and will lead to increased soil organic matter content, increase soil water holding capacity, improved soil structure and less accumulation of N on soils at high risk times. This should reduce the risk of contaminant loss to groundwater, including from deep cracks that potentially can form in Braxton soils due to swell/shrink properties, which is a risk not particularly addressed by Overseer. An investigation by Environment Southland in January 2018 showed that Braxton soils at the property may not in fact tend to form deep cracks, which reduces the background risk to groundwater to a degree. The applicants will provide Environment Southland with certainty that contaminant losses will not increase through the implementation of consent conditions and by submitting a year-end Overseer nutrient budget annually. As Overseer nutrient budget analysis has demonstrated that contaminant losses (N, P, and by proxy sediment and microbes) will not increase, in this instance the application for resource consent for additional dairy farming of cows should be granted.

Under **Policy 10**, adverse effects on water quality from contaminant loss via deep drainage, and via artificial drainage and overland flow where relevant, in the Oxidising physiographic zone must be avoided, remedied or mitigated by the implementation of good management practices. The Oxidising physiographic zone is mapped as a major physiographic zone at the property and the Horner Block with Oxidising areas generally found on the east side of the dairy platform where free draining soils are found. Due to the nature of its topography and soils, artificial drainage or overland flow pathways are not believed to be a particular risk for Oxidising areas at the property. In this instance, deep drainage of contaminants, particularly nitrate loss to groundwater, is a risk for Oxidising areas and must be managed under Policy 10. The assessment provided in Policy 5 relating to the management of the risk of contaminant loss via deep drainage to groundwater also applies to the management of Oxidising soils. Rather than repeating the policy assessment, please see the above assessment provided for Policy 5.1, 5.2 and 5.3. Better soil structure, better nutrient management and in particular less N accumulation on soils at high risk times will see less nitrate loss to groundwater via deep drainage in Oxidising areas. It is noted that Oxidising soils do not have similar swell/crack properties as Central Plain's soils, so the risk of deep crack formation and subsequent by-pass drainage to the underlying aquifer is not believed to be the case for Oxidising soils. As has been explained in Policy 5.3 above, the proposed increase in cow numbers in parallel with the implementation of several key mitigation measures will result in a small reduction in N and P loss according to Overseer analysis. The applicants will provide Environment Southland with certainty that contaminant losses will not increase through the implementation of consent conditions and by submitting a year-end Overseer nutrient budget annually. Under Policy 10, the proposed activity should be granted.

Policy 13 gives direction on the management of land use activities and discharges. In line with Policy 13.1 the proposed expansion will better enable the applicants to provide for their social, economic and cultural well-being. The increase in herd size of 160 cows, will allow changes in management practice to be made, whilst also operating a profitable and sustainable business model. The maintenance of a profitable and sustainable business model is central to the success the business, and provides social, economic and cultural benefits to the applicants, their employees, families and whanau, and to the wider community. In the context of an agricultural-based local economy, the use and development of the land and water resources at the property for primary production should be recognised. In line with Policy 13.2, land use activities and discharges (point source and non-point source) are managed to enable the achievement of Policies 15A, 15B and 15C.

In line with **Policy 14,** the discharge is to land and there is no discharge to water at the property.

Policy 16 gives direction on farming practices that affect water quality.

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Policy 16.1 (a) discourages the establishment of new dairy farming of cows in close proximity to Regionally Significant Wetlands and Sensitive Waterbodies. The nearest Regionally Significant Wetland is Dunearn Wetland, located approximately 4 km to the north west of the property. As the direction of ground and surfacewater flow is to the south, there is no risk to water quality at Duneran Wetland from the proposed activity. Drummond Peat Swamp is located approximately 12 km to the south east of the property, and Bayswater Peat Bog is located approximately 10 km to the south west of the property. Neither Drummond Peat Swamp nor Bayswater Peat Bog are *in close proximity* to the dairy farm so have little or no risk from the proposed activity. Under Policy 16.1 (a) the proposed activity can be established.

Policy 16.1 (b) ensures that until the development of freshwater objectives under FMU processes, applications to establish new, or further intensify existing dairy farming of cows, or to intensify winter grazing activities will generally not be granted under certain situations. The situations relate to different effects on and measures of water quality. This application is for an increase of 160 cows (11%) on land that has been dairy farmed for between 17 and 26 years to date, or on land that has been used for dairy support and was consented for dairy farming in October 2017. As such this application is not to establish new dairy farming of cows but is to intensify through an increase in cow numbers.

In parallel with the increase in cow numbers, it proposed to implement many key mitigation measures, such as the removal of all winter and summer fodder cropping, removal of cows and heifers wintered outside on fodder crop or pasture, expansion of size and use of wintering barn facilities and more efficient use of N fertiliser. The cessation of winter grazing cows on fodder beet is an important mitigation measure associated with the increase in cow numbers. It is an activity that has relatively high nutrient losses as is demonstrated by Overseer analysis, especially where free draining soils are sown in fodder beet and subsequently grazed by cows in June and July. It is noted that winter grazing is specifically included in Policy 16 as an activity that affects water quality. The removal of this practice from the farming system means that cultivation practices will move to direct grass to grass methods, with less disturbance of soil structure and less mineralisation processes, which should further increase soil organic matter content and water holding capacity, and further reduce contaminant losses to ground and surfacewaters. Importantly, the effects of the expansion are not being exported off-site. Rather they are being contained on farm through greater use of wintering facilities and through slurry effluent application at the dairy platform and Horner Block. In line with a stable replacement rate no more calves will go to Woldwide Runoff (WR) than have been going there in recent years. Council will have assurance of this through the implementation of a proposed condition to cap stock numbers at WR at their current levels.

In summary, the application to further intensify existing dairy farming of cows through an increase of 160 cows (11%) is not for new dairy farming of land and will see the removal of intensive winter grazing from the farming system. It is explained in the following three paragraphs why the proposed further intensification of existing dairy farming through an increase in cow numbers should be granted in this instance.

Policy 16.1 (b) (i) gives direction on generally not granting further intensification of existing dairy farming of cows where the adverse effects, including cumulatively, on the quality of groundwater and receiving surface waterways such as rivers, wetlands and estuaries cannot be avoided or mitigated. Section 7 of the application provides an in-depth assessment of effects (AEE) of the proposed further intensification on groundwater and receiving surface waters. The AEE addresses the potential for adverse effects on already elevated groundwater to the south east of the property, on groundwater to the south of the property including at Heddon Bush School, which has a registered bore for drinking water supply and on receiving surfacewaters including the Waimatuku Stream, Lower Oreti and Aparima catchments. The assessment covers contaminants N, P, sediment and microbes, with P used as a proxy for sediment and microbes.

The assessment supports the conclusion that adverse effects, including cumulatively, due to further intensification of existing dairy farming through an increase in cow numbers will be mitigated in this instance. The Overseer modelling submitted with this application shows that the total modelled N and P losses for the proposed 1,500 cow scenario are no greater than for the pre-expansion system due to the implementation of several key mitigation measures. As is mentioned above, ceasing the practice of intensive winter grazing is one such measure and has relevance to Policy 16, where it is one of three activities specifically included as having effects on water quality. The effects of the expansion are not being exported off-site but are being transitioned inside to wintering in barns. Additional effluent from barns will be applied to land at very low depth (less than or equal to 2.5 mm per application) at the dairy platform and Horner Block. As adverse effects due to the proposed further intensification of existing dairy farming due to an increase in cow numbers will be mitigated in this instance, the activity should be granted.

Policy 16.1 (b) (ii) gives direction on generally not granting further intensification of existing dairy farming of cows where existing water quality is already degraded to the point of being over-allocated. It is recognised that there is a high degree of variation in existing groundwater quality in the area, with an area to the east and south east of the property showing high groundwater nitrate concentrations, above the New Zealand Drinking Water Standard of 11.3 ppm. In particular, groundwater at an ES monitoring bore at Boyle Road to the south east of the property has shown high nitrate concentrations, indicative of groundwater degradation due to land use effects in the area, such as intensive winter grazing practices on free draining soils. This matter is discussed in depth in the AEE provided in Section 7. Furthermore, it is noted that a predominant risk to water quality for the physiographic zones found at the property is contaminant loss (nitrate in particular) to groundwater. Based on the predominant direction of groundwater flow (south) and observed groundwater water quality results from bores at the property, it is concluded the proposed activity will not adversely affect groundwater quality to the south east of the property, where groundwater shows degradation.

Groundwater flow for most of the property is believed to be to the south (Hitchcock, 2014). Groundwater quality measured at the southernmost location at the property (E45/0622) shows relatively low levels of nitrate, as does a bore located ~2.3 km due south at Heddon Bush School (1.8 – 2.0 ppm in 2017/2018). Bore E45/0622 at the south end of the property is an indicator of groundwater quality at the bottom of the property. It should capture the cumulative effect of land use on water quality in the groundwater stream north of the bore, upstream of groundwater flow including some Braxton and Drummond soils. If deep cracks form in Braxton soils, then contaminants such as nitrate can bypass the soil matrix and move to groundwater or move via subsurface drains into surfacewaters. Water quality at bore E45/0622 does not show evidence of nitrate reaching groundwater via this process, as despite occasional well-head contamination issues, nitrate levels have been consistently low at the bore. In conjunction with the low nitrate levels measured at the Heddon Bush School bore, data from bore E45/0622 indicate that groundwater groundwater flowing south from the dairy platform is certainly not degraded to the point of being overallocated.

There is an increasing gradient in the nitrate concentration of groundwater from west to east towards Terrace Creek, which flows approximately north to south, and is located approximately 1 km beyond the eastern boundary of the property. This concentration gradient is reflected by data from other bores at the property (E45/0665 and E45/0727), where the increasing gradient corresponds to a transition from heavier to lighter soils towards the east. The average groundwater nitrate concentrations at these two bores are considerably lower than the concentrations seen further east and south east of the property. Due south of the property, groundwater nitrate levels are predominantly low for approximately 10 km, which includes the area around Heddon Bush School.

Based on the above factors in conjunction with changing on farm practices, it is proposed that under Policy 16.1 (b) (ii), the activity should be granted. The cumulative effect of changing on farm practices over time, should see a further reduction in nitrate loss to groundwater at the property. There will be no further sowing of summer and winter fodder crops, which is an activity that has high N loss on light soils at the east of the property in particular. No winter grazing of crops by cows or heifers, and no winter grazing of pastures are measures that will reduce N mineralisation and accumulation in soils at high risk times. There will also be increased use of wintering barn facilities, application of slurry at very low depth (less than or equal to 2.5 mm per application) and more efficient use of nitrogen fertiliser, all of which should see a cumulative reduction in N loss to groundwater. The applicants believe that farming under the current system, with a maximum of 1,340 cows but using practices such as intensive winter grazing causes more cumulative loss of N to groundwater due to increased N accumulation on soils, more mineralisation of N in soils and more soil damage. As has been already mentioned, they propose to install a new bore at the south of the property, which will be used to monitor groundwater quality over time. They are prepared to use data to inform decision making at the property. In this case, granting this application to increase cow numbers by 160 will allow the applicants to facilitate these management changes, which cumulatively should cause less N loss to groundwater and degradation of groundwater.

Policy 16.1 (c) gives direction on processes after the development of freshwater objectives under FMU processes. As freshwater objectives have not yet been developed, this policy does not apply at the present time.

Policy 16.2 gives direction on farming activities, including existing activities.

Under **part (a)**, all such activities are required to implement a farm environmental management plan (FEMP), as set out in Appendix N. The applicants implement an FEMP as set out in Appendix N, so meet part (a) of Policy 16.2.

Under **part (b)**, sediment run-off risk must be actively managed by identifying critical source areas (CSAs) and implementing practices such as setbacks from waterbodies, riparian planting, sediment traps, preventing stock from entering the beds of surface waterbodies and limiting the duration of exposed soils.

The property is predominantly flat with minimal CSAs. Where CSAs are found close to where tiles have outfalls to surface drains, they have been mapped and are actively managed to minimise the risk of sediment loss. See the FEMP for locations of CSAs. Practices such as fencing off waterways are implemented at the property and have been for many years as part of the Dairy Accord. Stock do not have access to waterways at any time. Farm infrastructure such as tracks, lanes and sheds can act as critical source areas following periods of prolonged rainfall, where water can pool and move via overland flow to waterways, carrying contaminants such as sediment and microbes with it. Farm infrastructure is managed to ensure that surface drainage does not flow via overland flow directly into waterways, but is directed through pasture or riparian strips, where run-off is filtered, and sediment and microbes are trapped before reaching waterways. The applicants endeavour to limit the duration where soils are bare as much as possible. The proposed activity will bring about a change to the cultivation system whereby only grass to grass cultivation occurs, with no or minimal time duration where soils are bare. This will help to further reduce the risk of sediment run-off further.

Under part (c) of Policy 16.2, collected and diffuse run-off must be managed, as well as leaching of nutrients, microbial contaminants and sediment through the identification and management of CSAs *within individual properties*. The applicants manage their farm layout, infrastructure, soil types, drainage, CSAs and overall farming system to control and minimise collected and diffuse run-off, leaching of nutrients, microbial contaminants and sediment from such sources. These are explained in the FEMP. In particular, a lane adjacent to WOL's wintering barn has been identified as a potential CSA and is now being managed appropriately to avoid the runoff reaching a stream.

Policy 17 gives direction on agricultural effluent management.

In line with Policy 17, significant adverse effects on water quality from the operation of, and discharges from, the effluent management system at the dairy farm are avoided. Other adverse effects are also avoided, remedied or mitigated. The effluent management system, including storage ponds and low depth irrigation systems, follows best industry practice for effluent storage and discharge given the nature of soils and topography at the property. It has been designed, constructed and located in accordance with best industry practice including the relevant practice notes and guidelines, and the system is maintained and operated in accordance with best practice guidelines. By only irrigating effluent to land when ground conditions are at less than field capacity, and by ensuring that irrigation of effluent to land does not result in soils reaching field capacity, the risks of nutrient rich effluent leaching through the soil profile or moving via overland flow are mitigated.

The slurry tanker with the trailing shoe will apply slurry at depths of less than or equal to 2.5 mm per application to allow for the higher nutrient loading in slurry. It can apply slurry at depths as low as 1 mm per application, which further minimises the risk of adverse effects and increases the number of irrigation days available. It applies slurry directly on the ground, which minimises the risk of adverse odours. The recommended buffer zones from waterways are adhered to when applying effluent, effluent is not discharged over tile drains when the soil is at or near field capacity nor is effluent applied to areas where cracks in the top soil have formed. The effluent receiving area is sufficiently large to ensure that the N loading to land from dairy shed effluent and slurry does not exceed 150 kg N/hectare at the dairy farm, and that it does not exceed 250 kg N/hectare at the Horner Block. Slurry applied at the cut and carry Horner Block serves as a source of plant nutrient. In turn, pastures grown at the Horner Block are harvested and fed to cows in wintering barns at the dairy platform. In this way nutrients are recycled from animal feed to effluent, then back to animal feed etc.

In line with **Policy 18**, all stock is excluded from waterways at the property.

The range of the good management practices implemented on farm, result in improved integrated management of freshwater through good dairy farm land management practices. This is in line with **Policy 39A**.

In line with **Policy 40**, the applicants seek a term of 15 years for the activities, which aligns with Woldwide One's discharge and water permit terms. There is good certainty regarding the nature and scale of the activity going forward; there will be an increase in cow numbers as well as implementation of good management practices and specific mitigation measures to ensure that the activity is sustainable in the long term. Importantly the effects of the expansion have been carefully considered and will not be exported off-site but will be managed on farm. Considerable investment in farm infrastructure has been made to take the final steps towards future proofing the dairying operation; eliminating winter grazing of adult cattle on beet crops altogether. The level of investment demonstrates the applicant's belief in and commitment to sustainable farming and land management. The applicants believe that their presence at this location since 1992 (over 25 years) has not had a detrimental effect on the local environment, and that the proposed changes will mean a further reduction of that impact. A 15-year consent term will mean that the management of the resources under the same proven stewardship will be ensured into the future while allowing the applicants to operate a sustainable farming and business model. As 2013 supreme winners of the Southland Ballance Farm Environment Awards, their commitment to operating a sustainable farming model has been demonstrated.

Having assessed the matters above, it is considered that both the application for the expansion of dairy farming, the discharge and the water abstraction are generally in accordance with the relevant policies and objectives of the documents set out above, and having regard to Section 104, the proposal achieves the purpose of the RMA.

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4. Notification

Section 95A of the Act requires that the Consent Authority must publicly notify an application if the applicant has requested that the application be publicly notified. *The applicant hereby requests that the application be publicly notified.*

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6. Proposal Details

6.1 Effluent

Overview of effluent discharge activity

Table 6.1

Effluent Discharge	
Replacement of consents	Replace 301663 and 20171278-01 with a single discharge permit
Duration of consent sought	15 years
Herd size	1,500 cows total: 800 cows at WTL 700 cows at WOL
Supplier number	WTL unit = 32651 WOL unit = 32650
Period of discharge	The cowsheds are generally operated from 1 August to 31 May each year, with a limited number of late calving cows milked until mid-June (15th). Effluent irrigation to the discharge areas will be carried out between August and May, and as ground conditions permit for June and July if deemed necessary.
Milking frequency	Twice per day
Winter milking	Not anticipated, seasonal supply only
Feed pad/wintering pad/stand-off pad	There are two wintering barns at the property with a total capacity to house 1,280 cows.
Other sources of effluent collected in main effluent system	Concrete area at two vat stands Silage pad (WTL)

Feed Pad/Wintering Pad/Stand-off Pads

There are two wintering barns at the property with a total capacity to house 1,280 cows. One barn is located on each dairy unit; both have capacity to house 640 cows although typically they will house about 625 cows each to minimise cow stress. The WOL barn has recently been upgraded to go from 400 to 640 cow capacity as has its effluent storage infrastructure.

The wintering barns are mainly used in May, June, July, August and September but can be used as stand-off pads at other times during inclement weather. The use of wintering barns as a stand-off pads varies from year to year dependent on weather. Cows are removed from the wintering barn for calving.

The wintering barns have a sealed concrete floor. Effluent from the wintering sheds is scraped into a concrete collection channel from where it is pumped to respective storage ponds, which also stores effluent from the dairy shed as required. The wintering barns have a small uncovered area, which has been included in the Massey DESC reports.

A rainwater diversion is used on the concrete areas during the off season.

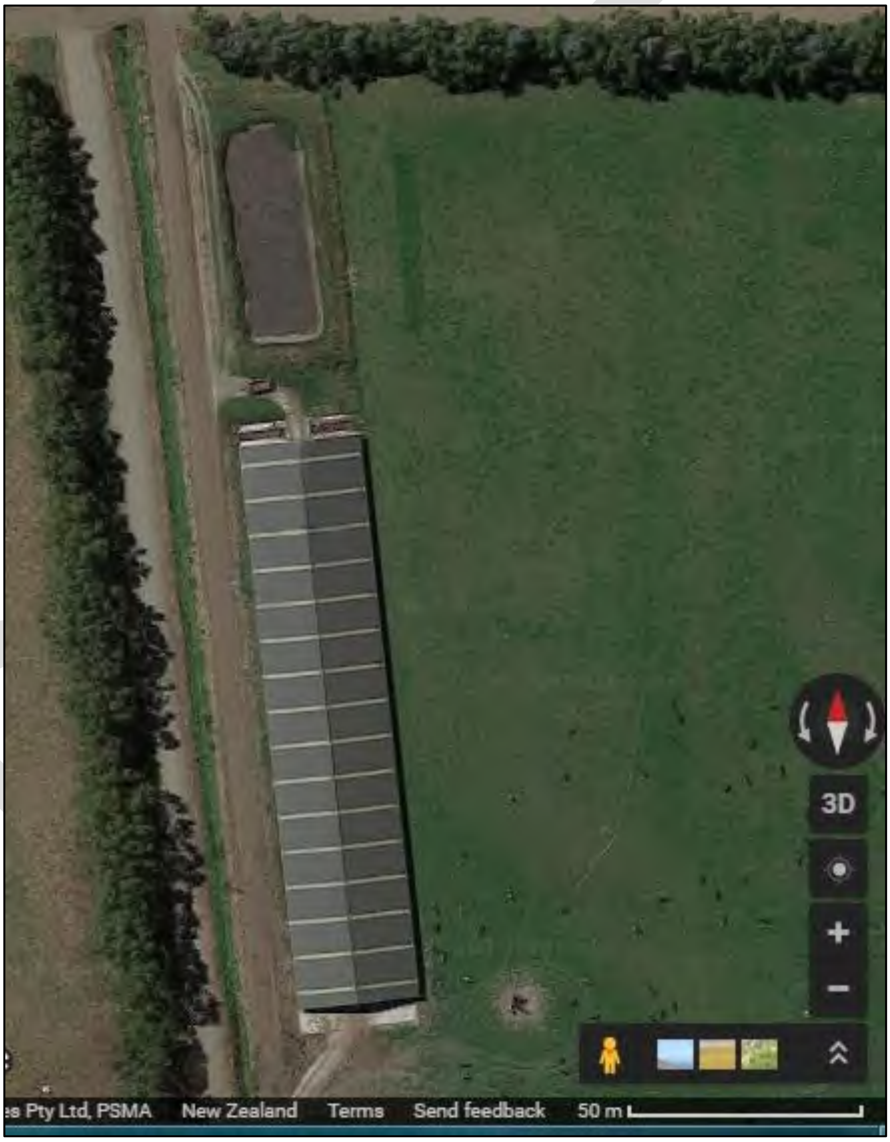

Figure 6.1 Wintering barn and effluent pond – WOL dairy unit.

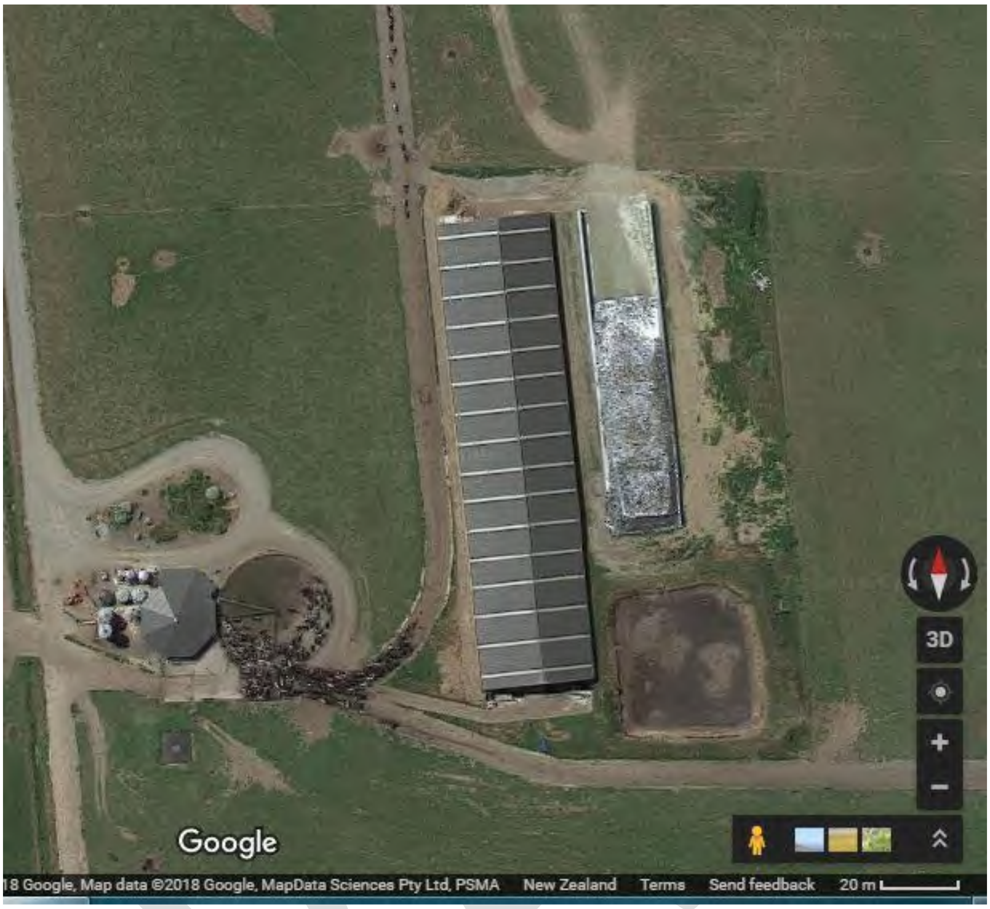

Figure 6.2 Wintering barn, silage pad, dairy shed and effluent pond – WTL dairy unit

WTL wintering barn – effluent volume

The total volume of effluent collected has been calculated based on approximately 50 litres per cow per 24-hour day. The volume has been calculated as follows:

May:

$$640\ cows\ x\ 12\ Hours/day\ x\ 50\ l\frac{effluent}{24}Hours\ \ x\ 31\ days = 496\ cubic\ metres$$

June and July:

$$640\ cows\ x\ \ 50\ l\frac{effluent}{day}\ x\ 61\ days = 1{,}952\ cubic\ metres$$

August:

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$$370\ cows\ x\ 23\ Hours/day\ x\ 50\ l\frac{effluent}{24}Hours\ \ x\ 31\ days = 550\ cubic\ metres$$

September:

$$75\ cows\ x\ 23\ Hours/day\ x\ 45\ l\frac{effluent}{24}Hours\ \ x\ 30\ days =\ 108\ cubic\ metres$$

Total

$$496\ m3 + 1{,}952\ m3 + 550\ m3 + 108\ \ = 3{,}106\ cubic\ metres$$

WOL wintering barn – effluent volume

The same calculation applies to WOL's wintering barn, which is estimated to be 3,106 m^3.

Wintering barns – total volume of effluent

The volume total of effluent collected from the wintering barns has been calculated as approximately 6,212 m^3/year.

Other sources of effluent

UNDERPASS

An underpass connects WTL blocks north and south of Wreys Bush Highway, which has a catchment of 200 m^2. The underpass has a concrete sump, from where rainfall and effluent is pumped to a dedicated sprinkler. The underpass has not been included in the Massey DESC report.

Rainfall site used in Massey DESC: Drummond Marson Road = 1.061 m per year
200 m^2 catchment X 1.061 m rainfall = 212 m^3 volume to discharge.

Underpass effluent is very dilute as it is primarily composed of rainwater. It is irrigated using a dedicated low rate sprinkler (less than 10 mm/hour and less than 10 mm depth per application).

The discharge is to paddocks close to the underpass (low risk soils). Underpass effluent is not discharged to a surface waterway either directly or by overland flow. There is no discharge of underpass effluent when the soil moisture exceeds field capacity.

The discharge of underpass effluent is:

- not within 20 metres of a surface waterway;
- not within 200 metres of a neighbouring dwelling;
- not within 20 metres of a boundary with another landholding; and
- not within 100 metres of a bore.

The maximum loading of N from underpass effluent does not exceed 150 kg N/hectare/year; it is very dilute. Due to its very small volume and highly dilute nature, the nutrient loadings and losses from underpass effluent are negligible compared to that from effluent, sludge and the overall farming activity. The extremely small quantity of nutrients that fall on the underpass and are discharged are accounted for in Overseer, through cow numbers, feed inputs and system losses. Underpasses are not modelled separately in Overseer due to the negligible contribution they make.

Figure 6.3 Aerial photograph of underpass.

SILAGE PAD - WTL

A concrete silage pad is located adjacent to the wintering barn at WTL. Its area is 1,200 m^2. It is constructed on a dry site. The silage pad has concrete walls and a dual drainage system; one for clean rainwater and one for silage leachate. Under the stack and immediately in front of it, the drains are opened into the leachate channel. This takes leachate to a sump from where it is pumped into the effluent storage pond and irrigated appropriately. The sumps in the rest of the pad are open to the farm drainage system so that clean rainwater can be diverted. Rain landing on the silage cover does not mix with leachate and is diverted to the farm drainage.

Only wilted silage is used to minimise the risk of creating leachate. The pad is empty for approximately 3-4 months per year. The silage pad catchment has been included in the Massey DESC report. Given the rainwater diversion in place when the pad is empty, and that rain landing on the cover does not mix with leachate so can be diverted to farm drainage, the silage pad leachate catchment is smaller than 1,200 m^2 for much of the year.

Good management practices for the concrete silage pad at WTL are:

1. Only wilted silage is stored on the pad to minimise leachate generation;

2. The bunker is filled to the top of the walls with silage and the silage cover hangs over the walls so that rain landing on the silage cover does not mix with leachate.

3. The silage pad is flanked by 1.8 m high sealed concrete walls to prevent leachate escaping;

4. A dual drainage system is operated inside the wall on the low side; one for clean rainwater and one for silage leachate. This ensures that only leachate is collected, stored and discharged to land appropriately:
    a. Drains at the front of the stack and underneath the stack are opened to the leachate channel. These drain leachate to a sump, from where it is pumped to WTL's effluent storage pond and irrigated appropriately. These areas capture no or minimal rainwater;
    b. The sumps in the rest of the pad are open to the farm drainage system so that clean rainwater can be diverted.

SILAGE PAD - WOL

The silage pad at WOL meets permitted activity rules both for the use of land and for leachate management. See Section 2 for details. No effluent is collected and pumped to the storage system.

Figure 6.4 Silage pad at WOL

Figure 6.5 Silage pad at WOL

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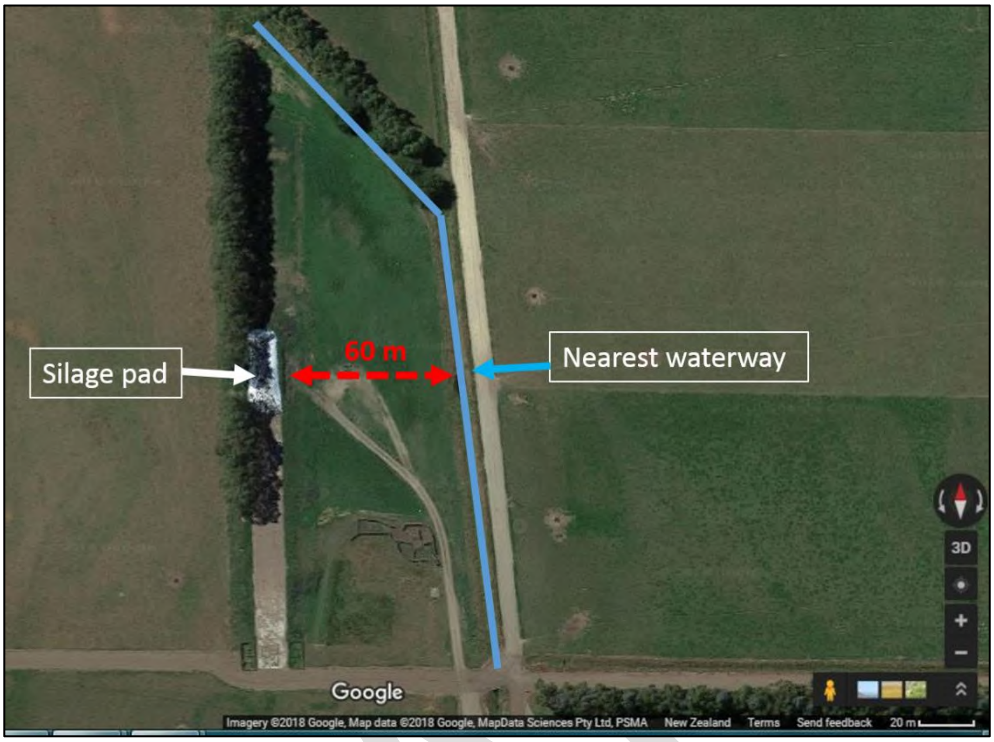

Figure 6.6 Location of the silage pad at WOL.

Effluent collection and storage system

WOL - DAIRY SHED

The maximum daily dairy shed effluent volume comprises 35 cubic metres of effluent plus any rainfall.

I. Raw effluent from the dairy shed gravity feeds to a pump sump.
II. When soils are below field capacity and have sufficient soil moisture deficit, raw effluent is pumped to a travelling irrigator, from where it is applied to land at low depth.
III. When soils are near or at field capacity, raw effluent is pumped to the buffer storage pond and there is enough storage in the pond so that irrigation is not required.
IV. When soil moisture conditions are suitable for irrigation, raw effluent (slurry) from the pond is applied at low depth to land using a slurry tanker with a trailing shoe or using an umbilical system.
V. An off-season diversion is put in place at the dairy shed.

WOL - WINTERING BARN

I. The effluent flows by gravity or is scraped to the concrete effluent collection sump, and then is pumped to the effluent storage pond.
II. The effluent is stored in the pond until soil moisture conditions allow for irrigation to occur.
III. The effluent is pumped from the pond to the slurry tanker with a trailing shoe or umbilical system and irrigated at very low depth to land; and
IV. A rainwater diversion is used in the off season.

WTL - DAIRY SHED

The maximum daily dairy shed effluent volume comprises 40 cubic metres of effluent plus any rainfall.

I. Raw effluent from the dairy shed gravity feeds to a pump sump.
II. When soils are below field capacity and have sufficient soil moisture deficit, raw effluent is pumped to a travelling irrigator, from where it is applied to land at low depth.
III. When soils are near or at field capacity, raw effluent is pumped to the buffer storage pond and there is enough storage in the pond so that irrigation is not required.
IV. When soil moisture conditions are suitable for irrigation, raw effluent from the pond is applied to land at very low depth using a slurry tanker with a trailing shoe or using an umbilical system.
V. An off-season diversion is put in place at the dairy shed.

WTL - WINTERING BARN

I. The effluent flows by gravity or is scraped to the effluent sump, and then is pumped to the effluent storage pond.
II. The effluent is stored in the pond until soil moisture conditions allow for irrigation to occur.
III. The effluent is pumped from the pond to the slurry tanker or umbilical system and irrigated at very low depth to land; and
IV. A rainwater diversion is used in the off season.

WTL – SILAGE PAD

I. Drains at the front and underneath the stack are opened to the leachate channel. These drain leachate to a sump, from where it is pumped to WTL's effluent storage pond and irrigated appropriately.

Storage capacity

WOL – EFFLUENT STORAGE

The pond was upgraded in autumn 2018. As part of its upgrade the storage volume was increased and a synthetic liner (1.5 mm HDPE) was installed, overlying a leak detection system. The pond design was certified by a CPEng as meeting Practice Note 21 standards. The leak detection system terminates at a 400 mm diameter inspection well. The storage capacity of the pond is 4,281 metres cubed. The Massey Dairy Effluent Storage Calculator 90% storage probability volume for WOL is 3,257 metres cubed, so has sufficient storage for 700 cows plus wintering barn effluent. See Appendix for the Massey DESC report.

WOL - DESC PARAMETERS

- 700 cows milked at peak
- Milking season is 1 Aug – 15 June
- Yard is diverted from 16 June to 31 Aug
- Yard area – 553 m^2
- Milking shed roof area diverted.

- Up to 640 cows wintered on a covered feedpad that includes an uncovered area of 170 m^2 that is not diverted.
- A winter/spring irrigation depth of 2 mm has been used. This reflects the predominant use of the trailing shoe slurry tanker to discharge slurry effluent from the storage pond, which can apply effluent to a depth of 1 mm if required. By applying effluent 20 m^3/hectare the slurry tanker applies slurry effluent to a depth of 2 mm. A low depth travelling irrigator is used to apply dairy shed effluent when there is sufficient soil moisture deficit.
- FDE area is split to reflect Drummond/Glenelg (low risk) and Braxton (high risk) soils at the milking platform and the Horner Block. Conservatively 50 hectares of low risk soils has been entered.

Note: if the dairy shed is upgraded/replaced in the future, additional storage is available in WOL's pond to allow for a larger yard catchment.

WTL – EFFLUENT STORAGE

The storage capacity of the pond is 3,751 metres cubed. The Massey Dairy Effluent Storage Calculator 90% storage probability volume for WOL is 3,203 metres cubed, so has sufficient storage for effluent from 800 cows, wintering barn effluent and silage pad leachate. See Appendix for the Massey DESC report.

WTL - DESC PARAMETERS

- 800 cows milked at peak
- Milking season is 1 Aug – 15 June
- Yard is diverted from 16 June to 31 Aug
- Yard area – 1,126 m^2
- Milking shed roof diverted
- 640 cows wintered on a covered feedpad that has an uncovered area of 170 m^2 that is not diverted.
- A silage pad catchment of 800 m^2 is entered under "Other catchments."
- A winter/spring irrigation depth of 2 mm has been used. This reflects the predominant use of the trailing shoe slurry tanker to discharge slurry effluent from the storage pond, which can apply effluent to a depth of 1 mm if required. By applying effluent 20 m^3/hectare the slurry tanker applies slurry effluent to a depth of 2 mm. It is noted that a low depth travelling irrigator is also used to apply dairy shed effluent when there is sufficient soil moisture deficit.
- FDE area is split to reflect Drummond/Glenelg (low risk) and Braxton (high risk) soils at the milking platform and the Horner Block. Conservatively 50 hectares of low risk soils has been entered.

WOL and WTL - Effluent irrigation

Primary irrigation methods – low depth travelling irrigator

A low depth travelling irrigator system is used to apply dairy shed effluent to land at a depth of less than 10 mm per application. Two travelling irrigator systems are on farm, with one connected to each dairy shed. Both have been tested as per consent conditions and apply effluent at a depth of < 10 mm per application. See the Appendix for reports from testing each travelling irrigator.

The travelling irrigator systems have a safety system, which automatically switches the system off in the event of an effluent system failure, such as irrigator stoppage or breakdown.

Primary irrigation methods – low depth slurry tanker with a trailing shoe

A low depth slurry tanker with a trailing shoe is used to apply pond slurry at a maximum depth of 2.5 mm per application. 2.5 mm is the maximum depth proposed as a consent condition.

It can apply slurry to depths as low as 1 mm depending on tractor speed. The applicants own a slurry tanker with a trailing shoe, which has a GPS system. The area and travel speed are monitored using the on-board GPS system. At a travel speed of 8-9 km/hour, the per hectare loading is 20 m^3, which gives a depth of 2 mm. By speeding up the tractor speed, the application depth of lowered further. The capacity of the slurry tanker is 24 metres cubed.

The trailing shoe part of the slurry tanker sits on the ground. It applies sludge at ground level and generates minimal aerosol and odour. It was invented in Europe to reduce adverse odours from the application of slurry/sludge to land, which is standard practice due to the housing of cows in barns over winter. It is regarded to be an effective odour minimisation technology and is best practice for slurry/sludge application. Its use will help to avoid adverse odour effects on neighbouring properties.

Contingency method – umbilical system

An umbilical system is used as a contingency irrigation method, with a maximum depth per application of pond slurry of 3.0 mm.

Future proof – low rate irrigation

It is proposed to future proof the discharge activity by including low rate irrigation. The applicants may install a low rate system such as pods or a cannon/rain-gun system in the future. Both systems will apply dairy shed effluent at a maximum rate of 10 mm/hour and a maximum depth of 10 mm per application.

By including both systems in the permit, the applicants will have flexibility when deciding which system is most suitable, while at the same time being able to assure Environment Southland via consent conditions that the new system will discharge effluent at low rate (< 10 mm/hour).

The system will only be plumbed to land authorised to receive liquid effluent (a.k.a. dairy shed effluent) on the discharge permit/Appendix 1 Discharge Map. If installed, the applicants intend to use a low rate system at times when the soil moisture deficit is too low to safely use the travelling irrigators. E.g. in the shoulders of the season, or in June and August if conditions are suitable/there is sufficient soil moisture deficit to irrigate at depths of 3 – 5 millimetres. The travelling irrigators would still be used over summer/early autumn when the soil moisture deficit is generally greater and irrigation of effluent at depths of less than 10 millimetres can be carried out without risk of drainage.

Note: The nutrient budgeting, proposal details and AEE used the high rate travelling irrigator as the primary irrigation system for dairy shed effluent. The low rate systems are regarded as best practice by Environment Southland, and as such will have similar or lesser effects as the high rate travelling irrigator system.

Other conditions

- A minimum return period of 28 days between applications;
- A maximum of 150 kg of N/hectare from effluent (dairy shed and pond slurry) applied at the dairy farm (WOL and WTL units).
- A maximum of 250 kg of N/hectare from effluent (pond slurry) is applied at the Horner Block.
- A maximum combined depth of application of 25 mm per year for dairy shed effluent to any land area, and
- A minimum land area of 8 hectares/100 cows for the dairy shed effluent.

WOL and WTL - Contingency measures

The aim is to operate the irrigation systems to always ensure there is buffer storage available. This allows a contingency for wet weather or pump failure.

The umbilical system may be used as a contingency irrigation method. The umbilical system will apply effluent at a maximum depth of application of 3 mm for each individual application.

Should the irrigation pump at either the WOL or WTL dairy sheds fail, a replacement pump is available within 12 hours. Alternately a petrol motor-driven or tractor driven pump could be hired. There is adequate storage to allow time for pump replacement.

Nutrient content of effluent

Dairy shed effluent

The nutrient content of dairy shed effluent has not been tested but is expected to be in line with typical dairy shed effluent (Longhurst, Rajendram, Miller and Dexter (2017)). An estimate for nutrient content of typical dairy shed effluent based on the above reference is as follows:

- 250 g/m^3 N
- 30 g/m^3 P
- 300 g/m^3 K
- 15 g/m^3 S

Discharging dairy shed effluent at a depth of 10 mm applies 25 kg of N/hectare, and 30 kg of K/hectare. Where the application depth is 9 mm, approximately 22.5 kg of N is applied per hectare.

Table 6.1. N loading from dairy shed effluent

	Dairy Shed
Number of cows	1,500
Nitrogen collected based on 50 L effluent per cow per day	0.013 kg N/cow/day
Daily nitrogen produced	19.5 kg N/day
Maximum days used per year	300
Annual nitrogen produced	5,850 kg N/year
Minimum annual size of discharge area (ha)	220 ha (WOL + WTL)
Annual nitrogen loading rate	26.6 kg N/ha

Wintering barn effluent

The nutrient concentration of wintering barn effluent is higher than dairy shed effluent due to lack of dilution and the housing of cows in the barns for up 24 hours per day. Slurry effluent in the ponds is predominantly composed of wintering barn effluent, with minor dilution from rain falling on the pond and dairy shed effluent, which is diverted to the ponds when ground conditions are unsuitable for irrigation.

The nutrient content of pond effluent (slurry) was tested as part of a 2011 AgResearch study "Characterising dairy manures and slurries – Case study 15." The nutrient content of slurry at the applicant's pond was measured at:

- 3,200 g/m^3 N
- 800 g/m^3 P
- 4,400 g/m^3 K
- 400 g/m^3 S

Applying 15.2 m^3/hectare applies slurry effluent at a depth of 1.5 mm. Discharging slurry effluent at 15.2 m^3/hectare applies:

- 49 kg of N;
- 12 kg of P;
- 69 kg of K; and
- 6 kg of S.

Slurry effluent is applied at the Horner Block and at the dairy platform.

The Horner Block is a cut and carry block used to grow feed for cows. Given the use of the Horner Block for grass harvesting, slurry effluent from WOL and WTL is applied at very low depth as fertiliser, and grass is harvested and fed to cows at WOL and WTL. Cows are not grazed at the Horner Block, so a higher slurry loading can be applied without the potential risk of adverse animal health effects due to excessive K levels. Nitrogen fertiliser is reduced accordingly at both the Horner Block and at the dairy platform to account for the N loading from slurry. Adverse N-related environmental effects are further avoided through the application of pond slurry at very low depths (less than or equal to 2.5 mm per application and typically at 1.5 – 2.0 mm depth per application).

E.g. Slurry effluent applied at 1.5 mm depth by applying 15.2 m^3/hectare, will apply 49 kg of N/hectare. Four further applications at 1.5 mm depth more than 28 days apart will apply a further 196 kg of N/hectare. Five applications at 1.5 mm depth each will apply a total of 243 kg N/hectare, which is less than the 250 kg N/hectare proposed limit for the Horner Block.

One application of slurry effluent at a similar depth and rate per hectare is also applied at the dairy platform.

Slurry volume

Slurry volume is estimated based on the volume of wintering barn effluent (6,212 m^3), rainwater on the ponds' surface (606 m^3 for WOL, 912 m^3 for WTL) and an allowance for dairy shed effluent diverted to the ponds (2,400 m^3) given the presence of low risk soils and use of very low depth application using the slurry tanker/trailing shoe, which results in a large number of irrigation days available. The area available at the Horner Block (97 ha) and dairy platform (> 180 ha) is sufficiently large to receive the volume of slurry.

Effluent discharge and receiving area

See table 1.1 for details of land areas within the FDE area.

Effluent irrigation to the discharge areas is carried out between August and May, and if ground conditions permit in June and July as necessary. As per existing consents, the effluent receiving area encompasses most of the dairy farm and the part of the Horner support block (c.97 hectares), less Council required buffers around waterways, bores, neighbouring dwellings, boundaries etc.:

- 20 metres from any surface watercourse;
- 100 metres from any potable water abstraction point;
- 20 metres from any property boundary (unless the adjoining landowner's consent is obtained to do otherwise);
- 200 metres from any residential dwelling other than residential dwellings on the property;
- Dairy shed effluent shall not be discharged onto any land area that has been grazed within the previous 5 – 10 days;
- Effluent shall not be discharged to leased land described as Lot 1 DP 451158, Lot 1 DP 13077 and Lot 1 DP 9925;

- Effluent shall not be discharged where the soil has cracked, and
- Effluent shall not be discharged over tiles or mole drains when the soil is at field capacity.

Allowing for the above buffers, a conservative estimate for the size of the effluent discharge area is c.350 hectares at WOL and WTL, and c.97 hectares at the Horner Block, which gives a total FDE area of 447 hectares. Given the presence of Drummond and Glenelg soils, there are significant areas of low risk (for FDE) soils.

At an operational level:

- Dairy shed effluent from WOL and WTL units will continue to be discharged via travelling irrigator at low depth at the WOL and WTL platforms, in the future a low rate irrigation system may be installed;
- Slurry effluent will be discharged at very low depth via slurry tanker (or umbilical system) at the WOL and WTL dairy platform. This includes land referred to as the SH96/Marcel Block. A maximum of 150 kg N/ha/year from effluent (slurry and dairy shed) will be applied at the dairy platform;
- Slurry effluent will be carted via slurry tanker and discharged at low depth at the Horner Block. Approximately 97 hectares is available at the Horner Block for this purpose (see figure 6.7). A maximum of 250 kg N/ha/year from effluent (slurry) will be applied at the Horner Block.
- The slurry effluent areas at the milking platform (WOL and WTL) and at the Horner Block are sufficiently large to receive both the volume and N loading from the effluent ponds.
- Effluent will not be discharged at times where there is snow on the ground or when rainwater/irrigation water has ponded on the land surface.
- Effluent will also not be discharged when soil conditions are considered unsuitable i.e. when soil temperature is at or below 5 degrees Celsius or when the soil moisture deficit is insufficient. Environment Southland’s Beacon website will be consulted as a guide to soil moisture levels.

Figure 6.7 Horner support block with slurry effluent area annotated in purple.

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Horner Block – slurry receiving area

Land use

The land is used as for cut and carry, and to discharge slurry effluent. No stock is grazed at the block so there is no nutrient loss from urine patches. Cut and carry block are used to grow grass only with typically 4 cuts per season. Relatively high N inputs are required to achieve this. In this case fertiliser and slurry provide N. Cut and carry blocks are efficient at utilising N and generally have low N loss to water despite relatively high N inputs.

The block (160 ha) will continue to be managed as it has been managed in recent years. A general description of how the block will be managed is as follows:

Cut and carry

- Pasture renewal - the pasture renewal programme is by grass to grass cultivation. Approximately 5% is re-grassed each year.
- Grass (approximately 17 t DM/ha) is harvested and is purchased by dairy farms in the Woldwide Farming Group (including WOL and WTL). Some grass harvested is fed fresh or is stored as silage and fed to cows at wintering barns at WOL and WTL.

Slurry

WOL/WTL slurry receiving area: 97 hectares

WOL/WTL N loading: 5 applications of slurry at 15.2 m^3 per hectare per application = 243 kg N/ha from slurry

Woldwide Three: 57.5 hectares (not part of this application)

General fertiliser use

For a detailed fertiliser programme, please see the nutrient budget inputs. N, P, K and S are applied as follows:

- N (207 kg/ha – split applications, little and often)
- P (10 kg/ha)
- K (0)

Fertiliser is applied outside high risk months (i.e. May – July). If ground conditions are suitable and there is minimal risk of drainage, fertiliser can be applied in August.

Downstream users of groundwater

- Farmland is found due south of the HB. Downstream users of groundwater are farms (sheep, dairy and cropping).
- Drummond Township is located ~ 9 km to the south east of the HB so has domestic users of groundwater including Drummond Primary School and Drummond Kindergarten. Both are located at the south of the township.

6.3 Water Take

Groundwater is abstracted from three bores on the property for use at the dairy sheds and to supply stock drinking water. The bores are over 100 metres apart. Two bores supply groundwater to the WTL dairy platform, one bore supplies groundwater to the WOL platform. **The maximum volume of groundwater abstracted for 1,500 cows will be 180 meters cubed per day.** This is abstracted as follows:

> **WOL -**The bore (well ID E45/0071) is located to the west of the dairy shed and supplies water via a submersible pump to three tanks (3 x 30,000 litres) at the dairy shed for stock drinking water and dairy shed use. The abstraction for WOL is currently managed under Water Permit 301664. **It is proposed to increase the groundwater take to meet the needs of 700 cows milked through the WOL dairy shed.** The proposed groundwater take at the WOL dairy platform is 84,000 litres per day.
>
> **WTL** - Two bores (well ID E45/0727 and E45/0083) supply groundwater for dairy use; one is adjacent to Wreys Bush Highway north of the dairy shed, and the other is on the west side of the dairy shed. The two bores supply water via submersible pumps to three tanks (3 x 30,000 litres) at the dairy shed for stock drinking water and dairy shed use. The abstraction for WTL is currently managed under Water Permit 20171278-02. **The proposed groundwater take at WTL will continue to meet the needs of 800 cows milked through the dairy shed.** The proposed groundwater take at WTL dairy platform is remaining at 96,000 litres per day.

Groundwater use equates to 120 litres per cow per day and is in line with the Council's standard estimate for water usage (i.e. 70 litres per cow per day for drinking water and 50 litres per cow per day for dairy shed washdown).

Water requirements

Season

During the milking season (twice per day milking), requirements are 70 l/cow/day for drinking water and 50 l/cow/day for dairy shed wash down water:

1,500 cows x 120 l/day = 180,000 litres per day

180,000 litres per day is split between the WOL (84,000 litres per day) and WTL (96,000 litres per day) dairy units.

An average lactation length is 280 days.

280 days x 180,000 litres per day = 50,400,000 litres

Off season

Cows remain on-farm over winter when they are housed in two wintering barns. An average lactation length for cows is 280 days, which leaves an average of 85 days when cows are dry. A drinking water allowance for dry cows is 45 l/cow/day. On average 1,280 cows require drinking water in the off season for 85 days:

1,280 cows x 45 l/day x 85 days = 4,896,000 litres for the off season.

Total volume of groundwater required

55,296,000 litres or 55,296 metres cubed

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Extraction

Groundwater is abstracted from three bores over 50 metres apart from each other, which ensures that the abstraction rate will be less than 2 L/sec.

Average daily rate of take (WOL)	0.97	litres per second
Average daily rate of take (WTL)	1.11	litres per second
Maximum daily rate of take	2.0	litres per second
Maximum daily volume	180	cubic metres per day
Maximum weekly volume	1,260	cubic metres per week
Maximum monthly volume	5,400	cubic metres per month (30-day month)
Maximum annual volume	55,296	cubic meters

The bores are over 50 metres apart from each other. The bores are not within 700 metres of a neighbouring bore or groundwater take.

The dairy supply bore map references (NZTM2000) are:

E45/0083	E1225011	N4889693
E45/0727	E1225014	N4890268
E45/0071	E1225145	N4888768

Water storage

Three water storage tanks (3 x 30,000 L) are utilised at WOL’s dairy shed to ensure that the rate of take is less than 2 L/sec.

Three water storage tanks (3 x 30,000 L) are utilised at WTL’s dairy shed to ensure that the rate of take is less than 2 L/sec.

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6.4 Land-use – Dairy farming

Land use activities – dairy platform

Land use

The land is used as a pasture based dairy farm. Calving officially starts on 1 August and cows are typically milked from 1 August to 31 May, with late calving cows milked until 15 June. Cows (Friesan) are milked twice per day.

A general description of proposed dairy management system follows:

Stock management

- Up to 1,500 cows (i.e. mixed age cows and replacements) are calved each year. The milking herd peaks in October/November at 1,500. It drops slightly over consecutive months depending on seasonal variation in pasture production; approximately 1,380 cows are milked in March. Cows are dried off in May and June. Approximately 270-330 cows are culled and replaced each year.
- Median calving date is 20 August with approximately 330 heifer calves kept as replacements. Calves are on farm for August, September and October. Weaned R1 heifer calves go to Woldwide Runoff.
- Approximately 300 in-calf R2 heifer replacements return to the farm for calving each year. Replacements calve in August, September and October and join the milking herd.
- Approximately 15 bulls are grazed on farm and used as part of the mating programme each year.

*Woldwide Runoff comprises the Merrivale and Merriburn blocks and is described in an accompanying report. A replacement rate of 22 – 25 % is maintained.

Wintering, cropping, grazing and supplements

- Wintering – all cows are wintered on farm where they are housed in two wintering barns over June and July. Cows are housed in wintering barns during May, August and September as required also.
- Fodder crop – no fodder crops (brassica or beet) are sown. Animals are not wintered on crop nor grazed in paddocks on fodder crop at any other time.
- Pasture renewal - the pasture renewal programme is by grass to grass cultivation. Approximately 5% of the farm is re-grassed each year.
- Grazing – cows are grazed on pasture throughout the season. The wintering barns are used to stand cows off paddocks during high risk inclement weather events.
- Supplements made – If there is a surplus, silage may be harvested at the dairy farm. There is no dedicated silage block, however, and in general silage is imported.
- Supplements imported – barley, molasses, PKE and grass silage (see nutrient budget inputs)

General fertiliser use

For a detailed fertiliser programme, please see the nutrient budget inputs. N, P, K and S are applied as follows:

Effluent block:

- N (139 kg/ha – split applications, little and often)
- P (25 kg/ha)
- K (0)

Slurry receiving area:

- N (179 kg/ha – split applications, little and often)
- P (22 kg/ha)
- K (0)

Non-effluent blocks:

- N (209 kg/ha – split applications, little and often)
- P (34 kg/ha)
- K (28 kg K/ha)

Fertiliser is applied outside high risk months (i.e. May – July). If ground conditions are suitable and there is minimal risk of drainage, fertiliser is applied in split applications from August to April.

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Good Management Practices

Good management practices (GMPs) implemented on farm are also described in the FEMP. A general strategy of good management practice is undertaken on farm. Details are described in table 6.2 below. Key mitigation measures (distinct from GMPS) are described in table 6.5.

Evidence of sustainable soil and nutrient management is clear in trends in soil testing across the property over many years. See the Appendix for reports from Ravendown supporting good practice management of farm soils and farm fertility.

Table 6.2 General Good Management Practices

Strategy Type	Summary of Management Practices
Operational	Utilising a nutrient management plan; Soil testing is carried out each year to inform on decision making regarding fertiliser application; Trends in soil testing are evaluated and used to inform on decision making regarding soil health, fertiliser and agronomy plans; Surface waterways are fully fenced and with good grass cover, fencing is maintained and stock are excluded from the riparian areas; Wide riparian buffers are maintained; All surface waterways are culverted; Sufficient land area is available for the dairy operation; Young stock is grazed off farm from weaning; Cows are wintered in barns over June and July; Good winter grazing management practice of R2 heifers is implemented*; Tracks and lanes predominantly sited away from streams; Lane runoff diverted to land; Good management practice of the silage pad is implemented; Restricted grazing of draining pastures in autumn/spring; Specialist machinery is used to harvest grass to minimise the risk of soil compaction; Care in irrigation of FDE, especially when the ground is near or at field capacity; A large land application area is available to ensure N & K returns are not excessive, taking into account the higher strength nature of slurry effluent;

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	Effluent volumes are minimized at source through efficient water use; Appropriate application depths for effluent and slurry are used; Appropriate FDE storage volume to allow for deferred irrigation for FDE; All data and maps are kept up to date and all staff are trained and informed of any changes; Programmed maintenance is done in and around FDE, and piping infrastructure around the dairy shed, silage bunkers, cow yards etc.;

*Winter grazing of R2 heifers at the WOL/WTL dairy platform will no longer occur from June 2019 as a mitigation measure.

Good Management Practices for Key Transport Pathways

See table 6.3 below for a summary of physiographic zones and key transport pathways of contaminants.

Table 6.3 Physiographic zones and key transport pathways

Physiographic Zone	Variant	Key Transport Pathways
Central Plains	n/a	Artificial drainage, deep drainage
Oxidising	n/a	Deep drainage

The dairy farm is classed in the Oxidising and Central Plains physiographic zones. The Horner support block also is classed both in the Oxidising and Central Plains physiographic zones.

Both physiographic types are susceptible to nitrate accumulation in soils and aquifers. Nitrates are transported to the underlying aquifer via deep drainage. Central Plain's type soils (Braxton) have risk of nitrate and contaminant (pathogen) loss to groundwater via deep cracks that can form in silty clay soils over extended dry summer periods. Subsequent heavy rainfall can transport nitrate or microbes down to the underlying aquifer. There is risk of contaminant loss (nutrients N and P, sediment and microbes) to surfacewaters via artificial drainage in Central Plain's type soils following heavy or prolonged rainfall.

Given the very flat topography and the tendency of soils to have good phosphorous retention, there is low risk of contaminant loss to surface waters via overland flow. Any risk of contaminant loss to surface waters from tracks and lanes via overland flow is mitigated by good management of areas where tracks and lanes are close to surface waters.

Recommendations described on Good Practice Management factsheets issues by Environment are implemented where practical. These measures will be reviewed annually with the inclusion of new measures where appropriate. Table 6.4 describes good management practices, which have been implemented on-farm through most recent annual cycle to mitigate the risk of contaminant loss to water (N, P, sediment and microbes).

Reference factsheets: Artificial drainage; Deep drainage; Overland flow

Table 6.4 Good management practices implemented on farm and further explanations.

Transport Pathway	Mitigation Measure	Summary of Management Practices
Artificial drainage, Overland flow	Protect soil structure (especially near streams)	Match stock management to land use capability, e.g. avoid grazing cows on more vulnerable soils, especially when wet. Fence off waterways. Stock will not graze riparian strips. Riparian strips are large and well vegetated; Cows are wintered off paddocks in wintering barns; When appropriate use minimum or no-till cultivation practices such as direct drilling; Use best practice winter grazing (young stock)*; Re-sow areas of bare or damaged soil as soon as is practical;
Artificial drainage, Overland flow	Reduce P use or loss	Prepare a nutrient budget; Soil test regularly; Maintain Olsen P values at agronomic optimum and no higher; Apply P fertiliser outside of high-risk months in autumn and winter; Manage CSAs close to surface drains appropriately; Where winter grazing occurs (young stock), implement best practice management*;
Artificial drainage, Deep drainage	Reduce accumulation of surplus N in the soil, particularly during autumn and winter	Maintain sustainable stocking rate; Reduce inputs of N where possible through optimal fertilizer application on farm, use little and often approach; Cows are wintered off paddocks in wintering barns; Where winter grazing occurs, implement best practice management; Optimize timing and amounts of effluent irrigation input applications, accounting for higher strength nature of slurry

		effluent; Substitute autumn diets with low-N feed when practical; Time N application to meet pasture demand using split applications and when pastures are actively growing (>6 degrees Celsius); Control the duration of grazing pastures; Cut and carry feed where practical;
Artificial Drainage Deep drainage	Avoid preferential flow of effluent through drains or soil cracks	Defer irrigation to effluent storage ponds when soil conditions are unsuitable; Very low depth slurry application is implemented; Low depth dairy shed effluent application is implemented; Avoid applying slurry or dairy shed effluent where soils are cracked; A sufficiently large FDE area is available for effluent; Observe buffer zones and placement guideline;s Observe discharge consent conditions;
Overland flow	Manage CSAs; low areas overlying tiles close to outfalls at surface drains	Restrict grazing of pasture CSAs when soils are near saturation; Avoid working pasture CSAs and their margins; Move troughs and gateways away from water flow paths; Reduce runoff from tracks and races;
Deep drainage	Avoid loss of contaminants (nitrate and faecal microbes) to groundwater via deep cracks formed in summer dry periods in Braxton soil types.	Monitor paddocks for deep cracks in summer/autumn. If and where they form, avoid grazing the area and irrigating effluent to the area; Avoid deep crack formation by maintaining good soil structure and good pasture cover;

*Winter grazing of R2 heifers at the WOL/WTL dairy platform will no longer occur from June 2019 as a mitigation measure.

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Specific Mitigation Measures – Expansion

As is described in the nutrient budget section, the change to the 1,500-cow system in conjunction with the implementation of key mitigation measures is predicted to result in a small decrease in average annual N and P losses to water for the WOL/WTL dairy platform. Some key mitigation measures are not recognised by Overseer so will further reduce N and P loss, although this is not recognised by Overseer. P loss is used as a proxy for sediment and microbial loss.

Key mitigation measures are described in table 6.5, along with their effectiveness and level of effectiveness.

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Table 6.5 Specific mitigation measures proposed for the dairy farming activity, their effectiveness and assessed level of effectiveness.

No.	Specific mitigation measures proposed for N, P, sediment and microbial contaminant loss.	Effectiveness of mitigation measure	Level of effectiveness
1	Continued development of soils and pastures through grass to grass cultivation methods and a focus on sustainable agronomy;	Over time this leads to increased soil organic matter content, water holding capacity and improved soil structure and consequently less N, P, sediment and microbial contaminant loss in artificial drainage, runoff and less N loss to groundwater.	High – this measure mitigates N, P, sediment and microbial contaminant loss and is implemented across the entire dairy farm.
2	No land cultivated into fodder crop and intensively winter/summer grazed;	Nutrient (N and P) loss from fodder crop blocks is high due to mineralisation processes in soils and inputs of nutrients from animal dung and urine. Eliminating these practices is effective at reducing nutrient losses via deep drainage, artificial drainage and to less of an extent, overland flow pathways in the future. Sediment and microbial contaminant loss from fodder crop blocks is high due to soil compaction, pugging and breakdown of the soil structure, and inputs of faecal microbes from animal dung and urine. Eliminating these practices is effective at reducing nutrient losses via artificial drainage and to less of an extent, overland flow pathways in the future.	High – where intensive winter grazing is carried out on free draining soils, N loss to groundwater is high. P, sediment and microbial contaminant loss is also high where soils are pugged.
3	Expansion of the size and use of the wintering barn facilities	An additional 225-240 animals (cows/R2 heifers) will be wintered in the WOL wintering barn. Both barns will be used more in the shoulders of the season (May, August and September) than they have been in the past. This is effective as effluent that would otherwise be deposited on paddocks at high risk times is captured and stored; less pugging of soils and accumulation of N in soils at high risk times occurs. The barns will be also used to stand cows off during inclement weather events during the season, which will also reduce soil damage.	High – reduces both N and P loss. Also reduces sediment and microbial contaminant loss.

4	More efficient use of N fertiliser, e.g. effluent block will have less N fertiliser applied than non-effluent block;	This is effective at reducing N loss to water in drainage events following fertiliser application.	Moderate – the reduction in N loss will be seen across part of the dairy platform
5	Increasing the N loading from slurry to the cut and carry Horner Block (HB) to 250 kg N/ha/year;	The use of the wintering barns generates a high volume of nutrient rich slurry. Increasing the N loading from slurry at the HB allows nutrients in slurry to be used efficiently as fertiliser with low risk of N loss to groundwater. Plants take up N efficiently from slurry applied at very low depth while N fertiliser application is reduced accordingly to ensure the input of N overall is sustainable. Since there is no grazing of stock at the HB there are no urine patches, which otherwise leach N at high rates from urine, slurry and fertiliser. Grass harvested at the HB is fed to cows at WOL/WTL.	Moderate – reduces both N and P loss and microbial contaminant loss at the WOL/WTL dairy platform
6	Conditioning very low depth application of slurry with the trailing shoe slurry tanker;	In recognition of the high strength nature of slurry and avoiding the overloading soils with N and microbes from slurry, this is effective at providing Environment Southland with certainty that slurry will be applied at less than or equal to 2.5 millimetres depth per application. In practice, an application depth of 1.5-2.0 millimetres per application will be used when applying slurry with the slurry tanker with the trailing shoe.	Moderate – reduces both N and P loss, and microbial contaminant loss
7	Lane CSA adjacent to WOL wintering barn to be assessed and remedial work carried out *see below for further details	The cow lane in between WOL's wintering barn and a stream will be assessed for risk of runoff from the lane to the stream. Where necessary the lane will be reshaped so that it will drain away from the stream towards the free stall barn. A large quantity of gravel is on-hand to use for lane re-shaping if necessary.	Moderate – this measure will prevent a potential point source discharge of nutrients N and P to surfacewater
8	Eliminate direct contamination of house bore (45/0622), which is also used by ES at a	Measures to eliminate contamination of the bore will be implemented: the casing will be extended far enough above ground level to ensure	Minor – this will prevent localised contamination of

	monitoring bore;	stormwater cannot enter the well. A sloping concrete pad will be placed around the casing. Any holes in the well liner will be sealed, the piping and fittings will be serviced, and any leaks will be repaired.	groundwater with N and P;
9	Olsen P levels are slightly below optimum level. Once target Olsen P levels are achieved, P fertiliser will be applied to maintain Olsen P levels within optimum range. Target Olsen P levels are 30.	This will avoid the loss of excess P to water in artificial drainage and runoff following prolonged wet periods	Moderately effective for mitigating P loss across farm.
10	Tracks/lanes managed to reduce runoff to streams;	Overseer assumes that 30% of P that lands on all tracks/lanes ends up in waterways. Given the farm layout (many tracks and lanes do not run close/adjacent to waterways) and management of track/lanes and associated buffers, P loss as assumed by Overseer is reduced. The farm has been operated as a dairy farm for many years. No new lane development is required to allow for expansion.	Highly effective for mitigating P, sediment and microbial contaminant loss.

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FURTHER INFORMATION REGARDING MITIGATION MEASURE #7

Two lanes lie adjacent to a stream close to the WOL wintering barn (see figure 6.7). Only one of these lanes (i.e. the east side lane), however, is used for cow traffic to the milking shed. The other one (i.e. west side lane) is solely used to truck silage in and for truck access to the cattle yards to load and unload stock. Cows do not use the west side lane so it only collects rainwater. Since there is no cow traffic on the west side lane, there is no risk of runoff of contaminants (containing phosphorous) from dung or urine to the stream.

Figure 6.7 Aerial photo of stream flanked by two lanes at WOL, close to wintering barn and north of milking shed.

The lane east of the stream has cow traffic, as seen in figures 6.8 – 6.10 below. The stream has wide buffers and is flanked on both sides by long grass. The water flowing in the stream appears clear, which is noteworthy as the photos were taken after 40 mm of rainfall in the previous week. The wide and well vegetated riparian buffers will filter run-off, trapping contaminants such as phosphorous and microbes, thereby helping to mitigate the risk of any contaminants reaching the stream via overland flow.

Additional mitigation due to increased cow numbers: The east lane will be visually assessed for risk of runoff from the lane to the stream. Where necessary the lane will be reshaped so that it will drain away from the stream, towards the free stall barn. A large quantity of gravel is on hand, which will be used for lane reshaping if necessary. This mitigation strategy will be incorporated into the FEMP as a good management practice for this location, following review of the FEMP at the end of the 18/19 season.

Figure 6.8 Stream flanked by two lanes. Wide buffers with long grass flanking the stream are present on both sides of stream. Note that photo was taken from the north/facing south.

Figure 6.9 Cows walking to milking shed on lane <u>east</u> of stream. Clean unused lane visible on <u>west</u> side of stream. Note that photo was taken from the north/facing south.

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Figure 6.10 Cows crossing waterway over culvert to walk to the dairy shed on the east lane. Please note the wide buffers with long grass flanking the stream on both sides.

N loss – as predicted by Overseer

The key drivers of the small decrease in N loss are as summarised follows:

- Removal of summer and winter crop;
- Removal of cows wintered outside on crop or grass;
- Expansion of size and use of wintering barn facilities;
- More efficient use of N fertiliser.

N losses from crop blocks are driven by fertiliser and effluent application, as well as mineralization processes associated with cropping. The proposed 1,500 cow system has no fodder crops grown annually going forward. The effect of this is to reduce the average N loss slightly, despite increasing cow numbers by 160.

P loss – as predicted by Overseer

The key drivers of the small decrease in P loss are summarised as follows:

- Decrease in winter crop area;
- Maintaining Olsen P at target level of 30;
- Expansion of size and use of wintering barn facilities.

The average annual P loss is predicted to decrease slightly despite an increase of 160 cows. The key measures that will mitigate P loss also will help to mitigate the loss of sediment and microbial contaminants to water, as they are generally transported to water via artificial drainage and overland flow also.

Other mitigation measure for P loss

There are other measures that mitigate P, sediment and microbial contaminant loss that are not modelled by Overseer; preventing overland flow from critical infrastructure to surface waterways following periods of heavy rainfall, greatly reduces the propensity of a pathway that transports P (and sediment and microbes) directly to surface waterways. P remains on lanes and/or is returned to adjacent paddocks. These measures include:

- Only a small proportion of lanes run parallel to or close to waterways. This greatly reduces the risk of runoff from tracks and lanes into waterways. Overseer does not take the layout of individual farms into account, however.
- Herd movement is managed to minimise the time cows spend on lanes and other tracks, especially where there is a risk of runoff to waterways;
- Minimise the number of culvert/bridge crossings of waterways, where run-off from tracks and lanes can reach surface waterways. Any locations where run-off could potentially occur are identified as CSAs and managed to minimise the risk of runoff occurring. Track shaping and cutting is carried out to direct surface drainage at such locations to paddocks and away from waterways. If necessary, nib boarding is put in place. Runoff is filtered before draining to waterways.

Due to the suite of measures mentioned above, there will be less soil disturbance and pugging, and less runoff from lanes, tracks etc. to waterways; less P, sediment and microbial loss to receiving surface waters will occur. Potential losses associated with the expansion are fully mitigated in line with Policies 5, 10 and 16 of the pSWLP.

Review

A review of good management practices and mitigation measures will be carried out annually. Practices undertaken in the previous 1 June to 31 May period will be reviewed and practices will be implemented over the following 1 June to 31 May as appropriate.

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Nutrient budgets

Seven nutrient budgets (NBs) have been prepared:

- Four pre-expansion nutrient budgets have been prepared based on actual figures for 2013/2014, 2014/2015, 2015/2016 and 2016/2017 years. A high level of evidence has been provided to support inputs used for all year end nutrient budgets.
- One nutrient budget has been prepared to reflect the proposed 1,500 cow dairy farm.
- Two nutrient budgets for the Horner Block (one current and one proposed).
    - Environment Southland have since been advised via a legal opinion that the Horner Block is not required to be on the land use consent for farming; as such nutrient budgets are not needed. Since nutrient budgets were already prepared for the Horner Block, they will be used to inform of the effect of the proposed activity.

Cain Duncan (CNMA) from Farm Source Sustainable Dairying carried out all Overseer work in May/June/July 2018. Soil nutrient test data, the latest version of the Overseer model (ver. 6.3.0) and Overseer Best Practice Data Input Standards from March 2018 were used. Associated XML files have been submitted electronically.

Table 6.6 Overseer files

Number	Year	XML file name
1	2013/2014	Ovr-Woldwide 1,2 & 96 13_14.xml
2	2014/2015	Ovr-Woldwide 1,2 & 96 14_15.xml
3	2015/2016	Ovr-Woldwide 1,2 & 96 15_16.xml
4	2016/2017	Ovr-Woldwide 1,2 & 96 16_17.xml
5	Proposed dairy platform	Ovr-Woldwide 1&2 Proposed (Mitigations & Slurry).xml
6	Current use - Horner Block	Ovr-Horner Block –Current.xml
7	Proposed use - Horner Block	Ovr-Horner Block – Proposed.xml

Mr. Duncan also prepared an in-depth nutrient budget analysis report, which is submitted with this application. Rather than duplicate material, please refer to the appended nutrient budget analysis report for assumptions and a summary of inputs for each nutrient budget:

- Assumptions: Sections 5, 6 and 7
- Inputs: Section 9, 12

Nutrient budgets 1 – 7 from the above table contain the same land areas: former WOL milking platform, former WTL milking platform, Marcel Block and SH96 block.

It is noted that where the nutrient budget report by Mr. Duncan states that the land area is being increased by bringing in support land, this refers to the SH96 and Marcel Blocks, which were consented for dairy farming as parts of WTL's land use consent issued in 2017.

Mr. Duncan has also prepared detailed maps and a summary for each individual nutrient budget as part of the report.

Potential Nutrient Losses as Modelled by Overseer

PRE-EXPANSION

Table 6.7 Modelled nutrient losses for pre-expansion year end nutrient budgets (source: Nutrient Budget Analysis Report).

	13/14	**14/15**	**15/16**	**16/17**	**Average**
Total N Loss (kg)	19053	23016	19111	20723	20476
N Loss/ha (kg)	40 (15)	46	38	41	41
N Concentration in Drainage (ppm)	7.3 - 12.9 (Pastoral) 16.4 - 27.1 (Crops) 5.9 – 12.5 (Silage/WGYS)	9.9 – 15.7 (Pastoral) 13.5 - 17.6 (Crops) 5.9 – 9.5 (Silage/WGYS)	7.3 – 14.3 (Pastoral) 13.1 - 18.8 (Crops) 4.0 – 9.8 (Silage/WGYS)	8.5 – 15.3 (Pastoral) 18.0 - 23.8 (Crops) 2.9 – 7.5 (Silage)	
Total P Loss (kg)	345	374	362	357	360
P Loss/ha (kg)	0.7 (0.2)	0.7	0.7	0.7	0.7
Pasture Grown Kg/DM/ha/yr (Dairy Platforms)	15,003	15,483	15,089	15,909	15,371

POST-EXPANSION

Table 6.7 Modelled nutrient losses for post-expansion nutrient budget (Source: nutrient budget analysis report).

	Proposed Dairy Unit
Total N Loss (kg)	20,205

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N Loss/ha (kg)	40
N Concentration in Drainage (ppm)	Pastoral – 7.7 to 17.1 ppm
Total P Loss (kg)	356
P loss/ha (kg)	0.7
Pasture Grown Kg/DM/ha/yr	15,391

Discussion – nutrient losses predicted by nutrient budget analysis:

N LOSS – DAIRY PLATFORM

The pre-expansion average annual N loss based on four years of supported data and analysis is 20,476 kg/year. The proposed 1,500 cow dairy farm is predicted by Overseer to have an average N loss of 20,205 kg/year. Overseer predicts an average reduction in N loss of 271 kg/year with the change to the proposed system. The N loss per hectare value for the proposed 1,500 cow farm (40 kg/year) is predicted to reduce slightly relative to the pre-expansion land use (41 kg/year).

This decrease is mainly driven by the removal of forage brassica and beet winter and summer crops, and their associated grazing, the removal of pasture grazing in winter, greater use of the wintering barns and more efficient fertiliser use. Soil aggregates are broken up and mixed when cultivated for cropping. This results in a high rate of N mineralisation through accelerated microbial decomposition of soil organic matter and subsequent rapid nitrification, which produces large quantities of nitrate. Dung and urine are deposited in relatively high volumes on winter crop ground, further driving losses of N. Greater use of the wintering barn facilities allows the collection and storage of nutrients in dung and urine, some of which were previously deposited on winter crop and grass paddocks as they were grazed. Because of significant changes in management practices, the proposed 1,500 cow system is predicted to have slightly less average annual N loss than the pre-expansion system despite an increase of 160 cows.

It is noted that pasture production is similar for both the pre-expansion system (15,371 kg DM/ha/year) and the proposed 1,500 cow farm (15,391 kg DM/ha/year).

P LOSS – DAIRY PLATFORM

The pre-expansion average annual P loss is based on four years of supported data and analysis is 360 kg/year. The proposed 1,500 cow dairy farm is predicted by Overseer to have an average P loss of 356 kg/year. Overseer predicts an average reduction in P loss of 4 kg/year with the change to the proposed system, which is essentially no change. The per hectare P loss value for the proposed 1,500 cow farm (0.7 kg/year) is predicted to remain as for the pre-expansion land use (0.7 kg/year). For both the pre-expansion

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and proposed 1,500 cow dairy farm, the risk of P loss from effluent is classed by Overseer as low for all blocks. The risk of P loss from soil and fertiliser is classed as low for all soil type blocks.

The key drivers of the stable predicted P loss are the removal of forage brassica and beet winter and summer crops, and their associated grazing, the maintenance of Olsen P at a target of 30, and the expansion in size and use of the wintering barns.

As already explained, effective measures to mitigate P loss that are not detected by Overseer will also be implemented on farm.

NUTRIENT LOSS – HORNER BLOCK

The current nutrient budget represents a conservative approach to modelling the existing nitrogen and phosphorus losses on the HB.

Under both current and proposed land use, the Horner Block has very low nutrient losses. The current use is predicted to have an annual average N loss of 20 kg/hectare; the proposed has N loss of 19 kg/hectare. The current use is predicted to have an average P loss of 0.1 kg/hectare; the proposed has P loss of 0.1 kg/hectare.

Discussion – effects of losses

Please see Section 7 (AEE) for a discussion on the effects of predicted nutrient losses.

1. Assessment of Environmental Effects/Mitigations

7.1 Effluent

Odour

Adverse effects from odour can occur due to the discharge of farm dairy effluent where it may be encountered beyond the boundary of the site. There is also the potential for adverse odour effects from the discharge of slurry. The applicants have proposed the continued use of very low depth and low depth application technology, which coupled with the proposed effluent discharge buffers means there is little risk of adverse effects from odour and spray drift on surrounding land owners and occupiers. They irrigate according to wind direction and risk, which helps to avoid adverse odour effects.

Slurry is applied a very low depth using the slurry tanker with the trailing shoe. The trailing shoe part of the slurry tanker sits on the ground. It applies sludge at ground level and generates minimal aerosol and odour. It was invented in Europe to reduce adverse odours from the application of slurry/sludge to land, which is standard practice due to the housing of cows in barns over winter. It is regarded to be an effective odour minimisation technology and is best practice for slurry/sludge application. Its use will help to avoid adverse odour effects on neighbouring properties. The discharge of slurry at the dairy platform is a permitted activity, as such its effects, including odour effects, are expected to be less than minor.

Risks to surfacewaters from effluent discharge

Adverse effects on surface water can occur from the discharge of farm dairy effluent where contaminants present in effluent such as nutrients N and P, organic matter and microbes reach receiving surface waters such as streams, rivers and estuaries. Effects such as nutrient enrichment of surface waters *are cumulative*, and can lead to algal blooms including slime, and promote nuisance aquatic plant growth. The collection of plants and animals that inhabit receiving waters are adversely affected by nuisance plant growth, as well as in-stream values such as biodiversity and ecosystem services. Values associated with surfacewater streams and coastal waters are many and relate to the landscape, biodiversity, history and people living in the catchment. These values include maintaining the health of water bodies both in-stream and coastal, protecting biodiversity and ecosystems, protecting recreational activities such as fishing, walking and boating; protecting human and animal health, maintaining sustainable farming practices and the socioeconomic well-being of people through preserving values that relate to inshore fishing, farming and tourism. Iwi/cultural values include the principles of protection or kaitiakitanga of the mauri of the water and mana of the land, while minimising adverse effects on taonga and mahinga kai.

As is described in Section 5, receiving surface waters predominantly lie in the Waimatuku Stream catchment, Waimatuku Estuary and coastal waters. Receiving surface waters also lie in the Oreti River, New River Estuary, Aparima River, Jacobs River Estuary and coastal waters. These are considered sensitive environments due to the accumulation of nutrients, sediment and microbes. Receiving waters show evidence of land use impacts, with elevated levels of nutrients, sediment and algal blooms at times. The Waimatuku Stream catchment shows higher levels of nutrients than the Aparima River or Oreti River catchments. As is described in Sections 5 and 6, artificial drainage is a contaminant pathway at the property, in particular subsurface drainage channels installed in silty clay Braxton soil types. Artificial drainage transports contaminants via bypass drainage to receiving surfacewaters during and following periods of heavy rainfall. Parts of the FDE area with Braxton soils types at both the dairy farm and the Horner Block are high risk for effluent discharge and require appropriate management of effluent discharge to mitigate the risk of contaminant loss to surfacewaters. It is noted that Braxton soils at the property are located in the Waimatuku catchment. Shallow groundwater in the Waimatuku catchment is understood to discharge to the local stream network and can potentially contribute cumulatively to adverse effects on surfacewaters.

Risks to Drummond Peat Swamp and Bayswater Bog are described and effects are assessed in section 5.

Risks to groundwater from effluent discharge

Adverse effects on groundwater can occur from the discharge of farm dairy effluent where contaminants present in effluent such as nutrients N (nitrate) and microbes (pathogens such as campylobacter) reach receiving groundwaters via leaching/deep drainage pathways. A major risk of elevated nitrate levels in groundwater is to users (consumers) of groundwater as nitrate becomes toxic to living organisms such as humans, animals and fish at high levels. The New Zealand Drinking Water Standard maximum allowable value for nitrate is 11.3 ppm. Another risk is to consumers of groundwater is waterborne gastroenteritis through the ingestion of groundwater contaminated with pathogens such as campylobacter. This was demonstrated in Havelock North in 2016, when over 5,000 people became ill with camplyobacteriosis. Adverse effects on other users of groundwater such as other farms, small industries, schools or settlements/domestic users are possible and need to be avoided. In particular, any risk from the discharge activity to the drinking water supply at Heddon Bush School 2.3 km south of the property needs to be avoided. *E.coli* is widely used as an indicator of faecal microbial contamination of water, including groundwater.

As is described in Section 5, the dairy farm property predominantly overlies the Waimatuku Groundwater Zone. The eastern part of the property overlies the Central Plains Groundwater Zone. The eastern part of the Horner Block overlies the Waimatuku Groundwater Zone and the western part overlies the Upper Aparima Groundwater Zone. Heddon Bush School also overlies the Waimatuku Groundwater Zone. Although Drummond and Glenlg soil types have risk of contaminant loss via deep drainage to underlying aquifers, they are low risk for effluent discharge due to their physical properties (and drainage properties), and due to the nature of the discharge activity. FDE applied at low depth and very low depth when sufficient soil moisture deficit exists, moves through the soil profile via matrix flow, allowing effluent to remain in the root zone as plant available water and allowing nutrients in effluent to be taken up by plants.

Braxton soil types have swell/crack characteristics that can allow contaminants in effluent to be washed down to the underlying groundwater resource via deep cracks that can form during prolonged dry summer conditions. Parts of the FDE area with Braxton soils types at both the dairy farm and the Horner Block are high risk for effluent discharge and require appropriate management of effluent discharge to mitigate the risk of contaminant loss to groundwater if and where deep cracks are formed. A site investigation by Environment Southland in January 2018 did not find evidence of deep cracks on Braxton type soils, however, leading to a conclusion Braxton soil types at the property may not form deep cracks and are therefore unlikely to provide a pathway for contaminants in effluent to reach groundwater. The risk to groundwater from effluent discharge to Braxton soil types is likely to be lower than previously believed.

Mitigation of adverse effects due to effluent discharge

Adverse effects, *including cumulative effects*, due to the discharge of agricultural effluent (dairy shed effluent and pond slurry) are either avoided, remedied or mitigated at the dairy platform and Horner Block through the implementation of good effluent management practice and mitigation measures. Contaminants present is effluent (N, P, microbes) are held in the root zone, adsorbed by plants or are filtered/adsorbed by soil particles.

Due to its nature and scale, there will be little or no effect on receiving ground and surface waters *including cumulatively*, from the effluent discharge activity in this instance. The discharge system meets industry best practice standards for farm dairy effluent discharge by using buffer storage and low depth application. The use of best practice effluent application should avoid adverse effects on the environment. This principle is well documented in various scientific reports prepared for Environment Southland during the process of setting policies and rules around effluent discharge to land. A 2009 Houlbrooke and Monaghan report provides context and background to the principle that best practice effluent application should not cause adverse effects on water quality. The graph below is taken from the 2009 Houlbrooke and Monaghan report to illustrate that nutrient loss from FDE application is minor if undertaken using best practice. In this example, less than 1% of nutrients applied in effluent reached drainage water on tile and mole drained soil. These soils are considered high risk relative to some of the soils available for effluent discharge at the dairy farm and Horner Block.

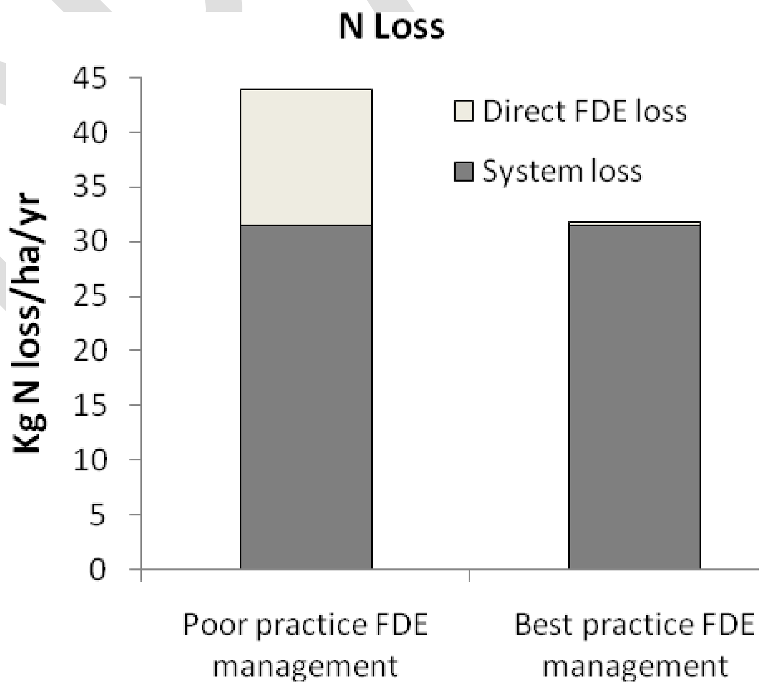

Figure 7.1. Houlbrooke and Monaghan (2009)

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The applicants intend to apply effluent in accordance with best practice at all times to avoid adverse or *cumulative effects* on the receiving environment. Houlbrooke and Monaghan (2009) explain that if effluent is applied to soil when a soil moisture deficit exists then the effluent preferentially remains in the soil's root zone as plant available water or is adsorbed onto soil particles. The soluble nutrients in the effluent can then be taken up by the plant and used in nutrient cycling. Microbes can be filtered and held by soil particles until they are no longer viable. The applicants use the closest Environment Southland soil moisture monitoring site, which is available on the ES website, to determine whether a suitable soil moisture deficit exists for each of the irrigation systems. Effluent application, including both dairy shed effluent and slurry, is deferred if soil moisture levels are too high to safely and correctly apply effluent. Effluent is only applied when there is a ground moisture deficit and when effluent application will not induce drainage.

Deferred irrigation

The dairy platform currently has a total storage capacity of 8,032 m^3 in two effluent storage ponds, which provides for deferred irrigation for effluent from 1,500 cows at the dairy sheds, 1,280 cows at the wintering barns, and silage leachate according to the Massey Dairy Effluent Storage Calculator. 6,460 m^3 is the 90% probability volume according to the Massey DESC. The ability to defer irrigation during marginal times means that effluent will only be applied when a soil moisture deficit occurs. By deferring irrigation when ground conditions are unsuitable, losses to drainage water should be considerably less than the 1.1% of the total nutrients applied in the effluent experienced in the above-mentioned trial. When soils are near or at field capacity and there is risk of contaminant loss via artificial drainage (or overland flow when soils are saturated) to receiving surfacewaters, or risk of contaminant loss via cracks in Braxton soil types to groundwater, irrigation is deferred by storing effluent in the two storage ponds. The risk of contaminant loss from effluent discharge via artificial drainage, overland flow or deep drainage is in this way mitigated.

Low depth irrigation

Low depth irrigation is defined as an application depth of less than 10 mm per application. Two low depth methods are utilised at the property and Horner Block; a travelling irrigator for dairy shed effluent and the slurry tanker with the trailing shoe for slurry. Both systems can apply effluent at low depths; less than 10 mm per application for the travelling irrigators and a maximum of 2.5 mm per application of pond slurry for the trailing shoe slurry tanker.

By discharging 15.2 m^3/hectare, the slurry tanker system applies effluent at a depth of 1.5 mm and can apply effluent at lower depths (e.g. 1 mm) by speeding up the tractor travel speed. The use of very low depth irrigation using the slurry tanker with a trailing shoe increases the frequency by which it is safe to apply effluent because a lower soil moisture deficit is required prior to irrigation. A slurry tanker with a trailing shoe is available to use at the property, as and when required. The travelling irrigators have been tested and found to apply effluent to a depth of less than 10 millimetres each (see Appendix for reports). The travelling irrigators are only used when a greater soil moisture deficit exists and no rain is forecasted for the following 24 hours. Where insufficient soil moisture deficit exists, dairy shed effluent irrigation is deferred and diverted to the ponds for storage.

The application of effluent (both dairy shed and slurry) in this manner should reduce the risk of exceeding a soil's infiltration rate, thus preventing ponding and surface runoff of freshly applied FDE. A low application depth also increases the likelihood of retaining the applied nutrients in the root zone. This decreases the likelihood of preferential flow and allows a greater volume of applied FDE to move through smaller soil pores via matrix flow, thus allowing for greater attenuation of effluent contaminants (Houlbrooke et al. 2006, McLeod et al. 1998). This is of importance where subsurface drainage has been installed.

Best practice irrigation minimises the risk of contaminant loss via pathways relevant to the Central Plains and Oxidising physiographic zones; subsurface drainage (tiles) when wet in winter/spring and deep drainage when cracks are present or when soils are saturated. Effluent is not applied over low points, where tile drains have been installed, when soils are near or at field capacity. In addition to this, buffer distances from discharge area to surface waterways are maintained minimising the risk of effluent reaching surface waters directly via overland flow or spray.

Future proof

The applicants may install a low rate irrigation system in the future, such a pods or a cannon/rain-gun travelling irrigator system. They have already demonstrated a willingness to invest, upgrade and innovate, which is evident in their recent investment in wintering barns. They will consider upgrading the dairy shed irrigation system as part of future developments once the current round of investment and expansion has been completed. The proposed system is described in section 6. Low rate irrigation is considered as best practice by Environment Southland, as such it will have effects that are the same or less than low depth irrigation.

Effluent receiving areas and nutrient loading

The effluent receiving area is large and comprises a combination of low and high-risk soils at both the dairy platform and Horner Block. The presence of low risk soils for effluent discharge reduces the risk of contaminant loss to ground and surfacewaters from effluent discharge as it reduces the risk of preferential flow of effluent through drainage channels. It allows higher risk areas to be avoided when there is risk of drainage to receiving ground and surfacewaters.

The N loading of soils from effluent is described in the nutrient budget analysis report and in section 6 of the application where it is demonstrated that the FDE area at the Horner Block and milking platform is sufficiently large to receive both the N loading from slurry effluent and volume of slurry effluent from the storage ponds. The higher strength nature of slurry effluent has been accounted for in calculating the N loading per hectare from slurry effluent.

A maximum of 150 kg N/hectare from dairy shed effluent and slurry will be applied at the dairy platform. The 150 kg N/hectare limit will be adhered to at the dairy platform, which is the standard limit placed on farm dairy effluent discharge activities on milking platforms by Environment Southland.

The scale of the discharge activity allows for the sustainable use of land to receive farm dairy effluent. The consented discharge area is large and has a ratio of over 30 hectares per 100 cows, which is well above the

Council recommended ratio of 8 hectares per 100 cows. As is modelled in Overseer, where effluent or slurry is applied to land, fertiliser is reduced accordingly, which mitigates the risk of overloading soils with nutrients such as N and P causing loss to water.

Horner Block – slurry receiving area

A maximum of 250 kg N/hectare will be applied from slurry at the cut and carry Horner Block (97 ha). The block is used to grow grass to feed cows at milking platforms and is not used to graze cows directly. Typically, there will be 4 cuts per season. Cows were grazed at the Horner Block in the past but are no longer grazed there. Urine patches are a major source of N leached to groundwater from pastoral farming. Since no stock are grazed at the Horner Block there are no recent/new urine patches, which greatly reduces the risk of N loss. Cut and carry blocks are efficient at utilising N and generally have low N loss to water despite high N inputs; this is supported by Overseer analysis. Overseer modelled the application of 243 kg N from slurry and predicts low average annual N loss for the HB (i.e. 19 kg N/hectare going forward). This supports a conclusion that the risk of nitrate loss to groundwater underlying the HB is very low. The potential issue of cracking in Braxton soils (arguably not covered by Overseer) is mitigated by monitoring and avoiding areas if and where this occurs.

As is shown in the proposed nutrient budget for the Horner Block, a limit of 250 kg N/hectare will be applied at very low depth at the Horner Block. According, less fertiliser N to be applied than would other be applied for pasture production to ensure that N inputs are not excessive. Overall (from both slurry and fertiliser), no additional N will be applied compared to what has been applied previously.

It is unlikely that the discharge of slurry at the Horner Block will result in elevated groundwater nitrate levels. Due to soil types (Drummond and Waiau) and their drainage properties (matrix flow), much of the HB classed as low risk for effluent discharge. So long as slurry is applied at a depth lower than the soil moisture deficit, there is little or no risk of nitrate loss to groundwater from low risk soils, as supported by Houlbrooke et al. (2006).

Where high risk soils are found (Braxton), there is a potential pathway for nitrate to reach groundwater via deep cracks that can form due to swell/crack properties of these soils. The east of the HB where Braxton soils are found, is monitored for evidence of cracking at high risk times (summer/autumn); slurry will not be discharged to areas where cracks form. Good soil management practices, as shown in the soil test trends appended to the application, mean that deep cracks are unlikely to form. Good pasture cover (and plant root structure) is always maintained, again minimising the risk of cracks to groundwater forming in the soil profile.

Downstream users of groundwater are dairy, sheep and cropping farms. These will not be adversely affected by the N loading of soils from slurry at the HB, as little or no N applied in slurry will be lost to groundwater; it will be taken up by plants and harvested as part of the cut and carry operation. Similarly, Drummond Township, Primary School and Kindergarten will not be affected by the N loading of soils from slurry at the HB. Groundwater nitrate levels in the vicinity and south of the HB are in the range of 1.0 – 8.5 g/m^3, so are below the NZ Drinking Water MAV of 11.3 g/m^3. The cumulative effect on groundwater nitrate levels from the N loading from slurry at the HB will extremely low due to the above reasons. The effects of the N loading from slurry effluent on groundwater will be less than minor, and much lower than when the HB was used in the past to winter graze cows on fodder crop.

Summary of mitigations for HB

- Slurry is applied at very low depth using slurry tanker with trailing shoe (less than or equal to 2.5 millimetres per application), when there is sufficient soil moisture deficit and nil risk of drainage;
- Soils are monitored for evidence of cracking; if and where this occurs slurry is not discharged;
- N loading is to a cut and carry block, so uses relatively high N inputs to grow grass. N is utilised efficiently to grow grass resulting in low N loss below the root zone;
- A maximum of 250 kg N/hectare will be applied from slurry annually;
- Recommended buffers will be adhered to when discharging slurry.

Summary of surfacewater mitigations for effluent discharge

Due to the implementation of good management practices and mitigation measures, there will be minimal risk to receiving surfacewaters in the Waimatuku, Oreti and Aparima catchments, the Waimatuku, Jacobs Riverand New River Estuaries, coastal waters and their values from the discharge activity. ***Effects on receiving surfacewaters due to the proposed activity will be no more than minor.***

- Irrigation of FDE is deferred when there is insufficient soil moisture deficit to safely apply effluent or when there is risk of drainage following irrigation of effluent. Effluent is stored in two large effluent ponds, which have sufficient storage for proposed activity according to the Massey DESC. This is effective at avoiding the risk of contaminant loss to surfacewaters from effluent when soils are at or above field capacity.

- Low depth irrigation methods are used to apply effluent to land. A slurry tanker with a trailing shoe is always available and can apply slurry effluent to depths as low as 1 mm per application, and always applies slurry at no more than 2.5 mm per application, which increases the number of irrigation days when effluent can safely be applied to land without risk of drainage. The travelling irrigators apply effluent to depths of less than 10 mm per application. Irrigation using the travelling irrigators is deferred by diverting effluent to the storage ponds unless there is sufficient soil moisture deficit. There is minimal to receiving surfacewaters when irrigating using these methods where there is sufficient soil moisture deficit. A low rate system may be installed in the future.

- Recommended buffers to waterways are implemented, mitigating the risk of contaminants present in effluent (i.e. N, P, microbes) reaching surfacewaters via overland flow. Effluent is not applied over tile drains when there is risk of preferential flow via drains to surfacewaters, mitigating the risk of the same contaminants present in effluent reaching surfacewaters via artificial drainage.

- The discharge area is sufficiently large both in terms of the area (ha) per 100 cows, and the N loading from effluent to effectively mitigate the risk of contaminant loss from effluent to surfacewaters. The dairy platform application rate will not exceed 150 kg/hectare from effluent, and the Horner Block will not exceed 250 kg N/hectare from effluent. The high strength nature of slurry effluent has been allowed for in calculating the N loading from slurry effluent. The on-site slurry tanker allows for very low application depths, which effectively controls the N loading per hectare from slurry and minimises the risk of contaminants present in effluent being lost to receiving surfacewaters.

Groundwater – mitigation of effects

Many good management practices and mitigation measures for effluent discharge described above also apply to avoiding, remedying and mitigating adverse effects on groundwater. These practices and measures are not repeated here; please refer to above. Whilst the effects of the discharge and dairy farming activities on groundwater are assessed separately in Section 7.1 and 7.3 respectively, it is difficult to separate these effects in practice.

The major contaminants present in effluent that are of risk to groundwater are nitrate and faecal microbes, with *E.coli* used as an indicator of faecal contamination of groundwater. As is described in Section 5, groundwater flow for much of the property is predominantly to the south (Waimatuku Zone). The east of the property overlies the Central Plains Zone, where groundwater may flow to the south/south east. Heddon Bush School due south of the discharge area also overlies the Waimatuku Groundwater Zone. Braxton soil types have swell/crack characteristics that can allow contaminants in effluent to be washed down to the underlying groundwater resource via deep cracks that can form during prolonged dry summer conditions. These soils require appropriate effluent management to avoid the loss of contaminants in effluent to groundwater via cracks. As already mentioned, an on-site investigation by Environment Southland in January 2018 found no evidence of deep cracking of Braxton soil types. A conclusion drawn was that Braxton soils at the dairy platform and Horner Block may not in fact be prone to deep cracking. Drummond and Glenlg soil types are low risk for effluent discharge due to their physical properties (and drainage properties), and due to the nature of the discharge activity.

Nitrate in groundwater due to the discharge activity:

Nitrate levels in groundwater are described in depth in Section 5. Given the nature of effluent management at the property and Horner Block, in addition to the scale of the discharge activity including the N loading of soils from effluent (dairy shed and slurry), it is very unlikely that the discharge of effluent at the property and the Horner Block will adversely affect water quality through an increase in groundwater nitrate concentrations from effluent.

Despite its tendency to suffer from localised contamination, the bore at the south end of the property (E45/0622) has demonstrated relatively low groundwater nitrate concentrations over the last five years (1.0 – 3.5 g/m^3), albeit with evidence of wellhead contamination due to its design, and therefore elevated nitrate levels at times. These localised events should not adversely affect groundwater quality beyond the zone of reasonable mixing. A monitoring bore located mid-farm/east on lighter soils and in a different groundwater zone (E45/0665) shows higher levels of groundwater nitrate over the last three years, indicative of moderate to high land use impacts (3.5 – 8.5 g/m^3), but much lower than at an ES monitoring bore located at Boyle Road to the south east of the property, where groundwater nitrate levels are at or above the NZ Drinking

Water Standards MAV of 11.3 g/m^3. Bores located to the east show evidence of higher groundwater nitrate levels than at the dairy platform. Given that groundwater nitrate levels are lower at the WOL/WTL dairy platform it is unlikely that the discharge of effluent at the property and the Horner Block is adversely affecting water quality, *including cumulatively*, through an increase in groundwater nitrate concentrations from effluent discharge. Groundwater nitrate levels underlying the property have been reasonably stable since bore testing began. The "farming" effect on free draining soils is likely to have a greater effect on groundwater nitrate levels than effluent discharge on low risk soils. For instance, farming practices such as growing fodder beet/winter grazing of cows on free draining soils are expected to have a greater cumulative effect on groundwater quality and moving away from this practice should see an improvement for groundwater quality, although it may be difficult to detect this due to effects from other properties and activities in the area.

There is little or no risk to the registered bore for drinking water supply at Heddon Bush School from the discharge of effluent (dairy shed and slurry) at the dairy platform and the Horner Block. The bore for school water supply (E45/0718) was recently tested (2017/2018) and returned nitrate concentrations in the range of 1.8 – 2.0 g/m^3. Given the following factors, adverse effects from the discharge activity such as an increase in groundwater nitrate levels would have been seen for some time in the vicinity of the school *if they were present*:

- the proximity of the school;
- land use in the area since the 1980s including cereal cropping, sheep farming and intensive winter grazing;
- the length of time that the property has been used for farming;
- the southerly direction of groundwater flow;
- the estimated lag time for nitrate at the surface to reach the water table and the underlying groundwater stream, and
- the estimated velocity of groundwater flow.

The evidence so far does not indicate that the discharge activity at the dairy platform and the Horner Block is having an adverse effect on the Heddon Bush School water supply through an increase in groundwater nitrate levels. The depth of the school bore further helps to protect it from land-use effects. The proposed activity is the same in nature and is of slightly increased scale compared to the existing discharge activity; there will be little or no increase in groundwater nitrate related adverse effects at Heddon Bush School.

The bore located at the south of the property (E45/0622) has been described above and is believed to be in the same "stream" of groundwater flow as the Heddon Bush groundwater supply. Its nitrate levels are generally low, with the already described localised contamination events due to poor well design. The applicants are proposing to install a new monitoring bore using industry best practice methods, which should not have issues with wellhead contamination. The new bore will be located at the south of the property, in the groundwater "stream" believed to flow towards Heddon Bush School. Water quality results from the bore will be monitored by the applicants and used to inform decision making at the property relating to the management of the discharge activity.

Shallow groundwater in the Waimatuku Catchment is understood to discharge to the local stream network. An effect of groundwater nitrate could be a very small increase in nitrate levels in downstream receiving waters such as shallow streams (connected to groundwaters), the Waimatuku Stream and eventually coastal waters. The risk of nitrates in effluent reaching groundwater is mitigated through using deferred storage and low depth irrigation. There is minimal risk to receiving surfacewaters through the discharge of groundwater from the discharge activity.

Faecal contamination of groundwater due to the discharge activity

If faecal microbes from the discharge activity are/have been reaching groundwater, the testing of groundwater in the vicinity of the property, especially from bores located in the south, could reveal this to be the case. Section 5 describes data from bores at the property and bores, and the previous section of this section (7.1) describes and assesses the risk of adverse effects on groundwater due to nitrate from effluent discharge. Much of these processes and potential effects directly apply to microbes also.

Groundwater testing of bores at and at the property are generally negative for *E.coli*, but at times return positive results with general low counts. As has already been explained, the south bore at the property (E45/0622) experiences localised contamination due to its design, which makes it unsuitable for use a monitoring bore and makes interpretation of *E.coli* data from the bore questionable; *E.coli* data from the WOL bore are corrupted by localised contamination. Following the zone of reasonable mixing, there is likely to be minimal adverse effect on the wider groundwater resource from this localised source. It is proposed to install a new monitoring bore at the south of the farm, which should eliminate the issue of localised contamination and provide a valid source of reliable groundwater data going forward.

The mid-farm/east monitoring bore (E45/0665) has generally been negative for *E.coli* since it was installed in 2015. It has returned three positive *E.coli* results in that time. The relatively high result in November 2017 is an outlier in the dataset and was likely to have been due to recent prolonged heavy rainfall, which occurred between November 3rd and 12th, and resulted in a high level and rate of drainage and the observed *E.coli* result (see figure 7.2). The subsequent test in April 2018 was negative for *E.coli* (<1 MPN/100 ml). It is noted that the ES monitoring bore at Boyle Road, which is southeast of the WTL bore and in the same groundwater zone, is tested every three months, has consistently been negative for *E.coli* in recent years with the exception of December 2017 (5 MPN/100 ml). It too was subsequently negative for *E.coli* in March 2018 (<1 MPN/100 ml). This indicates that if groundwater contamination occurs due to very high rainfall events and subsequent rapid drainage, it is relatively short lived, which is in line with the length of time that *E.coli* and similar microbes are believed to remain viable in groundwater (three months or less).

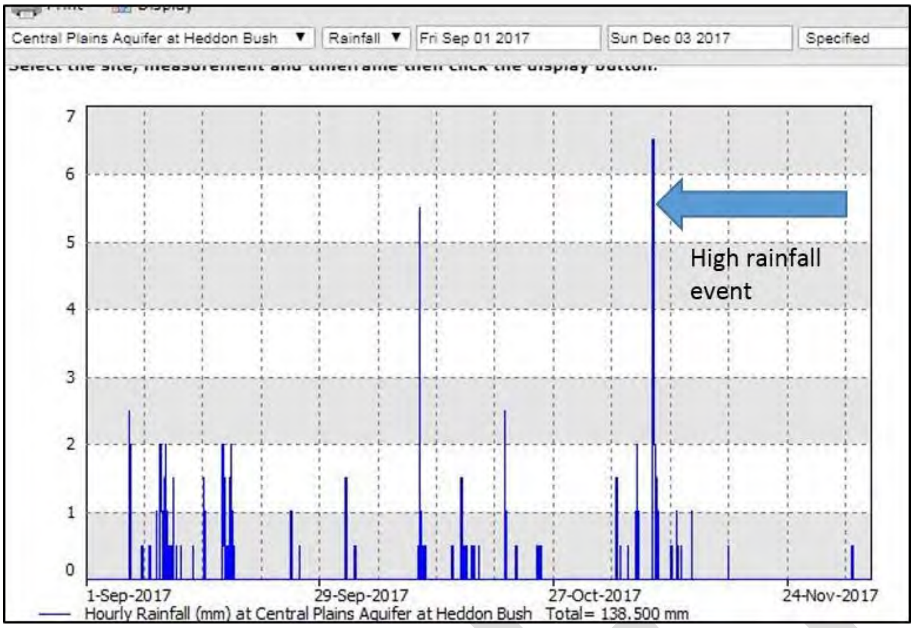

Figure 7.2. Rainfall at Central Plains Aquifer at Heddon Bush.

Slurry effluent is high strength in nature, including its microbial content. Applying slurry effluent at a low depth when there is sufficient soil moisture deficit (e.g. 2 mm depth per application) at the dairy platform and the Horner Block, ensures that the microbial loading of soils is low enough to allow soils to filter microbes, allowing them to be retained in the topsoil sufficiently long for microbes to die off and become unviable. U.V. radiation also plays a role in this process. The N loading limits of 150 kg/hectare and 250 kg/hectare at the dairy platform and Horner Block respectively, will allow for control on the soil loading of microbes from effluent by proxy. So long as effluent irrigation is deferred as required and does not induce drainage, microbes will be filtered and adsorb onto soil particles without leaching and will die off. Irrigation is deferred when soil conditions are unsuitable, which helps to mitigate an increased risk from a higher water table during wetter periods.

The same potential cracking process described for Braxton soils for nitrate contamination also applies to microbes. On-site investigation found that the risk of Braxton soils at the property and Horner Block cracking is lower than previously thought. So long as best practice effluent management is followed and soils are monitored for cracking, then there is minimal risk of microbes being transported to groundwater.

In summary the effect from the discharge of effluent (dairy shed and slurry) at the dairy farm and Horner Block in terms of microbial contamination of groundwater will be no more than minor.

There is little or no risk of microbial contamination of the registered bore for drinking water supply at Heddon Bush School from the discharge of effluent (dairy shed and slurry) at the dairy platform and the Horner Block. The bore has been tested quarterly since it was drilled and has consistently returned negative *E.coli* results (<1 MPN/100 ml). Given the factors listed on page 130, as well as the lifetime of *E.coli* in the environment (up to 3 months according to Edberg et al. 2000), adverse effects from the discharge activity such as microbial contamination would have been seen for some time in the vicinity of the school *if they were present*. The evidence so far does not indicate that the discharge activity at the dairy farm property and the Horner Block is having an adverse effect on the Heddon Bush School water supply through faecal contamination of groundwater. The proposed discharge activity is the same in nature and is of slightly increased scale compared to the existing discharge activity; there will be little or no increase in faecal microbes due to the proposed activity. It is noted that the depth of the school bore further helps to protect it from land-use effects, as does the presence of an ozone purification treatment system.

The bore located at the south of the property (E45/0622) has been described above and is believed to be in the same "stream" of groundwater flow as the Heddon Bush groundwater supply. It is unsuitable for use as a monitoring bore as it suffers from localised contamination due to its design. The applicants are proposing to install a new monitoring bore using industry best practice methods, which should not have issues with localised contamination. The new bore will be located at the south of the property, in the groundwater "stream" believed to flow towards Heddon Bush School. *E. coli* results from the bore will be monitored by the applicants and used to inform decision making at the property.

In conclusion there is minimal risk that consumers of groundwater, including at Heddon Bush School, will develop gastroenteritis due to faecal contamination of groundwater from the discharge activity. Good well-head maintenance at a new monitoring bore will help to ensure that there is no localised faecal contamination of groundwater to the discharge of effluent at the property.

Summary of mitigations for groundwater

Due to the implementation of good management practices and mitigation measures, there will be minimal risk to underlying groundwater resources, including the Waimatuku, Central Plains and Upper Aparima Groundwater Zones due to the discharge of effluent at the property and Horner support block. ***Effects on groundwater due to the proposed discharge activity will be no more than minor.***

- Irrigation of FDE is deferred when there is insufficient soil moisture deficit to safely apply effluent or when there is risk of drainage following irrigation of effluent. Effluent is stored in two large effluent ponds, which have sufficient storage for effluent from the proposed activity according to the Massey DESC.

- Low depth irrigation methods are used to apply effluent to land. A slurry tanker with a trailing shoe is always available and can apply slurry effluent to depths as low as 1 mm per application, and typically applies effluent to depths of 1.5 mm per application, which increases the number of irrigation days when effluent can safely be applied to land without risk of drainage. The travelling irrigators apply effluent to depths of less than 10 mm per application. There is little or no risk to receiving groundwater when irrigating using these methods where there is sufficient soil moisture deficit. A low rate irrigation system may be installed in the future.

- Soils are monitored for the formation of cracks. Effluent is not applied on Braxton type soils, if and where cracks form following extended summer dry periods. This mitigates the risk of effluent loss via preferential flow down deep cracks to shallow groundwater.

- The discharge area is sufficiently large both in terms of the area (ha) per 100 cows, and the N loading from effluent. The high strength nature of slurry effluent has been allowed for in calculating the N loading from slurry effluent. The on-site slurry tanker allows for very low application depths, which effectively controls the N loading per hectare from slurry. Slurry is typically applied at depths of 1.5 – 2.0 mm per application, which minimises the risk of contaminants present in effluent being lost to groundwater during drainage events. The slurry tanker application depth allows for effective control of N loading and microbial loading of soils, which allows microbes to be retained in the topsoil, filtered and attenuated until they become unviable.

- Installation of a new monitoring bore is proposed at the south of the dairy farm property to eliminate issues relating to localised contamination of the shallow E45/0622 bore. The bore will be used to monitor groundwater quality flowing south, in the predominant direction of groundwater flow at the property and in the direction of Heddon Bush School. Data collected from monitoring groundwater quality will be used to inform on decision making at the property, including effluent management.

Soil health

There is little or no risk to the life supporting capacity of soils due to the effluent discharge activity. The utilisation of land treatment for effluent allows for the sustainability of the soil ecosystem. The soils are suitable for effluent irrigation and the discharge follows current good management practice, which is described in Section 6 of the application and the FEMP. These include practices of a general nature and those specific to the contaminant transport pathway for the physiographic zones at the property (artificial drainage, deep drainage).

The existing storage ponds allows for deferred storage until the soil moisture content is suitable for irrigation for 1,500 cows on the farm. The land disposal area is larger than the best practice recommendation of 8 hectare per 100 cows. The land disposal at the Horner Block and dairy platform is sufficiently large to receive slurry effluent from the ponds, without exceeding the 250 kg N/hectare limit for the Horner Block, and 150 kg N/hectare for the dairy platform. The quantity of N spread from dairy shed effluent and slurry effluent over the proposed discharge area at the dairy platform is below the recommended restriction of 150 kg N typically placed on discharge permits by Environment Southland. This system is sustainable in the long term as it allows the effluent to be used both as a fertiliser and a soil conditioner, which improve the soil's health.

An ongoing soil monitoring programme is carried by the applicants and their fertiliser supplier (Ravensdown) at the dairy platform and Horner Block. Trends in soil tests are evaluated and used to inform on decision making, including effluent management. See the appended reports from Ravensdown for the WOL and WLD dairy units and the Horner Block. Good nutrient management is evident in soil fertility trends and is indicative of healthy soils. ***Effects on the soil resource due to the proposed effluent discharge activity will be no more than minor.***

Effluent storage and infrastructure

The effluent system is described in detail in Section 6 and meets the needs of 1,500 cows, including a maximum of 1,280 cows in the wintering barns, according to the Massey DESC.

WTL's storage pond stores slurry and does not have a leak detection system. It was drop tested in 2017 and a drop test report was submitted to Environment Southland who accepted that the pond was not leaking. The drop test met all criteria set out in Appendix P, except for the unavoidable presence of a crust on slurry. The drop test report is appended to this application. The characteristics of slurry and liquid effluent in storage systems are quite different. The viscosity of slurry is a lot lower than liquid effluent and as a result, slurry is self-sealing whereas liquid effluent is not. Also, the issue of wind-driven wave action causing bank erosion does not arise when storing slurry.

WOL' storage pond was upgraded in autumn 2018, when its storage capacity was increased and a synthetic liner (1.5 mm HDPE) was installed. The liner overlies a leak detection drain system, the specification for which was provided by a CPEng. The pond design was certified by a CPEng as meeting Practice Note 21 standards. CPEng sign off for the pond was submitted to Council as required. The leak detection system terminates at a 400 mm diameter inspection well. The leak detection inspection well has been inspected and either had no liquid or had liquid when the water table was high. The liquid had was clear and had no odour. There is therefore no evidence of leakage from the pond.

A visual inspection report prepared by a SQP for the ponds and ancillary storage structures was be completed and is appended to this application.

Two low depth travelling irrigation systems used at the dairy platform have been tested as per consent conditions and found to meet the required depth of less than 10 mm/application (see Appendix). The slurry tanker with the trailing shoe has been tested in the past and shown to achieve very low application depths; it can be retested if necessary. A low rate system such as pods or a cannon/rain-gun system may be installed in the future, once the current round of investment and expansion has been completed.

Summary

It is reasonable to conclude that there will be little or no risk to groundwater or surface waters including cumulatively, or to the soil resource by granting replacement of the existing discharge permit to allow for the discharge of effluent from 1,500 cows at the Woldwide One and Woldwide Two dairy platform, and at the Horner Block. The effects of the activity have been considered and are no more than minor.

Alternatives to effluent discharge methods

The irrigation systems in place are designed to meet best practice guidelines – specifically the use of very low depth, low depth irrigation and deferred storage of effluent. The applicants believe their system is both cost-effective and easy to manage.

An umbilical system has been included in the discharge permit because it provides a method of discharging large volumes of effluent at very low depths to different parts of the effluent discharge area. The umbilical system will be used as a potential back up to the low depth travelling irrigator irrigation system and low depth slurry tanker.

The umbilical system is a high rate/low depth application method. The depth of application is closely controlled by tractor speed. Typically, the depth of application will not exceed 3 mm for the umbilical system and can apply slurry at lower depths (e.g. 2 mm) by increasing the tractor travel speed. At this depth it poses no more potential for adverse effects on the receiving environment as the low depth irrigation systems.

Low rate irrigation has been included in the discharge permit because it is a best practice management irrigation method. A low rate pod or cannon/rain-gun irrigation system may be installed and used to complement the low depth travelling irrigator irrigation system and low depth slurry tanker.

The pods and cannon travelling irrigator systems are low rate/low depth application methods. They pose no more potential for adverse effects on the receiving environment as the low depth irrigation systems.

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7.2 Water Take

The water take is from the Waimatuku Groundwater Zone, which is described in Section 5.

The abstraction should have a less than minor effect on aquifer sustainability and water availability. The Waimatuku Groundwater Zone has low allocation status and the proposed take is moderate, although it is increasing relative to applicant's existing take. The applicants seek a maximum abstraction of 180,000 litres of groundwater per day. This is consistent with a total of 120 L/cow/day by allocating 70 L for stock drinking water and 50 L for shed wash down water for 1,500 cows. This equates to an annual take of 55,296 m^3 based on seasonal milk supply and a winter take for drinking water for stock in wintering barns. The take is considered reasonable in terms of Policy 21 of the Regional Water Plan. Based on the estimated recharge rate to the Waimatuku Groundwater Zone (Lincoln Environmental, 2003), annual recharge of the aquifer underlying the property is approximately 2,344,340 m^3. The annual water take is 2.4% of this volume.

Groundwater is abstracted from three bores at the property for dairy shed supply and stock drinking water, and bores are over 50 metres apart. The rate of take from individual bores does not exceed 2 L/sec and should not cause stream depletion effects on adjacent water bodies. Three water storage tanks are utilised at each dairy shed to ensure that the rate of take does not exceed 2 L/sec. The nearest neighbouring bore is over 700 m from the abstraction point and should not experience drawdown effects due to the take. There will be little or no effect on other water uses due to the water take.

Water efficiency will be a key focus on farm. Simple tasks such as keeping water reticulation systems and dairy shed plumbing in a good state of repair will prevent water leaks and reduce water wastage. Water metering devices have been installed to ensure the water use is monitored via a standard cumulative water meter and will allow the data to be supplied to Council as per the consent conditions.

Overall the abstraction should have a less than minor effect on water availability, other water users or the Waimatuku Groundwater Zone.

Assessment of Alternatives for Water Supply

There have not been any improvements in technology, which would achieve a better environmental result than the current groundwater supply to the farm. Effects on bore yields on neighbouring bores are expected to be no more than minor; the proposed groundwater take is greater than the existing take, but is still low relative to recharge rates in the groundwater zone. There is no surface water take. There will be no effect due to this activity on in-stream life, wetlands, recreational activities or marginal strips.

7.3 Dairy Farming – Land Use

Overseer is used to understand the nutrient interactions of a farm system based on soil properties, rainfall, drainage and feed requirements. The output from Overseer gives an indication of how much nutrient may be lost to the environment but it does not describe what the environmental impact of these losses is likely to be. Assessing the environmental effect of modelled nutrient losses from individual properties is complex because nutrients travel via different pathways through the receiving environment undergoing attenuation, processing, mixing, dilution and dispersion processes which can significantly change the quantity and nature of these nutrients in the receiving water bodies. The assessment provided here attempts to assess the effect of the proposed dairy farming activity in the receiving environment and the likelihood of effects, and explain what mitigation measures to be implemented in order to avoid or mitigate effects. The AEE is split into groundwater and surfacewater receiving environments.

Notes:

1. *Land referred to as Marcel/SH96 is included in this AEE, along with the former WOL and WTL dairy platforms. Land referred to as Marcel/SH96 is not assessed/considered separately as it is authorised under the land use consent for dairy farming #20171278-03 and is part of the existing environment. The application and nutrient budgets were structured to reflect this, with the discharge and farming activities on land referred to as Marcel/SH96 assessed and considered as part of the proposed dairy platform.*

2. *Environment Southland received legal opinion regarding the Horner Block. Based on the LO, the Horner Block is not part of the landholding at WOL/WTL dairy platform. It is not included in this AEE for the dairy farming activity.*

3. *Woldwide Runoff is not included in this AEE for the dairy farming activity. An AEE for Woldwide Runoff is provided in a separate report.*

Groundwater - AEE including cumulative effects of activity and mitigations

Table 7.1 summarises potential effects, likelihood of effects and mitigations. Table 7.1 links to table 6.5, which describes specific mitigation measures in detail.

Adverse effects on groundwater can occur from the expanded dairy farm activity where contaminants present in dung, urine, effluent, fertiliser and silage pad leachate, such as nutrients N (nitrate) and microbes (pathogens such as campylobacter) reach groundwater via leaching/deep drainage pathways. A major risk of elevated nitrate levels in groundwater is to users (consumers) of groundwater as nitrate becomes toxic to living organisms such as humans, animals and fish at high levels. The New Zealand Drinking Water Standard maximum allowable value for nitrate is 11.3 ppm. Another risk is to consumers of groundwater is waterborne gastroenteritis through the ingestion of groundwater contaminated with pathogens such as campylobacter. This was demonstrated in Havelock North in 2016, when over 5,000 people became ill with campylobacteriosis. Adverse effects on other users of groundwater such as Heddon Bush School, other farms, small industries or settlements/domestic users can occur and need to be avoided or mitigated.

Table 7.1 Risk of adverse effects from the proposed dairy farming activity due to contaminants N and microbes in groundwater. This table links to table 6.5 (mitigation measures).

Potential effect of N in groundwater	Related effects	Specific mitigations proposed at the dairy farm	Likelihood of effect due to proposed dairy farming activity	Risk of effect due to proposed dairy farming activity
Human health effects (methemoglobinemia) from groundwater consumption at Heddon Bush School if groundwater nitrate concentrations are at or above the NZDWS MAV of 11.3 ppm	n/a	See table 6.5 for explanations of effectiveness of mitigation measures. Measures #1, 2, 3, 4, 5, 6	Low likelihood due to the: nature and scale of activity; evidence of low groundwater nitrate levels at the south of the property and at Heddon Bush School in 17/18; and implementation of migration measures.	No more than minor
Human health effects (methemoglobinemia) on groundwater consumers in the Central Plains groundwater zone to the south east when groundwater nitrate concentrations are at or above the NZDWS MAV of 11.3 ppm	n/a	See table 6.5 for explanations of effectiveness of mitigation measures. Measures #1, 2, 3, 4, 5, 6	Low likelihood due to the: nature and scale of activity; evidence of groundwater nitrate levels at the east of the property between 3.5-8.5 ppm; and implementation of migration measures (particularly, the removal of fodder beet cropping/winter grazing from the north east of the property where lighter/more leaky soils are found).	No more than minor
Ecological effects due to discharge of groundwater with elevated nitrate to shallow streams in	Fish kills in Waimatuku Stream due to nitrate	See table 6.5 for explanations of effectiveness of mitigation	Low likelihood since N concentration in receiving waters is lower than toxicity level, and the nature and	No more than minor

Waitmatuku catchment	toxicity; Eutrophication of receiving surfacewaters (Waimatuku); Recreational effects; fishing in Waimatuku is reduced;	measures. Measures #1, 2, 3, 4, 5, 6	scale of the activity and implementation of proposed migration measures further reduce the likelihood of the effect occurring. See table 6.5 for explanations of effectiveness of mitigation measures.	
Human health effects due to faecal contamination of groundwater	Gastroenteritis such as camplyobacteriosis by consuming contaminated groundwater, including at Heddon Bush School	As per table 6.5 Measures #1, 2, 3, 5, 6, 7, 10	Low likelihood due to: implementation of mitigation measures; monitoring for soil cracks and avoidance of cracks when grazing stock or discharging effluent or slurry; limited viability of microbes in groundwater; and use of an ozone purification system at Heddon Bush School.	No more than minor

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Soil type and groundwater

There is risk to groundwater at the dairy platform from two soil processes:

1. Drummond/Glenelg soils are free draining and therefore have risk of contaminant loss via deep drainage to underlying aquifers due to their physical properties. Approximately 378 hectares (or 79%) of the dairy platform has Drummond and Glenelg soil types.
2. Braxton soil types have swell/crack characteristics that can allow contaminants present in dung and urine to be washed down to the underlying groundwater resource via deep cracks that can form during prolonged dry summer conditions. Parts of the property with Braxton soils types (approximately 100.5 hectares or 21%) require appropriate management to mitigate the risk of contaminant loss to groundwater if and where deep cracks form.

Nitrate loss to groundwater

Braxton soil types are believed to have a lower risk of deep cracking than previously thought and therefore also a lower risk of nitrate reaching groundwater via bypass drainage. They also have some denitrification potential. They have higher risk of N loss to surfacewaters via artificial drainage. These properties are reflected in low groundwater nitrate levels at the south and to the south, which is in the direction of groundwater flow for much of the property, including Braxton areas. *Despite this, Braxton soils need to be monitored at high risk times for the presence of deep cracks and managed appropriately.*

Drummond and Glenelg soils have low denitrificiation potential and are classed as Oxidising. Some N lost to water below the root zone in Drummond and Glenelg soils (i.e. 12 – 17 ppm estimate according to Overseer), is likely to reach the groundwater resource. It is not practical to quantify how much nitrate is reaching groundwater, given tools available/present day science. Nonetheless, a moderate loss of N to the groundwater resource will contribute to the N loading of groundwater underlying Oxidising soils, which cumulatively gives a concentration of between than 3.5 – 8.5 ppm for the Oxidising area (according to ES modelling). This is supported by bore testing at the property.

As has already been discussed, groundwater nitrate levels increase to the east of the dairy platform, as soils become progressively lighter and there is a transition to the Central Plains Groundwater Zone. A nitrogen hotspot is found to the south east of the property in the Central Plains Zone, where nitrate levels are frequently in excess of the NZ Drinking Water Standards (>11.3 ppm). Testing of a monitoring bore at the east side of the dairy platform (also found on Drummond soils and in the Central Plains Groundwater Zone) had a mean of 8.1 (range +/- 1.9) ppm in recent years. This is lower than at the Boyle Road/Heenan's Corner area, where the hotspot is centred.

Water percolating through to the underlying aquifer undergoes mixing and nutrients are diluted. As is explained in section 5, land use nitrate effects on groundwater in the area start to be seen within a year, and certainly are evident within three years. Since much of the wider area has been used for dairy farming, cereal cropping, winter grazing and sheep farming for many decades, effects on groundwater have been present for decades. The hotspot to the southeast is likely to reflect this. In terms of the proposed dairy expansion, there will be extensive mixing within a large aquifer and some dilution thereafter, which will change background N concentrations by a small degree, and cumulatively will give a concentration of no more than 1.0 – 8.5 ppm for the majority of the dairy platform.

Although the proposed activity represents an expansion of dairying through an increase in cow numbers, there will be less N lost to water due to the implementation of mitigation measures and good management practices, and therefore less effect on the groundwater resource and its associated values relative to the pre-expansion system. These help to reduce the accumulation of N in soils, particularly from mineralisation processes associated with forage brassica/beet fodder cropping, and grazing of fodder crops, particularly during winter and spring. Since less N accumulates in soils, then less N is lost to groundwater (and surfacewaters).

Groundwater nitrate effects

As is explained above, the main risk of elevated nitrate levels in groundwater is to users (consumers) of groundwater as nitrate becomes toxic to living organisms such as humans, animals and fish at high levels. Nitrate levels are likely to be maintained in the receiving groundwater resource between 1.0 – 8.5 ppm due to the proposed dairy farm activity. This is supported by bore data at the dairy platform. This will not result in adverse effects on other users of groundwater such as other farms, small industries, schools or settlements/domestic users; values of bore users in the groundwater zone will not be adversely affected. Values such as the protection of human health, animal health, sustainable farming and economic wellbeing will not be adversely affected by groundwater nitrate levels of 1.0 – 8.5 ppm, which are below the NZDWS maximum allowable value of 11.3 ppm.

The risk due to the proposed expansion to the bore water supply at Heddon Bush School needs to be carefully assessed. Groundwater underlying much of the dairy platform, flows south in the direction of the school. As is already described, groundwater nitrate levels at the south of the property are consistently low (despite an issue with localised well contamination). Given the following factors, adverse effects from the dairy farming activity such as an increase in groundwater nitrate levels, would have been seen for some time in the vicinity of the school *if they were present*:

- the proximity of the school;
- land use in the area since the 1980s including cereal cropping, sheep farming and intensive winter grazing;
- the length of time that the property has been used for dairy farming;
- the southerly direction of groundwater flow;
- the estimated lag time for nitrate at the surface to reach the water table and the underlying groundwater stream, and
- the estimated velocity of groundwater flow.

Sampling of the school bore over three dates in late 2017 and early 2018 returned a mean nitrate concentration of 1.9 ppm. This indicates that groundwater nitrate levels at the school are low and pose minimal risk to health. It also indicates that there are minimal effects on groundwater quality at the school from the dairy farm 2.3 km north of the school. Finally, it is unlikely that there will be any increase in adverse effects due to the proposed expansion. It is noted that the school bore is drilled to a depth of over 14 metres, which further reduces any potential risk.

Microbial loss to groundwater

If faecal microbes are/have been reaching groundwater, the testing of groundwater in the vicinity of the property, could reveal this to be the case. Groundwater testing of bores at the dairy platform are generally negative for *E.coli*, but at times return positive results with generally low counts. As has already been explained, the south bore at the dairy platform (E45/0622) suffers from localised contamination due to its design. This is reflected in the positive *E. coli* results for that bore, which corrupt the dataset making the bore unsuitable for monitoring purposes. Following the zone of reasonable mixing, there is likely to be minimal adverse effect on the wider groundwater resource from this localised source. *It is proposed to install a new* *monitoring bore at the south of the farm, which will eliminate the issue of localised contamination, making E.coli results valid, reliable and an important information source.*

The mid-farm/east monitoring bore (E45/0665) has generally been negative for *E.coli* since it was installed in 2015. It has returned some positive results (three) in that time, with one result likely to be an outlier in the dataset. The relatively high result in November 2017 was likely to be due to recent heavy rainfall that occurred between November 3rd and 12thand resulted in a very high level of drainage and the observed positive *E. coli* result (see figure 7.2). The subsequent test in April 2018 was negative for *E.coli* (<1 MPN/100 ml). It is noted that the ES monitoring bore at Boyle Road, which is southeast of the WTL bore and in the same groundwater zone, has consistently been negative for *E.coli* in recent years with the exception of December 2017. It too was subsequently negative for *E.coli* in March 2018 (<1 MPN/100 ml). This indicates that if groundwater contamination occurs due to very high level and rate of drainage, it is relatively short lived, which is in line with the length of time that *E.coli* and similar microbes are believed to remain viable in groundwater (three months or less). Land immediately south of the dairy platform is agricultural (dairying and dry stock) so there is minimal risk to human health from groundwater in the area. Heddon Bush school is further south and is assessed in a following section.

There is minimal risk of microbial contamination of the registered bore for drinking water supply at Heddon Bush School from the proposed dairy farming activity. According to the school principal, the bore has been tested quarterly since it was drilled and has consistently returned negative *E.coli* results (<1 MPN/100 ml). Given the bullets points summarised on the previous page as well as the lifetime of *E.coli* in the environment (up to 3 months according to Edberg et al. 2000), adverse microbial effects on the school bore should have been detected if they were present. The evidence so far does not indicate that dairy farming activity is having an adverse effect on the Heddon Bush School water supply through faecal contamination of groundwater. The proposed 1,500 cow activity is similar in nature (with some beneficial mitigation measures that will maintain good soil structure and health, and reduce microbial accumulation at high risk times), and is of slightly increased scale compared to the pre-expansion land use; there will be no increase in faecal microbes reaching groundwater due to the proposed activity. *Furthermore, the depth of the school bore further helps to protect it from land-use effects, as does the presence of an ozone water purification treatment system.*

The new monitoring bore will be located at the south of the property, in the groundwater "stream" believed to flow towards Heddon Bush School. *E. coli* results from the bore will be monitored by the applicants and used to inform decision making at the property. In conclusion there is minimal risk that consumers of groundwater, including at Heddon Bush School, will develop gastroenteritis due to the dairy farming activity. Good well-head maintenance at a new monitoring bore will help to ensure that there is no localised faecal contamination of groundwater.

Based on the above assessment, the effects of the proposed dairy farming activity on groundwater will be no more than minor.

Surfacewater - AEE including cumulative effects of activity and mitigations

Artificial drainage and overland flow are pathways by which contaminants (nutrients N and P, sediment and microbes) present in dung, urine, effluent and silage leactate may reach receiving waters such as surfacewater streams, the Waimatuku Stream, Waimatuku Estuary, the Oreti River, New River Estuary, Aparima River, Jacobs River Estuary and coastal waters. The major risk to surface waters is from contaminant loss via subsurface drainage channels that occurs following periods of heavy rain, when the soil's field capacity is exceeded and bypass drainage events occur; nutrients N and P, sediment and microbes are transported via subsurface drainage to streams. Due to its very flat topography, overland flow is not a particular risk to surfacewater quality at the property. There are, however, low points close to tile outfalls that can act as CSAs at times, where water can pond following intense rainfall. Runoff from tracks and lanes to surface waterways can occur risk close to and at culvert crossings following intense rainfall.

At the farm scale it is very difficult to quantify contaminants being lost to surfacewaters and their contribution to cumulative effects on receiving waters; there will be much seasonal and spatial variation in this. Furthermore, measuring the volume of drainage water leaving a sub-catchment and the concentration of nutrients in drainage water would require expensive equipment as well as long term monitoring to allow for temporal and spatial variation; this is not practical given available scientific methods. For these reasons, Overseer predictions are used along with knowledge of soils, rainfall infiltration and receiving waters.

Notes:

1. *The below calculations are carried out using values for N and P loss for the dairy platform only, as per Overseer nutrient budget analyses for the proposed 1,500 cow scenario. P loss is used as a proxy for sediment and microbial loss.*

2. *Drummond and Glenelg soils are free draining and do not pose a risk to surfacewaters via artificial drainage channels. The mid-west part of the dairy platform (approximately 100.5 hectares or 21%) has Braxton type soils; these have subsurface drainage installed and drain to the Waimatuku Stream catchment.* ***Since the major surfacewater risk is from Braxton soil types that drain to the Waimatuku Stream catchment, the focus of the AEE on surfacewaters is to the Waimatuku Stream catchment.***

Table 7.2 Effects of N and P in surfacewaters, predominantly including streams in the Waimatuku catchment, Waimatuku Stream, Waimatuku Estuary and coastal waters. Some of these effects may be seen in the Oreti catchment (shallow streams, Oreti River, New River Estuary) due to the discharge of groundwater to shallow streams in the Oreti catchment. P is understood to act as a proxy for sediment and microbes. This table links to table 6.5 (mitigation measures).

Contaminant	Potential effect in receiving surfacewaters	Related effects	Specific mitigations proposed at the dairy farm	Likelihood of effect due to proposed dairy farming activity	Risk of effect due to proposed dairy farming activity
N, P	Increased algal growth in the water column, especially when flows are low and/or temperatures are elevated in shallow streams and the Waimatuku Stream: • Degrades water quality and blocks light (increases turbidity and reduces clarity)	Ecological: exclusion of macrophytes, reduced visibility for fish and other aquatic organisms, loss of habitat, decreased suitability for recreational activity	As per table 6.5. Measures mitigating N loss are #1, 2, 3, 4, 5 and 6; Measures for mitigating P loss are #1, 2, 3, 5, 6, 7, 9, 10	Low likelihood due to the nature and scale of activity and implementation of migration measures	No more than minor
N, P	Increased algal growth in the water column: • Potentially increasing BOD	Ecological: reduced DO causing stress on aquatic organisms, loss of species and habitat	As per above	Very low likelihood since point source discharges affect BOD rather than diffuse sources (i.e. the proposed dairy farming activity). Although the discharge of FDE is a point source discharge, it is to land rather than water is managed appropriately.	Less than minor – point source discharges affect BOD rather than diffuse sources
N, P	Increased periphyton growth on stream beds, especially in smaller streams (Waimatuku) when temperatures are elevated or flows are low: • Smother streambed	Ecological: loss of habitat, effects on invertebrates and organisms in associated food webs, reduced biodiversity	As per above	Low likelihood due to the nature and scale of activity and implementation of migration measures	No more than minor

N, P	Increased periphyton growth, especially in streams and rivers when temperatures are elevated or flows are low: • Promote the growth of toxic matts of cyanobacteria (blue green algae)	Toxic effects on biota including domestic animals. Also, people using waterways for recreational activities are at risk of adverse health effects	As per above	Low likelihood due to the natures and scale of activity and implementation of migration measures	No more than minor
N	N toxicity effects if N concentration is high enough, particularly in the Waimatuku Stream	Ecological: loss of habitat, fish kills Animal and human health due to nitrate toxicity	As per above for N loss mitigation	Low likelihood since N concentration in receiving waters is lower than toxicity level and encouragingly N levels have decreased over the last two consecutive years in the Waimatuku Stream. The scale of the activity and implementation of proposed migration measures further reduce the likelihood of the effect occurring.	Less than minor
P	Increased nuisance plant growth on estuaries (Waimatuku and/or New River): P sorbed to soil particles following runoff is deposited in sediment and then released from bed into the water	Weed-driven habitat modification and loss; effects on invertebrates and organisms in associated food webs leading to	As per above for P loss mitigation	Low likelihood due to nature and scale of activity and implementation of proposed migration measures	No more than minor

	column	reduced biodiversity			
Sediment	Following runoff, increased turbidity and reduced water quality in Waimatuku Streams, Oreti River and respective estuaries.	Ecological: exclusion of macrophytes, reduced visibility for fish and other aquatic organisms, loss of habitat, decreased suitability for recreational activity	As per table 1. Measures 1, 2, 3, 5, 6, 7, 10 are the main mitigation measures for sediment loss.	Low likelihood due to nature and scale of activity and implementation of proposed migration measures	No more than minor
Sediment	Following runoff, increased deposition of sediment in Waimatuku Streams, Oreti River and respective estuaries. • Smother streambed	Ecological: loss of habitat and increased anoxic conditions (estuaries), effects on invertebrates and organisms in associated food webs, reduced biodiversity	As per above	Low likelihood due to nature and scale of activity and implementation of proposed migration measures	No more than minor
Microbial contaminants	Following run-off, elevated levels of microbial contaminants in streams, Waimatuku Stream, Oreti River and respective estuaries: • Exposure to pathogens	People using waterways for recreational activities and food gathering are at risk of adverse health effects (gastroenteritis)	As per above	Low likelihood due to nature and scale of activity and implementation of proposed migration measures	No more than minor

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Nitrogen

PROPOSED 1,500 COW SCENARIO – N CONCENTRATION IN SURFACE DRAINAGE WATER

A conservative estimate for N loss to surfacewaters is calculated below. For the purpose of the calculations, the average annual N loss figure from Braxton soils from Overseer was used. The mean annual land surface recharge rate was used to calculate an estimate of drainage volume to surfacewaters.

100 ha = 1,000,000 m^2

Recharge rate estimate (Lincoln Environmental, 2003) = 0.467 m

(1) *Area (m^2) X drainage (m) = drainage volume (m^3)*

Approximate drainage volume annually = 1,000,000 m^2 x 0.467 m = 467,000 m^3

If <u>all</u> 2,671 kg of N lost to water annually from the Braxton block according to Overseer, is transported via subsurface/artificial drainage channels and overland flow to surfacewaters, then the N concentration of water draining directly to surfacewaters is:

2,671 kg/467,000 m^3 = 5.7 g/m^3 = 5.7 ppm*

5.7 ppm is a conservative estimate as it assumes <u>all</u> N lost below the root zone ends up in surface drainage water. In fact some N will be lost below the root zone to the atmosphere via denitrification processes in soils, and a very quantity of N may be lost to groundwater. ***As such 5.7 ppm N reflects a "worst case scenario" for the 1,500 cow scenario.***

On average the concentration of N in water draining to surfacewaters will be less than 5.7 ppm. Furthermore, water reaching the receiving surfacewaters undergoes mixing and nutrients are diluted. Due to mixing and some dilution thereafter, it is reasonable to assume that this will change background N concentrations by some degree, and cumulatively will give a concentration of no more than 3.65 ppm for the Waimatuku Stream catchment (Median Total Nitrogen for SOE site at Waimatuku Stream at Lornville Riverton Highway).

Losses to the Lower Oreti receiving waters will be minimal due to the free draining nature of soils on that part of the dairy platform, and cumulatively will give a concentration of no more than 1.06 ppm for the Lower Oreti catchment (Median Total Nitrogen at SOE site at Oreti River at Wallace Town).

PRE-EXPANSION - N CONCENTRATION IN SURFACE DRAINAGE WATER

The pre-expansion land use based on four years of data is predicted by Overseer to have had slightly greater N loss to water than the proposed 1,500 cow scenario. Using the same process, the N concentration of water draining to surface waters would be predicted to be slightly higher than for the proposed scenario. It is reasonable to assume that there will be no increase in N related effects in receiving surfacewaters due to the 1,500-cow farm, relative to the pre-expansion land use, which included fodder cropping and associated grazing at the dairy platform. In a catchment where N levels are elevated (i.e. the Waimatuku in particular), any reduction in N loss is environmentally favourable, even where the decrease is a small one.

Some N that accumulates in Braxton type soils will reach surfacewaters following high rainfall events via artificial drainage, with a minor contribution from overland flow, particularly in the late autumn, winter and early spring. Although it is possible to estimate the "worst case scenario" concentration for N in surfacewater drainage from the dairy platform, estimating the N load of drainage water to the Waimatuku Stream catchment is unfeasible without knowing the flow rate of surfacewater leaving the dairy platform. Again, the Waimatuku Stream catchment is the focus due to its risk from artificial drainage of contaminants.

N LOAD - WAIMATUKU STREAM

The Waimatuku Stream at Lorneville Riverton Highway SOE site was used as a reference for this calculation.

Total nitrogen median** concentration = 3.65 g/m^3.

The average flow from 2013 – 2017 of the Waimatuku Stream at Township Road (1 km south of SOE site) = 2.13 m^3/s

(2) Load (g/s) = concentration (g/m^3) x flow (m^3/s)

N load in lower catchment Waimatuku Stream at Waimatuku township = 3.65 g/ m^3 x 2.13 m^3/s = **7.77 g/s**

**The median was used instead of the mean when the mean value was unavailable.

In order to quantify the contribution from the proposed activity to the N load of the Waimatuku Stream, the flow rate of surface water drainage from the dairy platform to the catchment is required. Given available tools and information, the flow rate of surfacewater drainage is unknown. It can reasonably be assumed, that the N loading to the Waimatuku Stream from the proposed activity will cumulatively contribute, with the loading from all other activities in the catchments, to the lower catchment N loading of c.7.77 g/s for the Waimatuku Stream. The contribution to the N loading from the proposed 1,500 cow activity is slightly less than the pre-expansion activity, which has slightly greater average annual N loss according to Overseer (i.e. 0.27 t N/year greater).

EFFECT OF N LOSS IN THE RECEIVING ENVIRONMENT – INCLUDING CUMULATIVELY

Potential effects of N in receiving surfacewaters are summarised and evaluated in table 7.2.

N is a plant macronutrient in aquatic systems. Excess N contributes cumulatively to the eutrophication of receiving waters and promotes nuisance plant growth in the form of algal blooms or slime. This has knock-on effects on the biota that inhabit aquatic ecosystems, and other associated values. The median Total Oxidised Nitrogen concentration for the Waimatuku Stream at Lorneville Riverton SOE site (3.30 mg/L) is well above the ANZECC Guideline of 0.44 mg/L but has an improving trend over ten years. Similarly, the median Total Nitrogen concentration for the Waimatuku Stream at Lorneville Riverton SOE site (3.65 mg/L) is well above the ANZECC Guideline of 0.614 mg/L but has an improving trend over ten years. This indicates that N levels in the Waimatuku Catchment are high enough to cause stress on sensitive species such as fish, as well as cause other adverse effects such as nuisance plant growth. Recently the ten-year trend for N in the Waimatuku Stream catchment has shown improvement, with a reduction in both the median concentration for Total Oxidised N and Total N over the last two consecutive years. The continuation of this trend can be achieved through improved land management in the catchment. The changes in land use at the dairy platform will see an improvement in land management and less mineralisation of N, which cumulatively should see less N loss in surfacewater drainage to the Waimatuku Stream in the long term.

As is described in Section 5, the Waimatuku Estuary is a sensitive environment that is adversely affected by nutrients, sediment and microbial contaminants from land use in the catchment, such as dairy farming. N loss to receiving surfacewaters such as the Waimatuku Stream and Estuary and coastal waters (and to a minor degree the Lower Oreti, and New River Estuary) will be low and slightly reduced compared to the pre-

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expansion situation due to many key mitigations that reduce N accumulation, N mineralisation processes and protect soil structure. These are summarised in table 6.5. These measures are complemented by the general strategy of good nutrient and soil management as demonstrated in the soil fertility trend reports from Ravensdown.

Phosphorous, sediment and microbial contaminants

The major pathway for P loss (and by proxy sediment and microbes) is artificial drainage following major drainage events. This process pertains to Braxton soil types in particular. Drummond and Glenelg soils have low risk of P loss. There is some risk of overland flow from the dairy platform from CSAs near tile outfalls and where tracks and lanes cross surface waterways. Following intense rainfall water can drain into waterways, carrying P, sediment and microbes with it.

Overseer predicts low average P losses of 0.7 kg/ha/year or 356 kg/year due to the proposed dairying activity (1,500 cows). Overseer predicts an average P loss of 0.4 kg/ha/year for Braxton type soils due to the proposed activity. P loss is split between "Other Sources," which is loss from tracks, lanes and infrastructure to waterways via overland flow, and "Blocks," which is P loss from paddocks due to dairy farming. "Other sources" P loss is estimated by Overseer to be 256 kg/year, with "Block" loss estimated to be 100 kg/year. "Other sources" P loss is calculated by a sub-model in Overseer, which assumes that 30% of P that lands on tracks, lanes, yards and other infrastructure, ends up in waterways (Gray, Wheeler and McDowell, 2016). Overseer does not account for the individual layout of dairy farms, however. In this case, tracks and lanes for the most part do not run close to or parallel to waterways, which reduces the risk of runoff from tracks and lanes to waterways significantly. By managing locations where overland flow from tracks and lanes etc. can potentially reach waterways (such as adjacent to the wintering barn at WOL), loss of "Other sources" P can be greatly reduced although Overseer does not recognise this. This will help to reduce P loss (and other contaminants such as sediment and microbes), by filtering runoff as it drains to waterways from paddocks. With management of such locations, the average annual P loss from the property, as predicted by Overseer, can be reduced. Given available tools, it is not possible to quantify this reduction.

As is described in Section 6, Overseer predicts that there will be no change in P loss with the increase in cow numbers. As such, the P related effects of the expansion, and by proxy sediment and microbes, will be minimal.

EFFECT OF P LOSS IN RECEIVING ENVIRONMENT– INCLUDING CUMULATIVELY

Potential effects of P in receiving surfacewaters are summarised and evaluated in table 7.2.

Due to physical and chemical interactions, P tends to be adsorbed by soil particles in surfacewaters and is taken out of solution to a large extent. A small portion of P, however, will remain soluble and available for uptake by aquatic plants in receiving water bodies. Some P will subsequently be released from sediments as soluble P and can then be taken up by plants. P is a plant macronutrient, which is often a growth limiting factor in aquatic systems. Excess P can contribute cumulatively to the eutrophication of receiving waters and promote nuisance plant growth in the form of algal blooms or slime. This has knock-on effects on biota that inhabit aquatic systems and associated values.

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The median DRP concentration for the Waimatuku Stream at Lorneville Riverton (SOE) site (0.042 mg/L) is above the ANZECC Guideline of 0.01 mg/L and has a degrading trend over ten years. This indicates that the Waimatuku Catchment has elevated and increasing levels soluble P, which can lead to the adverse environmental effects described above and in table 7.2. In order to improve water quality, a reduction in soluble P in waterways needs to occur and the ten-year trend needs to be show improvement. This can be achieved through improved land management in the catchment.

Due to mitigations summarised in table 6.5, the loading of P (and sediment and microbial contaminants) to receiving surfacewaters such as the Waimatuku Stream, Waimatuku Estuary and coastal waters (and to a very minor degree the Lower Oreti and New River Estuary) from the dairy platform will be low and will not increase. Particularly, practices that reduce soil pugging and improve soil structure are effective at reducing the risk of P, sediment and microbial losses to surfacewaters as they allow for P to be held in the soil, and for microbes to be filtered and held in the soil profile until they become unviable. The careful management of soil fertility through sustainable fertiliser and effluent application are also key mitigations for minimising P loss and are evident in the soil fertility trend reports for the dairy platform (see Appendix). Management of riparian areas and closely associated CSAs is an important mitigation for P loss and is taken seriously at the dairy platform. Collectively these measures mitigate P loss (and by proxy sediment and microbes), including cumulatively, to receiving surfacewaters.

Drainage waters mix with receiving waters and are diluted. Given mixing and dilution of drainage and receiving waters annually, the proposed activity will contribute an immeasurably small amount to the P load of receiving waters, and there will be no increase in the P load of receiving waters relative to the pre-expansion land use. Similarly, there will be minimal change in sediment and microbial contaminant levels of receiving waters due to the proposed activity.

Summary – AEE on surfacewaters

Although the proposed activity represents an expansion of dairying, there will be slightly less N and P lost to receiving surfacewaters due to the implementation of mitigation measures, and therefore slightly less effect on receiving surfacewaters and associated values compared to the pre-expansion system.

Values associated with surfacewater streams, rivers and coastal waters are many and relate to the landscape, biodiversity, history and people living in the catchment. These values include maintaining the health of water bodies both in-stream and coastal, protecting biodiversity and ecosystems, protecting recreational activities such as fishing, walking and boating; protecting human and animal health, maintaining sustainable farming practices and the socioeconomic well-being of people through preserving values that relate to inshore fishing, farming and tourism. Iwi/cultural values include the principles of protection or kaitiakitanga of the mauri of the water and mana of the land, while minimising adverse effects on taonga and mahinga kai. Contaminant losses from the proposed activity will be low and will not adversely affect these values. There will be no increase in adverse effects on any of the above values from the proposed activity.

Based on the above assessment, the effects of the proposed dairy farming activity on receiving surfacewaters will be no more than minor.

Biodiversity of surfacewaters

Nutrient enrichment (by N and P) and sedimentation of the Waimatuku Stream, Waimatuku Estuary, Oreti River, New River Estuary and coastal waters result in nuisance plant growth such as slime (cyanobacteria), algal blooms, the choking of waterways by macrophytes (weeds) and the smothering of stream beds. The collection of plants and animals that inhabit receiving waters are adversely affected, as well as in-stream values such as biodiversity.

As is outlined in Section 5, effects such as macroalgal blooms are frequently seen in at the Waimatuku Estuary over the summer period, when temperatures are elevated. These effects are complex and relate to many interacting factors, e.g. physical factors such as flow rates and temperature, as well as chemical and biological factors. Ecological data from a lower catchment site (close to the estuary), as described in Section 5, are indicative of land use effects on aquatic biota living in the Stream. The Waimatuku Stream and Estuary are used for the recreational fishing of trout and whitebait. Trout and native fish species such as short and long fin eels and galaxids, are found in the Stream and Estuary.

New River Estuary catchment is also described in Section 5, with some parts being identified as being highly muddy and anoxic, eutrophic and having associated nuisance algal growth. Poorly flushed parts of the estuary have been identified as eutrophic areas. The Oreti River and New River Estuary are used for the recreational fishing. Trout and native fish species such as short and long fin eels and galaxids, are found in the river and estuary.

There will be minimal effect on biodiversity due to the proposed activity due to the implementation of mitigation measures on farm. These set out to reduce contaminant loss relative to the pre-expansion situation. Implementation of several measures will cumulatively reduce nutrient, sediment and microbial loss from the activity over time, which reduces any potential adverse impacts on the biodiversity of the Waimatuku Stream and Estuary, Oreti River and New River Estuary, and coastal waters.

Winter Grazing

No further winter grazing of cows or heifers on pasture or winter/summer crop will occur at the WOL/WTL dairy platform. Instead all animals wintered at WOL/WTL will be wintered in barns. No AEE for winter grazing is required as this activity will not be carried out.

Consideration of alternatives for land use at the property

The land has been developed and used for dairy farming for many decades. Through their investment and experience farming the property, the applicants have developed a sustainable dairy farming model to suit the property. The proposed intensification is increasing the herd size by 160 cows, however, the proposed system will result in slightly less N loss to water than the existing situation, through the implementation of mitigation measures. The pre-expansion land use would not achieve a better environmental result than the proposed 1,500 cow dairy platform.

8. Consultation

The applicants have farmed the property as a dairy farm for many decades, starting in 1992 when they converted the WOL unit, with full dairy infrastructure on site. The irrigation systems are low depth with minimal visual or olfactory impact. Two large barns house cows over winter, which removes the practice of intensive winter grazing of beet crops. The proposed changes include an increase in cow numbers but are of similar nature as existing activities and land use at the property. Good management practices are in place and mitigation measures will be implemented. Environmental effects are expected to reduce with the proposed changes. For these reasons, no potentially affected parties are anticipated.

9. Conclusion

The applicants seek replacement consents for their current land use consent for expanded dairy farming, effluent discharge to land and groundwater take for a 1,500-cow dairy operation. The expansion is due to an increase of 160 cows to a maximum of 1,500 cows. The expansion will occur in parallel with key changes to the existing farm system; these changes result in a system with slightly lower average N and P loss annually according to Overseer. The effects of the expansion are not being exported elsewhere, but are being contained and managed appropriately at the land holding.

The application includes a policy assessment, an assessment of environmental effects and Farm Environmental Management Plan that demonstrate that the expected, actual or potential adverse effects generated by the continuation of the proposed activities on the environment can be avoided, remedied or mitigated to the extent that they are considered to be no more than minor.

The key concern with the expansion and effluent discharge is the potential for the activities to have adverse effects on groundwater and surface water quality, and on soils. Provided any consent conditions imposed by the Council are adhered to, and management practices are implemented in line with the attached Farm Environmental Management Plan, the activities should have little adverse effect on the environment.

The water take is should have little adverse effect on neighbours' bores, and a less than minor effect on aquifer sustainability, current allocation and stream depletion.

Overall the proposal is considered consistent with the purpose of the Resource Management Act 1991, and does not conflict with the purpose of the Act, or with Council policy. The adverse effects of the dairy farm activity, the water take and the discharge of dairy shed effluent onto land should be no more than minor provided that the applicants adhere to the attached Farm Environmental Management Plan.

11. References

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Sent: Thursday, 18 April 2019 2:23 p.m.
To: anita@woldwide.nz
Subject: FW: Hearing dates - Woldwide

From: Aurora Grant <Aurora.Grant@es.govt.nz>
Sent: 18 April 2019 14:18
To: 'Tanya Copeland' <tanya@landpro.co.nz>
Cc: 'Nessa Legg' <nessa.dgl@xtra.co.nz>; 'abe@woldwide.nz' <abe@woldwide.nz>; Alex Erceg <Alexander.Erceg@es.govt.nz>
Subject: RE: Hearing dates - Woldwide

Hi Tanya,

I know there has been a lot of discussion regarding when hearings would be able to be held – initially it was planned to hold March- April hearings based on the applications being resubmitted in early January (allowing roughly a 4 month timeframe for the entire process), however it turned out the applications were not resubmitted until the end of March due to hold ups on your/Nessa's end.

I had a phone conversation with Nessa in mid-February regarding the likelihood of hearings being held July – August due to the lateness of lodgement (based on an indicated lodgement date around the end of March - again allowing roughly a 4 month timeframe for the entire process). I explained then that due to the time needed to allow for notification the submission period, time for various parties to prepare evidence, availability of commissioners, staff availability and the Water and Land plan environment court dates would mean that the earliest hearings could be held would be July. This was why it was stressed the earlier you got the applications in the better in terms of holding a hearing asap. Due to when they were lodged it has ended in a bit of a bottle neck, however I have tried to streamline things as much as possible from my end.

It is at councils discretion (delegation sits with the consents manager) to appoint hearing commissioners. We always use independent commissioners (sometimes with a councillor sitting on the panel) for hearings.

Average costs of the last few hearings we have done range between $23,000 and $60,000 for the entire process. In terms of commissioners costs, their average hourly rates are between $170/hr - $250/hr.

Hopefully this answers your questions,

Cheers,

Aurora

Aurora Grant
Team Leader Consents
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From: Tanya Copeland <tanya@landpro.co.nz>
Sent: Thursday, 18 April 2019 10:13 AM
To: Aurora Grant <Aurora.Grant@es.govt.nz>
Cc: Nessa Legg <nessa.dgl@xtra.co.nz>; abe@woldwide.nz
Subject: Hearing dates - Woldwide

Hi Aurora,

I have been speaking with Abe and Anita regarding your email and we have a couple of questions please:

- Can we please schedule an earlier hearing? The timeframes we have previously agreed aimed to have this hearing occurring before the start of the next season. We understand that there ended up being a few delays but we would really appreciate a hearing as soon as possible. An August hearing, resulting in having a decision in September is really going to be impossible for the De Wolde's in making cropping decisions. Also, Nessa is going to be overseas from the beginning of July until the beginning of August and I am due to have baby #2 in August.
- Can you please let us know the costing of the Commissioners, based on two full days of hearings for WW1&2 and 4&5?
- If independent commissioners are not requested by us, who would hear the applications as decision makers on behalf of Council? Would it be a panel of Councillors or would this also be contracted to an independent commissioner?

Thanks Tanya

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From: Tanya Copeland <tanya@landpro.co.nz>
Sent: Friday, 24 May 2019 10:43 a.m.
To: Aurora Grant; 'Nessa Legg'
Cc: Alex Erceg; abe@woldwide.nz; 'Anita De Wolde'; Mike Freeman
Subject: RE: Hearing dates - Woldwide applications

Hi Aurora,

Thanks for your email. I have just spoken with Abe and all parties are available the week of the 19th August. Is this suitable for you guys and the commissioners?

The condition being that we would like to request the release of both a s42A report and comprehensive draft conditions earlier than required by the statutory timeframes. Could you please advise if this is possible and when you could realistically have a s42A report released.

Cheers

Tanya

From: Aurora Grant <Aurora.Grant@es.govt.nz>
Sent: Thursday, 23 May 2019 2:29 PM
To: Tanya Copeland <tanya@landpro.co.nz>; 'Nessa Legg' <nessa.dgl@xtra.co.nz>
Cc: Alex Erceg <Alexander.Erceg@es.govt.nz>; 'abe@woldwide.nz' <abe@woldwide.nz>; 'Anita De Wolde' <anita@woldwide.nz>
Subject: RE: Hearing dates - Woldwide applications

Hi Tanya and Nessa,

Timeframes for evidence circulation for a hearing in June will not be feasible for any party, and we are not able to contract commissioners or experts for that date. The week of the 12th August is unfortunately also out for all parties on our side, however should the applicant wish to use S91A to place the applications on hold to allow for overseas awayness then hold the hearing at a later date in August or early September that could be an option. As you know S91A is entirely at the applicants discretion to use.

At this stage I am working to the week of the 5th of August to meet the required timeframes, and delegation will be contracted to Commissioners to direct proceedings shortly.

I understand that this is not entirely helpful for you, but the tightness of timeframes and ability to line everyone up on the same dates is difficult for this one, which is why it was stressed at the end of last year the applications needed to come in the door in early January to have the matter finished mid year. As they didn't, this has resulted in the timeframe block being moved later in the year. That being said, it is important that we all use the time available to make sure the commissioners have quality evidence to consider rather than having it rushed through which could result in the hearing remaining open or commissioners directing that further information is requested before they can make a determination.

Thanks,

Aurora

From: Tanya Copeland <tanya@landpro.co.nz>
Sent: Thursday, 23 May 2019 10:08 AM
To: Aurora Grant <Aurora.Grant@es.govt.nz>; Nessa Legg <nessa.dgl@xtra.co.nz>
Cc: Alex Erceg <Alexander.Erceg@es.govt.nz>; abe@woldwide.nz; Anita De Wolde <anita@woldwide.nz>
Subject: RE: Hearing dates - Woldwide applications

Hi Aurora,

Thanks for getting back to us. Unfortunately the week of the 5th of August is unsuitable for the applicant as Nessa is still overseas and we feel that it is vital that planning evidence is given on the day for WW1&2.

The week of the 12th of August is suitable, or alternatively the last week of June prior to both the de Woldes and Nessa heading overseas. I understand the only consideration for the week of the 12th of August is the requirement to close the hearing within 75 days of the close of public submissions.

Thanks

Tanya

From: Aurora Grant <Aurora.Grant@es.govt.nz>
Sent: Wednesday, 22 May 2019 10:33 AM
To: Nessa Legg <nessa.dgl@xtra.co.nz>
Cc: Alex Erceg <Alexander.Erceg@es.govt.nz>; abe@woldwide.nz; Anita De Wolde <anita@woldwide.nz>; Tanya Copeland <tanya@landpro.co.nz>
Subject: Re: Hearing dates - Woldwide applications

Hi all,

At this stage the hearings will be held the week of the 5th of August. I'm awaiting confirmation of this from commissioners. Rob Enright and Emma Christmas will make up the panel.

Lacey Bragg, our hearing assistant will be in touch with further details regarding site visits and days in that week for hearing etc.

Nga mihi nui,

Aurora

Sent from my iPhone

Aurora Grant
Team Leader Consents
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On 22/05/2019, at 9:51 AM, Nessa Legg <nessa.dgl@xtra.co.nz> wrote:

Hi Aurora,

I know Tanya was in touch last week about potential hearing dates. I'm not sure if you got back to her yet so thought I would follow up this morning. I would really appreciate it if you could get back to me with an update regarding dates today please.

Many thanks,
Nessa

From: Tanya Copeland <tanya@landpro.co.nz>
Sent: Thursday, 16 May 2019 12:05 p.m.
To: Aurora Grant <Aurora.Grant@es.govt.nz>
Cc: abe@woldwide.nz; Nessa Legg <nessa.dgl@xtra.co.nz>
Subject: Hearing dates - Woldwide applications

Hi Aurora,

Just wondering if you had any updates for us on possible hearing dates.

Thanks heaps,

Tanya and Nessa

<image001.jpg>

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From:	Nessa Legg <nessa.dgl@xtra.co.nz>
Sent:	Tuesday, 4 June 2019 11:29 a.m.
To:	Aurora Grant
Cc:	abe@woldwide.nz; 'Anita De Wolde'; Alex Erceg; tanya@landpro.co.nz; 'Mike Freeman'
Subject:	FW: Draft to check - Woldwide - hearing date and site visit

Hi Aurora,

Hope all is well with you. Some questions are summarised below that we would really appreciate a response to as soon as possible please:

- Are the hearing dates confirmed for the week of August 19th? We have people to coordinate at our end so having confirmation of the dates is really important.

- Since you had a site visit of all farms and support blocks back in the spring, we were wondering if having another is necessary? If you think it is, we would appreciate it if you could explain why?

- If you believe a site visit is necessary, Abe and Anita can accommodate one later in the month, preferably Thursday 20th or Friday 21st June. They can't do one at short notice as they are attending a funeral up north later this week and have a full schedule after that up until the 20th.

Many thanks,
Nessa

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