

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:

WORLDWIDE FOUR LIMITED, WORLDWIDE FIVE LIMITED,
Applicants

BRIEF OF EVIDENCE OF MICHAEL FREEMAN

19 September 2019

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QUALIFICATIONS AND EXPERTISE

1. My full name is Michael Conrad Freeman and I am a Senior Scientist/Planner at Landpro Limited, a firm of consulting planners, scientists, surveyors and engineers. I hold the qualifications of BSc (Environmental Science, University of Warwick) and PhD (Periphyton and Water Quality, Massey University). I am a current Ministry for the Environment Certified RMA decision-maker with a chairing endorsement.
2. I have been involved in resource consents and related Resource Management Act (RMA) planning and regulatory processes since the inception of the RMA in 1991. I was the Director Regulation at Environment Canterbury from 1996 to 2007. Since 2008 I have been directly involved in a wide range of planning and regulatory roles relating to the RMA. This has included preparation of S42A reports for both resource consent and plan hearings, as well as the preparation of a wide range of resource consent applications. I have also served as an RMA decision maker for various local authorities since 2008.
3. I also have specific expertise in the use of Overseer Nutrient Budgets (Overseer) in planning and regulatory settings having worked with the Overseer team at AgResearch for 2.5 years. I have co-authored and reviewed various technical papers on Overseer, including a major project that resulted in the publication of the report: "Using Overseer in regulation - Technical resources and guidance for the appropriate and consistent use of Overseer by regional councils.
4. I am a member of the Resource Management Law Association (RMLA), and the Environmental Institute of Australia and New Zealand. I am also an Associate Member of the New Zealand Planning Institute.
5. I have been employed by Landpro since January 2018 and have undertaken a wide variety of resource management related work for various clients, including preparing resource consent applications, providing policy and regulatory advice, and consent management services. A significant proportion of my work relates to resource consents for dairy farms in Southland.
6. My colleague Ms Tanya Copeland prepared the original application and assessment of environmental effects (AEE). However, she is on parental leave and I have the responsibility to provide both planning and water quality advice to the hearing panel. I am familiar with the project and resource consent applications and I have personally visited the site. I also acknowledge that I have

worked closely with Ms Nessa Legg who has prepared evidence for the hearing for Woldwide One Limited and Woldwide Two Limited. To make this process as efficient and effective as possible, with her permission, some parts of this report reproduce material provided in her evidence. I also acknowledge that I have been assisted by my colleague Ms Matilda Ballinger, Graduate Planner, to prepare parts of this evidence. This is my evidence and I take full responsibility for all the content of this document.

7. This evidence has been prepared in relation to the application by WoldWide Four Limited and WoldWide Five Limited to use land for dairy farming that was not occurring as of June 2016, to discharge farm dairy effluent to land, to take and use groundwater, to use land for existing effluent storage ponds and to use land for wintering sheds at the locations specified in the applications. This evidence also includes matters relevant to the WRO land.

Other sources of information

8. I am of course familiar with my own water quality report and evidence and have also obtained and viewed the following information:

- (a) The S42A Report by Ms Grant and Mr Erceg
- (b) Brief of evidence from Mr Scandrett
- (c) Brief of evidence from Dr Roberts
- (d) Brief of evidence from Mr Crawford
- (e) Brief of evidence from Mr De Wolde

CODE OF CONDUCT FOR EXPERT WITNESSES

9. I have read the Code of Conduct for Expert Witnesses within the Environment Court Consolidated Practice Note 2014 and I agree to comply with that Code. This evidence is within my area of expertise, except where I state I am relying on what I have been told by another person. To the best of my knowledge I have not omitted to consider any material facts known to me that might alter or detract from the opinions I express.

SCOPE OF EVIDENCE

10. As the planning consultant for WoldWide Four Limited and WoldWide Five Limited, I will provide information on the following matters:

- Background and proposal
- Application summary
- Existing environment
- Comment on the Planning Report and Recommendations
- Policy and Statutory Planning Analysis
- Matters raised by submitters
- Conditions
- Conclusions

BACKGROUND

11. The following is a brief overview of the proposal as submitted on 28 March 2019, noting that the full description of the proposal is detailed in the Assessment of Environmental Effects (AEE). The key components of the proposal as originally lodged are as follows:

Woldwide 4:

12. The application site is located at 305 Mayfield Road, Bayswater. The site comprises a 349 hectare dairy platform owned by the Applicant. The property is located within the Upper Aparima Catchment.

13. The property is generally flat to undulating in slope and is underlain by artificial drainage through much of the property (a plan of the known tile drains is attached as Appendix A). The property has been run as a dairy farm (including winter grazing) by the applicant.

14. The applicant has recently purchased a neighbouring sheep block, 'Cochran's block'. The applicant seeks to split this block between WW4 and WW5 and use it as part of each dairy platform. 63ha of

the Cochran's block is proposed to be added to the WW4 dairy platform. Prior to this the property was run as a sheep farm.

15. Soils on the property are comprised of Braxton and Tuatapere soils which are known to have various vulnerabilities as indicated in the AEE submitted in support of the application, including a moderate vulnerability to structural compaction and severe vulnerability to waterlogging.
16. Physiographic zones on the property are comprised of Central Plains and Oxidising. Contaminant loss to surface water is the main water quality risk associated with these zones, via both artificial drainage in flatter areas and overland flow in sloping areas where there are slopes.
17. The dairy platform is located within the Waimatuku Stream and Aparima River catchments. All surface water flows via artificial drainage towards the Waimatuku Stream, intersecting with groundwater and eventually moving into underground tile drains at the southern boundary of the farm. The Cochran's block contains a small tributary of the Aparima within the farm boundary.

Woldwide 5:

18. The application site is located at 760 Bayswater Road, Bayswater. The site comprises of an 262 hectare dairy platform owned by the Applicant. The property is located within the Upper Aparima Catchment.
19. The property is generally flat to undulating in slope and is underlain by artificial drainage through much of the property (a plan of the known tile drains is attached as Appendix A). The property has been run as a dairy farm (including winter grazing) by the applicant.
20. The applicant has recently purchased a neighbouring sheep block, 'Cochran's block'. The applicant seeks to split this block between WW4 and WW5 and use it as part of the dairy platform. 70ha of the Cochran's block is to be added to the WW4 dairy platform. Prior to this the property was run as a sheep farm.
21. The applicant has also purchased a 45ha (approx.) block of land known as the Collies block. Under Land use consent AUTH-20157538-04 approved the conversion of the 45ha block under the proposal that the block would be purchased in 2019 and converted to join the dairy platform. In April 2016 this consent was surrendered, either mistakenly or unwillingly by the applicant. The Rule 20(e) land use consent application includes this land.

22. Soils on the property are comprised of Braxton, Upukerora and Tuatapere soils which are known to have various vulnerabilities as indicated in the assessment of effects submitted in support of the application, including a moderate vulnerability to structural compaction and severe vulnerability to waterlogging.
23. Physiographic zones on the property are comprised of Central Plains, Riverine and Oxidising. Contaminant loss to surface water is the main water quality risk associated with the Central Plains zone, via both artificial drainage in flatter areas and overland flow in sloping areas. The Riverine area is an extremely small strip of land. Land in the Oxidising zone can provide routes to both groundwater and surface waters depending on the local permeability.
24. The dairy platform is located within the Aparima River catchment. The new parts of Cochran's block are also located within the Aparima River catchment.

Woldwide Runoff:

25. WRO is a dry stock farm owned and operated by Woldwide Runoff Ltd "WROL". It provides dairy support services by providing grazing for dry stock associated with existing farms, including WW4&5, as well as other farms owned by separate companies, which share common directors and shareholders ("WW farms"). Under the current proposal WW4&5 propose to obtain support services from WRO. It is located 20 km to the west of Otautau, on the western side of the Longwood Ranges and has 160 hectares in commercial pine forestry and native beech.
26. WRO is comprised of two separate blocks: the Merrivale Block (507 ha, 322 ha effective) and the Merriburn block (385 ha, 338 ha effective). The Merriburn Block is leased.
27. From all WW farms, WRO will graze a total of 1,265 R1s and 1,265 R2s, with R2 numbers dropping to 1,165 in March. WRO will also graze carryover cows (37) and bulls (70).
28. WRO will IWG a maximum of 1,265 R1s and 450 R2s, with the balance of R2s (715) proposed to be wintered in barns at WW1&2, WW4 and WW5. 78 hectares of kale crop is proposed for IWG supplemented by 1,332 bales of baleage.
29. Surplus grass will be harvested and stored as silage and baleage. Minor changes made to the proposal since its submission in March are:
 - a. A reduction in area proposed for IWG to 72 hectares (from 100 ha).

- b. 12 hectares will be planted in trees.
 - c. Measures proposed to mitigate P loss. These are detailed in P loss Mitigation Plan section in the FEMP.
30. FEMPs have been reviewed and updated in accordance with Appendix N. An additional nutrient budget was provided for the 2016/17 year.

SUMMARY OF APPLICATIONS

31. An application has been prepared seeking resource consents to use land for a farming activity, discharge effluent to land, to abstract and use groundwater for dairy purposes, to use land for existing effluent storage facilities and to use land for wintering barns
32. In summary, the applications sought:
33. **WW4** Land Use Consent (RMA S9(2)) – To use land for a farming activity. The proposal seeks to increase the land area of the dairy platform above what existed at 3 June 2016 to include a 63 ha portion of Cochran’s block.
34. **WW4** Discharge Permit (RMA (15(1)(b)) – Phase 1- To discharge dairy shed effluent from 850 cows onto 78 ha of land via low rate irrigation and slurry tanker. Phase 2- To discharge dairy shed effluent from 1000 cows, underpass effluent, silage pad leachate and wintering shed slurry from a maximum of 1050 cows. The liquid effluent will be applied to 78 ha of land and the slurry effluent will be discharged to the remainder of the milking platform and the total area of the Gladfield block, approx. 320 ha.
35. **WW4** Water Permit (RMA (14(2)(a)) – Phase 1- To abstract 100,000 L/day of groundwater over a 300 day milking season. This abstraction of groundwater is for dairy shed washdown and stock drinking water for 850 cows. This is what is permitted under the current water permit and will not change during Phase 1. Phase 2- A new water permit is sought to abstract groundwater for dairy shed washdown and stock drinking water for 1000 cows during the milking season, and for the abstraction of stock drinking water during winter for 1000 cows in the wintering shed. The abstraction rates are not changing from the currently consented 100,000 L/day. The proposal results in a change in the stocking rate from 3.2 cows/ha to 2.1 cows/ha in Phase 1 and 3.2 cows/ha in Phase 2. I note that the

consenting officers incorrectly states the increase in number of cows milked to be 200, which would be a total of 1050.

36. **WW4** Land use Consent (RMA S9(2)) - for wintering shed. To construct and use a wintering shed that will be used for wintering of up to 1050 mixed age and R2 cows.
37. **WW4** Land use Consent (RMA S9(2)) - for existing effluent storage facilities. To use land for three existing effluent storage facilities (pump sump, concrete sludge bed bunker and effluent storage pond).
38. **WW5** Land Use Consent (RMA S9(2)) – To use land for a farming activity. The proposal seeks to increase the land area of the dairy platform above what was authorised as at 3 June 2016 to include a 70ha portion of Cochran’s block and a 45ha section of Collies block. In Phase 2 it is proposed to increase the cow numbers to 930.
39. **WW5** Discharge Permit (RMA (15(1)(b)) – Phase 1- To discharge dairy shed effluent from 770 peak milking cows (originally 800) cows onto 126 ha of land via low rate irrigation and slurry tanker. Phase 2- To discharge dairy shed effluent from 930 cows, underpass effluent, silage pad leachate and wintering shed slurry from 1050 cows. The liquid effluent will be discharged to 126 ha and the slurry effluent will be discharged to the remainder of the milking platform, approx. 133 ha.
40. **WW5** Water Permit (RMA (14(2)(a)) – Phase 1- To abstract 72,000 L/day of groundwater for 365 days of the year. This abstraction of groundwater is for dairy shed washdown and stock drinking water for 800 cows. This is what is permitted under the current water permit and will not change during Phase 1. Phase 2- To abstract 100,000 L/day of groundwater for dairy shed washdown and stock drinking water for 1000 cows during the milking season, and for the abstraction of stock drinking water during winter for 1000 cows in the wintering shed.
41. **WW5** Land use Consent (RMA S9(2)) - for wintering shed. To construct and use a wintering shed that will be used for wintering of up to 1050 mixed age and R2 cows.
42. **WW5** Land use Consent (RMA S9(2)) - for existing effluent storage facilities. To use land for one existing concrete sludge bunker as a storage facility.
43. A draft Farm Environmental Management Plan (FEMP) was lodged with the application which contains details of Good Management Practices (GMPs) proposed by the applicant to ensure that

the farm is operated with industry accepted good practice. Revised versions of the FEMPs are attached as Appendix C.

44. Minor changes made to the proposal since its submission in March are reflected in the modelling and focus on measures to reduce N and P loss. These are detailed in the FEMPs. Which have been prepared in accordance with Appendix N.

Overseer Modelling WW4

45. Overseer modelling has been used to model five baseline years (2012-2017) at the proposed dairy platform that will operate if consent is granted. Overseer FM version 6.3.2 has since been released (9 September 2019) and nutrient budgets have been re-run in this version. This approach has been used to provide data that is as close as possible to the type of format with which Environment Southland staff are familiar. It should, however, be noted that for discretionary activities under Rule 20(e), no baseline information is prescribed. A summary of Overseer outputs for the dairy platform is detailed in the following tables.

46. The summary outputs from the baseline models are:

Woldwide Four Phase 1			
	Current Farm System	Proposed Farm System	Reduction
N (kg/yr)	11,978	11,898	0.7 %
P (kg/yr)	343	349	-1.7 % (increase)

47. The summary outputs from the proposed model including the consideration of the inclusion of a wintering barn, off-site young stock grazing, additional P loss mitigations and further mitigations are:

Woldwide Four Final			
	Current Farm System	Proposed Farm System	Reduction
N (kg/yr)	11,978	9,727	18.8 %
P (kg/yr)	343	342	0.3%

48. Overseer modelling of the proposed farming system at the dairy platform indicates that nitrogen losses are predicted to reduce by 18.8% compared to the baseline combined model. Phosphorus losses are estimated to reduce by 0.3% compared to the baseline combined model and additional mitigations detailed in the FEMP.

Discharge Permit for WW4

49. A new discharge permit is sought under Phase 2 for the proposal to allow for the discharge of farm dairy effluent from 1000, underpass effluent, silage pad leachate and wintering shed slurry from a maximum of 1050 cows. This liquid effluent will be discharged to an area of 78 ha. Slurry effluent will be discharged to the remainder of the milking platform and the total area of Gladfield block, approx. 320 ha. Effluent infrastructure at the property consists of a pump sump, a concrete sludge bed bunker and an effluent storage pond.
50. The volume of deferred storage provided on farm meets the requirements of the Massey University Dairy Effluent Storage Calculator (DESC), as outlined in the application for resource consent.
51. Effluent will be discharged to land via low rate pods, slurry tanker and travelling irrigator. The slurry tanker will apply at depths of 1.5-2.5mm per application and will be used when a lower soil moisture deficit exists. The travelling irrigator applies effluent at a depth of 7-8mm and will be used when a higher soil moisture deficit exists. Low rate pods apply effluent at a maximum rate of 10mm/hr and can be used all year round provided soil moisture deficit is adequate. The soils within the FDE disposal area appear to be classified by Map 1 of Appendix N of the Regional Water Plan as being Category A soils (artificial drainage or coarse soil structure). The soils within the additional Cochran's block are classified as being Category A soils and Category D soils (well drained flat land).

Water Permit for WW4

52. A new water permit is sought for Phase 2 of the proposal to allow the abstraction of 100,000 L/day over the 300-day milking season and 75,000 L/day over the 65-day winter period. The abstraction rate will be less than 2 L/sec. The water will be used for stock drinking water and shed wash down water from 1000 cows during the milking season, and the abstraction of stock drinking water during the winter for 1000 cows in the wintering shed. This will be abstracted from bore E45/0426.

Land use Consent for existing effluent storage facilities WW4

53. Land use is required for the use of the existing concrete sludge bunker, the pump sump and the clay lined effluent storage pond as storage facilities for effluent. The clay lined effluent storage pond is not showing obvious signs of leakage and is confirmed in the pond certificate from Mr Murray Gardyne. A pond drop test was completed in July 2018.

Land use Consent for Wintering Shed WW4

54. The applicant seeks consent to build a new wintering shed within a 2-3 year timeframe of consent being granted, with the wintering shed aiming to be operational by the winter of 2021. It will be used to winter the majority of the herd from June through until calving dates. It would hold at maximum 1050 cows, a mixture of age cows and R2 replacements.

Land Use Consent for WW4

55. A land use consent is sought for the proposed farming activity which I have determined to include all activities located on the land which is directly associated and inherently linked with the applicant’s dairy farming operation over 365 days of the year.

56. The proposal is to increase the dairy platform of WW4 by 63 ha from Cochran’s block and to increase the number of cows milked to 1000, an increase of 150 from the currently consented 850 cows. The proposal results in a reduction in the stocking rate from 3.2 cows/ha to 2.1 cows/ha in Phase 1 and 3.2 cows/ha in Phase 2.

57. The proposal includes the use of wintering sheds which will have the capacity to hold up to 1050 cows. These will be of mixed age and R2.

Overseer Modelling WW5

58. Overseer modelling has been used to model five baseline years (2012-2017) at the proposed dairy platform that will operate if consent is granted. Overseer FM version 6.3.2 has since been released and nutrient budgets have been re-run in this version. This approach has been used in order to provide data that is as close as possible to the type of format with which Environment Southland staff are familiar. It should, however, be noted that for fully discretionary activities under Rule 20(e), no baseline information is prescribed. A summary of Overseer outputs for the dairy platform is detailed in the below tables.

59. The summary outputs from the baseline models are:

Woldwide Five Phase 1			
	Current Farm System	Proposed Farm System	Reduction
N (kg/yr)	16,247	16,047	1.2%
P (kg/yr)	243	233	4.0%

60. The summary outputs from the proposed model including the consideration of the inclusion of a winter barn, off-site young stock grazing, additional P loss mitigations and further mitigations are:

Woldwide Five Phase 1			
	Current Farm System	Proposed Farm System	Reduction
N (kg/yr)	16,247	16,047	10%
P (kg/yr)	243	236	3%

61. Overseer modelling of the proposed farming system at the dairy platform indicates that nitrogen losses are predicted to reduce by 10% compared to the baseline combined model. Phosphorus losses are estimated to reduce by 3% compared to the baseline combined model and additional mitigations detailed in the FEMP.

Discharge Permit for WW5

62. A new discharge permit is sought under Phase 2 for the proposal to allow for the discharge of farm dairy effluent from 930, underpass effluent, silage pad leachate and wintering shed slurry from a maximum of 1050 cows. This liquid effluent will be discharged to an area of 115 ha. Slurry effluent will be discharged to the remainder of the milking platform, approx. 133 ha. Effluent infrastructure at the property consists of an existing sludge concrete bunker.

63. The volume of deferred storage provided on farm meets the requirements of the Massey University Dairy Effluent Storage Calculator (DESC), as outlined in the application for resource consent.

64. Effluent will be discharged to land via low rate pods and a slurry tanker. The slurry tanker will apply at depths of 1.5-2.5mm per application and will be used when a lower soil moisture deficit exists. Low rate pods apply effluent at a maximum rate of 5mm/hr and can be used all year round provided soil moisture deficit is adequate. The soils within the FDE disposal area appear to be classified by Map 1 of Appendix N of the Regional Water Plan as being Category D soils (well drained flat land), Category A soils (artificial drainage or coarse soil structure) and Category E soils (other well drained but very stony flat land). The soils within the additional land are classified as Category A soils (33.4 ha), Category D soils (31ha) and Category E soils (5.6ha).

Water Permit for WW5

65. A new water permit is sought for Phase 2 of the proposal to allow the abstraction of 100,000 L/day during the 300-day milking season and 75,000 L/day during the 65 day-day winter period. The abstraction rate will be less than 2 L/sec. The water will be used for stock drinking water and shed

wash down water from cows during the milking season, and the abstraction of stock drinking water during the winter for 1000 cows in the wintering shed. This will be abstracted from bore D45/0347.

66. Although not part of this proposal, I note that the applicants have been granted a variation to consent conditions which has amended the bore number and bore location on Water Permit AUTH-20157537-02. The applicants upgraded the bore (D45/0347) to comply with NZS 4411:2001 standards.
67. The applicants provided a response on 02/08/2019 to a s92 RFI issued by the consent authority regarding the proposed water take at the dairy platform

Land use Consent for existing effluent storage facilities WW5

68. Land use is required for the use of the existing effluent storage facilities (concrete sludge bunker).

Land use Consent for Wintering Shed WW5

69. The applicant seeks consent to build a new wintering shed within a 2-3 year timeframe of consent being granted, aiming for the wintering shed to be operational by the winter of 2022. It will be used to winter the majority of the herd from June through until calving dates. It would hold at maximum 1050 cows, a mixture of age cows and R2 replacements.

Land Use Consent for WW5

70. A land use consent is sought for the proposed farming activity which I have determined to include all activities located on land which is directly associated and inherently linked with the applicant's dairy farming operation over 365 days of the year.
71. The proposal is to increase the dairy platform of WW5 by 115 ha, 70 ha from Cochran's block and 45 ha of Collies block and to increase the number of cows milked to 930, an increase of 130 from the currently consented 800 cows. The proposal results in a reduction in the stocking rate from 3.2 cows/ha to 2.1 cows/ha in Phase 1 and 3.2 cows/ha in Phase 2.
72. The proposal includes the use of wintering sheds which will have the capacity to hold up to 1050 cows. These will be of mixed age and R2.

COMMENTS ON SECTION 42A REPORT

73. I have read the Section 42A Report prepared by Ms Grant and Mr Erceg. The S42A report has recommended that the applications be declined. The reporting officers identify many key issues leading to the conclusion that should consent be granted, contaminant losses will increase, adverse effects on waterbodies will not be avoided or mitigated, water quality will not improve where standards are not met and best practice will not be observed in the maintenance and operation of the effluent system. I disagree with the reporting officers' views and adopt expert witnesses Mr Crawford, Ms Legg and Dr Roberts and my own water quality analysis report in coming to my consideration.

- (a) Key issues relating to the actual and potential effects from the proposal, including the potential for adverse effects on groundwater and surface water are identified by the reporting officer. the effects arising from an increase in cow numbers on the dairy platforms and support blocks;
- (b) effects on drinking water supplies;
- (c) effects on soil;
- (d) cumulative effects;
- (e) uncertainty around the relevance and accuracy of modelled losses shown by overseer;
- (f) uncertainty regarding the effectiveness and appropriateness of the proposed good management practices and mitigations;
- (g) what forms the landholding for the proposal; and
- (h) consistency of the proposal and effects arising from it with Council's policies and objectives

74. I only provide comment on key issues where I consider it will complement evidence provided by expert witnesses for the application. The following table endeavours to better understand the rationale behind each of these concerns and to respond to each of the concerns to ensure that they can be satisfactorily addressed. I have rearranged the concerns to enable them to be addressed in a more logical order because many concerns are fundamentally based on two principal concerns, namely confidence in mitigation measures and confidence in the Overseer modelling.

Concern	Response
The effects arising from an increase in cow numbers on the dairy platforms and support blocks.	I disagree with the reporting officer's view that an increase in cow numbers will cause an increase in adverse effects. I refer to evidence of Mr Crawford, and my own WW water quality report to conclude this is highly unlikely to be the case.

	<p>The reporting officers conclusion appears to not take into account the extensive modelling information provided, the mitigation measures proposed and the independent reviews of previously submitted modelling.</p> <p>I consider the reporting officer's contention that effects will increase on WRO, Cochrans block and Collies block is unfounded. There will be no increase in stocking rate at either WW4 or WW5. Rather the stocking rate will be as proposed in the application and as has been modelled in Overseer. In both phase 1 and phase 2 for WW4 and WW5 the stocking rate decreases compared to the existing situation. I do not consider this could raise a scope issue since this is no more not no less than what was applied for.</p>
Effects on drinking water supplies	<p>The Tuatapere Water supply is sourced from shallow bores on the western side of the Waiau River approximately 15 km south west of the WRO properties. The concern is based on an unwarranted concern about an increase in contaminant losses to surface water and groundwater.</p> <p>In any respect the distance and primary recharge of these bores from the Waiau River¹ makes it highly improbable that these supplies could be at risk from land use activities at WRO.</p>
effects on soil	<p>I consider the key issues relating to potential effects from the proposal, i.e. effects on drinking water supplies, effects on soil and cumulative</p>
the state of the existing environment	
cumulative effects	

¹ Rissman (2012) Groundwater Quality Survey Results for Lower Waiau Nitrate Survey, Environment Southland Report

	<p>effects, have been assessed in my WW water quality report. I conclude that it is highly unlikely there will be an increase in any of these identified potential adverse effects if the proposal is implemented. In fact the expert evidence strongly indicates that the proposal would result in a reduction of a range of adverse effects that are currently occurring. If the resource consents are not granted there it is unlikely that the current planning regime would provide for the same scale of reduction in nutrient losses in the time period proposed by the applicants.</p> <p>I agree with the reporting officer's view that the receiving environment (both groundwater and surface water) is degraded to varying degrees but no not consider this is a basis to decline the applications as implementing the proposal is highly likely to reduce nutrient loses and associated adverse effects, including cumulative adverse effects.</p> <p>Cumulative effects are effects as defined in Section 3² of the Resource Management Act and are considered as such in the submitted assessments of effects and in evidence provided to this hearing.</p>
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² "...the term effect includes—

- (a) any positive or adverse effect; and
- (b) any temporary or permanent effect; and
- (c) any past, present, or future effect; and
- (d) any cumulative effect which arises over time or in combination with other effects—
regardless of the scale, intensity, duration, or frequency of the effect, and also includes—
- (e) any potential effect of high probability; and
- (f) any potential effect of low probability which has a high potential impact."

<p>Uncertainty around the relevance and accuracy of modelled losses shown by overseer.</p>	<p>Overseer has been widely accepted in New Zealand as an appropriately robust model that has an important role in managing water quality. There are a number of publications available that provide guidance on its application for this purpose and the Environment Court on a number of occasions has accepted Overseer as an appropriate water quality management tool.</p> <p>The reporting officer has had external reviewers audit Mr Crawford's modelling and the only relatively minor matters raised have been satisfactorily addressed in Mr Crawford's evidence.</p> <p>Evidence from Dr Roberts and Mr Scandrett demonstrate that the concerns about the impact of cracking in Braxton soils is unfounded and that Overseer does provide a robust long-term model that can be applied to Braxton soils.</p> <p>Evidence from Dr Roberts, Mr Crawford and my water quality report addresses the accuracy and validity of Overseer modelling, which I consider to be critical to the validity of the proposal in its entirety. They conclude that when used in the context of comparing an existing and new farming system (using the analogy of comparing 'apples with apples') Overseer is a valid tool for modelling nutrient discharge. Dr Roberts succinctly explains that 'the quantitative difference between the existing and new scenarios can be treated with confidence.' This is despite the inability of Overseer to account for localised short-term effects such as cracked soils and by-pass flow.</p>
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Uncertainty regarding the effectiveness and appropriateness of the proposed good management practices and mitigations.

The evidence provided by Mr Crawford and Dr Roberts strongly supports the effectiveness and appropriateness of the proposed good management practices and mitigation measures as established, credible measures to reduce contaminant loss to water with appropriate modelling to estimate the likely quantitative effects of these measures.

Uncertainty of the barns: Clarification was provided on 18th July 2019 detailing that the wintering barns, if consent is granted, would be installed by winter 2021 and winter 2022 for WW4 and WW5 respectively.

WRO Mitigations: At the time of writing, the reporting officer states the mitigation plan for WRO block had been withdrawn entirely so was unable to consider mitigations and GMPs for WRO. I note that the finalised mitigation plan for WRO block was provided to Environment Southland on September 5 and the staff report was released on September 9 at 5 pm. I confirm that the finalised FEMP, which contains a P mitigation plan for WRO, as submitted on September 5, was prepared in agreement with the owners of the Merriburn block. I consider the GMPs and mitigations proposed for WRO to provide appropriate level of certainty regarding activities at WRO, their effectiveness and appropriateness. The extent to which some measures may or may not be claimed appears to relate to a contention that the Collies Block should not have been modelled as a baseline with dairying. However, Ms Grant agreed on 5 February 2019 that because of the circumstances

behind the surrender of the land use consent for conversion this approach was appropriate, provided that it was explained. This is further explained below in the response to concerns about the Collies Block.

<p>What forms the landholding for the proposal.</p>	<p>The reporting officer raises 'what forms the landholding for the proposal' as a key issue and provides an extensive assessment on the matter. I have also read a letter provided to the reporting officer by Duncan Cotterill on the landholding matter and consider the reporting officer's view to not be relevant to this application.</p> <p>The relevant land use consent application has been made under Rule 20(e).</p> <p><i>"The use of land for a farming activity that is not specified as a permitted, restricted discretionary or prohibited activity under Rule 20(d) is a discretionary activity."</i></p> <p>This rule does not use the word "landholding", so it is not clear to me why in the context of the rule the word is considered relevant.</p> <p>In any respect, the application has considered all the relevant effects including effects from land use that is directly supporting the land that is subject to the application.</p>
<p>Consistency of the proposal and effects arising from it with Council's policies and objectives</p>	<p>These concerns are based on the reporting officers' views that the proposals would result in an increase in nutrient losses to water. I consider that the expert evidence has shown that these concerns are not based on robust evidence.</p>
<p>Concern that Collies block has been modelled as dairy pasture.</p>	<p>In 2015, WW5 was granted land use consent AUTH-20157537-04 to establish a dairy farm on the property on a proposal which detailed that the majority of the proposed dairy platform was to be converted in 2015 and the remaining 45ha Collies block would be purchased by the applicant in 2019 and converted into dairy platform at the time of purchase. The land use</p>

	<p>consent and the conditions contained were worded as such to allow for the two phased conversion of this property to occur. At the time, both Environment Southland and Fonterra were encouraging consent holders who were converting farms under these consents to 'establish a dairy farm' to get the consents signed off as complete once the farm was converted, the consent given effect to and all conditions were met in order to enable supply to Fonterra to commence. Accordingly, the applicants surrendered the consent with Environment Southland in April 2016. The issue now arises that a consent was surrendered, either mistakenly or unwillingly by both the applicant and Environment Southland which had ongoing conditions and ongoing obligations for the conversion of Collies block.</p> <p>In order to resolve this situation, the applicant seeks land use consent under Rule 20(e) for the conversion of Collies block to dairy land in recognition of the fact that the land use consent which has previously approved the conversion of this land to dairy land has been surrendered. In order to give credit for the fact that the conversion of Collies block has already been assessed under proper process in 2015, and that the land use consent was surrendered in error, the applicant has agreed in writing with Environment Southland that this block can be modelled in the baseline models as already being dairy land. This is shown in the appended email.</p>
<p>Concerns that the Overseer budgets have included modelling of IWG on the Gladfield block</p>	<p>I am satisfied that the modelling undertaken by Mr Crawford accurately represents what has been</p>

<p>in both the present and phase 1 of the proposals when the officer considers that this does not represent what has actually happened or will happen.</p>	<p>occurring legally on the Gladfield Block. I am also confident that the future use of the land would be undertaken in compliance with any conditions that apply to it.</p>
<p>Concerns that IWG has occurred on WW5 land that did not comply with the permitted activity conditions of Rule 20 of the PSWLP, and concerns that this means that effects from the wider activities on this land can not form part of the existing environment.</p>	<p>Mr De Wolde has explained the circumstances that caused this non-compliance and explained that this has been rectified. In my view it is not correct to imply that anything other than a specifically unauthorised activity should be excluded from consideration as the valid baseline. For example, where cows were temporarily grazing closer than 5 m from the creek, that strip of land should not be included in any baseline assessment. That view is accepted. However, Mr De Wolde is not aware of any other non-compliance with the practices specified in PSWLP Rule 20(a)(iii)(3)</p> <p>Mr De Wolde accepts that cows should not have been grazing so close to a creek and greater care is now being taken to ensure that all the practices specified in PSWLP Rule 20(a)(iii)(3) are being fully applied on all WW farms.</p>

Statutory Considerations

75. Section 7 of the S42A report details an extensive planning assessment. I have avoided duplication of material where possible.

76. A detailed planning and rule framework assessment was provided in the application. In my evidence I have commented on relevant policies and clarified where I disagree with the reporting officers' assessment. I emphasise that the reporting officers' assessments appear to be based on a view that despite the evidence provided that the proposal would result in an increase loss of contaminants to receiving waters.

Part 2 of the RMA

77. I agree with the reporting officer that it is appropriate to refer to Part 2 of the RMA when considering this proposal³.
78. I consider the proposal is consistent with Part 2 of the RMA. It seeks to enable the applicants to utilise their land for farming in a way that provides for their social and economic well-being, that their staff, families and whanua and the rural economy, while also enabling them to reduce their environmental footprint in a manner that will achieve sustainable management as defined in Section 5(2).
79. The applicants acknowledge and respect the long history and relationship Tangata Whenua have with the area. Noting that TAMl have opposed the proposal, I consider that the implementation of the proposal will not adversely affect Tangata Whenua values, traditions or taonga.

National Policy Statement on Freshwater Management (2014), amended 2017

80. I consider the proposal is consistent with the NPSFM, including A4 and policies relating to water quality, quantity and Tangata Whenua interests. I highlight objective A2 as being particularly relevant at the present time since it guides that water quality must be maintained or improved in FMUs. I rely on the expert evidence to conclude that implementation of the proposal will see a small reduction in contaminant loss to water and that this will make a small contribution to improving water quality. Importantly, it will do so compared to the future if consent is not granted (notwithstanding other potential future requirements such as limit setting). I consider that implementation of the proposal will help to achieve an improvement in groundwater and surface water quality in FMUs, which will benefit ecosystem health and human health noting that these are two compulsory values identified by the NPSFM. The proposal inherently recognises the values and connections of Te Mana o te Wai as set out in the NPS.
81. Additional information was provided to the Consent Authority in response to a s92(1) RFI, which assessed the effects of the proposed increase in water take for WW5. The RFI response is appended to my water quality evidence for completion. Based on the assessment provided in the RFI response, I consider the proposed water takes for both WW4 and WW5 to be consistent with the objectives and policies relating to water quantity in the NPSFM.

³ R J Davidson Family Trust v Marlborough District Council [2018] NZCA 316.

Southland Regional Policy Statement (2017)

82. I disagree with the reporting officer that the applications are "...inconsistent with the key policies in the RPS".... The RPS does not identify "key" policies and the evidence strongly indicates that the reduction in contaminant loss would result in proposals that are consistent with all the relevant objectives and policies in the RPS.

Regional Water Plan

83. I do not agree with the reporting officer's view that the proposal is inconsistent with policies 3, 4 and 25. I consider that the expert evidence strongly indicates that the proposal will result in improvements in water quality and is consistent with these policies.
84. I consider the proposed water take is consistent with policies 29 and 30(e). These were assessed in a s92(1) RFI response that was submitted to Environment Southland on 2nd August 2019, which is appended to my water quality evidence for clarity. I clarify the proposed water take is in line with reasonable and efficient use of water, with a proposed allocation of 100L/cow/day, which is less than the recommended allocation of 120 L/cow/day for seasonal supply.

Proposed Southland Water and Land Plan

85. I largely agree with the reporting officers' view that since the pSWLP gives effect to the NPSFM and the RPS, it merits considerable weight being given to it. However, all the policies that relate to water quality management are still subject to appeal.
86. Contrary to the reporting officers I do not consider that there are "key policies". The use of the term appears to indicate that certain policies have greater status than other policies. I accept that some policies are more or less relevant. For example, the S42A report does not discuss Policy 13(1). I consider Policy 13(1) to be relevant to the proposal. Policy 13(1) recognises that the use of Southland's water and land resources enables people to provide for their socioeconomic and cultural wellbeing. The proposal meets this by enabling the applicants to continue to provide for their economic and social wellbeing and that of the staff and contractors they employ. The applicants' farming operation generates positive effects for the immediate small Southland community of Heddon Bush, as well as the wider regional economy of Southland and will be enabled to continue to do so through implementation of the proposal.

87. In relation to water quality, policies 5, 10, 12, 15B and 16, are the most relevant policies regarding the effects of diffuse discharges on water quality. I consider policies 15B and 17 are relevant to the applications seeking resource consent for the discharge of agricultural effluent.
88. I consider that the proposal is consistent with policies 5, 10 and 12 respectively. Clause 3 of policies 5, 10, 12 directs that in the Central Plains, Oxidising and Riverine zones, decision makers "...*generally not granting resource consents for additional dairy farming of cows or additional intensive winter grazing where contaminant losses will increase as a result of the proposed activity.*" I consider that because the expert evidence strongly indicates that contaminant losses will decrease rather than increase these proposals are not inconsistent with these policies.
89. Policy 15B directs that where existing water quality standards are not met, water quality must be improved and refers to the avoiding, remedying or mitigating any adverse effects of new discharges to achieve this. The expert evidence strongly indicates that contaminant losses will decrease and it is highly likely that there will be small (but not measurable) improvements in water quality. Therefore the proposals are consistent with this policy.
90. I don't consider that Policy 15B example clauses (1) and (2) are applicable because they refer specifically to mixing zones which as defined in the pSWLP appear to only be relevant to surface waters and some drinking water zones.
91. While it is my view that policy 15B is specific to surface receiving waterbodies, and it is an oversight that pSWLP does not have an equivalent policy for the management of groundwater quality, Objectives 6 and 8 provide a similar but not as specific direction to maintain and improve groundwater quality.
92. Policy 16(1)(b)(iii) is relevant to the proposals because the expert evidence strongly indicates that Appendix E Water Quality Standards are not fully met for any of the surface water receiving waters. Other parts of Policy 16 (1) are not relevant to the proposals. Policy 16(1)(b)(i) is not relevant because the adverse effects can be appropriately mitigated. Policy 16(1)(b)(ii) is not relevant because firstly the term overallocated is not defined in the pSWLP and secondly even if a common understanding of the term is accepted (as used in the NPSFM) no catchment nutrient load allocation limits have been set, as is the case in many other regions.
93. I disagree with the reporting officers' concerns about 'transferring or balancing' of effects. I accept the experts' evidence on the estimates of decreases of contaminant losses from the properties. As

far as I am aware, the contaminant loss modelling evidence has not been contested by any expert reviews.

94. I consider the use of the term 'generally' in the policy allows for exceptions based on the merits of a proposal. The expert evidence is that the proposals are highly likely to result in a reduction in nutrient losses to water with a significant reduction to the Waimatuku catchment from the WW4 & WW5 dairy platforms. The expert evidence is that effects are not being transferred elsewhere to achieve this. The expert evidence on the nutrient losses at WRO is that there would be a small reduction of nutrient losses there. The proposals would assist in the achievement of a number of water quality objectives of the pSWLP, the RPS and the RMA: to improve water quality where water quality is degraded.
95. Because the evidence is that the proposals are highly likely to result in small improvements in water quality they qualify to meet the exception "generally" provided in the rule.
96. The applicability of Policy 39 of the pSWLP will be commented on in the legal submission. I don't consider the permitted baseline concept that easy to apply to water quality management where it would be extremely difficult to attempt to for example separate out all the contributions to concentrations of nitrogen in groundwater and be able to identify those that are caused by activities that "... a National Environmental Standards or plan permits..." (S104(2)).
97. Tangata Whenua values have been considered in developing the proposal to meet policies 1,2 and 3 of the proposed 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 (if granted).

Rule Framework

98. I agree the overall activity status when bundled is discretionary, therefore, consent can be granted in accordance with Section 104B of the Resource Management Act. I note that the farming proposal is a discretionary activity under Rule 20(e), which does not mention a baseline (unlike (d)) nor does the rule mention the term "landholding". I clarify that four years of data was provided for the modelling of the proposed dairy platform area.

Draft consent conditions

99. I note the reporting officer has not yet recommended draft consent conditions but has indicated that draft conditions will be provided immediately prior to the commencement of the hearing. We would be pleased to provide input into preparing a suite of robust conditions that would provide an appropriate level of reassurance that all the farm systems and mitigation measures proposed are implemented and that the modelled reduction in nutrient losses are achieved.
100. To assist in starting this process the applicants proffer the following condition in relation to ensuring a high level of compliance is achieved in the future.
- a. Condition: The applicants will, by 30 June of each year, provide to the Manager Compliance, Environment Southland, an audit report produced by a person suitably qualified in rural environmental compliance, outlining the manner in which the conditions of this consent and all applicable LWRP permitted activity rule conditions have been complied with in the preceding season.

Consent Duration

101. Should consents be granted, the applicants have applied for terms of 20 years. The reporting officers has indicated that the pSWLP policies 40 and 41 should be considered. Policy 40 lists seven factors to be considered when determining the term of a resource consent. I consider that careful consideration of those matters should provide for durations of at least 15 years.
102. The reporting officer has also included an extensive assessment of matters that the officers consider justify a maximum duration of five years. The basis for this appears to be primarily concerns about prior relatively minor non-compliance instances and the concerns about a future plan change. I do not consider that either of those matters would justify such a short-term for resource consents of this scale. There are existing provisions in the RMA to enable resource consents to be reviewed for example, to ensure that any new water quality standards are implemented (S128(1)(b)), to implement new National Environmental Standards (S128(1)(ba)) or a relevant regional rule (S128(1)(bb)).

MATTERS RAISED BY SUBMITTERS

103. The application for resource consent was publicly notified. Submissions were received from seven parties. Further comment has been provided on submissions below.

Party	Position
Lindsay Youngman	Support
Mid Aparima Catchment Group	Support
Ivan Lines	Support
Joanne Flett and Susan Flett	Neutral
Te Ao Marama Inc. on behalf of Te Runanga o Oraka Aparima	Oppose
Ministry of Education	Oppose

104. We note that the submission from Ivan Lines is not covered in the section42A report however it has been confirmed by Ms Bragg that Mr Lines is submitting on this these proposals.

105. Supporting submissions recognise the applicants as being environmental leaders in the dairy industry in Southland. They describe actions strategically taken by the applicants to reduce their environmental footprint, which submitters believe yields benefits to soils and water in the catchment. Supporting submitters recognise the applicants to have a high level of commitment and investment (financial, social and environmental) in their farming life and to the local community in Southland.

106. A neutral submission was made by the owners of the Merriburn block (part of WR) Joanne and Susan Flett. The Fletts recognise that the applicants implement sound environmental practices at the Merriburn Block. They confirm that the lease has no right of renewal and ends in October 2021. While they will honour the terms and conditions of the lease agreements, they do not agree to jeopardise their position in the future and wish the Merriburn Block to be excluded from the landholding.

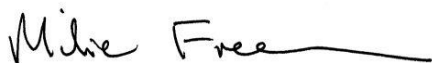
107. Te Ao Marama Inc (TAMI) have submitted in opposition to the application with concerns about the current state of water quality in the region and identify that water quality needs to be maintained and/or improved. Te Rūnanga o Ōraka Aparima are opposed because they have concerns about potential risks to the environment (including groundwater and surface water) and Ngāi Tahu values that it poses, the current degraded state and the need to avoid the risk of further deterioration to the environment and the Ngai Tahu values and cultural wellbeing.

108. An opposing submission by the Ministry for Education raised concerns about potential adverse effects on the water take for the Heddon Bush School bore, which supplies drinking water to the school. The school is located approximately 4 km north east of WW4 and 5 km north east of WW5. The Ministry seeks that the application is refused unless:

"-the applicant can provide quantitative assessment to establish water supply of Heddon Bush school is not adversely affected. "

CONCLUSIONS

109. Environment Southland have recommended decline for these applications. Fundamentally, they do not appear to agree with the expert evidence that implementing the proposals are highly likely to result in an improvement in water quality in the receiving environments. The central basis for their view appears to be that they do not have confidence in Overseer modelling, consider that the improvements rely on inappropriate baseline estimates that rely on what they consider unlawful land use and finally are concerned about the risks that they consider arise from the presence of Braxton soils. Other issues are raised such as difficulty in quantifying GMPs. I consider that these concerns are unfounded and the expert evidence is reliable and therefore the conclusions that it is highly likely that there will be reductions in contaminant losses and consequential small improvements in water quality is robust.
110. A central difference between my view and that of the reporting officers is that I have confidence in the Overseer and other modelling, both in terms of its appropriateness generally and in the context used in this proposal. My own technical background allows me an understanding of the nature, limitations and benefits of models, so long as they are appropriately used. In this case, I consider that the proposal is founded on appropriate and valid modelling that can be relied upon to determine reasonable estimates for both baseline and proposed nutrient losses. The assessment of effects' conclusion that implementation of the proposal will allow for a small improvement in water quality is founded on valid and accurate information and can safely be relied on.
111. The granting of the consent applications is highly likely to result in an improvement for water quality compared to the past and importantly, compared to the situation if consents are not granted. In the context of this application, the intent of the proposed plan and higher documents is to improve water quality in the receiving environment. My view is that overall and at each site (dairy platform and support blocks) this will be achieved by implementing the proposals.



MIKE FREEMAN
SENIOR SCIENTIST/PLANNER
19 September 2019

APPENDICIES

Appendix A- Email correspondence between Tanya Copeland and Aurora Grant regarding modelling of Collies block.

From: Aurora Grant <Aurora.Grant@es.govt.nz>
Sent: Tuesday, 5 February 2019 8:05 PM
To: Tanya Copeland <tanya@landpro.co.nz>
Cc: 'abe@woldwide.nz' <abe@woldwide.nz>; 'Anita De Wolde' <anita@woldwide.nz>
Subject: RE: WW5 and Collies block

Hi Tanya,

Attached is the reviewed AEE for WW4. It's looking really good, only a few comments from us. Some of the earlier comments you can probably disregard, because you covered them further down, but it may be worth briefly covering off in the top bit if you want.

I notice that WWRO has been excluded from the AEE – the same approach was taken with ww1&2, however I advised Nessa and need to let you know too that if WWRO is not addressed in the applications AEE's for the landholding we will not be able to accept them as complete under S88. I know Abe and

Anita feel strongly that it is not part of the landholding, however that would be a matter to bring up at the hearing rather than not including it and having the application returned.

In regards to your questions below, I have answered them in green below.

Thanks again for the chance to review the AEE's prior to submission, it has been very helpful.

Cheers,

Aurora

|

From: Tanya Copeland <tanya@landpro.co.nz>
Sent: Monday, 4 February 2019 4:57 PM
To: Aurora Grant <Aurora.Grant@es.govt.nz>
Cc: 'abe@woldwide.nz' <abe@woldwide.nz>
Subject: WW5 and Collies block

Hi Aurora,

Thanks for your email on Friday (attached below) – yes I have been speaking with Nessa. I can assure you that when you see my full and final draft you will see that our approaches to things match each other. We have spent a great deal of time in the last week or so ensuring that everything matches, especially if that means going down a conservative approach for one of the applications.

Also, when we withdrew our last applications you said you would check the legality of the surrender and what this means going forward. I cant remember if you got back to us with a final determination. However, in the interim I have ensured the new application officially re-seeks consent for the conversion of Collies block under Rule 20 and I have assessed it as I would the conversion of any other piece of land. I did give you an answer to this at some stage, I think on the phone. There is no legal option to "reverse" the surrender of the block, however I discussed that I plan on addressing it in my S42A report and essentially approaching with a consented baseline discussion. The approach you have taken regarding the reconsenting is correct. I'm sure you have already covered it, but if you could cover off any steps already taken towards converting that block prior to the surrender, and how it was included in the original conversion/ shed build for ww5 that would be helpful.

I need clarity from you however on how this situation needs to be modelled. We had an initial agreement that the Collies block would be modelled as dairy land in the baseline. The baseline we then drafted was completed some months ago when we originally submitted the application which we then used to formulate our entire proposal around. Are you happy that we continue with this agreed approach for the baseline going forward? It would be our utmost preference to leave these two budgets as they have been completed, reviewed and agreed upon as having to redo them will mean completely starting all budgets from scratch. Yes, provided it is well explained in the application why this approach has been taken and there is a discussion on the losses prior to conversion.

This means you will receive a baseline nutrient budget of the WW5 platform as existing with Collies proportioned in based on its previous approval to be dairy land. Then you will receive a proposed budget with the additional Cochrans land and cow numbers increased to discharge permit levels. Then there will be a nutrient budget with the wintering barn included. We believe the approach of these three models shows the proposal in the clearest way possible. That is fine.

Your advice is appreciated,

Thanks

Tanya

Appendix C – Farm Environmental Management Plan (Draft)

Woldwide Four Limited

Farm Environmental Management Plan

March 2019



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

Objectives of this plan:

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

This will be achieved through;

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

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

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

B: SITE PLANS

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

KEY FEATURES	PLAN(S) WHERE KEY FEATURES ARE MAPPED
Site boundary	All site plans in this FEMP
Physiographic zones, variants and soil types	Figure 1 and 2: Physiographic Plan Figure 3 and 4: Soil map
Lakes, rivers, streams ponds, artificial watercourses, modified watercourses and natural wetlands	Appendix A: Existing Waterways and Critical Source Areas
Other critical source areas (gullies, swales etc)	Appendix A: Existing Waterways and Critical Source Areas
Land with a slope greater than 20 degrees	N/A
Existing and proposed riparian vegetation and fences (or other stock exclusion methods) adjacent to waterbodies	Appendix A: Waterway location, most have riparian planting
Places where stock access or cross water bodies (including bridges, culverts and fords)	Appendix A: crossings labelled
Known subsurface drainage system(s) and the location of drain outlets	Appendix B
All land that may be cultivated over the next 12 months	TBC – once consent granted
All land that may be intensively winter grazed over the next 12 months	TBC – once consent granted

C: PHYSIOGRAPHIC ZONES AND KEY CONTAMINANT PATHWAYS

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

The physiographic plans shows the spatial distribution of the physiographic zones on the entire property according to the Environment Southland Proposed Water and Land Plan 2018 (PSWLP) as mapped by Beacon Mapping Service. The mapping system also details the key contaminant pathways present for each physiographic zone and any variants for the location.

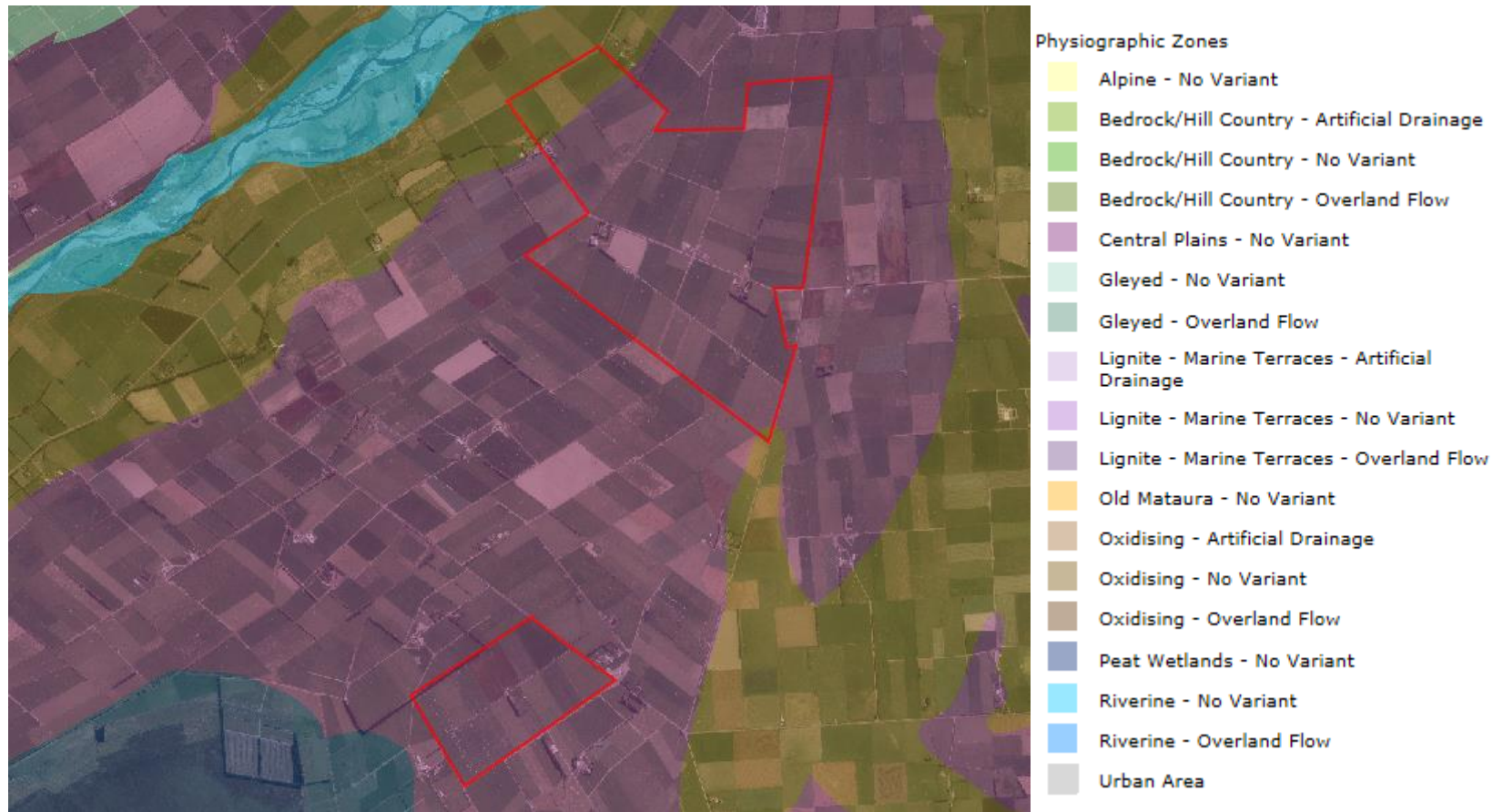


Figure 1: Physiographic Zones on the farm (showing dairy platform and Gladfield block)



Figure 2: Physiographic zones at Woldwide Runoff

D: SOIL TYPES

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

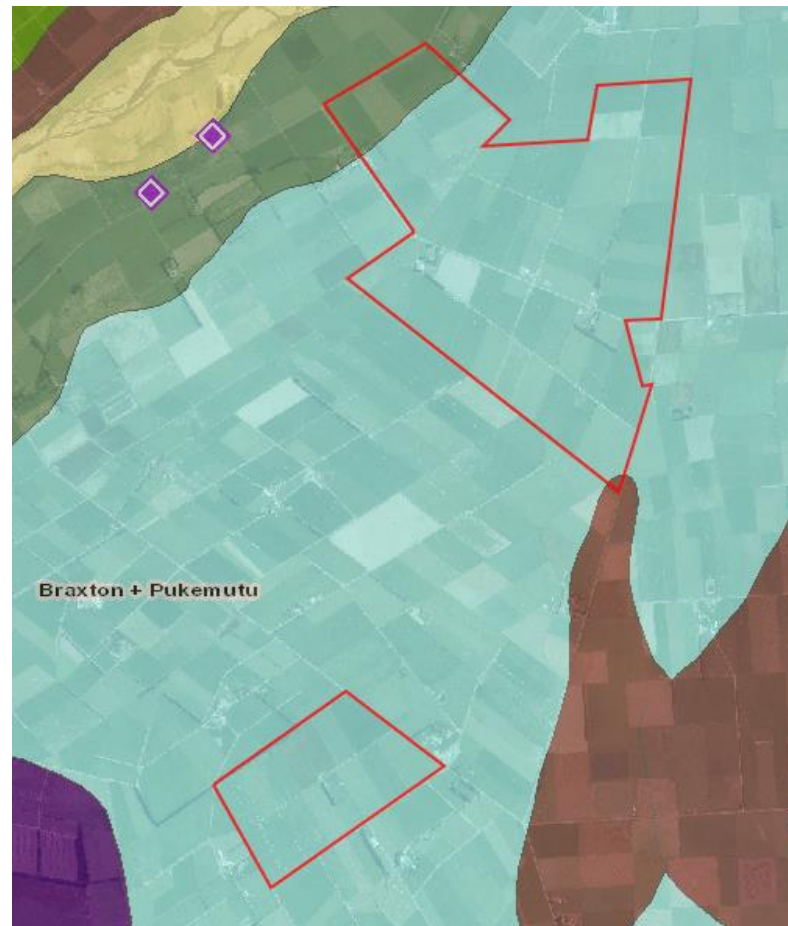


Figure 3: Soil types found on the farm (Blue = Braxton, Green= Tuatapere)

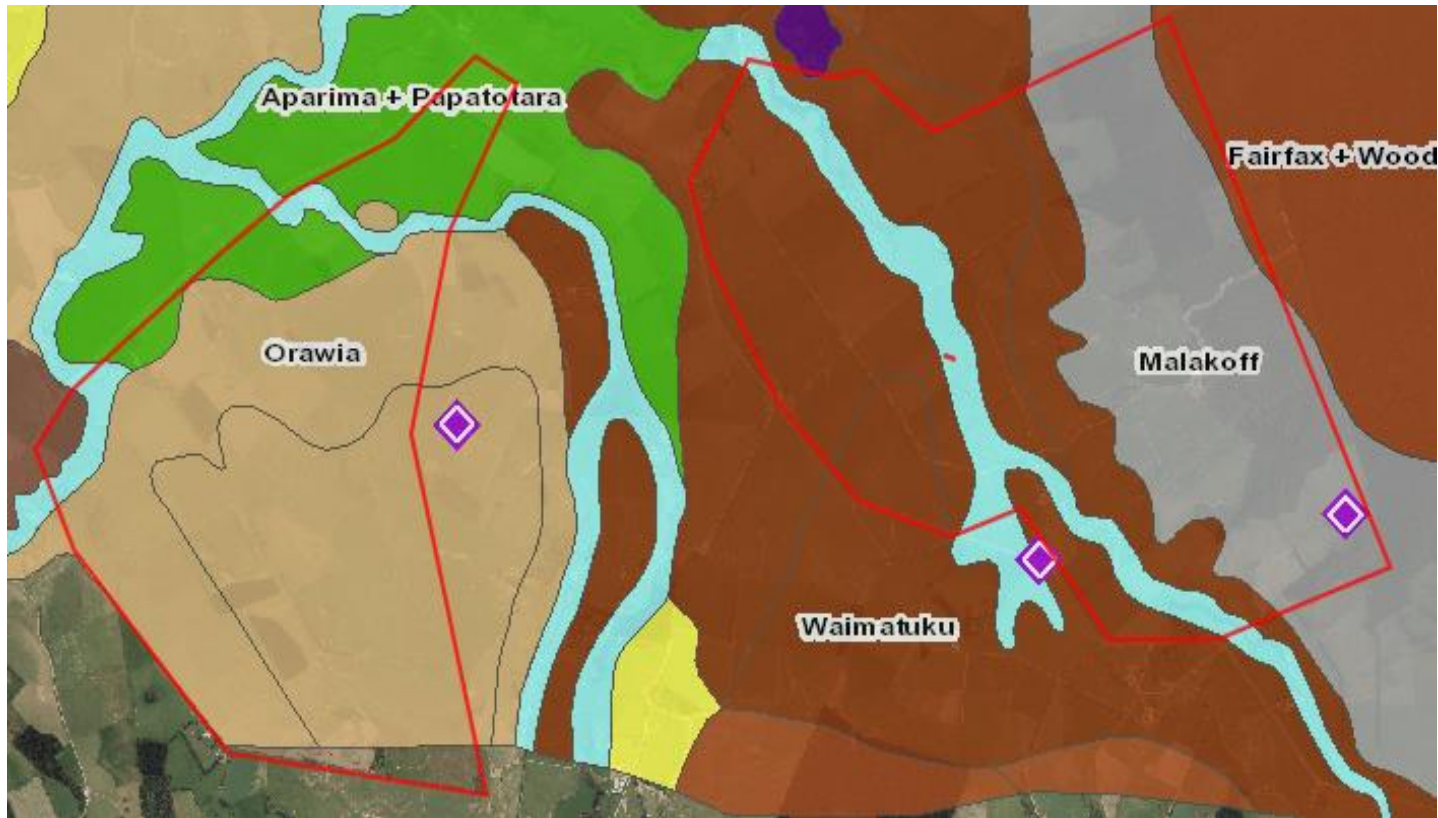


Figure 4: Soil types at Woldwide Runoff

E: GOOD MANAGEMENT PRACTICES - GENERAL

Mitigation	Good Management Practice	Review notes
Protect soil structure (will also help with P and N loss)	Wintering the milking herd on fodder beet on the support block (Gladfield) until wintering barns completed. Also refer to Section G.	
	Re-sow bare soils as soon as possible	
	Use of selective grazing to avoid grazing very wet paddocks and open the breaks up to avoid pugging and treading damage.	
Manage Critical Source Areas (CSA)	Avoid working CSAs and their margins	
	Leave grassed areas (or native vegetation) around CSAs especially when grazing winter forage crop and/or graze as "last bite". Grazing direction must be down the slope or towards CSA.	
	All riparian margins must be fenced and left to establish with grasses to enable filtration of contaminants that may be transported via overland flow processes.	
	Create Riparian areas to mitigate overland flow into water ways Refer to Consent Nutrient Budget Adjustments'.	
Additional P loss reduction	Reduce use of P fertiliser where Olsen P values are above agronomic optimum. Maintain Olsen P levels at around 40.	
	Reduce the risk of run-off to laneways and other sources by ensuring crossings are adequately maintained and maintain gradients of laneways to direct runoff to pasture.	
Reduce accumulation of N in the soil	Use nutrient budgeting to manage nutrient inputs and outputs	
	Time N fertiliser application to meet crop and pasture demand using split applications and avoid high risk times of the year i.e. when soil temperature is low or during drought periods	

Avoid preferential flow of FDE through soil profile and artificial drains	Defer effluent application when soil conditions are unsuitable especially when applying effluent to high risk paddocks	
	Apply effluent at low rates and depths and utilize entire effluent discharge area	

F: RIPARIAN MANAGEMENT

The dairy farm and Gladfield are mapped to drain to Waimatuku Stream and Aparima River. Woldwide Runoff drains to the Orauea River.

All waterways are already fenced to exclude stock as required by the supplier on the dairy platform. Any other waterways on the support land are fenced. All riparian margins are left to establish with grasses and native vegetation in the first instance or as a minimum. Some waterways contain riparian planting.

Riparian buffer zones will be created with natives and hedge like trees to retain nutrients and stop over land flows, along the River edges and any further created water ways. Riparian planting areas are identified on the map in Attachment A.

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

Appendix A maps the waterways present on the property, any stock crossings and/or CSA's for riparian management, with additional identified areas required to enable the P loss reductions modelled for the consent.



Figure 5: Photos of artificial drainage channels on the farm with stock exclusion and riparian vegetation.

G: CRITICAL SOURCE AREAS

Critical Source Areas (CSA's) are areas that have high risk of channelling contaminants to waterways. CSA's for the property have been identified, as indicated in the Cultivation Map (Attachment A) The CSA's for the property include:

Good Management Practices that will be employed in the management of CSAs are summarised in the table above.

Areas where over land flows collect and pool, with ability to flow into water ways are CSAs. As in Woldwide 1&2, these areas will be fenced and planted with Natives and flaxes etc. Fence off CSAs to create a grass or grass shrub buffer zone to filter contaminants and prevent stock access. The faster the water is flowing across a buffer zone, the wider the buffer zone should be to provide time for effective filtering. Plants which will slow and filter the sediment and nutrient overflows from entering water ways. The areas have been identified in the attached map in Attachment A.

H: INTENSIVE WINTER GRAZING

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

Appendix C includes a farm map of winter grazing paddocks for 2018/2019 and 2019/2020 seasons for the Gladfield block. Full cultivation is undertaken and crop type is fodder beet. Refer to Runoff block FEMP.

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

Mitigation	Good Management Practice	Review notes
Protect soil structure and reduce N, P, sediment and faecal indicator organism loss from intensive winter grazing activities	Grazing direction must be top of slope to bottom of slope. Use break or block feeding and ensure a last bite of 5-20m is left from CSA's	
	Back fencing must be used to prevent stock from entering previously grazed areas	
	Portable water troughs must be used to prevent stock from entering previously grazed areas	

	Portable feed containers must be used for supplementary feed to avoid feed wastage	

I: NUTRIENT MANAGEMENT

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

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

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

Lane ways: Identified lane ways are to be re directed, involving cutting trees back to aerate lanes better (thus drier), plus widen lanes and contour them to drain to the paddocks and away from water ways. In addition, where lanes have areas which add to over land flow into critical source areas, these also will be re directed.

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

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

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

Record	Nature of information/person	Collated (Y or N)
Production	Fonterra App, docketts	
Soil test results	Lab results, Ravensdown rep	
Fertiliser application records	MINDA land & feed, Ravensdown rep	
Proof of placement	MINDA land & feed	
Effluent application records	Dairy diary	
Crop rotation records	Farm map with total hectares	

Stock numbers	Culling timeframes Young stock grazed on farm Breeding bulls	
Record of supplements purchased	Invoices/Cash manager, MINDA	
Records of supplements made on farm	Invoices/Cash manager	
Farm map/effective hectares	Farm manager	

J: FARM DAIRY EFFLUENT

This section of this plan documents the methods that will be employed in the operation of the Farm Dairy Effluent (FDE) System to ensure that the discharge of effluent occurs in accordance with conditions of consent. Appendix D includes a full FDE Management Plan, monthly check sheets and staff training record.

Total effluent discharge area:	78 ha liquid effluent discharge area, 320 ha slurry discharge area
Available storage volume:	3,801m ³
Storage Type:	Effluent storage pond, concrete bunker, slurry effluent pond
Effluent application method:	Low rate pods Slurry tanker/muck spreader/umbillical Travelling irrigator
Maximum application rate and depth of application:	10mm/hr 25mm depth per application. 2.5mm depth for slurry/muck spreader/umbillical

Mitigation	Good Management Practice	Monitoring
Reduction in effluent generation	<ul style="list-style-type: none"> Reduce water use in shed by reusing clean water where possible Treat the herd gently to avoid upset 	N/A
Effluent applied only when soil conditions are appropriate	<ul style="list-style-type: none"> Sufficient storage provided so that when soils are at or above field capacity and/or during adverse weather conditions, effluent can be stored in the effluent storage pond until conditions are suitable for application Monitoring of soil moisture using the ES website. Paddocks will be inspected before effluent application to check that soil water deficit exists. 	N/A

	<ul style="list-style-type: none"> • Low rate application will be preferentially used during higher risk periods of the year with the travelling irrigator used mainly in summer when a greater soil moisture deficit occurs 	
Avoidance of direct effluent disposal or runoff to sensitive areas	<ul style="list-style-type: none"> • Effluent discharge will observe a range of buffers from sensitive receiving environments as shown on the Appendix I plan attached to the discharge permit • Low rate effluent discharge will avoid ponding and/or runoff • Effluent will not be discharged onto any land areas that have been grazed within the previous 5 days • Effluent discharge will be to the entire effluent discharge area 	Record irrigation dates, times and areas in the DAIRY DIARY
Avoidance of effluent contamination in tile drains	<ul style="list-style-type: none"> • Low rate effluent discharge to reduce the risk of through-drainage and associated risk of effluent entering water • Mapping of tile drains 	N/A
Efficient and effective collection, storage and delivery of effluent from infrastructure at all times	<ul style="list-style-type: none"> • Monthly/frequent system checks will be undertaken using the Monthly Effluent Check Sheet attached • All parts of the effluent system will be checked and maintained regularly • Leaks will be repaired immediately • Fail safe systems will be kept in place and kept in good working order i.e. automatic alarm and shut off system 	Record all repairs and maintenance (invoices, cash manager) Monthly Effluent Check Sheets filled out and signed
Staff appropriately trained in operation and understand the effluent system	<ul style="list-style-type: none"> • All staff involved in the management of the effluent system are fully trained in its use • All staff are familiar with and understand the conditions of consent • All new staff will be taken through the "Staff Training Guide" (attached) • Staff to take immediate action if incident or breakdowns occur including; <ul style="list-style-type: none"> - Rectifying the problem - Cleaning up if possible 	Keep signed training record in the back off this FEMP Ensure both farm manager and employee sign to confirm training
Application that is not offensive to neighbours	<ul style="list-style-type: none"> • Wind conditions will be checked to ensure the effluent can be discharged without resulting in spray drift and odour beyond the property boundary • Observation of buffers to dwellings not located on the property (200 m) and property boundaries (20 m) 	Complaints received by Environment Southland

K: COMPLIANCE AND REPORTING

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

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

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

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

L: ANNUAL REVIEW AND AUDIT OF FEMP

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

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

M: INDUSTRY GUIDELINES

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

Environment Southland www.es.govt.nz

Dairy NZ www.dairynz.co.nz

Fonterra www.fonterra.com

Dairy NZ – A staff guide to operating your effluent irrigation system – Low Rate System

Dairy NZ – A farmer's guide to managing farm dairy effluent – A good practice guide for land application systems

Dairy NZ – Wintering in Southland and South Otago – A land management guide to good environmental practice

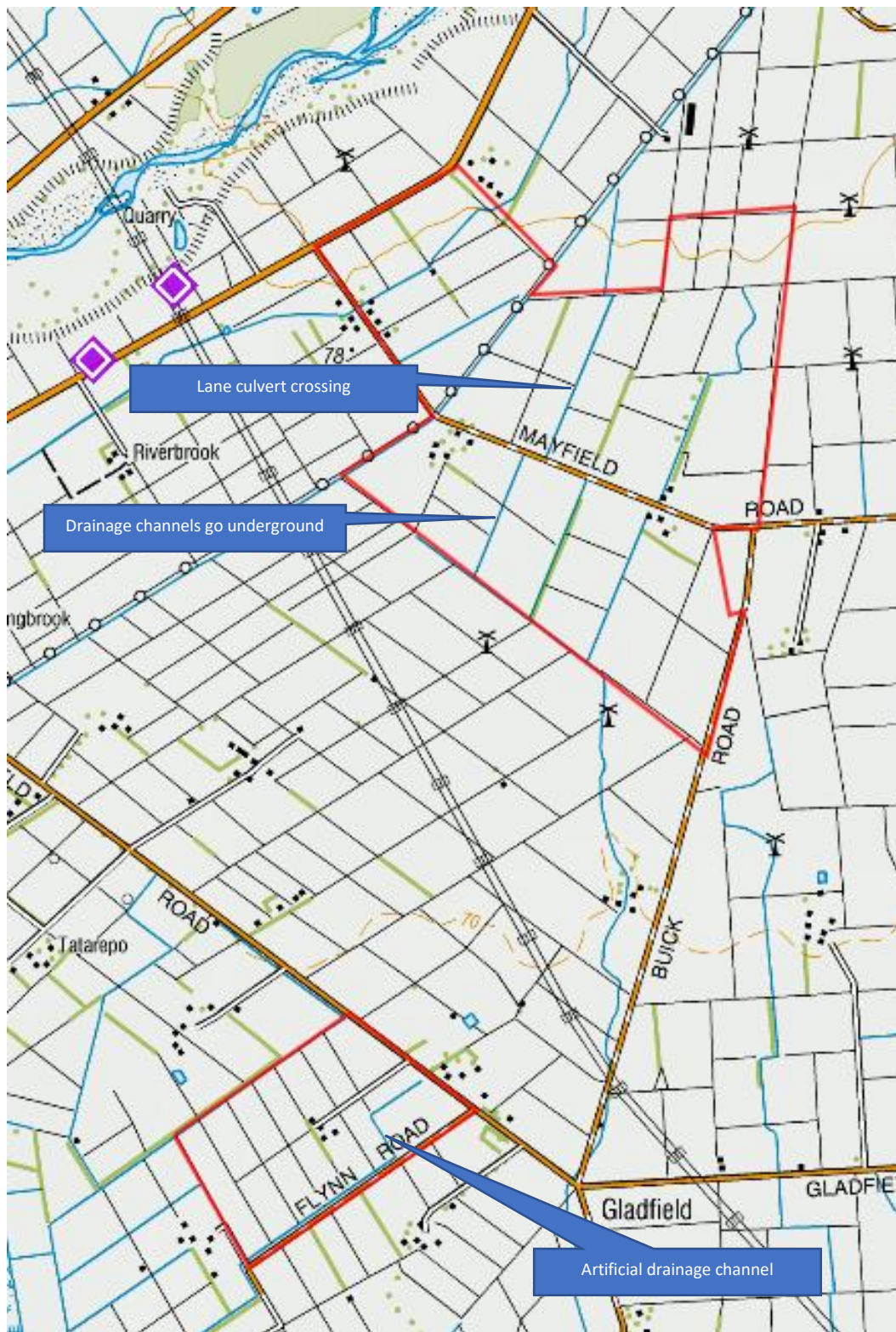
Dairy NZ – Land management on Canterbury Dairy Farms – Managing land to reduce sediment and phosphorous loss

Environment Southland Factsheet – Critical Source Areas

Environment Canterbury – Information Sheet for Farmers on OVERSEER®

Sustainable Dairying: Water Accord

Attachment A – Waterways, CSA



WW 4 P loss Mitigations



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HawkEye

Features of P Mitigation WW4	GPS point	Area
Critical Source Area 1	-46.098770; 168.1162341	0.09
Critical Source Area 2	-46.098691; 168.114946	0.02
Critical Source Area 3	-46.098745; 168.117293	0.02
Critical Source Area 4	-46.102338 168.103812	0.05
Total		0.2 ha effects 14.2 ha (3.6 % modelled 2.5 %)
Laneway 1	-46.094740 168.113817	0.4 km
Laneway 2	-46.088775 168.116765	0.3 km
Lane way 3	-46.099268 168.105640	0.6 km
Total		1.3 km (modelled 1.1 km)

Lane way 1














Critical Source Areas 1-3

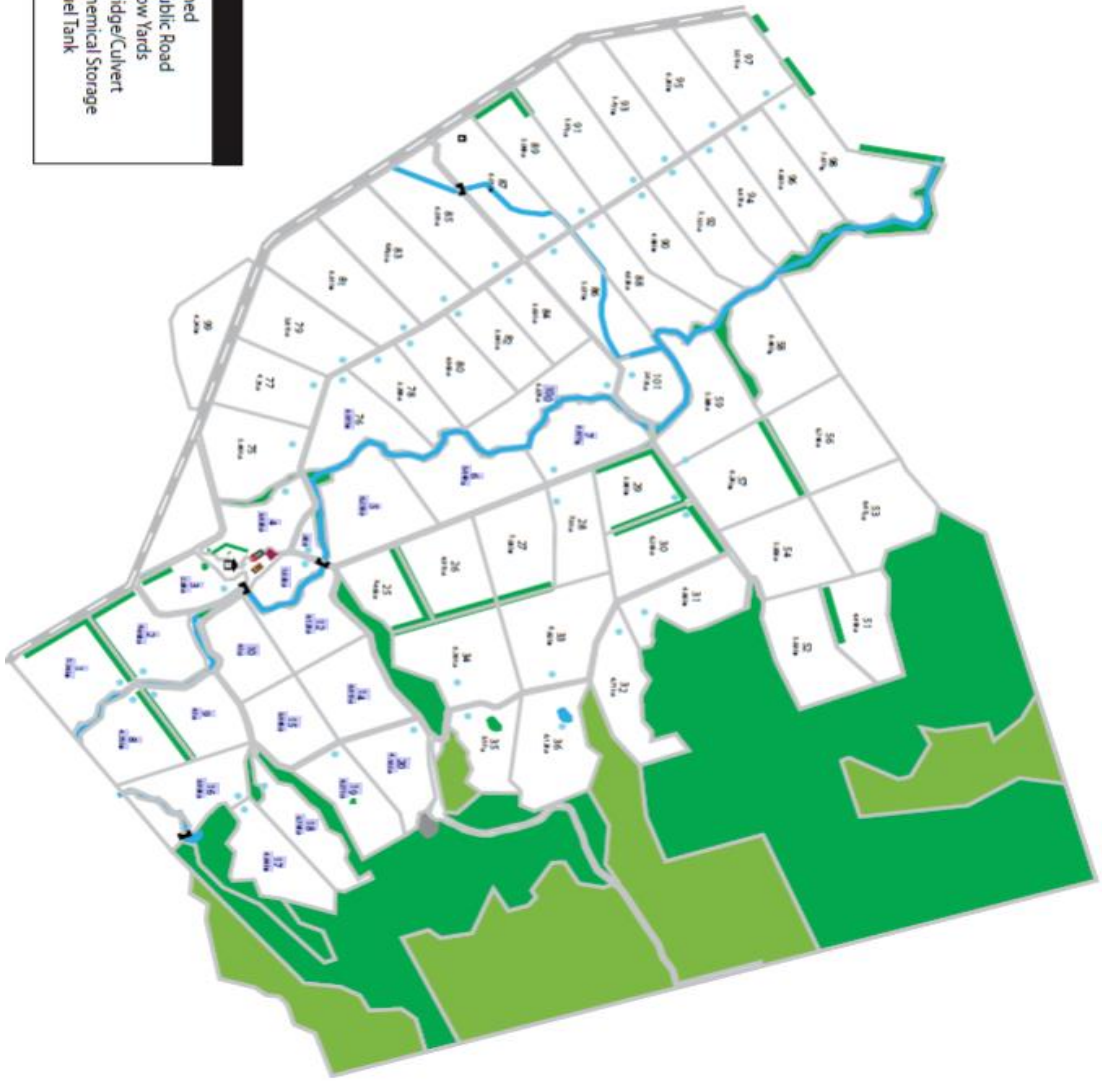


Culvert 2 and Laneway 3

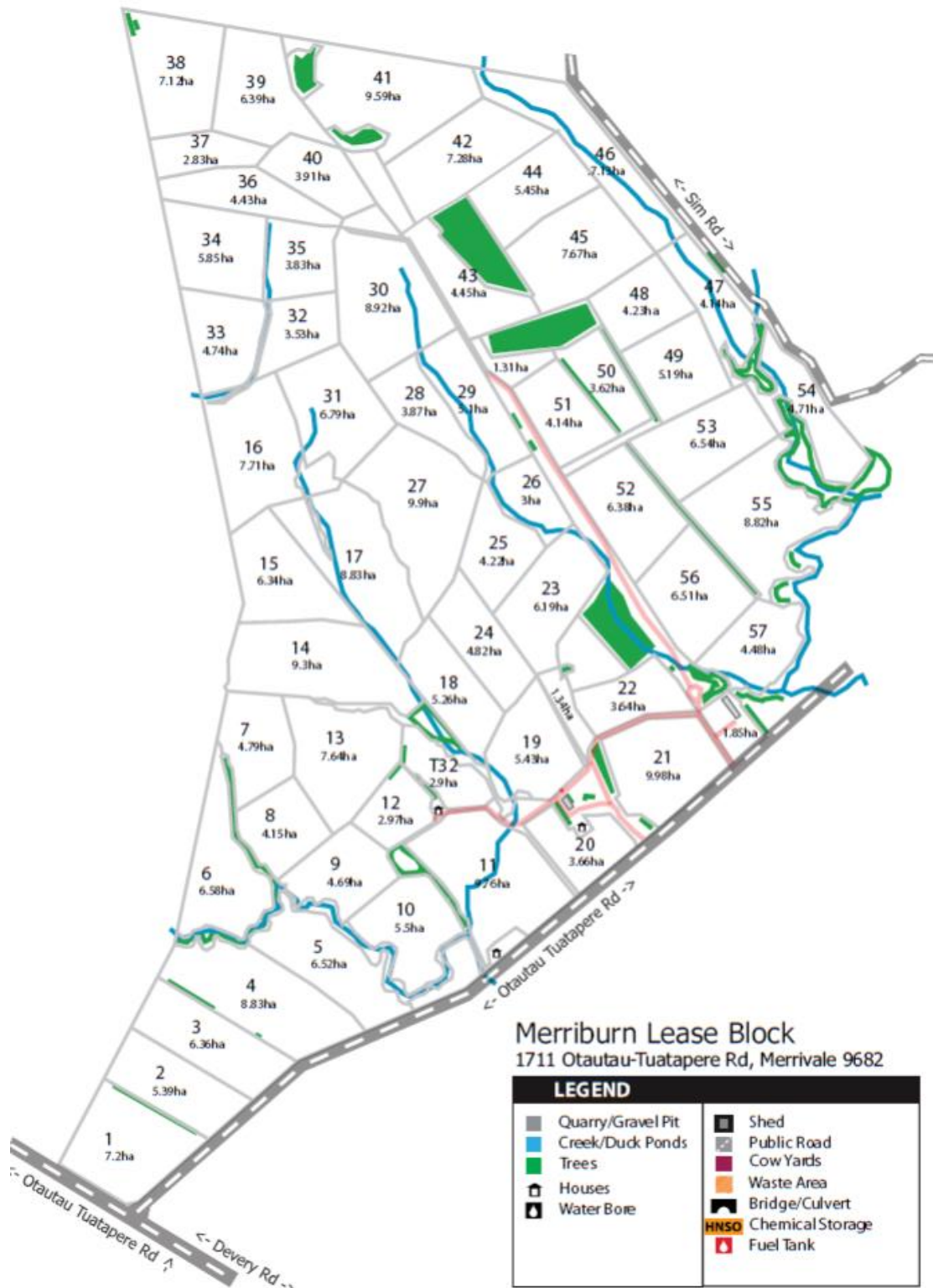


Woldwide Run-Off
 20 Gill Rd, Merrivale 9682

LEGEND			
	Quarry/Gravel Pit		Shed
	Creek/Duck Ponds		Public Road
	Trees		Cow Yards
	Houses		Bridge/Culvert
	Water Bore		Chemical Storage
			Fuel Tank



Farm map for Woldwide Runoff original block (Merrivale Block)



Farm map for Woldwide Runoff lease block (Merriburn)

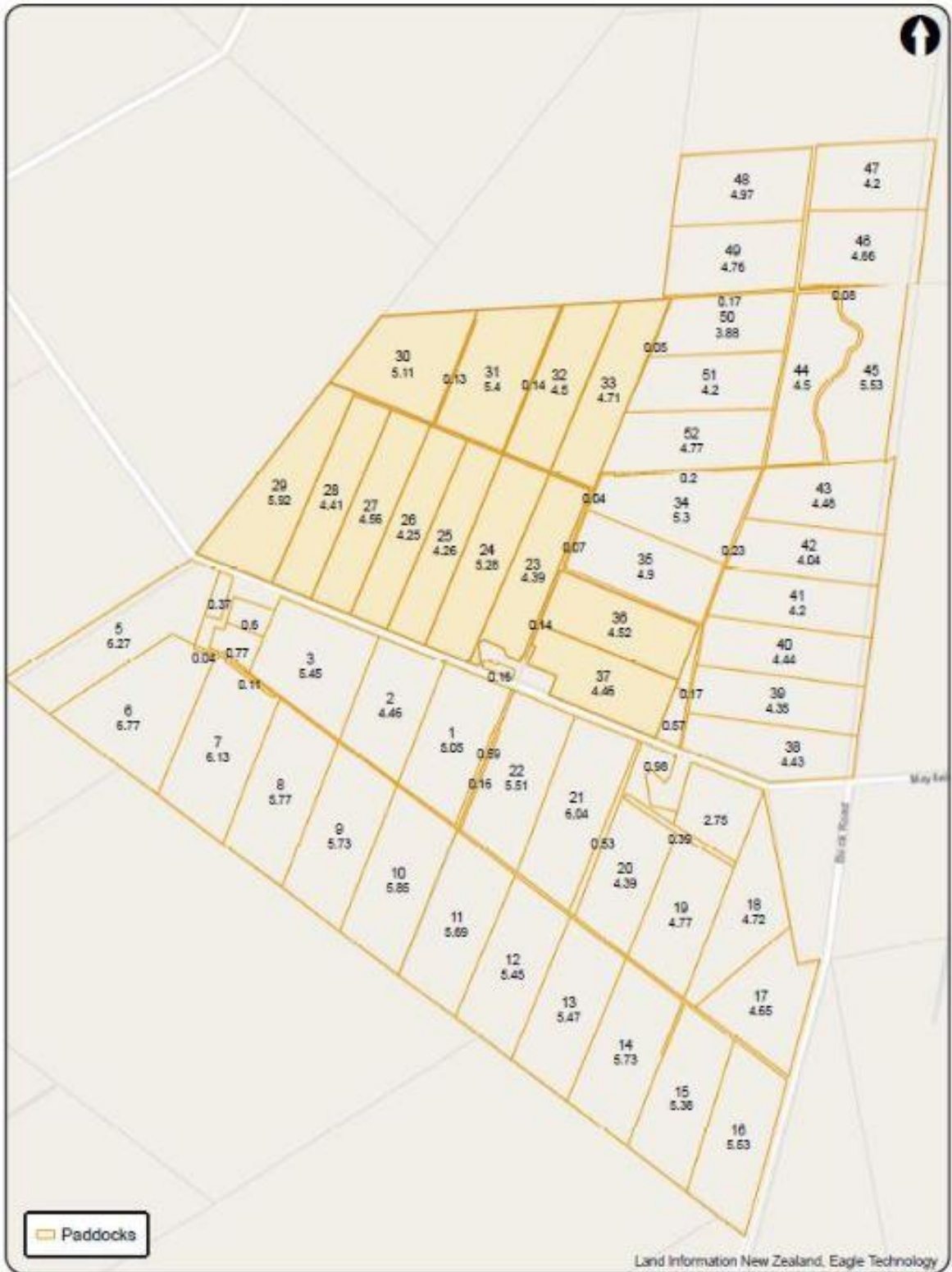
Appendix B – Tile drain map (Dairy platform)



Appendix C – Crop paddocks (Gladfield block)



Appendix D: Effluent Management



My Ravensdown Smart Maps
www.myravensdown.co.nz
 Note: Areas are in hectares
 Copyright Ravensdown Ltd

Effluent area 61.8 ha

0 70 140 280 420 560 Metres




Effluent Orientation and Training Record

Season ___/___

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

Trainer signature			
Employee signature			
Date			

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

Smart Water Use in the Farm Dairy

This guide looks at water use in and around the farm dairy, and whether there's potential for greater efficiency. Use it to evaluate your options for improvement.



Efficient use of water can help:

- control power use and costs
- manage effluent in a cost-effective manner
- get the most out of staff time
- reduce water costs if you pay for it by volume
- meet regulatory obligations that may apply in your region.



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Smart Water Use in the Farm Dairy

Milk cooling

Use source water from Tank 1.

Aim for the recommended ratio of 2½ water: 1 milk

For example,

$$2.5 \text{ litres (water) } \times \text{ peak daily litres (milk) } \\ \div 1,000 = \text{m}^3/\text{day water use}$$

To measure milk cooling efficiency

Measure exit flow into a 200 litre drum during milking.
Flow rate in litres/min x total daily milking time (clock this) ÷ 1,000 = m³/day water use

Alternatively, install a meter on the line delivering water to the plate cooler

Efficiency options

Things to consider if improved cooling efficiency is warranted:

- use of correct flow rates
- optimal plate spacing to increase flow
- pre-cool water source
- ice banks/heat exchangers (can be costly).



Return milk cooling water to Tank 2 for use in yard wash down.

Ensure adequate storage space remains to take all milk cooling water (use float ball or probes).

Capture roof water for reuse or at least exclude it from the yard to prevent increasing effluent volumes.

Yard wash down

To measure yard wash down water use

Follow the steps and calculations in the accompanying Worksheet to estimate water use.

Efficiency options

For manual yard washing, here are some ways to improve water-use efficiency.

- Pre-wet the yard on warm, sunny days with a yard hose or sprinkler.
- Use a scraper or a chain (inside an old yard hose) on the backing gate to break up dung before hosing.
- Wash the yard after each milking.
- Work actively and close to the effluent.
- Hose the yard with high water volume under low pressure.
- Include a timer setting on the yard wash down pump (set a time standard for wash down and train staff to achieve it).
- Consider capturing excess cooler water (that would otherwise go to waste) in tipper drums for yard wash.
- Flood wash with water recycled from the effluent pond (refer to conditions of use from your milk processor).



Plant/vat wash

Use water from Tank 1.

To track plant/vat water use Wash tubs and hot water cylinders use set amounts of water. Refer to washing routine instructions supplied by the detergent companies.



Efficiency options

Here are some steps you can take to reduce plant/vat wash water use:

- Seek advice from your detergent rep on litres required for hot/cold wash options.
- Refill tanks/cylinder with automatic shut-off (to avoid overflows). Use a toilet cistern and trough floats as proven refill/shut-off options.
- Consider heat exchange or pre-heating to improve energy efficiency.

Milking routines

Procedures and practices during milking affect water-use efficiency. Below are some ways to cut water use.

- ❖ Pre wet ball and yard.
- ❖ Minimise sprinkler/spray washing.
- ❖ Hose little and often (as required) in pit area.
- ❖ Put cups on dry, clean udders (see DairyNZ's SmartSAMM – www.smartsamm.co.nz).
- ❖ Implement a calm, consistent routine to reduce stress in animals and, in turn, effluent in the dairy (see DairyNZ's Milksmart – www.milksmart.co.nz).
- ❖ Maintain the dairy (paint/surfaces) to minimise the need for continual wetting.
- ❖ For rotaries, use air jet or other methods instead of water to back cows off.

Efficiency options

Here are a few more tips for efficient water use and to reduce water loss.

- Ensure high standard of water quality (if treatment is required).
- Do regular checks for pump pressure, line restrictions and possible leaks.
- Reduce the number of hand-held hoses in use throughout the dairy.

As a measure of efficiency, yard wash water use should not exceed milk cooling water.

Woldwide Five Limited

Farm Environmental Management Plan

March 2019



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FARM ENVIRONMENT MANAGEMENT PLAN

A: PROPERTY OVERVIEW

Contact Person(s)	Abe and Anita de Wolde	Plan Prepared By	Landpro Ltd
Contact Phone	02 227 2537	Date	28 March 2019
Email Address	abe@woldwide.nz	Date of Next Review	28 March 2020
Physical Address	104 Shaws Trees Road		
Consent Numbers and Expiry Dates	TBC		
Farm Area	335 ha Includes WW5 dairy platform and Woldwide Runoff	Peak Milked Herd Size	930
Legal Descriptions	<p>Lot 1 Deposited Plan 344176, Lot 2 Deposited Plan 344176, Lot 1 Deposited Plan 310140, Part Lot 12 Deposited Plan 238 and Lot 2-3 Deposited Plan 478843, Lot 1 Deposited Plan 12253 Lot 1 DP 478843 (new block called Collies Block) Lot 7 DP 238 (new block from Cochrans) Lot 2 DP 310140 (new block from Cochrans)</p> <p>Merrivale Block: Part Section 7 Block XII Waiau SD Part Section 7 Block XII Waiau SD Part Section 7 Block XII Waiau SD Lot 1 DP 3537</p> <p>Merriburn Lease Block: Lot 1 DP 302409 Sec 26 Merrivale Settlement No. 1 Sec 27 Merrivale Settlement No. 1</p>		

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

Objectives of this plan:

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

This will be achieved through;

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

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

Name: Signed: Date:

B: SITE PLANS

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

KEY FEATURES	PLAN(S) WHERE KEY FEATURES ARE MAPPED
Site boundary	All site plans in this FEMP
Physiographic zones, variants and soil types	Figure 1 and 2: Physiographic Plan Figure 3 and 4: Soil map
Lakes, rivers, streams ponds, artificial watercourses, modified watercourses and natural wetlands	Appendix A: Existing Waterways and Critical Source Areas
Other critical source areas (gullies, swales etc)	Appendix A: Existing Waterways and Critical Source Areas
Land with a slope greater than 20 degrees	N/A
Existing and proposed riparian vegetation and fences (or other stock exclusion methods) adjacent to waterbodies	Appendix A: Waterway location, most have riparian planting
Places where stock access or cross water bodies (including bridges, culverts and fords)	Appendix A: crossings labelled
Known subsurface drainage system(s) and the location of drain outlets	Appendix A
All land that may be cultivated over the next 12 months	TBC – once consent granted
All land that may be intensively winter grazed over the next 12 months	TBC – once consent granted

C: PHYSIOGRAPHIC ZONES AND KEY CONTAMINANT PATHWAYS

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

The physiographic plans shows the spatial distribution of the physiographic zones on the entire property according to the Environment Southland Proposed Water and Land Plan 2018 (PSWLP) as mapped by Beacon Mapping Service. The mapping system also details the key contaminant pathways present for each physiographic zone and any variants for the location.

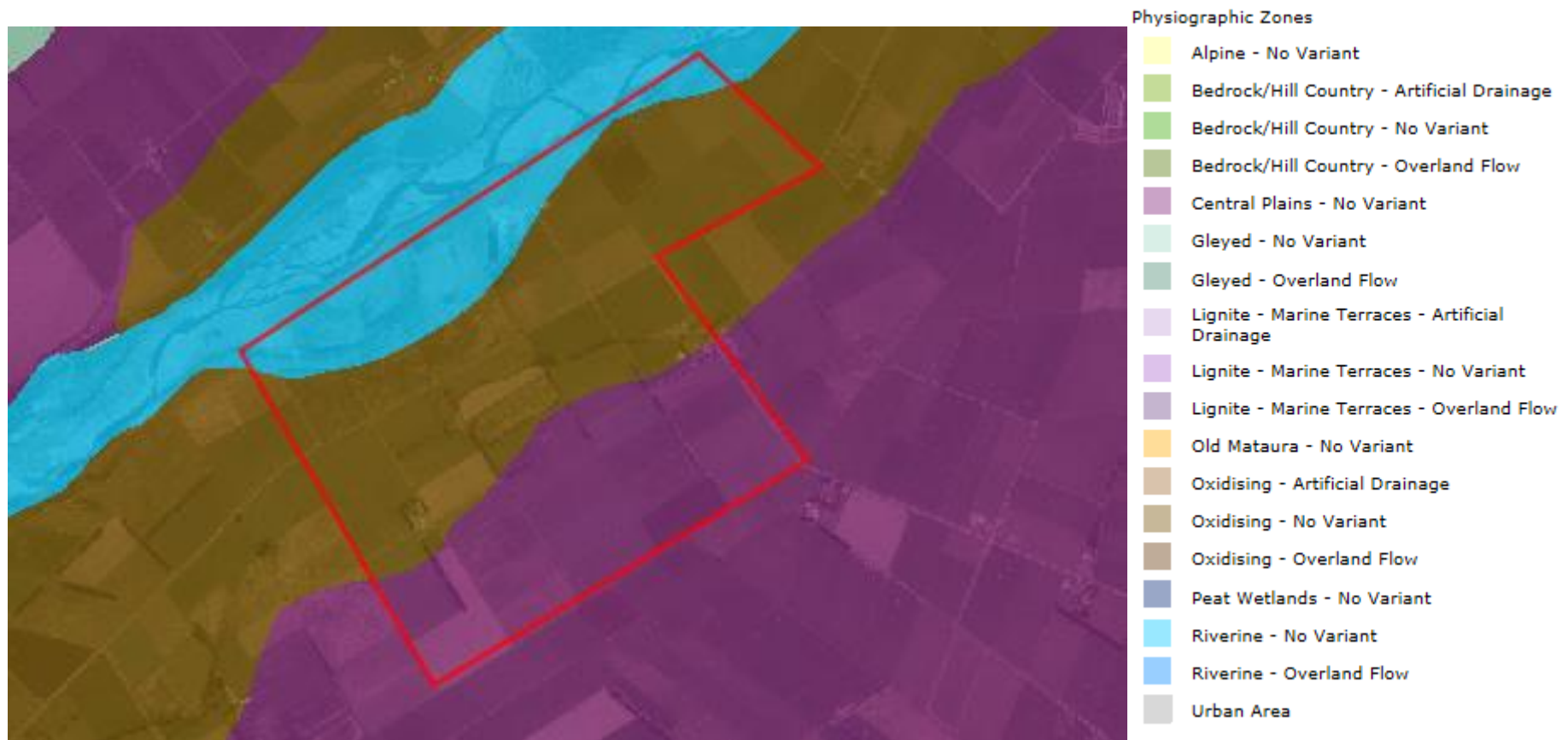


Figure 1: Physiographic Zones on the farm (showing dairy platform)



Figure 2: Physiographic zones at Woldwide Runoff

D: SOIL TYPES

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



Figure 3: Soil types found on the dairy platform

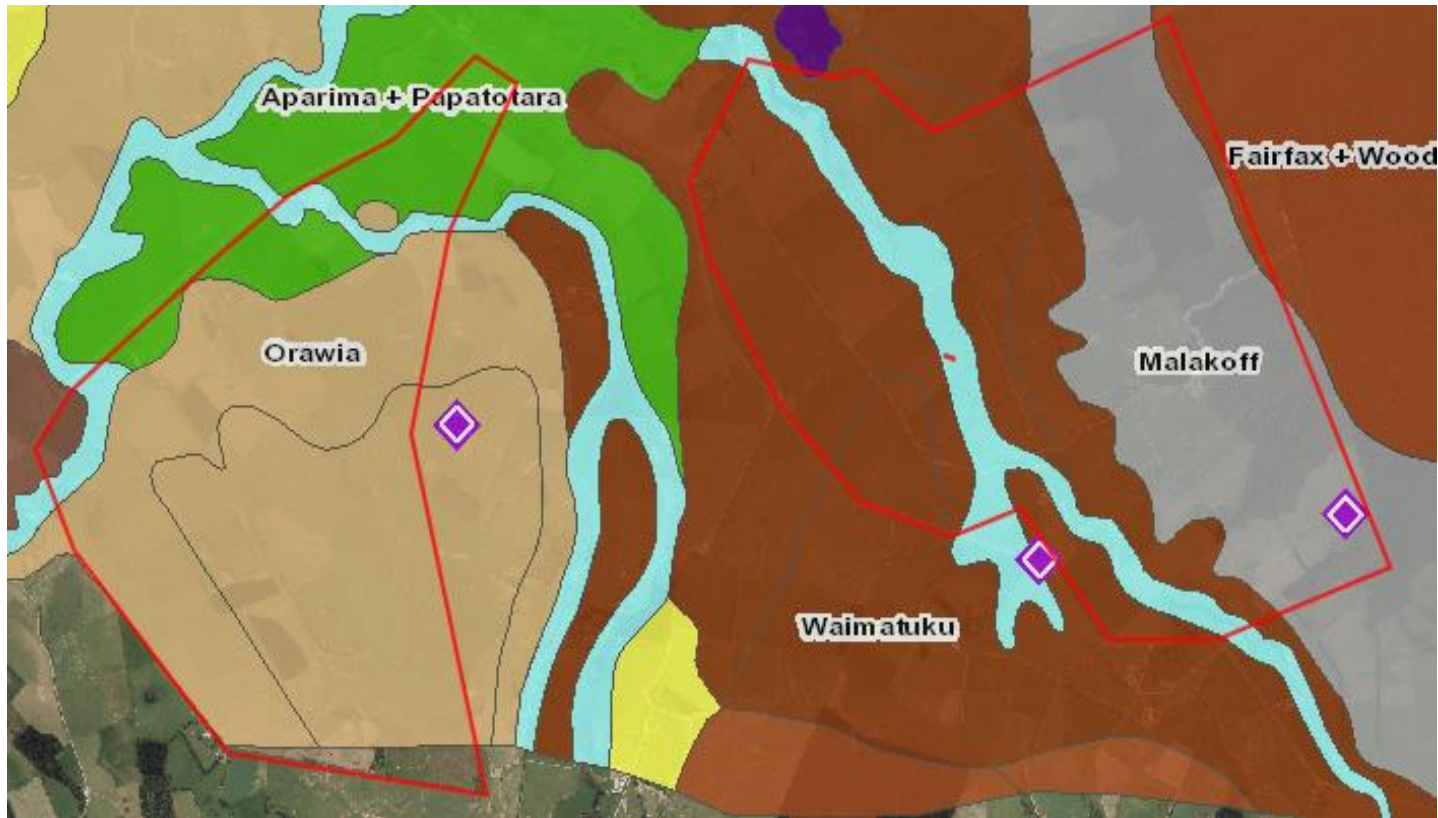


Figure 4: Soil types at Woldwide Runoff

E: GOOD MANAGEMENT PRACTICES - GENERAL

Mitigation	Good Management Practice	Review notes
Protect soil structure (will also help with P and N loss)	Wintering the milking herd on fodder beet on the dairy platform until wintering barns completed.	
	Re-sow bare soils as soon as possible	
	Use of selective grazing to avoid grazing very wet paddocks and open the breaks up to avoid pugging and treading damage.	
Manage Critical Source Areas (CSA)	Avoid working CSAs and their margins	
	Leave grassed areas (or native vegetation) around CSAs especially when grazing winter forage crop and/or graze as "last bite". Grazing direction must be down the slope or towards CSA.	
	All riparian margins must be fenced and left to establish with grasses to enable filtration of contaminants that may be transported via overland flow processes.	
Additional P loss reduction	Create Riparian areas to mitigate overland flow into water ways. Refer to 'Consent Nutrient Budget Adjustments'.	
	Reduce use of P fertilizer where Olsen P values are above agronomic optimum. Maintain Olsen P levels at around 40	
Reduce accumulation of N in the soil	Reduce the risk of run-off to laneways and other sources by ensuring crossings are adequately maintained and maintain gradients of laneways to direct runoff to pasture.	
	Use nutrient budgeting to manage nutrient inputs and outputs	
Avoid preferential flow of FDE through soil	Time N fertilizer application to meet crop and pasture demand using split applications and avoid high risk times of the year i.e. when soil temperature is low or during drought periods	
	Defer effluent application when soil conditions are unsuitable especially when applying effluent to high risk paddocks	

profile and artificial drains	Apply effluent at low rates and depths and utilize entire effluent discharge area	
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F: RIPARIAN MANAGEMENT

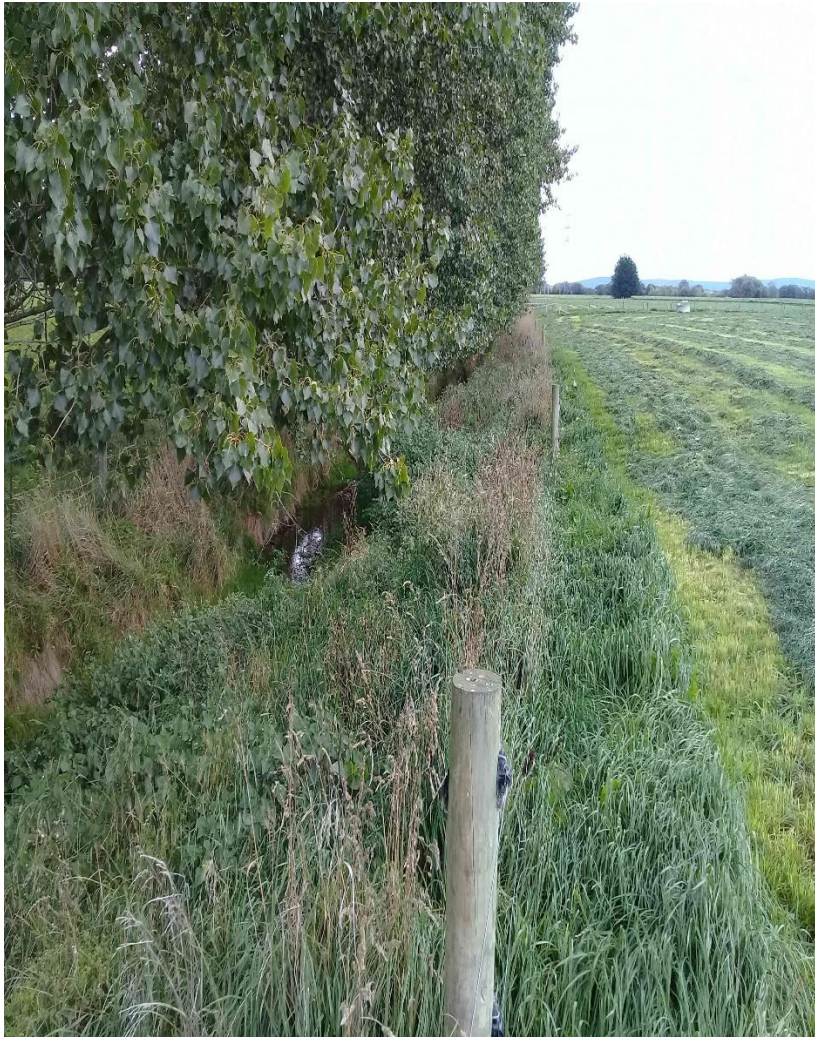
The dairy farm is mapped to drain to Waimatuku Stream and Aparima River. Woldwide Runoff drains to the Orauea River.

All waterways are already fenced to exclude stock as required by the supplier on the dairy platform. Any other waterways on the support land are fenced. All riparian margins are left to establish with grasses and native vegetation in the first instance or as a minimum. Some waterways contain riparian planting.

Riparian buffer zones will be created with natives and hedge like trees to retain nutrient s and stop over land flows, along the River edges and any further created water ways. These would run the length of paddocks 54 to 62 on Woldwide 5 alongside the river and the new water way fenced in the Cochrane block. See the attached map in Attachment A to see the location of riparian planting.

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

Appendix A maps the waterways present on the property, any stock crossings and/or CSA's for riparian management, with additional identified areas required to enable the P loss reductions modelled for the consent. Refer to 'Consent Nutrient Budget Adjustments' for further explanation. The photos below show existing riparian planting and fencing.







Photos of artificial drainage channels on the farm (CSAs) with stock exclusion and riparian vegetation.

G: CRITICAL SOURCE AREAS

Critical Source Areas (CSA's) are areas that have high risk of channelling contaminants to waterways. CSA's for the property have been identified, as indicated in the Cultivation Map (Attachment A) The CSA's for the property include:

Good Management Practices that will be employed in the management of CSAs are summarised in the table above.

Areas where where over land flows collect and pool, with ability to flow into water ways are CSAs. As in Woldwide 1&2, these areas will be fenced and planted with Natives and flaxes etc. Fence off CSAs to create a grass or grass shrub buffer zone to filter contaminants and prevent stock access. The faster the water is flowing across a buffer zone, the wider the buffer zone should be to provide time for effective filtering. Plants which will slow and filter the sediment and nutrient overflows from entering water ways. The areas have been identified in the attached map in Attachment A.

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Appendix B includes a farm map of winter grazing paddocks for 2018/2019 season. Full cultivation is undertaken and crop type is fodder beet.

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

Mitigation	Good Management Practice	Review notes
Protect soil structure and reduce N, P, sediment and faecal indicator organism loss from intensive winter grazing activities	Grazing direction must be top of slope to bottom of slope. Use break or block feeding and ensure a last bite of 5-20m is left from CSA's	
	Back fencing must be used to prevent stock from entering previously grazed areas	
	Portable water troughs must be used to prevent stock from entering previously grazed areas	

	Portable feed containers must be used for supplementary feed to avoid feed wastage	

I: NUTRIENT MANAGEMENT

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

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

Where culverts along identifies lane ways have edges, which are not banded and/or have little riparian strips which leads to sediment and nutrient loss by flows into water ways, these will be re directed back to paddocks by contouring and additional areas added as buffer/riparian edges to allow more grass and area to plant to filter these over land flows. These areas have been located on the map in Attachment A.

Lane ways: Identified lane ways are to be re directed, involving cutting trees back to aerate lanes better (thus drier), plus widen lanes and contour them to drain to the paddocks and away from water ways. In addition, where lanes have areas which add to over land flow into critical source areas, these also will be re directed. These areas have been located on the map in Attachment A.

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

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

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

Record	Nature of information/person	Collated (Y or N)
Production	Fonterra App, dockets	
Soil test results	Lab results, Ravensdown rep	
Fertiliser application records	MINDA land & feed, Ravensdown rep	
Proof of placement	MINDA land & feed	
Effluent application records	Dairy diary	
Crop rotation records	Farm map with total hectares	
Stock numbers	Culling timeframes	

	Young stock grazed on farm Breeding bulls	
Record of supplements purchased	Invoices/Cash manager, MINDA	
Records of supplements made on farm	Invoices/Cash manager	
Farm map/effective hectares	Farm manager	

J: FARM DAIRY EFFLUENT

This section of this plan documents the methods that will be employed in the operation of the Farm Dairy Effluent (FDE) System to ensure that the discharge of effluent occurs in accordance with conditions of consent. Appendix C includes a full FDE Management Plan, monthly check sheets and staff training record.

Total effluent discharge area:	126 ha liquid effluent discharge area, 133ha slurry effluent discharge area
Available storage volume:	335m ³ for liquid, 7,955m ³ for slurry
Storage Type:	Effluent tanks, concrete bunker, slurry effluent storage pond
Effluent application method:	Low rate pods Slurry tanker/muck spreader/umbillical
Maximum application rate and depth of application:	10mm/hr 25mm depth per application. 2.5mm depth for slurry/muck spreader/umbillical

Mitigation	Good Management Practice	Monitoring
Reduction in effluent generation	<ul style="list-style-type: none"> Reduce water use in shed by reusing clean water where possible Treat the herd gently to avoid upset 	N/A
Effluent applied only when soil conditions are appropriate	<ul style="list-style-type: none"> Sufficient storage provided so that when soils are at or above field capacity and/or during adverse weather conditions, effluent can be stored in the effluent storage pond until conditions are suitable for application Monitoring of soil moisture using the ES website. Paddocks will be inspected before effluent application to check that soil water deficit exists. Low rate application will be preferentially used during higher risk periods of the year with the slurry tanker used mainly in summer when a greater soil moisture deficit occurs 	N/A

<p>Avoidance of direct effluent disposal or runoff to sensitive areas</p>	<ul style="list-style-type: none"> • Effluent discharge will observe a range of buffers from sensitive receiving environments as shown on the Appendix I plan attached to the discharge permit • Low rate effluent discharge will avoid ponding and/or runoff • Effluent will not be discharged onto any land areas that have been grazed within the previous 5 days • Effluent discharge will be to the entire effluent discharge area 	<p>Record irrigation dates, times and areas in the DAIRY DIARY</p>
<p>Avoidance of effluent contamination in tile drains</p>	<ul style="list-style-type: none"> • Low rate effluent discharge to reduce the risk of through-drainage and associated risk of effluent entering water • Mapping of tile drains 	<p>N/A</p>
<p>Efficient and effective collection, storage and delivery of effluent from infrastructure at all times</p>	<ul style="list-style-type: none"> • Monthly/frequent system checks will be undertaken using the Monthly Effluent Check Sheet attached • All parts of the effluent system will be checked and maintained regularly • Leaks will be repaired immediately • Fail safe systems will be kept in place and kept in good working order i.e. automatic alarm and shut off system 	<p>Record all repairs and maintenance (invoices, cash manager)</p> <p>Monthly Effluent Check Sheets filled out and signed</p>
<p>Staff appropriately trained in operation and understand the effluent system</p>	<ul style="list-style-type: none"> • All staff involved in the management of the effluent system are fully trained in its use • All staff are familiar with and understand the conditions of consent • All new staff will be taken through the "Staff Training Guide" (attached) • Staff to take immediate action if incident or breakdowns occur including; <ul style="list-style-type: none"> - Rectifying the problem - Cleaning up if possible 	<p>Keep signed training record in the back off this FEMP</p> <p>Ensure both farm manager and employee sign to confirm training</p>
<p>Application that is not offensive to neighbours</p>	<ul style="list-style-type: none"> • Wind conditions will be checked to ensure the effluent can be discharged without resulting in spray drift and odour beyond the property boundary • Observation of buffers to dwellings not located on the property (200 m) and property boundaries (20 m) 	<p>Complaints received by Environment Southland</p>

K: COMPLIANCE AND REPORTING

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

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

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

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

L: ANNUAL REVIEW AND AUDIT OF FEMP

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

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

M: INDUSTRY GUIDELINES

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

Environment Southland www.es.govt.nz

Dairy NZ www.dairynz.co.nz

Fonterra www.fonterra.com

Dairy NZ – A staff guide to operating your effluent irrigation system – Low Rate System

Dairy NZ – A farmer's guide to managing farm dairy effluent – A good practice guide for land application systems

Dairy NZ – Wintering in Southland and South Otago – A land management guide to good environmental practice

Dairy NZ – Land management on Canterbury Dairy Farms – Managing land to reduce sediment and phosphorous loss

Environment Southland Factsheet – Critical Source Areas

Environment Canterbury – Information Sheet for Farmers on OVERSEER®

Sustainable Dairying: Water Accord

Attachment A – Waterways and CSAs

The location of the waterways are mapped in this section for WW5 and Woldwide Runoff. Photographs are included of the CSA's present on WW5 platform.

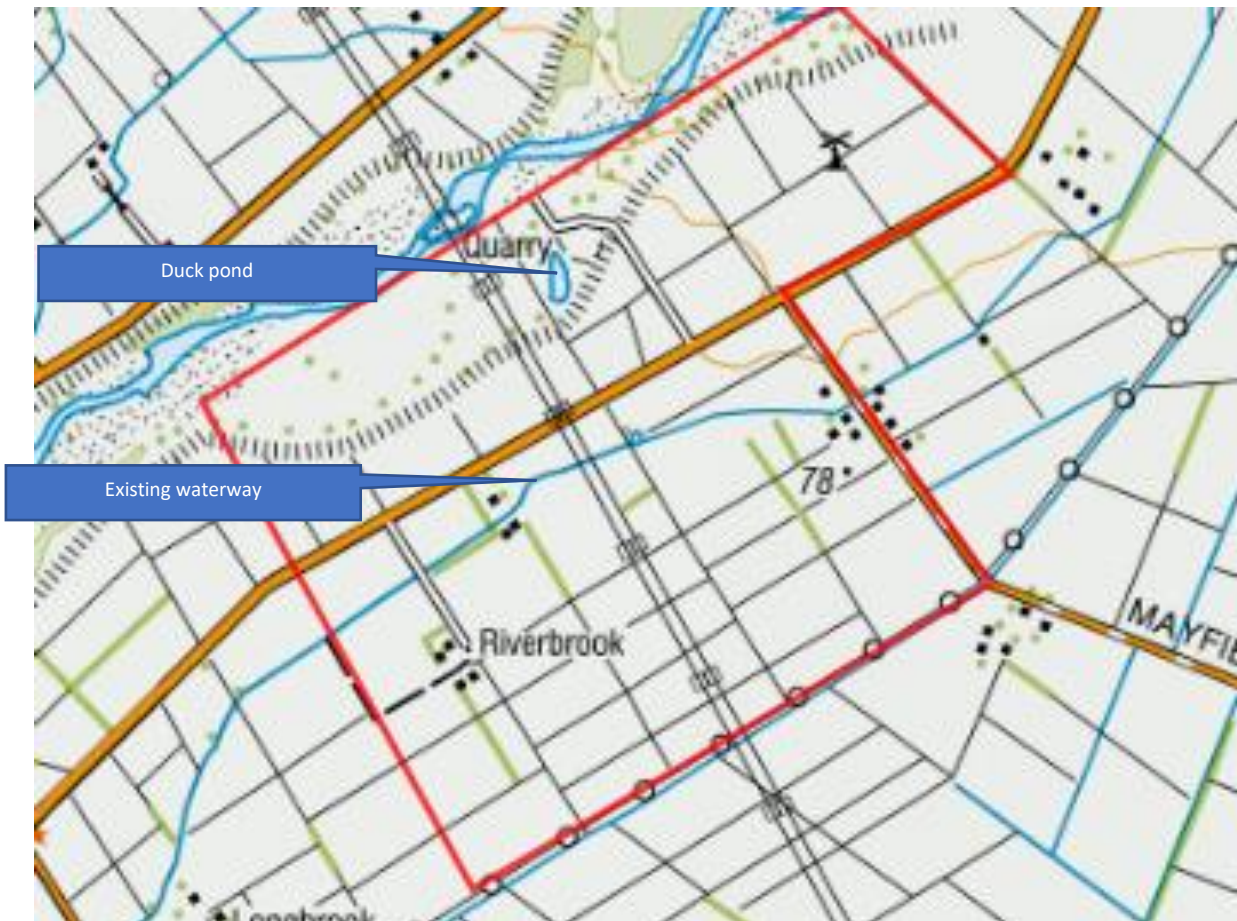
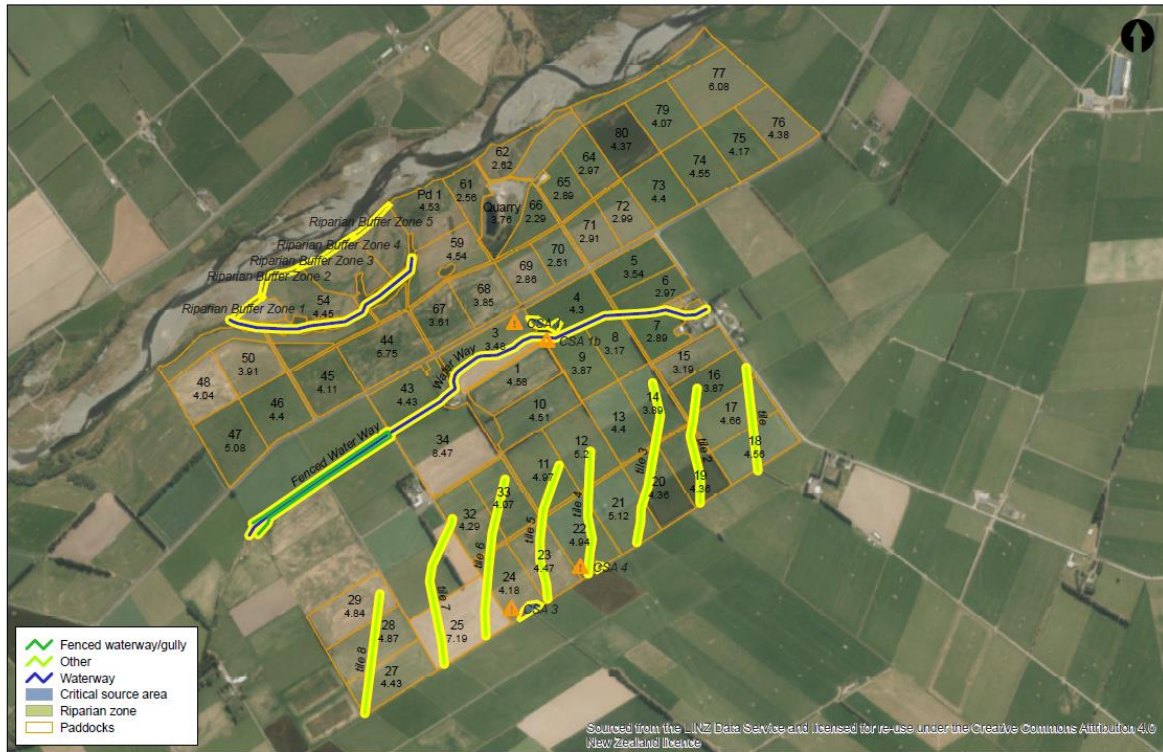


Figure: Waterways on dairy platform

WW5 P Mitigation



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www.hawkeye.farm

0 115 230 460 690 920
 Metres

Hawkeye

Features of P Mitigation WW5	GPS point	Area
Critical Source Area 1	-46.088933; 168.085793	0.11
Critical Source Area 1(b)	-46.089269 168.086665	0.05
Critical Source Area 3	-46.098744 168.084393	0.14
Critical Source Area 4	-46.097380 168.088048	0.02
Total		0.32 ha effects 13.4 ha (3.9 % modelled 2.5 %)
Fenced Water way	-46.093984 168.074506 (mid)	1.1 ha effects 37.3 ha
Riparian buffer zones	-46.086339 168.075157 (mid)	0.3 ha effects 13.3 ha, whole river edge 35.3 ha
Total		72.6 ha (modelled 82 ha)

Critical Source Areas 1:



3&4:














Buffer Zones:

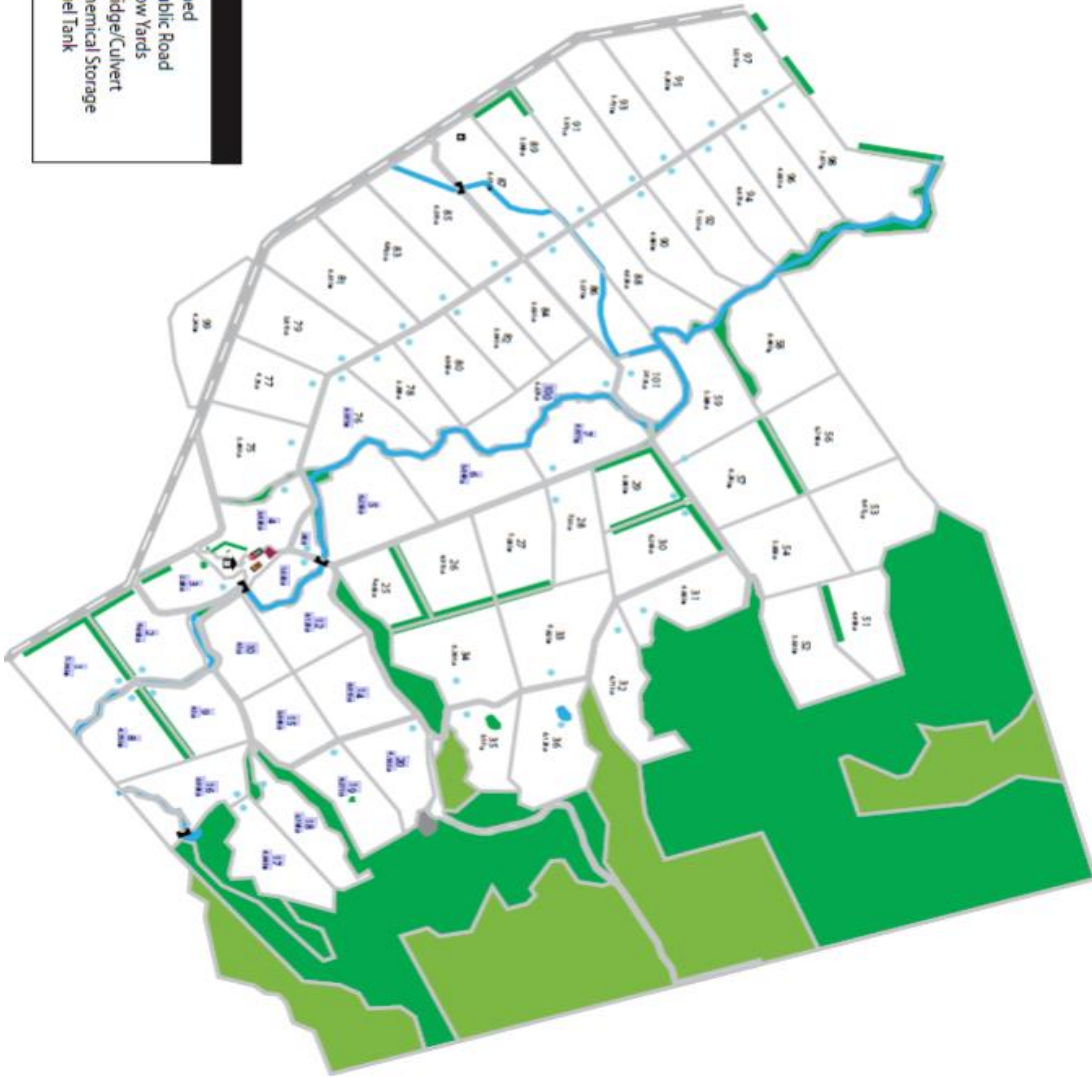




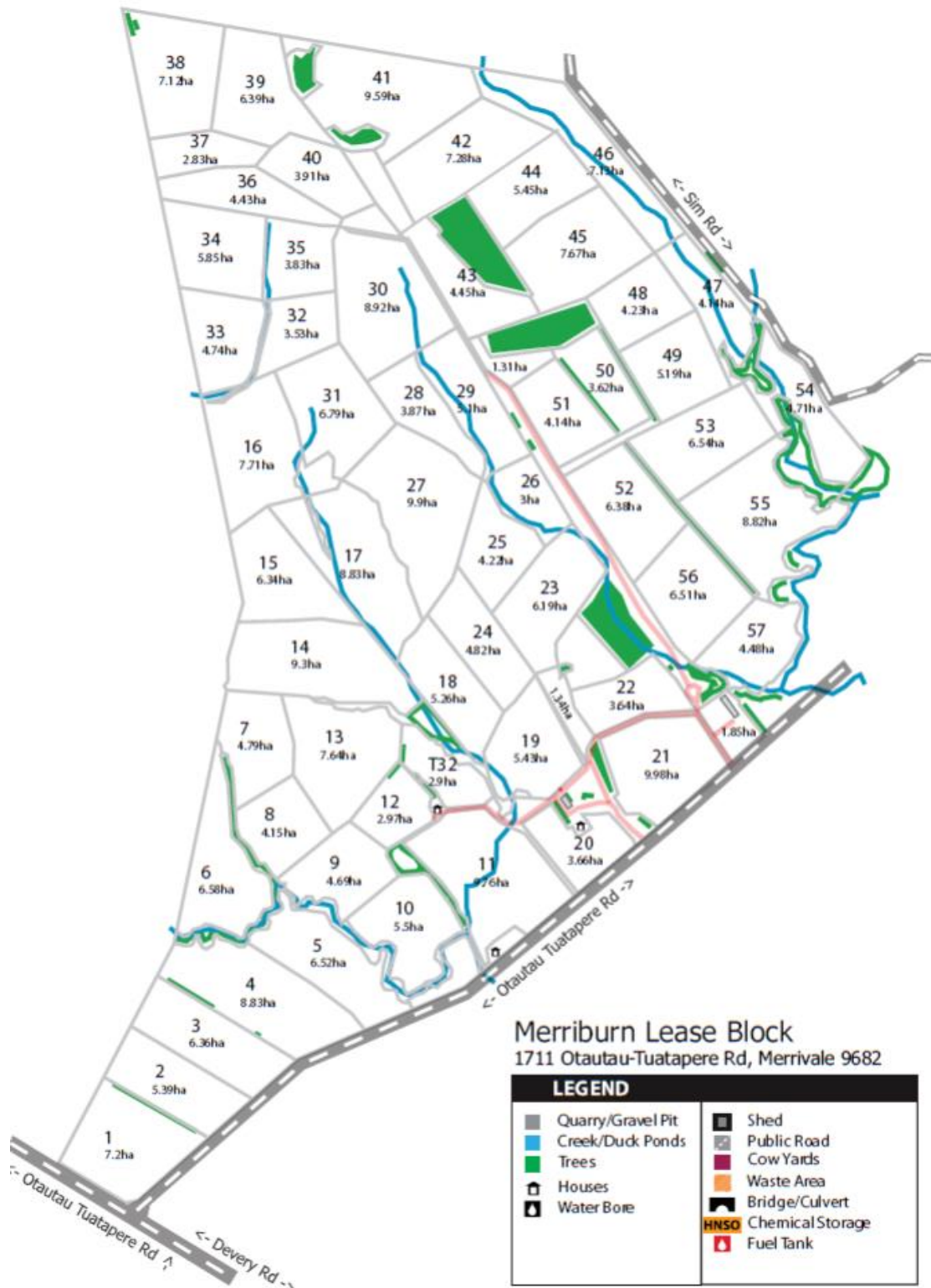


Woldwide Run-Off
 20 Gill Rd, Merrivale 9682

LEGEND			
	Quarry/Gravel Pit		Shed
	Creek/Duck Ponds		Public Road
	Trees		Cow Yards
	Houses		Bridge/Culvert
	Water Bore		Chemical Storage
			Fuel Tank



Farm map for Woldwide Runoff original block (Merrivale Block)



Farm map for Woldwide Runoff lease block (Merriburn)

Appendix C: Effluent Management




- Paddocks
- Discharge Area
- Titles Owned

Effluent Orientation and Training Record

Season ___/___

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

Trainer signature			
Employee signature			
Date			

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

Smart Water Use in the Farm Dairy

This guide looks at water use in and around the farm dairy, and whether there's potential for greater efficiency. Use it to evaluate your options for improvement.



Efficient use of water can help:

- control power use and costs
- manage effluent in a cost-effective manner
- get the most out of staff time
- reduce water costs if you pay for it by volume
- meet regulatory obligations that may apply in your region.



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Smart Water Use in the Farm Dairy

Milk cooling

Use source water from Tank 1.

Aim for the recommended ratio of 2½ water: 1 milk

For example,

$$2.5 \text{ litres (water) } \times \text{ peak daily litres (milk) } \\ \div 1,000 = \text{m}^3/\text{day water use}$$

To measure milk cooling efficiency

Measure exit flow into a 200 litre drum during milking.
Flow rate in litres/min x total daily milking time (clock this) ÷ 1,000 = m³/day water use

Alternatively, install a meter on the line delivering water to the plate cooler

Efficiency options

Things to consider if improved cooling efficiency is warranted:

- use of correct flow rates
- optimal plate spacing to increase flow
- pre-cool water source
- ice banks/heat exchangers (can be costly).



Return milk cooling water to Tank 2 for use in yard wash down.

Ensure adequate storage space remains to take all milk cooling water (use float ball or probes).

Capture roof water for reuse or at least exclude it from the yard to prevent increasing effluent volumes.

Yard wash down

To measure yard wash down water use

Follow the steps and calculations in the accompanying Worksheet to estimate water use.

Efficiency options

For manual yard washing, here are some ways to improve water-use efficiency.

- Pre-wet the yard on warm, sunny days with a yard hose or sprinkler.
- Use a scraper or a chain (inside an old yard hose) on the backing gate to break up dung before hosing.
- Wash the yard after each milking.
- Work actively and close to the effluent.
- Hose the yard with high water volume under low pressure.
- Include a timer setting on the yard wash down pump (set a time standard for wash down and train staff to achieve it).
- Consider capturing excess cooler water (that would otherwise go to waste) in tipper drums for yard wash.
- Flood wash with water recycled from the effluent pond (refer to conditions of use from your milk processor).



Plant/vat wash

Use water from Tank 1.

To track plant/vat water use Wash tubs and hot water cylinders use set amounts of water. Refer to washing routine instructions supplied by the detergent companies.



Efficiency options

Here are some steps you can take to reduce plant/vat wash water use:

- Seek advice from your detergent rep on litres required for hot/cold wash options.
- Refill tanks/cylinder with automatic shut-off (to avoid overflows). Use a toilet cistern and trough floats as proven refill/shut-off options.
- Consider heat exchange or pre-heating to improve energy efficiency.

Milking routines

Procedures and practices during milking affect water-use efficiency. Below are some ways to cut water use.

- ❖ Pre wet ball and yard.
- ❖ Minimise sprinkler/spray washing.
- ❖ Hose little and often (as required) in pit area.
- ❖ Put cups on dry, clean udders (see DairyNZ's SmartSAMM – www.smartsamm.co.nz).
- ❖ Implement a calm, consistent routine to reduce stress in animals and, in turn, effluent in the dairy (see DairyNZ's Milksmart – www.milksmart.co.nz).
- ❖ Maintain the dairy (paint/surfaces) to minimise the need for continual wetting.
- ❖ For rotaries, use air jet or other methods instead of water to back cows off.

Efficiency options

Here are a few more tips for efficient water use and to reduce water loss.

- Ensure high standard of water quality (if treatment is required).
- Do regular checks for pump pressure, line restrictions and possible leaks.
- Reduce the number of hand-held hoses in use throughout the dairy.

As a measure of efficiency, yard wash water use should not exceed milk cooling water.

