**A HEARING BEFORE**

**ENVIRONMENT SOUTHLAND**

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

# BRIEF OF EVIDENCE OF NICOLE MATHESON

**20 March 2018**

**Contents**

## QUALIFICATIONS AND EXPERIENCE

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

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

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

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

## SCOPE OF EVIDENCE

5 This evidence addresses the following issues:

5.1 Background to Application;

5.2 Water permits;

5.3 Activity Status.

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

5.5 Key RPS policies;

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

**BACKGROUND**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

16 The current consent applications are for the following;

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

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

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

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

**Other sources of information**

18 I have also obtained and viewed the following information:

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

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

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

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

**TAKE AND USE GROUNDWATER**

*Effects on neighbouring bores*

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

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

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

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

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

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

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

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

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

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

*Cumulative effects*

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

*Reasonable and efficient use*

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

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

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

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

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

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

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

- Recycling the water used for cooling (refrigeration)

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

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

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

*Stream depletion*

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

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

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

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

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

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

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

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

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

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

## PLANNING FRAMEWORK

### Activity Status

*Discharge of Dairy Effluent*

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

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

*Land Use*

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

*Take and Use of Water*

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

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

*Overall Activity Status*

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

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

*Consequences of Activity Status*

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

**APPLICABLE OBJECTIVES AND POLICIES**

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

**Operative Regional Water Plan**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

**REGIONAL EFFLUENT LAND APPLICATION PLAN**

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

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

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

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

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

- Soil moisture monitoring;

- Buffer distances to neighbouring dwellings, waterways and groundwater bores;

- Low rate supplication; and

- Deferred irrigation during times of adverse weather and soil conditions.

**Proposed Southland Water and Land Plan**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

- Critical source areas have been mapped; and

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

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

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

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

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

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

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

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

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

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

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

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

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

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

**SOUTHLAND REGIONAL POLICY STATEMENT**

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

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

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

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

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

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

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

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

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

- Recycling the water used for cooling (refrigeration)

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

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

**COMMENTS ON COUNCIL POSITION**

**Activity Status**

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

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

**Section 104D**

*Bundling*

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

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

*Effects*

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

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

*Contrary to Objectives and Policies*

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

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

**PROPOSED CONSENT CONDITIONS**

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

**General**

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

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

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

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

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

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

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

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

- No fodder crops to be grown at the property.

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

**Special Condition**

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

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

**CONCLUSION**

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

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

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

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

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

Dated 20 March 2018

Nicole Matheson

# APPENDIX A: RESOURCE CONSENT 301663

environment SOUTHLAND

**Consent No: 301663**

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

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

## Discharge Permit

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

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

### Details of Permit

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

### Schedule of Conditions

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

for the **Southland Regional Council**

Ken Swinney
**Policy and Planning Manager**

## Best Practice and Explanatory Notes

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

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

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

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

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

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

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

   A template may be viewed at:

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

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

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

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

**Environment Southland***

(03) 211 5115

Toll Free 0800 76 88 45 (Southland only)

or

Emergency After Hours (03) 211 5225

**if you have an effluent or pollution problem, call us**

environment SOUTHLAND

Held by: Woldwide One Ltd

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

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

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

## Problem Solving

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

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


Winton Wreys Bish Highway
Bore E45/0071
Heddon Bush Road
Hundred Line Road East
Hall Road
Drummond Heddon Bush Road
Key
Bore/Well
Property Boundary
Effluent Discharge Areas
environment SOUTHLAND
Appendix 1
WoldeWide One Ltd
Date: 23/08/2012
N
1:17,500
Cadastral information derived from Land Information New Zealand. CROWN COPYRIGHT RESERVED. Aerial Photography dated 5/2/2007 to 14/03/2008. Copyright Terralink International Limited.
DISCLAIMER: Environment Southland cannot guarantee that the information shown is 100% accurate and should not be reused in any manner without proper consultation.

## APPENDIX B: RESOURCE CONSENT 301664

environment SOUTHLAND

**Consent No: 301664**

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

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

# Water Permit

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

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

## Details of Permit

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

## Schedule of Conditions

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

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

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

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

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

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

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

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

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

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

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

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

for the **Southland Regional Council**

Ken Swinney
**Policy and Planning Manager**

# APPENDIX C: RESOURCE CONSENT 300626 (WOLDWIDE TWO LTD)

AUTH-300626-V2

environment SOUTHLAND

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

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

## Discharge Permit

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

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

### Details of Permit

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

### Consent Amended

Conditions amended on 4 August 2014 as follows:

### Schedule of Conditions

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(iii) the samples will be analysed for:

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

for the **Southland Regional Council**

Vin Smith
**Director of Policy, Planning and Regulatory Services**

## *Best Practice and Explanatory Notes*

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

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

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

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

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

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

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

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

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

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

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

**Environment Southland***

(03) 211 5115

Toll Free 0800 76 88 45 (Southland only)

or

Emergency After Hours (03) 211 5225

**if you have an effluent or pollution problem, call us**

environment SOUTHLAND

**Held by: Woldwide Two Ltd**

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

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

  - effluent storage for deferred irrigation

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

## Problem Solving

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

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


Legend
Dairyshed Effluent
Farm Boundaries
environment SOUTHLAND
Appendix 1
Woldwide Two Ltd
APP-300626-V2
N
1:12,000
Cadastral information derived from Land Information New Zealand. CROWN COPYRIGHT RESERVED.
Aerial Photography dated 5/2/2007 to 14/03/2008.
Copyright Terralink International Limited
DISCLAIMER: Environment Southland cannot guarantee that the information shown is 100% accurate and should not be reused in any manner without proper consultation.

# APPENDIX D: RESOURCE CONSENT 300627 (WOLDWIDE TWO LTD)

environment SOUTHLAND

AUTH-300627-V1

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

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

## Water Permit

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

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

### Details of Permit

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

### Consent Amended

Conditions amended on 4 August 2014 as follows:

### Schedule of Conditions

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

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

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

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

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

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

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

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

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

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

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

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

for the **Southland Regional Council**

Vin Smith
**Director of Policy, Planning and Regulatory Services**

# APPENDIX E: WELL INTERFERENCE GRAPHS

**Bore E45/0071 – Aquifer Parameters**

Transmissivity = 200 $m^2$/day

Storativity = 0.001

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

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

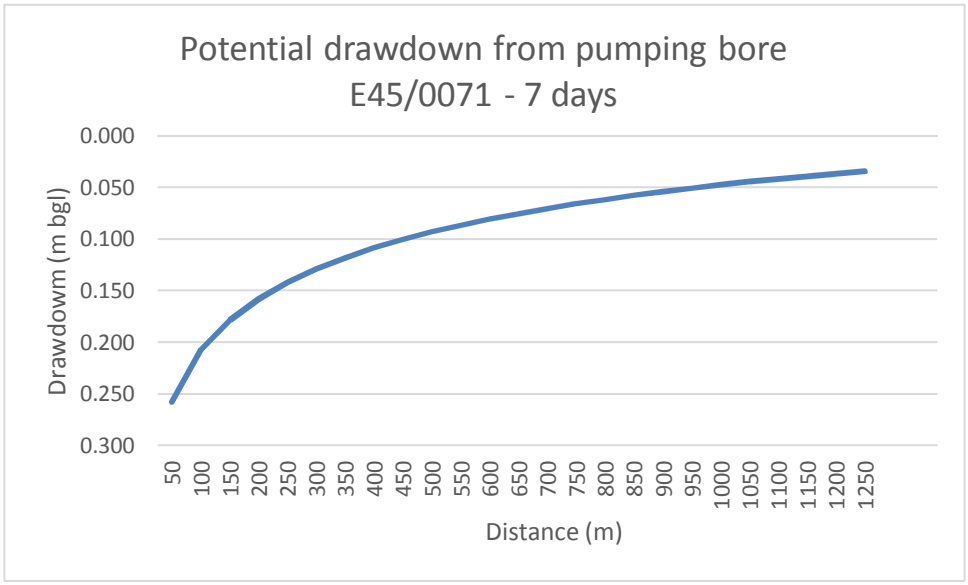



*Figure 1: Estimated maximum drawdown effects from pumping bore E45/0071 for 7 days*

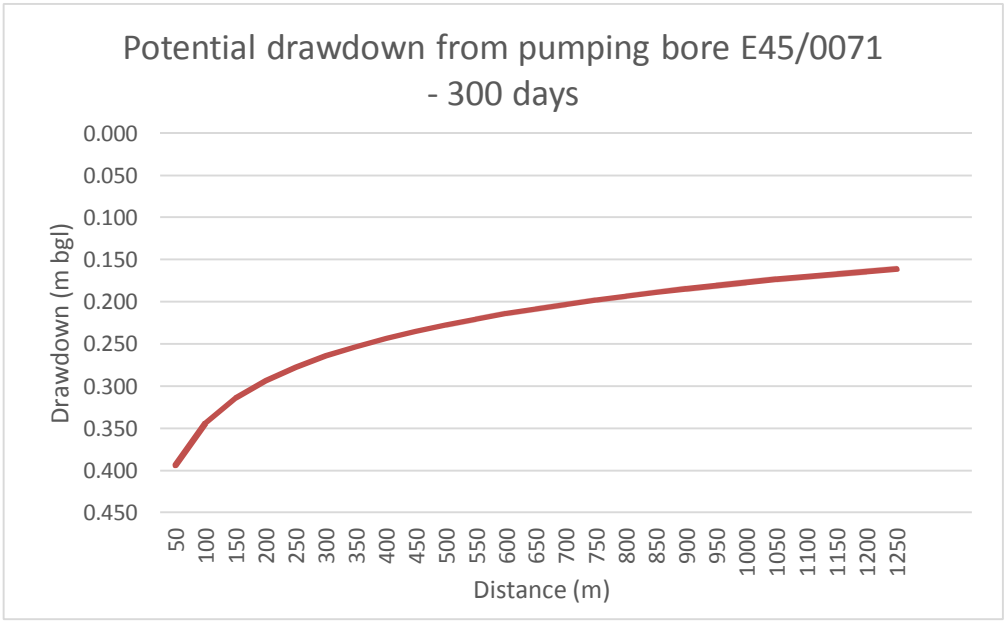



*Figure 2: Estimated maximum drawdown effects from pumping bore E45/0071 for 300 days*

# APPENDIX F: STREAM DEPLETION GRAPHS

*Table 3: Parameters used in stream depletion analysis*

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

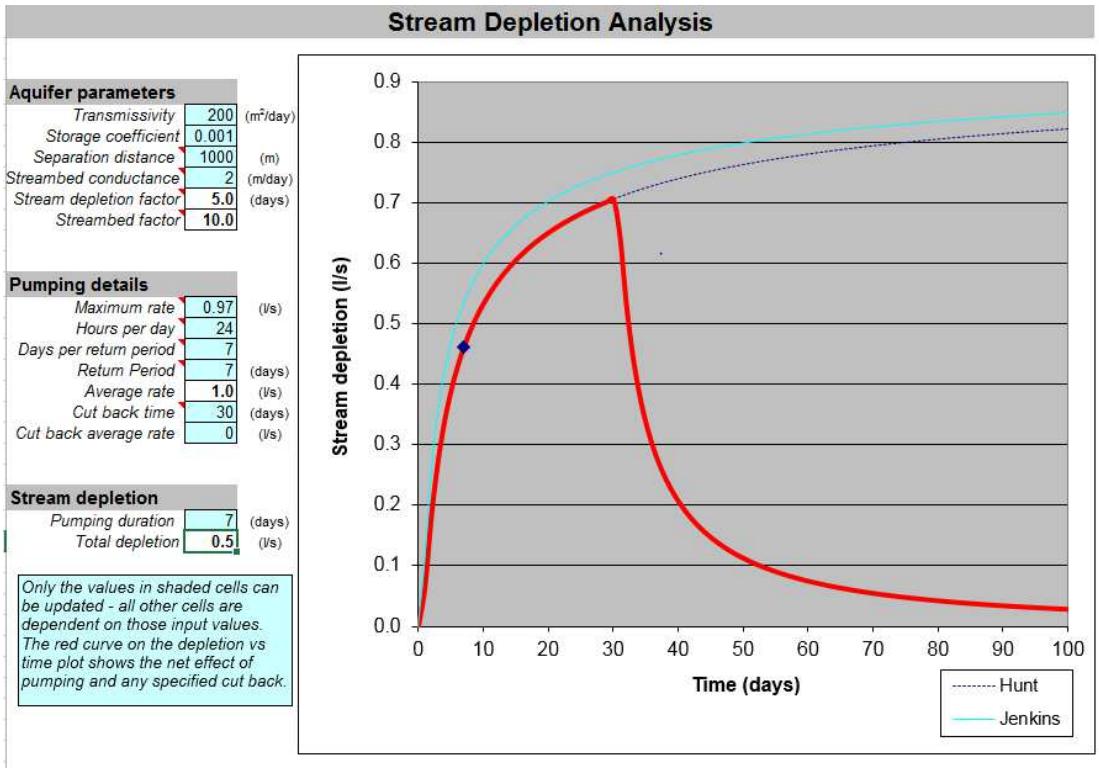



*Figure 1: Stream depletion assessment – pumping bore E45/0071 for 7 days*

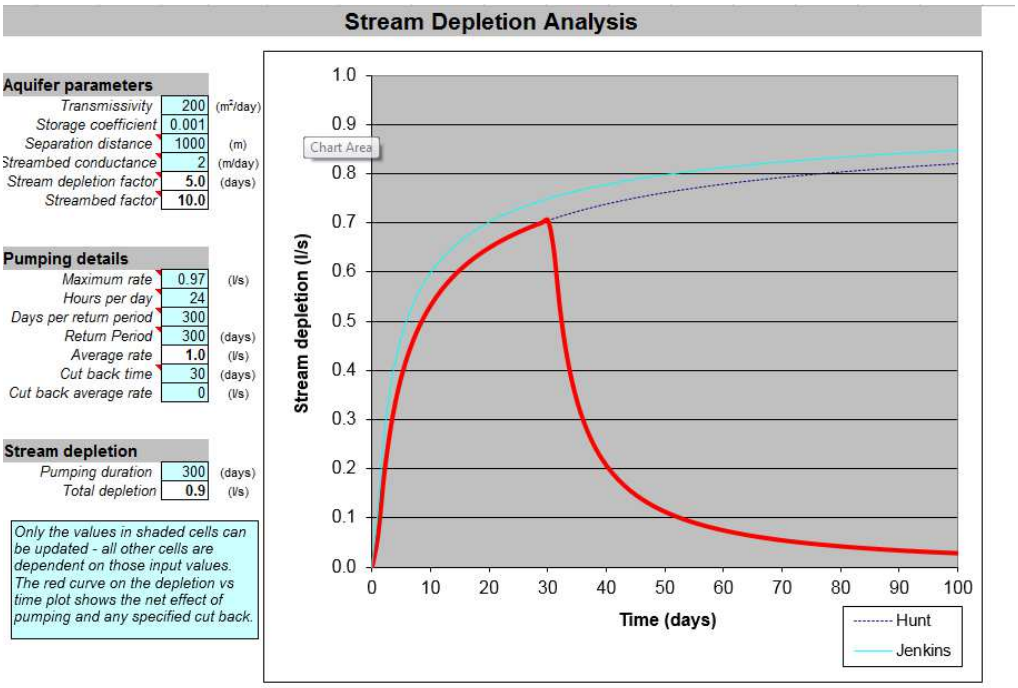



*Figure 2: Stream depletion assessment – pumping bore E45/0071 for 7 days*

# APPENDIX G: GOOD MANAGEMENT FACTSHEETS

GOOD MANAGEMENT PRACTICES
**FACTSHEET**

WATER AND LAND 2020 & BEYOND

# Artificial subsurface drainage

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

- Central Plains
- Gleyed
- Peat Wetlands

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

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

## Please note

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

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

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

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

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

GOOD MANAGEMENT PRACTICES
**FACTSHEET**

WATER AND LAND 2020 & BEYOND

# Deep drainage of nitrogen

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

- Central Plains
- Oxidising
- Old Mataura
- Riverine

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

## Please note

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

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

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

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

environment SOUTHLAND REGIONAL COUNCIL Te Taiao Tonga

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

May 2016

GOOD MANAGEMENT PRACTICES
FACTSHEET

WATER AND LAND 2020 & BEYOND

# Overland flow

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

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

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

## Please note

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

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

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

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

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

**A HEARING BEFORE**

**ENVIRONMENT SOUTHLAND**

**Under** An application under the Resource Management Act
**APP-20171445**

**Applicant** **WOLDWIDE ONE LIMITED**
**ABE AND ANITA DE WOLDE**

---

# BRIEF OF EVIDENCE OF JOHN SCANDRETT

**20 March 2018**

---

## Contents

## QUALIFICATIONS AND EXPERIENCE

1 My full name is John Stirling Scandrett. I am a director of Dairy Green Limited. I have been in this role since 2008.

2 I have 37 years' experience in the agricultural industry. Initially I worked as an agricultural and engineering advisor for the Ministry of Agriculture and Fisheries, starting work in Invercargill in 1981. In 2002 I formed Scandrett Rural Limited and set up my own agricultural and engineering consultancy business. In 2008 I set up Dairy Green Limited, which specifically handles agricultural engineering enquires, Scandrett Rural Ltd continues to provide consultancy services to farm management clients.

3 In 2003 I set up a Sustainable Farming Fund project called Dairy Green. The specific aim of the project was to develop better means of managing and applying dairy shed effluent to land. Key results were the development of low rate effluent application and a recognition for the need for effluent storage when soils were at or close to field capacity. These are key mitigation measures for managing the effects of dairy effluent application to land. The project also recommended monitoring the concentration of nutrients in the effluent and applying a depth of effluent appropriate for the nutrient requirements of the soil.

4 My agricultural engineering work includes drainage design and installation recommendations. Both drainage design and farm management consultancy requires good knowledge of soils and their properties, and physical inspection of soil profiles to determine soil texture, structure and drainage properties.

5 I hold a degree in Bachelor Agriculture Science with first class honours from Lincoln University.

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

## SCOPE OF EVIDENCE

7 This evidence addresses the likely adverse effects of the discharge of effluent to land, for which Worldwide One Ltd (WOL) seeks consent, and the manner in which these are avoided, remedied or mitigated. This is done with a view to supporting the grant of the application under the applicable planning documents, which are addressed in more detail in the evidence of Ms Nicole Matheson.

8 As part of this, this evidence also details recent groundwater testing results and field work on soil types and soil boundaries for Woldwide One Ltd. It also comments on the soil types on the property and the benefit of having free draining soils for effluent management and the mitigation provided by having a wintering barn for the cows.

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

## EVIDENCE

### Introduction and summary

10 I have been engaged by Woldwide One Ltd to consider the appropriateness of the application for a discharge consent. In order to do this, I have considered the following issues, which I consider help inform the current situation, and what changes the proposal may have on the water quality of the area:

10.1 Groundwater sampling and analysis;

10.2 Soil types, including potential issues with drainage and cracking;

10.3 The discharge permits sought; and

10.4 Comments from the s42A report prepared by members of the Council.

11 I have not assessed the appropriateness of the discharge permit against the objectives and policies of the Environment Southland planning regime, however I understand that this evidence has informed the assessment provided by Nicole Matheson.

12 Despite being unable to conclude against the objectives and policies of the planning regime, I make the following comments generally which support this granting of the discharge permits:

12.1 The groundwater sampling I have conducted shows that the nitrate concentrations at the Woldwide One property were low, and although the concentrations to the east of the property were higher, they were still below 11.3 mg/L, being the upper drinking water standard.

12.2 The soil maps available for the property are not accurate and this would affect the outcome of any Overseer reports produced using them. On that basis, I completed my own investigations (assisted by information from the landowner of 27 years) to establish what the actual on farm situation was. .

12.3 Effluent application is already managed, and will be managed in future, in a way which limits the depth of application, which assists in ensuring that nitrogen losses below the root zone are minimised.

12.4 I consider that the operation of the effluent system, including a larger effluent storage pond, and the application of dairy shed and wintering barn effluent by both travelling irrigator and slurry wagon, will meet the standard conditions of a discharge consent imposed by the Council.

**Groundwater Sample Analysis**

13 Council have raised concerns that the nitrate concentrations in the groundwater for the whole general area are high and that the proposed discharge may contribute to this. I have therefore attempted to address this through groundwater sample analysis, to see whether those concerns are likely to be realised. Logic suggests that if Overseer predicts low N losses below the root zone then ultimately this should be detectable in the groundwater. The pathway for nitrate to reach the groundwater is when there is a leaching event that takes soil solution below the root zone and ultimately to the aquifer.

14 Such leachate volume will be adding to the aquifer solution. It may have higher or lower nitrate levels than what the aquifer has. At any point in time the concentration of nitrate in the aquifer will reflect past farming and climatic history as well as substrate properties.

15 Measuring upstream and downstream nitrate concentrations over a period of time, will give an indication of trends for nitrate concentrations in the aquifer flow coming to and leaving the property. Importantly, it will indicate whether farming effects including the discharge of effluent to land from the application site is indeed likely to be causing an elevation in nitrate concentrations in groundwater.

16 To gain a better understanding of the nitrate concentration in the groundwater below Woldwide One and surrounding areas ground water samples were collected in December 2017 and January 2018 and March 2018 and analysed at an IANZ accredited laboratory.

Sampling sites included:

| *Site* | *Bore reference* |
|---|---|
| Woldwide Two House | E45/0727 |
| Woldwide Two monitoring bore | E45/0665 |
| Woldwide One House | E45/0622 |
| Woldwide One disused windmill Bore | |
| Environment Southland Boyle Road 3 m monitoring bore | E45/0330 |

17 Initially the two house sites were monitored and then the other sites were included. A 50mm diameter bore that was last used when the farm was a sheep property was sampled once, this is toward the eastern extremity of the farm and NNE of E45/0330, Council's Boyle Road monitoring bore. This bore is close to a stock race and the pipe is cut off just above ground level, so is potentially prone to contamination. For that reason, no further monitoring was done (or is proposed to be done) at that bore.

18 A map showing the sampling points is shown below.

Woldwide Bore location map

19 Samples were collected for nitrate analysis, and at the same time a separate sample was collected for E. Coli determination (MPN).

20 The results are as follows:

Nitrate Sampling Results (mg/L)

| | 6-12-17 | 18-12-17 | 12-01-18 | 25-01-18 | 14-03-18 |
|---|---|---|---|---|---|
| Woldwide Two House | 2.2 | 6.6 | 6.2 | | 4.2 |
| Woldwide Two M B | | | 7.2 | | 6.7 |
| Woldwide One House | 1.7 | 1.8 | 2.9 | | 2.0 |
| Woldwide One Windmill | | | | 9.0 | |
| ES Monitoring Bore | | | 10 | | 8.9 |
| Heddon Bush School | | 2.0 | 1.8 | | 1.8 |

E. Coli (MPN / 100 ml)

| | 6-12-17 | 18-12-17 | 12-01-18 | 25-01-18 | 14-03-18 |
|---|---|---|---|---|---|
| Woldwide Two House | <1.0 | <1.0 | <10 | | <1.0 |
| Woldwide Two M B | | | <10 | | 99 |
| Woldwide One House | 5.0 | >200 | 910 | | 220 |
| Woldwide One Windmill | | | | <10 | |
| ES Monitoring Bore | | | <10 | | <1.0 |
| Heddon Bush School | | <1.0 | <1.0 | | <1.0 |

21 Although the sampling period is over a relatively short time frame (approximately three months) the results provide real data for each point in time. Secondly there were minimal, if any leaching events during the sampling period for the Woldwide house sites so the results reflect past history for the aquifer.

22 The results for nitrate concentration are reasonably consistent over time particularly for the Woldwide Two house and Woldwide One house samples.

23 The Woldwide Two house site is two kilometres directly upstream of the Woldwide One site and had higher nitrate readings at each sampling occasion, although there was little difference in the December result.

24 There is a pattern that the further to the east the sample is taken the higher the nitrate concentration with the highest concentrations being for the Environment Southland monitoring bore on Boyle Road.

25 The Heddon Bush school samples all had consistently low concentrations of nitrate, not dissimilar to the Woldwide One house results. The results are well below the 11.3mg/L drinking water standard. On going monitoring will determine any trends but if the Woldwide One House bore results stay low there is no reason to believe the school results would increase since the school is directly downstream of Woldwide One based on Council information.

26 The Woldwide One house water source is an unprotected well using 0.9 m long concrete pipes on end of approx 0.9 m diameter. The top pipe is flush with ground level, the soil in the vicinity has a high organic matter content from the long grass and woody shrubs in the area. The water level fell from 1.2 m to 1.8 m below ground level from the 6 December 2017 sampling through to the 12 January sampling and remained at 1.8m below ground level at the 14 March sampling. Stock are excluded from the site. A photo of the well is shown below.

These results provide a relatively short term view of nitrate concentrations. However they do demonstrate relatively low nitrate levels, for the centre of the farm in the “minor to moderate land use impacts” category, and relative to the results from the Environment Southland monitoring bore on Boyle Road for the same time period. **Soil Types**

27 Mr de Wolde has had 27 years farming experience on Woldwide One and he advised me his observation is that soil boundaries and soil types described in Topoclimate are not particularly accurate, particularly for the middle and eastern part of the farm.

28 The Topoclimate map shows the majority of Woldwide One is based on Braxton and Pukemutu soils with an area of Glenelg soils to the eastern side of the farm.

29 To better understand the soil types and soil boundaries on Woldwide One and Two I made an inspection of the property on the 7 February 2017 and checked the soil profile in numerous paddocks. Comments and photographs and a farm map showing paddock numbers are appended.

30 My investigation showed much of the middle of Woldwide One had a soil profile better described as a Drummond soil than Braxton or Pukemutu or Glenelg.

31 Further evidence of this can be obtained from looking at the drainage map supplied in the FEMP page 5, which shows open drains, tile drains and critical source areas. There are no known tile drains east of the tanker track to the Woldwide One dairy shed. Tile drains are only found in the south west corner of the farm which is correctly mapped as Braxton and Pukemutu soil. Drummond soils are free draining and would not normally have tile drainage installed.

32 As a consequence of this inspection the map of soil boundaries and soil types was redrawn and submitted with the consent application, section 6.2, Soil Types. These findings are important as the Council's information is that 90% of the property is on poorly drained soil.

**Soil Drainage Properties and Potential for Cracking**

33 My experience is that silt loam soils that have dried out such that the soil moisture content is close to wilting point may exhibit cracking but the degree and size of surface cracking is highly related to the soil cover. A well established pasture with good grass content is unlikely to show large soil cracks, i.e. no greater than 1 – 2 mm in breadth and of limited depth. That is because grass, particular ryegrass has a strong fibrous root system which provides significant soil strength and controls shrinkage.

34 By comparison soils with a sparse cover or newly establishing pasture will be much more prone to significant shrinkage cracks which could easily be 5mm wide or more.

35 These points are illustrated in the following photographs taken on the 5 December 2017.

36 The first is on a well-established pasture on a Drummond soil type on Woldwide One.

The second is on a newly establishing pasture on a Braxton soil type.

37 A knowledge of these properties can be incorporated into good farm management practices in regard to residual pasture length after grazing and effluent application. Effluent should not be applied to soil which exhibits severe cracking. Effluent receiving paddocks could be selected based on better pasture cover and a visual inspection to ensure minimal cracking. Limiting the depth of application will also reduce any potential risk of contaminants being lost below the root zone.

38 I have also frequently observed an increase in macroporosity in soils that approach wilting point at least in the topsoil, as subsequent pasture growth after the dry period stabilises the increased porosity in the profile. Therefore natural drainage properties are enhanced.

39 It is also my experience that dry soils have a significant ability to retain rainfall and drainage doesn't occur until the soil moisture content is at or above field capacity. The exception would be prolonged or high intensity rainfall which leads to soil surface ponding and by pass flow down the soil profile. Southland generally receives low intensity rainfall so a combination of free draining soil and a limited area of soil prone to cracking and a low incidence of high intensity rainfall should lower the risk of contaminant risk for this property

**Soil Properties and Effluent Application and Storage**

40 The Massey University Dairy Effluent Storage Calculator (DESC) categorises soils as being either high risk or low risk when it comes to effluent application.

41 The low risk soils, which are free draining, don't have the large continuous vertical macropores down the soil profile that are common to high risk soils. It is these large macropores that are created through either artificial drainage processes or natural processes, particularly changes in soil moisture content, that allow approx 90 % of the drainage water that passes down the profile to drop below the root zone.

42 Low risk soils exhibit what is termed by soil scientists as matrix flow, or piston flow when liquid is applied to them. The liquid moves uniformly down the profile displacing the moisture already in the profile. For this reason having a soil moisture deficit greater than the effluent irrigation depth is less crucial. Consequently there are more irrigation days available with low risk soils and less effluent storage is needed compared to high risk soils.

43 The risks of applying dairy shed effluent to land with a travelling irrigator are therefore lower when applying to low risk soils compared to high risk soils. Limiting the application depth to a maximum depth of 10 mm also helps control any potential loss of contaminants below the root zone. The travelling irrigator on Woldwide One has been checked in March 2018 and was found to have an average application depth across its wetted diameter of 6.2mm. This relatively low depth of application allows a reduced risk of loss of contaminants from the root zone, especially at higher soil moisture contents.

44 The availability of the wintering barn allows manure from the cows to be collected and applied to the land uniformly at a later date when there is active pasture growth. This greatly reduces the risk of nutrients being lost below the root zone. The even application from a slurry tanker is in contrast to how cows deposit dung and urine in a very patchy manner when grazing pasture or winter crop.

45 Mr de Wolde uses a trailing shoe slurry tanker which is used to take effluent from the storage pond and apply it to land at low depths. The actual depth of application is controlled by the

tractor travel speed and the target depth is between 2 and 4 mm per pass. The risk of nutrient loss is therefore extremely low at these depths of application.

**DISCHARGE PERMITS & EFFLUENT MANAGEMENT**

46 The Staff Report for Hearing states in section 3.1.2.1 Discharge Permit: "Compliance with Discharge Permit AUTH-301663 has been good since commencement on 9 November 2012. No incidents have been recorded, and no compliance action has been taken during life of this permit".

47 This is not unexpected considering the design of the effluent system, the low risk soils that are available to receive the effluent and the equipment that is used.

48 There is adequate effluent storage in place for the number of cows being milked and housed in the wintering barn. The trailing shoe slurry tanker is capable of very low application depths, 2.0 mm or less per pass. As is outlined further below, further storage will be required before there is any change to the current numbers of cows.

49 The travelling irrigator can apply effluent at less than 10.0 mm depth and as low as 6.2 mm depth, as tested on farm this year.

50 The 'Staff Report for Hearing' refers to Council's Policy 17 which relate to the effects of effluent on the environment and describes the need to avoid adverse effects on water quality and avoid as far as possible other adverse environmental effects from the use of effluent management systems.

51 The consent application for effluent discharge for the property referred to the 2009 Houlbrooke and Monaghan report which provides context and background to the principle that low depth effluent application should not cause adverse effects on water quality.

52 The graph below from the 2009 Houlbrooke and Monaghan, visually illustrates the difference between poor practice FDE application and best practice FDE application. The graph shows a considerable reduction in observed nutrient losses when FDE is applied under best practice management.

53 The results also show that nutrient loss from effluent discharge is a very minor component of overall nutrient losses. The greatest nutrient loss being "system loss" caused dung and urine spots from grazing dairy cattle.

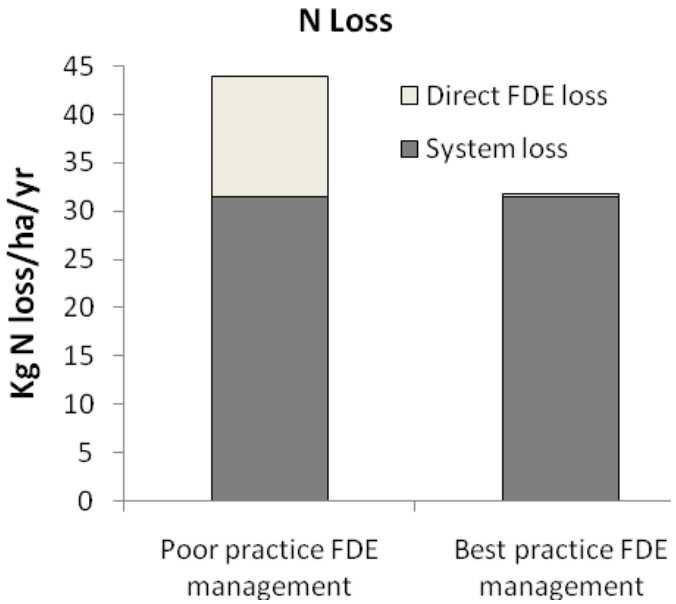


Figure 13. Houlbrooke and Monaghan (2009)

54 The Farm Environmental Management Plan with the application states that effluent will only be applied using best practice.

55 The staff for hearing report states under effluent management that effluent application is proposed to be high rate, therefore best practice effluent management is not achieved.

56 Best practice can be achieved by limiting the depth of application and in my experience, the effects of applying 2.0 mm depth of effluent on either a high risk or low risk soil will be no different than if a greater depth was applied with a low rate irrigator.

57 Likewise, the application of a limited depth of effluent with a travelling irrigator, less than 10.0 mm and as low as 6.2 mm onto a low risk soil will have the same effect as if a low rate irrigator was used. Low risk soils do not have the same level of risk of contaminants being transported directly to groundwater as high risk soils do.

**COMMENTS ON COUNCIL POSITION**

58 Ms King noted in the "Staff Report for Hearing" that "The existing storage is significantly smaller than the recommended Massey effluent storage pond calculator 90% storage volume for the proposed operation, which is not good practice."

59 The current storage is adequate for the 540 cow consented operation at present. Cow numbers were proposed to go up in stages and would not exceed 700 without a new dairy shed being built. Further cow numbers won't go up until the new storage is built.

60 An application has been made to build additional storage and the additional storage will be constructed as soon as the consent is granted and is expected to be finished in April this year.

61 This application is made on the basis that the resource consent for additional storage is granted, and then constructed. It is accepted that on the current storage the proposed increase in cow numbers could not occur, and that is not what the application is seeking. If required, a consent condition could be imposed which would require additional storage before any increase to the number of cows on the property.

62 The same report notes that groundwater information directly under the property is limited. Further information from recent testing has been presented earlier in this evidence. It shows at the same period in time the nitrate concentration particularly under the farm at Woldwide One and Two houses is significantly lower than that at the Councils monitoring bore to the south east of the farm.

63 It is accepted that nitrate concentrations can vary significantly spatially and a further monitoring bore as proposed by Mr Rodway will give confidence to the results collected to date.

64 An alternative soil map to Topoclimate was presented in the consent application. The application was based on the alternate soil map and the soil types it represents. The statement in the "Staff Report for Hearing" 3.1.1.3 Soil, "Soil classifications are not in dispute," is therefore incorrect. The staff report Table 3 uses the Topoclimate map which does not represent the application. As outlined above, the position of Mr de Wolde is that the map does not accurately represent the real-life situation on the property.

65 The implications of the farm having 66.3 % Drummond soils are significant. Drummond soils are regarded as free draining. The FDE soil risk category for them is "Well drained flat land (less than 7 degrees slope)". They are reported to exhibit what is called piston flow for soil water movement down the profile. This is in contrast to flow down large continuous soil macropores for Braxton and Pukemutu soil types. The potential for contaminant flow down the profile is therefore much reduced for this farm because of the Drummond soils.

66 The publication by Dairy NZ, "A farmers guide to managing farm dairy effluent" states "Effluent can be applied to "Low Risk" soils 24 hours after rainfall or irrigation has stopped, and any water puddles have disappeared", by comparison "'High Risk" soils require a water deficit equal or greater than the depth of the effluent to be applied."

**CONCLUSIONS**

67 From December 2017 to March 2018 nitrate concentrations at the Woldwide One shallow house bore were low.

68 At the same period of time the nitrate concentrations measured at the east side of the farm were much higher, but still less than 11.3 mg/L, a recognized drinking water standard.

69 The Environment Southland monitoring bore on Boyle Road which is further east had the highest concentrations. For the reasons outlined above, I do not consider this to be an accurate representation of what the concentration levels are on groundwater below the property.

70 The Heddon Bush School had low nitrate concentrations for this time period.

71 The Topoclimate map covering Woldwide One describes ninety percent of the farm as having poorly drained soil. This is disputed. On farm experience checked by digging a number of test holes found a significant part of the farm, in the order of 66 %, had free draining soil with profile depths up to 0.5 m deep or more overlying gravel.

72 There are no known tile drains under the free draining soil.

73 Soil cracking due to drought can be controlled to a reasonable degree by the way in which pastures are managed.

74 Effluent application can be managed to avoid soils with noticeable cracking thereby reducing the potential for a loss of contaminants below the root zone.

75 Manure collected by cows at the wintering barn is stored and can be applied at a later date when there is both a soil moisture deficit and active pasture growth. This ensures the greatest likelihood that nutrients will be used and not lost below the root zone.

76 The depth of application of pond stored manure can be closely controlled by the travel speed of the tractor for a slurry wagon. The target depth is 2 mm per pass.

77 On low risk soils a travelling irrigator is a suitable effluent application irrigator and depths of application up to 10 mm are acceptable.

78 On the information available I consider the operation of the effluent system including the application of dairy shed and wintering barn effluent meets all of Council's standard discharge consent conditions.

79 Importantly, I consider that the new storage pond and the system as proposed is highly unlikely to result in a measurable way, even cumulatively, in a deterioration in groundwater based on the science of Houlbrooke and Monaghan. Likewise I do not consider that the operation of the effluent system will result in an increase in nitrogen loss to groundwater that is greater than the existing scenario. Improvements in technology tend to be ongoing, including travelling irrigators, so further long term reductions are likely although these are not possible to quantify at this stage.

80 It is my view that the systems proposed will be effective in managing nutrient loss in accordance with industry best practice.

Dated 20 March 2018

John Scandrett

# APPENDIX A: WOLDWIDE ONE SOILS

The following photographs and comments refer to various paddocks across Woldwide One using paddock numbers provided on a farm plan as at January 2017.

Holes were dug to check the depth of topsoil, stone content and drainage properties. The topsoil and subsoil were checked for texture using field methods and for the drainage properties mottling was taken as an indication of impeded drainage.

The profile at each site was compared to the Topoclimate South soil map to determine if the soils were true to type as described in the Topoclimate soil information sheets.

It was found the Topoclimate maps were inaccurate with soil profiles generally better than stated. In places the soils were an intergrade between two types. The Braxton and Pukemutu soils are less extensive than shown.

Prior to Topoclimate maps being produced most of the block were depicted as being of the Drummond soil type in DSIR Soil Bureau Bulletin 27. Makarewa soils were shown to cover the west end of the farm. Makarewa soils are inherently poorly drained. Topoclimate has redefined the area covered by the Makarewa type as being a Braxton or Pukemutu soil type, both of which are poorly drained. Topoclimate has also extended the area of poorly drained soil to cover approximately 90% of Woldwide One.

I believe shallow to moderately deep Drummond soils cover much of the area shown as the Braxton type, other than for the west end of the block.

## Paddock 23

Topoclimate suggests a Glenelg soil type for this area. However, there was no stone in the topsoil and there was a well developed subsoil. The subsoil was free draining with no mottling to the bottom of the subsoil level at 0.5 m. This profile is more characteristic of a Drummond soil type. The sample site was on a broad ridge. The paddock had recently been cultivated and the profile was reported as being uniform to plough depth across it, i.e. no stones in the topsoil.

## Paddock 24

Topoclimate suggests a Glenelg soil type for this paddock. There was 250 mm depth of soil to stone. The profile was better than a typical Glenelg soil which has stone throughout all horizons. The south west corner where this hole was dug is the lightest part of the paddock.

## Paddock 21

Topoclimate suggests Braxton and Pukemutu soil types cover this area. The profile was 250 mm depth of topsoil, no mottles present, well structured, overlying a heavier textured subsoil. There were some mottles present in the subsoil and no stone with 0.5 m of the surface. This profile is tending towards the Braxton soil type. The sample site was in a slight hollow and would be expected to have a wetter profile compared to the higher adjoining ground.

## Paddock 7

Topoclimate suggests Braxton and Pukemutu soil types cover this area. The topsoil depth was 200 mm, overlying a 50 mm thick intergrade layer overlying a heavy and mottled subsoil. This profile showed poorer drainage than the profile in paddock 21 and is more characteristic of a Braxton soil type.

# Woldwide One Ltd

1354 Hundred Line Rd, Dunearn 9783

**LEGEND**

| | |
|---|---|
| Quarry/Gravel Pit | Shed |
| Creak/Duck Ponds | Public Road |
| Trees | Slurry Pit |
| Flood Bank | Tanker Track |
| Pilones/Powerline | Cow Yards |
| Effluent Paddocks | Waste Area |
| Houses | Bridge/Culvert |
| Water Bore | HNSO Chemical Storage |
| Under Pass | Fuel Tank |
| OFFAL Pit | Water Trough |

**A HEARING BEFORE**

**ENVIRONMENT SOUTHLAND**

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

# BRIEF OF EVIDENCE OF CAIN DUNCAN

**20 March 2018**

**Contents**

## QUALIFICATIONS AND EXPERIENCE

1 My full name is Cain Ross Duncan and I am currently employed as a Sustainable Dairy Advisor with Fonterra Co-Operative Group.

2 I hold a Bachelor of Resource Studies and a Masters in Applied Science from Lincoln University which were completed in 2000 and 2005 respectively. I achieved a Certificate of Completion from Massey University for satisfying the course requirements for the Advanced Certificate in Sustainable Nutrient Management in 2014. This is part of the training required for understanding and using of OVERSEER®.

3 In addition to the above qualifications I hold a Certificate of Completion for satisfying the course requirements for Advanced Farm System Modelling from Massey University.

4 I am a current Certified Nutrient Management Advisor having satisfied the criteria under the Nutrient Management Advisor Certification Programme managed by the Fertiliser Association of New Zealand. I completed my last annual assessment for this programme in December 2017.

5 I have 6 years' experience in the dairy industry in the role of a Sustainable Dairy Advisor. This role involves providing advice and support to Fonterra shareholders to assist them in developing and adopting practices that will improve the sustainability of their farming operations. I work one on one with our suppliers, to accelerate their adoption of good management practices, meeting Fonterra's minimum standards and complying with regional rules and consents.

6 Since 2013 Fonterra has annually collected data from its farmer shareholders to enabled modelling of individual farms nitrogen loss using OVERSEER®. Last year this resulted in the processing of over 9500 OVERSEER® files by Sustainable Dairy Advisors and QCONZ. Each year I process between 50-100 OVERSEER® files as part of this programme as well as a number of regulatory and predictive budgets for shareholders throughout the year.

7 I have a sound knowledge of farm systems and their relationship with nutrient management plans, having provided these to Fonterra shareholders in recent years.

8 Prior to my employment with Fonterra I worked for the London Borough of Tower Hamlets and the London Borough of Haringey (United Kingdom) as a Planning Officer/Enforcement Manager in their respective Planning sections for a total of 7 years. Before moving to the United Kingdom I worked as a Compliance Monitoring Officer for Environment Canterbury.

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

**SCOPE OF EVIDENCE**

10 This evidence addresses the following issues:

10.1 Determination of the correct land area and nutrient allocations to be used in the Woldwide One Ltd **"WOL"** Existing OVERSEER® file.

10.2 OVERSEER® v6.2.3 modelling for the existing consented farm system being undertaken on WOL and the 54ha of land leased to Woldwide Two Ltd **"WTL"** as well as modelling for the proposed farm system for which resource consent is being applied for.

10.3 The outputs and suitability of OVERSEER® in the context of this application and Policy 16 of the Proposed Southland Water and Land Plan **"pSWLP"**.

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

## BACKGROUND

### Site visit

12 On 3rd February 2017 I visited the farm, and discussed the proposal with Mr de Wold:

12.1 During this visit I collected information on the existing and proposed farming systems for WOL and WTL. This was collected in the standard format used by Fonterra farmers to submit their end of season farm data for the Fonterra Nitrogen Programme.

12.2 Mr de Wolde supplied me with maps of the proposed changes to the land area of WOL and WTL and his fertiliser plan prepared by Kieran Anderson of Ravensdown.

### Other sources of information

13 I have also obtained and viewed the following information:

13.1 An email on the 13th February 2017 from Mr de Wolde providing copies of the soil test results for WOL and WTL.

13.2 Mr de Wolde and I had a number of telephone conversations between the 13th and the 19th February 2017 to clarify information and insure the accuracy of the OVERSEER® modelling inputs.

13.3 An initial nutrient budget and associated analysis was sent to the applicant and his consultant on the 20th February 2017.

13.4 In June 2017, additional nutrient budgets were sought from the applicant's consultant to account for the 54ha of land leased to WTL from WOL. Upon discussion with Mr de Wolde and his consultant the file was updated to reflect changes to the wintering barn size and to correct an error in how farm dairy effluent and wintering barn effluent were being modelled.

13.5 An update was made to the OVERSEER® modelling in July 2017 to incorporate lower optimal Olsen P targets and reduced phosphorus fertiliser applications.

13.6 A final update was made to the OVERSEER® modelling on the 19th March 2018 following a discussion with Mr de Wolde on the wintering of young stock on the Horner Block. This is outlined in paragraph 30 below.

14 I prepared the final OVERSEER® modelling based on the information from the above sources.

**CORRECT LAND AREA AND NUTRIENT LOSSES FOR THE EXISTING SCENARIO MODELLING**

15 Ms Matheson sets out in the background to this application the errors that arose in assessing the land that should form part of the existing scenario OVERSEER® modelling for WOL and the challenges in determining how best to apply for consent and allocate nutrient losses. These challenges arose due to the 54ha block of land that has been leased to WTL from WOL and the fact WTL was also subject to a separate resource consent application for expanded dairy farming.

16 An error has been made in the way the consent application relates to the OVERSEER® modelling in that it does not deal with WOL and WTL as one proposal. Equally, in retrospect I would now have to accept the OVERSEER® modelling has not been undertaken in a way that correlated correctly with the separate consents that have been applied for WOL and WTL.

17 I accept that this hearing is based on the notification of an application for WOL alone. Therefore I do not take into account matters pertaining to the operations associated with WTL. As a result the key comparison is between the total existing nitrogen and phosphorus losses on WOL (including the 54ha lease block) and those that will occur under the proposed farm system.

18 It is correct to include the land and associated nutrients from the 54ha Lease Block in the OVERSEER® modelling of the existing use

of the land that is subject to this consent hearing. This Lease Block did not form part of the expanded dairying consent associated with WTL but is part of the current application for WOL.

19 This does result in an error in the OVERSEER® modelling associated with the WTL consent application due to the 54ha Lease Block and associated nutrient losses being included in the "existing" land use OVERSEER® file for WTL. The implications of this and how it will be remedied will be addressed in the Applicant's legal submissions.

20 I have however undertaken some initial modelling of nitrogen and phosphorus losses between a correctly modelled WTL existing scenario (updated to include the section of the Horner Block proposed to be utilised by WTL) and the WTL proposed scenario and this shows a reduction in nitrogen loss between the existing and proposed OVERSEER® scenarios.

21 Phosphorus loss between the two scenarios is initially showing a very small increase between the existing and proposed scenarios but this doesn't account for any mitigations that sit outside of OVERSEER®. These mitigations could be clearly quantified to show how mitigation measures will in reality avoid this small modelled increase in phosphorus.

**OVERSEER MODELLING**

22 OVERSEER® is a tool used by farmers and advisors to assess nutrient use, loss and movements within a farming system. The computer model calculates and estimates the flow of nutrients in a farming system and identifies the risk of environmental impacts through nutrient loss.

23 There are three main assumptions underpinning the use of OVERSEER® as a modelling tool. They are:

23.1 OVERSEER® assumes steady state conditions, i.e. the farm is at a state where there is minimal change each year.

23.2 OVERSEER® uses long term average inputs such as rainfall, PET and temperature and thus produces annual average outputs.

23.3 OVERSEER® assumes the inputs into the model are actual and reasonable and that certain best practices are occurring, i.e dairy shed effluent ponds are sealed.

24 OVERSEER® uses animal stocking rate and productivity to estimate animal requirements (MJME), which is then used to estimate production.

25 The OVERSEER® modelling has been carried out using OVERSEER® version 6.2.3 and data has been inputted into the model in accordance with the Fonterra Audited Nitrogen Management Programme Practice Note (Appendix 1) and the OVERSEER® Best Practice Input Standards, November 2016.

26 Soils information is based on a farm specific soil map (Appendix 2) produced by Mr Scandrett. It was specifically requested that this soils information be used in the OVERSEER® modelling so as to be consistent with the resource consent application. To the best of my knowledge Mr Scandrett is a capable person for undertaking farm level soil investigations but is not a trained soil pedologist as specified in the Best Practice Input Standards.

27 Climate settings were obtained from the Overseer climate station tool and milk production has been based on actual milk production volumes held by Fonterra Co-Operative Group Ltd and predicted long term production goals.

**WOL existing nutrient budget**

28 This scenario models the existing consented farm system for WOL and the Horner Support Block (without the 54ha Lease Block).

29 The Horner Support Block has been used for the spreading of wintering barn (and small quantities of dairy) effluent from WOL and for the cut and carrying of grass silage for three wintering barns (including WOL) owned by companies of which Mr de Wolde is a Director.

30 An omission was brought to my attention by Mr de Wolde during the final stages of preparing my evidence for this hearing. He noted that the 252 R1's (10 month old cows) that are wintered on grass on the Horner Block from late May to early August (part of the 938 that grazed across the entire Horner Block) had not been included in the existing WOL OVERSEER® modelling. The modelling has been updated to reflect this practice upon confirmation from Mr de Wolde he has documentation to support this.

31 The total land area occupied by the existing WOL and Horner Block operations is approximately 215ha and is consented for 540 cows.

32 Fertiliser inputs for the OVERSEER® modelling have been based on the 2015/16 fertiliser application plan developed by Ravensdown. This was confirmed by Mr de Wolde as being representative of a typical farming year for the property.

33 Supplements taken off the cut and carry blocks are based on an average weight of 15.3T/DM/ha taken over four cuts. Silage fed to mature cows in the wintering barn and in paddocks are based on silage intakes of 700kg/DM/cow in winter and 510kg/DM/cow over the rest of the season. Additional supplements are also utilised in the form of PKE, barley grain and molasses to supplement the cows pasture based diet.

34 Milk solids production is based on 491kg/MS/cow/yr which is a true reflection of the typical total milk solids supplied to Fonterra Co-Operative Group in a season.

35 Wintering barn slurry is applied to the Horner Block in three applications totalling between 1200 and 1400$m^3$. Modelling has been undertaken on the higher volume of 1400$m^3$.

36 To enable the utilisation of testing carried out on the nutrient content of the wintering barn effluent; effluent from the wintering barn has been entered as all exported and then re-imported as a fertiliser (Organic – Dairy Effluent) on the Horner Block. The nutrient content of the wintering barn effluent is derived from testing carried out by AgResearch in 2009 as part of their report to Environment Southland characterising dairy manures and slurries.

37 The nutrient loss figures for the WOL existing consented nutrient budget are as follows:

| Total Farm N Loss | Average N Loss/ha | Total Farm P Loss | Average P Loss/ha |
|---|---|---|---|
| 3683kg/yr | 17kg/ha/yr | 152kg/yr | 0.7kg/ha/yr |

**54ha Leased Block (WTL) existing nutrient budget**

38 As indicated, there is a 54ha block that has been leased to WTL, but will be returned to WOL. There is nutrient loss associated with the existing use of this block, which must stay with this block when it is transferred back to WOL, as it is a vital part of determining the existing nutrient loss associated with the land uses on the land subject to the WOL applications. In order to do this, this scenario models the existing farm system for that 54ha block.

39 As this land has been used as part of WTL it has been modelled as part of the existing nutrient budget for WTL but as a separate block. This enables the nutrients associated with the 54ha Lease Block to be differentiated from the rest of WTL.

40 A proportionate quantity of the losses associated with the summer turnips that partly rotate through the Lease Block and losses from "other sources" have also been allocated to the Lease Block.

41 This is deemed appropriate as losses from other sources, such as lanes, yards, unsealed silage and stand-off pads and effluent management systems (such as effluent not collected from off-paddock facilities) are likely to be spread relatively evenly across WTL. This is not the case on all dairy farms as losses from point source areas such as unsealed stand-off pads that have no effluent collection will make a significantly higher contribution to "other source" losses. In the case of WOL and WTL there are none of these types of facilities.

42 The figures and accuracy of the existing WTL nutrient budget have already been assessed by the Council as part of the expanded dairy consent application for WTL, however the key inputs are outlined below.

43 The WTL existing nutrient budget (and the 54ha Lease Block contained within it) is modelled on the existing WTL dairy farm and the SH96 Block.

44 The existing use of the SH96 Block (92ha) is winter grazing of R1 & R2 stock on Fodder Beet during May, June and July; the cut and carrying of grass silage for three wintering barns (including WOL & WTL) and for the application of wintering barn and some dairy effluent. The existing (pre-application) WTL dairy unit occupied an effective area of 232ha and is consented for 800 cows.

45 Fertiliser inputs for the OVERSEER® modelling have been based on the 2015/16 fertiliser application plan developed by Ravensdown. This was confirmed by Mr de Wolde as being representative of a typical farming year for the property.

46 Supplements taken off the cut and carry blocks are based on an average weight of 17T/DM/ha taken over 4 cuts. Silage fed to mature cows in the wintering barn and in paddocks is based on silage intakes of 700kg/DM/cow in winter and 380kg/DM/cow over the rest of the season. Additional supplements are also utilised in the form of PKE, barley grain and molasses to supplement the cows pasture based diet.

47 Milk solids production is based on 476kg/MS/cow/yr, which is less than WOL. This is logical as less supplementary feed is used on WTL

48 Wintering barn effluent is applied to the SH96 Block in three applications and has been modelled in OVERSEER® as outlined in the WOL existing nutrient budget.

49 The nutrient loss figures for the WTL existing nutrient budget and the 54ha Lease Block that forms part of those total losses are as follows:

| | Total Farm/Block N Loss | Average N Loss/ha | Total Farm/Block P Loss | Average P Loss/ha |
|---|---|---|---|---|
| WTL + SH96 | 7564kg/yr | 22kg/ha/yr | 189kg/yr | 0.6kg/ha/yr |
| 54ha Lease Block | 827kg/yr | 15kg/ha/yr | 37kg/yr | 0.7kg/ha/yr |

**Total nutrient losses existing WOL and 54ha Lease Block nutrient budgets**

50 The combined nutrient loss figures for the WOL existing nutrient budget and the 54ha Lease Block existing nutrient budget are as follows:

| | Total Farm/Block N Loss | Average N Loss/ha | Total Farm/Block P Loss | Average P Loss/ha |
|---|---|---|---|---|
| WOL | 3683kg/yr | 17kg/ha/yr | 152kg/yr | 0.7kg/ha/yr |
| 54ha Lease Block | 827kg/yr | 15kg/ha/yr | 37kg/yr | 0.7kg/ha/yr |
| **Total** | **4510kg/yr** | **16kg/ha/yr** | **189kg/yr** | **0.7kg/ha/yr** |

**WOL proposed nutrient budget**

51 This scenario models the proposed farm system for WOL and includes the Horner Block and the 54ha Lease Block that will be returned from WTL as well as an additional 260 cows (800 cows total).

52 The wintering barn has been increased in size to accommodate 620 cows with any additional cows wintered off the property. Wintering barn effluent continues to be spread on the Horner Block to support the cut and carry silage operation for three wintering barns. With the additional effluent from the wintering barn, imported fertiliser has been reduced on the Horner Block.

53 Wintering barn effluent on the Horner Block is modelled to provide 143kg/N/ha/yr but this is insufficient to meet the nitrogen, phosphorus and potassium requirements of the cut and carry operation, due to the lack of nutrients returned via dung and urine while grazing. On this basis nitrogen and phosphorus fertiliser has still been modelled on the Horner Block but to a lesser extent that in the existing WOL OVERSEER® modelling. As no young stock will be grazing on the Horner Block the amount of cut and carry silage is proposed to increase to 17T/DM/ha/yr.

54 On the main dairy platform Olsen P levels are proposed to be maintained at 30 which is within the range of a high producing dairy farm and adequate to sustain the levels of pasture production being proposed. The decrease in Olsen P levels results in less phosphorus fertiliser being required per hectare in the proposed WOL modelling.

55 PKE use in the dairy shed is proposed to increase slightly to supplement pasture eaten in paddocks and maintain the existing milk production per cow. Silage, barley and molasses inputs remain the same as modelled in the existing scenario (on a per cow basis).

56 The nutrient loss figures for the WOL proposed nutrient budget and a comparison with the existing WOL and 54ha Lease Block losses are as follows:

| | Total Farm/Block N Loss | Average N Loss/ha | Total Farm/Block P Loss | Average P Loss/ha |
|---|---|---|---|---|
| WOL Existing | 4510kg/yr | 16kg/ha/yr | 189kg/yr | 0.7kg/ha/yr |
| WOL Proposed | 4350kg/yr | 16kg/ha/yr | 176kg/yr | 0.7kg/ha/yr |
| **Difference** | **-160kg/yr** | **0kg/ha/yr** | **-13kg/yr** | **0kg/ha/yr** |

57 The OVERSEER® modelling for the WOL proposed nutrient budget shows a slight reduction in the levels of nitrogen and phosphorus loss when compared to the existing WOL nutrient budget and associated 54ha lease block nutrient budget.

58 The main reason there is no increase in nutrient loss between the existing and proposed scenarios is due to the transfer of nutrients associated with the management and cows on the 54ha Lease Block from WTL to WOL. Essentially a proportion of the nutrients associated with WTL that pertain to the 54ha Lease Block are being transferred back to WOL.

59 In addition to this, the removal of the summer turnips and winter grazing of young stock as well as the reduction in manufactured fertiliser on the Horner Block, in the proposed scenario, has also resulted in more minor reductions in nutrient losses.

**COMMENTS ON COUNCIL POSITION**

60 Ms King makes reference to the OVERSEER® modelling on page 23 of her statement of evidence and comments on the inappropriateness of comparing nutrient losses across WOL and WTL in the context of the current application. I agree with Ms King's

position on this matter, in light of the fact the current consent hearing does not include WTL.

61 However, Ms King concludes that the nutrient budgets provided with the application show nitrogen and phosphorus are predicted to increase. This conclusion is only valid if you simply compare the WOL existing nutrient budget and the WOL proposed nutrient budget without taking into account the existing land use on the 54ha Block Leased to WTL.

62 As the application before the hearing seeks to include that block as well, the land use occurring on that block must also be added to what was occurring on WOL. When this is correctly accounted for in the nutrient losses for the existing land use, there is a reduction in nutrient losses between the existing and proposed land use scenarios.

63 Comments are made by Ms King and Mr Rodway about the ability of OVERSEER® to accurately model the potential nutrient losses on the farm due to the nature of the shrink/swell soils on the property. This conclusion may be accurate in terms of the total losses and kg/ha losses predicted from the OVERSEER® modelling but the relative increases or decreases in nutrient losses between scenarios is still valid and carries important weight in the context of Policy 16 of the pSWLP.

64 This is because the existing scenario and the proposed scenario were both modelled using the same version of OVERSEER® with the same "bias". Because the focus is on finding the difference between those scenarios, as long as the bias is the same, it makes no difference for the validity of the comparison. It is similar to finding the difference in weight between two objects, using scales that slightly under-read. As long as the same scales under-reading by the same extent are used, the difference will remain accurate and not be undermined by the under-reading.

65 Mr Rodway has made comment on the OVERSEER® modelling undertaken and stated it was logical and followed the best practice inputs standards. He raised one issue with the size of the effluent areas in the modelling. To clarify, the effluent areas in both the

existing and proposed modelling were based on the areas currently set up and proposed to be set up for permanent effluent irrigation. They represent a conservative approach, whereby increasing the size of the effluent area will likely result in reduced nutrient losses from dairy effluent.

**CONCLUSION**

66 When the existing nutrient losses from the land subject to the expanded dairying consent application are correctly accounted for, OVERSEER® predicts no increase to occur in the modelled nutrient losses between the existing and proposed farming operations.

67 The main reason there is no increase in nutrient loss between the existing and proposed scenarios is due to the transfer of nutrients associated with the management and cows on the 54ha Lease Block from WTL to WOL. The resulting over-accounting of existing loss for the land subject to the "new" WTL operation (minus the 54ha block) will be addressed by the Applicant.

68 The total losses and kg/ha losses predicted from the OVERSEER® modelling could be inaccurate due to the shrink/swell properties of some of the soils on the farm. However because the existing and proposed scenario modelling used the same approach, if there is any inaccuracy it will be uniform for both scenarios. This means that the relative increases or decreases in nutrient losses between scenarios are still valid.

Dated 20 March 2018

Cain Duncan

# Fonterra Audited Nitrogen Management Programme

Practice Note 16 / 17 season data entry

**Version 4**

June 2017

## Purpose

This practice note is intended to provide guidance to those inputting on-farm data into the Overseer model as part of Fonterra's Audited Nitrogen Management Programme. This document is intended to be complementary to the Best Practice Data Input Standards (BPDIS) and to reduce the need to refer to the longer and more detailed document when processing large numbers of Overseer files.

The practice note will be a 'live' document and will be updated over time as/when issues are identified to provide guidance to parties inputting on-farm data into the Overseer model.

## How to use this practice note

The practice note is to be utilised as a first reference guide for Overseer users involved with the Audited Nitrogen Management Programme, where further information/guidance is required users are to refer to the BPDIS for details. As such the structure of the practice note is generally consistent with the BPDIS in terms of order.

Where quality data has not been provided and the BPDIS does not specify an optional default, the Practice note should be referred to unless further information can be collected through a farmer phone call.

Where the practice note does not provide a clear default; please refer the query to either gavin.marshall@fonterra.com or Richard.allen2@fonterra.com to provide agreed approach to resolve the issue and include in the practice note (to be utilised by all users).

### 1.1 General

#### 1.1.1 Process

| Parameter | Process |
|---|---|
| **Create new farm** | Enter Supply Number and season (xxxxx16/17) |
| **Farm scenario** | The "**Farm name**" will be the Supply Number<br>The "**Assessment year**" will be 16/17 |
| **Client details** | No entry required |
| **Property** | No entry required |
| **Consultant details** | Your name and organisation |

### 1.2 Location

#### 1.2.1 Process

| Parameter | Process |
|---|---|
| **Location** | Select "**By region**".<br>Select the "**region**" (as specified in farm information spreadsheet) by clicking on the map provided. |

## 1.3 Blocks

**Note: Suppliers are classified 1-3 by the quality of their Overseer base file; this will determine the process/information that must be entered into Overseer.**

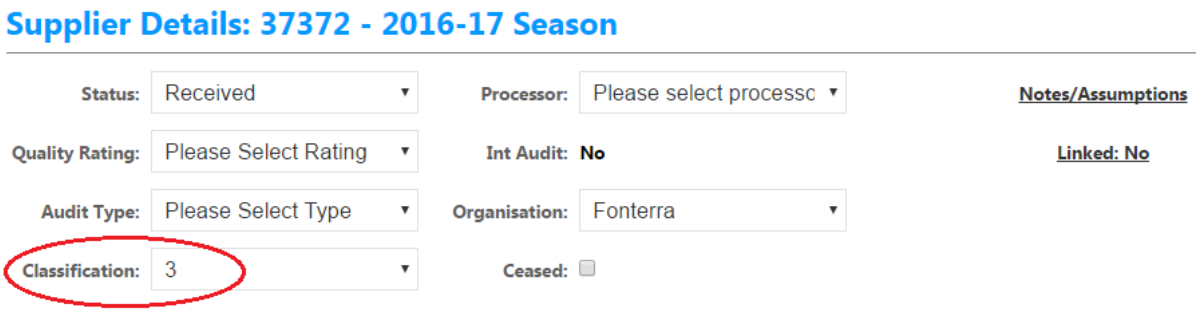
**This is as follows:**

**Category 1** **This farm has been mapped using our GIS software and there will be a .pdf file in 'Background Files' in Gary. This block setup and block attribute information MUST take precedence over any other block allocation process.**

**Category 2** **This farm has an Overseer base file that has been specified as part of a resource consent. There will be an Overseer file in 'Overseer Files' in Gary. This file MUST take precedence over any other block allocation Process.**

**Category 3** **This farm has not been mapped to block level, or have a resource consent specified Overseer base file. The block allocation process (in conjunction with last season's file – where applicable) should be used to create the Overseer base file. Appendix 3 provides direction on this process.**

**Fig: 1 Screen shot of Gary displaying the location of the file classification**




### 1.3.1 Process

| Parameter | Process |
|---|---|
| **Farm area** | |
| **Total farm area** | Enter the "**Total farm area**". –**Note: Compulsory Exception below:**<br>Where a farmer has provided a 'Total farm area' and a different number for the 'Dairy farm area' and the difference between the Total farm area and Dairy farm area is greater than 20%, this requires a QA call to the farmer to determine what the additional land is used for and if it should be included in the nutrient budget. **This information must be recorded in the note/assumptions form in Gary**.<br><br>Only if the additional land would be considered a different enterprise i.e. in no way related to the dairy farm, should it be excluded from the Overseer entry of 'total farm area'.<br><br>*If tick box at top of farmer data page has been used but there is no file on record from last season – the file will be returned to QA for follow up.* |
| **Total area declared as** | Enter the blocks using information from the farmer provided recording |

| Parameter | Process |
|---|---|
| **blocks** | pages, (including where tickbox has been used and information from the previous seasons file will be checked and replicated).<br>*Note: Where the farmer information for blocks is incomplete and cannot be taken from the previous seasons file – the file will be returned to QA for follow up.*<br>Select block type: pastoral, fodder crop, crop, or trees. For each block enter a name and soil description that best describes the area being described. Enter the block area as provided e.g. 'Effluent – Pallic.<br><br>Check that the "total area declared as blocks" that the Overseer field shows is consistent with the block areas provided on the forms |
| **Non-productive area** | Where blocks have been entered as effective areas the model will calculate the difference between the total farm area and the total of the blocks. This will be the "non-productive" area. |
| **Blocks Further Information** | |
| | For most dairy farms the blocks will be separated into:<br>**Pastoral** (including **Pastoral/Effluent**) blocks, **Fodder Crop** (not allocated a block area in the farm area field) and **Crop** blocks. Where information on a stock excluded bush / scrub / riparian /wetland area this should be entered to Overseer as either **Tree and Scrub** or **Riparian.**<br>**NB: The wetland block option in Overseer should not be used, however a block can be named as wetland and entered as a riparian block.**<br>Separate blocks should be set up for areas under different management (i.e. subsurface drainage areas, irrigated areas, areas which receive farm dairy effluent or where there are known significant differences in soil types and texture, and topography (i.e. flat versus rolling versus steep land).<br>**Riparian** and **Trees and Scrub** blocks may be added where information has been provided.<br>**Lucerne** areas should be entered as a separate 'Pastoral' block, and called 'Lucerne'.<br>**Fodder crops** should be entered as **crop blocks** when:<br>• >25% of the pastoral area is in fodder crop **AND/OR**,<br>• the same paddock/s of the farm is used continuously for fodder cropping **AND/OR**,<br>• The fodder crops cycle i.e. the duration between sowing and harvest, is greater than a single assessment year (12 months).<br>**A fodder crop block that does not meet the above criteria shall be set as a 'Fodder Crop'*.**<br>**EXCEPTION** if a single fodder crop is grown and its crop cycle is greater than a single assessment year (12 months) **AND** farmer information suggests that this is an annual rotation e.g. similar area and practices each year. In this instance enter via fodder crop model. |
| | |

*There may be instances where more complex fodder crop rotation processes mean that it is only practical to enter information via the 'crop' model. Where this approach is taken, it must be noted in 'assumptions form'; and processor should check the previous seasons file to ascertain the method used to ensure consistency.

## 1.4 Enterprises (Stock)

1.4.1 Process

| Parameter | Process |
|---|---|
| **Select the enterprise types that are present on the farm** | Select "**Dairy**".<br>Select "**Dairy replacements**" unless farmer provided data suggests that<br><br>**Compulsory data quality check required:**<br>Please note we have identified a situation where there is the potential for farmers to overlook entering their monthly replacement stock (calves R1's & R2's) numbers when using the online Nitrogen recording pages and the 'monthly stock numbers' entry approach. This issue only exists for farmers when submitting monthly stock numbers using the online recording pages.<br><br>**To ensure we can detect if this issue has occurred please follow the steps outlined below:**<br>When you encounter an online form where monthly milking herd numbers and a replacement rate have been provided but replacements (calves R1 and R2) have not been provided, further investigation is required to confirm if the farmer intentionally omitted the replacements data from the recording pages.<br>Check the previous seasons recording pages to determine the correct entry approach.<br>1. If 1516 season farmer data clearly states replacements are off farm,<br>**Optional default**: you can assume this is the case for the 1617 season. (Assumption must be recorded in Gary)<br>**OR**<br>2. If 1516 season farmer data states replacements are on farm,<br>**Compulsory default**: A QA call to the farmer must be made to clarify if replacements should be on farm for this season also.<br><br>replacements are off farm prior to weaning.<br><br>Select any other stock type as appropriate. However, do not enter enterprises that comprise of less than 20 stock units (RSU) in total or pets. (Refer to the RSU guide at 2.5 of this document) |
| | |

## 1.5 Structures

### 1.5.1 Definitions

The Overseer model allows for structures listed (and defined below) to be modelled:

- **Feed pad**

  A feed pad is a hard surface area (i.e. concrete) that is normally sited adjacent to the farm dairy where stock can be held for a period of time (i.e. one to two hours), either prior to ,or after milking, and that is provided with supplementary feed.

- **Winter standoff or loafing pad**

  An area specifically built to enable stock to be withheld from grazing pasture (or crops) during wet periods, with the main aim being to minimise damage to pasture (or crop). There is no provision for stock feeding while animals are on the winter standoff or loafing pad.

- **Wintering pad, animal shelter or barn**

  A wintering pad, animal shelter, barn or housing are specially built areas constructed to accommodate animals which have been withheld from pasture for extended periods, and supplementary feeds can be brought to them.

### 1.5.2 Process

| Parameter | Process |
|---|---|
| **Dairy cow structures** | Select the structures that are present on the dairy farm, and that are used during the assessment year for dairy cows.<br>**Note:** Only select the "Wintering pad, animal shelter or housing" option where dairy cows are withheld from pasture for extended periods of time (i.e. weeks or months), **AND** where they are primarily fed in this structure. |
| **Dairy cow replacement structures** | Select the structures that are present on the dairy farm, and that are used during the assessment year for dairy cow replacements. |
| **Other enterprises** | Select the structures that are used for that enterprise, and that are used during the assessment year for stock associated with that enterprise. |

## 1.6 Animal Distribution

### 1.6.1 Process

| Parameter | Process |
|---|---|
| **Method for determining relative productivity** | **Differences are NOT specified by farmer:** If differences in productivity on grazed blocks are not known, enter "**no difference between blocks**".<br>**Differences are specified by farmer:** Where there is evidence to show that relative pasture productivity is different between blocks (e.g. flat versus hill country), productivity differences may be entered.<br>Evidence includes measured pasture production, recorded animal grazing days, and recorded differences in stocking rates. The basis for an entry other than the default MUST be provided in the file assumptions form.<br>**Irrigated and non-irrigated blocks:** Where freshwater irrigation occurs on selected blocks, select "**Relative pasture yield**".<br>Enter the irrigated block as "**1.00**" and the non-irrigated blocks as a |

| Parameter | Process |
|---|---|
| | "**0.75**", unless better information has been made available. |
| **Assume animals on all blocks eat pasture at the same ratio as farm intake** | **Compulsory default: Check this box.**<br>Note: This option only appears where there is more than one "enterprise" on the farm. |

## 1.7 Dairy Effluent System

### 1.7.1 Process

| Parameter | Process |
|---|---|
| **Dairy effluent system** | |
| **Management system** | *Where the tickbox has been used on the farm data form (data completed for last season has not changed) the information from the previous seasons file will be checked and replicated).*<br>Select the most accurate option from the drop-down box.<br>Where farmer has specified that effluent is both irrigated to pasture and discharged to water. **Compulsory Default:** Select "**Two pond and discharge**"<br>If irrigation to land is known but more information about the system has not been provided the default entry is "**Spray from sump**".<br>**Less than three days storage:** Where an effluent management system has no more than three (3) days storage, and effluent is applied to land, the compulsory default is "**Spray from sump**".<br>**More than three days storage** select "**Holding pond**". |
| **Solids are separated out before effluent enters the holding pond** | Check this box if solids are separated out before effluent enters the holding pond.<br>*Note this information is not usually collected so would only be entered if a note has been provided or was known from a previous season file.* |
| **Solid separation** | |
| **Disposal method** | Select the most applicable options for managing separated solids.<br>**Optional default**: Select "**Spread on selected blocks**". |
| **Storage method** | **Optional default**: Select "**Open**". |
| **Time in storage** | **Optional default**: Enter "**3**" months. |
| **Pond solids** | |
| **Management** | **Optional default:** "**Spread on selected blocks**". |
| **Ponds emptied every** | **Optional default**: Enter "**1**" year. |
| **Liquid effluent** | |
| **Management** | Select the most applicable method for liquid effluent management on the dairy farm.<br>Where "spray infrequently" has been specified; this should only be utilised where specified storage > 30 days. Otherwise utilise optional default.<br>**Optional default:** "**Spray regularly**". |

## 1.8 Supplements Imported

### 1.8.1 Process

| Parameter | Process |
|---|---|
| **Supplement source** | Click "**Add supplement**" and select its "**source**". |
| **Category** | Select the most applicable description option from the list provided. |
| **Supplementary feed** | ***Note: If a given supplement is not available from the Overseer dropdown lists, select the supplement with the closest protein levels from the list available to the processing teams*** (located under "manage" tab – "view training files" on GARY front screen)***. This list is to be updated where supplements not previously considered are identified. Contact Gavin or Richard if no clear replacement option.***<br><br>**Hay or silage:** Select the most applicable option from the list provided.<br>**Optional default**: select **'Good Quality'**.<br>**Baled imported feed:** Select "**Standard bale sizing**" and then enter a bale equivalent. Where no information is provided, or if it is of insufficient quality, the default option for bale equivalents is "**12**".<br>Note that where farmer data says a "conventional" bale this would normally be referring to a small bale (1 bale equivalent)<br>Note that options for entering volume of supplementary feed vary depending on the source of the supplement. It may be necessary to select 'purchased' in order to enter supplements as bales and utilise the Overseer model to calculate this as Tonnes DM prior to entering as 'from storage'. |
| **Weight** | Enter the weight of the imported feed in tonnes, and where applicable check the "**Weight on a dry weight basis**".<br>**Note:** Checking this box will make a significant difference for silage and hay. Therefore, where possible ensure that DM or wet-weight is entered accurately.<br>**(The on-line form does not display information for DM where the data has been entered as wet weight i.e. if DM is not specified – enter as wet weight. See examples below).**<br><br>**Fig.2 examples of supplement from the online pages:**<br>**Dry Weight** **Wet Weight**<br>Type 1: Maize silage<br>Where did it come from?<br>Purchased<br>Amount<br>100 Tonnes (T) , DryWeight<br>Type 1: Pasture silage<br>Where did it come from?<br>Other from run-off<br>Amount<br>600 Tonnes (T) |

| Parameter | Process |
|---|---|
| **Storage conditions** | **Optional default:** Select "**Average**" unless there is a justifiable reason for a different input to be selected.<br>**Silage:** The **optional default** is "**Silage stack used**" and "**Effluent from the stack is contained**". |
| **Destination** | Select where the imported feed will be fed to stock on the dairy farm. If available, identify the blocks where the imported feed will be fed.<br>**Optional default:** Select "**Paddocks**" and "**Evenly spread across blocks**". |
| **Specify timing of feeding** | Leave the box **unchecked**. |
| **In-shed feeding** | To access this parameter you will need to set it up (Dairy > Enterprises > Milking shed feeding) before allocating imported supplements to this system. (See 2.4 page 12) |
| **Utilisation** | **Optional default** values:<br>• Where imported feed is fed in **paddocks**: "**Average**"<br>• Where imported feed is fed on the **feed pad**: "**Very good**"<br>• Where imported feed is fed through an **in-shed feeding system**: "**Very good**". |

### 1.9 DCD (Nitrification Inhibitor)

1.9.1 Process

This is not an input option.

### 1.10 Wetlands

1.10.1 Process

This is not an input option.

### 1.11 GHG footprint

1.11.1 Process

This is not an input option.

### 1.12 Report Settings

1.12.1 Process

| Parameter | Process |
|---|---|
| **Farm type for benchmarking data** | **Compulsory default:** Select "**Typical dairy farm**". |
| **Greenhouse gas emissions report units** | **Compulsory default:** Select "**CO2 equivalents (kg/ha)**" |

## 2.0 Enterprises (Dairy)

### 2.1 Numbers

2.1.1 Process

Note:

- Where monthly stock numbers have been provided choose "specify based on specific stock numbers"
- Where peak cow numbers have been provided choose from the following two options:
  - ✓ Single herd – follow option 1 below "specify based on specific stock number"

- ✓ Two or more herds – follow option 2 below "specify based on peak cows numbers"

| Parameter | Process |
|---|---|
| **1. Dairy stock numbers**<br>**(Single herd or monthly stock numbers are provided)** | Select "**Specify based on specific stock numbers**". (ensure files that are being reworked based on previous season file have this changed entry approach added)<br>Enter replacement rate if known.<br>Leave "calves fed milk powder" unchecked except where different information has been provided. (be aware that this setting reverts to the default of ticked if you make any changes in the field before saving) |
| **Monthly stock number** | For any farm where actual monthly stock numbers have been provided use "add new herd" option to describe the herd(s)<br>Please refer to the Compulsory data quality check outlined on Page 4, under 1.4 Enterprises (Stock) before continuing<br>For all other farms with one milking herd use the "**generate standard milking platform**" option to generate milking herd and replacements |
| | |
| **Breed** | Select the most applicable option from the list provided. |
| **Peak number of cows milked** | Enter the peak number of cows in this herd that were milked during the assessment year. (note that this entry is the "cows calved" number for the herd in the farmer data form)<br>Leave "constant over season" unchecked |
| **Breeding bulls** | **If this information has not been provided in the farmer data form default will be to enter as 1 bull per 100 cows (rounded up to nearest 100s- eg 120 cows – 2 bulls)** |
| **Replacements** | Select the most applicable option from the list provided |
| **Replacement rate** | Enter if provided or leave as Overseer default (23%) if unknown |
| **Median calving date** | Enter as 3 weeks after the start of calving date provided in the farmer data forms. |
| **Winter grazing off % of breeding stock** | Based on the information provided, and if wintering off occurs, enter the **percentage** (**%**) of breeding stock that are wintered off during the season.<br>Refer to 'Cowculator' (located under "manage" tab – "view training files" on GARY front screen) to apportion percentage (%) of stock wintered off where less than 100% of herd is removed from the dairy farm for less than 100% of specified month.<br>**Note:** The information entered for wintering off must relate to the assessment year (i.e. from 1 June to May 31). Therefore, you must consider wintering-off at both the start, and end of the assessment year.<br>**Where breeding stock are wintered on support land that is not included in this Overseer file as a dairy farm block, the winter grazing table should be completed.**<br>**Where breeding stock are wintered on a "support block", included** |

| Parameter | Process |
|---|---|
| | **in this Overseer file, that is a part of the dairy farm i.e. attached / adjacent land the winter grazing table should be left blank** |
| **Drying off date** | **NB to enter the drying off date for the herd that is set out in the monthly stock number table: click on the edit icon in the milking herd 1 row – enter the date given in the recording pages in to the "drying off" field.**<br>**Note: where no drying off date is specified; Optional default: last milk collection date (from Fonterra database).This must be recorded in 'assumptions' page.** |
| | |
| **2. Dairy Stock Numbers (2 or more milking herds where actual monthly numbers are not known)** | **Select "specify using peak cow numbers"** |
| **Breed** | Select the most applicable option from the list provided. |
| **Peak Number of cows milked** | Add the total of the herds at peak (total of cows calved from the recording pages)<br>Leave "breeding numbers are constant" unchecked |
| **Replacement grazing** | Select best option from dropdown (note first option "calves reared on farm" is meant to mean that they leave the farm after weaning – do not use this option for where calves are on farm permanently) |
| **Average mob weight** | **Compulsory default:** |
| **Breeding cow replacement rate** | **Enter percentage replacements as provided or use the Overseer default of 23%** |
| **Winter grazing off % of breeding stock** | Based on the information provided, and if wintering off occurs, enter the **percentage** (**%**) of breeding stock that are wintered off during the season.<br>Refer to 'Cowculator' (located under "manage" tab – "view training files" on GARY front screen) to apportion percentage (%) of stock wintered off where less than 100% of herd is removed from the dairy farm for less than 100% of specified month.<br>**Note:** The information entered for wintering off must relate to the assessment year (i.e. from 1 June to May 31). Therefore, you must consider wintering-off at both the start, and end of the assessment year.<br>**Where breeding stock are wintered on support land that is not included in this Overseer file as a dairy farm block the winter grazing table should be completed.**<br>**Where breeding stock are wintered on a "support block", included in this Overseer file, that is a part of the dairy farm i.e. attached / adjacent land the winter grazing table should be left blank** |
| **Compulsory - Specify** | Click "**Add herd**" for each herd identified as having a different calving |

| Parameter | Process |
|---|---|
| **dairy calving times** | date.<br>The "**Median calving date**" is "**3 weeks**" after the start of calving, unless better information is available.<br>Enter the "**Drying off**" date, and proportion of the total cow numbers in this relevant herd.<br>**Percentage of cows: calculate the percentage that each herd makes up of the total cow number as entered to "peak numbers of cows milked" field (eg "peak numbers" entered is 300, first herd 220 cows ( 220 ÷ 300 = 73%), second herd is 80 cows (80 ÷ 300 = 27%)** |

## Dairy Replacements

**Dairy Replacements Note**: where dairy numbers have been entered as "specify based on specific stock numbers" and the "Generate milking Mob and replacements selected" the dairy replacement input is as a monthly entry and will be prepopulated in the "Dairy replacements" table based on the replacement rate you have entered in to the Dairy numbers field. These numbers should not be changed unless better information about replacement numbers on farm by month has been provided.

Where monthly stock numbers have been provided and entered as "specify based on specific stock numbers" using "Add a new mob" the replacement data will need to be populated in the "Dairy replacement" table manually using the farmer supplied data.

### Other 'stock' Enterprises

Process

| Parameter | Process |
|---|---|
| **Stock numbers** | For all other stock that graze on the dairy farm select either "**Specify using RSU**" (recommended) or "**Specify based on specific stock numbers**". |

If you have selected "**Specify using RSU**" use the following table (**Table 2**) as a guide when entering stock information into the Overseer model.

**Table 2:** Stock type and RSU guidelines.

| Stock type | RSU |
|---|---|
| Breeding hind and fawn to weaning | 2 |
| Breeding / velvet stag | 2 |
| Rising yearling deer M / F | 1.5 |
| Breeding ewe and lamb to weaning | 1 |
| Adult wether | 1 |
| Rising yearling M / F sheep | 1 |
| Ram | 1.5 |
| Beef breeding cow and calf to weaning | 6 |
| Breeding or more than 1 year beef bull | 5 |
| Rising yearling M / F: (includes grazing dairy heifers other than own replacements) | 4 |

## 2.2 Production (Dairy)

### 2.2.1 Process

| Parameter | Process |
|---|---|
| **Milk solids** | Enter the **production** (kg/yr) for the assessment year (1 June to 31 May).<br>Note this entry MUST come from the farm data form, it cannot be entered from any other source<br>**Note: For "linked" supply number files ensure the production data for the additional supply numbers is added.** |
| **Once a day milking** | Select the most applicable option from the list provided.<br>**Optional default:** "**Never**". The optional default should only be changed where the selected practice applies to the majority of the herd. |
| **Lactation length** | Lactation length will be the difference between the "**Median calving date**" and the "**Drying off**" date (Refer to 2.1.1).<br>**This information should be calculated and added to all files.** |
| **Milk volume yield** | **Compulsory default:** Leave this box **unchecked**. |
| **Fat yield** | **Compulsory default:** Leave this box **unchecked**. |

## 2.3 Health Supplements

2.3.1 Process

Not an Input Option. (no data collection process here but for a file received from third party this field can be used)

## 2.4 Milking Shed Feeding

2.4.1 Process

| Parameter | Process |
|---|---|
| **Percentage of cows fed in the shed** | Enter the **percentage** (**%**) of cows fed in the shed for months in which milking occurs. (enter 100% of herd for lactation months if more detailed information is not known)<br>**Note:** This option must be setup before entering information about supplements that are fed in the milking shed, otherwise this feeding location will not be available. |

## 3.0 Structures

## 3.1 Feed pad

3.1.1 Process

Note: Where specified that liquids from the feedpad / wintering barn are captured and managed, but no further information as to how these are managed - assumption is that they are managed via the farm dairy effluent system (e.g. applied to land/discharged to water)

| Parameter | Process |
|---|---|
| **Feed pad details** | |
| **Manure removal method** | Select the most applicable option from the list provided.<br>**Optional default:** Select "**Scraping no water**". |
| **Solids are separated** | **Note the data collection does not ask for this information – do not check tickbox unless information on separation was provided in a note or comment.**<br>**Solid separation occurs mechanically, or through a weeping wall**: Select "**Solids separated**".<br>**Solids management method:** Default **"Spread on selected block"**<br>**Storage method before solids are spread:** select appropriate dropdown default **"open to rain".**<br>**Optional default**: **"Scraped material added to farm dairy effluent system".** |
| **Time in storage** | **Optional default**: Enter "**3**" (months) for length of storage time |

| Parameter | Process |
|---|---|
| **Time animals are on the feed pad** | Enter for each month the **percentage** (**%**) of milking cows on the feed pad, and the **average number of hours** spent on the feed pad per day. |

## 3.2 Winter standoff and loafing pads

### 3.2.1 Process

| Parameter | Process |
|---|---|
| **Winter standoff pad construction and maintenance** | |
| **Pad surface** | Select the most applicable option from the list provided.<br>**Optional default:** Select "**Inert (lime, rock mix)**".<br>Note if "other" is entered on the data form enter as inert. |
| **Lined, concrete floor or subsurface drained or effluent captured** | **Optional default:** Leave this box **unchecked**.<br>**Effluent is captured:** If effluent is effectively captured from pad and transferred to the effluent system, then select this option. If this option is selected, then the captured effluent is assumed to be treated the same way as farm dairy effluent. |
| **Surface scraped regularly** | **Optional default:** Leave this box **unchecked**.<br>**Scraping occurs:** If the surface is scraped annually, or more frequently, then select this option. |
| **Management of scraped solids** | |
| **Scraped surface solids management method** | **Optional default:** Select "**Spread on selected blocks**".<br>**Effluent is exported off the dairy farm:** Select "**Other (exported)**". |
| **Storage method before solids are disposed of** | **Optional default:** Select "**Open to rain**" |
| **Time in storage** | **Optional default:** Select "**3**" months. |

| Parameter | Process |
|---|---|
| **Percentage of milking cows** | Enter the percentage(**%**) of milking cows that use the winter standoff pad for each particular month. |
| **Hours per day on the standoff pad** | Use the above calculation (**Days in the month/total hours on pad in that same month**) to determine how many **hours per day** the milking cows spent on the standoff pad. |

## 3.3 Wintering Pads, Animal Shelter, or Housing (Covered)

### 3.3.1 Process

| Parameter | Process |
|---|---|
| **Wintering pad, animal shelter or housing details** | |
| **Pad type** | **Optional default:** Select "**Covered wintering pad, animal shelter**". |
| **Bunker management** | |
| **Bunker lining material** | **Optional default:** Select "**No lining material**". |
| **"No lining material" is** | **Optional default:** Select "**Scraping (no water)**" and then leave the |

| Parameter | Process |
|---|---|
| **selected** | "**Concrete apron cleaning method**" box **unchecked**. |
| **"Carbon rich" or "Soil" is selected** | **Time between first adding animals and cleaning out of bunker:** The **optional default** is "**12**" months, and for the **"Liquids drained away**" box **check as appropriate**. |
| **Concrete feeding apron** | |
| **Concrete apron cleaning method** | **Optional default:** If selected, leave this **unchecked**.<br>If more information is known, select this option and complete the relevant details (i.e. solids separation, etc.). |
| **Solids management** | |
| **Solids disposal method** | **Optional default:** Select "**Spread on selected blocks**".<br>**Effluent is exported off the dairy farm:** Select "**Other (exported)**". |
| **Storage method before solids are disposed of** | **Optional default:** Select "**Open to rain**" unless good information is available to suggest otherwise. |
| **Time in storage** | **Optional default:** Select "**3**" months. |

| Parameter | Process |
|---|---|
| **Wintering pad, animal shelter or housing usage** | |
| **Feeding regime** | Select the most applicable option from the list provided. If the information provided is insufficient, this structure should not be selected. |
| **Grazed out most of farm before moving animals onto the pad** | **Default**: Leave this box **unchecked**. |
| **Time spent on pad** | |
| **Percentage of milking cows** | Enter the **percentage (%)** of milking cows that use the pad for each month. |
| **Hours per day on the pad** | Enter the average **hours per day** that the milking cows use the pad for each month. |

## 3.4 Wintering Pads, Animal Shelter, or Housing (Uncovered)

### 3.4.1 Process

| Parameter | Process |
|---|---|
| **Wintering pad, animal shelter or housing details** | |
| **Pad type** | **Optional** default: Select "**Uncovered wintering pad**". |
| **Bedding pad** | |
| **Pad surface** | Select the most applicable option from the list provided.<br>**Optional default:** "**Inert (lime, rock mix)**". |
| **Lined, concrete floor or subsurface drained or effluent captured** | **Optional default:** Leave this **unchecked**.<br>**Effluent is captured:** If effluent is effectively captured from pad and transferred to the effluent system, then select this option. |

| Parameter | Process |
|---|---|
| **Surface scraped regularly** | **Optional default:** Leave this **unchecked**.<br>**Scraping occurs:** If the surface is scraped annually, or more frequently, then select this option. |
| **Concrete feeding apron** | |
| **Concrete apron cleaning method** | **Optional default:** If selected, leave this **unchecked**. If more information is known, select this option and complete the relevant details (i.e. solids separation, etc.). |
| **Solids management** | |
| **Solids disposal method** | **Optional default:** Select "**Spread on selected blocks**".<br>**Effluent is exported off the dairy farm:** Select "**Other (exported)**". |
| **Storage method before solids are disposed of** | **Optional default:** Select "**Open to rain**" unless good information is available to suggest otherwise. |
| **Time in storage** | **Optional default:** Select "**3**" months. |

| Parameter | Process |
|---|---|
| **Wintering pad, animal shelter or housing usage** | |
| **Feeding regime** | Select the most applicable option from the list provided. If the information provided is insufficient, this structure should not be selected. |
| **Grazed out most of farm before moving animals onto the pad** | **Default**: Leave this box **unchecked**. |
| **Time spent on pad** | |
| **Percentage of milking cows** | Enter the **percentage(%)** of milking cows that use the pad for each month. |
| **Hours per day on the pad** | Enter the **hours per day** that the milking cows use the pad for each month. |

# 4. Block Data

## 4.1 General

### 4.1.1 Process

| Parameter | Process |
|---|---|
| **Fodder crop** | If you have entered a fodder crop block on the farm you will need to identify if the fodder crop rotates through this block. If one does, **check** this box. (see Dairy Farm Blocks page in the nitrogen recording pages) |
| **Cultivated in the last 5 years** | **Compulsory default**: Leave this option **unchecked**. |
| **Topography** | **If the farm is classified '1' i.e a block mapped farm use topography data were available from the from the soils csv file.**<br>**Optional default:** Peat, recent, or gley soil select "**Flat**". **For other soil Orders** Select "**Rolling**". If there is topography information from an earlier Overseer file this can be carried through to the 16/17 season file. |
| **Distance from coast** | **Optional default:** Enter "**30**" kilometres unless better information is available. |

## 4.2 Climate

### 4.2.1 Process

| Parameter | Process |
|---|---|
| **Daily rainfall pattern setting** | **Compulsory approach: Select** "**Climate station tool**" and enter farm dairy location coordinates (from spreadsheet). Select "**Retrieve climate data**" and "**Use these values**".<br>Note: for the first block on each farm file please check this input if working from last season's base file.(ie re-enter the coordinates and see if any significant change to rainfall / temp / PET) If it had been previously entered incorrectly please note this correction on the assumptions form and ensure all blocks are corrected |
| **Mean annual rainfall** | **Compulsory default: Select** "**Climate station tool**" and enter farm dairy location coordinates (from 'Background Files'). Select "**Retrieve climate data**" and "**Use these values**".<br>Enter the "**NIWA 500 metre grid long-term average rainfall**" |
| **Temperature** | **Compulsory default**: Select "**Specify actual temperature**" and then enter the "**NIWA 500 metre grid long-term average temperature data**" |
| **Potential evapotranspiration (PET)** | **Compulsory default**: Select "**Enter known annual PET**" and then enter the "**NIWA 500 metre grid PET data**" |
| **PET seasonal variation** | Select the most accurate option using the map provided in Overseer. |
| **Snowfall** | Not an input option. |

## 4.3 Soil Description and 4.4 Soil profile (where soil order has been entered)

### 4.3.1 Process

**Note: before entering the soil information at block level it will be necessary to consider the way the soils underlying the property are going to be attributed to the management blocks described in the Farm Block setup. Refer to notes at 1.3 for guidance**

| Parameter | Process |
|---|---|
| **Soil Description.** | 1. Where information provided suggests detailed soil mapping has been undertaken at farm level by a trained person – escalate file or seek advice on entry approach to be applied.<br>2. Where the Fonterra GIS process has been undertaken to identify management blocks and underlying soils – these files will have a pdf document in 'background files' where the block level soils data is provided. This soils and block information must be used without any changes.<br>3. Where soil data is available at farm level only ('in background files'). Apportion effluent block to the highest risk soil (highest drainage class "well" is the highest risk for leaching) for farm and apportion the rest of the blocks across the specified soil types*.<br>a) Where there is soil sibling information available, click 'Link to S-Map'. **NB files being based on a previous seasons Overseer file must have this entry approach change made wherever the additional data is available.** If S-Map data was used in the previous seasons Overseer file select the 'Update or Change' button to ensure the latest soils data is used.<br>b) ONLY where there is not soil sibling information available in the farm information spreadsheet – click on 'select soil by order' and enter all the available soil profile characteristics.<br><br>* Refer to Appendix 3 for detailed instructions on how to attribute soil characteristics to farm block level. |
| **Option 1. Link to SMap** | **Enter soil sibling name from Farm Information Sheet (located in 'Background Files'). Click 'Get S-Map Data'** |
| **Option 2. Select soil by order (Only use this entry approach where no soil moisture values are available)** | **Order:** Enter from Farm Information Sheet (located in 'Background Files'<br>**Note: If soil order in spreadsheet is "raw" enter this as "recent"** |
| **Option 2 (cont) Soil profile (this field will not be available if you use the soil moisture input options)** | **Top soil texture:** From spreadsheet if available for the soil order entered. Where not known **optional default: "unknown"**<br>Processor note: Where there is no topsoil data in the FIS and a previous seasons file has a topsoil described and that information has come from a credible source (fert rep / Area Manager soils form etc) this can be left in and a note added to |

| Parameter | Process |
|---|---|
| | the assumption form.<br>**Is stony:** only check this box where known to be a very stony topsoil. **Optional default:** leave this box **unchecked**<br>**Is compacted: compulsory default**: leave this box **unchecked**<br>**Maximum rooting depth:** Enter from spreadsheet, where not known leave as Overseer default (0)<br>**Depth to impeded drainage layer:** Enter from spreadsheet, where not known leave as Overseer default (0)<br>**Soil texture group:** not an input option for all soil orders- where it does appear enter from spreadsheet – **Optional default: "medium"**<br>**Non-standard layer:** Enter from spreadsheet, where not known leave as Overseer default (empty field) |
| | |

## 4.5 Drainage/Runoff

### 4.5.1 Process

| Parameter | Process |
|---|---|
| **Natural soil drainage and runoff characteristics** | |
| **Profile drainage class**<br><br>**Option 1. Link to SMap** | Where you have entered soil sibling name from Farm Information Sheet (located in 'Background Files); and selected 'Get S-Map Data'.<br>**Compulsory default**: "**Use default**" i.e. do not change. |
| **Option 2. Select soil by order** (Only use this entry approach where no soil moisture values are available) | **Enter from spreadsheet where available**<br><br>**Optional default:** Select **"Use default"** |
| **Hydrophobic condition** | **Compulsory default:** Select "**Use default**". |
| **Susceptibility to pugging or treading damage** | **Compulsory default:** Select "**Occasionally**". |
| **Artificial drainage system** | |
| **Drainage method** | **Optional default:** Select "**None**".<br>Where information is available enter the method, and estimate the percentage of the block that is being effectively drained by the system described.<br>Do not enter for areas where drainage is not effective.<br>Slotted nova flow type drains, clay tiles and mole drains should be entered as "**Mole/tile systems**". |
| **Specify drainage placements** | **Default:** Leave this box **unchecked**. |

| Parameter | Process |
|---|---|
| **All drainage captured by artificial wetland** | **Default:** Leave this box **unchecked**. |
| **Grass filter interception** | **Compulsory default:** Leave this box **unchecked**. |

## 4.6 Soil Tests

### 4.6.1 Process

| Parameter | Process |
|---|---|
| **Soil test values** | **Optional default**: Select "**Replace missing soil test data with typical values**". (Soil test information in an existing base file can be left there rather than deleting and replacing with typical values) |
| **ASC or PR** | **Optional default:** Leave this box **unchecked** unless better soil test information is available. |
| **Slow release K** | **Optional default:** Leave this box **unchecked** unless better soil test information is available. |

## 4.7 Soil Properties

**Compulsory Default**: This is not an input option for the processing team.

If a base file has **immobilisation potential** or **soil water properties** settings entered they should be removed for a nitrogen programme file. (i.e. all boxes should be unchecked under soil properties detail section)

## 4.8 Pasture

### 4.8.1 Process

| Parameter | Process |
|---|---|
| **Pasture type** | **Optional default: Select** "**Ryegrass/white clover**" unless there is good information available to show that another pasture dominates this particular block.<br>**Lucerne:** Areas planted in lucerne should be setup as a separate pasture block called "lucerne block" and pasture type entered as lucerne, unless lucerne is being grown as an annual crop in which case enter as fodder crop or crop as appropriate. |
| **Specify clover levels, pasture utilisation or pasture N concentrations** | **Compulsory default*:** Leave this box **unchecked**.<br>*(Only exceptions here would be where very good long term evidence of a clover content that is outside normal range. This might occur on farms receiving high levels of factory waste or very high N fertiliser inputs over long periods – refer to programme team before overriding this default.) |
| **Specify pasture quality by month** | **Compulsory default:** Leave this box **unchecked**. |

## 4.9 Supplements Made

Information about supplements made should only be entered into this section where they were harvested on blocks that form part of the "Dairy Farm".

**Fodder crops:** Do not enter fodder crops or other imported feeds into this section of the model.

Note: where it is not clear which block a supplement was grown on **-** If the data provided does not identify which block the supplement is made on then the default option is to assume that the supplement was made on the main pasture block.

### 4.9.1 Process

| Parameter | Process |
|---|---|
| **Category** | Select the most applicable option from the list provided. |
| **Feed quantity** | Select the most applicable option of estimating the quantity of supplement made from the options provided.<br>**Silage:** If no information is provided for weight but hectares cut for supplements is known use **4.5 tonne DM/hectare**. |
| **Baled feed** | **Optional default**: Select "**Use bale size**" and then enter the **Number of standard** bale equivalents/bale. Where none is provided, the **default option** is "**12**". |
| **Silage cutting method** | **Optional default:** Select "**Wilted**".<br>This will only appear if "**Enter actual weight**" and "**as wet weight"** were selected. |
| **Supplements wrapped or covered with plastic** | **Optional default:** If supplements made information is provided as bales assume supplements are wrapped. **Check this box** unless there is information available to show that supplements are not wrapped or covered with plastic. |
| **Silage stack used** | **Optional default:** Except where bale information has been provided **check this box** |
| **Effluent from stack contained** | **Optional default: check this box**<br>This will only appear if "**Silage stack used**" was checked. |
| **Destination** | Select the most applicable option from the list provided.<br>**Optional default**: Select "**Paddocks**" and then "**Evenly across pastoral blocks**" and leave the "**Specify the time of feeding**" box **unchecked**. |
| **Storage conditions** | **Compulsory default:** Select "**Average**".<br>This will only apply where supplements are made but not used within the season, and entered as "**To storage**". |
| **Utilisation** | **Fed on paddocks default:** Select "**Average**".<br>**Fed on a feed pad**: **default**: Select "**Very good**". |

## 4.10 Fertiliser

### 4.10.1 Process

| Parameter | Process |
|---|---|
| **Add application** | Click on "**Add application**". |
| **Month** | Enter the **month** that the nitrogen fertiliser was applied. |
| **Manufacturer and** | Fertiliser Product entry: Select the most applicable option from |

| Parameter | Process |
|---|---|
| **Product** | the list provided.<br>Notes<br>1) If fertiliser information has been provided with a %N in a blend or in a product not in Overseer dropdown use the "soluble fertiliser" entry option. From the information provided calculate the kg/ha applied to the block in the month. (e.g. product applied at 200kg /ha; product contains 15%N – therefore 200 x .15 = 30 kg /ha)<br>2) Where special mixes/capital dressings/maintenance dressings (usually identifiable because of high application rate and only one or two dressings in the year) are listed without specifying a Nitrogen %, there are two processing options:<br>a) If there are other issues with the file and a QA call is required, you will need to determine:<br>i. Do these dressings contain nitrogen? And (if yes);<br>ii. What is the nitrogen %:<br>b) If this is the only issue with the file and a QA call is not required: **Enter as a user defined fertiliser with Nitrogen content of 3% record this assumption under fertiliser applications**. |
| | Enter the **amount** as "**kg/hectare**" or "**total tonnes** or **kgs**" applied to that block, during the selected month.<br>Applying a known total tonnage of fertiliser in a month to a block is the preferred entry where that data has been provided.<br>**Note**: If the quantity of nitrogen applied is only given as "kgs N/hectare" then estimate the "total kgs of the product applied" using the "NPKS" applied numbers. Check that the total amount entered aligns with the data that has been provided. If the product name is **not** known and kg N / hectare has been provided enter as soluble fertiliser.<br>**Note: fertiliser quantities should be entered as kilograms rather than tonnes where smaller amounts are applied.** |
| **Organic forms of N fertiliser – refer to Non Specified Supplements, Crops and Fertilisers document if required** (located under "manage" tab – "view training files" on GARY front screen) | |
| **Product** | Identify the **type of fertiliser** from the options provided, and then describe the product being applied. |
| **Amount** | Enter the **tonnes applied** (wet weight), and estimate the DM content.<br>If known, enter the N content as a percentage (%). If no N content is provided, further research may be required to ascertain the normal value. Assumptions / rationale must be recorded.<br>**Chicken manure:** The average range for fresh product will be between 70 and 80 percent. Enter "**3%**" N, if no better information is available. |
| **Specify last previous lime application (if within last 5 years)** | **Optional default:** Leave this box **unchecked**. |

## 4.11 Irrigation

**Processor Note:** When changing irrigation data within Overseer, if you select 'save and continue' the model will then move you to the next block and miss the DCD and Effluent pages. Ensure that all effluent data is entered as Overseer will not prompt you.

| Parameter | Process |
|---|---|
| **Irrigation** | |
| **Irrigation system type** | Select the most accurate method from the options provided.<br>**Optional default for spray systems**: Where the information provided is not clear relative to the Overseer options select "**Travelling irrigator"**<br>**Multiple methods on one block**: For spray irrigation systems, select the predominant method or if relative areas under different systems are known split the block accordingly. Areas of border dyke or flood irrigation should always be split into a separate block from the spray irrigation. |
| **Source of nutrient data** | **Select "Overseer default – fixed" from menu.**<br>**Note:** Where fertiliser is being applied through the irrigation system, this information should generally be entered in the fertiliser input section and not in this field. |
| **Irrigation management** | |
| **Irrigation practice by month** | Click on the icon on the dark green "irrigate" box on the left of the table.<br><br>Month by month data entry can be used where more detailed information is available that shows different management practices during the season.<br><br>**Where irrigation scheduling information has been provided enter relevant information.**<br><br>Note: Farmer supplied scheduling data (triggers and targets) are typically in mm deficit but can vary between % PAW, mm deficit and % Volumetric Soil Water Content depending on the technology used to measure these.<br><br>If farmer submitted data states they have soil moisture monitoring technology AND they provide trigger and/or target value of <50% then this needs further investigation (as likely farmer is quoting a volumetric measure) that will not be consistent with Overseer input. If better information cannot be obtained via QA select the appropriate irrigation system from 1-4 below and follow input instructions using **Trigger point** = 66, **Target** = 95, **Units** %PAW<br><br>1. **Linear and Centre Pivot**: Select the months where irrigation occurs, select 'soil water budget', select 'trigger point and depth applied to achieve target', select 'user defined' and enter specified 'trigger point' and 'target'.<br><br>2. **Travelling Irrigator**: Select the months where irrigation occurs, select 'soil water budget', select 'Depth applied to achieve target; fixed return period', select 'user defined' and enter specified 'Minimum application depth', 'maximum application depth', ,return period' and 'target' |

| Parameter | Process |
|---|---|
| | 3. **Spray lines**: Select the months where irrigation occurs, select 'soil water budget', select 'Depth applied to achieve target; fixed return period', select 'user defined' and enter specified 'Minimum application depth', 'maximum application depth', ,return period' and 'target'<br><br>4. **Solid set**: Select the months where irrigation occurs, select 'soil water budget', select 'trigger point and depth applied to achieve target', select 'user defined' and enter specified 'trigger point' and 'target'<br><br>5. **Border Dyke**: Select the months where irrigation occurs, select 'user defined' and enter 'application depth', enter 'return period'.<br><br>**NOTE: Where a single scheduling parameter has not been included as part of farmer information e.g. Target soil moisture; please use defaults from the Input Standards (Appendix 11).**<br><br>**Optional Defaults (no scheduling information has been provided)**<br><br>1. **Linear and Centre Pivot and Solid Set**: Enter as "Soil water budget" and "Depth applied to achieve target; fixed return period", select 'Default'.<br><br>2. **Travelling Irrigator**: (includes rotorainer, raingun, canon etc) Enter as "Soil water budget" and "Depth applied to achieve target; fixed return period", select 'Default 1 shift per day'.<br><br>3. **Spraylines** (includes K lines, other towable pod systems, long lateral sprinkler systems,). Enter as "Soil water budget" and "Trigger point; fixed depth applied select 'Default 1 shift per day'.<br><br>4. **Border Dyke**: optional default on "outwash management" enter as "no outwash", select 'Default'. |
| **Management systems definition** | For Travelling Irrigator/Spray lines optional default is **1 shift per day.**<br><br>**For all other irrigation methods optional default is 'Default'.** |

### 4.12 Animals

The recommended approach is to **leave grazing management unchanged** ie all stock classes on farm at any one time are considered to graze all blocks all year round. However where a block is clearly identified as support / grazing non-dairy stock classes, or where there is detailed animal information available - the grazing months and pasture eaten percentage by enterprise may be entered.

### 4.13 DCD applications (block)

This is not an input option.

### 4.14 Effluent

### 4.14.1 Process

| Parameter | Process |
|---|---|
| **Liquid effluent applications** | |
| **Source** | If liquid effluent from the farm dairy is applied to this block, **check** this box. |
| **Application depth** | Select the most accurate option from the list provided.<br>**Optional defaults**:<br>• Low rate systems (i.e. K-line): Select "**Low application method**".<br>• Travelling irrigators and muck wagons: Select "**12-24 mm**".<br>• Stationary irrigators, cannons, contractor pumping to: Select "**> 24 mm**". |
| **Applications are actively managed** | **Compulsory default:** Leave this box **unchecked**. |
| **Percentage of block area receiving effluent** | **Optional default**: Enter "**100**" percent. |
| **Months effluent applied** | If farmer has specified 'spray infrequently' (refer 1.7). Where no further information is available **Default:** Check all lactation months in "**Months effluent are applied**" box. |
| **Solid effluent applications** | |
| **Effluent source** | Select the most accurate option from the list provided. |
| **Month** | Enter the "**Month**" that it was applied.<br>**Optional default:** Select "**January**". |

## 4.15 Block History

| | |
|---|---|
| **Long term paddock history** | **Optional default 5 years** |
| **Land use prior to crop rotation** | Where it is known this is a long term crop grown in the same area, enter as the same type of crop as currently grown as the main crop. Eg if long term maize crop enter "grain crop".<br>If no information available **optional default** enter as **pasture** |
| **Specify lime application** | **Optional default leave unchecked** |

## 4.16 Fodder Crop Block

Where a fodder crop block has been entered into the block setup (refer to **Section 1.3**), management practices relating to that fodder crop must also be entered. In terms of modelling the fodder crops in Overseer, there are four scenarios that could apply, for each scenario follow the guidelines as below. This will ensure that the impacts of that crop are captured and reported as accurately as possible.

Note: Where a farmer provides information that indicates only part of a crop cycle occurs during the assessment year e.g. a sowing event only then you will need to check last year's file to confirm whether this is an annual practice i.e. confirm whether a harvest event should be included.

1. **All actions for the fodder crop cycle occur within the same assessment year (i.e. between 1 June and 31 May)** Enter all the management practices in the crop rotation table **Entry Approach** - Enter via fodder crop model

2. **Single Fodder crop where crop cycle falls over more than one assessment year (1 June – 31 May**) e.g. sow Kale in October but don't graze until June.

   **Entry Approach -** Two options:

   a. If farmer has provided you with a sowing and harvest event and there is information to suggest that this is an annual rotation e.g. the same type of fodder crop is grown each year rotating through the same block(s) with same management practices and each year the hectares in crop remains reasonably consistent r. Enter via fodder crop model. Will result in a harvest event early in season, and sowing later in season.
   b. If farmer has provided information (and previous years file) indicates that this is a 'one-off' occurrence then enter using the **crop model** with relevant portion of the crop cycle modelled i.e. may only model a sowing event and no harvest

3. Multiple fodder crops grown over a period greater than assessment year e.g. Kale sown in **October** 14, grazed in June 15; Turnips sown in October, grazed in February.

**Entry Approach** – Enter as 2 x crop blocks. Block 1 will capture the first 12 months and Block 2 will capture the second 12 months:

   a. Block 1 - First 12 months of year 1 will be pasture. Crop will be entered in 'Reporting year'.
   b. Block 2 – enter the crop that was grown in year 1. Enter the crop that was grown in year 2 in 'reporting year'.

   Refer to Use Standard (BPDIS) in this case for more information on entry approach detail where required

4. **The cropping area is greater than 25 percent of the block or blocks it rotates through and/or the same paddocks are used continuously for the fodder crop.**

Entry Approach- via a **crop block**.

### 4.16.1 General

4.16.1.1 Process

| Parameter | Process |
|---|---|
| **Fodder crop block** | |
| **Rotation area** | Enter the **crop area** for the assessment year. |
| **Low N mineralisation capacity** | **Compulsory default:** Leave this box **unchecked**. |
| **Crop rotation** | |
| **Month resown into pasture** | Enter this as the **month** the crop is resown back into pasture from farmer information. |

### 4.16.2 Irrigation / Fodder Crop Rotation

4.16.2.1 Process

| Parameter | Process |
|---|---|
| **Crop rotation** | |
| **Irrigation** | Follow the same approach as set out in the irrigation inputs section (4.11).<br>Where the fodder crop is grown on an irrigated block and the fodder crop data form identifies "**No"** irrigation: Add irrigation events that fall outside of the crop period in the crop rotation table but not during the crop rotation period (green in crop row)<br><br>Where the fodder crop is grown on an irrigated block and the fodder crop data form identifies **"Yes"** irrigation: Add all irrigation events for the underlying block to the crop rotation table. |
| **Management** | Enter the management practices by month.<br>For example, this should consist of **crop sown**, **defoliation** over at least one month, followed by crop **resown** to re-establish pasture in the final month. |
| **Product yield** | **Optional default**: Select "**Typical yield**". |
| **Cultivation practice at sowing** | **Optional default**: Select "**Conventional**". |
| **Fertiliser** | Enter fertiliser and lime production description, application rate and method applied on a monthly basis.<br>**Fertiliser applied in month that sowing occurred, optional default**: Select "**Incorporated**".<br>**Not applied in month that sowing occurred (i.e. at any other time), optional default**: Select "**Surface applied**".<br>Where farmer has indicated that fertiliser is applied to fodder crop block but type and amount is not recorded. **Optional default: Specify fertiliser applications identical to those applied to the block which the fodder crop rotates through.**<br><br>***Important Note:***<br>***Fertiliser applied to the pastoral block (that the fodder crop area*** |

| Parameter | Process |
|---|---|
| | ***rotates through) that would also be applied to the fodder crop block before it is sown in to the crop and after it is resown to pasture should also be entered here.***<br>***It is necessary to calculate the percentage of the block that is in fodder crop and apply this percentage to the fertiliser quantity applied to the block, or where rate has been calculated for the underlying block fertiliser application enter the same rate to the fodder crop table outside of the crop growing months.***<br><br>***Eg 3ha fodder crop rotating through 57 ha main pasture block,***<br>***3 ÷ 57 x 100 = 5%.***<br>***5000 kg urea applied to main pasture block in September, therefore enter 5000 x.05 = 250 kg urea to the fodder crop table for September if the rotation shows pasture is present in that month.*** |

## Appendix 1: Data Rating Guide

The Industry Audited Self Management System specified that all data sets that are processed will be rated in terms of the quality of the information provided. The scale ranges from '1' or deficient where data is absent or deficient and assumptions have to be made around critical fields, through to '5' or excellent where all data is accurate and can be verified (refer to Table 1 below).

Note this scale relates to the data that ended up in the completed file **not** just the data that was provided in the original form submitted.

**Table 1: Data rating criteria**

| Rating | | Criteria |
|---|---|---|
| 1 | Deficient | **Data for critical fields is not provided, or highly likely to be inaccurate.**<br>Where any of these fields are likely to be significantly misstated the file is considered to be of poor quality and should be prioritised for audit.<br>Files with a '1' rating should be excluded from collated data reporting.<br>Where possible, the service provider should attempt to access better information to allow the file to be corrected to an acceptable standard. |
| 2 | Marginal | **Data for multiple non-critical fields is not provided, or likely to be inaccurate. Therefore, multiple assumptions are required to complete the file.**<br>Where multiple non-critical input fields require assumptions to be made the rating will be '2' and the file should be excluded from collated data reporting and prioritised for audit.<br>Where possible, the service provider should attempt to access better information to allow the file to be corrected to an acceptable standard. |
| 3 | Adequate | **Data is missing, or of poorer quality for a small number of non-critical inputs.**<br>Assumptions are required, but unlikely to significantly impact on whole farm reported output values. |
| 4 | Complete | **All necessary data is provided, and is credible, and pasture model outputs are within normal range for the region and the farm system.** |
| 5 | Excellent | **All necessary data is provided, is credible and is backed by records that have been sighted by the service provider.** |

For the purpose of applying a data rating the input data is split into **critical** and **non-critical** fields. These fields have been determined based on the sensitivity of the model to each parameter.

- **Critical fields** are those that define farm area, production, stock numbers (including non-dairy stock), imported supplements and nitrogen fertiliser use
- **Non-critical fields** cover all other fields.

**Process**

1. The following critical fields must be completed in order to achieve a minimum of rating of '2'.

**Table 2: Minimum standard to achieve rating of 2**

| Critical Field | Minimum standard |
|---|---|
| Farm Area | Following fields must contain data:<br>- Total Farm Area<br>- Dairy Farm Area |
| Effective Dairy Farm Blocks | Specified Farm Blocks Areas **=** Dairy Farm Area or Dairy Effective Area |
| Fodder Crop Block | If indicated that there is a fodder crop block on the farm; the fodder crop form must contain information. |
| Stock Numbers | Field contains data (cow numbers) |
| Imported Supplements | If specified, must include:<br>- Name/Type of supplement<br>- Volume (tonnes/kg/bales/dimensions) of supplement. |
| Nitrogen Fertiliser Use | If specified, must include:<br>- Name/Type of fertiliser<br>- Volume (tonnes/kg/kg/ha) of fertiliser<br>- Area applied. |

**Files that are passed from processing team back to QA team for follow up:**

In general files that are rated 2 or below based on the above criteria will be referred to the QA team for follow up. Alternatively the processor may elect to contact the supplier themselves so a file can be completed without referral.

It is expected that the processor will work through the file as far as possible before the QA referral is made so as to ensure all data issues can be covered in the one phone call (or e mail).

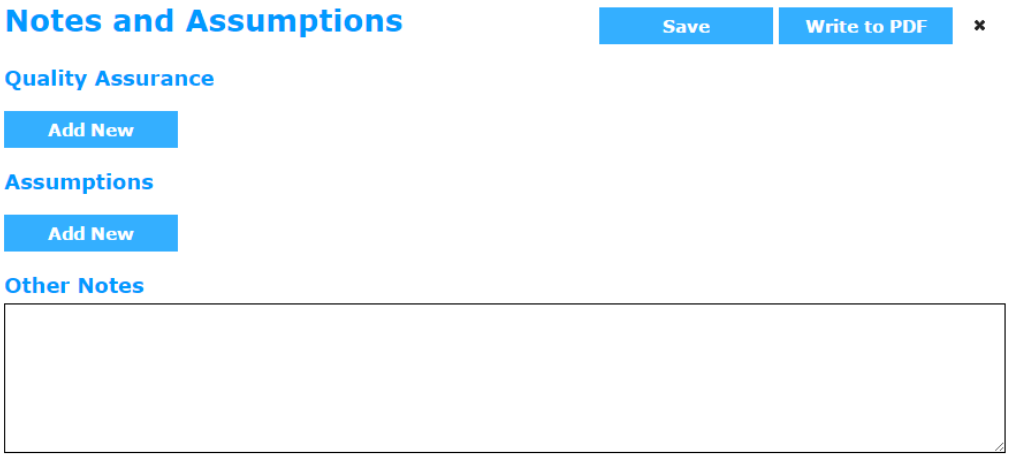
All data gaps and clear messaging about the information required will be added by the processor to the assumptions form for the file. If the assumptions form is not clear enough the QA team will speak to the processor (or e mail) prior to contacting the supplier so as to ensure the conversation is properly informed and does collect the right information.

The additional information collected by the QA team will be added to the assumptions note, which will become a record of the data gap and the information collected to fill that gap. This form becomes a key audit document so do not delete earlier comments / notes once file is able to be completed.

## Appendix 2: Assumptions Form

### Process

1. Where a farmer has specified a nitrogen input and/or management strategy which is not specified as part of the Overseer model and there is no default specified within the Practice Note/Overseer Input Standard then the processor will need to obtain default information to enter into the Overseer model.
2. In any instance(s) where data that is not provided on Nitrogen Forms or specified within the Practice Note/Input Standard this must be noted on the 'Assumptions Form[1]' and saved to secure storage in accordance with naming convention.




3. Where a Nitrogen Form specifies that a crop/fertiliser or input/imported supplement is brought into the farm system that is not defined within the Overseer model, processors should refer to the Non-Specified Supplements, Crops and Fertiliser Inputs document. This document specifies a number of defaults for commonly used crops/fertiliser/supplements which are not defined within Overseer. These defaults should be entered into the Overseer file as 'custom supplements/fertilisers' and noted in Assumptions form.

   "Non specified supplements, crops and fertiliser inputs" is located under the "manage" tab (training documents) on the nitrogen database (GARY) front screen.
4. Where the fertiliser/supplement input is not specified in Non-Specified Inputs document, this should be referred to Gavin Marshall (gavin.marshall@fonterra.com) or Richard Allen (Richard.allen2@fonterra.com) to obtain this data and add to Non-Specified Supplements, Crops and Fertiliser Inputs document.

[1] Appendix 2 – Assumptions Form.

Appendix 3: Detailed Soils Guide - Attribution of soils to farm block**Note: before entering the soil information at block level it will be necessary to consider the way the soils underlying the property are going to be attributed to the management block described in the Farm Block setup. Appendix 2 provides direction on this process.**

**Process**

1. **Where detailed soil mapping has been undertaken at farm block level and provided as part of Nitrogen Recording Pages**

   If the information provided is clear and credible; set up blocks in accordance with information provided, identify the soil characteristics for the soil order provided (from the farm information spreadsheet) and apply this information to each block. If unsure escalate file or seek advice on entry approach to be applied.

2. **Where the Fonterra GIS process has been undertaken to identify management blocks and underlying soils** –

   These files will have a pdf document in the background files where the block level soils data is provided – the final block setup in the Overseer file will reflect the more detailed block level soils data provided.

   **Processor Note:** While this process might result in multiple blocks on some farms the management block information can simply be copied across the relevant soils block – only fields that might be affected by a copy (soils, fertiliser inputs if entered as kg or tonnes, supplements harvested) would need to be checked / changed in each block. Seek advice on the entry approach to be applied if required and record that this is a mapped farm on the assumptions form and on the Overseer farm scenario page.

3. **Where farm management blocks are known and soil data (at farm level) is available in the farm information spreadsheet.**

   Where soil data is available at farm level only (in the farm information spreadsheet). Apportion effluent block to the highest risk soil (highest drainage class “well” is the highest risk for leaching) for farm and apportion the rest of the blocks across the specified soil types.

   a. Apportion appropriate soil types to farm block level.

   b. Do not include soils which make up < 10% of the farm area. Refer to example below:

| Notes or block name | Effective Area (Ha) |
|---|---|
| Effluent - Pivot | 15 |
| | |
| Pasture - Pivot | 80 |
| Pasture - Rotorainer | 40 |

| A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SupplyNo | FarmTyp | Hectares | Topsoil Texture | Is Stor | Non-Standard Layer | Maximum Rooting Dep | Impeded Drainage | Longitude | Latitude | Temp | Overseer Region | MilkSolids | Soil Drainage | Soil Order | Profile Texture |
| 33288 | FF | 25 | Clay loam | n | Stony (22.5cm) | 25 | 0 | 168.94215 | -46.06579 | 10 | Southland | 252370 | Well Drained | Recent Soils | Light |
| 33288 | FF | 85 | Loamy silt l | n | Stony matrix (72.5cm) | 0 | 0 | 168.94215 | -46.06579 | 10 | Southland | 252370 | Well Drained | Recent Soils | Medium |
| 33288 | FF | 5.4 | Silt loam | n | leave blank | 0 | 0 | 168.94215 | -46.06579 | 10 | Southland | 252370 | Imperfectly Drai | Brown Soils | Medium |
| 33288 | FF | 1.6 | Silt loam | n | leave blank | 0 | 0 | 168.94215 | -46.06579 | 10 | Southland | 252370 | Poorly Drained | Gley Soils | Medium |
| 33288 | FF | 18 | Silty clay | n | leave blank | 0 | 40 | 168.94215 | -46.06579 | 10 | Southland | 252370 | Poorly Drained | Gley Soils | Heavy |

For this example: (note that the spreadsheet may look different for 16/17 season processing)

1. Identify which of the soils areas are to be considered in the block breakdown exercise. In this example the 3 areas highlighted in red text will be considered, the other two areas are less than 10% of the total area and therefore can be ignored.

2. The 15ha effluent block will be assumed to be the highest risk soil – in this case the well drained “recent” soil with the light profile texture. This leaves 10 ha of this soil type which is less than 10% of the property so can be ignored in allocating soils to the remaining blocks

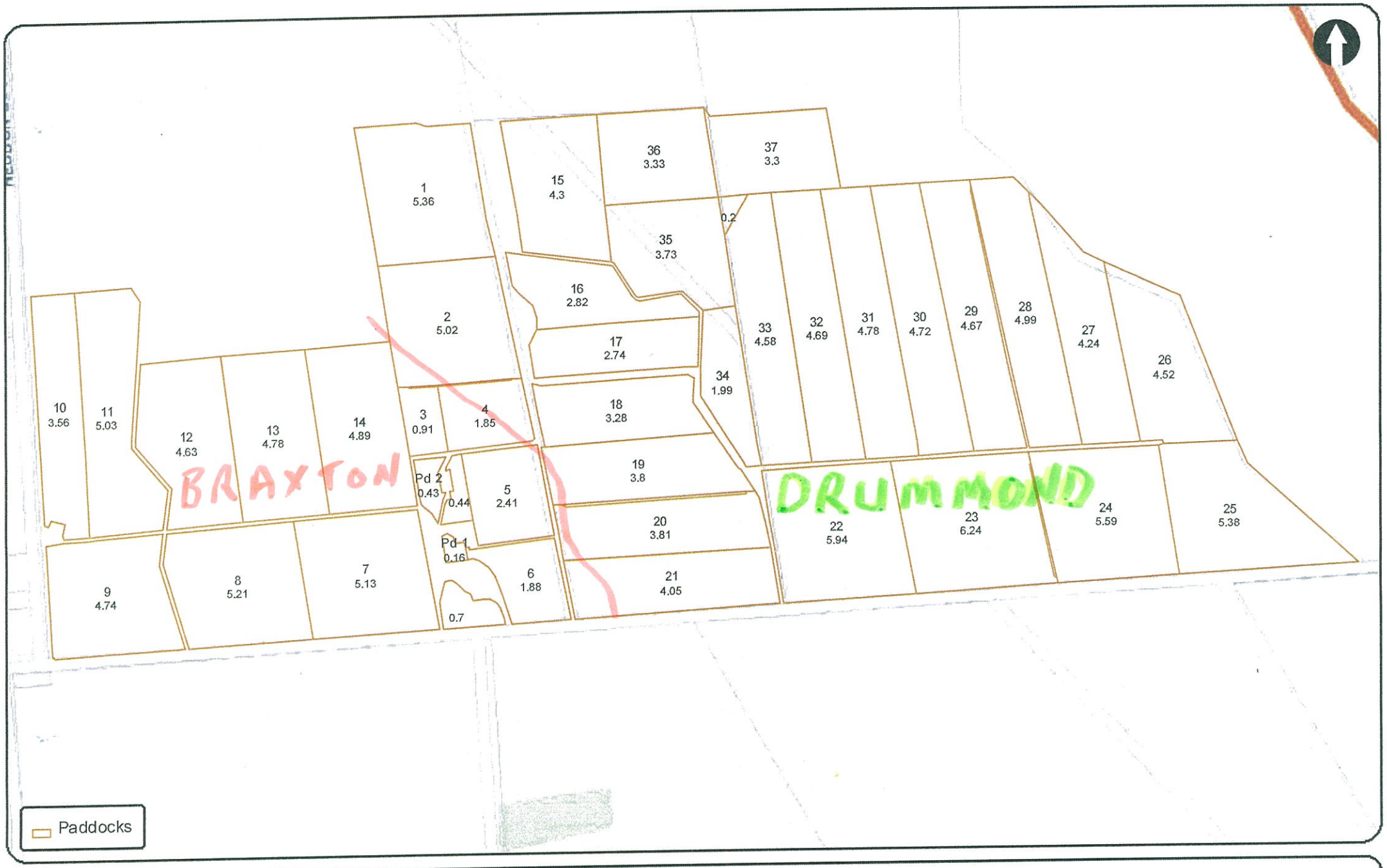
3. As there is no information identifying which management block is better drained the entry approach is to allocate soils to blocks proportionally. In the example there are two soils to be considered (85ha of recent soils with medium profile texture and 18ha of gley soils). The proportion of the soils to allocate across the two blocks is therefore approximately 82% recent and 18% gley.
   The two blocks total 120ha therefore allocate 82% of 120ha (98ha) as recent and 22ha as gley.

   If all of the pasture pivot block is allocated to the “recent” soil (80ha) this leaves just the pasture rotorainer block which should be split in to pasture rotorainer “recent soil” block of 18ha and pasture rotorainer “gley soil” block of 22ha.

   Final blocks set out in the Overseer file for this example would be:
   *Effluent pivot (15ha)*
   *Pasture pivot (80ha)*
   *Pasture rotorainer “recent soil”(18ha)*
   *Pasture rotorainer “gley soil” (22ha)*

   Note: this is an interim approach to be applied as a best representation of the underlying soils where we do not have the detailed block level data in the GIS. Please note your assumptions / rationale for block allocations in the assumptions form for audit clarity.

4. Where the Farm Information Sheet lists several soil siblings, **but same Soil Order, and same Drainage Characteristics** then these can be combined. In this instance you would enter the soil characteristics from the most prevalent (greatest area) soil sibling into Overseer.




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

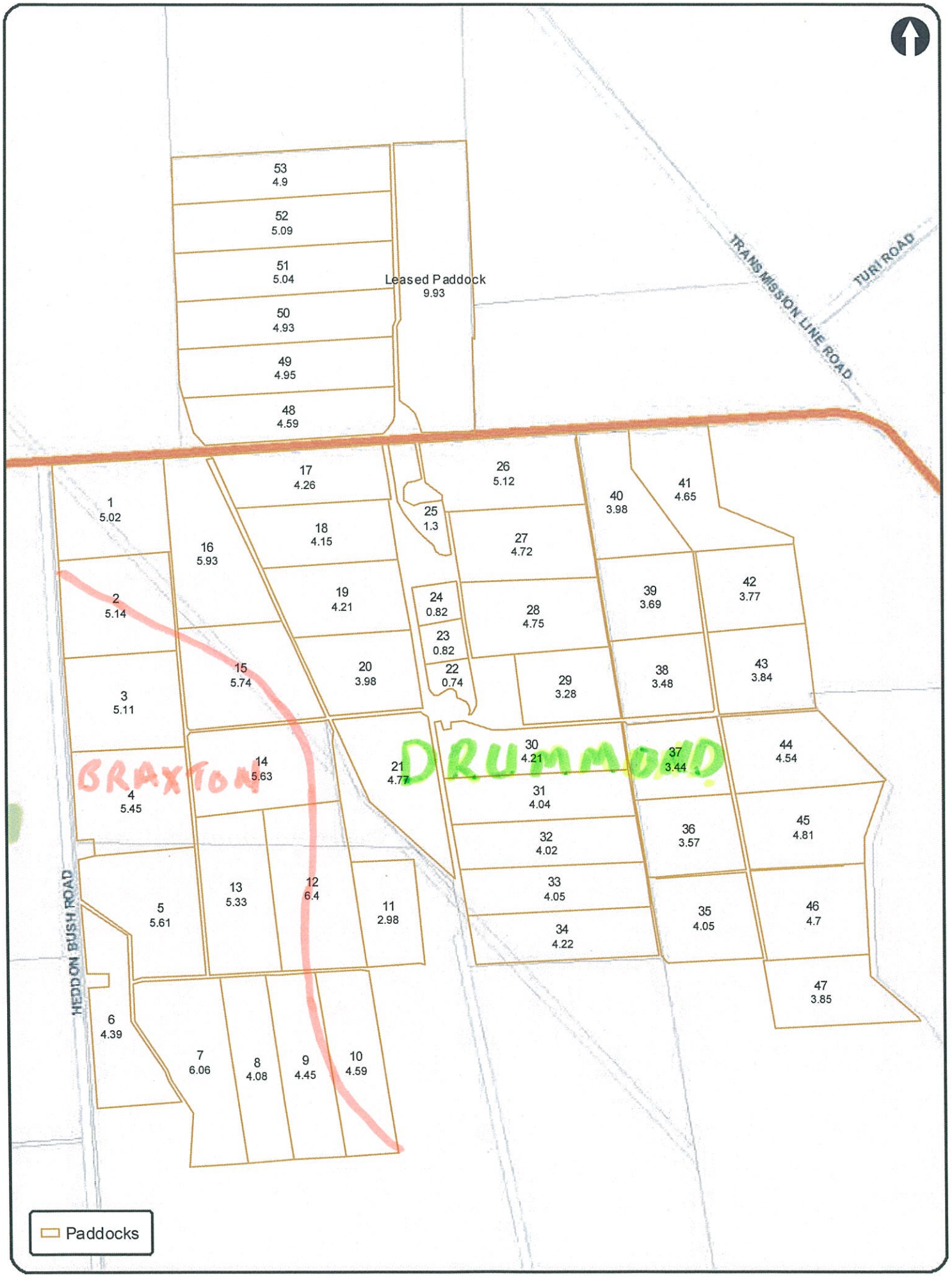

## Woldwide One Ltd

0 55 110 220 330 440 Metres

ravensdown



*08 October 2015*




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



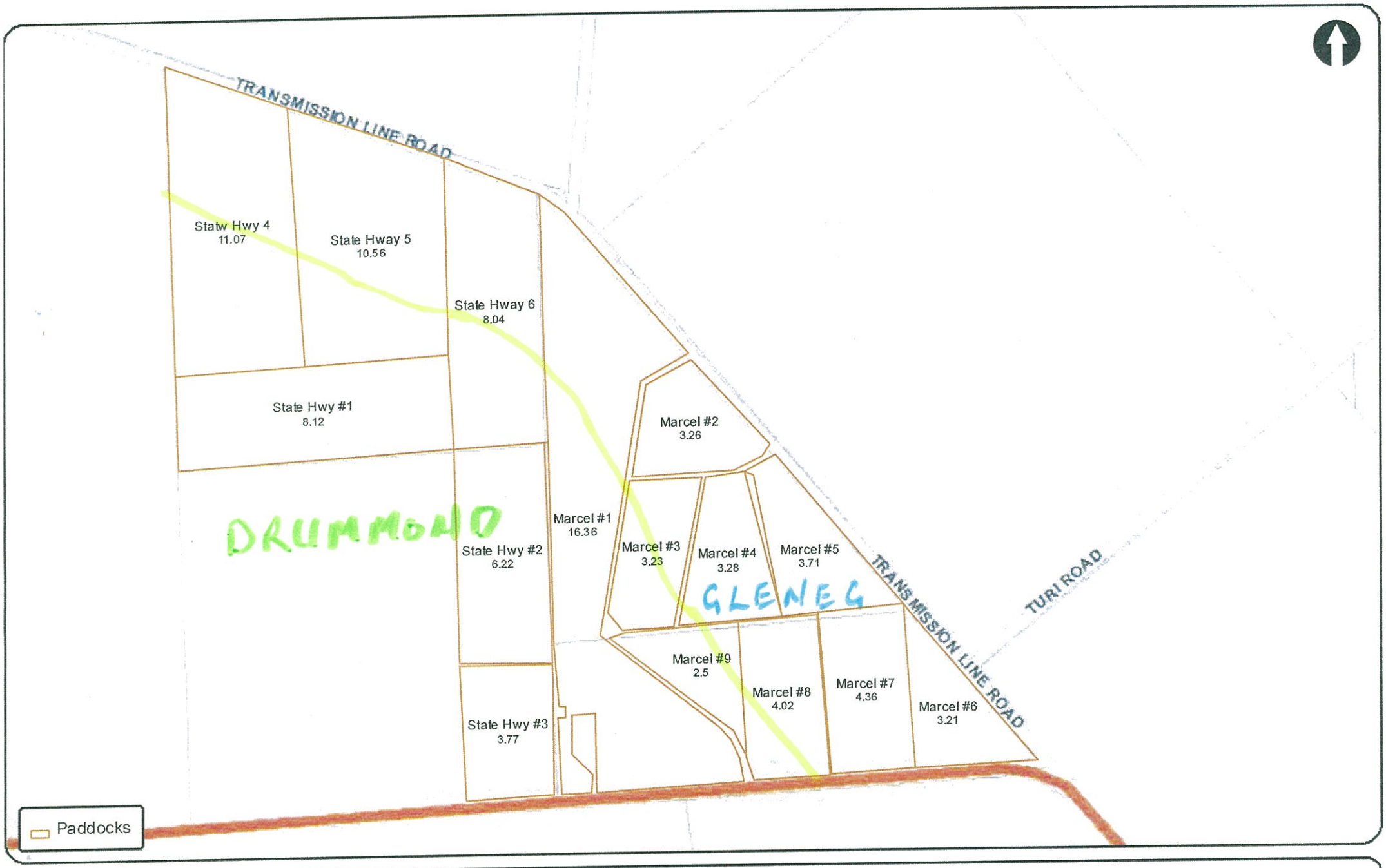
## Woldwide Two

0 50 100 200 300 400 500 Metres

ravensdown



*12 October 2015*




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


# Highway 96 Support

0 55 110 220 330 440 Metres

ravensdown



12 October 2015

WW2 - Current (SS) + SH96 + WW1 Blk

Cain Duncan
Fonterra

Client reference:
Farm name: 32651- Evidence Version (15/16)

# FarmParameters

## Farm details

| | | |
|---|---|---|
| Type | Farm type | Full range |
| Assessment | Assessment year | 15/16 |
| Region | Region | Southland |

## Farm blocks

| | | |
|---|---|---|
| Main Pasture Brax_4a.1 | Pastoral | 19 |
| Main Pasture Drum_2a.1 | Pastoral | 74 |
| Effluent Drum_2a.1 | Pastoral | 45 |
| Maintenance Block Drum_2a.1 | Pastoral | 36 |
| No Fert Block Drum_2a.1 | Pastoral | 4 |
| WW1 Brax_4a.1 | Pastoral | 34 |
| WW1 Drum_2a.1 | Pastoral | 20 |
| Turnips | Fodder Crop | |
| Support Crop Glene_4a.1 | Crop | 17 |
| Support Crop Drum_2a.1 | Crop | 2 |
| Support CC Barn Eff Glene_4a.1 | Cut and Carry | 12 |
| Support CC Barn Eff Drum_2a.1 | Cut and Carry | 30 |
| Support CC Glen_4a.1 | Cut and Carry | 19 |
| Support CC Drum_2a.1 | Cut and Carry | 12 |
| Total farm area declared in blocks | ha | 324 |
| Total farm area | ha | 337 |
| Non-productive area | ha | 13 |

## Farm animals

### Stock numbers

*Stock reconciliation - Dairy*

Production

| | | |
|---|---|---|
| Milk solids | kg/yr | 380364 |
| Milk volume yield | l/yr | Not entered |
| Fat yield | kg/yr | Not entered |
| Lactation length | days | 315 |
| Average weight | kg/animal | Not entered |
| Calving times | | |
| Median calving date | | 20 August |
| Drying off | | 30 June |
| Percent of herd | | 0 |

Stock numbers

| *Class* | *Breed* | *Jul* | *Aug* | *Sep* | *Oct* | *Nov* | *Dec* | *Jan* | *Feb* | *Mar* | *Apr* | *May* | *Jun* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MilkingHerd | Friesian | 500 | 800 | 800 | 800 | 750 | 750 | 750 | 720 | 720 | 670 | 560 | 500 |
| Max weight (kg) | LW start (kg) | LW end (kg) | CW (kg) | Age (months) | Source | Fate | Sex | Mated | | | | | |
| 462 | 0 | 0 | 0 | 0 | | | Female | | | | | | |
| Bulls | Friesian | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Max weight (kg) | LW start (kg) | LW end (kg) | CW (kg) | Age (months) | Source | Fate | Sex | Mated | | | | | |
| 740 | 0 | 0 | 0 | 0 | | | Male | | | | | | |

Stock numbers - Dairy replacements

| *Class* | *Breed* | *Jul* | *Aug* | *Sep* | *Oct* | *Nov* | *Dec* | *Jan* | *Feb* | *Mar* | *Apr* | *May* | *Jun* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CalvesWeanedMixedSex | Friesian | 0 | 62 | 176 | 176 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Max weight (kg) | LW start (kg) | LW end (kg) | CW (kg) | Age (months) | Source | Fate | Sex | Mated | | | | | |
| 525 | 0 | 228 | 0 | 1 | Weaned | Sold to store/removed | Female | | | | | | |
| HeiferReplacements | Friesian | 320 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 200 | 400 |
| Max weight (kg) | LW start (kg) | LW end (kg) | CW (kg) | Age (months) | Source | Fate | Sex | Mated | | | | | |
| 0 | 0 | 0 | 0 | 10 | Brought | | Female | | | | | | |
| HeiferReplacements | Friesian | 480 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 300 | 600 |
| Max weight (kg) | LW start (kg) | LW end (kg) | CW (kg) | Age (months) | Source | Fate | Sex | Mated | | | | | |
| 0 | 0 | 0 | 0 | 22 | Brought | | Female | | | | | | |

### Stock management

*Dairy - Wintering pad, animal shelter or housing - Dairy*

Construction

| | |
|---|---|
| Pad type | Covered wintering pad or animal shelter |
| Material used to line the bunker | No lining material |

WW2 - Current (SS) + SH96 + WW1 Blk

Cain Duncan
Fonterra

Client reference:
Farm name: 32651- Evidence Version (15/16)

# FarmParameters

| | | |
|---|---|---|
| Concrete surface cleaning method | | Scraping (no water) |
| Solids separated | | False |
| Scraped material strore in stack | | False |
| Liquid effluent management | | |
| Treatment method | | All exported |
| Time spent on structure | | |
| May | 90 | 4.5 |
| June | 100 | 0 |
| July | 100 | 0 |
| August | 40 | 2 |

*Milking shed - Dairy - Dairy*

| | | |
|---|---|---|
| Time spent on structure | | |
| January | 100 | 0 |
| February | 100 | 0 |
| March | 100 | 0 |
| April | 100 | 0 |
| May | 100 | 0 |
| June | 100 | 0 |
| August | 100 | 0 |
| September | 100 | 0 |
| October | 100 | 0 |
| November | 100 | 0 |
| December | 100 | 0 |

*Animal excreta distribution*

| | | |
|---|---|---|
| Relative productivity assessment method | | Relative pasture yield |
| Block relative productivity | | |
| Main Pasture Brax_4a.1 | | 1 |
| Main Pasture Drum_2a.1 | | 1 |
| Effluent Drum_2a.1 | | 1 |
| Maintenance Block Drum_2a.1 | | 1 |
| No Fert Block Drum_2a.1 | | 0.5 |
| WW1 Brax_4a.1 | | 1 |
| WW1 Drum_2a.1 | | 1 |

Ratio of stock types on pastoral blocks is the same as the farm stock ratios

*Farm dairy effluent management system*

| | | |
|---|---|---|
| Effluent management method | | Holding pond |
| Solid separation and disposal | | False |
| Pond solids | | |
| Pond solids management method | | Spread on selected blocks |
| Pond emptied every | years | 2 |
| Liquid effluent | | |
| Liquid management method | | Spray regularly |

**Animal health supplements**

*Animal - Dairy*

No animal supplementation has been entered

*Animal - Dairy replacements*

No animal supplementation has been entered

**Left over feeding**

No left over feeding specified

**Stored supplements**

*Supplement information*

| | | |
|---|---|---|
| Conservation type | | Silage |
| Name | | |
| Supplement amount | | |
| Dry weight basis | T | 350 |
| Silage cutting method | | Not entered |
| Utilisation | | Very good |

# FarmParameters

| | | |
|---|---|---|
| Destination | | Wintering pad, animal shelter or housing |
| Animal | | Dairy |
| *Supplement information* | | |
| Conservation type | | Silage |
| Name | | |
| Supplement amount | | |
| Dry weight basis | T | 224 |
| Silage cutting method | | Not entered |
| Supplements are distributed evenly across all pastoral blocks | | |
| No timing of feeding has been specified | | |

**Imported supplements**

| | | |
|---|---|---|
| *Supplement information* | | |
| Conservation type | | Grains |
| Name | | Barley grain |
| Supplement amount | | |
| Dry weight basis | T | 665 |
| Utilisation | | Very good |
| Destination | | Milking shed |
| Animal | | Dairy |
| *Supplement information* | | |
| Conservation type | | Process byproducts |
| Name | | Palm kernel meal |
| Supplement amount | | |
| Dry weight basis | T | 295 |
| Utilisation | | Very good |
| Destination | | Milking shed |
| Animal | | Dairy |
| *Supplement information* | | |
| Conservation type | | Process byproducts |
| Name | | Molasses |
| Supplement amount | | |
| Dry weight basis | T | 52 |
| Utilisation | | Very good |
| Destination | | Milking shed |
| Animal | | Dairy |
| *Supplement information* | | |
| Conservation type | | Silage |
| Name | | Pasture good quality silage |
| Supplement amount | | |
| Dry weight basis | T | 65 |
| Supplements are distributed evenly across all pastoral blocks | | |
| No timing of feeding has been specified | | |
| *Supplement information* | | |
| Conservation type | | Silage |
| Name | | Baleage |
| Supplement amount | | |
| Dry weight basis | T | 205 |
| Fed to animal: Dairy replacements | | |
| No timing of feeding has been specified | | |

## Report settings

Greenhouse gas emission report units: CO2 equivalents (kg/ha/yr)
Target N application rate as effluent: kg N/ha/yr

## Block Information

**Block - Main Pasture Brax_4a.1**

| | |
|---|---|
| Block name | Main Pasture Brax_4a.1 |

WW2 - Current (SS) + SH96 + WW1 Blk

Cain Duncan
Fonterra

Client reference:
Farm name: 32651- Evidence Version (15/16)

# FarmParameters

| | | |
|---|---|---|
| Block type | | Pastoral |
| Area | ha | 19 |
| Relative productivity | | 1 |
| Pasture block type | | Yes |
| Topography | | Flat |
| Distance from coast | km | 30 |
| Cultivated in last 5 years | | False |
| Fodder rotates through | | Yes |

*Climate*

| | | |
|---|---|---|
| Annual average rainfall | mm/yr | 1002 |
| Mean annual temperature | | 9.8 |
| Seasonal variation in rainfall | | 731-1450 mm, Low |
| Annual potential evapotranspiration | mm | 711 |
| Seasonal variation in PET | | Moderate |

*Soil description*

| | | |
|---|---|---|
| Soil order (default) | | Gley |
| Soil group (default) | | Sedimentary |
| SMaps | | |
| Sibling | | Brax_4a.1 |
| Date downloaded | | 2016 August 15 14:09 |
| Wilting point | 0 - 30cm | 25 |
| | 30 - 60cm | 32 |
| | > 60 | 34 |
| Field capacity | 0 - 30cm | 53 |
| | 30 - 60cm | 53 |
| | > 60 | 54 |
| Saturation | 0 - 30cm | 65 |
| | 30 - 60cm | 58 |
| | > 60 | 58 |
| Natural drainage class | | Poor |
| Depth to impeded layer | cm | Not entered |
| Maximum rooting depth | cm | Not entered |
| Top soil horizon chemical and physical parameters | | |
| ASC/PR | % | 38 |
| Bulk density | kg/m³ | 940 |
| Clay | % | 32 |
| Sand | % | 12 |
| Sub soil | | |
| Sub soil clay | % | 39 |

*Soil profile*

| | | |
|---|---|---|
| Profile drainage class | | Poor |
| Top soil texture | | Unknown |
| Maximum rooting depth | m | 0 |
| Depth to impeded drainage layer | | 0 |

*Soil drainage*

| | |
|---|---|
| Drainage method | |
| Method | None |
| Hydrophobic condition | Use default |
| Occurence of pugging damage | Occasional |
| Compacted top soil | False |

*Soil settings*

| | |
|---|---|
| K leaching (%s) | Medium |
| N immobilisation status | Standard |

*Soil tests*

| Olsen P | QT K | QT Ca | QT Mg | QT Na |
|---|---|---|---|---|
| 38 | 9 | 13 | 33 | 9 |

| | |
|---|---|
| Organic S | 12 |
| Anion storage capacity or phosphate retention | Not entered |
| TBK reserve K test | Not entered |

WW2 - Current (SS) + SH96 + WW1 Blk

Cain Duncan
Fonterra

Client reference:
Farm name: 32651- Evidence Version (15/16)

# FarmParameters

| | | |
|---|---|---|
| K reserve status | | Use default |
| *Pasture* | | |
| Pasture type | | Ryegrass/white clover |
| Clover levels | | Use default |
| *Supplements removed* | | |
| Supplement information | | |
| Conservation type | | Silage |
| Name | | |
| Wrapping | | Wrapped in plastic |
| Supplement amount | | |
| Number of bales | | 15 |
| Packaging | | Round bales |
| Bale size | | |
| Standard bale equivalents | | 12 |
| Supplement is exported from the farm | | |
| *Fertiliser application* | | |
| Fertiliser products - October | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 70 |
| Fertiliser products - December | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 50 |
| Fertiliser products - February | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 50 |
| Fertiliser products - March | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 60 |
| Fertiliser products - August | | |
| Category | | Ravensdown cropping |
| Product | | Ammo 36 |
| Amount | kg/ha | 100 |
| Fertiliser products - September | | |
| Category | | User defined |
| Product | | 18 Nitrogen |
| Amount | kg/ha | 100 |
| Fertiliser products - April | | |
| Category | | User defined |
| Product | | 18 Nitrogen |
| Amount | kg/ha | 100 |
| Fertiliser products - November | | |
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 60 |
| Fertiliser products - January | | |
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 60 |
| Fertiliser products - November | | |
| Category | | Ravensdown super |
| Product | | 20 potash super |
| Amount | kg/ha | 225 |
| Fertiliser products - January | | |
| Category | | Ravensdown super |
| Product | | 30 potash super |
| Amount | kg/ha | 150 |
| *Irrigation* | | |

WW2 - Current (SS) + SH96 + WW1 Blk

Cain Duncan
Fonterra

Client reference:
Farm name: 32651- Evidence Version (15/16)

# FarmParameters

No irrigation entered

*Animals on block*

Ratio and type of stock based on whole farm values due to this option being selected on block set up

| | | |
|---|---|---|
| Animals grazing | | |
| Dairy | % | 0 |
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |
| January | | True |
| February | | True |
| March | | True |
| April | | True |
| May | | True |
| August | | True |
| September | | True |
| October | | True |
| November | | True |
| December | | True |
| Animals grazing | | |
| Dairy replacements | % | 0 |
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |
| August | | True |
| September | | True |
| October | | True |

*Effluent application*

Receives no liquid or solid effluents

**Block - Main Pasture Drum_2a.1**

| | | |
|---|---|---|
| Block name | | Main Pasture Drum_2a.1 |
| Block type | | Pastoral |
| Area | ha | 74 |
| Relative productivity | | 1 |
| Pasture block type | | Yes |
| Topography | | Flat |
| Distance from coast | km | 30 |
| Cultivated in last 5 years | | False |
| Fodder rotates through | | Yes |

*Climate*

| | | |
|---|---|---|
| Annual average rainfall | mm/yr | 1002 |
| Mean annual temperature | | 9.8 |
| Seasonal variation in rainfall | | 731-1450 mm, Low |
| Annual potential evapotranspiration | mm | 711 |
| Seasonal variation in PET | | Moderate |

*Soil description*

| | | |
|---|---|---|
| Soil order (default) | | Brown |
| Soil group (default) | | Sedimentary |
| SMaps | | |
| Sibling | | Drum_2a.1 |
| Date downloaded | | 2017 February 22 11:26 |
| Wilting point | 0 - 30cm | 29 |
| | 30 - 60cm | 28 |
| | > 60 | 12 |
| Field capacity | 0 - 30cm | 45 |
| | 30 - 60cm | 43 |
| | > 60 | 20 |
| Saturation | 0 - 30cm | 55 |
| | 30 - 60cm | 52 |
| | > 60 | 27 |
| Natural drainage class | | Well |

WW2 - Current (SS) + SH96 + WW1 Blk

Cain Duncan
Fonterra

Client reference:
Farm name: 32651- Evidence Version (15/16)

# FarmParameters

| | | |
|---|---|---|
| Depth to impeded layer | cm | Not entered |
| Maximum rooting depth | cm | Not entered |
| Top soil horizon chemical and physical parameters | | |
| ASC/PR | % | 48 |
| Bulk density | kg/m³ | 1080 |
| Clay | % | 40 |
| Sand | % | 17 |
| Sub soil | | |
| Sub soil clay | % | 36 |

*Soil profile*

| | | |
|---|---|---|
| Profile drainage class | | Use default |
| Top soil texture | | Unknown |
| Maximum rooting depth | m | 0 |
| Depth to impeded drainage layer | | 0 |

*Soil drainage*

| | |
|---|---|
| Drainage method | |
| Method | None |
| Hydrophobic condition | Use default |
| Occurence of pugging damage | Occasional |
| Compacted top soil | False |

*Soil settings*

| | |
|---|---|
| K leaching (%s) | Medium |
| N immobilisation status | Standard |

*Soil tests*

| Olsen P | QT K | QT Ca | QT Mg | QT Na |
|---|---|---|---|---|
| 43 | 14 | 14 | 37 | 9 |

| | |
|---|---|
| Organic S | 11 |
| Anion storage capacity or phosphate retention | Not entered |
| TBK reserve K test | Not entered |
| K reserve status | Use default |

*Pasture*

| | |
|---|---|
| Pasture type | Ryegrass/white clover |
| Clover levels | Use default |

*Supplements removed*

| | | |
|---|---|---|
| Supplement information | | |
| Conservation type | | Silage |
| Name | | |
| Wrapping | | Wrapped in plastic |
| Supplement amount | | |
| Number of bales | | 67 |
| Packaging | | Round bales |
| Bale size | | |
| Standard bale equivalents | | 12 |
| Supplement is exported from the farm | | |

*Fertiliser application*

| | | |
|---|---|---|
| Fertiliser products - October | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 70 |
| Fertiliser products - December | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 50 |
| Fertiliser products - February | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 50 |
| Fertiliser products - March | | |

# FarmParameters

| | | |
|---|---|---|
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 60 |
| Fertiliser products - August | | |
| Category | | Ravensdown cropping |
| Product | | Ammo 36 |
| Amount | kg/ha | 100 |
| Fertiliser products - September | | |
| Category | | User defined |
| Product | | 18 Nitrogen |
| Amount | kg/ha | 100 |
| Fertiliser products - April | | |
| Category | | User defined |
| Product | | 18 Nitrogen |
| Amount | kg/ha | 100 |
| Fertiliser products - November | | |
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 60 |
| Fertiliser products - January | | |
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 60 |
| Fertiliser products - November | | |
| Category | | Ravensdown super |
| Product | | 20 potash super |
| Amount | kg/ha | 225 |
| Fertiliser products - January | | |
| Category | | Ravensdown super |
| Product | | 30 potash super |
| Amount | kg/ha | 150 |

*Irrigation*

No irrigation entered

*Animals on block*

Ratio and type of stock based on whole farm values due to this option being selected on block set up

| | | |
|---|---|---|
| Animals grazing | | |
| Dairy | % | 0 |
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |
| January | | True |
| February | | True |
| March | | True |
| April | | True |
| May | | True |
| August | | True |
| September | | True |
| October | | True |
| November | | True |
| December | | True |
| Animals grazing | | |
| Dairy replacements | % | 0 |
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |
| August | | True |
| September | | True |
| October | | True |

*Effluent application*

Receives no liquid or solid effluents

**Block - Effluent Drum_2a.1**

# FarmParameters

| | | | |
|---|---|---|---|
| Block name | | | Effluent Drum_2a.1 |
| Block type | | | Pastoral |
| Area | ha | | 45 |
| Relative productivity | | | 1 |
| Pasture block type | | | No |
| Topography | | | Flat |
| Distance from coast | km | | 30 |
| Cultivated in last 5 years | | | False |
| Fodder rotates through | | | No |
| *Climate* | | | |
| Annual average rainfall | mm/yr | | 1002 |
| Mean annual temperature | | | 9.8 |
| Seasonal variation in rainfall | | | 731-1450 mm, Low |
| Annual potential evapotranspiration | mm | | 711 |
| Seasonal variation in PET | | | Moderate |
| *Soil description* | | | |
| Soil order (default) | | | Brown |
| Soil group (default) | | | Sedimentary |
| SMaps | | | |
| Sibling | | | Drum_2a.1 |
| Date downloaded | | | 2017 February 22 11:30 |
| Wilting point | 0 - 30cm | | 29 |
| | 30 - 60cm | | 28 |
| | > 60 | | 12 |
| Field capacity | 0 - 30cm | | 45 |
| | 30 - 60cm | | 43 |
| | > 60 | | 20 |
| Saturation | 0 - 30cm | | 55 |
| | 30 - 60cm | | 52 |
| | > 60 | | 27 |
| Natural drainage class | | | Well |
| Depth to impeded layer | cm | | Not entered |
| Maximum rooting depth | cm | | Not entered |
| Top soil horizon chemical and physical parameters | | | |
| ASC/PR | % | | 48 |
| Bulk density | kg/m³ | | 1080 |
| Clay | % | | 40 |
| Sand | % | | 17 |
| Sub soil | | | |
| Sub soil clay | % | | 36 |
| *Soil profile* | | | |
| Profile drainage class | | | Use default |
| Top soil texture | | | Unknown |
| Maximum rooting depth | m | | 0 |
| Depth to impeded drainage layer | | | 0 |
| *Soil drainage* | | | |
| Drainage method | | | |
| Method | | | None |
| Hydrophobic condition | | | Use default |
| Occurence of pugging damage | | | Occasional |
| Compacted top soil | | | False |
| *Soil settings* | | | |
| K leaching (%s) | | | Medium |
| N immobilisation status | | | Standard |

*Soil tests*

| Olsen P | QT K | QT Ca | QT Mg | QT Na |
|---|---|---|---|---|
| 51 | 16 | 13 | 45 | 8 |

| | |
|---|---|
| Organic S | 11 |
| Anion storage capacity or phosphate retention | Not entered |

WW2 - Current (SS) + SH96 + WW1 Blk

Cain Duncan
Fonterra

Client reference:
Farm name: 32651- Evidence Version (15/16)

# FarmParameters

| | | |
|---|---|---|
| TBK reserve K test | | Not entered |
| K reserve status | | Use default |
| *Pasture* | | |
| Pasture type | | Ryegrass/white clover |
| Clover levels | | Use default |
| *Supplements removed* | | |
| Supplement information | | |
| Conservation type | | Silage |
| Name | | |
| Wrapping | | Wrapped in plastic |
| Supplement amount | | |
| Number of bales | | 60 |
| Packaging | | Round bales |
| Bale size | | |
| Standard bale equivalents | | 12 |
| Supplement is exported from the farm | | |
| *Fertiliser application* | | |
| Fertiliser products - October | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 60 |
| Fertiliser products - November | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 50 |
| Fertiliser products - March | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 50 |
| Fertiliser products - August | | |
| Category | | Ravensdown cropping |
| Product | | Ammo 36 |
| Amount | kg/ha | 120 |
| Fertiliser products - September | | |
| Category | | User defined |
| Product | | 18 Nitrogen |
| Amount | kg/ha | 100 |
| Fertiliser products - January | | |
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 55 |
| Fertiliser products - January | | |
| Category | | Ravensdown super |
| Product | | Superphosphate |
| Amount | kg/ha | 195 |
| *Irrigation* | | |
| No irrigation entered | | |
| *Animals on block* | | |
| Ratio and type of stock based on whole farm values due to this option being selected on block set up | | |
| Animals grazing | | |
| Dairy | % | 0 |
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |
| January | | True |
| February | | True |
| March | | True |
| April | | True |
| May | | True |
| August | | True |

# FarmParameters

| | | |
|---|---|---|
| September | | True |
| October | | True |
| November | | True |
| December | | True |
| Animals grazing | | |
| Dairy replacements | % | 0 |
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |
| August | | True |
| September | | True |
| October | | True |
| *Effluent application* | | |
| Liquid effluents | | |
| Receives farm dairy effluent | | |
| Effluent application depth | | < 12 mm |
| Percentage of block effluent applied to | % | 100 |

**Block - Maintenance Block Drum_2a.1**

| | | |
|---|---|---|
| Block name | | Maintenance Block Drum_2a.1 |
| Block type | | Pastoral |
| Area | ha | 36 |
| Relative productivity | | 1 |
| Pasture block type | | Yes |
| Topography | | Flat |
| Distance from coast | km | 30 |
| Cultivated in last 5 years | | False |
| Fodder rotates through | | Yes |
| *Climate* | | |
| Annual average rainfall | mm/yr | 1002 |
| Mean annual temperature | | 9.8 |
| Seasonal variation in rainfall | | 731-1450 mm, Low |
| Annual potential evapotranspiration | mm | 711 |
| Seasonal variation in PET | | Moderate |
| *Soil description* | | |
| Soil order (default) | | Brown |
| Soil group (default) | | Sedimentary |
| SMaps | | |
| Sibling | | Drum_2a.1 |
| Date downloaded | | 2017 February 22 11:35 |
| Wilting point | 0 - 30cm | 29 |
| | 30 - 60cm | 28 |
| | > 60 | 12 |
| Field capacity | 0 - 30cm | 45 |
| | 30 - 60cm | 43 |
| | > 60 | 20 |
| Saturation | 0 - 30cm | 55 |
| | 30 - 60cm | 52 |
| | > 60 | 27 |
| Natural drainage class | | Well |
| Depth to impeded layer | cm | Not entered |
| Maximum rooting depth | cm | Not entered |
| Top soil horizon chemical and physical parameters | | |
| ASC/PR | % | 48 |
| Bulk density | kg/m³ | 1080 |
| Clay | % | 40 |
| Sand | % | 17 |
| Sub soil | | |
| Sub soil clay | % | 36 |
| *Soil profile* | | |
| Profile drainage class | | Use default |

WW2 - Current (SS) + SH96 + WW1 Blk

Cain Duncan
Fonterra

Client reference:
Farm name: 32651- Evidence Version (15/16)

# FarmParameters

| | | |
|---|---|---|
| Top soil texture | | Unknown |
| Maximum rooting depth | m | 0 |
| Depth to impeded drainage layer | | 0 |

*Soil drainage*

| | |
|---|---|
| Drainage method | |
| Method | None |
| Hydrophobic condition | Use default |
| Occurence of pugging damage | Occasional |
| Compacted top soil | False |

*Soil settings*

| | |
|---|---|
| K leaching (%s) | Medium |
| N immobilisation status | Standard |

*Soil tests*

| Olsen P | QT K | QT Ca | QT Mg | QT Na |
|---|---|---|---|---|
| 32 | 5 | 12 | 27 | 8 |

| | |
|---|---|
| Organic S | 11 |
| Anion storage capacity or phosphate retention | Not entered |
| TBK reserve K test | Not entered |
| K reserve status | Use default |

*Pasture*

| | |
|---|---|
| Pasture type | Ryegrass/white clover |
| Clover levels | Use default |

*Supplements removed*

No supplements removed from this block

*Fertiliser application*

| | | |
|---|---|---|
| Fertiliser products - October | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 70 |
| Fertiliser products - December | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 50 |
| Fertiliser products - February | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 50 |
| Fertiliser products - March | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 60 |
| Fertiliser products - August | | |
| Category | | Ravensdown cropping |
| Product | | Ammo 36 |
| Amount | kg/ha | 100 |
| Fertiliser products - September | | |
| Category | | User defined |
| Product | | 18 Nitrogen |
| Amount | kg/ha | 100 |
| Fertiliser products - April | | |
| Category | | User defined |
| Product | | 18 Nitrogen |
| Amount | kg/ha | 100 |
| Fertiliser products - November | | |
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 60 |
| Fertiliser products - January | | |
| Category | | Ravensdown other |

# FarmParameters

| | | |
|---|---|---|
| Product | | Flexi-N |
| Amount | kg/ha | 60 |
| Fertiliser products - November | | |
| Category | | Ravensdown super |
| Product | | 15 potash super |
| Amount | kg/ha | 250 |
| Fertiliser products - January | | |
| Category | | Ravensdown super |
| Product | | 15 potash super |
| Amount | kg/ha | 250 |

*Irrigation*

No irrigation entered

*Animals on block*

Ratio and type of stock based on whole farm values due to this option being selected on block set up

| | | |
|---|---|---|
| Animals grazing | | |
| Dairy | % | 0 |
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |
| January | | True |
| February | | True |
| March | | True |
| April | | True |
| May | | True |
| August | | True |
| September | | True |
| October | | True |
| November | | True |
| December | | True |
| Animals grazing | | |
| Dairy replacements | % | 0 |
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |
| August | | True |
| September | | True |
| October | | True |

*Effluent application*

Receives no liquid or solid effluents

**Block - No Fert Block Drum_2a.1**

| | | |
|---|---|---|
| Block name | | No Fert Block Drum_2a.1 |
| Block type | | Pastoral |
| Area | ha | 4 |
| Relative productivity | | 0.5 |
| Pasture block type | | No |
| Topography | | Flat |
| Distance from coast | km | 30 |
| Cultivated in last 5 years | | False |
| Fodder rotates through | | No |

*Climate*

| | | |
|---|---|---|
| Annual average rainfall | mm/yr | 1002 |
| Mean annual temperature | | 9.8 |
| Seasonal variation in rainfall | | 731-1450 mm, Low |
| Annual potential evapotranspiration | mm | 711 |
| Seasonal variation in PET | | Moderate |

*Soil description*

| | |
|---|---|
| Soil order (default) | Brown |
| Soil group (default) | Sedimentary |
| SMaps | |

WW2 - Current (SS) + SH96 + WW1 Blk

Cain Duncan
Fonterra

Client reference:
Farm name: 32651- Evidence Version (15/16)

# FarmParameters

| | | |
|---|---|---|
| Sibling | | Drum_2a.1 |
| Date downloaded | | 2017 February 22 11:36 |
| Wilting point | 0 - 30cm | 29 |
| | 30 - 60cm | 28 |
| | > 60 | 12 |
| Field capacity | 0 - 30cm | 45 |
| | 30 - 60cm | 43 |
| | > 60 | 20 |
| Saturation | 0 - 30cm | 55 |
| | 30 - 60cm | 52 |
| | > 60 | 27 |
| Natural drainage class | | Well |
| Depth to impeded layer | cm | Not entered |
| Maximum rooting depth | cm | Not entered |
| Top soil horizon chemical and physical parameters | | |
| ASC/PR | % | 48 |
| Bulk density | kg/m³ | 1080 |
| Clay | % | 40 |
| Sand | % | 17 |
| Sub soil | | |
| Sub soil clay | % | 36 |

*Soil profile*

| | | |
|---|---|---|
| Profile drainage class | | Poor |
| Top soil texture | | Unknown |
| Maximum rooting depth | m | 0 |
| Depth to impeded drainage layer | | 0 |

*Soil drainage*

| | |
|---|---|
| Drainage method | |
| Method | None |
| Hydrophobic condition | Use default |
| Occurence of pugging damage | Occasional |
| Compacted top soil | False |

*Soil settings*

| | |
|---|---|
| K leaching (%s) | Medium |
| N immobilisation status | Standard |

*Soil tests*

| Olsen P | QT K | QT Ca | QT Mg | QT Na |
|---|---|---|---|---|
| 40 | 9 | 14 | 35 | 9 |

| | |
|---|---|
| Organic S | 11 |
| Anion storage capacity or phosphate retention | Not entered |
| TBK reserve K test | Not entered |
| K reserve status | Use default |

*Pasture*

| | |
|---|---|
| Pasture type | Ryegrass/white clover |
| Clover levels | Use default |

*Supplements removed*

No supplements removed from this block

No fertiliser application applied on block

*Irrigation*

No irrigation entered

*Animals on block*

Ratio and type of stock based on whole farm values due to this option being selected on block set up

| | | |
|---|---|---|
| Animals grazing | | |
| Dairy | % | 0 |
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |
| January | | True |

# FarmParameters

| | | |
|---|---|---|
| February | | True |
| March | | True |
| April | | True |
| May | | True |
| August | | True |
| September | | True |
| October | | True |
| November | | True |
| December | | True |
| Animals grazing | | |
| Dairy replacements | % | 0 |
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |
| August | | True |
| September | | True |
| October | | True |

*Effluent application*

Receives no liquid or solid effluents

**Block - WW1 Brax_4a.1**

| | | |
|---|---|---|
| Block name | | WW1 Brax_4a.1 |
| Block type | | Pastoral |
| Area | ha | 34 |
| Relative productivity | | 1 |
| Pasture block type | | Yes |
| Topography | | Flat |
| Distance from coast | km | 30 |
| Cultivated in last 5 years | | False |
| Fodder rotates through | | Yes |

*Climate*

| | | |
|---|---|---|
| Annual average rainfall | mm/yr | 1002 |
| Mean annual temperature | | 9.8 |
| Seasonal variation in rainfall | | 731-1450 mm, Low |
| Annual potential evapotranspiration | mm | 711 |
| Seasonal variation in PET | | Moderate |

*Soil description*

| | | |
|---|---|---|
| Soil order (default) | | Gley |
| Soil group (default) | | Sedimentary |
| SMaps | | |
| Sibling | | Brax_4a.1 |
| Date downloaded | | 2016 August 15 14:09 |
| Wilting point | 0 - 30cm | 25 |
| | 30 - 60cm | 32 |
| | > 60 | 34 |
| Field capacity | 0 - 30cm | 53 |
| | 30 - 60cm | 53 |
| | > 60 | 54 |
| Saturation | 0 - 30cm | 65 |
| | 30 - 60cm | 58 |
| | > 60 | 58 |
| Natural drainage class | | Poor |
| Depth to impeded layer | cm | Not entered |
| Maximum rooting depth | cm | Not entered |
| Top soil horizon chemical and physical parameters | | |
| ASC/PR | % | 38 |
| Bulk density | kg/m³ | 940 |
| Clay | % | 32 |
| Sand | % | 12 |
| Sub soil | | |
| Sub soil clay | % | 39 |

WW2 - Current (SS) + SH96 + WW1 Blk

Cain Duncan
Fonterra

Client reference:
Farm name: 32651- Evidence Version (15/16)

# FarmParameters

*Soil profile*

| | | |
|---|---|---|
| Profile drainage class | | Poor |
| Top soil texture | | Unknown |
| Maximum rooting depth | m | 0 |
| Depth to impeded drainage layer | | 0 |

*Soil drainage*

| | |
|---|---|
| Drainage method | |
| Method | None |
| Hydrophobic condition | Use default |
| Occurence of pugging damage | Occasional |
| Compacted top soil | False |

*Soil settings*

| | |
|---|---|
| K leaching (%s) | Medium |
| N immobilisation status | Standard |

*Soil tests*

| Olsen P | QT K | QT Ca | QT Mg | QT Na |
|---|---|---|---|---|
| 38 | 9 | 13 | 33 | 9 |

| | |
|---|---|
| Organic S | 12 |
| Anion storage capacity or phosphate retention | Not entered |
| TBK reserve K test | Not entered |
| K reserve status | Use default |

*Pasture*

| | |
|---|---|
| Pasture type | Ryegrass/white clover |
| Clover levels | Use default |

*Supplements removed*

| | | |
|---|---|---|
| Supplement information | | |
| Conservation type | | Silage |
| Name | | |
| Wrapping | | Wrapped in plastic |
| Supplement amount | | |
| Number of bales | | 25 |
| Packaging | | Round bales |
| Bale size | | |
| Standard bale equivalents | | 12 |
| Supplement is exported from the farm | | |

*Fertiliser application*

| | | |
|---|---|---|
| Fertiliser products - October | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 70 |
| Fertiliser products - December | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 50 |
| Fertiliser products - February | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 50 |
| Fertiliser products - March | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 60 |
| Fertiliser products - August | | |
| Category | | Ravensdown cropping |
| Product | | Ammo 36 |
| Amount | kg/ha | 100 |
| Fertiliser products - September | | |
| Category | | User defined |

# FarmParameters

| | | |
|---|---|---|
| Product | | 18 Nitrogen |
| Amount | kg/ha | 100 |
| Fertiliser products - April | | |
| Category | | User defined |
| Product | | 18 Nitrogen |
| Amount | kg/ha | 100 |
| Fertiliser products - November | | |
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 60 |
| Fertiliser products - January | | |
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 60 |
| Fertiliser products - November | | |
| Category | | Ravensdown super |
| Product | | 20 potash super |
| Amount | kg/ha | 225 |
| Fertiliser products - January | | |
| Category | | Ravensdown super |
| Product | | 30 potash super |
| Amount | kg/ha | 150 |

*Irrigation*
No irrigation entered

*Animals on block*
Ratio and type of stock based on whole farm values due to this option being selected on block set up

| | | |
|---|---|---|
| Animals grazing | | |
| Dairy | % | 0 |
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |
| January | | True |
| February | | True |
| March | | True |
| April | | True |
| May | | True |
| August | | True |
| September | | True |
| October | | True |
| November | | True |
| December | | True |
| Animals grazing | | |
| Dairy replacements | % | 0 |
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |
| August | | True |
| September | | True |
| October | | True |

*Effluent application*
Receives no liquid or solid effluents

**Block - WW1 Drum_2a.1**

| | | |
|---|---|---|
| Block name | | WW1 Drum_2a.1 |
| Block type | | Pastoral |
| Area | ha | 20 |
| Relative productivity | | 1 |
| Pasture block type | | Yes |
| Topography | | Flat |
| Distance from coast | km | 30 |
| Cultivated in last 5 years | | False |
| Fodder rotates through | | Yes |

WW2 - Current (SS) + SH96 + WW1 Blk

Cain Duncan
Fonterra

Client reference:
Farm name: 32651- Evidence Version (15/16)

# FarmParameters

*Climate*

| | | |
|---|---|---|
| Annual average rainfall | mm/yr | 1002 |
| Mean annual temperature | | 9.8 |
| Seasonal variation in rainfall | | 731-1450 mm, Low |
| Annual potential evapotranspiration | mm | 711 |
| Seasonal variation in PET | | Moderate |

*Soil description*

| | | |
|---|---|---|
| Soil order (default) | | Brown |
| Soil group (default) | | Sedimentary |
| SMaps | | |
| Sibling | | Drum_2a.1 |
| Date downloaded | | 2017 February 22 11:26 |
| Wilting point | 0 - 30cm | 29 |
| | 30 - 60cm | 28 |
| | > 60 | 12 |
| Field capacity | 0 - 30cm | 45 |
| | 30 - 60cm | 43 |
| | > 60 | 20 |
| Saturation | 0 - 30cm | 55 |
| | 30 - 60cm | 52 |
| | > 60 | 27 |
| Natural drainage class | | Well |
| Depth to impeded layer | cm | Not entered |
| Maximum rooting depth | cm | Not entered |
| Top soil horizon chemical and physical parameters | | |
| ASC/PR | % | 48 |
| Bulk density | kg/m³ | 1080 |
| Clay | % | 40 |
| Sand | % | 17 |
| Sub soil | | |
| Sub soil clay | % | 36 |

*Soil profile*

| | | |
|---|---|---|
| Profile drainage class | | Use default |
| Top soil texture | | Unknown |
| Maximum rooting depth | m | 0 |
| Depth to impeded drainage layer | | 0 |

*Soil drainage*

| | |
|---|---|
| Drainage method | |
| Method | None |
| Hydrophobic condition | Use default |
| Occurence of pugging damage | Occasional |
| Compacted top soil | False |

*Soil settings*

| | |
|---|---|
| K leaching (%s) | Medium |
| N immobilisation status | Standard |

*Soil tests*

| Olsen P | QT K | QT Ca | QT Mg | QT Na |
|---|---|---|---|---|
| 43 | 14 | 14 | 37 | 9 |

| | |
|---|---|
| Organic S | 11 |
| Anion storage capacity or phosphate retention | Not entered |
| TBK reserve K test | Not entered |
| K reserve status | Use default |

*Pasture*

| | |
|---|---|
| Pasture type | Ryegrass/white clover |
| Clover levels | Use default |

*Supplements removed*

| | |
|---|---|
| Supplement information | |
| Conservation type | Silage |

# FarmParameters

| | | |
|---|---|---|
| Name | | |
| Wrapping | | Wrapped in plastic |
| Supplement amount | | |
| Number of bales | | 23 |
| Packaging | | Round bales |
| Bale size | | |
| Standard bale equivalents | | 12 |
| Supplement is exported from the farm | | |

*Fertiliser application*

| | | |
|---|---|---|
| Fertiliser products - October | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 70 |
| Fertiliser products - December | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 50 |
| Fertiliser products - February | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 50 |
| Fertiliser products - March | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 60 |
| Fertiliser products - August | | |
| Category | | Ravensdown cropping |
| Product | | Ammo 36 |
| Amount | kg/ha | 100 |
| Fertiliser products - September | | |
| Category | | User defined |
| Product | | 18 Nitrogen |
| Amount | kg/ha | 100 |
| Fertiliser products - April | | |
| Category | | User defined |
| Product | | 18 Nitrogen |
| Amount | kg/ha | 100 |
| Fertiliser products - November | | |
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 60 |
| Fertiliser products - January | | |
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 60 |
| Fertiliser products - November | | |
| Category | | Ravensdown super |
| Product | | 20 potash super |
| Amount | kg/ha | 225 |
| Fertiliser products - January | | |
| Category | | Ravensdown super |
| Product | | 30 potash super |
| Amount | kg/ha | 150 |

*Irrigation*

No irrigation entered

*Animals on block*

Ratio and type of stock based on whole farm values due to this option being selected on block set up

| | | |
|---|---|---|
| Animals grazing | | |
| Dairy | % | 0 |
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |

# FarmParameters

| | | |
|---|---|---|
| January | | True |
| February | | True |
| March | | True |
| April | | True |
| May | | True |
| August | | True |
| September | | True |
| October | | True |
| November | | True |
| December | | True |
| Animals grazing | | |
| Dairy replacements | % | 0 |
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |
| August | | True |
| September | | True |
| October | | True |

*Effluent application*
Receives no liquid or solid effluents

**Block - Turnips**

| | | |
|---|---|---|
| Block name | | Turnips |
| Block type | | Fodder Crop |
| Rotation area | ha | 6.5 |
| Low N mineralisation | | False |
| Final grid month | | April |
| Irrigation system type | | No Irrigation |

**Crop information**

*Current assessment year 15/16*

| | | |
|---|---|---|
| May - Grazed pasture | | |
| June - Grazed pasture | | |
| July - Grazed pasture | | |
| August - Grazed pasture | | |
| Fertiliser or lime added | See details below | |
| September - Grazed pasture | | |
| Fertiliser or lime added | See details below | |
| October - Turnips bulb | | |
| Crop management | See details below | Crop sown |
| Fertiliser or lime added | See details below | |
| November - Turnips bulb | | |
| December - Turnips bulb | | |
| January - Turnips bulb | | |
| February - Turnips bulb | | |
| Crop management | See details below | Defoliation |
| March - Turnips bulb | | |
| Crop management | See details below | Defoliation |
| April - Grazed | | |
| Crop management | See details below | Crop sown |
| Fertiliser or lime added | See details below | |

*Crop sowing information - October of the Current assessment year 15/16*

| | | |
|---|---|---|
| Crop category | | Fodder |
| Crop type | | Turnips bulb |
| Product yield | T/ha dry matter | 8 |
| Cultivation practice at sowing | | Conventional |

*Defoliation information - February of the Current assessment year 15/16*

| | |
|---|---|
| Defoliation method | Grazed in-situ |
| Final harvest | False |
| Source of animal | Farm stock - see Enterprise numbers panes |
| Percentage of crop eaten by animals | |

WW2 - Current (SS) + SH96 + WW1 Blk

Cain Duncan
Fonterra

Client reference:
Farm name: 32651- Evidence Version (15/16)

# FarmParameters

| | | |
|---|---|---|
| Dairy | % | 100 |
| Crop grazed for | hours/day | Not entered |

*Defoliation information - March of the Current assessment year 15/16*

| | | |
|---|---|---|
| Defoliation method | | Grazed in-situ |
| Final harvest | | True |
| Source of animal | | Farm stock - see Enterprise numbers panes |
| Percentage of crop eaten by animals | | |
| Dairy | % | 100 |
| Crop grazed for | hours/day | Not entered |

*Crop sowing information - April of the Current assessment year 15/16*

| | | |
|---|---|---|
| Crop category | | Permanent pasture |
| Crop type | | Grazed |
| Source of animals | | Not entered |

*Fertiliser application*

| | | |
|---|---|---|
| Fertiliser products - Current assessment - August (N Method: Surface applied) | | |
| Category | | Ravensdown cropping |
| Product | | Ammo 36 |
| Amount | kg/ha | 100 |
| Fertiliser products - Current assessment - September (N Method: Surface applied) | | |
| Category | | User defined |
| Product | | 18 Nitrogen |
| Amount | kg/ha | 100 |
| Fertiliser products - Current assessment - October (N Method: None) | | |
| Category | | Ravensdown other |
| Product | | Potassium chloride |
| Amount | kg/ha | 50 |
| Fertiliser products - Current assessment - October (N Method: Incorporated) | | |
| Category | | Ravensdown cropping |
| Product | | Cropmaster DAP Boron plus |
| Amount | kg/ha | 250 |
| Fertiliser products - Current assessment - April (N Method: Surface applied) | | |
| Category | | User defined |
| Product | | 18 Nitrogen |
| Amount | kg/ha | 100 |

*Effluent application*

Receives no liquid or solid effluents

**Block - Support Crop Glene_4a.1**

| | | |
|---|---|---|
| Block name | | Support Crop Glene_4a.1 |
| Block type | | Crop |
| Area | ha | 17 |
| Cultivated area | % of area | 100 |
| Headland area | % of area | 0 |
| Other area | % of area | 0 |
| Distance from coast | km | 30 |
| Final grid month | | October |
| Irrigation system type | | No Irrigation |

*Climate*

| | | |
|---|---|---|
| Annual average rainfall | mm/yr | 1002 |
| Mean annual temperature | | 9.8 |
| Seasonal variation in rainfall | | 731-1450 mm, Low |
| Annual potential evapotranspiration | mm | 711 |
| Seasonal variation in PET | | Moderate |

*Soil description*

| | |
|---|---|
| Soil order (default) | Brown |
| Soil group (default) | Sedimentary |
| SMaps | |
| Sibling | Glene_4a.1 |
| Date downloaded | 2017 April 20 21:43 |

WW2 - Current (SS) + SH96 + WW1 Blk

Cain Duncan
Fonterra

Client reference:
Farm name: 32651- Evidence Version (15/16)

# FarmParameters

| | | | |
|---|---|---|---|
| Wilting point | 0 - 30cm | | 19 |
| | 30 - 60cm | | 12 |
| | > 60 | | 1 |
| Field capacity | 0 - 30cm | | 36 |
| | 30 - 60cm | | 21 |
| | > 60 | | 2 |
| Saturation | 0 - 30cm | | 48 |
| | 30 - 60cm | | 28 |
| | > 60 | | 3 |
| Natural drainage class | | | Well |
| Depth to impeded layer | cm | | Not entered |
| Maximum rooting depth | cm | | 33 |
| Top soil horizon chemical and physical parameters | | | |
| ASC/PR | % | | 43 |
| Bulk density | kg/m³ | | 1090 |
| Clay | % | | 25 |
| Sand | % | | 25 |
| Sub soil | | | |
| Sub soil clay | % | | 25 |

*Soil profile*

| | | |
|---|---|---|
| Profile drainage class | | Use default |
| Top soil texture | | Unknown |
| Maximum rooting depth | m | 0.33 |
| Depth to impeded drainage layer | | 0 |

*Soil drainage*

| | |
|---|---|
| Drainage method | |
| Method | None |

*Soil settings*

| | |
|---|---|
| K leaching (%s) | Medium |

*Soil tests*

| | |
|---|---|
| Anion storage capacity or phosphate retention | Not entered |
| TBK reserve K test | Not entered |
| K reserve status | Use default |

**Crop block history**

| | |
|---|---|
| Years in pasture | 5 |
| Prior history | Grazed pasture |

*Source of animal information*

| | |
|---|---|
| Animal source | Not entered |

**Crop information**

*Previous assesment year*

November - Grazed pasture
December - Grazed pasture
January - Grazed pasture
February - Grazed pasture
March - Grazed pasture
April - Grazed pasture
May - Grazed pasture
June - Grazed pasture
July - Grazed pasture
August - Grazed pasture
September - Grazed pasture
October - Grazed pasture

*Current assessment year 15/16*

| | | |
|---|---|---|
| November - Fodder beets | | |
| Crop management | See details below | Crop sown |
| Fertiliser or lime added | See details below | |
| December - Fodder beets | | |

WW2 - Current (SS) + SH96 + WW1 Blk

Cain Duncan
Fonterra

Client reference:
Farm name: 32651- Evidence Version (15/16)

# FarmParameters

| | | |
|---|---|---|
| Fertiliser or lime added | See details below | |
| January - Fodder beets | | |
| February - Fodder beets | | |
| Fertiliser or lime added | See details below | |
| March - Fodder beets | | |
| April - Mature - Fodder beets | | |
| May - Fodder beets | | |
| Crop management | See details below | Defoliation |
| June - Fodder beets | | |
| Crop management | See details below | Defoliation |
| July - Fodder beets | | |
| Crop management | See details below | Defoliation |
| August - Bare ground | | |
| September - Bare ground | | |
| October - Annual ryegrass | | |
| Crop management | See details below | Crop sown |

*Crop sowing information - November of the Current assessment year 15/16*

| | | |
|---|---|---|
| Crop category | | Fodder |
| Crop type | | Fodder beets |
| Product yield | T/ha dry matter | 25 |
| Cultivation practice at sowing | | Conventional |

*Defoliation information - May of the Current assessment year 15/16*

| | | |
|---|---|---|
| Defoliation method | | Grazed in-situ |
| Final harvest | | False |
| Source of animal | | Farm stock - see Enterprise numbers panes |
| Percentage of crop eaten by animals | | |
| Dairy replacements | % | 100 |
| Crop grazed for | hours/day | Not entered |

*Defoliation information - June of the Current assessment year 15/16*

| | | |
|---|---|---|
| Defoliation method | | Grazed in-situ |
| Final harvest | | False |
| Source of animal | | Farm stock - see Enterprise numbers panes |
| Percentage of crop eaten by animals | | |
| Dairy replacements | % | 100 |
| Crop grazed for | hours/day | Not entered |

*Defoliation information - July of the Current assessment year 15/16*

| | | |
|---|---|---|
| Defoliation method | | Grazed in-situ |
| Final harvest | | True |
| Source of animal | | Farm stock - see Enterprise numbers panes |
| Percentage of crop eaten by animals | | |
| Dairy replacements | % | 100 |
| Crop grazed for | hours/day | Not entered |

*Crop sowing information - October of the Current assessment year 15/16*

| | | |
|---|---|---|
| Crop category | | Forages |
| Crop type | | Annual ryegrass |
| Yield at final defoliation | T/ha dry matter | 0 |
| Cultivation practice at sowing | | Conventional |

*Fertiliser application*

| | | |
|---|---|---|
| Fertiliser products - Current assessment - November (N Method: Incorporated) | | |
| Category | | Ravensdown cropping |
| Product | | Cropmaster 15 |
| Amount | kg/ha | 385 |
| Fertiliser products - Current assessment - November (N Method: None) | | |
| Category | | Ravensdown other |
| Product | | Potassium chloride |
| Amount | kg/ha | 100 |
| Fertiliser products - Current assessment - November (N Method: None) | | |
| Category | | Ravensdown other |
| Product | | Salt (sodium chloride) |

# FarmParameters

| | | |
|---|---|---|
| Amount | kg/ha | 100 |
| Fertiliser products - Current assessment - December (N Method: Surface applied) | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 120 |
| Fertiliser products - Current assessment - December (N Method: None) | | |
| Category | | Ravensdown other |
| Product | | Potassium chloride |
| Amount | kg/ha | 70 |
| Fertiliser products - Current assessment - February (N Method: Surface applied) | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 120 |

*Effluent application*

Receives no liquid or solid effluents

**Block - Support Crop Drum_2a.1**

| | | |
|---|---|---|
| Block name | | Support Crop Drum_2a.1 |
| Block type | | Crop |
| Area | ha | 2 |
| Cultivated area | % of area | 100 |
| Headland area | % of area | 0 |
| Other area | % of area | 0 |
| Distance from coast | km | 30 |
| Final grid month | | October |
| Irrigation system type | | No Irrigation |

*Climate*

| | | |
|---|---|---|
| Annual average rainfall | mm/yr | 1002 |
| Mean annual temperature | | 9.8 |
| Seasonal variation in rainfall | | 731-1450 mm, Low |
| Annual potential evapotranspiration | mm | 711 |
| Seasonal variation in PET | | Moderate |

*Soil description*

| | | |
|---|---|---|
| Soil order (default) | | Brown |
| Soil group (default) | | Sedimentary |
| SMaps | | |
| Sibling | | Drum_2a.1 |
| Date downloaded | | 2017 April 20 22:22 |
| Wilting point | 0 - 30cm | 29 |
| | 30 - 60cm | 28 |
| | > 60 | 12 |
| Field capacity | 0 - 30cm | 45 |
| | 30 - 60cm | 43 |
| | > 60 | 20 |
| Saturation | 0 - 30cm | 55 |
| | 30 - 60cm | 52 |
| | > 60 | 27 |
| Natural drainage class | | Well |
| Depth to impeded layer | cm | Not entered |
| Maximum rooting depth | cm | Not entered |
| Top soil horizon chemical and physical parameters | | |
| ASC/PR | % | 48 |
| Bulk density | kg/m³ | 1080 |
| Clay | % | 40 |
| Sand | % | 17 |
| Sub soil | | |
| Sub soil clay | % | 36 |

*Soil profile*

| | | |
|---|---|---|
| Profile drainage class | | Use default |
| Top soil texture | | Unknown |
| Maximum rooting depth | m | 0 |

# FarmParameters

| | | |
|---|---|---|
| Depth to impeded drainage layer | | 0 |
| *Soil drainage* | | |
| Drainage method | | |
| Method | | None |
| *Soil settings* | | |
| K leaching (%s) | | Medium |
| *Soil tests* | | |
| Anion storage capacity or phosphate retention | | Not entered |
| TBK reserve K test | | Not entered |
| K reserve status | | Use default |
| **Crop block history** | | |
| Years in pasture | | 5 |
| Prior history | | Grazed pasture |
| *Source of animal information* | | |
| Animal source | | Not entered |
| **Crop information** | | |
| *Previous assesment year* | | |
| November - Grazed pasture | | |
| December - Grazed pasture | | |
| January - Grazed pasture | | |
| February - Grazed pasture | | |
| March - Grazed pasture | | |
| April - Grazed pasture | | |
| May - Grazed pasture | | |
| June - Grazed pasture | | |
| July - Grazed pasture | | |
| August - Grazed pasture | | |
| September - Grazed pasture | | |
| October - Grazed pasture | | |
| *Current assessment year 15/16* | | |
| November - Fodder beets | | |
| Crop management | See details below | Crop sown |
| Fertiliser or lime added | See details below | |
| December - Fodder beets | | |
| Fertiliser or lime added | See details below | |
| January - Fodder beets | | |
| February - Fodder beets | | |
| Fertiliser or lime added | See details below | |
| March - Fodder beets | | |
| April - Mature - Fodder beets | | |
| May - Fodder beets | | |
| Crop management | See details below | Defoliation |
| June - Fodder beets | | |
| Crop management | See details below | Defoliation |
| July - Fodder beets | | |
| Crop management | See details below | Defoliation |
| August - Bare ground | | |
| September - Bare ground | | |
| October - Annual ryegrass | | |
| Crop management | See details below | Crop sown |
| *Crop sowing information - November of the Current assessment year 15/16* | | |
| Crop category | | Fodder |
| Crop type | | Fodder beets |
| Product yield | T/ha dry matter | 25 |
| Cultivation practice at sowing | | Conventional |

*Defoliation information - May of the Current assessment year 15/16*

# FarmParameters

| | | |
|---|---|---|
| Defoliation method | | Grazed in-situ |
| Final harvest | | False |
| Source of animal | | Farm stock - see Enterprise numbers panes |
| Percentage of crop eaten by animals | | |
| Dairy replacements | % | 100 |
| Crop grazed for | hours/day | Not entered |

*Defoliation information - June of the Current assessment year 15/16*

| | | |
|---|---|---|
| Defoliation method | | Grazed in-situ |
| Final harvest | | False |
| Source of animal | | Farm stock - see Enterprise numbers panes |
| Percentage of crop eaten by animals | | |
| Dairy replacements | % | 100 |
| Crop grazed for | hours/day | Not entered |

*Defoliation information - July of the Current assessment year 15/16*

| | | |
|---|---|---|
| Defoliation method | | Grazed in-situ |
| Final harvest | | True |
| Source of animal | | Farm stock - see Enterprise numbers panes |
| Percentage of crop eaten by animals | | |
| Dairy replacements | % | 100 |
| Crop grazed for | hours/day | Not entered |

*Crop sowing information - October of the Current assessment year 15/16*

| | | |
|---|---|---|
| Crop category | | Forages |
| Crop type | | Annual ryegrass |
| Yield at final defoliation | T/ha dry matter | 0 |
| Cultivation practice at sowing | | Conventional |

*Fertiliser application*

| | | |
|---|---|---|
| Fertiliser products - Current assessment - November (N Method: Incorporated) | | |
| Category | | Ravensdown cropping |
| Product | | Cropmaster 15 |
| Amount | kg/ha | 385 |
| Fertiliser products - Current assessment - November (N Method: None) | | |
| Category | | Ravensdown other |
| Product | | Potassium chloride |
| Amount | kg/ha | 100 |
| Fertiliser products - Current assessment - November (N Method: None) | | |
| Category | | Ravensdown other |
| Product | | Salt (sodium chloride) |
| Amount | kg/ha | 100 |
| Fertiliser products - Current assessment - December (N Method: Surface applied) | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 120 |
| Fertiliser products - Current assessment - December (N Method: None) | | |
| Category | | Ravensdown other |
| Product | | Potassium chloride |
| Amount | kg/ha | 70 |
| Fertiliser products - Current assessment - February (N Method: Surface applied) | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 120 |

*Effluent application*

Receives no liquid or solid effluents

**Block - Support CC Barn Eff Glene_4a.1**

| | | |
|---|---|---|
| Block name | | Support CC Barn Eff Glene_4a.1 |
| Block type | | Cut and Carry |
| Area | ha | 12 |
| Pasture block type | | Ryegrass/white clover |
| Distance from coast | km | 30 |

WW2 - Current (SS) + SH96 + WW1 Blk

Cain Duncan
Fonterra

Client reference:
Farm name: 32651- Evidence Version (15/16)

# FarmParameters

*Climate*

| | | |
|---|---|---|
| Annual average rainfall | mm/yr | 1002 |
| Mean annual temperature | | 9.8 |
| Seasonal variation in rainfall | | 731-1450 mm, Low |
| Annual potential evapotranspiration | mm | 711 |
| Seasonal variation in PET | | Moderate |

*Soil description*

| | | |
|---|---|---|
| Soil order (default) | | Brown |
| Soil group (default) | | Sedimentary |
| SMaps | | |
| Sibling | | Glene_4a.1 |
| Date downloaded | | 2017 April 20 21:43 |
| Wilting point | 0 - 30cm | 19 |
| | 30 - 60cm | 12 |
| | > 60 | 1 |
| Field capacity | 0 - 30cm | 36 |
| | 30 - 60cm | 21 |
| | > 60 | 2 |
| Saturation | 0 - 30cm | 48 |
| | 30 - 60cm | 28 |
| | > 60 | 3 |
| Natural drainage class | | Well |
| Depth to impeded layer | cm | Not entered |
| Maximum rooting depth | cm | 33 |
| Top soil horizon chemical and physical parameters | | |
| ASC/PR | % | 43 |
| Bulk density | kg/m³ | 1090 |
| Clay | % | 25 |
| Sand | % | 25 |
| Sub soil | | |
| Sub soil clay | % | 25 |

*Soil profile*

| | | |
|---|---|---|
| Profile drainage class | | Use default |
| Top soil texture | | Unknown |
| Maximum rooting depth | m | 0.33 |
| Depth to impeded drainage layer | | 0 |

*Soil drainage*

| | |
|---|---|
| Drainage method | |
| Method | None |

*Soil settings*

| | |
|---|---|
| K leaching (%s) | Medium |

*Soil tests*

| Olsen P | QT K | QT Ca | QT Mg | QT Na |
|---|---|---|---|---|
| 38 | 10 | 12 | 32 | 12 |

| | |
|---|---|
| Organic S | 12 |
| Anion storage capacity or phosphate retention | Not entered |
| TBK reserve K test | Not entered |
| K reserve status | Use default |

*Supplements removed*

| | | |
|---|---|---|
| Supplement information | | |
| Conservation type | | Silage |
| Name | | |
| Silage stack storage | | Stack effluent contained |
| Supplement amount | | |
| Dry weight basis | T | 204 |
| Silage cutting method | | Not entered |
| Destination | | Storage |
| Storage conditions | | Average |

WW2 - Current (SS) + SH96 + WW1 Blk

Cain Duncan
Fonterra

Client reference:
Farm name: 32651- Evidence Version (15/16)

# FarmParameters

*Fertiliser application*

Organic nutrient inputs - November

| | |
|---|---|
| Description | Wintering Barn Effluent |
| Organic type | Imported dairy effluent |

Nutrients added as a loading (kg/month) applied to pasture

| N | P | K | S | Ca | Mg | Na | H |
|---|---|---|---|---|---|---|---|
| 664 | 168 | 916 | 84 | 0 | 0 | 0 | 0 |

Effluent form: Liquids

Organic nutrient inputs - January

| | |
|---|---|
| Organic type | Imported dairy effluent |

Nutrients added as a loading (kg/month) applied to pasture

| N | P | K | S | Ca | Mg | Na | H |
|---|---|---|---|---|---|---|---|
| 664 | 168 | 916 | 84 | 0 | 0 | 0 | 0 |

Effluent form: Liquids

Organic nutrient inputs - March

| | |
|---|---|
| Organic type | Imported dairy effluent |

Nutrients added as a loading (kg/month) applied to pasture

| N | P | K | S | Ca | Mg | Na | H |
|---|---|---|---|---|---|---|---|
| 664 | 168 | 916 | 84 | 0 | 0 | 0 | 0 |

Effluent form: Liquids

Fertiliser products - August

| | | |
|---|---|---|
| Category | | Ravensdown cropping |
| Product | | Ammo 36 |
| Amount | kg/ha | 200 |

Fertiliser products - August

| | | |
|---|---|---|
| Category | | Ravensdown other |
| Product | | Potassium chloride |
| Amount | kg/ha | 120 |

Fertiliser products - December

| | | |
|---|---|---|
| Category | | Ravensdown cropping |
| Product | | Cropmaster DAP |
| Amount | kg/ha | 250 |

Fertiliser products - October

| | | |
|---|---|---|
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 100 |

Fertiliser products - February

| | | |
|---|---|---|
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 50 |

Fertiliser products - December

| | | |
|---|---|---|
| Category | | Ravensdown other |
| Product | | Potassium chloride |
| Amount | kg/ha | 180 |

*Irrigation*

No irrigation entered

*Animals on block*

Ratio and type of stock based on whole farm values due to this option being selected on block set up

*Effluent application*

Receives no liquid or solid effluents

**Block - Support CC Barn Eff Drum_2a.1**

| | | |
|---|---|---|
| Block name | | Support CC Barn Eff Drum_2a.1 |
| Block type | | Cut and Carry |
| Area | ha | 30 |
| Pasture block type | | Ryegrass/white clover |
| Distance from coast | km | 30 |

*Climate*

| | | |
|---|---|---|
| Annual average rainfall | mm/yr | 1002 |
| Mean annual temperature | | 9.8 |

WW2 - Current (SS) + SH96 + WW1 Blk

Cain Duncan
Fonterra

Client reference:
Farm name: 32651- Evidence Version (15/16)

# FarmParameters

| | | |
|---|---|---|
| Seasonal variation in rainfall | | 731-1450 mm, Low |
| Annual potential evapotranspiration | mm | 711 |
| Seasonal variation in PET | | Moderate |
| *Soil description* | | |
| Soil order (default) | | Brown |
| Soil group (default) | | Sedimentary |
| SMaps | | |
| Sibling | | Drum_2a.1 |
| Date downloaded | | 2017 February 22 11:30 |
| Wilting point | 0 - 30cm | 29 |
| | 30 - 60cm | 28 |
| | > 60 | 12 |
| Field capacity | 0 - 30cm | 45 |
| | 30 - 60cm | 43 |
| | > 60 | 20 |
| Saturation | 0 - 30cm | 55 |
| | 30 - 60cm | 52 |
| | > 60 | 27 |
| Natural drainage class | | Well |
| Depth to impeded layer | cm | Not entered |
| Maximum rooting depth | cm | Not entered |
| Top soil horizon chemical and physical parameters | | |
| ASC/PR | % | 48 |
| Bulk density | kg/m³ | 1080 |
| Clay | % | 40 |
| Sand | % | 17 |
| Sub soil | | |
| Sub soil clay | % | 36 |
| *Soil profile* | | |
| Profile drainage class | | Use default |
| Top soil texture | | Unknown |
| Maximum rooting depth | m | 0 |
| Depth to impeded drainage layer | | 0 |
| *Soil drainage* | | |
| Drainage method | | |
| Method | | None |
| *Soil settings* | | |
| K leaching (%s) | | Medium |

*Soil tests*

| Olsen P | QT K | QT Ca | QT Mg | QT Na |
|---|---|---|---|---|
| 51 | 16 | 13 | 45 | 8 |

| | |
|---|---|
| Organic S | 11 |
| Anion storage capacity or phosphate retention | Not entered |
| TBK reserve K test | Not entered |
| K reserve status | Use default |
| *Supplements removed* | |
| Supplement information | |
| Conservation type | Silage |
| Name | |
| Silage stack storage | Stack effluent contained |
| Supplement amount | |
| Dry weight basis T | 510 |
| Silage cutting method | Not entered |
| Destination | Storage |
| Storage conditions | Average |
| *Fertiliser application* | |
| Organic nutrient inputs - November | |
| Description | Wintering Barn Effluent |

WW2 - Current (SS) + SH96 + WW1 Blk

Cain Duncan
Fonterra

Client reference:
Farm name: 32651- Evidence Version (15/16)

# FarmParameters

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Organic type | | | | | | Imported dairy effluent | |
| Nutrients added as a loading (kg/month) applied to pasture | | | | | | | |
| N | P | K | S | Ca | Mg | Na | H |
| 1718 | 430 | 2363 | 215 | 0 | 0 | 0 | 0 |
| Effluent form | | | | | | Liquids | |
| Fertiliser products - August | | | | | | | |
| Category | | | | | | Ravensdown cropping | |
| Product | | | | | | Ammo 36 | |
| Amount | | | | kg/ha | | 200 | |
| Fertiliser products - August | | | | | | | |
| Category | | | | | | Ravensdown other | |
| Product | | | | | | Potassium chloride | |
| Amount | | | | kg/ha | | 120 | |
| Fertiliser products - December | | | | | | | |
| Category | | | | | | Ravensdown cropping | |
| Product | | | | | | Cropmaster DAP | |
| Amount | | | | kg/ha | | 250 | |
| Fertiliser products - October | | | | | | | |
| Category | | | | | | Ravensdown other | |
| Product | | | | | | Flexi-N | |
| Amount | | | | kg/ha | | 100 | |
| Fertiliser products - February | | | | | | | |
| Category | | | | | | Ravensdown other | |
| Product | | | | | | Flexi-N | |
| Amount | | | | kg/ha | | 50 | |
| Fertiliser products - December | | | | | | | |
| Category | | | | | | Ravensdown other | |
| Product | | | | | | Potassium chloride | |
| Amount | | | | kg/ha | | 180 | |
| Organic nutrient inputs - January | | | | | | | |
| Description | | | | | | Wintering Barn Effluent | |
| Organic type | | | | | | Imported dairy effluent | |
| Nutrients added as a loading (kg/month) applied to pasture | | | | | | | |
| N | P | K | S | Ca | Mg | Na | H |
| 1718 | 430 | 2363 | 215 | 0 | 0 | 0 | 0 |
| Effluent form | | | | | | Liquids | |
| Organic nutrient inputs - March | | | | | | | |
| Description | | | | | | Wintering Barn Effluent | |
| Organic type | | | | | | Imported dairy effluent | |
| Nutrients added as a loading (kg/month) applied to pasture | | | | | | | |
| N | P | K | S | Ca | Mg | Na | H |
| 1718 | 430 | 2363 | 215 | 0 | 0 | 0 | 0 |
| Effluent form | | | | | | Liquids | |

*Irrigation*
No irrigation entered

*Animals on block*
Ratio and type of stock based on whole farm values due to this option being selected on block set up

*Effluent application*
Receives no liquid or solid effluents

**Block - Support CC Glen_4a.1**

| | | |
|---|---|---|
| Block name | | Support CC Glen_4a.1 |
| Block type | | Cut and Carry |
| Area | ha | 19 |
| Pasture block type | | Ryegrass/white clover |
| Distance from coast | km | 30 |

*Climate*

| | | |
|---|---|---|
| Annual average rainfall | mm/yr | 1002 |
| Mean annual temperature | | 9.8 |
| Seasonal variation in rainfall | | 731-1450 mm, Low |
| Annual potential evapotranspiration | mm | 711 |

WW2 - Current (SS) + SH96 + WW1 Blk

Cain Duncan
Fonterra

Client reference:
Farm name: 32651- Evidence Version (15/16)

# FarmParameters

| | | | |
|---|---|---|---|
| Seasonal variation in PET | | | Moderate |
| *Soil description* | | | |
| Soil order (default) | | | Brown |
| Soil group (default) | | | Sedimentary |
| SMaps | | | |
| Sibling | | | Glene_4a.1 |
| Date downloaded | | | 2017 April 20 21:43 |
| Wilting point | 0 - 30cm | | 19 |
| | 30 - 60cm | | 12 |
| | > 60 | | 1 |
| Field capacity | 0 - 30cm | | 36 |
| | 30 - 60cm | | 21 |
| | > 60 | | 2 |
| Saturation | 0 - 30cm | | 48 |
| | 30 - 60cm | | 28 |
| | > 60 | | 3 |
| Natural drainage class | | | Well |
| Depth to impeded layer | cm | | Not entered |
| Maximum rooting depth | cm | | 33 |
| Top soil horizon chemical and physical parameters | | | |
| ASC/PR | % | | 43 |
| Bulk density | kg/m³ | | 1090 |
| Clay | % | | 25 |
| Sand | % | | 25 |
| Sub soil | | | |
| Sub soil clay | % | | 25 |
| *Soil profile* | | | |
| Profile drainage class | | | Use default |
| Top soil texture | | | Unknown |
| Maximum rooting depth | m | | 0.33 |
| Depth to impeded drainage layer | | | 0 |
| *Soil drainage* | | | |
| Drainage method | | | |
| Method | | | None |
| *Soil settings* | | | |
| K leaching (%s) | | | Medium |

*Soil tests*

| Olsen P | QT K | QT Ca | QT Mg | QT Na |
|---|---|---|---|---|
| 38 | 10 | 12 | 32 | 12 |

| | | | |
|---|---|---|---|
| Organic S | | | 12 |
| Anion storage capacity or phosphate retention | | | Not entered |
| TBK reserve K test | | | Not entered |
| K reserve status | | | Use default |
| *Supplements removed* | | | |
| Supplement information | | | |
| Conservation type | | | Silage |
| Name | | | |
| Silage stack storage | | | Stack effluent contained |
| Supplement amount | | | |
| Dry weight basis | | T | 323 |
| Silage cutting method | | | Not entered |
| Destination | | | Storage |
| Storage conditions | | | Average |
| *Fertiliser application* | | | |
| Fertiliser products - August | | | |
| Category | | | Ravensdown cropping |
| Product | | | Ammo 36 |
| Amount | | kg/ha | 139 |

WW2 - Current (SS) + SH96 + WW1 Blk

Cain Duncan
Fonterra

Client reference:
Farm name: 32651- Evidence Version (15/16)

# FarmParameters

| | | |
|---|---|---|
| Fertiliser products - August | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 140 |
| Fertiliser products - November | | |
| Category | | Ravensdown super |
| Product | | 50 potash super |
| Amount | kg/ha | 200 |
| Lime / dolomite application - November | | |
| Lime material | | Lime (good quality) |
| Rate | kg/ha | 300 |
| Dissolves within the year | | False |
| Fertiliser products - November | | |
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 155 |
| Fertiliser products - January | | |
| Category | | Ravensdown super |
| Product | | 50 potash super |
| Amount | kg/ha | 200 |
| Fertiliser products - January | | |
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 105 |
| Fertiliser products - March | | |
| Category | | Ravensdown super |
| Product | | 30 potash super |
| Amount | kg/ha | 330 |
| Fertiliser products - March | | |
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 25 |
| Fertiliser products - December | | |
| Category | | Ravensdown super |
| Product | | 30 potash super |
| Amount | kg/ha | 500 |

*Irrigation*
No irrigation entered

*Animals on block*
Ratio and type of stock based on whole farm values due to this option being selected on block set up

*Effluent application*
Receives no liquid or solid effluents

**Block - Support CC Drum_2a.1**

| | | |
|---|---|---|
| Block name | | Support CC Drum_2a.1 |
| Block type | | Cut and Carry |
| Area | ha | 12 |
| Pasture block type | | Ryegrass/white clover |
| Distance from coast | km | 30 |

*Climate*

| | | |
|---|---|---|
| Annual average rainfall | mm/yr | 1002 |
| Mean annual temperature | | 9.8 |
| Seasonal variation in rainfall | | 731-1450 mm, Low |
| Annual potential evapotranspiration | mm | 711 |
| Seasonal variation in PET | | Moderate |

*Soil description*

| | |
|---|---|
| Soil order (default) | Brown |
| Soil group (default) | Sedimentary |
| SMaps | |
| Sibling | Drum_2a.1 |

WW2 - Current (SS) + SH96 + WW1 Blk

Cain Duncan
Fonterra

Client reference:
Farm name: 32651- Evidence Version (15/16)

# FarmParameters

| | | | |
|---|---|---|---|
| Date downloaded | | | 2017 February 22 11:26 |
| Wilting point | 0 - 30cm | | 29 |
| | 30 - 60cm | | 28 |
| | > 60 | | 12 |
| Field capacity | 0 - 30cm | | 45 |
| | 30 - 60cm | | 43 |
| | > 60 | | 20 |
| Saturation | 0 - 30cm | | 55 |
| | 30 - 60cm | | 52 |
| | > 60 | | 27 |
| Natural drainage class | | | Well |
| Depth to impeded layer | cm | | Not entered |
| Maximum rooting depth | cm | | Not entered |
| Top soil horizon chemical and physical parameters | | | |
| ASC/PR | % | | 48 |
| Bulk density | kg/m³ | | 1080 |
| Clay | % | | 40 |
| Sand | % | | 17 |
| Sub soil | | | |
| Sub soil clay | % | | 36 |

*Soil profile*

| | | |
|---|---|---|
| Profile drainage class | | Use default |
| Top soil texture | | Unknown |
| Maximum rooting depth | m | 0 |
| Depth to impeded drainage layer | | 0 |

*Soil drainage*

| | |
|---|---|
| Drainage method | |
| Method | None |

*Soil settings*

| | |
|---|---|
| K leaching (%s) | Medium |

*Soil tests*

| Olsen P | QT K | QT Ca | QT Mg | QT Na |
|---|---|---|---|---|
| 38 | 10 | 12 | 32 | 12 |

| | |
|---|---|
| Organic S | 12 |
| Anion storage capacity or phosphate retention | Not entered |
| TBK reserve K test | Not entered |
| K reserve status | Use default |

*Supplements removed*

| | | |
|---|---|---|
| Supplement information | | |
| Conservation type | | Silage |
| Name | | |
| Silage stack storage | | Stack effluent contained |
| Supplement amount | | |
| Dry weight basis | T | 204 |
| Silage cutting method | | Not entered |
| Destination | | Storage |
| Storage conditions | | Average |

*Fertiliser application*

| | | |
|---|---|---|
| Fertiliser products - August | | |
| Category | | Ravensdown cropping |
| Product | | Ammo 36 |
| Amount | kg/ha | 139 |
| Fertiliser products - August | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 140 |
| Fertiliser products - November | | |
| Category | | Ravensdown super |
| Product | | 50 potash super |

WW2 - Current (SS) + SH96 + WW1 Blk

Cain Duncan
Fonterra

Client reference:
Farm name: 32651- Evidence Version (15/16)

# FarmParameters

| | | |
|---|---|---|
| Amount | kg/ha | 200 |
| Lime / dolomite application - November | | |
| Lime material | | Lime (good quality) |
| Rate | kg/ha | 300 |
| Dissolves within the year | | False |
| Fertiliser products - November | | |
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 155 |
| Fertiliser products - January | | |
| Category | | Ravensdown super |
| Product | | 50 potash super |
| Amount | kg/ha | 200 |
| Fertiliser products - January | | |
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 105 |
| Fertiliser products - March | | |
| Category | | Ravensdown super |
| Product | | 30 potash super |
| Amount | kg/ha | 330 |
| Fertiliser products - March | | |
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 25 |
| Fertiliser products - December | | |
| Category | | Ravensdown super |
| Product | | 30 potash super |
| Amount | kg/ha | 500 |

*Irrigation*
No irrigation entered

*Animals on block*
Ratio and type of stock based on whole farm values due to this option being selected on block set up

*Effluent application*
Receives no liquid or solid effluents

Woldwide 1 - Current (Soil Survey)
Woldwide 1
Client reference:
Farm name: 32650-Current - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

## Farm details

| | | |
|---|---|---|
| Type | Farm type | Full range |
| Assessment | Assessment year | 2015-16 |
| Region | Region | Southland |

## Farm blocks

| | | |
|---|---|---|
| Effluent (Drum_2a.1) | Pastoral | 31 |
| Non-Effluent (Brax_4a.1) | Pastoral | 28 |
| Non-Effluent (Drum_2a.1) | Pastoral | 91.4 |
| New Grass | Pastoral | 4.6 |
| Horner Block Support | Pastoral | 49 |
| Turnips | Fodder Crop | |
| Total farm area declared in blocks | ha | 204 |
| Total farm area | ha | 215 |
| Non-productive area | ha | 11 |

## Farm animals

### Stock numbers

*Stock reconciliation - Dairy*

Production

| | | |
|---|---|---|
| Milk solids | kg/yr | 265277 |
| Milk volume yield | l/yr | Not entered |
| Fat yield | kg/yr | Not entered |
| Lactation length | days | 321 |
| Average weight | kg/animal | Not entered |
| Calving times | | |
| Median calving date | | 15 August |
| Drying off | | 30 June |
| Percent of herd | | 0 |

Stock numbers

| *Class* | *Breed* | *Jul* | *Aug* | *Sep* | *Oct* | *Nov* | *Dec* | *Jan* | *Feb* | *Mar* | *Apr* | *May* | *Jun* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MilkingHerd | Friesian | 400 | 540 | 540 | 540 | 530 | 530 | 530 | 530 | 510 | 460 | 400 | 400 |

| Max weight (kg) | LW start (kg) | LW end (kg) | CW (kg) | Age (months) | Source | Fate | Sex | Mated |
|---|---|---|---|---|---|---|---|---|
| 462 | 0 | 0 | 0 | 0 | | | Female | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bulls | Friesian | 0 | 0 | 0 | 5 | 5 | 5 | 5 | 0 | 0 | 0 | 0 | 0 |

| Max weight (kg) | LW start (kg) | LW end (kg) | CW (kg) | Age (months) | Source | Fate | Sex | Mated |
|---|---|---|---|---|---|---|---|---|
| 740 | 0 | 0 | 0 | 0 | | | Male | |

Stock numbers - Dairy replacements

| *Class* | *Breed* | *Jul* | *Aug* | *Sep* | *Oct* | *Nov* | *Dec* | *Jan* | *Feb* | *Mar* | *Apr* | *May* | *Jun* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CalvesWeanedMixedSex | Friesian | 0 | 63 | 123 | 123 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| Max weight (kg) | LW start (kg) | LW end (kg) | CW (kg) | Age (months) | Source | Fate | Sex | Mated |
|---|---|---|---|---|---|---|---|---|
| 525 | 0 | 228 | 0 | 1 | Weaned | Sold to store/removed | Female | |

*Stock reconciliation - Beef / dairy grazing*

Stock production

| | | |
|---|---|---|
| Calving percentage | % | Not entered |
| Percent replacements | % | Not entered |
| Mean calving date | | Not entered |
| Mean weaning date | | Not entered |
| Weaning weight | kg | Not entered |

Stock numbers

| *Class* | *Breed* | *Jul* | *Aug* | *Sep* | *Oct* | *Nov* | *Dec* | *Jan* | *Feb* | *Mar* | *Apr* | *May* | *Jun* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DairyReplacements | Friesian | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 252 |

| Max weight (kg) | LW start (kg) | LW end (kg) | CW (kg) | Age (months) | Source | Fate | Sex | Mated |
|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 10 | Brought | | Female | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DairyReplacements | Friesian | 252 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| Max weight (kg) | LW start (kg) | LW end (kg) | CW (kg) | Age (months) | Source | Fate | Sex | Mated |
|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 11 | Brought | | Female | |

### Stock management

*Dairy - Wintering pad, animal shelter or housing - Dairy*

Construction

Woldwide 1 - Current (Soil Survey)
Woldwide 1
Client reference:
Farm name: 32650-Current - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

| | | |
|---|---|---|
| Pad type | | Covered wintering pad or animal shelter |
| Material used to line the bunker | | No lining material |
| Concrete surface cleaning method | | Scraping (no water) |
| Solids separated | | False |
| Scraped material strore in stack | | False |
| Liquid effluent management | | |
| Treatment method | | All exported |
| Time spent on structure | | |
| May | 100 | 17 |
| June | 100 | 0 |
| July | 100 | 0 |
| August | 40 | 2 |

*Milking shed - Dairy - Dairy*

| | | |
|---|---|---|
| Time spent on structure | | |
| January | 100 | 0 |
| February | 100 | 0 |
| March | 100 | 0 |
| April | 100 | 0 |
| May | 100 | 0 |
| August | 100 | 0 |
| September | 100 | 0 |
| October | 100 | 0 |
| November | 100 | 0 |
| December | 100 | 0 |

*Animal excreta distribution*

| | | |
|---|---|---|
| Relative productivity assessment method | | No difference between blocks |
| All blocks have a relative productivity value of 1 | | |
| Ratio of stock on blocks can differ from the farm stock ratios | | |

*Farm dairy effluent management system*

| | | |
|---|---|---|
| Effluent management method | | Holding pond |
| Solid separation and disposal | | False |
| Pond solids | | |
| Pond solids management method | | Other (exported) |
| Pond emptied every | years | 0 |
| Liquid effluent | | |
| Liquid management method | | Spray regularly |

**Animal health supplements**

*Animal - Dairy*
No animal supplementation has been entered

*Animal - Dairy replacements*
No animal supplementation has been entered

*Animal - Beef / dairy grazing*
No animal supplementation has been entered

**Left over feeding**
No left over feeding specified

**Stored supplements**

*Supplement information*

| | | |
|---|---|---|
| Conservation type | | Silage |
| Name | | |
| Supplement amount | | |
| Dry weight basis | T | 280 |
| Silage cutting method | | Not entered |
| Utilisation | | Very good |
| Destination | | Wintering pad, animal shelter or housing |
| Animal | | Dairy |

Woldwide 1 - Current (Soil Survey)
Woldwide 1
Client reference:
Farm name: 32650-Current - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

*Supplement information*

| | | |
|---|---|---|
| Conservation type | | Silage |
| Name | | |
| Supplement amount | | |
| Dry weight basis | T | 276 |
| Silage cutting method | | Not entered |

Fed on blocks: Effluent (Drum_2a.1),Non-Effluent (Brax_4a.1),Non-Effluent (Drum_2a.1),New Grass
No timing of feeding has been specified

**Imported supplements**

*Supplement information*

| | | |
|---|---|---|
| Conservation type | | Grains |
| Name | | Barley grain |
| Supplement amount | | |
| Dry weight basis | T | 437 |
| Utilisation | | Very good |
| Destination | | Milking shed |
| Animal | | Dairy |

*Supplement information*

| | | |
|---|---|---|
| Conservation type | | Process byproducts |
| Name | | Molasses |
| Supplement amount | | |
| Dry weight basis | T | 26 |
| Utilisation | | Very good |
| Destination | | Milking shed |
| Animal | | Dairy |

*Supplement information*

| | | |
|---|---|---|
| Conservation type | | Process byproducts |
| Name | | Palm kernel meal |
| Supplement amount | | |
| Dry weight basis | T | 316 |
| Utilisation | | Very good |
| Destination | | Milking shed |
| Animal | | Dairy |

## Report settings

Greenhouse gas emission report units: CO2 equivalents (kg/ha/yr)
Target N application rate as effluent: kg N/ha/yr

## Block Information

**Block - Effluent (Drum_2a.1)**

| | | |
|---|---|---|
| Block name | | Effluent (Drum_2a.1) |
| Block type | | Pastoral |
| Area | ha | 31 |
| Relative productivity | | 1 |
| Pasture block type | | No |
| Topography | | Flat |
| Distance from coast | km | 30 |
| Cultivated in last 5 years | | False |
| Fodder rotates through | | No |

*Climate*

| | | |
|---|---|---|
| Annual average rainfall | mm/yr | 1001 |
| Mean annual temperature | | 9.8 |
| Seasonal variation in rainfall | | 731-1450 mm, Low |
| Annual potential evapotranspiration | mm | 711 |
| Seasonal variation in PET | | Moderate |

*Soil description*

| | | |
|---|---|---|
| Soil order (default) | | Brown |

Woldwide 1 - Current (Soil Survey)
Woldwide 1
Client reference:
Farm name: 32650-Current - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

| | | | |
|---|---|---|---|
| Soil group (default) | | | Sedimentary |
| SMaps | | | |
| Sibling | | | Drum_2a.1 |
| Date downloaded | | | 2017 February 17 09:20 |
| Wilting point | 0 - 30cm | | 29 |
| | 30 - 60cm | | 28 |
| | > 60 | | 12 |
| Field capacity | 0 - 30cm | | 45 |
| | 30 - 60cm | | 43 |
| | > 60 | | 20 |
| Saturation | 0 - 30cm | | 55 |
| | 30 - 60cm | | 52 |
| | > 60 | | 27 |
| Natural drainage class | | | Well |
| Depth to impeded layer | cm | | Not entered |
| Maximum rooting depth | cm | | Not entered |
| Top soil horizon chemical and physical parameters | | | |
| ASC/PR | % | | 48 |
| Bulk density | kg/m³ | | 1080 |
| Clay | % | | 40 |
| Sand | % | | 17 |
| Sub soil | | | |
| Sub soil clay | % | | 36 |

*Soil profile*

| | | |
|---|---|---|
| Profile drainage class | | Use default |
| Top soil texture | | Unknown |
| Maximum rooting depth | m | 0 |
| Depth to impeded drainage layer | | 0 |

*Soil drainage*

| | | |
|---|---|---|
| Drainage method | | |
| Method | | None |
| Hydrophobic condition | | Use default |
| Occurence of pugging damage | | Occasional |
| Compacted top soil | | False |

*Soil settings*

| | |
|---|---|
| K leaching (%s) | Medium |
| N immobilisation status | Standard |

*Soil tests*

| Olsen P | QT K | QT Ca | QT Mg | QT Na |
|---|---|---|---|---|
| 42 | 20 | 17 | 50 | 8 |

| | |
|---|---|
| Organic S | 18 |
| Anion storage capacity or phosphate retention | Not entered |
| TBK reserve K test | Not entered |
| K reserve status | Use default |

*Pasture*

| | |
|---|---|
| Pasture type | Ryegrass/white clover |
| Clover levels | Use default |

*Supplements removed*

No supplements removed from this block

*Fertiliser application*

| | | |
|---|---|---|
| Fertiliser products - August | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 100 |
| Fertiliser products - October | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 60 |

Woldwide 1 - Current (Soil Survey)
Woldwide 1
Client reference:
Farm name: 32650-Current - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

| | | |
|---|---|---|
| Fertiliser products - November | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 50 |
| Fertiliser products - January | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 50 |
| Fertiliser products - March | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 50 |
| Fertiliser products - September | | |
| Category | | User defined |
| Product | | 18 Nitrogen |
| Amount | kg/ha | 100 |
| Fertiliser products - January | | |
| Category | | Ravensdown super |
| Product | | Superphosphate |
| Amount | kg/ha | 200 |
| Fertiliser products - August | | |
| Category | | Ravensdown super |
| Product | | Superphosphate |
| Amount | kg/ha | 150 |

*Irrigation*

No irrigation entered

*Animals on block*

| | | |
|---|---|---|
| Animals grazing | | |
| Dairy | % | 99 |
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |
| January | | True |
| February | | True |
| March | | True |
| April | | True |
| May | | True |
| August | | True |
| September | | True |
| October | | True |
| November | | True |
| December | | True |
| Animals grazing | | |
| Dairy replacements | % | 1 |
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |
| August | | True |
| September | | True |
| October | | True |

*Effluent application*

| | | |
|---|---|---|
| Liquid effluents | | |
| Receives farm dairy effluent | | |
| Effluent application depth | | < 12 mm |
| Percentage of block effluent applied to | % | 100 |

**Block - Non-Effluent (Brax_4a.1)**

| | | |
|---|---|---|
| Block name | | Non-Effluent (Brax_4a.1) |
| Block type | | Pastoral |
| Area | ha | 28 |
| Relative productivity | | 1 |
| Pasture block type | | Yes |

Woldwide 1 - Current (Soil Survey)
Woldwide 1
Client reference:
Farm name: 32650-Current - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

| | | | |
|---|---|---|---|
| Topography | | | Flat |
| Distance from coast | km | | 30 |
| Cultivated in last 5 years | | | False |
| Fodder rotates through | | | Yes |
| *Climate* | | | |
| Annual average rainfall | mm/yr | | 1001 |
| Mean annual temperature | | | 9.8 |
| Seasonal variation in rainfall | | | 731-1450 mm, Low |
| Annual potential evapotranspiration | mm | | 711 |
| Seasonal variation in PET | | | Moderate |
| *Soil description* | | | |
| Soil order (default) | | | Gley |
| Soil group (default) | | | Sedimentary |
| SMaps | | | |
| Sibling | | | Brax_4a.1 |
| Date downloaded | | | 2017 February 13 22:00 |
| Wilting point | 0 - 30cm | | 25 |
| | 30 - 60cm | | 32 |
| | > 60 | | 34 |
| Field capacity | 0 - 30cm | | 53 |
| | 30 - 60cm | | 53 |
| | > 60 | | 54 |
| Saturation | 0 - 30cm | | 65 |
| | 30 - 60cm | | 58 |
| | > 60 | | 58 |
| Natural drainage class | | | Poor |
| Depth to impeded layer | cm | | Not entered |
| Maximum rooting depth | cm | | Not entered |
| Top soil horizon chemical and physical parameters | | | |
| ASC/PR | % | | 38 |
| Bulk density | kg/m³ | | 940 |
| Clay | % | | 32 |
| Sand | % | | 12 |
| Sub soil | | | |
| Sub soil clay | % | | 39 |
| *Soil profile* | | | |
| Profile drainage class | | | Use default |
| Top soil texture | | | Unknown |
| Maximum rooting depth | m | | 0 |
| Depth to impeded drainage layer | | | 0 |
| *Soil drainage* | | | |
| Drainage method | | | |
| Method | | | None |
| Hydrophobic condition | | | Use default |
| Occurence of pugging damage | | | Occasional |
| Compacted top soil | | | False |
| *Soil settings* | | | |
| K leaching (%s) | | | Medium |
| N immobilisation status | | | Standard |

*Soil tests*

| Olsen P | QT K | QT Ca | QT Mg | QT Na |
|---|---|---|---|---|
| 43 | 11 | 12 | 34 | 9 |

| | |
|---|---|
| Organic S | 16 |
| Anion storage capacity or phosphate retention | Not entered |
| TBK reserve K test | Not entered |
| K reserve status | Use default |
| *Pasture* | |
| Pasture type | Ryegrass/white clover |

Woldwide 1 - Current (Soil Survey)
Woldwide 1
Client reference:
Farm name: 32650-Current - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

| | | |
|---|---|---|
| Clover levels | | Use default |
| *Supplements removed* | | |
| No supplements removed from this block | | |
| *Fertiliser application* | | |
| Fertiliser products - August | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 102 |
| Fertiliser products - October | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 61 |
| Fertiliser products - December | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 51 |
| Fertiliser products - January | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 50 |
| Fertiliser products - March | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 61 |
| Fertiliser products - September | | |
| Category | | User defined |
| Product | | 18 Nitrogen |
| Amount | kg/ha | 102 |
| Fertiliser products - August | | |
| Category | | Ravensdown super |
| Product | | Superphosphate |
| Amount | kg/ha | 152 |
| Fertiliser products - February | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 51 |
| Fertiliser products - April | | |
| Category | | User defined |
| Product | | 18 Nitrogen |
| Amount | kg/ha | 102 |
| Fertiliser products - November | | |
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 34 |
| Fertiliser products - January | | |
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 61 |
| Fertiliser products - November | | |
| Category | | Ravensdown super |
| Product | | 20 potash super |
| Amount | kg/ha | 114 |
| Fertiliser products - January | | |
| Category | | Ravensdown super |
| Product | | 20 potash super |
| Amount | kg/ha | 202 |
| *Irrigation* | | |
| No irrigation entered | | |
| *Animals on block* | | |
| Animals grazing | | |
| Dairy | % | 99 |

Woldwide 1 - Current (Soil Survey)
Woldwide 1
Client reference:
Farm name: 32650-Current - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

| | | |
|---|---|---|
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |
| January | | True |
| February | | True |
| March | | True |
| April | | True |
| May | | True |
| August | | True |
| September | | True |
| October | | True |
| November | | True |
| December | | True |
| Animals grazing | | |
| Dairy replacements | % | 1 |
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |
| August | | True |
| September | | True |
| October | | True |

*Effluent application*
Receives no liquid or solid effluents

**Block - Non-Effluent (Drum_2a.1)**

| | | |
|---|---|---|
| Block name | | Non-Effluent (Drum_2a.1) |
| Block type | | Pastoral |
| Area | ha | 91.4 |
| Relative productivity | | 1 |
| Pasture block type | | Yes |
| Topography | | Flat |
| Distance from coast | km | 30 |
| Cultivated in last 5 years | | False |
| Fodder rotates through | | Yes |

*Climate*

| | | |
|---|---|---|
| Annual average rainfall | mm/yr | 1001 |
| Mean annual temperature | | 9.8 |
| Seasonal variation in rainfall | | 731-1450 mm, Low |
| Annual potential evapotranspiration | mm | 711 |
| Seasonal variation in PET | | Moderate |

*Soil description*

| | | |
|---|---|---|
| Soil order (default) | | Brown |
| Soil group (default) | | Sedimentary |
| SMaps | | |
| Sibling | | Drum_2a.1 |
| Date downloaded | | 2017 February 17 09:32 |
| Wilting point | 0 - 30cm | 29 |
| | 30 - 60cm | 28 |
| | > 60 | 12 |
| Field capacity | 0 - 30cm | 45 |
| | 30 - 60cm | 43 |
| | > 60 | 20 |
| Saturation | 0 - 30cm | 55 |
| | 30 - 60cm | 52 |
| | > 60 | 27 |
| Natural drainage class | | Well |
| Depth to impeded layer | cm | Not entered |
| Maximum rooting depth | cm | Not entered |
| Top soil horizon chemical and physical parameters | | |
| ASC/PR | % | 48 |
| Bulk density | kg/m³ | 1080 |
| Clay | % | 40 |

Woldwide 1 - Current (Soil Survey)
Woldwide 1
Client reference:
Farm name: 32650-Current - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

| | | |
|---|---|---|
| Sand | % | 17 |
| Sub soil | | |
| Sub soil clay | % | 36 |

*Soil profile*

| | | |
|---|---|---|
| Profile drainage class | | Use default |
| Top soil texture | | Unknown |
| Maximum rooting depth | m | 0 |
| Depth to impeded drainage layer | | 0 |

*Soil drainage*

| | |
|---|---|
| Drainage method | |
| Method | None |
| Hydrophobic condition | Use default |
| Occurence of pugging damage | Occasional |
| Compacted top soil | False |

*Soil settings*

| | |
|---|---|
| K leaching (%s) | Medium |
| N immobilisation status | Standard |

*Soil tests*

| Olsen P | QT K | QT Ca | QT Mg | QT Na |
|---|---|---|---|---|
| 42 | 8 | 12 | 33 | 8 |

| | |
|---|---|
| Organic S | 13 |
| Anion storage capacity or phosphate retention | Not entered |
| TBK reserve K test | Not entered |
| K reserve status | Use default |

*Pasture*

| | |
|---|---|
| Pasture type | Ryegrass/white clover |
| Clover levels | Use default |

*Supplements removed*

| | | |
|---|---|---|
| Supplement information | | |
| Conservation type | | Baleage |
| Name | | |
| Wrapping | | Wrapped in plastic |
| Supplement amount | | |
| Dry weight basis | T | 12 |
| Destination | | Storage |
| Storage conditions | | Average |

*Fertiliser application*

| | | |
|---|---|---|
| Fertiliser products - August | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 102 |
| Fertiliser products - October | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 61 |
| Fertiliser products - December | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 51 |
| Fertiliser products - January | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 50 |
| Fertiliser products - March | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 61 |
| Fertiliser products - September | | |

Woldwide 1 - Current (Soil Survey)
Woldwide 1
Client reference:
Farm name: 32650-Current - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

| | | |
|---|---|---|
| Category | | User defined |
| Product | | 18 Nitrogen |
| Amount | kg/ha | 102 |
| Fertiliser products - August | | |
| Category | | Ravensdown super |
| Product | | Superphosphate |
| Amount | kg/ha | 152 |
| Fertiliser products - February | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 51 |
| Fertiliser products - April | | |
| Category | | User defined |
| Product | | 18 Nitrogen |
| Amount | kg/ha | 102 |
| Fertiliser products - November | | |
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 34 |
| Fertiliser products - January | | |
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 61 |
| Fertiliser products - November | | |
| Category | | Ravensdown super |
| Product | | 20 potash super |
| Amount | kg/ha | 114 |
| Fertiliser products - January | | |
| Category | | Ravensdown super |
| Product | | 20 potash super |
| Amount | kg/ha | 202 |

*Irrigation*

No irrigation entered

*Animals on block*

| | | |
|---|---|---|
| Animals grazing | | |
| Dairy | % | 99 |
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |
| January | | True |
| February | | True |
| March | | True |
| April | | True |
| May | | True |
| August | | True |
| September | | True |
| October | | True |
| November | | True |
| December | | True |
| Animals grazing | | |
| Dairy replacements | % | 1 |
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |
| August | | True |
| September | | True |
| October | | True |

*Effluent application*

Receives no liquid or solid effluents

**Block - New Grass**

| | |
|---|---|
| Block name | New Grass |

Woldwide 1 - Current (Soil Survey)
Woldwide 1
Client reference:
Farm name: 32650-Current - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

| | | |
|---|---|---|
| Block type | | Pastoral |
| Area | ha | 4.6 |
| Relative productivity | | 1 |
| Pasture block type | | No |
| Topography | | Flat |
| Distance from coast | km | 30 |
| Cultivated in last 5 years | | False |
| Fodder rotates through | | No |

*Climate*

| | | |
|---|---|---|
| Annual average rainfall | mm/yr | 1001 |
| Mean annual temperature | | 9.8 |
| Seasonal variation in rainfall | | 731-1450 mm, Low |
| Annual potential evapotranspiration | mm | 711 |
| Seasonal variation in PET | | Moderate |

*Soil description*

| | | |
|---|---|---|
| Soil order (default) | | Brown |
| Soil group (default) | | Sedimentary |
| SMaps | | |
| Sibling | | Drum_2a.1 |
| Date downloaded | | 2017 February 17 09:33 |
| Wilting point | 0 - 30cm | 29 |
| | 30 - 60cm | 28 |
| | > 60 | 12 |
| Field capacity | 0 - 30cm | 45 |
| | 30 - 60cm | 43 |
| | > 60 | 20 |
| Saturation | 0 - 30cm | 55 |
| | 30 - 60cm | 52 |
| | > 60 | 27 |
| Natural drainage class | | Well |
| Depth to impeded layer | cm | Not entered |
| Maximum rooting depth | cm | Not entered |
| Top soil horizon chemical and physical parameters | | |
| ASC/PR | % | 48 |
| Bulk density | kg/m³ | 1080 |
| Clay | % | 40 |
| Sand | % | 17 |
| Sub soil | | |
| Sub soil clay | % | 36 |

*Soil profile*

| | | |
|---|---|---|
| Profile drainage class | | Use default |
| Top soil texture | | Unknown |
| Maximum rooting depth | m | 0 |
| Depth to impeded drainage layer | | 0 |

*Soil drainage*

| | |
|---|---|
| Drainage method | |
| Method | None |
| Hydrophobic condition | Use default |
| Occurence of pugging damage | Occasional |
| Compacted top soil | False |

*Soil settings*

| | |
|---|---|
| K leaching (%s) | Medium |
| N immobilisation status | Standard |

*Soil tests*

| Olsen P | QT K | QT Ca | QT Mg | QT Na |
|---|---|---|---|---|
| 43 | 11 | 12 | 34 | 9 |

| | |
|---|---|
| Organic S | 16 |
| Anion storage capacity or phosphate retention | Not entered |
| TBK reserve K test | Not entered |

Woldwide 1 - Current (Soil Survey)
Woldwide 1
Client reference:
Farm name: 32650-Current - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

| | | |
|---|---|---|
| K reserve status | | Use default |
| *Pasture* | | |
| Pasture type | | Ryegrass/white clover |
| Clover levels | | Use default |
| *Supplements removed* | | |
| No supplements removed from this block | | |
| *Fertiliser application* | | |
| Fertiliser products - April | | |
| Category | | Ravensdown super |
| Product | | Sulphur super 30 |
| Amount | kg/ha | 100 |
| Fertiliser products - November | | |
| Category | | Ravensdown super |
| Product | | 20 potash super |
| Amount | kg/ha | 252 |
| Fertiliser products - January | | |
| Category | | Ravensdown cropping |
| Product | | Cropmaster 15 |
| Amount | kg/ha | 202 |
| Fertiliser products - March | | |
| Category | | Ravensdown cropping |
| Product | | Cropmaster 15 |
| Amount | kg/ha | 202 |
| *Irrigation* | | |
| No irrigation entered | | |
| *Animals on block* | | |
| Animals grazing | | |
| Dairy | % | 99 |
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |
| January | | True |
| February | | True |
| March | | True |
| April | | True |
| May | | True |
| August | | True |
| September | | True |
| October | | True |
| November | | True |
| December | | True |
| Animals grazing | | |
| Dairy replacements | % | 1 |
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |
| August | | True |
| September | | True |
| October | | True |
| *Effluent application* | | |
| Receives no liquid or solid effluents | | |

**Block - Horner Block Support**

| | | |
|---|---|---|
| Block name | | Horner Block Support |
| Block type | | Pastoral |
| Area | ha | 49 |
| Relative productivity | | 1 |
| Pasture block type | | No |
| Topography | | Flat |

Woldwide 1 - Current (Soil Survey)
Woldwide 1
Client reference:
Farm name: 32650-Current - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

| | | | |
|---|---|---|---|
| Distance from coast | | km | 30 |
| Cultivated in last 5 years | | | False |
| Fodder rotates through | | | No |
| *Climate* | | | |
| Annual average rainfall | | mm/yr | 1001 |
| Mean annual temperature | | | 9.8 |
| Seasonal variation in rainfall | | | 731-1450 mm, Low |
| Annual potential evapotranspiration | | mm | 711 |
| Seasonal variation in PET | | | Moderate |
| *Soil description* | | | |
| Soil order (default) | | | Gley |
| Soil group (default) | | | Sedimentary |
| SMaps | | | |
| Sibling | | | Brax_4a.1 |
| Date downloaded | | | 2018 March 19 16:11 |
| Wilting point | 0 - 30cm | | 25 |
| | 30 - 60cm | | 32 |
| | > 60 | | 34 |
| Field capacity | 0 - 30cm | | 53 |
| | 30 - 60cm | | 53 |
| | > 60 | | 54 |
| Saturation | 0 - 30cm | | 65 |
| | 30 - 60cm | | 58 |
| | > 60 | | 58 |
| Natural drainage class | | | Poor |
| Depth to impeded layer | | cm | Not entered |
| Maximum rooting depth | | cm | Not entered |
| Top soil horizon chemical and physical parameters | | | |
| ASC/PR | | % | 38 |
| Bulk density | | kg/m³ | 940 |
| Clay | | % | 32 |
| Sand | | % | 12 |
| Sub soil | | | |
| Sub soil clay | | % | 39 |
| *Soil profile* | | | |
| Profile drainage class | | | Use default |
| Top soil texture | | | Unknown |
| Maximum rooting depth | | m | 0 |
| Depth to impeded drainage layer | | | 0 |
| *Soil drainage* | | | |
| Drainage method | | | |
| Method | | | None |
| Hydrophobic condition | | | Use default |
| Occurence of pugging damage | | | Occasional |
| Compacted top soil | | | False |
| *Soil settings* | | | |
| K leaching (%s) | | | Medium |
| N immobilisation status | | | |

*Soil tests*

| Olsen P | QT K | QT Ca | QT Mg | QT Na |
|---|---|---|---|---|
| 38 | 10 | 12 | 32 | 12 |

| | |
|---|---|
| Organic S | 12 |
| Anion storage capacity or phosphate retention | Not entered |
| TBK reserve K test | Not entered |
| K reserve status | Use default |
| *Pasture* | |
| Pasture type | Ryegrass/white clover |
| Clover levels | Use default |

Woldwide 1 - Current (Soil Survey)
Woldwide 1
Client reference:
Farm name: 32650-Current - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

*Supplements removed*

| | | |
|---|---|---|
| Supplement information | | |
| Conservation type | | Silage |
| Name | | |
| Supplement amount | | |
| Dry weight basis | T | 750 |
| Silage cutting method | | Not entered |
| Supplement is exported from the farm | | |

*Fertiliser application*

Organic nutrient inputs - November

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Description | | | | | | | WW1 Barn Effluent |
| Organic type | | | | | | | Imported dairy effluent |
| Nutrients added as a loading (kg/month) applied to pasture | | | | | | | |
| N | P | K | S | Ca | Mg | Na | H |
| 1494 | 374 | 2055 | 187 | 0 | 0 | 0 | 0 |
| Effluent form | | | | | | | Liquids |

Organic nutrient inputs - January

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Organic type | | | | | | | Imported dairy effluent |
| Nutrients added as a loading (kg/month) applied to pasture | | | | | | | |
| N | P | K | S | Ca | Mg | Na | H |
| 1494 | 374 | 2055 | 187 | 0 | 0 | 0 | 0 |
| Effluent form | | | | | | | Liquids |

Organic nutrient inputs - March

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Organic type | | | | | | | Imported dairy effluent |
| Nutrients added as a loading (kg/month) applied to pasture | | | | | | | |
| N | P | K | S | Ca | Mg | Na | H |
| 1494 | 374 | 2055 | 187 | 0 | 0 | 0 | 0 |
| Effluent form | | | | | | | Liquids |

| | | |
|---|---|---|
| Fertiliser products - August | | |
| Category | | Ravensdown cropping |
| Product | | Ammo 36 |
| Amount | kg/ha | 200 |
| Fertiliser products - August | | |
| Category | | Ravensdown other |
| Product | | Potassium chloride |
| Amount | kg/ha | 120 |
| Fertiliser products - December | | |
| Category | | Ravensdown cropping |
| Product | | Cropmaster DAP |
| Amount | kg/ha | 250 |
| Fertiliser products - October | | |
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 100 |
| Fertiliser products - February | | |
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 50 |
| Fertiliser products - December | | |
| Category | | Ravensdown other |
| Product | | Potassium chloride |
| Amount | kg/ha | 180 |
| Fertiliser products - September | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 140 |

*Irrigation*

No irrigation entered

*Animals on block*

| | | |
|---|---|---|
| Animals grazing | | |
| Beef / dairy grazing | % | 100 |

Woldwide 1 - Current (Soil Survey)
Woldwide 1
Client reference:
Farm name: 32650-Current - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

| | | |
|---|---|---|
| Block intensity | | |
| Finishing beef | | False |
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |
| June | | True |
| July | | True |

*Effluent application*
Receives no liquid or solid effluents

**Block - Turnips**

| | | |
|---|---|---|
| Block name | | Turnips |
| Block type | | Fodder Crop |
| Rotation area | ha | 6.5 |
| Low N mineralisation | | False |
| Final grid month | | April |
| Irrigation system type | | No Irrigation |

**Crop information**

*Current assessment year 2015-16*

| | | |
|---|---|---|
| May - Grazed pasture | | |
| June - Grazed pasture | | |
| July - Grazed pasture | | |
| August - Grazed pasture | | |
| Fertiliser or lime added | See details below | |
| September - Grazed pasture | | |
| Fertiliser or lime added | See details below | |
| October - Turnips bulb | | |
| Crop management | See details below | Crop sown |
| November - Turnips bulb | | |
| Fertiliser or lime added | See details below | |
| December - Turnips bulb | | |
| January - Turnips bulb | | |
| February - Turnips bulb | | |
| Crop management | See details below | Defoliation |
| March - Turnips bulb | | |
| Crop management | See details below | Defoliation |
| April - Grazed | | |
| Crop management | See details below | Crop sown |

*Crop sowing information - October of the Current assessment year 2015-16*

| | | |
|---|---|---|
| Crop category | | Fodder |
| Crop type | | Turnips bulb |
| Product yield | T/ha dry matter | 8 |
| Cultivation practice at sowing | | Conventional |

*Defoliation information - February of the Current assessment year 2015-16*

| | | |
|---|---|---|
| Defoliation method | | Grazed in-situ |
| Final harvest | | False |
| Source of animal | | Farm stock - see Enterprise numbers panes |
| Percentage of crop eaten by animals | | |
| Dairy | % | 100 |
| Crop grazed for | hours/day | 2 |

*Defoliation information - March of the Current assessment year 2015-16*

| | | |
|---|---|---|
| Defoliation method | | Grazed in-situ |
| Final harvest | | True |
| Source of animal | | Farm stock - see Enterprise numbers panes |
| Percentage of crop eaten by animals | | |
| Dairy | % | 100 |
| Crop grazed for | hours/day | 2 |

*Crop sowing information - April of the Current assessment year 2015-16*

| | | |
|---|---|---|
| Crop category | | Permanent pasture |

Woldwide 1 - Current (Soil Survey)
Woldwide 1
Client reference:
Farm name: 32650-Current - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

| | | |
|---|---|---|
| Crop type | | Grazed |
| Source of animals | | Not entered |

*Fertiliser application*

| | | |
|---|---|---|
| Fertiliser products - Current assessment - August (N Method: Surface applied) | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 100 |
| Fertiliser products - Current assessment - August (N Method: None) | | |
| Category | | Ravensdown super |
| Product | | Superphosphate |
| Amount | kg/ha | 152 |
| Fertiliser products - Current assessment - September (N Method: Surface applied) | | |
| Category | | User defined |
| Product | | 18 Nitrogen |
| Amount | kg/ha | 102 |
| Fertiliser products - Current assessment - November (N Method: Surface applied) | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 150 |

*Effluent application*

Receives no liquid or solid effluents

Woldwide 1 - Proposed - 800cows
Woldwide 1
Client reference:
Farm name: 32650-Proposed - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

## Farm details

| | | |
|---|---|---|
| Type | Farm type | Full range |
| Assessment | Assessment year | 2015-16 |
| Region | Region | Southland |

## Farm blocks

| | | |
|---|---|---|
| Effluent (Drum_2a.1) | Pastoral | 50 |
| Non-Effluent (Brax_4a.1) | Pastoral | 62 |
| Non-Effluent (Drum_2a.1) | Pastoral | 93.4 |
| New Grass | Pastoral | 4.6 |
| Support Horner Blk (CC) Barn Eff (Brax_4a.1) | Cut and Carry | 49 |
| Total farm area declared in blocks | ha | 259 |
| Total farm area | ha | 270 |
| Non-productive area | ha | 11 |

## Farm animals

### Stock numbers

*Stock reconciliation - Dairy*

Production

| | | |
|---|---|---|
| Milk solids | kg/yr | 392000 |
| Milk volume yield | l/yr | Not entered |
| Fat yield | kg/yr | Not entered |
| Lactation length | days | 321 |
| Average weight | kg/animal | Not entered |

Calving times

| | |
|---|---|
| Median calving date | 15 August |
| Drying off | 30 June |
| Percent of herd | 0 |

Stock numbers

| *Class* | *Breed* | *Jul* | *Aug* | *Sep* | *Oct* | *Nov* | *Dec* | *Jan* | *Feb* | *Mar* | *Apr* | *May* | *Jun* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MilkingHerd | Friesian | 620 | 620 | 800 | 800 | 760 | 760 | 760 | 760 | 720 | 700 | 680 | 620 |

| Max weight (kg) | LW start (kg) | LW end (kg) | CW (kg) | Age (months) | Source | Fate | Sex | Mated |
|---|---|---|---|---|---|---|---|---|
| 462 | 0 | 0 | 0 | 0 | | | Female | |

| *Class* | *Breed* | *Jul* | *Aug* | *Sep* | *Oct* | *Nov* | *Dec* | *Jan* | *Feb* | *Mar* | *Apr* | *May* | *Jun* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bulls | Friesian | 0 | 0 | 0 | 8 | 8 | 8 | 8 | 0 | 0 | 0 | 0 | 0 |

| Max weight (kg) | LW start (kg) | LW end (kg) | CW (kg) | Age (months) | Source | Fate | Sex | Mated |
|---|---|---|---|---|---|---|---|---|
| 740 | 0 | 0 | 0 | 0 | | | Male | |

Stock numbers - Dairy replacements

| *Class* | *Breed* | *Jul* | *Aug* | *Sep* | *Oct* | *Nov* | *Dec* | *Jan* | *Feb* | *Mar* | *Apr* | *May* | *Jun* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HeiferReplacements | Friesian | 0 | 91 | 176 | 176 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| Max weight (kg) | LW start (kg) | LW end (kg) | CW (kg) | Age (months) | Source | Fate | Sex | Mated |
|---|---|---|---|---|---|---|---|---|
| 525 | 0 | 228 | 0 | 1 | Weaned | | Female | |

### Stock management

*Dairy - Wintering pad, animal shelter or housing - Dairy*

Construction

| | |
|---|---|
| Pad type | Covered wintering pad or animal shelter |
| Material used to line the bunker | No lining material |
| Concrete surface cleaning method | Scraping (no water) |
| Solids separated | False |
| Scraped material strore in stack | False |
| Liquid effluent management | |
| Treatment method | All exported |

Time spent on structure

| | | |
|---|---|---|
| May | 100 | 17 |
| June | 100 | 0 |
| July | 100 | 0 |
| August | 40 | 2 |

*Milking shed - Dairy - Dairy*

Time spent on structure

| | | |
|---|---|---|
| January | 100 | 0 |
| February | 100 | 0 |

Woldwide 1 - Proposed - 800cows
Woldwide 1
Client reference:
Farm name: 32650-Proposed - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

| | | |
|---|---|---|
| March | 100 | 0 |
| April | 100 | 0 |
| September | 100 | 0 |
| October | 100 | 0 |
| November | 100 | 0 |
| December | 100 | 0 |

*Animal excreta distribution*

Relative productivity assessment method: No difference between blocks
All blocks have a relative productivity value of 1
Ratio of stock types on pastoral blocks is the same as the farm stock ratios

*Farm dairy effluent management system*

Effluent management method: Holding pond
Solid separation and disposal: False
Pond solids
- Pond solids management method: Other (exported)
- Pond emptied every: 0 years

Liquid effluent
- Liquid management method: Spray regularly

**Animal health supplements**

*Animal - Dairy*

No animal supplementation has been entered

*Animal - Dairy replacements*

No animal supplementation has been entered

**Left over feeding**

No left over feeding specified

**Stored supplements**

*Supplement information*

Conservation type: Silage
Name:
Supplement amount
- Dry weight basis: 434 T
- Silage cutting method: Not entered

Utilisation: Very good
Destination: Wintering pad, animal shelter or housing
Animal: Dairy

*Supplement information*

Conservation type: Silage
Name:
Supplement amount
- Dry weight basis: 410 T
- Silage cutting method: Not entered

Supplements are distributed evenly across all pastoral blocks
No timing of feeding has been specified

**Imported supplements**

*Supplement information*

Conservation type: Process byproducts
Name: Palm kernel meal
Supplement amount
- Dry weight basis: 500 T

Utilisation: Very good
Destination: Milking shed
Animal: Dairy

*Supplement information*

Conservation type: Grains

Woldwide 1 - Proposed - 800cows
Woldwide 1
Client reference:
Farm name: 32650-Proposed - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

| | | |
|---|---|---|
| Name | | Barley grain |
| Supplement amount | | |
| Dry weight basis | T | 647 |
| Utilisation | | Very good |
| Destination | | Milking shed |
| Animal | | Dairy |
| *Supplement information* | | |
| Conservation type | | Process byproducts |
| Name | | Molasses |
| Supplement amount | | |
| Dry weight basis | T | 39 |
| Utilisation | | Very good |
| Destination | | Milking shed |
| Animal | | Dairy |

## Report settings

Greenhouse gas emission report units: CO2 equivalents (kg/ha/yr)
Target N application rate as effluent: kg N/ha/yr

## Block Information

**Block - Effluent (Drum_2a.1)**

| | | |
|---|---|---|
| Block name | | Effluent (Drum_2a.1) |
| Block type | | Pastoral |
| Area | ha | 50 |
| Relative productivity | | 1 |
| Pasture block type | | No |
| Topography | | Flat |
| Distance from coast | km | 30 |
| Cultivated in last 5 years | | False |
| Fodder rotates through | | No |
| *Climate* | | |
| Annual average rainfall | mm/yr | 1001 |
| Mean annual temperature | | 9.8 |
| Seasonal variation in rainfall | | 731-1450 mm, Low |
| Annual potential evapotranspiration | mm | 711 |
| Seasonal variation in PET | | Moderate |
| *Soil description* | | |
| Soil order (default) | | Brown |
| Soil group (default) | | Sedimentary |
| SMaps | | |
| Sibling | | Drum_2a.1 |
| Date downloaded | | 2017 February 17 10:44 |
| Wilting point | 0 - 30cm | 29 |
| | 30 - 60cm | 28 |
| | > 60 | 12 |
| Field capacity | 0 - 30cm | 45 |
| | 30 - 60cm | 43 |
| | > 60 | 20 |
| Saturation | 0 - 30cm | 55 |
| | 30 - 60cm | 52 |
| | > 60 | 27 |
| Natural drainage class | | Well |
| Depth to impeded layer | cm | Not entered |
| Maximum rooting depth | cm | Not entered |
| Top soil horizon chemical and physical parameters | | |
| ASC/PR | % | 48 |
| Bulk density | kg/m³ | 1080 |
| Clay | % | 40 |
| Sand | % | 17 |
| Sub soil | | |

Woldwide 1 - Proposed - 800cows
Woldwide 1
Client reference:
Farm name: 32650-Proposed - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

| | | |
|---|---|---|
| Sub soil clay | % | 36 |

*Soil profile*

| | | |
|---|---|---|
| Profile drainage class | | Use default |
| Top soil texture | | Unknown |
| Maximum rooting depth | m | 0 |
| Depth to impeded drainage layer | | 0 |

*Soil drainage*

| | | |
|---|---|---|
| Drainage method | | |
| Method | | None |
| Hydrophobic condition | | Use default |
| Occurence of pugging damage | | Occasional |
| Compacted top soil | | False |

*Soil settings*

| | | |
|---|---|---|
| K leaching (%s) | | Medium |
| N immobilisation status | | Standard |

*Soil tests*

| Olsen P | QT K | QT Ca | QT Mg | QT Na |
|---|---|---|---|---|
| 30 | 20 | 17 | 50 | 8 |

| | | |
|---|---|---|
| Organic S | | 18 |
| Anion storage capacity or phosphate retention | | Not entered |
| TBK reserve K test | | Not entered |
| K reserve status | | Use default |

*Pasture*

| | | |
|---|---|---|
| Pasture type | | Ryegrass/white clover |
| Clover levels | | Use default |

*Supplements removed*

No supplements removed from this block

*Fertiliser application*

| | | |
|---|---|---|
| Fertiliser products - August | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 100 |
| Fertiliser products - October | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 60 |
| Fertiliser products - November | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 50 |
| Fertiliser products - January | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 50 |
| Fertiliser products - March | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 50 |
| Fertiliser products - September | | |
| Category | | User defined |
| Product | | 18 Nitrogen |
| Amount | kg/ha | 100 |
| Fertiliser products - January | | |
| Category | | Ravensdown super |
| Product | | Superphosphate |
| Amount | kg/ha | 130 |

*Irrigation*

No irrigation entered

Woldwide 1 - Proposed - 800cows
Woldwide 1
Client reference:
Farm name: 32650-Proposed - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

*Animals on block*

| | | |
|---|---|---|
| Ratio and type of stock based on whole farm values due to this option being selected on block set up | | |
| Animals grazing | | |
| Dairy | % | 0 |
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |
| January | | True |
| February | | True |
| March | | True |
| April | | True |
| May | | True |
| August | | True |
| September | | True |
| October | | True |
| November | | True |
| December | | True |
| Animals grazing | | |
| Dairy replacements | % | 0 |
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |
| August | | True |
| September | | True |
| October | | True |

*Effluent application*

| | | |
|---|---|---|
| Liquid effluents | | |
| Receives farm dairy effluent | | |
| Effluent application depth | | < 12 mm |
| Percentage of block effluent applied to | % | 100 |

**Block - Non-Effluent (Brax_4a.1)**

| | | |
|---|---|---|
| Block name | | Non-Effluent (Brax_4a.1) |
| Block type | | Pastoral |
| Area | ha | 62 |
| Relative productivity | | 1 |
| Pasture block type | | No |
| Topography | | Flat |
| Distance from coast | km | 30 |
| Cultivated in last 5 years | | False |
| Fodder rotates through | | No |

*Climate*

| | | |
|---|---|---|
| Annual average rainfall | mm/yr | 1001 |
| Mean annual temperature | | 9.8 |
| Seasonal variation in rainfall | | 731-1450 mm, Low |
| Annual potential evapotranspiration | mm | 711 |
| Seasonal variation in PET | | Moderate |

*Soil description*

| | | |
|---|---|---|
| Soil order (default) | | Gley |
| Soil group (default) | | Sedimentary |
| SMaps | | |
| Sibling | | Brax_4a.1 |
| Date downloaded | | 2017 February 13 22:00 |
| Wilting point | 0 - 30cm | 25 |
| | 30 - 60cm | 32 |
| | > 60 | 34 |
| Field capacity | 0 - 30cm | 53 |
| | 30 - 60cm | 53 |
| | > 60 | 54 |
| Saturation | 0 - 30cm | 65 |
| | 30 - 60cm | 58 |

Woldwide 1 - Proposed - 800cows
Woldwide 1
Client reference:
Farm name: 32650-Proposed - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

| | | |
|---|---|---|
| | > 60 | 58 |
| Natural drainage class | | Poor |
| Depth to impeded layer | cm | Not entered |
| Maximum rooting depth | cm | Not entered |
| Top soil horizon chemical and physical parameters | | |
| ASC/PR | % | 38 |
| Bulk density | kg/m³ | 940 |
| Clay | % | 32 |
| Sand | % | 12 |
| Sub soil | | |
| Sub soil clay | % | 39 |

*Soil profile*

| | | |
|---|---|---|
| Profile drainage class | | Use default |
| Top soil texture | | Unknown |
| Maximum rooting depth | m | 0 |
| Depth to impeded drainage layer | | 0 |

*Soil drainage*

| | |
|---|---|
| Drainage method | |
| Method | None |
| Hydrophobic condition | Use default |
| Occurence of pugging damage | Occasional |
| Compacted top soil | False |

*Soil settings*

| | |
|---|---|
| K leaching (%s) | Medium |
| N immobilisation status | Standard |

*Soil tests*

| Olsen P | QT K | QT Ca | QT Mg | QT Na |
|---|---|---|---|---|
| 30 | 11 | 12 | 34 | 9 |

| | |
|---|---|
| Organic S | 16 |
| Anion storage capacity or phosphate retention | Not entered |
| TBK reserve K test | Not entered |
| K reserve status | Use default |

*Pasture*

| | |
|---|---|
| Pasture type | Ryegrass/white clover |
| Clover levels | Use default |

*Supplements removed*

No supplements removed from this block

*Fertiliser application*

| | | |
|---|---|---|
| Fertiliser products - August | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 102 |
| Fertiliser products - October | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 61 |
| Fertiliser products - December | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 51 |
| Fertiliser products - January | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 50 |
| Fertiliser products - March | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 61 |

Woldwide 1 - Proposed - 800cows
Woldwide 1
Client reference:
Farm name: 32650-Proposed - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

| | | |
|---|---|---|
| Fertiliser products - September | | |
| Category | | User defined |
| Product | | 18 Nitrogen |
| Amount | kg/ha | 102 |
| Fertiliser products - August | | |
| Category | | Ravensdown super |
| Product | | Superphosphate |
| Amount | kg/ha | 75 |
| Fertiliser products - February | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 51 |
| Fertiliser products - April | | |
| Category | | User defined |
| Product | | 18 Nitrogen |
| Amount | kg/ha | 102 |
| Fertiliser products - November | | |
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 34 |
| Fertiliser products - January | | |
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 61 |
| Fertiliser products - November | | |
| Category | | Ravensdown super |
| Product | | 20 potash super |
| Amount | kg/ha | 114 |
| Fertiliser products - January | | |
| Category | | Ravensdown super |
| Product | | 20 potash super |
| Amount | kg/ha | 202 |

*Irrigation*

No irrigation entered

*Animals on block*

Ratio and type of stock based on whole farm values due to this option being selected on block set up

| | | |
|---|---|---|
| Animals grazing | | |
| Dairy | % | 0 |
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |
| January | | True |
| February | | True |
| March | | True |
| April | | True |
| May | | True |
| August | | True |
| September | | True |
| October | | True |
| November | | True |
| December | | True |
| Animals grazing | | |
| Dairy replacements | % | 0 |
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |
| August | | True |
| September | | True |
| October | | True |

*Effluent application*

Receives no liquid or solid effluents

Woldwide 1 - Proposed - 800cows
Woldwide 1
Client reference:
Farm name: 32650-Proposed - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

**Block - Non-Effluent (Drum_2a.1)**

| | | |
|---|---|---|
| Block name | | Non-Effluent (Drum_2a.1) |
| Block type | | Pastoral |
| Area | ha | 93.4 |
| Relative productivity | | 1 |
| Pasture block type | | No |
| Topography | | Flat |
| Distance from coast | km | 30 |
| Cultivated in last 5 years | | False |
| Fodder rotates through | | No |

*Climate*

| | | |
|---|---|---|
| Annual average rainfall | mm/yr | 1001 |
| Mean annual temperature | | 9.8 |
| Seasonal variation in rainfall | | 731-1450 mm, Low |
| Annual potential evapotranspiration | mm | 711 |
| Seasonal variation in PET | | Moderate |

*Soil description*

| | | |
|---|---|---|
| Soil order (default) | | Brown |
| Soil group (default) | | Sedimentary |
| SMaps | | |
| Sibling | | Drum_2a.1 |
| Date downloaded | | 2017 February 17 11:34 |
| Wilting point | 0 - 30cm | 29 |
| | 30 - 60cm | 28 |
| | > 60 | 12 |
| Field capacity | 0 - 30cm | 45 |
| | 30 - 60cm | 43 |
| | > 60 | 20 |
| Saturation | 0 - 30cm | 55 |
| | 30 - 60cm | 52 |
| | > 60 | 27 |
| Natural drainage class | | Well |
| Depth to impeded layer | cm | Not entered |
| Maximum rooting depth | cm | Not entered |
| Top soil horizon chemical and physical parameters | | |
| ASC/PR | % | 48 |
| Bulk density | kg/m³ | 1080 |
| Clay | % | 40 |
| Sand | % | 17 |
| Sub soil | | |
| Sub soil clay | % | 36 |

*Soil profile*

| | | |
|---|---|---|
| Profile drainage class | | Use default |
| Top soil texture | | Unknown |
| Maximum rooting depth | m | 0 |
| Depth to impeded drainage layer | | 0 |

*Soil drainage*

| | |
|---|---|
| Drainage method | |
| Method | None |
| Hydrophobic condition | Use default |
| Occurence of pugging damage | Occasional |
| Compacted top soil | False |

*Soil settings*

| | |
|---|---|
| K leaching (%s) | Medium |
| N immobilisation status | Standard |

*Soil tests*

| Olsen P | QT K | QT Ca | QT Mg | QT Na |
|---|---|---|---|---|
| 30 | 8 | 12 | 33 | 8 |

Woldwide 1 - Proposed - 800cows
Woldwide 1
Client reference:
Farm name: 32650-Proposed - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

| | | |
|---|---|---|
| Organic S | | 13 |
| Anion storage capacity or phosphate retention | | Not entered |
| TBK reserve K test | | Not entered |
| K reserve status | | Use default |
| *Pasture* | | |
| Pasture type | | Ryegrass/white clover |
| Clover levels | | Use default |
| *Supplements removed* | | |
| No supplements removed from this block | | |
| *Fertiliser application* | | |
| Fertiliser products - August | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 102 |
| Fertiliser products - October | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 61 |
| Fertiliser products - December | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 51 |
| Fertiliser products - January | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 50 |
| Fertiliser products - March | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 61 |
| Fertiliser products - September | | |
| Category | | User defined |
| Product | | 18 Nitrogen |
| Amount | kg/ha | 102 |
| Fertiliser products - August | | |
| Category | | Ravensdown super |
| Product | | Superphosphate |
| Amount | kg/ha | 50 |
| Fertiliser products - February | | |
| Category | | Ravensdown other |
| Product | | Urea |
| Amount | kg/ha | 51 |
| Fertiliser products - April | | |
| Category | | User defined |
| Product | | 18 Nitrogen |
| Amount | kg/ha | 102 |
| Fertiliser products - November | | |
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 34 |
| Fertiliser products - January | | |
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 61 |
| Fertiliser products - November | | |
| Category | | Ravensdown super |
| Product | | 20 potash super |
| Amount | kg/ha | 114 |
| Fertiliser products - January | | |
| Category | | Ravensdown super |
| Product | | 20 potash super |
| Amount | kg/ha | 202 |

Woldwide 1 - Proposed - 800cows
Woldwide 1
Client reference:
Farm name: 32650-Proposed - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

*Irrigation*
No irrigation entered

*Animals on block*
Ratio and type of stock based on whole farm values due to this option being selected on block set up

| | | |
|---|---|---|
| Animals grazing | | |
| Dairy | % | 0 |
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |
| January | | True |
| February | | True |
| March | | True |
| April | | True |
| May | | True |
| August | | True |
| September | | True |
| October | | True |
| November | | True |
| December | | True |
| Animals grazing | | |
| Dairy replacements | % | 0 |
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |
| August | | True |
| September | | True |
| October | | True |

*Effluent application*
Receives no liquid or solid effluents

**Block - New Grass**

| | | |
|---|---|---|
| Block name | | New Grass |
| Block type | | Pastoral |
| Area | ha | 4.6 |
| Relative productivity | | 1 |
| Pasture block type | | No |
| Topography | | Flat |
| Distance from coast | km | 30 |
| Cultivated in last 5 years | | False |
| Fodder rotates through | | No |

*Climate*

| | | |
|---|---|---|
| Annual average rainfall | mm/yr | 1001 |
| Mean annual temperature | | 9.8 |
| Seasonal variation in rainfall | | 731-1450 mm, Low |
| Annual potential evapotranspiration | mm | 711 |
| Seasonal variation in PET | | Moderate |

*Soil description*

| | | |
|---|---|---|
| Soil order (default) | | Gley |
| Soil group (default) | | Sedimentary |
| SMaps | | |
| Sibling | | Brax_4a.1 |
| Date downloaded | | 2017 February 13 22:00 |
| Wilting point | 0 - 30cm | 25 |
| | 30 - 60cm | 32 |
| | > 60 | 34 |
| Field capacity | 0 - 30cm | 53 |
| | 30 - 60cm | 53 |
| | > 60 | 54 |
| Saturation | 0 - 30cm | 65 |
| | 30 - 60cm | 58 |

Woldwide 1 - Proposed - 800cows
Woldwide 1
Client reference:
Farm name: 32650-Proposed - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

| | | |
|---|---|---|
| | > 60 | 58 |
| Natural drainage class | | Poor |
| Depth to impeded layer | cm | Not entered |
| Maximum rooting depth | cm | Not entered |
| Top soil horizon chemical and physical parameters | | |
| ASC/PR | % | 38 |
| Bulk density | kg/m³ | 940 |
| Clay | % | 32 |
| Sand | % | 12 |
| Sub soil | | |
| Sub soil clay | % | 39 |

*Soil profile*

| | | |
|---|---|---|
| Profile drainage class | | Use default |
| Top soil texture | | Unknown |
| Maximum rooting depth | m | 0 |
| Depth to impeded drainage layer | | 0 |

*Soil drainage*

| | |
|---|---|
| Drainage method | |
| Method | None |
| Hydrophobic condition | Use default |
| Occurence of pugging damage | Occasional |
| Compacted top soil | False |

*Soil settings*

| | |
|---|---|
| K leaching (%s) | Medium |
| N immobilisation status | Standard |

*Soil tests*

| Olsen P | QT K | QT Ca | QT Mg | QT Na |
|---|---|---|---|---|
| 30 | 11 | 12 | 34 | 9 |

| | |
|---|---|
| Organic S | 16 |
| Anion storage capacity or phosphate retention | Not entered |
| TBK reserve K test | Not entered |
| K reserve status | Use default |

*Pasture*

| | |
|---|---|
| Pasture type | Ryegrass/white clover |
| Clover levels | Use default |

*Supplements removed*

No supplements removed from this block

*Fertiliser application*

| | | |
|---|---|---|
| Fertiliser products - April | | |
| Category | | Ravensdown super |
| Product | | Sulphur super 30 |
| Amount | kg/ha | 100 |
| Fertiliser products - November | | |
| Category | | Ravensdown super |
| Product | | 20 potash super |
| Amount | kg/ha | 252 |
| Fertiliser products - January | | |
| Category | | Ravensdown cropping |
| Product | | Cropmaster 15 |
| Amount | kg/ha | 202 |

*Irrigation*

No irrigation entered

*Animals on block*

Ratio and type of stock based on whole farm values due to this option being selected on block set up

| | | |
|---|---|---|
| Animals grazing | | |
| Dairy | % | 0 |
| Water connectivity | | |

Woldwide 1 - Proposed - 800cows
Woldwide 1
Client reference:
Farm name: 32650-Proposed - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

| | | |
|---|---|---|
| Direct access to streams | | False |
| Animal grazing | | |
| January | | True |
| February | | True |
| March | | True |
| April | | True |
| May | | True |
| August | | True |
| September | | True |
| October | | True |
| November | | True |
| December | | True |
| Animals grazing | | |
| Dairy replacements | % | 0 |
| Water connectivity | | |
| Direct access to streams | | False |
| Animal grazing | | |
| August | | True |
| September | | True |
| October | | True |

*Effluent application*
Receives no liquid or solid effluents

**Block - Support Horner Blk (CC) Barn Eff (Brax_4a.1)**

| | | |
|---|---|---|
| Block name | | Support Horner Blk (CC) Barn Eff (Brax_4a.1) |
| Block type | | Cut and Carry |
| Area | ha | 49 |
| Pasture block type | | Ryegrass/white clover |
| Distance from coast | km | 30 |
| *Climate* | | |
| Annual average rainfall | mm/yr | 1001 |
| Mean annual temperature | | 9.8 |
| Seasonal variation in rainfall | | 731-1450 mm, Low |
| Annual potential evapotranspiration | mm | 711 |
| Seasonal variation in PET | | Moderate |
| *Soil description* | | |
| Soil order (default) | | Gley |
| Soil group (default) | | Sedimentary |
| SMaps | | |
| Sibling | | Brax_4a.1 |
| Date downloaded | | 2017 February 13 22:00 |
| Wilting point | 0 - 30cm | 25 |
| | 30 - 60cm | 32 |
| | > 60 | 34 |
| Field capacity | 0 - 30cm | 53 |
| | 30 - 60cm | 53 |
| | > 60 | 54 |
| Saturation | 0 - 30cm | 65 |
| | 30 - 60cm | 58 |
| | > 60 | 58 |
| Natural drainage class | | Poor |
| Depth to impeded layer | cm | Not entered |
| Maximum rooting depth | cm | Not entered |
| Top soil horizon chemical and physical parameters | | |
| ASC/PR | % | 38 |
| Bulk density | kg/m³ | 940 |
| Clay | % | 32 |
| Sand | % | 12 |
| Sub soil | | |
| Sub soil clay | % | 39 |

*Soil profile*

Woldwide 1 - Proposed - 800cows
Woldwide 1
Client reference:
Farm name: 32650-Proposed - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

| | | |
|---|---|---|
| Profile drainage class | | Use default |
| Top soil texture | | Unknown |
| Maximum rooting depth | m | 0 |
| Depth to impeded drainage layer | | 0 |

*Soil drainage*

Drainage method

| | |
|---|---|
| Method | None |

*Soil settings*

| | |
|---|---|
| K leaching (%s) | Medium |

*Soil tests*

| Olsen P | QT K | QT Ca | QT Mg | QT Na |
|---|---|---|---|---|
| 38 | 10 | 12 | 32 | 12 |

| | |
|---|---|
| Organic S | 12 |
| Anion storage capacity or phosphate retention | Not entered |
| TBK reserve K test | Not entered |
| K reserve status | Use default |

*Supplements removed*

Supplement information

| | | |
|---|---|---|
| Conservation type | | Silage |
| Name | | |
| Silage stack storage | | Stack effluent contained |
| Supplement amount | | |
| Dry weight basis | T | 833 |
| Silage cutting method | | Not entered |
| Destination | | Storage |
| Storage conditions | | Average |

*Fertiliser application*

Organic nutrient inputs - November

| | |
|---|---|
| Description | WW1 Barn Effluent |
| Organic type | Imported dairy effluent |

Nutrients added as a loading (kg/month) applied to pasture

| N | P | K | S | Ca | Mg | Na | H |
|---|---|---|---|---|---|---|---|
| 2330 | 582 | 3203 | 291 | 0 | 0 | 0 | 0 |

| | |
|---|---|
| Effluent form | Liquids |

Organic nutrient inputs - January

| | |
|---|---|
| Description | WW1 Barn Effluent |
| Organic type | Imported dairy effluent |

Nutrients added as a loading (kg/month) applied to pasture

| N | P | K | S | Ca | Mg | Na | H |
|---|---|---|---|---|---|---|---|
| 2330 | 582 | 3203 | 291 | 0 | 0 | 0 | 0 |

| | |
|---|---|
| Effluent form | Liquids |

Organic nutrient inputs - March

| | |
|---|---|
| Description | WW1 Barn Effluent |
| Organic type | Imported dairy effluent |

Nutrients added as a loading (kg/month) applied to pasture

| N | P | K | S | Ca | Mg | Na | H |
|---|---|---|---|---|---|---|---|
| 2330 | 582 | 3203 | 291 | 0 | 0 | 0 | 0 |

| | |
|---|---|
| Effluent form | Liquids |

Fertiliser products - August

| | | |
|---|---|---|
| Category | | Ravensdown cropping |
| Product | | Ammo 36 |
| Amount | kg/ha | 200 |

Fertiliser products - August

| | | |
|---|---|---|
| Category | | Ravensdown other |
| Product | | Potassium chloride |
| Amount | kg/ha | 120 |

Fertiliser products - December

| | | |
|---|---|---|
| Category | | Ravensdown cropping |
| Product | | Cropmaster DAP |
| Amount | kg/ha | 200 |

Woldwide 1 - Proposed - 800cows
Woldwide 1
Client reference:
Farm name: 32650-Proposed - Evidence (2015-16)

Cain Duncan
Fonterra

# FarmParameters

| | | |
|---|---|---|
| Fertiliser products - October | | |
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 100 |
| Fertiliser products - February | | |
| Category | | Ravensdown other |
| Product | | Flexi-N |
| Amount | kg/ha | 50 |
| Fertiliser products - December | | |
| Category | | Ravensdown other |
| Product | | Potassium chloride |
| Amount | kg/ha | 180 |

*Irrigation*
No irrigation entered

*Animals on block*
Ratio and type of stock based on whole farm values due to this option being selected on block set up

*Effluent application*
Receives no liquid or solid effluents