
in the matter of: the Resource Management Act 1991

and: submissions and further submissions in relation to
proposed Variation 1 to the proposed Canterbury Land
and Water Regional Plan

and: **Fonterra Co-operative Group Limited**
Submitter

and: **DairyNZ**
Submitter

Statement of evidence of Gerard Matthew Willis (planning)

Dated: 29 August 2014

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STATEMENT OF EVIDENCE OF GERARD MATTHEW WILLIS

INTRODUCTION

- 1 My full name is Gerard Matthew Willis.
- 2 I am a director of Enfocus Ltd, a resource management consultancy based in Auckland. I have practiced as a planner and resource management specialist for the past 25 years.
- 3 I hold a Bachelor of Regional Planning (Hons) degree from Massey University and am a full member of the NZ Planning Institute.
- 4 My previous experience includes working in policy and regulatory planning roles in local government both in New Zealand and in the United Kingdom. I also spent a considerable part of my early career in central government roles including as a senior policy analyst at Ministry for the Environment (MfE) and environment adviser to the Minister for the Environment.
- 5 Since 2001, I have been a planning and resource management consultant, establishing my own practise in 2002. In that capacity I have acted for a number of district and regional councils, public and private companies and government agencies. The scope of consulting commissions has been broad ranging. Of note, over recent years, I have advised three different regional councils on the development of regional policy statements and/or regional plans.
- 6 I have also been involved in reform of freshwater management at the national level having been previously engaged by MfE under the Sustainable Water Programme of Action to advise on alternatives to first-in-first served allocation regimes and on barriers to tradable permits. In 2010 I was engaged by MfE to assist in the Fresh Start for Freshwater Programme with specific involvement in water governance issues. In 2013 I was engaged by the Ministry for the Environment to draft amendments to the National Policy Statement on Freshwater Management (NPS-FM), including the incorporation of the National Objectives Framework. I have previously been engaged by the Ministry for the Environment to assist in the development of several other national policy statements and national environmental standards.
- 7 My relevant experience also involves the preparation of evidence for hearings in relation to water quantity and/or quality matters in respect of Horizons One Plan, Variation 6 to Environment Waikato's Regional Plan, Proposed Change 6A to the Otago Regional Plan and, in Canterbury, the Proposed Hurunui and Waiau Rivers Regional Plan and the Canterbury Land and Water Plan.
- 8 Although this is not a Court hearing, I have read the Environment Court's Code of Conduct for Expert Witnesses, and I agree to

comply with it. My qualifications as an expert are set out above. I confirm that the issues addressed in this brief of evidence are within my area of expertise, except where I state I am relying on what I have been told by another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

- 9 I am familiar with the Proposed Variation 1 to the Proposed Canterbury Land and Water Regional Plan (*the Variation*) to which these proceedings relate.

SCOPE OF EVIDENCE

- 10 This planning evidence relates to provisions of the Variation that seek to manage the cumulative effects of land use on water quality. It also addresses some specific matters in relation to water quantity.
- 11 In that regard my evidence will deal with the following:
- 11.1 Relevant planning instruments with particular emphasis on the application of the National Policy Statement for Freshwater Management 2014 and its attribute tables;
 - 11.2 The water management context and the proposed management/planning approach;
 - 11.3 The planning principles relevant to the consideration of the planning issues;
 - 11.4 The key nutrient and water planning concepts used in the Variation and how these are applied in the planning framework including:
 - (a) The nitrogen baseline (as it applies in various policies and rules);
 - (b) Good Management Practices and Good Management Practice Nitrogen and Phosphorus Loss Rates (Policies 11.4.13, 11.4.14 11.4.15 and Rule 11.5.9);
 - (c) Stock exclusion (Policy 11.4.12(d) and Rule 11.5.18);
 - (d) Diffuse rural discharges (Rules 11.5.21 and 11.5.28);
 - (e) Water allocation and takes (Policy 11.4.28 and Rules 11.5.32 and 11.5.33); and
 - (f) Outcomes, limits and targets (Tables 11.4 (a) – 11.4 (m)).
- 12 Proposed amendments to Variation 1 are provided as Appendix 1.

THE PLANNING FRAMEWORK

- 13 The Variation needs to be prepared in the context of Part 2 of the Resource Management Act 1991 (the Act) and other existing planning documents, some of which must be “given effect to” by the Variation. Others need to be “taken into account” or “not be inconsistent with” as the case may be.

Part 2 of the Act

- 14 The purpose of a regional plan is to assist the Council to carry out its functions in order to achieve the purpose of the Act. In that regard, sections 5 (2) (a)-(c) of the Act are relevant.
- 15 In terms of Section 6 (Matters of National Importance), the Variation (taking into account its functional scope) needs to recognise and provide for:
- 15.1 The preservation of the natural character of ...wetlands, lakes and rivers
 - 15.2 The protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna
 - 15.3 The relationship of Maori and their culture and traditions with their ancestral lands, water ...
- 16 In accordance with Section 7, the Variation must have particular regard to all matters (a)–(j) as specified – all of which will be relevant to the issue of water quality management in the Selwyn Waihora sub region.
- 17 Of course, Section 6 and 7 matters need to be weighed in the overall broad judgement required by Section 5 of the Act (i.e. the reconciliation of the obligation to *enable* resource use with the obligation to safeguard environmental values). Consistent with the King Salmon decision¹, that overall broad judgement is subject to any national policy statement expressing policy that constrains the scope of that overall judgement. In that regard, my understanding of the place of Part 2 of the Act in plan decision-making is broadly consistent with the assessment of Part 2 provided in the Officers’ Report. That is, such a judgement continues to be important but it cannot be relied on to justify a departure from directive policies of a higher order policy document.
- 18 In the context of the Variation, I understand that to mean that an overall judgement under Part 2 of the Act cannot be relied on to argue, for example, that limits and targets ought not be set. However, an overall judgement will be important in determining the

¹ Environmental Defence Society Incorporated v New Zealand King Salmon Company Limited [214] NZSC 38.

level at which those limits are set (where the NPS-FM allows for discretion to be exercised) and the timing associated with target setting.

19 My planning assessment is based on that understanding.

Relevant planning instruments

20 I agree with the Officer's Report that the planning instruments that the Variation must give effect to are:

20.1 The National Policy Statement for Freshwater Management 2014 (NPS-FM);

20.2 The New Zealand Coastal Policy Statement 2010 (NZCPS);

20.3 The National Policy Statement for Renewable Energy Generation 2011 (NPSRE);

20.4 The National policy Statement on Electricity Transmission 2011 (NPSET); and

20.5 The Canterbury Regional Policy Statement 2013 (CRPS).

21 In order to provide clear and concise planning evidence I do not repeat the discussion of those instruments here. Where my opinion departs from that of the Officers' Report, or where it is otherwise relevant, I make mention of it in relation to specific provisions being discussed. The exception to this in the National Policy Statement for Freshwater Management 2014 which was not published in time to be addressed in the Officers' Report. Accordingly, I discuss that in paragraph 23 and from paragraph 167.

22 I also agree with the Officers' Report that other planning instruments relevant to the Variation include:

22.1 Planning documents recognised by iwi (which must be "taken into account") including:

(a) Mahaanui Iwi Management Plan (2013)

(b) Te Waihora Joint Management Plan 2005)

(c) Te Rununga o Ngai Tahu Freshwater Policy (1999)

22.2 Planning documents with which the Variation must "not be inconsistent" include:

(a) The Resource Management (National Environmental Standard for Sources of Drinking Water) Regulations 2007;

- (b) The Lake Ellesmere (Te Waihora) Water Conservation Order 1990 (as amended in 2001); and
- (c) The National Water Conservation (Rakaia River) Order 1988.

22.3 The Canterbury Water Management Strategy (2009) and the Selwyn Waihora Zone Implementation Plan (ZIP) (2012) and the ZIP Addendum (2013), which although not mandatory to consider are clearly intended as primary inputs into the regional planning framework and Variation 1 in particular. This is confirmed by Policy 4.10 of the pLWRP as discussed in paragraph 34.

22.4 That final matter is addressed comprehensively in the Officers' Report and is not repeated here except where necessary to explain why I propose a departure from the planning approach promoted by the ZIP Addendum.

National Policy Statement on Freshwater Management

- 23 Section 67 (3) of the Act requires the Council to "give effect" to the NPS-FM.
- 24 The NPS-FM 2011 was amended in July 2014 and took effect as of 1 August 2014. I understand that it is that amended NPS-FM that must be given effect to by the Variation rather than the version that applied when the Variation was notified. References to the NPS-FM in this evidence therefore refer to the NPS-FM 2014.
- 25 Policy E1 b) of the NPS-FM requires the regional council "to implement the policy as promptly as is reasonable in the circumstances, and so it is fully completed by no later than 31 December 2025".
- 26 Policy E1 ba) provides for the date by which the NPS-FM is to be implemented to be extended to 2030 in some circumstances.
- 27 Policy E1 c) provides councils the opportunity to implement a programme of defined time-bound stages to fully implement the NPS-FM by 31 December 2025 or 31 December 2030 if it is impractical for it to complete implementation by 31 December 2015. If a council does this it must formally adopt the staged programme by 12 December 2015.
- 28 I understand that, although the updated NPS-FM took effect on 1 August 2014, five months *after* the Variation was notified, the Variation must still give effect to it in accordance with section 67(3)(a) of the Act.

- 29 On that basis, my planning opinion is that, in terms of water quality, the Variation should² (in concert with the pLWRP):
- 29.1 Establish *freshwater objectives* in accordance with Policies CA1-CA4 to give effect to the objectives of the NPS-FM. Note Policies CA1-CA4 establish a process for selecting an attribute state as a basis for freshwater objectives NPS-FM, Policy A1(a);
 - 29.2 Set *freshwater limits* for all bodies of freshwater (freshwater limits must reflect local and national values – values that include benefits and interests in both use and protection), NPS-FM Policy A1(a);
 - 29.3 Specify targets and implement methods to assist water bodies to *meet targets* where objectives are not met NPS-FM, Policy A2;
 - 29.4 Establish methods to *avoid over-allocation* (allocated beyond a limit or used to a point where freshwater objective is no longer met), NPS Policy A1 (b).
- 30 My assessment of the extent to which the Variation gives effects to the attributes tables of the NPS-FM is discussed in detail from paragraph 167.
- Canterbury Regional Policy Statement**
- 31 Chapter 7 of the Canterbury Regional Policy Statement (CRPS) sets out relevant objectives and policies relevant to the Variation. In my opinion the Variation gives effect to those policies and the amendments I propose in this evidence would similarly give effect to the CRPS policies.
- 32 Where relevant I refer to CRPS policies when proposing amendments.
- 33 Reviews of sub-regional plans also need to be in accordance with Appendix 2 of the CRPS. In my opinion the Variation gives effect to that Appendix.
- Proposed Canterbury Water and Land Regional Plan**
- 34 As at the time of writing there are nine appeals on points of law associated with pLWRP waiting to be determined by the High Court.
- 35 Although the Act does not specifically require a variation to be consistent with a proposed plan, it would seem good practice for a variation to be so. That is especially so in this situation where the Variation relates to the introduction of sub regional sections and the

² Unless NPS-FM Policy E1 c) is applied.

pLWRP contains specific policies 4.9 to 4.11 directed at the development of sub-regional sections.

36 Policy 4.9 states:

Reviews of sub-regional sections will:

- (a) be in accordance with Appendix 2 of the RPS 2013; and*
- (b) identify and provide for the social, economic, cultural and environmental values of each catchment; and*
- (c) have particular regard to collaboratively developed local water quality and quantity outcomes and methods, and timeframes to achieve them, including through setting limits and targets; and*
- (d) establish methods and a timeframe to phase out any over-allocation where over-allocation of water for abstraction from surface water catchments or groundwater zones or nutrient discharges has been determined.*

37 Appendix 2 of the RPS specifies a range of matters that must be addressed to provide for integrated solutions to freshwater management. In my opinion the Variation addresses those matters.

38 As noted later in this evidence, my assessment is that Council has recognised, to some extent, the social, economic cultural and social values of the Selwyn Waihora catchment although some refinement of provisions is required to ensure social and economic values are fully identified and provided for.

39 Similarly, regard has been had to the collaboratively agreed outcomes and methods in the form of the regard given to the zone implementation plan (ZIP) Addendum.

40 Provision has also been made to phase out over-allocation of nutrient assimilative capacity.

41 Policy 4.10 states:

Reviews of sub-regional sections will not make any changes to the Objectives or Policies 4.1-4.10 of this Plan, except that catchment-specific outcomes and limits may be developed to implement the objectives and policies of this Plan.

42 The variation does not change the Objectives or Policies 4.1-4.10 of the pLWRP and is consistent with this policy.

43 Policy 4.11 states:

Acknowledging the pivotal role of good management practices in the sustainable management of the Region's water bodies, good management practice will be codified and introduced

into this Plan by way of a change on or before 30 October 2016.

- 44 The variation acknowledges the role of good management practices by:
- 44.1 Providing for good management practice to be required for all farming activities (which require resource consent) by 2017;
 - 44.2 Including Schedule 24 (Farm management practices); and
 - 44.3 Linking irrigation takes to the reasonable use test of Schedule 10 of pLWRP.
- 45 For those reasons, except insofar as this evidence suggests amendments, I consider that the Variation is consistent with the pLWRP.

UNDERSTANDING OF WATER MANAGEMENT CONTEXT AND PROPOSED MANAGEMENT APPROACH

What the Variation does

- 46 The Variation substantially revises the Selwyn Waihora sub regional section (section 11) of the pLWRP.
- 47 It does this by adding³:
- 47.1 New introductory text explaining the particular characteristics and challenges of the Selwyn Waihora catchment;
 - 47.2 A new and additional suite of policies specific to Selwyn Waihora addressing (amongst other things) cultural values, managing land use to improve water quality and the sustainable use of water and improved flows;
 - 47.3 Freshwater *outcomes* for rivers and lakes in the Selwyn Waihora sub region (in addition to those of sections 3 and 4 of the pLWRP);
 - 47.4 Water quality *limits and targets* that prevail over the water quality limits in Schedule 8 of the pLWRP (except the load limits which are in addition to Schedule 8);
 - 47.5 Water quantity limits and targets (minimum flows and groundwater and surface water allocation limits) for the Selwyn Waihora catchment;

³ For simplicity this summary does not include matters that are not relevant to the scope of the Fonterra/DairyNZ submissions.

- 47.6 A new suite of rules controlling land use and stock exclusion that prevail over the land use rules of the pLWRP in the Selwyn Waihora sub region;
- 47.7 A new suite of rules controlling the taking and use of ground and surface water that prevail over the water take rules of the pLWRP in the Selwyn Waihora sub region; and
- 47.8 Other miscellaneous and associated provisions and amendments.

The existing environment

- 48 In water management terms, the Selwyn Waihora catchment presents some significant challenges related to the existing environment, changes in pressure already “in the pipeline” and the management policies of the pLWRP.
- 49 The planning context within which the Variation is prepared is as follows.
 - 49.1 Te Waihora/Lake Ellesmere is a tribal toanga of outstanding cultural significance.
 - 49.2 The health of Te Waihora/Lake Ellesmere is generally poor and has been in decline for several decades. This is reflected in a current TLI of 6.8 compared to 6 for the lake Margins and 6.6 for the Mid Lake specified in Table 11(l) of the Variation.
 - 49.3 Observed average annual maximum aquatic plant cover exceeds the freshwater outcomes (Table 11(a) of the Variation) in most of the rivers and streams flowing into Lake Ellesmere/Te Waihora and the observed average annual maximum filamentous algae cover also exceeds the Variation’s outcome in many of the same rivers/streams.
 - 49.4 There are occasional temporary exceedences of the drinking water (Nitrate-N) standard, however, the average concentrations are just over half the drinking water standard of 11.3 mg/L. Nitrate-N concentrations in groundwater are increasing in about a third of monitored wells.
 - 49.5 There has been a decline in base flows in the rivers and streams flowing into Te Waihora/Lake Ellesmere, commensurate with a decline in groundwater levels over the past decade or so.
 - 49.6 For the above reasons the catchment is regarded as over-allocated for nutrients. In many areas of the catchment surface and ground water (quantity) are also considered over-allocated.

- 49.7 One of the primary reasons for the highly enriched state (super-hypertrophic) of Te Waihora/Lake Ellesmere is the point and non point source discharges associated with agriculture. This combined with other drivers of the health of the lake (hydrology and lake level management) contribute to the poor overall state of the lake.
- 49.8 The lag time between the loss of nitrogen from agricultural land and it entering the Lake is likely to be 10-30 years meaning, the worst (in terms of cumulative nitrogen load) still to come. Other contaminants (especially phosphorus) have much shorter transport times (months to years).
- 49.9 Agriculture is a major component of the local economy.
- 49.10 There is a range of non-regulatory (operational) interventions that will be critical to achieving the outcomes set for Te Waihora/Lake Ellesmere. A commitment has been made to a number of these interventions as part of a package. (They address, flow, habitat and water quality issues as outlined more fully at paragraph 192). Regulatory measures to control discharges also need to be part of that package but alone will be insufficient.
- 49.11 The modelled maximum nitrogen load from farming activities required to deliver the nitrogen-related freshwater outcomes (in conjunction with the operational interventions) has been assessed by the Council as 4830 tonnes per year lost below the root zone.
- 49.12 Council has granted resource consent to Central Plains Water (CPW) to irrigate an additional 30,000ha of land within the catchment. The CPW scheme will enable land use change and intensification, however, it will also enable the replacement of groundwater takes as well as (potentially) other direct interventions such as targeted stream augmentation and managed aquifer recharge. These measures have the potential to take pressure off lowland surface water resources and improve outcomes.
- 49.13 Reductions in phosphorus and sediment are also important to achieve the outcomes sought for Te Waihora/Lake Ellesmere.
- 49.14 Even with all the proposed regulatory and non-regulatory measures it will take a long time to achieve desired water quality outcomes for the lake.
- 49.15 Although considerable work has been done in monitoring and modelling there is still much that is unknown about the contributions of contaminants and the interactions between ground water and surface water.

PLANNING PRINCIPLES

- 50 With very limited exceptions⁴, my evidence does not challenge the freshwater outcomes (i.e. Table 11 (a) and 11(b) sought by the Variation. Given the context of the pLWRP, the extensive ZIP process that gave rise to the freshwater outcomes (and the absence of technical evidence on an opposing position currently available to me) there seems to me to be no planning grounds supporting an alternative view.
- 51 Rather the planning evidence advanced here focuses largely on whether key planning principles have been properly applied in developing planning provisions to deliver the outcomes sought.
- 52 In that respect I focus on:
- 52.1 *Effectiveness*– what will most reliably achieve the outcome sought;
 - 52.2 *Efficiency* – will the outcome sought be achieved at least overall cost;
 - 52.3 *Equity* – how the burden of change ought to be shared amongst current users and between current and future resource users;
 - 52.4 *Fairness* – How rapidly change should be required, and what lead time is reasonable for resource users to make required change. How existing rights and individual circumstances are recognised; and
 - 52.5 *Dealing with uncertainty* – How we factor in improved information into planning as it becomes available (adaptive management).
- 53 These principles and themes are relevant to sustainable management since they help to determine the overall broad judgement that is required to reconcile conflicting objectives of enabling people to provide for their needs and protecting environmental values.

INTRODUCTORY NARRATIVE

- 54 The Fonterra submission proposes changes to the introductory narrative of the Variation.
- 55 The general nature of those proposed changes is:

⁴ Discussed from paragraph 197.

- 55.1 To increase recognition of the economic and social context and the importance of the agricultural sector to community well-being; and
- 55.2 To establish the principle that obligations placed on the agricultural sector needed to be paced (and kept under review) so that they align with the ability of the agricultural sector to comply without major economic disruption.
- 56 The Officers' Report accepts that some change to the introductory narrative is warranted to recognise the point made in paragraph 55.1 above, but preferred other parties' wording over that offered by Fonterra. It did not accept that the second point should be included.
- 57 In my opinion the wording recommended by the Officers' Report is appropriate, being consistent with Policy 4.9 (b) of the pLWRP, and satisfies Fonterra's submission in part. The secondary point raised by Fonterra relates to matters of policy and is best addressed in the policies, rules and other methods as detailed elsewhere in this evidence.

THE NITROGEN BASELINE

- 58 The pLWRP (Decisions' Version) introduced the notion of the *nitrogen baseline* as a means of assigning an initial nitrogen allocation to existing landholders.
- 59 The Fonterra submission noted that the nitrogen baseline and nitrogen loss calculation included in the pLWRP has led to some unexpected difficulties. Issues have arisen because of the period within which the baseline is set (2009 to 2013) overlap with the nitrogen leaching calculation for the first four-year rolling average period. That is, for the first full year that the obligation applies (2014/15) farmers need to comply (using a four-year rolling average) with a baseline set as an annual average over the period 2009/10 to 2012/13. Thus the 2011/12 and 2012/13 years are common to the baseline period and the four-year rolling average calculation.
- 60 In simple terms, it means that in the first full year for which the baseline limit applies (2014/15) a farm must make an adjustment (i.e. a reduction in nitrogen leaching below the baseline) that could be significant given that the 2011/12, 2012/13, are likely to be the high years in the baseline data set).
- 61 This year-one adjustment (i.e. the need for a single low leaching year) has the corresponding effect of allowing leaching above the baseline in subsequent years before another significant correction is required in 2018/2019. This creates a "wave" effect in terms of the nitrogen leaching allowed that continues indefinitely unless a farmer

leaches nitrogen below that entitled. Thus instead of creating flexibility as intended, for many farmers the four-year averaged baseline and rolling average approach to compliance actually creates a regime whereby every four years that nitrogen leaching allowance may be very restrictive. (Although I acknowledge that the regulatory approach changes post 2017 and hence it is the period until 2017 that is most relevant).

- 62 The phenomenon of a year-one low nitrogen leaching adjustment is illustrated in the evidence of Mr Pellow.
- 63 Fonterra sought that the matter be addressed, for the Selwyn Waihora sub region by introducing a new definition of *nitrogen baseline* as that concept applies to the Selwyn Waihora sub region. This would have the effect of changing the baseline from a four-year average to an approach that allows a farmer to select the average over two, three or four consecutive years over the period 2009-2013 period.
- 64 The issue raised by the Fonterra submission is acknowledged in the Officers' Report (pages 166 to 168). The report points out that the Council has previously recognised the issue and has published implementation guidance that acknowledges that a transition to the new scheme is required. It does this by:
- 64.1 Regarding the 2013/14 year as a transitional year (where it accepts N leaching may exceed the baseline).
- 64.2 From 30 June 2014, expecting all farmers (in red zones and Lakes zones) to introduce practice changes to ensure long term compliance with the baseline but only take compliance action when nitrogen leaching exceeds the highest year in the nitrogen baseline period.
- 64.3 Expecting full compliance with the baseline from 30 June 2017.
- 65 I agree with the Officers' Report that the implementation approach outlined in the April 2014 "Nitrogen Baseline Compliance Note" would, if applied to the Selwyn Waihora sub region, address the concern expressed in the Fonterra submission.
- 66 Despite that, I do not consider it good planning practice to rely on an implementation guide to make the provisions of a plan workable. This is especially so when there is a clear and obvious opportunity to rectify anomalies in the relevant planning provisions as part of this variation.
- 67 Should the approach proposed in the Officers' Report be adopted, farmers would be left in the invidious position of being exposed to compliance and enforcement action notwithstanding that the Council

has publicly agreed that it is unreasonable to enforce the rules. In my opinion that is simply not a tenable planning position.

- 68 It is my understanding that there is no substantive disagreement that the farming activity should be required to comply, in the initial stages of the regime, with a baseline that represents the pre-regime rate of leaching. I concur with that proposition.
- 69 In my opinion, the Fonterra proposal (see paragraph 63 above) would deliver the desired interim regime for the Selwyn Waihora sub region without consequences for other parts of the Canterbury region.
- 70 Nevertheless, I also accept the approach proposed may be seen as somewhat cumbersome – especially if it was to be repeated in other sub regional sections. An alternative, simpler approach, that I propose is to effectively codify the Council’s published implementation guidance. That would simply involve replacing the requirement to comply with the nitrogen baseline pre 1 January 2017 with a requirement that:

“the nitrogen discharge for the property does not exceed the highest annual (30 June to 1 July) nitrogen loss modelled for that property over the period July 1 2009 to 30 June 2013”.

- 71 Importantly this will not lead to a higher long term baseline than the pLWRP would otherwise deliver because, consistent with the Council’s stated compliance note, this arrangement would only apply until 30 June 2017.
- 72 Such a change would require amendment to Policy 11.4.12 and Rule 11.5.7 as shown in Appendix 1.

GOOD MANAGEMENT PRACTICES AND GOOD MANAGEMENT PRACTICE NITROGEN AND PHOSPHORUS LOSS RATES

- 73 The basic scheme of the Variation as it applies to farming activities, (which require resource consent) is to require compliance with a baseline nitrogen loss rate and adoption of clearly stated good management practices (specified in Schedule 24). Based on the need to reduce nitrogen load a transition is then proposed whereby farming activities must first move from the baseline to good management practice and then to a level of leaching below good management practice. This transition is to occur over a period of years.
- 74 While I support that general strategy, the way the Variation currently seeks to give effect to it in planning terms is, in my opinion, problematic.

Reductions Post 1 January 2017 – Policy 11.4.13 and Rule 11.5.9

- 75 Policy 11.4.13 seeks to achieve reductions in farming activity-generated contaminants post 1 January 2017. It seeks to do so through requiring compliance with Good Management Practice Nitrogen and Phosphorus Loss (GMPNPL) rates from 1 January 2017 for any farming activity leaching more than 15 kg N/Ha/yr.
- 76 The term “Good Management Practice Nitrogen and Phosphorus Loss Rates” is defined. The definition states:
- Means nitrogen and phosphorus loss rates (in kilograms per hectare per annum) from a property (including losses below the root zone of a property) for different soils, rainfall and farm type operating at good management practice.*
- 77 The Fonterra submission opposes that policy and seeks that it be deleted. The Officers’ Report rejects that submission but recommends that the defined term be deleted. I support the Fonterra relief for the reasons set out below but offer an alternative relief that retains the policy in a modified form.
- 78 Policy 11.4.13 needs to be understood in the context of Rule 11.5.9. That rule makes it clear that the GMPNPL rates are not intended as a condition, standard or term of a rule. Rather, they are intended as a matter over which discretion may be exercised.
- 79 As detailed in the evidence of Mr Ryan there is a process known as the MGM process that is tasked with developing “good practice” leaching rates for the Canterbury Region. This process has yet to generate the GMPNPL rates. While it is expected to do so sometime in 2015 it would be inappropriate, in my opinion, to refer specifically to those rates as though they exist already.
- 80 It would be better for references to good management leaching rates to remain generic and not be tied specifically to a particular process or document. That will avoid any potential need to amend the plan in the future should the process, for whatever reason and despite best intentions, fail to generate the GMPNPL rates as expected.
- 81 For both those reasons (i.e. the reasons set out in paragraph 78 and paragraph 80), Policy 11.4.13 is not, in my opinion appropriate as currently worded. Wording that better reflects the operation of the associated rule would be:

From 1 January 2017, ~~further~~ reduce discharges of nitrogen, phosphorus, sediment and microbial contaminants from farming activities in the catchment by requiring farming activities to:

(a) Implement a Farm Environment Plan prepared in accordance with Schedule 7 Part A, where a property is greater than 50 hectares; and

(b) Where a property's nitrogen loss calculation is greater than 15kg of nitrogen per hectare per annum achieve a rate of nitrogen and phosphorus loss that is consistent with good management practice for the farming activity taking into account the circumstances applicable to each property ~~meet the Good Management Practice Nitrogen and Phosphorus Loss Rates for the property's baseline land use.~~

82 In my opinion such wording would still allow Council to have regard to the MGM-derived GMPNPL rates if, and when, they are available – they would become a tool that would assist the Council decision-makers to exercise the discretion.

83 It is my understanding that, because the GMPNPL rates are not proposed as a condition, standard or term, they need not be included in the plan but, as a matter of discretion, may sit outside the plan. I note that the Variation contains no commitment to a future variation or change to introduce the GMPNPL rates to the pLWRP⁵

84 That raises Section 32 as the other relevant consideration. In my opinion, if there is a clear intention to apply the MGM-derived GMPNPL rates strictly through the RDA rule then there is a clear obligation for the provisions to be subject to a section 32 evaluation. Clearly that cannot be done as the GMPNPL rates do not currently exist. That is another reason why taking a more generic approach to the provisions of the variation has merit.

85 If, however, Council does intend to apply the GMPNPL rates strictly through Rule 11.5.9 then it has a clear obligation, in my opinion, to subject those rates to a section 32 evaluation.

86 For that reason, Council faces a clear choice. It must either:

86.1 Take an approach to require good management practice leaching rates that is generic and flexible but which can be informed by the MGM output when it materialises (as proposed above); or

86.2 Remove reference to requiring GMPNPL rates from the plan and commit to a plan change or variation to introduce GMPNPL rates to the pLWRP through the First Schedule process and hence subject the GMPNPL rates to a section 32 evaluation as to costs and benefits). That is the relief sought

⁵ As noted in paragraph 42 notes, Policy 4.11 commits only that Good Management practice will be codified". In my opinion, that may be said to be achieved by Appendix 24 (i.e. codification does not necessary mean quantification).

in the Fonterra submission. If this approach and strict application of the GMPNPL rates is intended, then it would be more honest and transparent to impose those rates (subject to satisfying section 32) as a standard or term rather than as a matter of discretion or control⁶.

87 Should, as I propose, the option in paragraph 86.1 be taken then an amendment is also required to Rule 11.5.9 in addition to the amendment to Policy 11.4.13 indicated above.

88 Matter of discretion 2 in Rule 11.5.9 is unclear and potentially misleading as currently worded. As a matter of discretion, Council can chose when, whether or how much to require compliance with such rates. Yet the wording proposed (particularly when read in conjunction with Policy 11.4.13 as proposed) implies that fixed, pre-determined GMPNPL rates will be applied without regard to individual circumstances.

89 My proposed rewording of matter of discretion (2) is as follows:

~~The Good Management Practice Nitrogen and Phosphorus Loss Rates~~ maximum nitrogen loss rate to be applied to the property in accordance with Policy 11.4.13(b); and

90 As noted above, this rewording would (and ought) not, in my opinion, prohibit the council taking into account the GMPNPL rates (when available) in exercising this discretion.

91 This change is also consistent with the Officers' Report recommendation to delete the defined term "Good Management Practice Nitrogen and Phosphorus Loss Rates".

92 The alternative approach described in 86.2 is one I would also support. It has the advantage of providing greater certainty both for council and for applicants as to the leaching rates that will be applied. I favour the option described in paragraph 86.1 only because it avoids the need for another change to the plan in the near future.

93 As noted above, if strict observance of GMPNPL rate is intended then any such rates should be brought into the Plan by the First Schedule process.

Policy 11.4.14 and Rule 11.5.9

94 Policy 11.4.14 requires that, to achieve the water quality limits in Section 11.7.3, farming activities must reduce nitrogen loss from the good practice rates by a prescribed percentage by 1 January 2022.

⁶ Although it were to do this it would be appropriate to provide for departures from the GMPNPL rates as a discretionary activity.

- 95 The policy takes effect through Rule 11.5.9 discussed above. The RDA rule contains matter of discretion 3 which states:

The nitrogen loss rates to be applied to the property in accordance with Policy 11.4.14 (b), Policy 11.4.15 and Policy 11.4.16.

- 96 In simple terms, this means that there is a clear expectation that dairy farmers will reduce nitrogen losses by 30% between 2017 and 2022 (from the good practice leaching rate to be achieved by 2017 – a leaching rate likely to be lower than current leaching rates).

- 97 The Fonterra submission opposes Policy 11.4.14 on the basis that the percentage reduction cannot be subject to a section 32 evaluation since the GMPNPL rates are not known and because change in EBIT (earnings before interest and tax) is not considered a fair means by which to calculate “equal pain”. (The concept of equal pain across farming activity types being the basis upon which the 30% reduction was derived).

- 98 I agree with the Fonterra submission.

- 99 As indicated earlier, based on evidence available to me, I support the target 4830 tonnes/year load limit for the catchment (including the provision for land use changes associated Central Plains Water) and hence the need for reduction in nitrogen loss over time from current farming activities leaching greater than 15 kgs N/ha/year.

- 100 Based on evidence of Ms Hayward, I understand that the level of reduction required by existing farms to meet the catchment load is 14% plus the level that is to be achieved by those activities moving to good management practice (GMP). (As noted earlier, the level of reduction to be achieved by movement to GMP is unknown at this point).

- 101 The outstanding issues are:

101.1 How that reduction target is allocated between sectors and users; and

101.2 Over what timeframe is the reduction to be required.

- 102 My understanding from the evidence of Mr Ryan and Mr Curtis is that the use of EBIT and the percentage reductions was not a “collaboratively developed local water quality and quantity methods” as envisaged by Policy 4.9(c) of the pLWRP.

- 103 Mr Smeaton explains in his evidence that the use of EBIT does not take account of interest, drawings and depreciation, meaning it is difficult to consider farmers' ability to withstand additional financial cost or reduction in revenue.

- 104 I have been unable to locate any analysis of the derivation of the percentage reductions other than a footnote in the Section 32 report noting that⁷:

The percentages was [sic] determined on the basis of all landowners being subject to the same level of cost to achieve the mitigation required to achieve the load limit. The level of cost is based on the cost of mitigation as a proportion of earnings before interest and tax (EBIT).

- 105 The allocation of reduction responsibility was not included in the ZIP addendum. That document stated that:

Land users discharging more than 15KgN/ha/yr are required to make about 15-20% improvement on GMP loss rates by 2022⁸.

- 106 I understand that the proportional reductions proposed are based on a 7% reduction in EBIT. That is, how much nitrogen loss mitigation can be achieved before a benchmark 7% loss in EBIT is exceeded.

- 107 Mr Smeaton's evidence makes two key points:

107.1 Based on an analysis of eight case study farms in the Selwyn Waihora catchment, and working with a representative subset of five farms, achieving a 30% reduction in nitrogen leaching will on average lead to a 17% profit reduction. That is over twice the 7% profit reduction that was considered in the Section 32 evaluation report.

107.2 While the differentiation in reduction targets may (in theory) equalise cost between sectors (when assessed as a proportion of EBIT) there is significant variation *within* the dairy sector. Mr Smeaton's evidence indicates that some farms could face profit reductions of significantly above the 17% average.

- 108 It is obvious that no allocation of the reduction target will satisfy all parties. However, it does seem to me that the allocation proposed has, in contrast to most of the other technical and modelling work undertaken for the Selwyn Waihora sub regional process, been arrived at precipitously and without the collaboration or level of analysis that has characterised other parts of the policy package.

- 109 Ironically, given the policy track proposed there does not seem to me to be a need to agree this part of the policy package at this time.

⁷ Proposed Variation 1 to the Proposed Canterbury Land and Water Regional Plan Section 32 Evaluation Report, February 2014

⁸ Selwyn Waihora, ZIP Addendum, October 2013.

- 110 Aside from allowing for more detailed analysis of cost and equity, delaying the apportionment of the reduction target has two advantages.
- 110.1 First, we do not currently know what GMP will deliver by way of reduction. Once consents are granted based on GMP the scale of additional required reductions will be known with greater certainty.
- 110.2 Understanding of current and future load contributions from farming activities across the catchment will be significantly improved once the MGM is fully developed. This will also lead to improved understanding of nitrogen loss reduction requirements.
- 111 For those reasons I consider that a preferable planning approach is to:
- 111.1 Delete the sector specific percentage reductions from Policy 11.4.14 (b) (and instead make reference to Section 11.7A);
- 111.2 Insert a new policy requiring a *collective* reduction in nitrogen leaching loss of 14%⁹ across the catchment by 1 January 2022;
- 111.3 Commit to a plan change or variation to introduce specific reduction targets to be applied in the context of individual resource consents before 1 January 2022; and
- 111.4 Ensure that consents issued from 1 January 2017 include a year five review condition enabling the Council to impose a reduction on or about 1 January 2022.
- 112 I note that the Officer's Report raised a similar approach as an alternative to listing prescribed reductions percentages by sector. However, it commented that:
- The risk of this approach is that it does not put industries "on-notice" about the likely future position, and therefore may encourage additional investment that does not account for regulatory uncertainty. It would also not allow the setting of longer-term nutrient loss limits in resource consents, requiring more frequent reviews and consequent uncertainty*
- 113 I accept that the approach does require a consent review. However the analysis provided in the Officers' Report does seem contradictory. On the one hand, it implies that the regulatory uncertainty created by the proposed policy is a good thing as it will

⁹ 14% being the amount of reduction required from existing 15kg+ farms to reach the catchment load target assuming a level of reduction already achieved by GMP (according to the evidence of Ms Hayward).

discourage additional (imprudent) investment. On the other hand, it suggests that more frequent consent reviews will lead to uncertainty – which is implied as a bad thing. It seems to me that the uncertainty associated with a consent review will dissuade the additional investment that seems to be of concern. I agree that a signal about the magnitude of the overall reduction required in the medium to long-term is appropriate.

114 The amendments I propose are set out in Appendix 1.

Policy 11.4.15

115 Policy 11.4.15 sets out some criteria to be applied when deciding what (if any) extension to the 2022 timeframe to achieve nitrogen loss reductions ought to be allowed.

116 I support, in principle, Policy 11.4.15 (if Policy 11.4.14 is to be retained). But I agree with the Fonterra submission that the criteria contained in the policy could be clearer. In my opinion the factors that ought to be considered include:

116.1 The starting position of the farm (i.e. the current level of its leaching) and the level of nitrogen loss reduction already made;

116.2 Any particular constraints faced on-farm that are outside of a farmer's control;

116.3 The investment on-farm and where a farmer might be in the cycle of farm infrastructure replacement.

116.4 The capital and operational costs of making reductions and the benefit (in terms of maintaining a farm's financial sustainability) of spreading that investment over time.

117 In my opinion, specificity such as indicated above, would be more helpful in a consenting context that the three generic matters currently listed in the Policy 11.4.15.

118 I include an amended Policy 11.4.15 in Appendix 1.

Farm Practices - Schedule 24

119 Policy 11.4.12 and permitted activity Rule 11.5.7 require farming activities to implement the practices listed in Schedule 24. Those practices relate to nutrient management, irrigation management, intensive winter grazing, cultivation and collected animal effluent.

120 I understand that this list of practices was included as a "stop gap" measure, pending the availability of GMPNPL rates.

121 As a general rule, I consider output control (i.e. leaching rates) to be preferable in planning terms as they offer the potential for a

farmer to find the least cost means of compliance and hence comply with the efficiency principle.

- 122 In this situation though I agree that a list of basic practices that can be expected of farming activities is appropriate, at least in the interim period.
- 123 The Fonterra submission supports Schedule 24 except that it seeks the deletion of Practice (e) relating to collected animal effluent.
- 124 I support that submission in part. I note from the evidence of Mr Cullen that Fonterra now supports Schedule 24 (e)(i) whereby all new collection, storage and treatment systems for dairy effluent meet the Dairy NZ Farm Dairy Effluent Design Standard (the Design Standard) and Code of Practice [2013] (Code of Practice).
- 125 I have reviewed that document and have no reason to suspect it is not appropriately applied to new effluent systems through the Rule 11.5.7.
- 126 However, on the basis of the evidence presented by Mr Cullen, I propose amendment to Schedule 24 (e)(ii). That provision requires farmers to annually self assess all (i.e. including pre 2014) effluent disposal system application separation distances, depth, uniformity and intensity "in accordance with Section 4 of the Design Standard".
- 127 Mr Cullen notes, Section 4 of the Design Standard does not include any guide or methodology regarding self-assessment of these matters.
- 128 I have reviewed the Design Standard and include Section 4 of it as Appendix 3 to this evidence. Section 4 contains specific design standards for application, separation distances, depth, uniformity and intensity as would be expected. But I agree with Mr Cullen. It does not contain information regarding self-assessment.
- 129 There are two possible explanations for this situation. Either:
- 129.1 The Variation is simply mistaken as to the appropriate guidance on self-assessment of effluent systems reasons; or
- 129.2 The Variation intends "self-assessment" to mean compliance with the detailed design requirements of section 4 of the Design Standard.
- 130 It seems to me unlikely that the second interpretation can be correct since that would involve imposing additional, and potentially conflicting, requirements over and above the requirements that already apply to effluent systems consented prior to 1 January 2014 (noting that all effluent systems require an RDA consent under Rule 5.36 of the pLWRP and before that, required at least a controlled

activity consent under the Canterbury Natural Resources Regional Plan).

131 On that basis, I think the former interpretation is correct. That is, "annual self-assessment" is intended to mean a farmer annually checking effluent system performance and compliance with applicable standards (either the Design Standards or, for pre 2014 consents, conditions of consent).

132 That being the case, reference to Section 4 of the Design Standard should be deleted from Schedule 24 (e) (ii) and replaced by reference to the applicable guideline. Mr Cullen suggests that the documents that provide guidance on self-assessment are:

132.1 Dairy farm effluent – the rules for achieving compliance in Canterbury; and

132.2 A farmers guide to managing farm dairy effluent – a good practice guide for land application systems ("Farmers Guide").

133 I have reviewed those documents and note the Section 4 of the Farmers Guide contains detailed advice on how to measure application depth rates and related matters. It seems to me that this was the intended reference. Accordingly, I have proposed a change to Schedule 24 (e) (ii) in Appendix 1.

STOCK EXCLUSION

Policy 11.4.12 (d) and Rule 11.5.18

134 The Fonterra submission opposes Policy 11.4.12 and Rule 11.5.18 largely on the basis that the use of two different terms ("drain" in Policy 11.4.12(d) and "artificial watercourse" in Rule 11.5.18) leads to confusion and potentially means that artificial swales and ephemeral drains would need to be fenced to exclude stock.

135 The Officers' Report recommends an amendment to more consistently apply the term "drains" to both the policy and rule. It also usefully clarifies that in this context a drain does not include "any subsurface drain, stormwater swale or other artificial watercourse which is ephemeral in nature".

136 In my opinion the proposed rewording of Rule 11.5.18 addresses the Fonterra concerns and I note that this is confirmed by Mr Cullen.

DIFFUSE RULE DISCHARGE ISSUES

Drainage water discharges in the Cultural Landscape/Values Management Area

137 Rule 11.5.21 adds an additional condition to Rule 5.77 of the pLWRP.

- 138 Rule 5.77 of the pLWRP makes the discharge from surface or sub surface drains permitted activities, subject to conditions that limit the number of drains and quality of the drainage water discharge.
- 139 Rule 11.5.21 adds the condition that no such discharge can be into the Lake area in the Cultural Landscape/Values Management Area ("the Lake area"). That area is shown on the planning maps and includes Te Waihora Lake Ellesmere, Coopers Lagoon and the immediate surrounding area.
- 140 As a result of the additional condition, drains that discharge to the Lake Area become discretionary activities under Rule 5.78 of the pLWRP.
- 141 The Fonterra submission opposes Rule 11.5.21 and seeks that it be deleted. I agree with that submission.
- 142 Although the motivation for the Rule is understandable, in my opinion the rule breaches planning principles of effectiveness/practicality and fairness.
- 143 Regulating discharges from drains is, in my experience, a highly problematic area of water management for three fundamental reasons.
- 143.1 Surface drains often flow through multiple properties collecting contaminants as they go (from overland flow, groundwater seepage, and sub-surface drains). The person at the end of the drain cannot be reasonably held accountable for the contaminant load at the end of the drain since he/she will only be one contributor. If they are held to account for that discharge their ability to reduce contaminant loads can be extremely limited relative to the overall load.
- 143.2 The ability to impose controls on land use to improve drainage water quality is often limited because the activities that influence drainage water quality are often already controlled through other farm activity-related rules and related mechanisms (such as farm environmental plans). Hence the marginal value of another rule is difficult to justify (in terms of its potential effectiveness).
- 143.3 Both these reasons apply in the context of the Variation. The evidence of Mr Cullen points out that many of the drains discharging to Te Waihora Lake Ellesmere serve multiple properties. Often those drains are carrying runoff water from public roads and other land uses as well as farm-sourced contaminants. As proposed, Rule 11.5.21 would require those at the end of the drain to apply for resource consent.

- 143.4 Such a consent would be in addition to consents held for effluent discharge to land, land use consent for a farming activity (nitrogen loss) and the associated Farm Environment Plan as well as compliance with various other conditions of permitted activities (farm dumps, offal holes, silage pits, stockholding areas, stock access to water bodies etc).
- 144 The alternatives to regulating discharges from drains are:
- 144.1 The regulation of discharges *to* a drain (as attempted in Otago's recent Plan Change 6A); or
- 144.2 Requiring risks to drain discharges arising from activities not regulated by other rules and consents to be specifically considered and addressed through a farm environment plan (FEP) mechanism.
- 145 In my opinion, the option of regulating discharges to drains becomes highly complex and uncertain. It was only attempted in Otago because there was no appetite on behalf of the Council to require farm environment plans. It has yet to be proven effective.
- 146 FEPs offer a much more sensible and effective means of controlling risks associated with drainage water from drainage networks.
- 147 I note that the Officers' Report agrees with this analysis and I support the relief suggested in that report. That involves making specific mention of risks associated with contaminants entering drainage water a consideration in the preparation of FEPs.
- Stormwater discharges into the Cultural Landscape/Values Management Area**
- 148 Rule 11.5.28 adds an additional condition to Rule 5.95 of the pLWRP.
- 149 Rule 5.95 of the pLWRP makes the discharge of storm water to water or onto land in a manner that may enter water a permitted activity, subject to conditions designed to manage adverse effects.
- 150 Rule 11.5.28 adds the condition that no such discharge can be into the Lake area in the Cultural Landscape/Values Management area. As a consequence any stormwater discharge in the Lakes area would be a discretionary activity
- 151 The Fonterra submission opposes Rule 11.5.28 and seeks that it be deleted. I agree with that submission.
- 152 The main reason I oppose the rule is that stormwater discharges in a farming environment are ubiquitous. They arise from every building or hard surface area. As Mr Cullen advises, in a farming environment there can be a great many of these, spread across a

very wide area (e.g. houses, implement sheds, pump sheds, barns, stock handling areas, hard stand areas and races). Having to obtain consent and potentially install stormwater devices (such as settling ponds) for all such dispersed discharges is unrealistic and unreasonable given that many discharges will be small and clean.

- 153 Moreover, high-risk discharges associated with, for example, stockhandling areas, are already controlled under Rule 5.31. Rule 5.31 requires that stormwater from stockhandling areas is collected and diverted into an authorised collection and storage system.
- 154 As the Fonterra submission points out (and as confirmed by Mr Cullen's evidence), in the dairy context there is the potential for a perverse outcome if farmers seek to avoid the obligation to secure consent for stormwater by diverting such discharges to effluent ponds. That would simply reduce effluent storage potential and increase risk associated with effluent discharges.
- 155 The Officers' Report notes some similar points and recommends that the rule be deleted. I support the recommendation.

WATER ALLOCATION AND TAKE ISSUES

Minimum Flows – Policy 11.4.28

- 156 Policy 11.4.28 applies new minimum flows and partial restrictions from 2025.
- 157 I understand that these minimum flows are made possible, without significant adverse effect on consent holders' reliability, by managed aquifer recharge (MAR) and targeted stream augmentation (TSA) and groundwater abstraction reducing in favour of alpine surface water.
- 158 The issue here is one of certainty and the appropriate planning approach in a future with uncertain resource availability. I do not question the modelling used to determine that higher minimum flows are possible (and desirable) once the various planning outcomes are realised. However, it would seem a prudent planning approach for the Variation to provide some room to move should the increase in flows not eventuate in the time frames anticipated.
- 159 I note that the Officers' Report states that:
- The flow benefits should [my emphasis] be fully realised by 2025 when the minimum flows come in.*
- 160 There are various uncertainties regarding, for example, when the MAR and TSA will occur, how much groundwater abstraction decreases and whether the surface water flows will react as expected. Hence it is not unexpected that the Officers' report can only assert what "should" happen, not what will happen.

- 161 For that reason I propose a minor amendment to Policy 11.4.28 as follows (note this differs from that sought by the Fonterra submission but has similar effect).

Protect the ecological and cultural health of the Waikirkiri/Selwyn River and lowland streams by including the minimum flow and partial restrictions in Table 11 (c) and (d) on new and replacement resource consents from 2025 unless surface water flows have not increased as expected by that time.

Rules 11.5.32 and 11.5.33

- 162 The Fonterra submission raises two, largely technical, issues with Rules 11.5.32 and 11.5.33. Those rules relate to the taking of surface and groundwater as an RDA.
- 163 In my opinion there is an issue in that a groundwater take in the Selwyn catchment and including all areas within the Little Rakaia Combined Surface and Groundwater Allocation Zone are caught by both Rule 11.5.32 and Rule 11.5.33. As I read it, Rule 11.5.33 is intended as an exception that provides for a groundwater take even where such a take cannot satisfy the standards and terms of Rule 11.5.32.
- 164 As currently worded however, the rules could be read as suggesting that a groundwater take has to meet both the standards and terms of Rule 11.5.32 and Rule 11.5.33 (which in some instances could also make an activity prohibited under Rule 11.5.36 which does not appear to be what was intended by the rules framework). In my view this matter could be easily resolved by replacing the Rule 11.5.32 wording "Despite Rule 11.5.32" with "Unless 11.5.32 applies".
- 165 I set out in full the proposed wording for this policy in Appendix 1
- 166 I do however note that although my suggested relief appears to address my concerns where, for example, the take is only for groundwater – the actual intended purpose of the two rules (as between groundwater, surface water, and connected groundwater over time) is not that clear.

OUTCOMES, LIMITS AND TARGETS

Giving effect to the NPS-FM attribute tables

- 167 As noted earlier, Section CA of the NPS-FM contains the process by which councils must select freshwater objectives from the menu provided in Appendices 1 and 2 of the NPS-FM. Policy CA2 (f) sets out relevant matters for Councils to consider.
- 168 Both the pLWRP and the Variation were developed prior to the 2014 NPS-FM and, not surprisingly, there are some aspects of the NPS-FM

with which the Variation may not be consistent. Compliance with Section CA being the key issue. I note that the Officers' Report commits to presenting further evidence on that point.

169 Policy CA2 e) of the NPS-FM states:

e) formulating freshwater objectives:

i. in those cases where an applicable numeric attribute state is specified in Appendix 2, in numeric terms by reference to that specified numeric attribute state.

170 It is my understanding that the Variation must set freshwater objectives that reference each attribute relevant to the compulsory national values of ecosystem health and human health for recreation.

171 The evidence of Ms Hayward sets out a comparison of the outcomes ("attribute states") required by the NPS-FM and those contained in Variation 1.

172 I do not repeat that analysis here other than to note that to give full effect to the NPS-FM at this time the Variation would need to:

172.1 Use different metrics for measuring attributes and values than currently proposed in some cases;

172.2 Assign attribute states to *all* water management units and include some additional water quality attributes;

172.3 Re-label some of the "targets" as "freshwater objectives"; and

172.4 Refine some of the targets/outcomes to ensure they are above the national bottomlines.

173 This later point is most critical, particularly as it relates to lake water quality. While the Variation does not include the ammonia and nitrate toxicity attribute states for rivers as *freshwater objectives* of Section 11.6 (Table 11(a)) it does include *targets* for nitrate-nitrogen (nitrate toxicity) (Section 11.7, Tables 11 (i)).

174 With regard to lakes, the NPS-FM requires freshwater objectives for TP, TN, Chl *a* and ammonia. The Variation does not set freshwater objectives for lakes in respect of these attributes but does set the targets for TP, TN and Chl *a* in Te Waihora/Lake Ellesmere. These targets are set below the national bottom lines specified for lakes in Appendix 2 of the NPS-FM.

175 However, the key question is whether Te Waihora/Lake Ellesmere is a "lake" for the purpose of Appendix 2 of the NPS-FM. Of some note

is the footnote to the table in Appendix 2 that sets out TN attribute states. That states that:

“Intermittently closing and opening lagoons (ICOLs) are not included in brackish lakes”

The total nitrogen (TN) attribute and ICOLs

- 176 I understand from the evidence of Ms Hayward that Te Waihora/ Lake Ellesmere is an ICOL. From the NPS-FM Appendix 2 footnote it is clear that there is no TN attribute state specified for ICOLs and hence no NPS-FM TN attribute state applies to Te Waihora Lake Ellesmere.
- 177 Applying the NPS-FM bottom line for TN for lakes to Te Waihora Lake Ellesmere would mean reducing the target by 78% (from 3.4 mg/L to 0.75 mg/L). This would have a consequential effect on the catchment load which would also need to be reduced by a similar proportion (although complex modelling is required to determine the exact reduction in load required). I understand that a reduction in TN of that magnitude would necessitate wholesale changes in land use in the catchment.
- 178 For those reasons, it is my opinion that the NPS TN attribute state does not and should not be applied to Te Waihora/Lake Ellesmere.

The total phosphorus (TP) and Chl. a attributes and ICOLs

- 179 The footnote referred to above also raises questions about whether the TP and Chl *a* attributes states are intended to apply to ICOLs. I understand that this has been a matter of some uncertainty around the country since the NPS-FM 2014 was gazetted.
- 180 Accordingly, the Ministry for the Environment (MfE) has recently written to all regional councils advising them that:

“The current attribute tables for lakes are not intended to apply to ICOLs and were developed on the basis that they do not apply to ICOLs”.

- 181 That letter (attached as Appendix 2) goes on to advise that:

“The Minister for the Environment sees merit in making clarifying changes to the NPS-FM 2014 to remove any remaining uncertainty, and is considering potentially doing so alongside the current amendment process for adding infrastructure to Appendix 3 of the NPS-FM 2014.

It is our intention to consider developing attributes for ICOLs that are managed as freshwater bodies as a further stage of the NPS-FM 2014. If appropriate attributes are able to be developed, they could be consulted on as part of an amendment to the NPS-FM...”

182 As noted above the TN bottom line for “general” lakes would, if applied, have very significant implications for land use across the catchment. I understand that the same is true in respect of the TP and Chl *a* attributes. Again, based on my understanding of the economic modelling work carried out for Council, as recorded in the Section 32 Report (page 52), achieving a TLI of 6 in Te Waihora/ Lake Ellesmere was considered to have an unacceptably high social and economic cost. A TLI of 5.1 (the equivalent of NPS-FM bottomline attributes according to Ms Hayward) would therefore have an even less acceptable social and economic outcome.

183 On the basis of clear evidence that none of the attribute tables of the NPS-FM were intended to apply to ICOLs, and that to apply them would have significant social and economic implications, it is my view that they ought not be applied.

184 As noted earlier in this evidence, the obligation on Council under Part E of the NPS-FM is to *“implement the policy as promptly as is reasonable in the circumstances ...”*.

185 Similarly, referring to the question of when a local authority must amend a plan or variation to recognise a national policy statement, Section 55 (2D) of the Act states:

In all cases the local authority must make the amendments-
 (a) *as soon as practicable; or*
 (b) *within the time specified in the national policy statement (if any); or*
 (c) *before the occurrence of an event specified in the national policy statement (if any).*

186 In my opinion, given the uncertainty, the potential cost and the now well-signalled intention of the government to clarify the application of the NPS-FM as it relates to ICOLs, it would not be reasonable to amend the variation to base outcomes and limits of Te Waihora Lake Ellesmere on the attribute tables of the NPS-FM at this time.

187 Rather, a reasonable approach would be to proceed with the outcomes and limits as proposed in the Variation (subject to specific amendments as discussed in paragraph 199 of this evidence).

188 If necessary, the plan could include (as a method or advisory note) that the Plan will be amended to give effect to outcomes included in the NPS-FM specifically for ICOLs and that this will be done prior to 31 December 2015 (or later if the NPS-FM is amended after that date). In my opinion that would be consistent with Section 55(2D) of the Act.

189 Similarly, rather than making a series of technical changes to the outcomes and limits of the Variation to attempt to give full effect to Section CA and Appendix 1 of the NPS-FM as part of the decision on

Variation 1, a commitment could be made by Council to a programme of time-limited stages to ensure that Variation 1/pLWRP fully implement the NPS-FM. This is provided for in Policy E1 c) of the NPS-FM as discussed in section 27 of this evidence.

Outcomes and non-regulatory methods

- 190 Table 11(a) sets out the freshwater outcomes for Selwyn Waihora Rivers. Table 11(b) sets out freshwater outcomes for lakes.
- 191 The Fonterra submission generally supports Tables 11(a) and 11(b) but notes that the achievement of at least some of the outcomes specified is unlikely unless the changes in farming practices are complemented by non-regulatory methods such as described in the evidence of Ms Hayward.
- 192 In my opinion it is a very pertinent point. I consider that Variation 1 needs to make very clear that the outcomes specified are to be achieved by regulatory controls on land use activities and discharges as well and non-regulatory methods including modification of flow regimes and catchment and lake interventions and investment.
- 193 In the absence of that there is a danger that applications will be made in a false context. That is, that the sum of regulatory decision-making must deliver the outcomes of Tables 11(a) and 11 (b). Clearly that could lead, over time, to an overly harsh approach to consenting that would be contrary to the collaboratively agreed approach.
- 194 While the context is discussed in the introductory narrative, this is not linked to an understanding of the outcomes of Table 11 (a) and 11 (b). The Strategic Policies of Section 4 of the pLWRP do not capture the point noted in the Fonterra submission in fact Policy 4.2 conveys the opposite meaning. It states that:
- The management of lakes, rivers, wetlands and aquifers will take account of the freshwater outcomes, water quantity limits and the individual and cumulative effects of land uses, discharges and abstractions will meet the water quality limits set in Sections 6 to 15 or Schedule 8 and the individual and cumulative effects of abstractions will meet the water quantity limits in Section 6 to 15.*
- 195 In my opinion, mention should be made in policy of the broad package of measures that has been agreed for Selwyn Waihora to ensure that the achievement of freshwater outcomes is understood and managed in that broader context.
- 196 The most appropriate means of doing that is to amend Policy 11.4.1. As noted above, the Fonterra submission sought that recognition be given to the place of non-regulatory methods in achieving the freshwater outcomes. It also sought an amendment

to Policy 11.4.1 to insert the terms “significant” and “adverse” around the reference to cumulative effects. Giving effect to those two parts of the Fonterra submission would be achieved by an amendment as follows.

11.4.1 Manage water abstraction and discharge of contaminants within the entire Selwyn Waihora catchment to avoid significant cumulative adverse effects on the water quality of Te Waihora/Lake Ellesmere and flow of water in springs and tributaries flowing into Te Waihora/Lake Ellesmere and achieve, in combination with non regulatory interventions, the freshwater outcomes for the catchment.

Table 11(k)

- 197 Table 11(k) set out limits for rivers. Fonterra’s submission opposes the limits for “Hill-fed- lower” rivers on the basis that the Selwyn River comes within that classification and does not meet the nitrate-nitrogen target (in fact it would require a 50% reduction in nitrate to comply).
- 198 The submission states that the inability to meet the target is because, below SH1, the Selwyn River is dominated by groundwater inputs. The submission seeks that Table 11(k) be amended so that the nitrate limit for the Hill-fed-lower rivers correspond with the 80% level of protection rather than the 95% percentile as proposed. That would mean a median of 6.9 mg/L and a 95th percentile of 9.8 mg/L.
- 199 The issue is explained in more detail in Ms Hayward’s evidence and is not repeated here. I do note, however, that:
- 199.1 The change would apply the same limit to the Selwyn River as applies to spring-fed plains rivers;
- 199.2 The change (as I propose it) would not affect any river other than the Selwyn; and
- 199.3 The limit is at, but not below, the bottom line set by the NPS-FM.
- 200 For those reasons, and for the reasons set out in Ms Hayward’s evidence, I support Fonterra’s amendment and propose that the change be made to Table 11(k) as shown in Appendix 1.

MONITORING, REPORTING AND ADAPTIVE MANAGEMENT

- 201 Ms Hayward notes in her evidence that Fonterra and DairyNZ generally support the outcomes and targets set in the Variation, and agrees that, on the whole, they represent the best information available based on current knowledge and modelling techniques. However, Ms Hayward also notes that there is still a lot that is not

fully understood about ground and surface water interactions and the flow of nutrients throughout the Selwyn Waihora catchment.

- 202 On that basis, I support the Fonterra submission where it seeks that Variation 1 include a commitment to monitor the achievement and achievability of the limits and targets and to enhance the accuracy of models used to determine sources and loads of contaminants. Better, more reliable and accurate modelling and monitoring may yield information that points to the need for limits and targets to be revised over time.
- 203 In my opinion this is a classic situation where adaptive management is required. That is, limits and targets are set on best available information, effectiveness and appropriateness of limits is kept under review and adjustments made over time on the basis of greater certainty.
- 204 I would make the same point in regard to the 15kg N/ha/yr allowance that may or may not be taken up depending on land use and farm system choices made by farmers across the catchment over time. Based on the evidence of Ms Hayward I understand that 520 tonnes N/yr has been provided for within the 4830 tonne catchment load (more than has been provided for the CPW scheme). That may be fair and appropriate but the level of uptake must be in some doubt. That is a matter that should be regularly monitored/modelled and reported.
- 205 Similarly, certainty about the amount of reduction required from existing (15kg +) farms to achieve the catchment load will improve over time particularly as the MGM project to completed and consents issues post 2017.
- 206 On that point I note that Section CC of the NPS-FM will require the Council to account for allocation against limits by August 2016.
- 207 For those reasons and to give stakeholder confidence that uncertainty will be reduced over time, and any justifiable "corrections" to limits and targets made, I propose a new and additional policy. That policy would state:

Monitoring and adaptive management

11.4.36 Ensure decision-making is based on the best available information by:

- a) continually improving monitoring and modelling systems enabling accurate, reliable and transparent water accounting of allocation relative to limits; and

- b) revising and updating limits and targets over time on the basis on improving catchment modelling and water accounting.
- c) reviewing catchment limits and targets (and reductions required to reach targets) following the release of improved quantification of good management practice nitrogen and phosphorus loss rates.

Dated: 29 August 2014

Gerard Matthew Willis

ATTACHMENT 1

Amendments to Policies

- 11.4.1 Manage water abstraction and discharge of contaminants within the entire Selwyn Waihora catchment to avoid significant cumulative adverse effects on the water quality of Te Waihora/Lake Ellesmere and flow of water in springs and tributaries flowing into Te Waihora/Lake Ellesmere and achieve, in combination with non regulatory interventions, the freshwater outcomes for the catchment.
- 11.4.12 Reduce discharges of nitrogen, phosphorus, sediment and microbial contaminants from farming activities in the catchment by requiring farming activities to:
- (aa) Before 1 January 2017 not exceed the highest annual (30 June to 1 July) nitrogen loss modelled for that property over the period July 1 2009 to 30 June 2013 where a property's nitrogen loss calculation is more than 15 kg of nitrogen per hectare per annum; and
- (a) After 1 January 2017 ~~Not~~ exceed the nitrogen baseline where a property's nitrogen loss calculation is more than 15 kg of nitrogen per hectare per annum; and
- (b) Implement the practices set out in Schedule 24; and
- (c) Implement a Farm Environment Plan prepared in accordance with Schedule 7 Part A, from 1 July 2015, when a property is greater than 10 hectares and is within the Lake Area in the Cultural Landscape/Values Management Area; and
- (d) Exclude stock from drains, in addition to the regional requirements to exclude stock from lakes, rivers and wetlands.
- 11.4.13 From 1 January 2017, ~~further~~ reduce discharges of nitrogen, phosphorus, sediment and microbial contaminants from farming activities in the catchment by requiring farming activities to:
- (a) Implement a Farm Environment Plan prepared in accordance with Schedule 7 Part A, where a property is greater than 50 hectares; and
- (b) Where a property's nitrogen loss calculation is greater than 15kg of nitrogen per hectare per annum achieve a rate of nitrogen and phosphorus loss that is consistent with good management practice for the farming activity taking into account the circumstances applicable to each property ~~meet the Good~~

~~Management Practice Nitrogen and Phosphorus Loss Rates for the property's baseline land use.~~

11.4.14 From 1 January 2022, to achieve the water quality limits in Section 11.7.3 require farming activities to:

(a) Implement a Farm Environment Plan prepared in accordance with Schedule 7 Part A, where a property is greater than 20 hectares;

(aa) collectively reduce nitrogen loss rate across the Selwyn Waihora catchment by 14%; and

(b) Where a property's nitrogen loss calculation is greater than 15 kg of nitrogen per hectare per annum, make the ~~following further~~ percentage reductions in nitrogen loss rates set out in Section 11.7A (~~, beyond those set out in Policy 11.4.13(b),~~) to achieve the catchment target for farming activities in Table 11(i)

~~i. 30% for dairy~~

~~ii. 22% for dairy support; or~~

~~iii. 20% for pigs; or~~

~~iv. 13% for irrigated sheep, beef or deer; or~~

~~v. 10% for dryland sheep and beef; or~~

~~vi. 7% for arable; or~~

~~vii. 5% for fruit, viticulture or vegetables; or~~

~~viii. 0% for any other land use.~~

11.4.15 In circumstances where the reductions required in Policy 11.4.14(b) are unable to be achieved by 2022, any extension of time to achieve the reductions will be considered having regard to:

(a) The implications on achieving the catchment nitrogen targets in Table 11(i) by 2037; and

(b) The nature of any proposed steps to achieve the reduction; and

(c) The sequencing, measurability and enforceability of any steps; and

- (d) The nitrogen baseline for the property and the level of any reductions achieved from that baseline; and
- (e) Any natural or physical constraints to lower nitrogen leaching faced on-farm that are outside of a farmer's control; and
- (f) The level of investment in farm infrastructure and where a farm might be in the cycle of infrastructure replacement; and
- (g) The capital and operational costs of making reductions and the benefit (in terms of maintaining a farm's financial sustainability) of spreading that investment over time.

11.4.28 Protect the ecological and cultural health of the Waikirkiri/Selwyn River and lowland streams by including the minimum flow and partial restrictions in Table 11 (c) and (d) on new and replacement resource consents from 2025 unless surface water flows have not increased as expected by that time.

New and additional policy

Monitoring and adaptive management

11.4.36 Ensure decision-making is based on the best available information by:

- a) continually improving monitoring and modelling systems enabling accurate, reliable and transparent water accounting of allocation relative to limits;
- b) revising and updating limits and targets over time on the basis on improving catchment modelling and water accounting; and
- c) Reviewing catchment limits and targets (and reductions required to reach targets) following the release of improved quantification of good management practice nitrogen and phosphorus loss rates.

Amendments to Rules

11.5.7 Until 1 January 2017 the use of land for a farming activity in the Selwyn Waihora catchment is a permitted activity provided the following conditions are met:

- 1 The nitrogen loss calculation for the property does not exceed 15 kg per hectare per annum; or
- 2 The nitrogen loss calculation for the property is greater than 15 kg per hectare per annum and the nitrogen loss calculation for the

property or farm enterprise will not increase above the ~~nitrogen baseline~~ highest annual (30 June to 1 July) nitrogen loss modelled for the property over the period July 1 2009 to 30 June 2013; and

- 3 The Practices in Schedule 24 are being implemented and the information required is recorded in accordance with Schedule 24, and supplied to Canterbury Regional Council on request; and
- 4 From 1 July 2015, for properties within the Lake Area in the Cultural Landscape/Values Management Area a Farm Environment Plan has been prepared and implemented in accordance with Schedule 7 Part A for all properties greater than 10 hectares.

11.5.9 From 1 January 2017, the use of land for a farming activity in the Selwyn Waihora catchment is a restricted discretionary activity, provided the following conditions are met:

1. The nitrogen loss calculation for the property is greater than 15 kg per hectare per annum; and
2. A Farm Environment Plan has been prepared in accordance with Schedule 7 Part A; and
3. The nitrogen loss calculation for the property has not increased above the nitrogen baseline. The exercise of discretion is restricted to the following matters:
 1. The quality of, compliance with the Farm Environment Plan; and
 2. *The Good Management Practice Nitrogen and Phosphorus Loss Rates maximum nitrogen loss rate to be applied to the property in accordance with Policy 11.4.13(b); and*
 3. The nitrogen loss rates to be applied to the property in accordance with Policy 11.4.14 (b), Policy 11.4.15 and Policy 11.4.16; and
 4. The nitrogen load target for farming activities in Table 11(i); and
 5. The potential benefits of the activity to the applicant, the community and the environment.

~~11.5.21 Within the Selwyn Waihora catchment Regional Rule 5.77 shall include the following additional condition:~~

- ~~1. The discharge is not within the Lake Area in the Cultural Landscape/Values Management Area.~~

~~11.5.28 Within the Selwyn Waihora catchment Regional Rule 5.95(2) and 5.96(2) shall include the following additional condition:~~

~~1. The discharge is not within the Lake Area in the Cultural Landscape/Values Management Area.~~

11.5.33 ~~Despite~~ Unless Rule 11.5.32 applies the taking of groundwater within the Selwyn Waihora catchment and including all areas within the Little Rakaia Combined Surface and Groundwater Allocation Zone is a restricted activity provided the following conditions are met.

Amendment to Schedule 24

(e) Collected Animal Effluent:

(i) All collection, storage and treatment systems for animal effluent installed or replaced after 1 January 2014 meet the Dairy NZ Farm Dairy Effluent Design Standard and Code of Practice [2013].

(ii) The animal effluent disposal system application separation distances, depth, uniformity and intensity are self-checked annually in accordance with Section 4 'Land Application' in the Dairy NZ ~~Dairy Effluent Design Standard and Code of Practice [2013]~~ guideline "A Farmers Guide to Managing Farm Dairy Effluent – A Good Practice Guide for Land Application Systems" [2013].

Records of self-checked animal effluent disposal system application separation distances, depth, uniformity and intensity in accordance with Section 4 'Land Application' in the Dairy NZ Farm Dairy Effluent Design Standard [2013] are kept and provided to the Canterbury Regional Council upon request.

New definition

Modelled for the purposes of Rule 11.5.7 means calculated using OVERSEER™ or equivalent model approved by the Chief Executive of Environment Canterbury. If OVERSEER™ is update the most recent version is to be used.

Table 11(k) – Limits for Lakes

River type	Type	Measurement	Limit
Alpine - upland	Nitrate toxicity	Annual median	1.0
		Annual 95 th percentile	1.5
Hill-fed – upland (<u>excluding the</u>	Nitrate toxicity	Annual median	1.0

<u>Selwyn River below SH1)</u>		Annual 95 th percentile	1.5
Hill-fed - lower	Nitrate toxicity	Annual median	2.4
		Annual 95 th percentile	3.5
Banks Peninsula	Nitrate toxicity	Annual median	1.0
		Annual 95 th percentile	1.5
Spring-fed – plains (including the <u>Selwyn River below SH1)</u>	Nitrate toxicity	Annual median	6.9
		Annual 95 th percentile	9.8

ATTACHMENT 2

Dear

National Policy Statement for Freshwater Management, 2014

The National Policy Statement for Freshwater Management 2014 (NPS-FM 2014) takes effect on 1 August 2014. It requires regional councils to use attribute tables in Appendix 2 to set freshwater objectives in their regional plans. We understand that a footnote to the table for attributes for total nitrogen (page 25 of the NPS-FM) has raised concerns as to whether or not the NPS-FM 2014 applies to “intermittently closing and opening lagoons” (ICOLs).

As you are aware, the current water quality attributes established under the NPS-FM 2014 are the first step in establishing attributes for ecosystem health and human health for all freshwater bodies. The current attribute tables for lakes are not intended to apply to ICOLs and were developed on the basis that they do not apply to ICOLs.

Under the Resource Management Act 1991 (RMA), “fresh water” is defined as all water except coastal and geothermal water, and “coastal water” is defined broadly as all seawater (with or without a substantial freshwater component).

Under the NPS-FM 2014, regional councils have the discretion to determine which water bodies are included in each freshwater management unit, and there is only a requirement to ensure that all freshwater bodies within a region are included in a freshwater management unit.

The Minister for the Environment sees merit in making clarifying changes to the NPS-FM 2014 to remove any remaining uncertainty, and is considering potentially doing so alongside the current amendment process for adding infrastructure to Appendix 3 of the NPS-FM 2014.

It has been our intention to consider developing attributes for ICOLs that are managed as freshwater bodies as a further stage of the NPS-FM 2014. If appropriate attributes are able to be developed, they could be consulted on as part of an amendment to the NPS-FM 2014. Initial advice suggests that the attributes for human health and ammonia toxicity as set out in the NPS-FM 2014 are likely to remain unchanged for ICOLs.

Why are we writing to you?

Under section 46(a) of the RMA, on behalf of the Minister for the Environment, we are seeking your comments on this potential change to the NPS-FM 2014 and are interested in any information you have on ICOLs in your region.

Officials will liaise with relevant staff from your council to find out the best way to hear their views and answer any questions about the contents of this letter.

We would appreciate any comments by 10 September 2014.

What happens next?

If the Minister decides to proceed with an amendment, there will be public consultation in accordance with the RMA. If you have any questions, please call Barry Johnson, Manager, NPS-FM amendment team on (04) 439 7769 or barry.johnson@mfe.govt.nz.



Yours sincerely

Guy Beatson
Deputy Secretary, Resources Policy Division

APPENDIX 3

4.0 LAND APPLICATION

All land application systems must be designed to uniformly spread the FDE to the desired depth, and at the desired intensity, according to the standards in Sections 4.1-4.8, so that:

- contamination of groundwater and surface water bodies is minimised, and
- the beneficial use of nutrients for plant growth is maximised.

4.1 Application Area(s)

Land application systems must control FDE application to within the boundaries of a defined application area.

The minimum area of land to be used for the application of FDE must be based on:

- local regulatory requirements for nutrient loading (i.e. kg N/ha), and
- a nutrient budget.

The most stringent of these (i.e. the one requiring the largest area) must be used as a minimum size for the application area.

If solids separation is used, both the liquid and solid components of FDE must be considered separately when calculating land application area.

FDE solids should not be applied to areas with a ground slope of >7 degrees

4.2 Separation Distances

The design must ensure minimum separation distances required by local regulations are met.

In addition, all practicable steps should be taken to ensure FDE does not move outside the target application area or otherwise impact sensitive areas.

The following guidelines may be used. FDE should not be applied to land within:

- 45 m of the milking area, milk receiving area, milk storage area, and milk collection point
- 20 m of any surface water body for ground slope <3 degrees
- 30 m of surface water body for ground slopes of 3-5 degrees
- 90 m of any surface water body for ground slopes of 5-6 degrees
- 90 m of any water supply used for human consumption
- 90 m of public roads
- 90 m of property boundaries, and
- 90 m of dwellings or public use areas.

4.3 Application Depth

The maximum FDE application depth is determined by soil hydraulic properties and nutrient loading calculations, and must:

- account for local climate, the potential for periods of high soil moisture levels and periods of limited staff availability (e.g. calving)
- meet the criteria in Table 1 in at least 9 out of every 10 years, based on a statistical analysis
- account for the application uniformity of the chosen land application method, and
- comply with all local regulations.

4.4 Application Uniformity

All liquid FDE land application systems must achieve a DU_{uq} (as defined in the accompanying *FDE Design Code of Practice 2013*) of no greater than 1.25.

If DU_{uq} information is not available, a design may use the low quartile equivalent, in which case DU_{lq} must be no less than 0.80.

4.5 Application Intensity

For sloping land ($>7^\circ$) or other areas identified as high risk, the instantaneous application intensity of the land application system must not exceed the expected infiltration rate of the soil based on the best available information.

For all other situations, the average application intensity of the land application system must not exceed the expected infiltration rate of the soil based on the best available information.

4.6 General Hydraulic Design

The hydraulic design of FDE systems must take into consideration the physical and chemical properties of FDE, which may differ from clean water. The hydraulic design standards presented in this section apply broadly to all components of the FDE system, including drains, pipes, pumps, storage, and land applicators.

Material Selection

All inlet and conveyance structures must be constructed of corrosion resistant materials, as they may spend long periods of time submerged in potentially corrosive material.

Pipe Friction

Friction losses must be accounted for when designing a FDE system. Appropriate pipe sizes, for mainline and lateral pipes, should be selected that do not result in a friction loss of more than 2.0 m per 100 m of pipe.

Maximum Water Velocity

The maximum pipe water velocity should not result in a friction loss that exceeds the pipe friction standard.

Minimum Water Velocity

All pipes and open channels should achieve an average operating water velocity of ≥ 0.8 m/s, to ensure that solids do not settle and cause blockages.

Pressure Variation

The FDE land application system must be designed to apply within $\pm 10\%$ of target applied depth with acceptable uniformity and application intensity in any location. In general the total pressure at the applicator(s) should not vary by more than 20% of the design operating pressure at any point in the system.

Provision must be made for pressure measurement at both the pump and the applicator (ie either at the effluent irrigator or at the sprinklers depending on the applicator used).

Flow Control

All flow through the system must stop when the system is shut down for any reason. For systems with mainline running downhill from the liquid FDE storage facility, measures must be put in place to prevent the unintended:

- siphoning of the storage, and
- drainage of the main pipeline.

Flushing

Consider facility to allow the FDE conveyance system to be flushed with clean water. This will include collection as well as distribution infrastructure. Note when connecting to a fresh water supply that back flow prevention must be accommodated (see section 4.8).

4.7 Pump Motor Efficiency

Minimum Energy Performance Standards (MEPS) are included in AS/NZS 1359.5:2004, which sets out minimum energy performance and labelling of motors in Australia and New Zealand.

4.8 Back-Flow Prevention

The design must ensure that FDE cannot contaminate any fresh water source. Local regulations will dictate the type of back-flow prevention necessary.

In the absence of local regulation, an effective back-flow prevention device must be used if the FDE system is to be hydraulically connected to a freshwater source. This includes systems where FDE is injected into freshwater irrigation systems connected to a groundwater supply or surface water source.