

**IN THE MATTER**

of the Resource Management Act 1991

**AND**

**IN THE MATTER**

of the proposed Variation 2 to the Proposed  
Canterbury Land and Water Regional Plan -  
Section 13 Ashburton

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**MEMORANDUM OF COUNSEL FOR DAIRYNZ LIMITED AND FONTERRA CO-  
OPERATIVE GROUP LIMITED IN RELATION TO MATTERS RAISED BY THE  
COMMISSIONERS AT THE HEARING**

**25 JUNE 2015**

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## MAY IT PLEASE THE COMMISSIONERS:

### Introduction

1. This memorandum provides supplementary information in relation to the scope of certain matters raised by DairyNZ Limited ("**DairyNZ**") and Fonterra Co-operative Group Limited ("**Fonterra**") (together, "**the submitters**"), following the queries raised by the Commissioners at the hearing of Variation 2 to the proposed Canterbury Land and Water Regional Plan ("**Variation 2**").
2. As discussed at the hearing, in terms of whether there is jurisdiction for the Council to consider the inclusion of the relief sought, to be fairly regarded as being "on" a variation, submissions must address the extent to which the variation changes the pre-existing status quo; and must adequately inform and offer a real opportunity for participation to those who are potentially affected.<sup>1</sup>

### Purpose

3. This memorandum addresses the submitters' scope in relation to:
  - (a) the proposed two-tier flexibility cap; and
  - (b) the application of a 36% reduction to "dairy support" farms.
4. This memorandum also:
  - (a) confirms that the final relief sought by DairyNZ and Fonterra to Variation 2 is as per the marked-up provisions provided as Appendix 2 to the evidence of Mr Willis for DairyNZ and Fonterra, dated 15 May 2015;
  - (b) includes a statement of clarification at **Appendix 1** from Mr Mark Neal in relation to his response to a question asked by Commissioner van Voorthuysen in respect of irrigation; and
  - (c) includes, as requested, a signed and confirmed copy of the evidence of Dr Brian Bell at **Appendix 2**, in lieu of Dr Bell appearing in person.

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<sup>1</sup> *Clearwater Resort v Christchurch City Council* HC Christchurch AP 34/02, 14 March 2003 ("**Clearwater**"); *Palmerston North City Council v Motor Machinists* [2013] NZHC 1290 ("**Motor Machinists**").

## Supplementary information in relation to scope

### *Scope for capped flexibility*

5. The submitters' proposed solution includes a two-tier flexibility cap in the context of nitrogen discharge reductions.<sup>2</sup> The concept of a flexibility cap was proposed in the primary submissions of the Hinds Plains Land and Water Partnership, Federated Farmers Combined Canterbury Branch and Rangitata Diversion Race Management Limited (together, "**the primary submitters**"),<sup>3</sup> in the following terms:
- (a) Delete condition 1 of Rule 13.5.9 and provide an appropriate flexibility threshold.<sup>4</sup>
  - (b) Delete Part 1 of Rule 13.5.10 and provide an appropriate flexibility threshold, below which farm enterprises can change land use as a discretionary activity, to enable flexibility of land use within the Upper Plains area. Amend the discharge cap accordingly.<sup>5</sup>
  - (c) Amend Policy 13.4.11 to provide an appropriate flexibility threshold, below which farmers can change land uses as a permitted activity, to enable flexibility of land use within the Upper Plains area. Amend the discharge cap to enable appropriate flexibility of land use.<sup>6</sup>
  - (d) Amend Variation to provide for a flexibility cap (similar to South Canterbury Coastal Streams proposal) and include in Rule 13.5.15. Any consequential amendments.<sup>7</sup>

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<sup>2</sup> This is set out in the primary evidence of Mr Willis. Specifically, "low" leaching farms can increase their nitrogen discharges up to a 15kg N/ha/yr "Tier 1 flexibility cap" as a permitted activity; and "medium" leaching farms (leaching between 15 and 20kg N/ha/yr) can increase their discharges up to a 20kg N/ha/yr "Tier 2 flexibility cap" (although not past a cumulative increase exceeding 17 tonnes) as a restricted discretionary activity.

<sup>3</sup> We note that other submitters (Te Runanga o Arowhenua & Te Runanga o Ngai Tahu, Ballance Agri-Nutrients Limited, Ravensdown Fertiliser Co-operative Ltd etc) also sought a similar flexibility cap in their submissions. However, DairyNZ and Fonterra's scope is provided through their further submissions on the primary submitters listed.

<sup>4</sup> Federated Farmers Combined Canterbury Branch submission V2 pLWRP-313; Eiffelton Community Group Irrigation Scheme V2 pLWWP-1289.

<sup>5</sup> Federated Farmers Combined Canterbury Branch submission V2 pLWRP-314.

<sup>6</sup> Federated Farmers Combined Canterbury Branch submission V2 pLWRP-283. We note that in the Summary of Decisions Requested Report this submission point refers to Policy 13.4.12 - this should read Policy 13.4.11, as per the submission.

<sup>7</sup> Hinds Plains Land and Water Partnership primary submission V2 pLWRP-322.

- (e) Amend Variation to provide for a flexibility cap (similar to South Canterbury Coastal Streams proposal) and include in Rule 13.5.16. Any consequential amendments.<sup>8</sup>
6. The submitters supported the primary submitters' relief in relation to the proposed flexibility cap in their further submissions.<sup>9</sup>
7. We say that the primary submitters' relief on the proposed provisions relating to the flexibility cap provides sufficient scope for DairyNZ and Fonterra's proposed new Policy 13.4.13(b)<sup>10</sup> (set out in Appendix 2 to Mr Willis' evidence) for the following reasons:
- (a) The primary submitters' relief refers to the *South Canterbury Coastal Streams* proposal, which provides for catchment-based flexibility caps of 10 or 15, increasing to 17 kg N/ha/year over time,<sup>11</sup> meaning there was a base for the flexibility cap "numbers", which were then further refined in evidence.
- (b) The flexibility cap request was not made in complete isolation from numbers, as in their submissions the Upper Plains position is compared with the Lower Plains position (ie allowing intensification up to a discharge of 27 kg N/ha/year).<sup>12</sup>
- (c) The flexibility cap can be seen as a compromise position in relation to the primary submitters' seeking the deletion of condition 1 of Rule 13.5.9 (or the deletion of the requirement for adherence to the N baseline).
8. In respect of Policy 13.4.13(a), the inclusion of (i) to (vii) are broadly consistent with DairyNZ and Fonterra's submissions on Policy 13.4.13.<sup>13</sup> In their submissions, new wording was proposed to be included in the policy (specifically, in 13.4.13(c)(B)) setting out matters to be considered

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<sup>8</sup> Hinds Plains Land and Water Partnership primary submission V2 pLWRP-324.  
<sup>9</sup> Further submission by Fonterra Co-operative Group Limited, C15C/10476-02; further submission by DairyNZ Limited; C15C/10541-02. We note that in their further submissions the submitters specifically focused on the amendments sought to the rules to provide for the flexibility cap. The amendments to the associated policies are necessary consequential changes and, as such, we say the submitters have sufficient scope in this respect.

<sup>10</sup> And the associated amendments to Rules 13.5.16 and 13.5.17.  
<sup>11</sup> Refer to the South Coastal Canterbury ZIP Addendum, September 2014, at pages 8, 11 and 22-23 (Appendix 2), which outlines the flexibility cap proposal and suggested numbers.

<sup>12</sup> Federated Farmers Combined Canterbury Branch primary submission V2 pLWRP-283, refer also to section 2 on page 3 and the reasons provided on page 6 of the submission.

<sup>13</sup> DairyNZ primary submission V2 pLWRP-559; and Fonterra primary submission V2 pLWRP-779.

in determining resource consent applications. These included matters relevant to determining what "good management practice" would be on the subject property.

9. Some amendment to the wording set out in those submissions was proposed in Mr Willis' primary evidence in light of the Commissioners' decision on Variation 1, where similar matters were considered (and where Dairy NZ and Fonterra had sought the same relief). However, the nature of the relevant matters at the time of any resource consent application are consistent with those proposed in DairyNZ and Fonterra's submissions. For example:
  - (a) the drainage characteristics of the soil and the climatic conditions and topography (matters (a)(ii) and (iii) of the policy proposed by Mr Willis) are within the scope of the wording sought in the submissions (ie "Any natural or physical constraints to lower nitrogen leaching faced on-farm that are outside of a farmer's control"); and
  - (b) the nitrogen baseline for the property and the level of any enduring reduction (matter (vi)) of the policy proposed by Mr Willis) is comparable to matter (B)(i) as sought in DairyNZ and Fonterra's submissions.
10. Other minor consequential changes were made to the relief sought to provide clearer guidance for users of the proposed LWRP in light of other parts of Variation 2 and/or other parts of DairyNZ and Fonterra's submissions.
11. In terms of the jurisdiction of the Council to consider the inclusion of the relief sought, we submit that the proposed relief:
  - (a) *Squarely addressed the extent to which Variation 2 changes the pre-existing status quo* - the flexibility cap was sought to be included in the relevant provisions which, as notified, set the activity status for farming activities based on their nitrogen loss calculations being less or greater than 20 kg N/ha/yr. The flexibility cap retains the nitrogen loss calculation approach (ie the change to the pre-existing status quo), but seeks to provide additional flexibility up to the 20 kg N/ha/yr for low and medium leaching farms.

- (b) *Adequately informed and offered those potentially affected a real opportunity for participation in the variation process* - the submissions that sought to include a flexibility cap, as above, put those potentially affected on notice of the flexibility cap notion, allowing them to make further submissions.<sup>14</sup> Further:
- (i) While the specific flexibility cap "tiers" were provided in evidence (following refinement between the primary sector groups for clarity and workability), in their primary submissions, the primary submitters made reference to the *South Canterbury Coastal Streams* proposal (and impliedly the numbers within that proposal) and made the submission in the context of comparing the Upper and Lower Hinds Plains "numbers".
  - (ii) The "mischief" sought to be addressed in *Clearwater* and *Motor Machinists* is where those potentially affected are denied an effective response in the variation process to additional amendments. This would apply to:
    - (aa) submissions simply seeking the deletion of certain provisions, and then alternative provisions being provided at the hearing; and
    - (bb) submissions reserving parties' positions or stating that provisions may not be appropriate and require further assessment, and then alternative provisions being provided at the hearing.
  - (iii) We say that the relief sought by the primary submitters appropriately foreshadowed the introduction of the flexibility cap "numbers", putting those potentially affected on adequate notice such that they could make further submissions, and that the specific "tiers" presented in evidence simply provide a refined,

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<sup>14</sup> And further submissions on the flexibility cap concept were made by DairyNZ, Fonterra, the Central South Island Fish and Game Council and others.

workable and flexible approach to the notified provisions.

- (iv) In any event, submitters would likely fall into two camps - those who want the capped flexibility, and those who are interested in the environmental outcomes. In that regard:
  - (aa) as made clear in Mr Willis' evidence,<sup>15</sup> the flexibility cap approach in fact benefits those "potentially affected" by sharing the reduction requirements in a more equitable, even-handed manner; and
  - (bb) there is no prejudice caused by the capped flexibility to those who are interested in the environmental outcome, because the submitters' proposed solution (including the capped flexibility) will provide the same environmental outcome by the same time.

*Scope for the 36% percentage reduction for dairy and dairy support farms*

- 12. The second area relates to the submitters' proposed 36% reduction in N discharges from dairy and dairy support farms.
- 13. By way of background:
  - (a) As notified, Variation 2 proposed a 45% reduction requirement for dairy farms and a 25% reduction requirement for dairy support farms.
  - (b) DairyNZ and Fonterra's primary submissions sought activity neutral reductions at a level of 30%.<sup>16</sup>
  - (c) DairyNZ and Fonterra's proposed solution in evidence proposes activity neutral nitrogen reductions at 36% for all farms discharging above 20kg N/ha/yr. The increase to 36% reductions came about through further modelling work undertaken by DairyNZ and Fonterra, following the primary submission stage.

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<sup>15</sup> Evidence in Chief of Mr Willis for DairyNZ and Fonterra, 15 May 2015, from 12.5.

<sup>16</sup> DairyNZ primary submission points V2 pLWRP-542, 550; Fonterra primary submission points V2 pLWRP-739, 759.

- (d) The submitters' relief now seeks:
- (i) a reduction of 36% for dairy farming, compared to 45% as notified (this is clearly within scope as it remains less than what was notified, and is not considered further); and
  - (ii) a reduction of 36% for dairy support activities, compared to 25% as notified and 30% as sought in the primary submissions by Fonterra and DairyNZ.

14. Applying the *Clearwater* test to the relief sought in respect of the dairy support activities:

- (a) in respect of the first limb, a proposed reduction for N discharges from dairy support farms is clearly on the Variation; a control for such was notified, and the only difference now being sought is a slightly greater reduction - in terms of *Clearwater*, the proposal came neither "from left field" nor was it something "completely novel";<sup>17</sup>
- (b) as for the second limb, the question is whether those potentially affected would have been adequately informed and offered a real opportunity for participation; or, to put it another way, are there potential submitters who would have lodged a further submission had the primary submission sought a 36% reduction rather than a 30% reduction, but did not. In our respectful submission:
  - (i) The proposed increased reduction to 36% will not cause any prejudice because any submitter who might be interested in a requirement to reduce N discharges by 36% would equally have been interested in any requirement to reduce by 30% and therefore would have lodged a further submission.

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<sup>17</sup> *Clearwater Resort v Christchurch City Council* HC Christchurch AP 34/02, 14 March 2003, at [69].



- (ii) The situation in this case is, with respect, quite different to one where a party might not have thought they were affected at all.<sup>18</sup>
  - (iii) The proposed relief seeking 36% reduction has not undermined "robust, notified, and informed public participation in the evaluative and determinative process",<sup>19</sup> and nor would this relief (compared to the clearly notified 30% reduction) represent the "submissional side-wind" of concern in *Motor Machinists*.<sup>20</sup>
  - (iv) While recognising that, irrespective of the merits of a proposal, there must be jurisdiction to hear a submission, in this case the proposed merger of dairy farming and dairy support into one category (with a combined N loss reduction of 36%) will better meet the objectives of the LWRP and the purpose of the Variation. In particular, having the same reduction percentage for both activities avoids the (almost insurmountable) enforcement difficulties associated with endeavouring to define "dairy support" and to then separate out dairy support from dairy farming. The proposed relief will promote the purpose of the Act.
15. Finally, and without losing sight of the importance of primary submissions clearly setting out relief so that the interests of potentially affected parties are not prejudiced without them given the opportunity to join, care must be taken not to set the bar too high. This is particularly so when - as in this case - planning processes are being completed within increasingly tight timeframes, exacerbated by the need for submitters to obtain technical evidence to support their relief. The Council, as the proponent of the water quality variations throughout Canterbury, has had a lengthy period of time to develop the provisions, and carefully justify the rules being sought. However, submitters in this and the related processes (Variation 1 and 3) have not had the luxury of being in control of the timing of the process. It will be inevitable that thinking will develop as technical work is completed and as submitters compare notes and test

<sup>18</sup> *Halswater Holdings Ltd v Selwyn District Council* (1999) 5 ELRNZ 192 (EC), where there was no suggestion that there was to be any rezoning of land.

<sup>19</sup> *Palmerston North City Council v Motor Machinists* [2013] NZHC 1290, at [77].

<sup>20</sup> At [82].

ideas. Subject to there being jurisdiction (approached in a pragmatic and not overly formalistic manner, and so long as prejudice is not caused to people who would have submitted but did not), the primary focus should, we respectfully submit, be the overall quality of the planning instrument.

**DATED:** 25 June 2015



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**Bal Matheson / Anna McConachy**

Counsel for DairyNZ Limited and Fonterra Co-operative Group Limited

## Appendix 1

### Clarification from Mr Neal on Commissioner van Voorthuysen's question on irrigation

1. I may have misunderstood a question from Commissioner van Voorthuysen. He asked about, I believe, Variable Rate Irrigation ("VRI"), which I misunderstood as variable irrigation. The term variable irrigation is a term used by Overseer, while VRI is a term used by industry to describe a type of precision irrigation technology. The primary difference is the area over which the variation can occur, which for Overseer is management block level, and for precision irrigation is usually sub-paddock level.
2. Variable irrigation in Overseer can refer to variable return period (ie varying the time between irrigations) and variable irrigation depth (the amount of water applied at each irrigation). This is described in detail in Technical Note 7, produced by Overseer, which is available online at <http://overseer.org.nz/files/download/1114459a561b895>. The important point is that the area for which irrigation is varied is the management block in Overseer, which is usually a unit of similar soils and irrigation type.
3. VRI, as typically used by industry, refers to the ability through technology to vary the amount of water applied at small (sub-paddock) units. The benefits depend primarily on the variability of soils, and hence detailed soil testing and sensor networks would be required to realise the potential benefits. A description of this in practice is available at <http://www.landcareresearch.co.nz/publications/newsletters/discovery/discovery-issue-30/variable-rate-irrigation>.
4. I believe Commissioner van Voorthuysen may have had VRI in mind in his question (as it is referred to in the MRB report), but I answered it with variable irrigation (as per Overseer) in mind. I apologise for any confusion resulting from this misunderstanding.



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**Mark Neal**

**25 June 2015**

## **Appendix 2**

### **Dr Bell's signed and confirmed evidence**

**IN THE MATTER**

of the Resource Management Act 1991

**AND**

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of the proposed Variation 2 to the Proposed  
Canterbury Land and Water Regional Plan -  
Section 13 Ashburton

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**STATEMENT OF PRIMARY EVIDENCE OF BRIAN BELL FOR FONTERRA CO-  
OPERATIVE GROUP LIMITED AND DAIRYNZ LIMITED**

**15 MAY 2015**

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## CONTENTS

1. INTRODUCTION.....	1
2. SCOPE OF EVIDENCE .....	2
3. EXECUTIVE SUMMARY .....	3
4. CONTEXT AND ISSUES .....	5
5. DIRECT ECONOMIC IMPACT OF VARIATION 2 .....	8
6. DIRECT ECONOMIC IMPACT OF ALTERNATIVE SOLUTIONS FROM DAIRYNZ/FONTERRA .....	9
7. DISCUSSION.....	10

## 1. INTRODUCTION

1.1 My full name is Brian Albert Bell. I have a Masters in Agricultural Science (Honours) from Lincoln University majoring in natural resource economics and a PhD in environmental economics from Waikato University. I am a Founding Partner and Shareholder Director of Nimmo-Bell & Company Ltd ("**Nimmo-Bell**"), a company providing advisory services related to agribusiness to corporate and government clients within New Zealand and internationally.

### **Qualifications and experience**

1.2 I have over 40 years experience as a natural resource economist and financial analyst, specialising in economic analysis, research, promotion and policy development. I have provided consultancy services to government, industry organisations and corporates on many issues and in particular on challenges related to natural resource management.

1.3 My current interests are centred on the interface between economics and the environment, extending cost benefit analysis ("**CBA**") to quantify environmental and social values using stated preference tools such as discrete choice modelling. My key areas of analysis include estimating dollar values for indigenous biodiversity and assessing the balance between income and environmental outcomes for intensive pastoral systems.

1.4 I have an ongoing interest in developing and applying methodology for natural resource management and R&D evaluation using CBA and risk analysis. Nimmo-Bell has trade marked a framework for quantitative risk analysis called QuRA™, which utilises a risk simulation tool for quantifying uncertainty in project appraisal and financial feasibility.

1.5 I have recently assessed the economic impact of environmental policy change for some of New Zealand's most sensitive waterways, including the Waikato River, Rotorua Lakes, Horizons Region, Tasman District, Southland and Selwyn/Te Waihora.

1.6 I have provided an independent assessment for dairy levy payers of the value that DairyNZ adds by achieving strategic industry targets. This includes an \$80 million investment (2009 – 2015) by DairyNZ leveraged

by a further \$29 million from other investors targeting the programme "farming with environmental limits".

### **Background**

- 1.7 My involvement in the proposed Variation 2 to the Proposed Canterbury Land and Water Regional Plan - Section 13 Ashburton ("**Variation 2**") commenced in November 2014. My role has been to quantify in aggregate the direct benefits and costs to the dairy industry from the adoption of Variation 2 and to compare this with an alternative solution put forward by DairyNZ/Fonterra. In doing this I have worked closely with Mark Neal and Shirley Hayward from DairyNZ in relation to on-farm systems and farm representation, and on scheduling of the nitrogen reductions and background information to Variation 2, respectively. Mr Neal provided the budgets for the representative farms that were the basis for the aggregation of benefits and costs over the 20 year life of the analysis.
- 1.8 I am familiar with the provisions of Variation 2 to which these proceedings relate. In preparing my evidence I have reviewed the relevant parts of the section 32 Report and the section 42A Report.
- 1.9 I have also read the evidence of Mr Neal, Ms Hayward, Dr Brown, Dr Fairgray and Mr Willis.

### **Code of Conduct**

- 1.10 I have read the Code of Conduct for expert witnesses contained in the Environment Court's Practice Note as updated in 2014 and agree to comply with it. In that regard, I confirm that this evidence is within my area of expertise, except where I state that I am relying on the evidence of another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in this evidence. I record that I am a contractor to DairyNZ.

## **2. SCOPE OF EVIDENCE**

- 2.1 In my evidence I have provided an assessment of the aggregate direct benefits and costs to the dairy industry of Variation 2, as proposed by Environment Canterbury. The cashflows of the various options produced by my analysis form the underlying building blocks for the economic



impact analysis undertaken by Dr Fairgray of Market Economics. As such, my work forms the link between the representative farm budget information provided by Mr Neal, and the wider indirect and induced economic impacts at the regional, South Island and national levels generated by Dr Fairgray.

2.2 I have also assessed the same effects with DairyNZ/Fonterra's proposed alternative solution, as set out in the proposed amendments to the rules in Appendix 2 of the evidence of Mr Willis.

2.3 I have reviewed and agree with the evidence of Mr Neal, who has assessed the financial impacts at a farm scale, and Dr Fairgray, who has assessed the wider indirect and induced economic impacts at a regional scale and beyond.

2.4 My evidence is structured as follows:

- (a) Context and issues;
- (b) Direct economic impact of proposed Variation 2;
- (c) Direct economic impact of two alternative solutions from DairyNZ/Fonterra, namely implementation of nitrogen leaching reductions over four stages and three stages; and
- (d) Comparison and discussion of the direct economic impacts between the proposed Variation 2 and DairyNZ/Fonterra solutions.

### **3. EXECUTIVE SUMMARY**

3.1 My evidence forms the link between the representative farm budget information provided by Mr Neal, and the wider indirect and induced economic impacts generated by Dr Fairgray.

3.2 My assessment modelled the direct economic impacts of the proposed Variation 2, and two alternative DairyNZ/Fonterra solutions, firstly as a Four Stage implementation schedule with the same timing as the proposed Variation 2 and secondly assuming a Three Stage implementation schedule, but arriving at the same reduction in nitrogen loss by 2035. My analysis focussed on existing dairy and dairy support

farmers, dry stock farmers converting to dairy, and dairy support farmers intensifying their operations.

- 3.3 A standard quantitative CBA framework was used where cashflows were developed over 20 years and discounted to a Net Present Value ("**NPV**"). In estimating the cashflows I relied on the information provided by DairyNZ, including details of the scheduling of nitrogen restrictions. For the dairy farms the stages for the proposed Variation 2 solution were good management practice ("**GMP**"), -15%, -25%, -35% and -45% and for dairy support GMP, -10%, -15%, -20% and -25%. Under the DairyNZ/Fonterra Four Stage solution the stages were GMP, -9%, -18%, -27% and -36% for both the dairy and dairy support farms and under the Three Stage solution -15%, -25% and -36% at 2025, 2030 and 2035 respectively.
- 3.4 The area currently in dairy (49,089 ha) was divided into free draining soils (represented by seven farms) and poor draining soils (three farms). Intensive dairy wintering support units (11,047 ha) were represented by one farm. Additionally, I modelled the conversion of 5,000 ha of sheep and beef to dairy, the intensification of 10,000 ha of sheep and beef and some dairy support, and a flexibility cap on 22,000 ha for arable/mixed cropping farms on heavier soils.
- 3.5 Mr Neal provided budgets for Variation 2 and I used these to generate budgets for the DairyNZ/Fonterra solutions for each stage for the representative farms, giving a detailed breakdown of Revenue, Expenditure and Earnings before Interest and Tax ("**EBIT**"). These details allowed the wider economic impacts to be assessed by Dr Fairgray. Standard assumptions were used for milksolids ("**MS**") payout, mixed age cow price and Fonterra shares. Budgets for the DairyNZ/Fonterra solutions were interpolated from the Variation 2 budgets.
- 3.6 Results showed the marginal change in the Variation 2 solution for existing dairy and dairy support is \$22m (8% more costly in NPV terms) compared with the marginal change in the DairyNZ/Fonterra Four Stage solution, and \$74m (28% more costly) compared with the Three Stage solution.
- 3.7 Discount rates have a highly significant impact on the results, particularly in the development scenario where the front loading of conversion costs

caused the greatest sensitivity. Modelling shows development from sheep and beef to dairy is marginally economic being negative at 8% discount rate and positive at 5% discount rate.

- 3.8 Under the Variation 2 solution, by 2035 total annual milk solids production on existing dairy and dairy support farms is expected to fall by 16% compared with GMP. Under the DairyNZ/Fonterra solutions production is expected to fall by 13% compared with GMP. The marginal change under the DairyNZ/Fonterra solution is 15% less than the marginal change in the Variation 2 solution.

*Table1: Summary of Results for existing Dairy and Dairy Support comparing Variation 2 (Var2) with DairyNZ/Fonterra (DNZ/F) solutions*

	GMP to Var2 and DNZ/F							
	GMP	Var2			DNZ/F			Marginal change Var2 v DNZ/F
		Solution	Reduction	%change	Solution	Reduction	%change	
NPV EBIT \$m, 8% discount rate								
DNZ/F 4	2,110	1,848	262	-12%	1,870	240	-11%	-8%
DNZ/F 3	2,110	1,848	262	-12%	1,923	188	-9%	-28%
Milk Solids (tonnes)	75,836	63,952	11,885	-16%	65,728	10,108	-13%	-15%
Cow numbers	176,780	150,926	25,854	-15%	154,790	21,990	-12%	-15%
N fertiliser (\$m)	19	9	10	-52%	11	8	-41%	-20%

- 3.9 Significant variation exists among the eleven representative farms used in the analysis. Under average conditions, without severe weather events or price shocks, I consider the adjustments required to achieve the reductions in nitrogen leaching appear achievable with good management. However, it is likely that there will be significant numbers of farmers who will struggle financially and who will find it difficult to adapt their farming systems, particularly those with high levels of debt and those with below average levels of management.

#### 4. CONTEXT AND ISSUES

- 4.1 My assessment modelled the direct economic impacts of Variation 2, as assessed by Mr Neal, on existing dairy and dairy support farmers, dry stock farmers converting to dairy, and dairy support farmers intensifying their operations. It also included analysis of the direct economic impacts on arable/mixed cropping farms on heavier soils from the possible introduction of a flexibility cap on nitrogen leaching (as is being sought by DairyNZ/Fonterra).
- 4.2 My analysis employed a standard quantitative CBA framework where Variation 2 was compared with the status quo situation depicted by budgets assuming GMP. Cashflows were developed over 20 years from 2015/16 to 2034/35 for both situations and discounted to a NPV using the

standard Treasury discount rate of 8% (with a sensitivity analysis on discount rates at 5% and 2%). As the final level of nitrogen reduction was assumed to take place in 2034/35, the longer term impact of this was taken into account by capitalising that cashflow in the following year as a terminal value in the NPV calculation. This analysis was then repeated for the DairyNZ/Fonterra alternative solution.

4.3 In estimating the cashflows I relied on the information provided by DairyNZ. Key input data provided included:

- (a) Details of the scheduling of nitrogen restrictions on existing dairy farms are set out in Table A1 in the Appendix. There are two scenarios: staged and smoothed. Under the Variation 2 staged introduction, it was assumed farmers would delay until the deadline for each stage before making changes. Under a smoothed introduction, it was assumed a straight line introduction between stages. This had the effect of bringing forward the introduction (and hence effects/impact) of the policy and increasing costs over time. For dairy farms (milking platform) the stages are GMP, -15%, -25%, -35% and -45% and for dairy support GMP, -10%, -15%, -20% and -25% achieved at 2020, 2025, 2030 and 2035 respectively. Under the Fonterra/DairyNZ solution two options are modelled. In the first option there are four stages GMP, -9%, -18%, -27% and -36% for both dairy and dairy support for the same time steps as for Variation 2. In the second option there are three stages with implementation of management changes to achieve -15% nitrogen leaching at 2025, -25% at 2030 and -36% at 2035. While I have modelled both the staged and smoothed introduction of both the Variation 2 and DairyNZ/Fonterra solutions, and present the results for both in the **Appendix**, my evidence focuses on the smoothed scenario as that is more likely to be the actual adoption path followed by farmers. The DairyNZ/Fonterra Three Stage solution is modelled assuming a smoothed introduction only.
- (b) Allocation of areas to representative farms: DairyNZ estimate the area in milking platform at 49,089 ha, of which 92% is effective. This was divided into free draining soils (seven farms) and poor draining soils (three farms), based on a percentage of

area basis (details are set out in Table A2 in the **Appendix**). The budgets for each farm were reduced to a per hectare basis then multiplied by the number of hectares relating to each representative farm (e.g. 5,935 ha for Farm 1).

- (c) **Farm Budgets:** Mr Neal provided budgets for each stage for 11 representative farms including one for dairy support units, making 55 budgets in total. Each budget gave details of revenue, expenditure and EBIT (as shown in Table A3 in the **Appendix**) so that the wider economic impacts could be assessed.
- (d) **Standard Assumptions:** The budgets had standardised inputs for MS payout (including Fonterra dividend) at \$6.61/kg MS, mixed age cow price at \$1,653 and Fonterra shares at \$5.62, all the average of the last five years in 2013 prices. Using the average mixed aged cow price was considered reasonable given the small proportion of cows in the region affected with a maximum of -1.7% reduction per year under the Variation 2 smoothed solution. Budgets for the DairyNZ/Fonterra stages were interpolated from the Variation 2 budgets (e.g. the budget for -9% nitrogen leached was a weighted average of the GMP and -15% budget, in the ratio of 60:40).
- (e) In addition to existing dairy farms the analysis for both the Variation 2 and DairyNZ/Fonterra solutions included the conversion of 5,000 ha of sheep and beef to dairy at 1,000 ha per year over 5 years, the intensification of 10,000 ha of sheep and beef and some dairy support at 1,000 ha per year over 10 years, and a flexibility cap for arable/mixed cropping farmers on heavier soils. This scenario (referred to as Tier 1) was for farms leaching less than 15kg nitrogen (17,500 ha in total) that could increase up to 15kg, and the analysis assumed this was fully taken up. The flexibility cap would also apply for properties leaching between 15kg and 20kg (4,500 ha in total) to increase up to 20kg (referred to as Tier 2 farms).

## 5. DIRECT ECONOMIC IMPACT OF VARIATION 2

5.1 My analysis uses the Variation 2 solution discussed in the evidence of Mr Neal. Mr Neal has replaced a number of the input assumptions used by Environment Canterbury to provide a more comprehensive, accurate and realistic model of the overall impacts.<sup>1</sup>

5.2 The key results of the analysis of direct benefits and costs (ie at the aggregate farm level) for the Variation 2 solution over 20 years, estimated in NPV terms at 8% discount rate are as follows (for further details see Table A4 in the Appendix):

(a) Existing dairy farms: Marginal change from GMP to a reduction in nitrogen leaching on the dairy farms by -15%, -25%, -35% and -45% and for dairy support -10%, -15%, -20% and -25% achieved at 2020, 2025, 2030 and 2035 respectively (see Table A1 for details).

- GMP EBIT	\$2,110m
- Marginal change GMP to smoothed EBIT	-\$262m (-12%)

(b) Conversion of 1,000 ha/year sheep and beef to dairy for five years (total 5,000 ha) with increased nitrogen leaching from 18 to 27kg/ha.

- Sheep and beef EBIT at 18kg N leaching	\$27m
- Dairy EBIT at 27kg N leaching	\$115m (+326%)
- Less conversion costs	-\$105m
- Marginal change sheep and beef to dairy	-\$11m
(ie a net loss at a discount rate of 8%)	

(c) Intensification of 1,000 ha/year sheep and beef plus some dairy support for ten years with increased N leaching from 18 to 27kg/ha.

- Sheep and beef EBIT	\$53m
- Marginal change sheep and beef to intensified	\$11m

(d) Flexibility cap for arable/mixed cropping farmers.

- Current EBIT	\$479m
- Marginal change with flexibility cap	\$26m (+5%)

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<sup>1</sup> See the evidence of Mark Neal at paragraph 3.3.

- 5.3 I note that while EBIT is the criteria for assessing GMP profitability, the scenarios that involve changes to capital structure have EBIT adjusted for this.

## 6. DIRECT ECONOMIC IMPACT OF ALTERNATIVE SOLUTIONS FROM DAIRYNZ/FONTERRA

- 6.1 The results of the analysis of direct benefits and costs (ie at the aggregate farm level) for the DairyNZ/Fonterra solutions over 20 years estimated in NPV terms at 8% discount rate are as follows and summarised in Table 2 (for further details see Table A5 in the **Appendix**):

- (a) Existing dairy farms Four Stage: Marginal change from GMP to a reduction in nitrogen leaching on the milking platform and support units -9%, -18%, -27% and -36% achieved at 2020, 2025, 2030 and 2035 respectively (see Table A1 for details of scheduling).

- GMP EBIT	\$2,110m
- Marginal change GMP to smoothed EBIT	-\$240m (-11%)

- (b) Conversion of 1,000 ha/year sheep and beef to dairy for five years (total 5,000 ha) with increased nitrogen leaching from 18 to 27kg/ha.

- Sheep and beef EBIT	\$27m
- Dairy EBIT	\$115m (+326%)
- Less conversion costs	-\$105m
- Marginal change sheep and beef to dairy	-\$11m (-141%)

- (c) Intensification of 1,000 ha/year sheep and beef plus some dairy support for ten years with increased nitrogen leaching from 18 to 27kg/ha.

- Sheep and beef EBIT	\$53m
- Marginal change sheep and beef to intensified	\$11m (+21%)

- (d) Flexibility cap for arable/mixed cropping farmers.

- Current EBIT	\$479m
- Marginal change with flexibility cap	\$26m (+5%)

6.2 Existing dairy farms: Three Stage introduction with marginal change from GMP to a reduction in nitrogen leaching on the milking platform and support units by -15%, -25% and -36% at 2025, 2030 and 2035 respectively (see Table A1 for details of scheduling). Table 2 summarises the results with greater detail provided in Table A6.

- GMP EBIT	\$1923m
- Marginal change GMP to smoothed EBIT	-\$188m (-28%)

6.3 Results for conversions, intensification and flexibility cap are the same as for the Variation 2 and DairyNZ/Fonterra Four Stage solution.

## 7. DISCUSSION

7.1 For existing dairy and dairy support farms, the change in the Variation 2 solution is \$22m (or 8% more costly in NPV terms) compared with the change in the DairyNZ/Fonterra Four Stage solution. If, however, implementation is scheduled over three stages as proposed in the DairyNZ/Fonterra Three Stage solution, the change in the Variation 2 solution is \$74m (or 28% more costly).

7.2 When the changes from conversions, intensification and the flexibility cap are also taken into account, the marginal reduction in EBIT for the Variation 2 solution is \$22m (or 9% greater than DairyNZ/Fonterra's Four Stage solution) (see Table 2). Similarly for the Three Stage solution the marginal reduction in EBIT is \$75m (or 32% greater).

	GMP	Variation 2			DNZ/F 4 Stage			Marginal	DNZ/F 3 Stage			Marginal			
	Total	Total	Reduction	%change	Total	Reduction	%change	Var2 v DNZ/F4	Total	Reduction	%change	Var2 v DNZ/F3			
<b>NPV \$m*</b>	2,110	1,848	-	262	-12%	1,870	-	240	-11%	8%	1,923	-	188	-9%	28%
<b>Existing</b>															
<b>Conv</b>	27	16	-	11	-41%	16	-	11	-41%	-	16	-	11	-41%	-
<b>Int</b>	53	65		11	21%	65		11	21%	-	65		11	21%	-
<b>Flexi</b>	479	504		26	5%	504		26	5%	-	504		26	5%	-
<b>Total</b>	2,668	2,433	-	236	-9%	2,455	-	214	-8%	9%	2,507	-	161	-6%	32%

\* 8% discount rate

7.3 For both the Variation 2 and DairyNZ/Fonterra solutions, I assume farmers adopt a linear approach to transitioning to the required reduction in nitrogen losses, which is 14% more costly in NPV terms compared with adoption at each stage immediately before required. In spite of this, practical considerations mean most farmers will not leave making the changes until the last minute.



- 7.4 Discount rates have a highly significant impact on the results. This is most apparent in the development scenario where the front loading of conversion costs causes the greatest sensitivity (e.g. the marginal change from sheep and beef at 8% discount rate in NPV terms is a net loss of \$11m, and at a 5% discount rate a positive \$46m).
- 7.5 On existing dairy farms, cow numbers decrease from 176,780 at GMP to 150,926 (-15%) under the Variation 2 solution, and to 154,790 under the DairyNZ/Fonterra solution (-12%), a marginal difference between solutions of 2.5%.
- 7.6 Total nitrogen fertiliser use by 2035 under the Variation 2 solution is expected to be 52% less than GMP, while under the DairyNZ/Fonterra solutions the reduction is expected to be 41%.
- 7.7 Under the Variation 2 solution, by year 2035 total annual MS production on existing farms is expected to fall to 64.0m kg MS, -16% compared with GMP at 75.9m kg MS. Under the DairyNZ/Fonterra solutions, total MS production is expected to be 65.7m kg MS, -13% compared with GMP and 3% more than under the Variation 2 solution.
- 7.8 These results assume technology is constant and average economic and physical conditions prevail. In reality there is considerable uncertainty around these and other key variables, such as the absolute level of nitrogen loss as estimated by Overseer under different management and physical conditions. These uncertainties exist for both the Variation 2 and DairyNZ/Fonterra solutions.
- 7.9 Significant variation exists among the eleven representative farms used in the analysis. Farms on lighter soils will be required to make the largest adjustments with consequent negative impacts on EBIT, while other farms on heavier soils may have little or no impact from the policy change. Figure A1 in the **Appendix** highlights these changes by representative farms on a per hectare basis for N fertiliser use, cows, and EBIT.
- 7.10 Under average conditions, without severe weather events or price shocks, I consider the adjustments required to achieve the reductions in nitrogen leaching appear achievable with good management. However, it is likely there will be significant numbers of farmers who will struggle financially and who will find it difficult to adapt their farming systems,

particularly those with high levels of debt and those with below average levels of management, as discussed in the evidence of Mr Neal.

**Dr Brian Bell**

15 May 2015

A handwritten signature in blue ink, appearing to read "B. Bell", with a horizontal line underneath it.

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Dr Brian Bell - confirmed to be a true and correct statement as at 25 June 2015

Appendix

Environment Canterbury: Variation 2 CBA																				
Table A1: Scheduling of Variation 2, DairyNZ Four and Three Stage Solutions																				
Project year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Years beginning 1 June	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35
<b>Variation 2 Solution</b>																				
<b>Milking platform</b>																				
Staged	GMP	GMP	GMP	GMP	-15%	-15%	-15%	-15%	-15%	-25%	-25%	-25%	-25%	-25%	-35%	-35%	-35%	-35%	-35%	-45%
Smoothed (% of total area)																				
GMP	100%	100%	67%	33%																
-15%			33%	67%	100%	80%	60%	40%	20%											
-25%						20%	40%	60%	80%	100%	80%	60%	40%	20%						
-35%											20%	40%	60%	80%	100%	80%	60%	40%	20%	
-45%																20%	40%	60%	80%	100%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
<b>Dairy Support</b>																				
Staged	GMP	GMP	GMP	GMP	-10%	-10%	-10%	-10%	-10%	-15%	-15%	-15%	-15%	-15%	-20%	-20%	-20%	-20%	-20%	-25%
Smoothed (% of total area)																				
GMP	100%	100%	67%	33%																
-10%			33%	67%	100%	80%	60%	40%	20%											
-15%						20%	40%	60%	80%	100%	80%	60%	40%	20%						
-20%											20%	40%	60%	80%	100%	80%	60%	40%	20%	
-25%																20%	40%	60%	80%	100%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
<b>DairyNZ Four Stage Solution</b>																				
<b>Milking platform &amp; Dairy Support</b>																				
Staged	GMP	GMP	GMP	GMP	9%	9%	9%	9%	9%	18%	18%	18%	18%	18%	27%	27%	27%	27%	27%	36%
Smoothed (% of total area)																				
GMP	100%	100%	67%	33%																
-9%			33%	67%	100%	80%	60%	40%	20%											
-18%						20%	40%	60%	80%	100%	80%	60%	40%	20%						
-27%											20%	40%	60%	80%	100%	80%	60%	40%	20%	
-36%																20%	40%	60%	80%	100%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
<b>DairyNZ Three Stage Solution</b>																				
<b>Milking platform &amp; Dairy Support</b>																				
Smoothed (% of total area)																				
GMP	100%	100%	100%	100%	100%	80%	60%	40%	20%											
-15%						20%	40%	60%	80%	100%	80%	60%	40%	20%						
-25%											20%	40%	60%	80%	100%	80%	60%	40%	20%	
-36%																20%	40%	60%	80%	100%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Permitted activity as long as the N loss does not exceed 20 kgN/ha/yr																				

Table A2: Allocation of representative farms

Milking Platform	Free										Poor			Total
	Soils (medium, light to extremely light)										Soils (heavy, deep, poor draining)			
Drainage														
Area in dairying (ha)	41,960										8,772			49,089
% of dairying area (milking platform)	83%										17%			
Number of dairy farms	165										35			200
Individual farm ID	Farm 1	Farm 2	Farm 3	Farm 4	Farm 6	Farm 8	Farm 10	Farm 5	Farm 7	Farm 9				
% representation of farm (area and No.)	13%	5%	13%	13%	13%	13%	13%	4%	4%	9%			100%	
Effective Ha % of area basis	5,935	2,160	5,935	6,062	5,616	5,935	6,318	1,865	1,748	3,799			45,373	
<b>Support units</b>														
Total area (ha)	11,047													
Effective area (ha)	10,163													

Table A3: Example of representative farm budgets

		<b>Farm 1</b>				
N losses per ha	N Leaching DNZ Protocol, kg N/ha	59.0	50.1	44.2	38.3	32.4
N losses	Total N leached, kg	11,083	9,421	8,312	7,204	6,096
	Policy targets: N leached/ha	-	0.15	0.25	0.35	0.45
Farm	Effective Area, ha	175	175	175	175	175
	Stocking Rate	3.7	3.6	3.5	3.3	3.2
Herd	Cow Numbers (1st July)	670	638	623	603	573
	Peak Cows Milked	650	618	603	583	553
Production			32	15	20	30
	Milk Solids total, kg	279,393	265,924	259,276	250,723	237,533
<b>Revenue</b>						
Stock	Net Milk Sales - this season, \$	1,806,553	1,719,461	1,676,478	1,621,178	1,535,890
	Net Milk Sales - last season	-	-	-	-	-
	Net Milk Sales - dividend	-	-	-	-	-
	Net Livestock Sales, \$	80,847	76,336	74,927	71,950	66,290
	Contract Grazing, \$	-	-	-	-	-
	Change in Livestock Value	-	-	-	-	-
	Total	1,887,401	1,795,797	1,751,405	1,693,128	1,602,181
Crop & Feed	Capital Value Change	- 32,598	- 30,611	- 31,730	- 31,768	- 31,193
	Total	- 32,598	- 30,611	- 31,730	- 31,768	- 31,193
<b>Total Revenue</b>		<b>1,854,802</b>	<b>1,765,186</b>	<b>1,719,675</b>	<b>1,661,359</b>	<b>1,570,988</b>
<b>Farm Working Expenses</b>						
Wages	Wages	182,650	182,650	182,650	182,650	182,650
	Management Wage	36,400	36,400	36,400	36,400	36,400
Stock	Animal Health	54,600	51,900	50,615	48,975	46,428
	Breeding	29,250	27,803	27,115	26,237	24,872
	Farm Dairy	14,950	14,211	13,859	13,410	12,712
	Electricity	24,307	23,135	22,557	21,813	20,665
Feed/Crop	Pasture Conserved	6,300	7,700	7,700	8,537	9,724
	Feed Crop	32,400	32,400	32,400	32,400	32,400
	Bought Feed	100,543	74,279	73,644	79,789	64,761
	Calf Feed	3,250	3,089	3,013	2,915	2,764
Grazing	Grazing	312,947	297,726	290,232	281,228	264,649
	Farm Environment Plan (FEP)	2,500	2,500	2,500	2,500	2,500
Other Farm Working	Fertiliser (Excl. N)	118,300	118,300	118,300	118,300	118,300
	Nitrogen	69,783	60,763	53,584	44,677	30,122
	Irrigation	37,275	37,275	37,275	37,275	37,275
	Regrassing	17,500	17,500	17,500	17,500	17,500
	Weed & Pest Control	6,475	6,475	6,475	6,475	6,475
	Vehicle Expenses	34,125	34,125	34,125	34,125	34,125
	R&M Land/Buildings	67,375	67,375	67,375	67,375	67,375
	Freight & Cartage	7,800	7,414	7,231	6,996	6,633
Overheads	Administration Expenses	22,925	22,925	22,925	22,925	22,925
	Insurance	13,300	13,300	13,300	13,300	13,300
	ACC Levies	6,300	6,300	6,300	6,300	6,300
	Rates	11,900	11,900	11,900	11,900	11,900
<b>Total FEW</b>		<b>1,213,155</b>	<b>1,157,446</b>	<b>1,138,975</b>	<b>1,124,003</b>	<b>1,072,755</b>
Net interest change		-	9,014	4,382	5,620	8,694
Depreciation		100,625	100,625	100,625	100,625	100,625
<b>Operating Expenses</b>		<b>1,313,780</b>	<b>1,249,057</b>	<b>1,235,217</b>	<b>1,219,008</b>	<b>1,164,686</b>
<b>EBIT (adjusted)</b>						
		561,654	527,590	500,475	457,037	417,767
EBIT/ha		3,209	3,015	2,860	2,612	2,387
		3,209	3,093	2,968	2,810	2,589

<b>Table A4: Hinds Variation 2 Solution - Results Summary</b>									
(Based on total farm areas)									
<b>Annual change</b>									
<b>Catchment Total</b>						<b>Percent change from GMP</b>			
<b>Reduction in N Leached</b>									
Milking Platform	GMP	-15% NL	-25% NL	-35% NL	-45% NL	-15% NL	-25% NL	-35% NL	-45% NL
Support Units	GMP	-10% NL	-15% NL	-20% NL	-25% NL	-10% NL	-15% NL	-20% NL	-25% NL
<b>Catchment totals</b>									
<b>Area in Dairy</b>		<b>Effective</b>	<b>Total</b>						
Effective Area Sub-total ha		55,536	60,136						
Milking platform ha		45,373	49,089						
Support units ha		10,163	11,047						
<b>Impact over 20 years and beyond</b>									
<b>Net Present Values \$</b>									
Discount rate	2%		5%		8%				
<b>GMP</b>									
Revenue		29,017,762,606	11,551,215,205	7,234,614,215					
Milk Sales		24,733,174,254	9,845,632,221	6,166,394,579					
Operating Expenses		20,554,515,055	8,182,216,874	5,124,584,856					
EBIT		8,463,247,551	3,368,998,331	2,110,029,359					
<b>Marginal Change in NPV of GMP</b>									
						<b>Per cent change</b>			
<b>Staged reduction in NL</b>									
Revenue	-	3,435,720,036	- 1,042,731,001	- 514,267,885					
Milk Sales	-	3,176,426,678	- 961,720,769	- 473,192,032	-12%	-9%	-7%		
Operating Expenses	-	1,764,335,416	- 557,382,707	- 284,775,919	-13%	-10%	-8%		
EBIT	-	1,671,384,619	- 485,348,295	- 229,491,966	-9%	-7%	-6%		
<b>Smoothed reduction in NL</b>									
Revenue	-	3,547,497,685	- 1,126,819,962	- 579,374,792					
Milk Sales	-	3,280,313,046	- 1,039,731,065	- 533,472,012	-12%	-10%	-8%		
Operating Expenses	-	1,816,912,718	- 598,273,618	- 317,448,261	-13%	-11%	-9%		
EBIT	-	1,730,584,968	- 528,546,344	- 261,926,531	-9%	-7%	-6%		
<b>Smoothed - Staged reduction in NL</b>									
Revenue	-	111,777,649	- 84,088,961	- 65,106,907					
Milk Sales	-	103,886,368	- 78,010,296	- 60,279,980	-3%	-8%	-13%		
Operating Expenses	-	52,577,301	- 40,890,911	- 32,672,342	-3%	-8%	-13%		
EBIT	-	59,200,348	- 43,198,050	- 32,434,565	-3%	-7%	-11%		
<b>NPV of Marginal EBIT</b>									
Development		304,555,961	45,897,080	-10,967,408					
Intensification		57,793,802	20,296,577	11,340,741					
Flexi Cap				0					
<b>Combined Marginal EBIT</b>									
Staged	-	1,309,034,857	- 419,154,638	- 229,118,633					
Smoothed	-	1,368,235,205	- 462,352,687	- 261,553,198					
Smoothed - Staged	-	59,200,348	- 43,198,050	- 32,434,565					

**Table A5: Hinds Fonterra / DairyNZ Four Stage Solution - Results Summary**

(Based on total farm areas)

**Annual change**

Catchment Total						Percent change from GMP			
<b>Reduction in N Leached</b>									
Milking Platform	GMP	-9% NL	-18% NL	-27% NL	-36% NL	-9% NL	-18% NL	-27% NL	-36% NL
Support Units	GMP	-9% NL	-18% NL	-27% NL	-36% NL	-9% NL	-18% NL	-27% NL	-36% NL
<b>Existing dairy and dairy support farms</b>									
<b>Area in Dairy</b>		<b>Effective</b>	<b>Total</b>						
Effective Area Sub-total ha		55,536	60,136						
Milking platform ha		45,373	49,089						
Support units ha		10,163	11,047						
Nitrogen Use \$	18,562,871	17,144,603	15,611,238	13,615,329	10,901,076	-8%	-16%	-27%	-41%
Cow Numbers (1st July)	176,780	170,866	165,485	160,747	154,790	-3%	-6%	-9%	-12%
Milk Solids total kg	75,836,325	73,189,188	70,779,554	68,604,977	65,728,144	-3%	-7%	-10%	-13%

**Impact over 20 years and beyond**

	Net Present Values \$		
	2%	5%	8%
Discount rate			
<b>GMP</b>			
Revenue	29,017,762,606	11,551,215,205	7,234,614,215
Milk Sales	24,733,174,254	9,845,632,221	6,166,394,579
Operating Expenses	20,554,515,055	8,182,216,874	5,124,584,856
Operating Profit	8,463,247,551	3,368,998,331	2,110,029,359

**Marginal Change in NPV of GMP****Staged reduction in NL**

	2%	5%	8%
Revenue	- 4,743,094,168	- 1,252,046,699	- 545,449,926
Milk Sales	- 2,627,885,235	- 764,966,690	- 363,339,602
Operating Expenses	- 3,096,058,778	- 799,343,107	- 341,836,587
EBIT	- 1,747,474,608	- 474,560,647	- 211,173,796

**Smoothed reduction in NL**

	2%	5%	8%
Revenue	- 4,946,814,903	- 1,349,512,479	- 610,057,630
Milk Sales	- 2,720,211,540	- 832,272,335	- 413,951,075
Operating Expenses	- 3,144,249,774	- 835,794,990	- 370,217,262
EBIT	- 1,802,565,129	- 513,717,489	- 239,840,369

**Smoothed - Staged reduction in NL**

	2%	5%	8%
Revenue	- 203,720,736	- 97,465,780	- 64,607,704
Milk Sales	- 92,326,306	- 67,305,644	- 50,611,473
Operating Expenses	- 48,190,996	- 36,451,883	- 28,380,674
EBIT	- 55,090,521	- 39,156,842	- 28,666,572

**NPV of Marginal EBIT**

	2%	5%	8%
Development	304,555,961	45,897,080	-10,967,408
Intensification	57,793,802	20,296,577	11,340,741
Flexi Cap	103,052,367	41,022,462	25,692,681

**Combined Marginal EBIT**

	2%	5%	8%
Staged	- 1,282,072,478	- 367,344,528	- 185,107,782
Smoothed	- 1,337,162,999	- 406,501,370	- 213,774,354
Smoothed - Staged	- 55,090,521	- 39,156,842	- 28,666,572

**Per cent change**

	2%	5%	8%
Revenue	-16%	-11%	-8%
Milk Sales	-11%	-8%	-6%
Operating Expenses	-15%	-10%	-7%
EBIT	-21%	-14%	-10%
Revenue	-17%	-12%	-8%
Milk Sales	-11%	-8%	-7%
Operating Expenses	-15%	-10%	-7%
EBIT	-21%	-15%	-11%
Revenue	-4%	-8%	-12%
Milk Sales	-4%	-9%	-14%
Operating Expenses	-2%	-5%	-8%
EBIT	-3%	-8%	-14%

**Table A6: Hinds Fonterra / DairyNZ Three Stage Solution - Results Summary**

(Based on total farm areas)

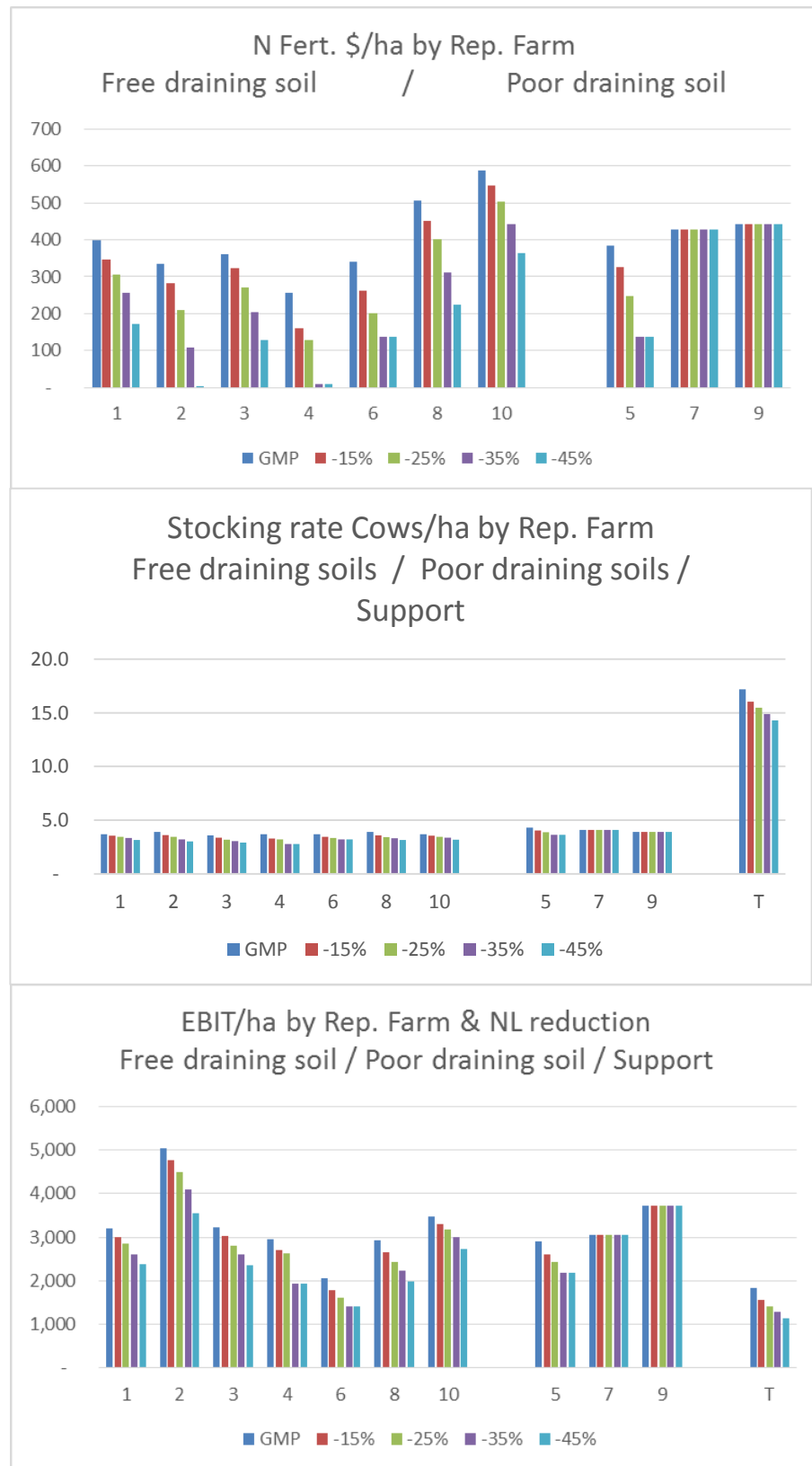
**Annual change**

		Catchment Total				Percent change from GMP		
<b>Reduction in N Leached</b>								
Milking Platform	GMP	-15% NL	-25% NL	-36% NL	-15% NL	-25% NL	-36% NL	
Support Units	GMP	-15% NL	-25% NL	-36% NL	-9% NL	-18% NL	-27% NL	
<b>Existing dairy and dairy support farms</b>								
<b>Area in Dairy</b>		<b>Effective</b>	<b>Total</b>					
Effective Area Sub-total ha		55,536	60,136					
Milking platform ha		45,373	49,089					
Support units ha		10,163	11,047					
Nitrogen Use \$		18,562,871	17,144,603	15,611,238	10,901,076	-8%	-16%	-41%
Cow Numbers (1st July)		176,780	166,923	162,129	154,790	-6%	-8%	-12%
Milk Solids total kg		75,836,325	73,189,188	70,779,554	68,604,977	-3%	-7%	-10%

**Impact over 20 years and beyond**

		Net Present Values \$					
Discount rate		2%	5%	8%			
<b>GMP</b>							
<b>Revenue</b>		29,017,762,606	11,551,215,205	7,234,614,215			
Milk Sales		24,733,174,254	9,845,632,221	6,166,394,579			
<b>Operating Expenses</b>		20,554,515,055	8,182,216,874	5,124,584,856			
<b>Operating Profit</b>		8,463,247,551	3,368,998,331	2,110,029,359			
<b>Marginal Change in NPV of GMP</b>							
<b>Smoothed reduction in NL</b>							
<b>Revenue</b>	-	4,747,921,198	- 1,198,868,183	- 493,515,023	-16%	-10%	-7%
Milk Sales	-	2,539,761,008	- 695,760,531	- 308,476,130	-10%	-7%	-5%
<b>Operating Expenses</b>	-	3,038,808,961	- 754,261,976	- 305,986,332	-15%	-9%	-6%
<b>EBIT</b>	-	1,709,112,237	- 444,606,207	- 187,528,691	-20%	-13%	-9%
<b>NPV of Marginal EBIT</b>							
<b>Development</b>		304,555,961	45,897,080	-10,967,408			
<b>Intensification</b>		57,793,802	20,296,577	11,340,741			
<b>Flexi Cap</b>		103,052,367	41,022,462	25,692,681			
<b>Combined Marginal EBIT</b>							
<b>Smoothed</b>	-	1,337,162,999	- 406,501,370	- 161,462,677			

Figure 1: N Fert., Cows and EBIT /ha by Rep. farm and N leaching reduction



Note: Farm T is representative of dairy support farms