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: **Central Plains Water Limited**
Submitter

Statement of evidence of Dr Caroline Mary Saunders (regional economics)

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REFERENCE: JM Appleyard (jo.appleyard@chapmantripp.com)
BG Williams (ben.williams@chapmantripp.com)

Chapman Tripp
T: +64 3 353 4130
F: +64 3 365 4587

245 Blenheim Road
PO Box 2510, Christchurch 8140
New Zealand

www.chapmantripp.com
Auckland, Wellington,
Christchurch

STATEMENT OF EVIDENCE OF DR CAROLINE MARY SAUNDERS

INTRODUCTION

1 My name is Caroline Mary Saunders.

2 Over the last 30 years I have been engaged in a number of research projects relating to the economics of agriculture. I have published extensively on the development of agricultural economics and cost benefit of land use options and I have over 300 publications.

3 I have graduated from the University College of North Wales in 1979 with an honours degree in Agriculture and Agricultural Economics and from the University of Newcastle (UK) in 1987 with a PhD in Agricultural Economics. I was employed at the University of Newcastle upon Tyne firstly as a research associate then as a lecturer from 1984 to 1994 and then 1995 to 1996. I was employed at Lincoln University in 1994 to 1995 as a senior lecturer and then from 1996 to date. Since 2001, I have been Professor of Trade and the Environment at Lincoln University and director of the Agribusiness and Economics Research Unit.

4 In preparing my evidence I have reviewed *Economic Value of Potential irrigation in Canterbury* Saunders and Saunders (2012). The purpose of the study was to provide the ability to estimate the overall benefits of irrigation in Canterbury to the Canterbury and New Zealand economies. This study estimated the impacts of irrigation and *Agricultural expenditure flows from Selwyn and Waimakariri districts into Christchurch*, Guenther, M., Saunders, C., Rutherford, P. and Tait, P. (2013). The purpose of this study was to estimate the amount of economic activity in Christchurch which was due to agricultural activity in Selwyn and Waimakariri districts.

SCOPE OF EVIDENCE

5 In my evidence I have been asked to provide an outline of the likely economic benefits that will be provided by the Central Plains Water Enhancement Scheme (*the Scheme*), including:

5.1 the likely financial benefits to farmers under appropriate base-line assumptions about project cost, land uses, product prices and farmer productivity;

5.2 the likely impacts on regional production (value added / GDP), wages and salaries, and numbers employed;

5.3 the likely impacts on output and expenditure in Canterbury

6 Therefore the following topics are covered in this evidence include:

6.1 direct effects;

6.2 indirect effects;

6.3 induced effects; and

6.4 the total impacts on the Canterbury and wider New Zealand economies (and within this the impact on the Christchurch economy)

7 Although this is a Council hearing, I have read the Expert Witness Code of Conduct set out in the Environment Court's Practice Note 2011. I have complied with the Code of Conduct in preparing this evidence and I agree to comply with it while giving oral evidence before the hearing committee. Except where I state that I am relying on the evidence of another person, this written evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in this evidence.

AN OVERVIEW OF APPROACH AND DEFINITIONS

8 I note at the outset that this evidence is not a full costs benefits analysis – just a high level overview of the value of the Central Plains Water Enhancement Scheme (*the Scheme*) to Canterbury.

9 In this context I understand the overall vision for proposed variation 1 to the proposed Canterbury Land and Water Regional Plan (*Variation 1*) is '*To restore the mauri of Te Waihora while maintaining the prosperous land-based economy and thriving communities*" (Introductory section). Within this, and as is set out in the evidence of **Mr Hamish Peacock**, I also understand many of the outcomes anticipated by Variation 1 are reliant on the development of the Scheme.

10 However, prior to discussing the wider economic value of the Scheme, there are some definitions that will assist:

Direct effect

10.1 Estimating the contribution of increased revenue from irrigation (as is the case here) includes the calculation of the direct, indirect and induced impacts on the local economy. The **direct effect** is simply the change in a farm's own output and/or employment levels. For the purposes of this study the output is measured in dollar terms as product passes beyond the farm gate. It is accepted that secondary processing of the product (such as conversion of milk to milk powder) may occur but these additional economic benefits have not been incorporated into the study. By the same token, employment

may be generated off–farm for every additional kg of milk fat produced, but the direct effects to employment in my study reflect only the added employment opportunities on-farm.

Indirect effect

10.2 The **indirect effects** are the output and/or employment generated by other firms servicing the farms in the local area, such as input suppliers. An example may be that as production intensifies, further specialist expertise such as: transport services, refrigeration specialisation, farm management consultancy, which for example, will need to be engaged for the successful development of additional production associated with irrigation. These services or outputs are quantified as indirect effects.

Induced effect

10.3 The **induced effect** is the impact on output and employment resulting from the increased household expenditure, in the local area, flowing from the direct and indirect effects. The sharemilker who visits a cafe in Darfield or the electrician who purchases goods from the local supermarket are two examples of induced effects arising from the added production associated with irrigation development.

Capital Impacts

10.4 The scheme will have impact on capital expenditure. This incorporates the actual cost of developing the core infrastructure of the Scheme. However, there is also a capital impact from farmers developing the infrastructure on farm to irrigate their land and also that associated with change in land use such as the construction of dairy sheds. In this evidence these are ignored.

Land Values

10.5 The analysis also excludes the changes in land values which occur with potentially irrigable land. These values are only quantifiable when the land is sold, but it is important as it allows the farmers greater ability to borrow for investment against land value, hence enabling growth. There are also additional exchequer benefits such as the increase in tax income, reduction in social security payments and the increase in rates from business and other activity. These all have upside potential in a system of growth, but are highly related to individual circumstances, so have been ignored for the purposes of the more macro-level overview set out in my evidence.

11 With a basic description of the definitions as set out above (along with an understanding of some of the matters which have and have

not been modelled) it possible to turn to the economic modelling undertaken.

12 In this regard I have considered the full development of the Scheme which I have assumed to include an additional 30,000 hectares of 'new' irrigation. Although the exact final area of dry land that is irrigated may vary a little from that figure, I understand that an area of 30,000 hectares is what has been typically referred to in relation to the Scheme.

13 I also note that:

13.1 new irrigation may be established on parts of properties which will produce economic benefits for the whole property; and

13.2 the substitution of existing groundwater takes with surface water from the Scheme may also allow irrigation to occur in a more cost efficient manner on those properties already irrigated,

however, as these flow-on effects are difficult to quantify, my assessment has taken the conservative approach, and it focuses simply on the additional outputs which are derived from each new hectare of new irrigable land.

Irrigation Valuation Model

14 To value the impact of irrigation this evidence draws upon the irrigation model developed by the AERU for CDC (Canterbury Development Corporation) to estimate the potential direct, indirect, induced and total monetary and employment effects a change in land-use associated with a further irrigation of Canterbury. The model projects these impacts out to 2031, with the use of projected prices from the Lincoln Trade and Environment Model (LTEM), based on current commodity prices informed from MPI Farm monitoring reports among other sources as identified.

15 In terms of the value ascribed to different land uses, there are of course a large range of agricultural land-uses (farm systems) that would benefit under irrigation and it was not possible to explore all possible options for irrigated land. Instead, four farm types were chosen, based on the practically of implementation in Canterbury and the availability of data. These farm types were dairy, sheep and beef, arable (grain) and high value arable (representing high value arable and horticulture).

16 It is also assumed that potentially irrigable land is converted from dryland sheep and beef farming.

17 The land use on irrigated land is assumed to be 58 per cent dairy; 20 per cent arable; 18 percent sheep and beef and 3 per cent high value arable. The land use prior to irrigation was assumed to be 75 per cent sheep; 18 per cent beef and 8 per cent deer (based on Harris 2006). Therefore, the main change in land use with irrigation is increase in dairy and arable with additional production from sheep and beef. Although **Mr Stu Ford** and **Mr Andy MacFarlane** have done a much more detailed assessment of the likely area of dairy the more basic assessment set out in Harris (2006) is sufficient for the purposes of my relatively high level assessment (and, if the actual area of higher value land uses such as dairy is higher than that I have relied on it is likely to result in greater economic benefits).

18 The value for each potential land-use under irrigation was determined by multiplying average production figures with average commodity prices. Production figures were sourced from the Canterbury model farm in MPI's Farm Monitoring Reports in the case of dairy, and sheep and beef farming. These provide information inputs and outputs giving returns to producers. As the required production data for arable crops is not available from the MPI's Farm Monitoring reports, arable production is taken instead from average national yields sourced from the OECD agricultural statistics database.

19 Current price data was obtained similarly from MPI's Farm Monitoring Reports for all pastoral commodities, and from the OECD for arable statistics. Prices for dairy, for example, were taken from the Canterbury model farm in MPI's Dairy monitoring reports to most accurately describe Canterbury dairy. The price of 718 (cents per milksolid) in 2010 was used, giving an average return per hectare of dairy of $8,550 in the same year. Again, this is an area where **Mr Stu Ford** and **Mr Andy MacFarlane** have used slightly different figures but I have kept with the MPI figures as I have used them elsewhere in my evidence.

20 Price projections for all commodities were modelled in the LTEM up to the year 2020. The LTEM is a partial equilibrium trade model focusing on the agricultural sector. The framework of the LTEM has 20 agricultural commodities and 21 countries, giving a comprehensive map of global agricultural trade.

21 The LTEM simulates global trade, consumption and production of agricultural commodities out to the year 2020. As part of this simulation the LTEM derives national commodity prices for all modelled goods. These projected commodity prices from the LTEM were used to project changes to the prices used from the MPI farm monitoring budgets, out to 2020.

22 The LTEM uses the appropriate multipliers to calculate the direct indirect and induced impact of the increase in irrigated land on Canterbury and New Zealand. Thus, the model produces the total direct, indirect and induced changes in revenue and employment as a result of irrigation and land-use changes.

23 As I noted earlier in my evidence, the analysis does exclude downstream benefits such as an increase in processing. These could be estimated on an *ad hoc* basis but there is no consistent methodology to assess their total amount.

RESULTS

24 In 2020, the direct effect of the additional 30,000 hectares of irrigated land on the Canterbury and New Zealand economy is $158.63 million of additional revenue, with 465 additional full-time equivalent (FTE) jobs. The indirect and induced effects differ for Canterbury and New Zealand as a whole. In Canterbury an additional $109.74 million in revenue and 384 FTE jobs result. Across New Zealand this is $117.81 million in revenue and 461 FTE jobs. The results for New Zealand include the regional increases for Canterbury.

25 In total, the additional revenue for Canterbury is $268.38 million with 81.39 per cent coming from dairy enterprises, and a total of 849 FTE jobs across the region. This equates to $8,946 of total added revenue per irrigated hectare for 2020.

26 The total effects for New Zealand in 2020 then are an additional $276.44 million in revenue and 926 FTE additional jobs. Of total revenue the majority (57 per cent) comes from direct effects, whereas approximately 50 per cent of jobs are from direct effects. Per hectare, this equates to $9,215 total revenue for New Zealand in 2020.

Impact of the increase in irrigation on Christchurch City.

27 The proximity of the Scheme to Christchurch City and its associated infrastructure does enhance the viability of the scheme. In this regard farming within the scheme has access to the underlying infrastructure that is needs to service the changes in land use and increased output such as ability to export the products via transport networks and processing.

28 Moreover there is a benefit to Christchurch city itself from the expenditure from the extra activity being spent within the city. The extra expenditure in Christchurch from the change in land use into Christchurch city is calculated from the report Guenther et al (2013). This report shows that for 2012 the expenditure of farms from Selwyn and Waimakariri districts in Christchurch was $82,312

per farm and in total $305 million accounting for 7 per cent of Christchurch total household expenditure. Including the indirect and induced impact of this expenditure this rises to $778 million, 17 per cent of expenditure in Christchurch.

29 Farms also spend on rural business in Selwyn and Waimakariri and they in turn spend a proportion of this into Christchurch. This expenditure accounted for a direct amount of $511 million rising to $1,378 when the indirect and induced effect is accounted for. These data show the importance of the local agricultural sector to the City.

30 It is not possible to allocate the general business expenditure described above to farms type and therefore an estimate the impacts of changes in land use on this. However, the expenditure by farm into the city was available by farm type so an estimate can be made of the impact of the increase in irrigation on expenditure into the city.

31 The average expenditure per hectare of a dairy farm in the city was $582.6 per hectare, a mixed cropping farm $1,191.9 and a sheep and beef farm $227.9. Therefore, if the number of hectares of dairy was increased by 17,400 hectares converted from sheep and beef (58 per cent of the 30,000 hectares) this would be a net gain to the city of $6.17 million. In the case of arable, this would be an increase of 23 per cent of area (6,900 hectares) converted again from sheep and beef resulting in extra $6.65 million expenditure in Christchurch. This is likely to be an underestimate as the change in intensity is not taken into account and therefore expenditure on those sheep and beef farms which would be irrigated under the scheme.

32 Therefore, the additional direct expenditure form the increase in dairy and arable hectares from the schemes adds $12.82 million to expenditure in Christchurch city. When the indirect and induced effects are included, this rises to $34.6 million.

33 In the Canterbury context it is therefore important that the benefits of irrigation development are seen in their wider context (beyond the Selwyn District where the Scheme is located).

Dated: 29 August 2014

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Caroline Mary Saunders

APPENDIX

Table 1: Additional revenue and employment effects for Canterbury in 2020

	Revenue (mil. NZD)			Employment (FTEs)		
	Direct Effects	Indirect & Induced Effects	Total Effects	Direct Effects	Indirect & Induced Effects	Total Effects
Dairy	131.73	86.70	218.43	361	286	646
Sheep & Beef	4.61	3.47	8.07	12	13	25
High Value Arable	8.50	7.30	15.80	71	33	104
Arable	13.79	12.28	26.07	20	53	72
Total	158.63	109.74	268.38	465	384	849

Table 2: Additional revenue and employment effects for New Zealand in 2020

	Revenue (mil. NZD)			Employment (FTEs)		
	Direct Effects	Indirect & Induced Effects	Total Effects	Direct Effects	Indirect & Induced Effects	Total Effects
Dairy	131.73	92.97	224.70	361	346	707
Sheep & Beef	4.61	3.81	8.42	12	19	32
High Value Arable	8.50	7.87	16.38	71	65	136
Arable	13.79	13.16	26.95	20	31	51
Total	158.63	117.81	276.44	465	461	926