

IN THE MATTER OF The Resource Management Act 1991

AND

IN THE MATTER OF applications by Central Plains Water Trust to:

The Canterbury Regional Council for resource consents to take and use water from the Waimakariri and Rakaia Rivers and for all associated consents required for the construction and operation of the Central Plains Water Enhancement Scheme; and

The Selwyn District Council for resource consents to construct and operate the Central Plains Water Enhancement Scheme

AND

IN THE MATTER OF a Notice of Requirement by Central Plains Water Limited to:

The Selwyn District Council for the designation of land for works associated with the construction and operation of the Central Plains Water Enhancement Scheme

STATEMENT OF JOINT EVIDENCE OF THE LOWLAND FARMING GROUP

7 August 2008

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1. INTRODUCTION

1.1 This statement of joint evidence is presented in support of the following submitters who have **opposed** the above stated applications for resource consent and notice of requirement:

A G Barnett, Lakeside	B McCartin, Leeston
R L and J L Barnett, Lakeside	P W B and D P Birkett, Leeston
S, A L and C Osborne, Leeston	S Shirtcliff, Leeston
W Thian, Leeston	L Cocks, Leeston
A McIlraith, Southbridge	P Reid, Leeston
R N Croft, Lakeside	T W Norton, Springston
D P McEvedy, Southbridge	L S and S A Parnham, Lakeside
D J, A J and A K Winchester, Leeston	I and L Lochhead, Lakeside
D and K B Stacey, Leeston	L G and V M McMillan, Lakeside
J P O'Neill, Brookside	A Bailey, Southbridge
P Lowery, Leeston	R J Heslop, Southbridge
C L Croft and C J Waugh, Lakeside	Barnett Partnership, Lakeside
C McIlraith, Southbridge	R L Inwood, Southbridge
S R Inwood, Southbridge	J McLachlan, Lakeside
T Williams, Southbridge	K A and J M Greenwood, Southbridge
I D Baxter, Leeston	Beachcroft Farm (member of Southbridge Water Users Group and their submission)

1.2 All of the above submitters own and/or operate farming ventures in the lowland plains area down-gradient of the Central Plains Water Enhancement Scheme (hereafter referred to as the "Scheme") area, being south east of State Highway 1 between the Rakaia River, Lake Ellesmere, Springston and the coast. Some of the above submitters also undertake activities such as market gardening and the operation of a specialist drilling business and water testing laboratory.

1.3 The above listed parties (hereafter referred to as 'we' or 'the Group') have significant practical knowledge of the water quality and quantity characteristics of the lowland plains/Lake Ellesmere Catchment area. We have lived and worked in the area for many years and in some cases are third or fourth generation farmers of the same property. We have first hand knowledge of how changes in the groundwater levels and systems affect our day-to-day and year-to-year operations. The Group also includes Mr L G and Mrs V M McMillan who have many years experience in well drilling and water quality testing in this area and other parts of Canterbury, New Zealand and the Pacific.

1.4 Several of the submitters listed above are also involved in an Advisory Group with Environment Canterbury (ECan) in relation to the Restorative Lowland

Stream Programme and the Review of Resource Consents for groundwater take and use in the lowland area.

- 1.5 This statement of evidence has been prepared to support the submissions made by the parties listed in paragraph 1.1 regarding the Central Plains Water Trust (CPW) resource consent applications and the notice of requirement. It describes these parties' common interest in groundwater and how it may be affected by the proposed Scheme.
- 1.6 The Group's primary interests in the Scheme applications are the impacts that the Scheme will have on:
 - Groundwater quantity – the potential increase in the groundwater levels in our area. The Assessment of Environmental Effects recognised that groundwater levels in our area would rise;
 - Groundwater quality – the potential for nitrate contamination and raised nitrate levels in groundwater; and
 - Surface water quantity – the potential increase in surface water.
- 1.7 It is intended that this written statement of evidence be provided to the Hearing Commissioners prior to the Group's appearance at the hearing. A short summary of the Group's concerns, in the form of a power point presentation, will be provided at the hearing with some of the parties listed above being available to answer questions from the Commissioners.

2. **LOWLAND FARMING GROUP AND THE CENTRAL PLAINS WATER ENHANCEMENT SCHEME**

- 2.1 The maps attached in **Annexure A** shows the location of the Scheme in relation to the areas we consider would be potentially adversely affected and the area of main concern to the Lowland Farming Group, primarily with respect to groundwater quantity and quality, and surface water quantity issues. As can be seen from the second map, the area of main concern to us covers approximately 45,000ha of land. Within this area the main production activities are intensive arable and pastoral, and to a lesser degree, vegetable production.
- 2.2 Typically this area of land is low-lying with some undulation, including gully areas which vary from small areas of gentle rolling slopes, to larger areas that were possibly stream valleys in the past. Also present is a system of spring fed lowland streams that have their outlets to Lake Ellesmere and the sea, and a spring system that not only creates and/or contributes to these streams but

also appear in farmland in the form of individual or groups of springs or seepage areas of paddocks.

- 2.3 Land in this area is generally very wet in winter periods compared to land areas north west of here. During summer months irrigation is used but only on an as needed basis as the rich nature of the soil and the wet character of the area significantly reduces the need to apply large amounts of water. The soils in this area are variable but generally silt loam and clay which have good water holding capacity. There are numerous wells in this area which are used for irrigation, stock water and domestic supply. In addition, there are a series of drains, some under the administration of the Selwyn District Council (SDC) and the Canterbury Regional Council (CRC/ECan) while the remainder are private drains. The location of the SDC and ECan drains are shown in **Annexure B**.
- 2.4 The key concern for this Group is the quantity and quality of the groundwater that is a contributing factor to not only land use activities in this area but also provides the base flow to the spring-fed streams including: Harts Creek, Birdling Brook, Waikekewai Creek, Taumutu Creek, Lee River, Tent Burn, Jollies Brook, Boggy Creek and the Irwell River.
- 2.5 The overriding source of water supply for domestic, stock water, and irrigation purposes here is from groundwater. Although there are some surface water takes permitted from the streams, their use is generally limited to irrigation by immediately adjacent landholders and when stream flow levels allow.
- 2.6 Groundwater levels in this area range from ground level to 2.0m below ground level. Practical experience, which is also confirmed by the operations of McMillan Specialist Drilling Services Limited, also recognises that groundwater in this area has a considerable variability in distance from the ground surface. In some areas groundwater can be at ground level, and there is also a considerable area of land where groundwater can be located within 1 to 2m of the ground surface. The map contained in **Annexure C** shows where ECan and the former North Canterbury Catchment Board records indicate that the groundwater is less than 5m below the ground surface. **Annexure D** shows where we have knowledge of groundwater being between 0.3m to 2m below the ground surface. Within this area there are numerous groundwater bores used for irrigation and domestic water supply bores. The effects of the Scheme on this groundwater system will be discussed later in this evidence.
- 2.7 The groundwater flow direction in this area runs generally from north-west to south-east. Wells in this area are generally shallow and take water from the first aquifer. Water is abundant here and there is very high transmissivity e.g. values of transmissivity can range from 12,000 to 20,000m²/day here. This can partly be attributed to the recharge characteristics of the Rakaia River, and

other existing irrigation Schemes, for example the North Bank Scheme. Consequently we expect that given the direction of the underground water flow it is likely that effects of the CPW Scheme will easily be apparent in our area. This has also been recognised by the applicant and we expect other submitters dealing with similar issues.

- 2.8 The age of groundwater in our area is likely to be 10's of years old but we expect that because of the shallow nature of the groundwater here and its use, we would expect to experience any adverse effects of the Scheme earlier than other parties where effects might relate more to deeper aquifers/wells, i.e. the use of domestic water supply wells from say the second, third or fourth aquifers. We note also that areas to the north east of Harts Creek the geological character of the area is different to that area below Harts Creek. However, the issues relating to impacts on groundwater quality and quantity are very similar.
- 2.9 One of the main issues associated with the water ages is that any adverse effects from agricultural activities (increased nitrate levels) on the central plains area to be occupied by the Scheme will take many years until they become evident. This matter will be discussed in more detail later.
- 2.10 The Group also has a specific interest in the management of water issues and in particular activities, such as the Scheme, which should only proceed if the future consent holders are to use water in a way that will have a positive benefit for the region while at the same time avoiding or minimising any potential adverse effects on the environment.
- 2.11 Our Group is not single-mindedly opposed to the concept of an irrigation scheme supplying water to the inner plains of Canterbury. In fact, we are strong supporters of the use of water for irrigation purposes and the significant benefits that this brings to farming operations, the economy and the social and economic wellbeing of not only ourselves and families but also the wider community, region and New Zealand as a whole. Some of the direct benefits of the Scheme to us include the potential to:
- Increase flows in the lowland streams during summer months when they are flowing at a lower rate;
 - Grow produce to support increased intensive land use activities, such as dairying. For example, growing feed crops such as barley and maize that can be offered to an increased area of local market; and
 - Further development of support industries to the local agricultural operations and the associated communities.
- 2.12 There is likely to be benefits from the activities that develop from the Scheme. We recognise these benefits, but they must be considered in light of the

potential adverse environmental effects that may also result. It is important that any potential adverse effects are acknowledged, understood and consequently addressed. The benefits of such a Scheme should be considered in context and not accepted until a solution is found for any adverse impacts on the environment, either within or beyond the Scheme area.

2.13 The Group also wishes to recognise that the Scheme proposes to allow the development of land uses to an area not naturally capable of sustaining such intensive activity without the application of significant quantities of water and fertiliser. We consider that while the Scheme will promote the 'efficient' use of water under the modelling systems available, in practical farming terms it is far more economic, sustainable and environmentally effective to develop highly intensive land uses on soil types that are able to sustain such intensive use. The deploying of the proposed artificial inputs will potentially give rise to major adverse environmental effects down-gradient over time.

2.14 The particular aspects of the CPW Scheme that are considered to have a significant impact on the matters of concern to the Lowland Farming Group are:

- The increased area of irrigated land and the quantities of water to be applied on the inland plains (both through irrigation practices and seepage from canals and the storage lake) and its impact on:
 - - Groundwater levels and quantity;
 - - Groundwater quality; and
 - - Increased surface water that may result in exacerbated or additional flood events and groundwater recharge,

in the Lake Ellesmere Catchment area.

2.15 The remainder of this evidence will examine these issues.

3. CONSULTATION

3.1 Since the Scheme had its first resource consents applied for we have had just two meetings with representatives of the applicants. Both meetings were instigated by our Group. The first meeting was arranged at our request by Federated Farmers and consisted of a public meeting at Leeston during the submission period in 2006. At this meeting Mr Cliff Tipler advised us that if we had concerns about the Scheme in terms of downstream effects then we should submit in support of the Scheme subject to conditions. We found this response not only misleading but clearly biased in favour of the Scheme. It

was also at this meeting that maps indicating that groundwater may rise at least 1 – 1.5m in our area were presented.

- 3.2 Dissatisfied that the applicants had made no effort to consult with people who were going to be directly affected by the down-gradient effects of the Scheme, our Group chose to invite representatives of the applicants to a meeting of some of our Group members in order to further determine the exact effects that the Scheme would have on our area and our farming activities. This meeting was held on 10 December 2007.
- 3.3 At this meeting a map of the area which we considered to have groundwater within 1m of the ground surface was provided to Mr Walter Lewthwaite and Mr Klaus Ohlbock from URS appearing on behalf of the applicant. To our knowledge the information provided has not been included in the application or later at the hearing. However, the applicant continues to rely on the modelling undertaken by Aqualinc which ...“is not intended to predict exact areas at each depth-to-water contour. It is built on 20m contour intervals available from LINZ topo maps, which is coarse, and it is a regional scale model with grid sizes from 500m up to a few km in size. However, Aqualinc considers it can be relied upon to indicate the differences that would occur with different scenarios, e.g. between wet and dry years, and between with-and-without CPWES. Further, in practice in these areas the effects will be constrained by drains and the relief they provide. “¹ This type of information is just a sample of the lack of understanding and consideration that the applicants have given to down-gradient effects and how any effects might actually and effectively be mitigated. It also illustrates a continued ignorance of how close groundwater is to the ground surface here.
- 3.4 The applicant’s representatives made further comments about drainage and impacts on the lowland streams. However, to date we have still not received any information detailing exactly how remedial work would be undertaken and how this would work in practice. Although proposed conditions of consent have been put forward on behalf of the applicant at this hearing, these are at best a preliminary draft and have been devised with no further consultation with the lowland farmers.
- 3.5 Unfortunately, rightly or wrongly, the hearing of the applications has overtaken any further consultation with landowners in our area. However, we have found the considerable lack of consultation to be a somewhat arrogant approach taken by the applicants, surprisingly so given that the potential effects could be significantly adverse on the environment and result in considerable loss of production.

¹ From “Initial Responses to questions and Issues”, item 2 attached to URS letter dated 21 December 2007. Copy attached as **Annexure E**

4. LAND USE IMPACTS FROM RAISED GROUNDWATER QUANTITY AND LEVELS

- 4.1 The Scheme will involve the irrigation of 60,000 ha of land within a command area of 101,800 ha. Through the distribution of water via canals/pipes and then the use of water in irrigation over the land, there will be an increase in the amount of water that drains to the underlying groundwater system via the free draining soils in that area. This has been demonstrated by expert witnesses for the applicant, including Mr Weir and Mr Lewthwaite. We understand that a regional scale groundwater flow model has been used to estimate the likely quantities of water that will be added to the groundwater system once the Scheme is operating.
- 4.2 We are not qualified experts in the field of groundwater modelling, however we do have an understanding of the practical impact of increased groundwater levels when undertaking agricultural activities on our properties. We are also aware of the evidence given by Mr Callander (for the CCC) at this hearing, who considered that a regional scale groundwater flow model was not a particularly precise instrument for assessing groundwater level changes at a local level and the overall quantification of the water balance may have errors in it.² Mr Callander went on to recognise the failures of such a model at the local level. It is also our understanding (as provided in consultation received from Mr Lewthwaite as contained in Annexure E) that the groundwater modelling undertaken by Aqualinc is based on 20m contours from Land Information New Zealand (LINZ). As shown in **Annexure F** attached most of our area falls below the 20m contour and the 10m contour for that matter. We therefore question the model's relevance at all to our properties and environment. The map contained in **Annexure D** shows the significant area where water can be encountered between 0.3m to 2m from the ground surface. Within this area the land is undulating and a regional scale model based on the LINZ contours could not adequately represent the varied nature of the land here.
- 4.3 Mr Hugh Blake-Manson provided evidence on behalf of the Selwyn District Council in relation to similar matters and we support the matters raised and addressed in his evidence also.
- 4.4 In addition to the evidence from the above parties, we also understand that the modelling used to estimate the likely eventualities of the Scheme has been questioned as to its preciseness by the relevant ECan Officers in their Section 42A Officer reports, namely Dr Howard Williams and Mr David Scott.

² From paragraphs 4.2 to 4.5 of the evidence of Mr Peter Callander on behalf of the Christchurch City Council.

4.5 As we see it, the effect of groundwater mounding resulting from the Scheme is a significant one that has the potential to be extremely adverse. We have concluded this based on:

- The considerable amount of evidence produced on this matter by the applicant and the regulating authority;
- The contentious arguments surrounding the use/application of the model used to predict the level of groundwater mounding; and
- Our own understanding and experience of the simple concept of adding large amounts of water to land upstream when we have already experienced similar effects from other much smaller schemes in our locality.

Our concerns are specifically at the 'local' level. The modelling undertaken quite simply could not possibly truly recognise the unique characteristics of the groundwater system in our area.

4.6 The evidence we present will not further argue the appropriateness of the groundwater modelling used. We consider its application at the local and everyday level is highly questionable and offers little certainty to understanding what will really happen to the underground water system in our area once the Scheme is up and running.

4.7 The objective of our evidence, therefore, is to illustrate to the Hearing Commissioners what any additional groundwater mounding might mean to our everyday, season-to-season on-farm operations. We wish to make it clear also, that we have had the opportunity to engage our own hydrological consultant to present evidence on our behalf. We very consciously chose not to take that path because it became clear to us that such an expert would probably only provide us with the same arguments you have already heard in relation to the mounding model. It is considered that our 'local' and 'practical' knowledge is now of more value having become aware of the many arguments surrounding the model.

4.8 The following are just some examples of what we experience in our area with respect to groundwater, the lowland stream system and the impact any further raising of the groundwater table may have.

Groundwater Allocation in the Southbridge Water Users Group Area

4.9 The Southbridge Water Users Group (SWUG) consists of a group of predominantly farmers who live and farm within an area between the Rakaia River and Lake Ellesmere, the area is shown in **Annexure G** attached. This Group was originally set up to discuss issues relating to groundwater and to liaise with ECan on these matters. The main objective of SWUG has been to get ECan to recognise the high level of groundwater quantities in this area

given that it is somewhat contentiously contained within a zone that is considered in the Proposed Canterbury Natural Resources Regional Plan to be over allocated. As mentioned previously, ECan is presently undertaking investigations that have preliminarily indicated that this area is recharged by rainfall and the Rakaia River. There is also the potential that the area will be re-zoned in the future to recognise these recharge characteristics and the abundance of water in the area.

- 4.10 Large numbers of farmers in this area, and indeed the entire lowland farming area, have never known their wells, whether for domestic, irrigation or stock water use, to go dry or suffer any noticeable decreases in levels. It is also known that in the monitoring of some farm wells the level of water within the well and in the shallow aquifer may only drop a very small amount during the main summer/irrigation season and will be less than 1m from the ground surface during winter months.
- 4.11 SWUG has also had concerns about ECan's Restorative Lowland Stream programme that has instigated the review of existing groundwater take and use consents with respect to allocation and impacts on the flows of the lowland streams. Much has been made of the proposed Scheme's ability to rejuvenate the streams with increased flows and help to eliminate the perceived impacts of existing irrigation on these streams. While this is seen as a positive benefit of the Scheme it could well come at the cost of a significantly raised water table, causing major problems for farmers in this area. Any further increase in groundwater levels in this area would significantly impact on the farming operations during times of cultivation and harvest. We note also that if existing groundwater users in the Scheme area relinquish their existing water take consents once the Scheme is operating then there will be further water added to the groundwater system.
- 4.12 This information recognises that there is considerable water in this area and that water from the Scheme will add further to the existing water levels experienced here. Contrary to the existing zoning in this area and the misconception that our area is short of water, there is considerable groundwater available here. We note also that much of the information surrounding the existing zoning of this area related to a major increase in groundwater take and use consents being issued in this area since 1990. However, the majority of these consents related to the renewal of existing consents and the legalisation of existing water use that had not been consented previously. The amount of water being used here prior to 1990 is likely to be very similar to what it is now, albeit that it has been legalised.
- 4.13 We acknowledge too that the majority of this area is already irrigated and that while the Scheme may boast the replenishing of the groundwater aquifers, we see no real benefit of any more water in this area as there is already more than enough.

Evidence from Farm Well Monitoring

- 4.14 ECan has monitoring wells located in our area and in addition some farmers within the Lake Ellesmere Catchment are undertaking monitoring of their own wells in conjunction with rainfall gauging and in some cases stream level measurements. Messrs Paul and David Birkett who farm at Leeston, have considerable records of well monitoring and rainfall gauging over several years. We understand that this information will be presented to you as a separate submission relating specifically to their property and joint farming operation.
- 4.15 Farm well monitoring has started recently on the Barnett Partnership property at Lakeside. The graph shown in **Annexure H** shows the weekly tracking of four wells on that property and the associated rainfall measurements. The wells are all 100-150mm wells with a depth of approximately 9m. While the recording period is short it does give an indication of how groundwater will rise even prior to the main winter periods and spring.
- 4.16 The well currently recording its closest height to ground surface is also pictured in **Annexure I**. This photograph was taken in August 2006 nearing the end of a wetter winter in this area. As can be seen from the photograph, the water level in the well is at ground level. If there was to be more water added to the groundwater system in years similar to the 2005-2006-2007 seasons then these wells would have water even closer to or at the surface. This information also illustrates the impact that rainfall recharge can have in shallower groundwater i.e. where it is only 1 to 2m from the ground surface. If more water was added to the underground system from the Scheme and combined with the rainfall recharge, then we would expect to experience longer or permanent periods where groundwater will come to the surface or exacerbated wetness of land over and above that already experienced.

Experiences From Drilling in the Lake Ellesmere Catchment

- 4.17 McMillan Specialist Drilling Services Limited is a well established and recognised drilling company which operates from the township of Southbridge. This company has been in operation for the last 60 years. Mr Lyell McMillan is a central figure in this business and has considerable knowledge in the actual physical characteristics of the groundwater system in this area.
- 4.18 Mr McMillan has a sound understanding of how far groundwater levels are from the ground surface in this area. The map contained in **Annexure D** shows where groundwater can be experienced between 0.3m to 2m of the ground surface.

- 4.19 From the experiences of Mr McMillan and other farmers it is known that in places groundwater can be found at ground level or within 0.3m of the ground surface and that there is a considerable area where groundwater will be found within 1m of the surface. Many farmers in this area have experienced the digging of holes for purposes such as posts for fences or silo stands that have resulted in these holes filling with water. It is not uncommon at all and generally farmers in this area will dig holes and leave their filling or fitting with a structure until they are sure that they have not intercepted groundwater i.e. over night or several days.
- 4.20 Mr McMillan also has first hand knowledge of the application of modelling groundwater characteristics of activities versus what actually happens in practice. For instance, recently he was involved with a drilling project where the modelling for the project predicted that dewatering of the site should be required at 15 l/s. However, when work proceeded the dewatering activity resulted in pumping at 150 l/s. This is a good example of how modelling can not predict with any great certainty what will actually happen once an activity involving groundwater proceeds.
- 4.21 With respect to the levels and quantities of water within the Lake Ellesmere catchment it is the opinion of many farmers in this area and the McMillans (based on their technical and practical knowledge) that not only the modelling developed for this Scheme but other modelling that is applied by ECan and other hydrologists, is completely irrelevant to what actually happens in practice here. For example, ECan uses models to determine well interference/drawdown effects and these generally are extremely conservative and arbitrary in this area. In practice we know that in most cases there is no significant effect from one well to another on the same property let alone neighbouring bores and or streams.
- 4.22 This example highlights the uncertainty that the proposed Scheme creates in terms of groundwater mounding, the relevance of the mounding model and the reliability of the model used in relation to the groundwater system in this area.

Examples of What Increased Groundwater Levels and Quantity in this area means for farming

- 4.23 Mapped information contained within the evidence for the applicant and the assessment of environmental effects for this Scheme all show that the water flow direction on the central plains runs from the foothills of the Southern Alps to the sea in a north-west to south-east direction. Our land is located at the end of the down-gradient flow just before it reaches the sea. Here the interactions of the down-gradient flow pressures and the conflicting pressures created by the influence of the sea and Lake Ellesmere and confining layers, cause water to be close to the ground surface. In some

cases it comes to the surface in the form of springs, seepage and spring-fed streams.

- 4.24 These characteristics have been contended with and managed by the farmers in this area for many decades, and while challenging at times of wet years/winters they have none-the-less been worked around successfully. The biggest fear for these farmers is that this situation will be made worse by the proposed Scheme. It is one thing to manage and farm around intermittent natural environmental occurrences or events, but it is another to cope with permanently degraded conditions caused by human interference.
- 4.25 It is important to acknowledge that this area is renowned for its production quantities and the quality of product. Many awards for produce quality have been won in this area over the years. Most recently, the 2008 Supreme National Awards for both Biscuit Wheat and Feed Wheat Production were won by farms in the Lakeside and Southbridge area. This indicates that we are not farming marginal land to an adequate level, but more importantly producing high quality produce from land ideally suited to such farming i.e. highly nutrient and moist soils.
- 4.26 The following sub-sections give examples of the different facets of farming that will be adversely affected by a raised ground water table in this area.

Impact on Arable Cycle and Farm Production

- 4.27 Farming operations constantly have to cope with rainfall events and the interrelationship of these events with the height of the groundwater table. The crucial crop planting times for this area are in the autumn and spring. It is during these periods that the main seed multiplication crops are sown. If the water table was to rise during these times then there is the strong possibility that crops such as winter wheat or spring sown barley/wheat/peas/beans/maize etc could not be grown and/or that their planting times would be later. If planting times are delayed by say at least 10 days to two weeks then this has a significant effect on the growth of the crop or in some cases, for instance clover or radish, such crops would not be able to be grown at all. This could result in different crops having to be grown in order to deal with wetter land characteristics. For this area this would have a significant impact as the crops grown already have to deal with damp conditions. To exacerbate these wetter conditions may result in many types of crops not being able to be grown to any successful level. It is also important to note that some crops have specific planting dates set by the contracting company i.e. Watties will require peas to be sown on a specified day to ensure their harvesting cycle stays in order. Failure to plant in order or at the correct time could result in crops being harvested prior to their real maturity and therefore reducing their overall profitability.

- 4.28 Delays in planting can also mean the overall delay in harvesting a crop. A seed crop such as wheat or barley needs to mature and be ready for harvesting in our area during the months of February and March. Some harvesting may be done in late January and at times in April depending on how hot the summer has been and the level of humidity during the important harvest months. To not plant at the right time therefore has significant delays in the harvest time and in some cases may lead to the inability of the crop to mature to its full potential.
- 4.29 The following information demonstrates the time frame for the planting and harvesting of selected crops for an example 200ha model farm common in the lowland farming area. The following tables show the 'windows' when planting and harvesting activities are undertaken. The 'Key' provided explains the three different windows and their practical application for sowing and harvesting.

Key to windows:

Green - indicates the optimum window for crop establishment and harvesting
- the normal planting/harvesting time;

Yellow – indicates the marginal window for crop establishment and harvesting which is less preferred but still manageable for some crops at a reduced quality/quantity output. Some losses are expected here in wet years;

Red – indicates the least preferred window for crop establishment and harvesting times, when excessive losses result from missing the optimum window and marginal windows (green and yellow), for example in very wet years.

Crop Establishment Windows:

Autumn

Month	February		March				April				May			
Crop	Wk3	Wk4	Wk1	Wk2	Wk3	Wk4	Wk1	Wk2	Wk3	Wk4	Wk1	Wk2	Wk3	Wk4
Grass seed			Green	Green	Green	Green	Green	Green	Green	Green				
Wheat(milling)											Green	Green	Green	Yellow
Clover	Green	Green	Green	Green	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Red	Red	Red	Red

Spring

Month	August				September				October				November	
Crop	Wk1	Wk2	Wk3	Wk4	Wk1	Wk2	Wk3	Wk4	Wk1	Wk2	Wk3	Wk4	Wk1	Wk2
Wheat	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Red	Red	Red	Red				
Peas						Green	Green	Green	Yellow	Yellow	Yellow	Red	Red	Red
Radish			Green	Green	Yellow	Yellow								
Barley	Green	Green	Green	Green	Green	Green	Green	Yellow	Yellow	Yellow	Red	Red	Red	Red

Some crops, for example Radish, have no red zone as it is not possible to grow them outside the optimum/marginal sowing windows. Other crops, while they can still be planted, their yields are seriously affected if the optimum window is missed i.e the green window.

Crop Harvest Windows:

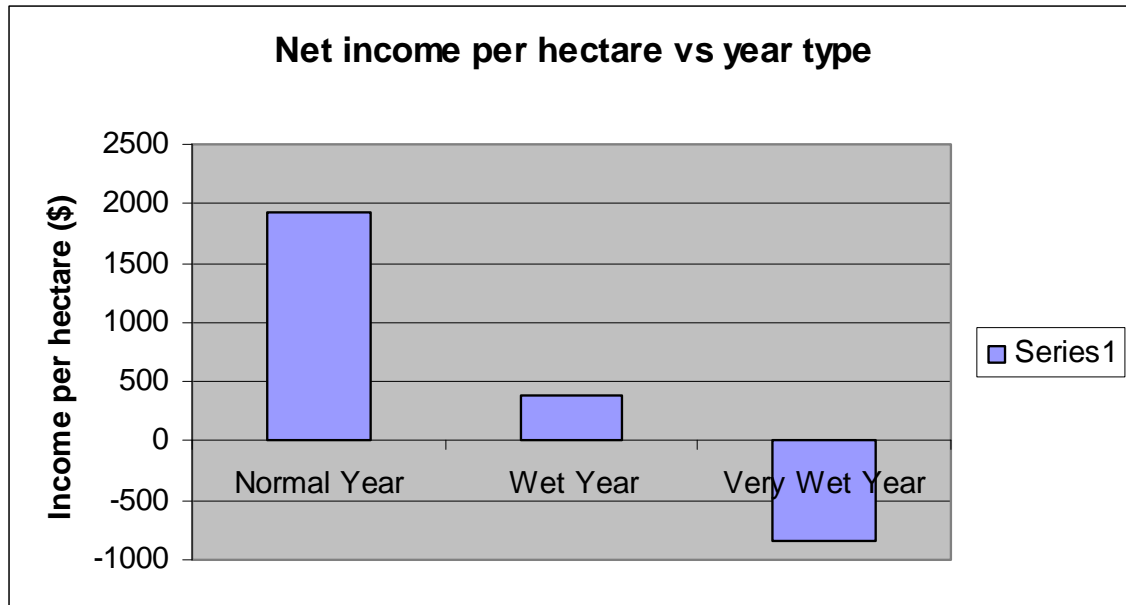
Month	January				February				March				April	
Crop	Wk1	Wk2	Wk3	Wk4	Wk1	Wk2	Wk3	Wk4	Wk1	Wk2	Wk3	Wk4	Wk1	Wk2
Grass-seed			Green	Green	Green	Yellow	Red							
Wheat				Green	Green	Green	Green	Yellow	Yellow	Yellow	Red	Red	Red	Red
Clover			Green	Green	Green	Green	Green	Green	Yellow	Yellow	Red	Red	Red	Red
Peas				Green	Green	Green	Yellow	Yellow	Red	Red	Red			
Radish											Green	Green	Yellow	Yellow
Barley					Green	Green	Green	Yellow	Yellow	Red	Red	Red		

The issues associated with delayed harvest include:

1. Crop quality being compromised through sprouting, infection with mould and reduced germination in seed crops;

2. Loss of crops: Where crops are windrowed e.g. grass-seed, radish, peas and clover; the crops have to lie on the ground in order to mature and dry suitable for harvest. These crop types are particularly prone to deteriorate under conditions of high soil moisture. Deterioration may range from loss of germination through to total crop loss due to extended harvest delays; and
3. Inability of large machinery (harvesters and carrying vehicles/trailers) to enter paddocks to harvest due to wetness and risk of bogging.

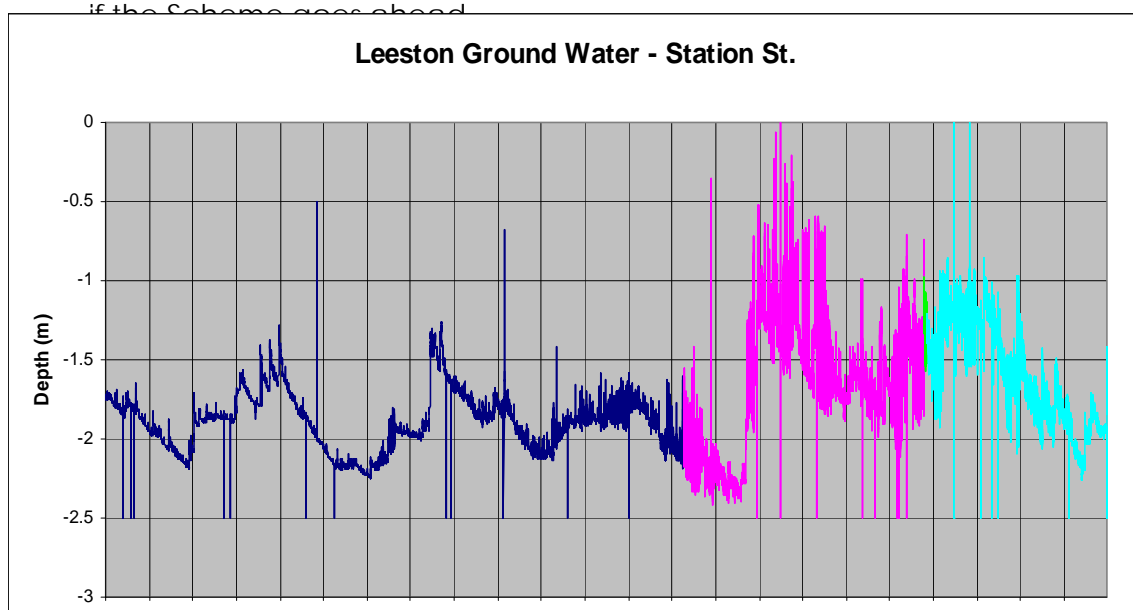
4.30 The Group’s concern is that the Scheme will have a cumulative net effect on the moisture levels of the soil to such an extent that the number of “very wet” events that the lowland cropping farmers will have to endure will compromise the viability of their farms.



Key for years

- **Normal Year** - possibly containing one wet event
- **Wet Year** – e.g. 1 in 10 year event, defined as two wet events per year. At planting **or** harvest. Our rainfall records suggest that a “wet year” occurs once in every five years.
- **Very Wet Year** – e.g. 1 in 20 year event, defines a wet event at both planting times and harvest.

4.31 The term ‘wet’ in this context is weather, in combination with a high water table, which delays the desired activity at the optimum time for a greater period than is likely to occur in a ‘normal’ year. A typical wet year has a corresponding higher water table. This is clearly demonstrated in the graph below in the winter of 2006. The occurrence of a “Very Wet Year” will increase if the Scheme goes ahead.



Historical Experiences of Farming in this Area in the Past

- 4.32 Many of the farmers in the Lowland Farmers Group have farmed in this area for many years and have experienced major difficulties in wet periods in conjunction with when the water table has been close to the ground surface. The following gives some examples of what they have encountered in relation to their own properties and other locations within the area of concern to the Group.

Mr D P (Pat) McEvedy – Phoenix Park Farm, Southbridge

- 4.33 Pat has farmed in the Southbridge area for 34 years and currently farms a 206ha property in partnership with his wife Lynley.
- 4.34 Pat's first experience of high groundwater table in Southbridge was in the mid 1970s. At this time he was working on different farms in the area on a casual basis while also working for his father at Southbridge. This period was dominated by heavier than average rainfall over a period of several years, and with this the water table rose, gullies began to fill with water and then flow in the winter. Some stock water wells became artesian and had to be capped and it became very difficult to farm this land. Fencing became impossible as post holes dug would fill with water over night.
- 4.35 These conditions carried on into the summer of 1978 with dire financial consequences for local cropping farmers. In 1978 Pat's father farmed 250 acres and wrote off 80 acres of white clover, and a similar area of barley was only harvested after it had sprouted. This is because the harvester constantly became bogged and the grain tank could only be half filled to stop it sinking. This was not uncommon at all in the Southbridge and Lakeside areas.
- 4.36 In March 1979 the Southbridge Domain had to be tile drained because of prolonged surface flooding as it had become a health hazard. This was not a case of springs coming up, but the general water table being above ground level over a large area. It was attempted to pump the water away but the gullies just kept filling up again.
- 4.37 Along with others from the Group, Pat attended a meeting hosted by CPW which included the delivery of information from Mr Cliff Tipler. The Group vividly remembers Mr Tipler saying, after establishing that there were no journalists present, that he would be open about what he said. Mr Tipler was asked about the consequences of downstream flooding as compared to the 1970s experiences and he replied ..."think of the 70s and double it." Needless to say this has brought about major concerns for our Group members and other farmers in the area. Mr Tipler also said to submit in support of the Scheme and mention our concerns about drainage and they would fix any

problems. While this may appear on the face of it to be reasonable, the concern is that once the Scheme is in place there is no going back and some of the issues may not be 'fixable'. In many areas it would be impossible to drain as this would require water to run up hill.

- 4.38 Pat considers, as do the others in the Group, that if the downstream effects of the Scheme are as stated or worse, then the loss of production in the arable farming business in this area could force farmers from the land and depress the price of properties that are intensive cropping farms which produce to high standards.

Impact on Gullies on Farm Properties

- 4.39 As mentioned previously, this area contains undulating country that, while appearing largely flat, contains many areas of gullies. In periods when the groundwater table is high these gullies may contain water. Most of the farms in this area will have some form of gullying or lower lying land that can become filled at times when the water table is raised. The Group's main concern is that with an artificially raised water table in this area, as is likely to occur as a result of this Scheme, the times when these gullies are to contain water will be more prevalent and potentially more extreme. This in turn may create significant areas of land that will no longer be able to be cropped or cropped to a lesser extent. The following gives an example of what has been experienced in terms of draining such gullies.

Mr Ron Inwood – "Waihora", Southbridge

- 4.40 Ron farms a property at Sedgemere in partnership with his son. This is a mixed arable and pastoral farming operation.
- 4.41 A number of years ago Ron was considering tile draining some of the gullies on his farm. In most of the winter months these gullies carry water and the amount of water in them varies depending on the wetness of the winter season and distance the water table is from the ground surface. Ron had a drainage contractor undertake levels in order to determine the practicality of installing tile drainage.
- 4.42 The Lee Stream runs through Ron's property and it was found by the contractor that the level of this stream was too high for tile drainage to be effective. On the basis that the Scheme was to increase the levels of the lowland streams, as is proposed by the applicant, and say the Lee Stream was to rise a metre, then there would be little drainage from the land and possibly water from this stream could flow up the lower gullies.
- 4.43 If the water table is to rise as proposed by the applicant then Ron considers that it is likely that other gullies on his property not connected to the Lee Stream would also carry water most of the year as well. Under these conditions Ron considers that cropping would be extremely difficult and on most parts of the farm impossible.

Increased Stream Flows, Drainage and Flooding Issues

- 4.44 Flooding in the lowland plains has in the past had serious impacts on farming operations in this area and also on domestic properties. Any rising of the water table in this area would accentuate any flood events causing the impacts to be greater and to last longer periods of time. The following are experiences encountered from flooding in the past.

Mr Ron Inwood – “Waihora”, Southbridge

- 4.45 Ron and his family before him have kept extensive records over the years of rainfall data measured at “Waihora” farm. On 16 May 1993 Ron recorded that heavy rain fell for most of the day with a total of 50ml falling between 8.00am to 12.00noon alone. Again heavy rain fell all day on the following day and eased on 18 May 1993. A total of 196.5ml (7.86in) fell during this period.
- 4.46 As a result of this rainfall and combined with the high water table in this area, flooding was very bad all around Southbridge. The Lee Stream broke its banks and flowed across country/farm land to Coopers Lagoon.
- 4.47 The other time the Lee Stream broke its banks was in February 1936 after 11.85in of rain fell with 5.81in falling in March 1936, which only added to the farmers misery in this area.
- 4.48 Photographs of flooding and ponding on Ron and his son’s farm are contained in **Annexure J**. This flood event was after 100ml fell from mid August to the end of the month, followed by more rain from the beginning of September culminating in 56ml over a two day period on 10 and 11 September 2000.

Mr David Birkett - “Greenmeadows” Farm, Leeston

- 4.49 David farms at Leeston in partnership with his father Paul. They have witnessed over many years of farming the major impacts associated with a high water table and wet climatic conditions.
- 4.50 David considers the ability of the drainage and stream system is currently over taxed at times of high groundwater levels. The raising of these levels reduces the ability of a drain to perform. This is caused by a reduction in head of the drainage system and reduced capacity of the drain. Both of these occurrences increase the likelihood of flooding and also the severity of it.
- 4.51 A case history of this can be seen on Birdling Brook. A plan change request (Plan Change 49) was made to the Selwyn District Council (SDC) for a rural residential subdivision on farmland within the classified Leeston drainage system. The main reason the plan change was declined was that the downstream effects on drainage and drain capacities. This was reinforced by the SDC report that Birdling Brook was at capacity and any increase in the flow would increase flooding. Flooding in this area in August 1992 can be seen in **Annexure K**.

- 4.52 The classified drains in this area are also taxed due to high groundwater levels and rainfall events. This can be seen in **Annexure L**. These photographs were taken after only 50mm of rainfall that fell on land with a low field capacity due to high groundwater levels (photographs taken on 10 September 2000).
- 4.53 There is currently 36,900ha in the classified drainage systems (as shown in **Annexure B**) This area would need to be improved and expanded to cope with the increased groundwater levels due to the proposed Scheme. There is potentially another 10-15,000ha that would be affected and drainage work would need to be implemented. This makes a total area of 45-50,000ha (which is nearly the same size as the Scheme's irrigable area) that is adversely affected. When you adversely affect an area nearly as large as the Scheme itself, one has to seriously question if the loss of production over such a large area is acceptable. It is certainly more than a minor effect.
- 4.54 The stream flow increase claimed by CPW is an increase of 1 to 20%. Yet the modelled stream flow statistics that are presented in their evidence shows a range of 2 to 233% increase in flows, with an average increase in litres per second of 46%. The effect that this level of increase will have on our drainage system will be a lowering of productivity, which will have a financial impact that is simply not acceptable.
- 4.55 The area of land that has groundwater levels within 1m of the surface once the Scheme is commissioned is to increase by 25% not the 3.7% stated by CPW.

Mr Robin Heslop - "Dalkeith", Southbridge

- 4.56 Robin purchased a 64ha farm in 1982, of which half of the property was located on the east coast about 2.5km north of the Rakaia Huts. This land, because it is so low-lying, is rated to cover maintenance of the culverts which run through the sea bank that allow the lowland creeks to drain/flow to the sea.
- 4.57 Robin farmed this land through to 2004 when the opportunity arose to sell it and buy some of his father's farm adjacent to his home block, approximately 3km inland. Robin attended the meeting in Leeston facilitated by Federated Farmers at which Mr Cliff Tipler (for the applicant) advised on some of the downstream effects of the proposed Scheme. Of the information he produced one slide showed where groundwater would rise to ground level – yellow showed where groundwater would rise to ground level, red where it would be above ground level. Mr Tipler laughed at this and stated that obviously this could not happen. This did not fill Robin with confidence as to the accuracy of the information provided then or for that matter now.
- 4.58 Robin recalls that all of his original farm and most of where he currently farms were yellow areas apart from a large portion of the coastal block which was red.

- 4.59 Jollies Brook is the creek which runs around the coastal block, it then runs for about 1.25km south along the coast to White's Culvert – to ensure enough fall along the coast the creek gradient around the paddock is very little with the creek bank all that is keeping the creek constrained for the last 100m to the coast. If there was significant rainfall over winter resulting in the creek overflowing, there can be as much as 6ha of land under water. There is then nowhere to run it off to as the creeks are higher than the paddock level. There is still a pipe through the stopbank for stockwater and filling a duck pond if this needs to be demonstrated.
- 4.60 This land is the red area which was originally identified as a concern in the CPW 2006 meeting at Leeston. Under the Scheme the issues of drainage related to this land would become permanent, and everything shown in the yellow or on the fringe of yellow would become un-farmable also.
- 4.61 **Annexure M** contains three photographs of the subject land. Photograph 1 was taken in the late 1980s showing the 6ha under water. Photograph 2 shows the same land taken in June 2008 and Photograph 3 is taken from the stopbank looking up the coast showing creek and paddock levels.

Other Concerns

- 4.62 There are also concerns relating to increased water flows in the lowland streams. For example, the already high water table in the area causes saturated soils adjoining the lower edges of Harts Creek and Birdling Brook in the area of the confluence of the two streams. This results in erosion of the creekside during the quite frequent flood events that occur in particularly wet winters. If the water table was raised further and/or the flow in the streams were to be greatly enhanced by the Scheme as stated by the applicant, then greater rates of erosion can be expected in the future and will not necessarily be confined to winter as at present. The creeksides are not farmed so the loss of soil is not significant from an agricultural point of view except in adding to the silt loading of the stream which can have an adverse impact on irrigation equipment, causing expense and delays. It also has a significant impact on water quality in what is an important lowland trout fishery.

Culverts

- 4.63 There are four culverts located between Lake Ellesmere and the Rakaia River mouth that transport water from the lowland streams and drains to the sea. The location of these culverts are shown in **Annexure N** They are known as the White's, McIlraith's, McEvedy's and McLachlan's culverts. The table below sets out some characteristics of these culverts in terms of their funding and repairs.

Table Four: Culvert Information

Culvert Name	Information
All culverts	Funding for all the culverts is administered by the Selwyn District Council (SDC) but only a few coastal farmers are rated for all the costs associated with their up keep plus the SDC charges.
White's	SDC have draft plans of spending \$105,000 for repairs at this culvert.
McIlraith's	This culvert is operated by NZ Salmon who spent approximately \$80,000 recently on repairs, of which the culvert fund contributed \$20,000.
McEvedy's	This culvert is closed as Ngai Tahu want it to aid wetlands for Cooper's Lagoon and there is no resource consent to open them. The water is then diverted to McLachlan's culvert which is already running to capacity.
McLachlan's	This culvert is running full and therefore could not sustain more water in its present form (see Photograph contained in Annexure O)

- 4.64 All of these culverts have required repairs recently with local farmers repairing holes to stop widespread flooding. However, these pipes will require more concrete to be laid. The pipes wear because of heavy seas which is making the beach retreat inland at one metre per year in this area. Previously there were subsidies for the upkeep of these facilities, but now the Government wants assets without liabilities.
- 4.65 There are numerous drains leading to these culverts, most of which require cleaning every year. We note though that many of these drains are not presently the responsibility of either ECan or the SDC but the individuals who farm there. To add further water in this area would have a significant impact on these drains and the culverts which should not fall on the responsibility of the land owners but rather any additional effects should be the responsibility of the applicant/CPW. Why should the locals bare the cost of exacerbated effects that they have not caused?
- 4.66 In addition, as the water volume in the area increases, there is a corresponding increase in birdlife. This bird life has a detrimental effect on the productivity of the area and are regarded as a pest in other areas e.g. Canadian Geese.
- 4.67 These examples merely touch on the many different farming activities and associated facilities that may be affected by increases in the groundwater and surface water levels in this area. However, the examples above clearly illustrate that even a slight raising of the water table in this area could have significant adverse effects on agricultural activities and associated activities here.

SUMMARY DISCUSSION ON MITIGATION

4.68 The applicant has proposed a series of conditions for the various consents should the Scheme be granted approval. At best these are a preliminary 'first draft' of conditions. The applicant has suggested drainage as one solution to dealing with raised water table issues. With respect to that we make the following points:

- Modification of existing drains may lead to interception of the groundwater table. We know that when the Selwyn District Council was trying to excavate soak pits for the end points of the water race system in this area. The Council commissioned this work in order to prevent water race water from the Rakaia River transporting Didymo to Lake Ellesmere. The contractor had difficulty digging one soak pit because groundwater was intercepted.
- Provision of field tile drains to properties. The photographs attached in **Annexure P** illustrate water lying on the Barnett Partnership farm during August 2007. All of these photographs relate to land that already has field tile drainage. As the photographs illustrate, this is not a sufficient mitigation option. The cost of undertaking sufficient field tile drainage in the area affecting our farms would be substantial and potentially prohibitive.
- Field tile drainage may not be a physically feasible option in this area if the groundwater level was to rise. This is because such drainage would have to be laid higher and may also not have the required fall.
- Drainage can only work where water can reach the drain facility. A site visit to the affected area would clearly show that the land here is low lying and also undulating. Unless furrows for drainage are cut into paddocks there is no way that water can be drained to any formalised drain system. These practices occur now but only on an as needed basis and we see no reason why we should have to cope with further and/or exacerbated drainage issues because of this Scheme.
- In some instances, for example the culverts that drain to the sea, the drainage systems are already operating at their full capacity and to add additional water to this system would require significant redevelopment which should be provided at the applicant's expense. Maintenance and repair would also need to be funded by the applicant on an on-going basis.
- Under-pumping drainage has been suggested by the applicant as an option to deal with groundwater increases. Our concern is once this pumping was done then where would the water go? There are already capacity issues at the sea culverts and under pumping will not relieve their pressures.

5. LAND USE IMPACTS ON GROUNDWATER QUALITY

- 5.1 We are aware of the main evidence provided by the applicant in relation to the potential adverse effects associated with extra drainage of water to groundwater beneath the new irrigation areas. These will contain contaminants derived from the new land use activities likely to occur in the Scheme area. We are also aware of the evidence provided by Mr Peter Callander on behalf of the CCC on this issue and the Section 42A Officer Report by Dr Howard Williams for ECan. The Hearing Commissioners will also hear other evidence on this topic throughout this hearing.
- 5.2 From the information we have had the opportunity to consider we understand the following:
1. CPW are proposing the implementation of a high standard of land management practices and require the development of farm management plans that are proposed to be audited in order to deal with drainage and contaminants.
 2. The main contaminant that will affect the underlying groundwater is nitrate derived from animal effluent and fertiliser application. Microbial contamination may also be an issue as this has been recognised as a major concern in other dairying areas of NZ e.g. Waikakahi.
 3. We note here that ECan has indicated to us that there are already some domestic wells in our area showing that they are close to or have exceeded the MAV of the Drinking Water Standard for NZ.
 4. Elevated nitrate concentrations from the Scheme could further impact: groundwater aquifers down-gradient in our area where domestic and irrigation wells use water from the shallow aquifer. High concentrations of nitrates in groundwater also threaten streams and lakes which are fed by the groundwater as occurs in the Lake Ellesmere catchment. Elevated nitrate levels can increase the risk of eutrophication which would exacerbate existing problems in Lake Ellesmere and could lead to problems developing in regionally important lowland streams such as Hart's Creek.
 5. Most of the groundwater down-gradient of the Scheme area is several 10s of years old, therefore the full impact of the Scheme on groundwater quality will not be observed for a few 10s of years after the Scheme is fully operating.
 6. The applicants have indicated they will use an adaptive management approach such as reviewing farm management procedures through the monitoring of data from the effects that arise from such practices.

7. Because of the lag-time in observing groundwater quality effects it will be important to manage the generation of nitrate and its migration conservatively.
8. There will be a significant increase in nitrogen mass entering groundwater as a result of the Scheme but CPW contend that because of extra drainage from irrigation and water race leakage there will be little change in nitrate concentrations.
9. The model to predict the likely effects or decreases and increases in nitrate levels in groundwater does not take into account seasonal or spatial variations and concentrates on achieving Drinking Water Standards without considering other ecosystem susceptibility.
10. CPW intend to use scheme and farm management plans to require high standards of land use management through: properly designed and efficient irrigation systems; water budgeting; fertiliser and effluent management; nutrient budgeting; and riparian management. They intend to implement these measures through: training/support for Scheme water users; the development of environmental farm management plans; monitoring of groundwater levels and quality, surface water flows and quality; and, the development of an environmental fund to provide for mitigation measures.

5.3 With respect to these matters we hold similar concerns to other down-gradient submitters that the Commissioners may have already heard submissions from or will hear from after our presentation. Our concerns are:

- a. As we raised with respect to groundwater levels, the use of modelling to determine what will happen in relation to groundwater quality amounts to really a 'best guess'. While we realise that some sort of mechanism must be used to assist estimation of the effects of such activities, we are nervous as to their practical application in our area. Our ground water system is adversely affected by small variations in ground water level and rainfall events.
- b. The effects on groundwater quality are likely to only become apparent after 10 to 50 years of irrigation in the Scheme area and that to rectify any adverse effects on groundwater quality will require changes to the farm/scheme management plans. This may take several years to not only change but then implement and in the mean time we continue to be adversely affected.
- c. We are not convinced that the Scheme managers/consent holders of the Scheme will willingly or openly respond to any addressing of adverse effects in relation to water quality issues. Mr Lewthwaite's evidence seems to hold a theme that the burden of proof will fall upon those affected. This signals to us that we would have many years of

arbitration before us in the face of a large entity which refuses to address the effects it may have brought about. We cannot imagine that once such a Scheme was up and running that its managers would easily/openly look at large scale cutbacks in its shareholders applications of fertiliser, water use, stock unit ratios etc or in the worst case scenario, contemplate the closure of part or the entire Scheme.

There has already been a major financial commitment to this Scheme and further commitment will be required to actually build it. At some point a Scheme such as this becomes unviable because shareholders can no longer afford to buy in when the costs become too great. With such a large commitment to the Scheme it just would not make practical business sense to then cut a Scheme back once built or provide major compensation or remedial actions/works. This is because the continued operation of the Scheme under such restrictions could become unviable. We therefore find it hard to swallow that any adverse effects relating to these issues would be openly received by the applicant/consent holder. That is not how business operates and we are not so naive to believe the proposals put forward by the applicant on this matter, and this is further fuelled by the lack of consultation undertaken on these matters to date.

- d. Much has been made of ensuring water from wells meet the Drinking Water Standards and we assume that this is mainly intended for domestic water supply. Matters relating to additional nitrates in groundwater that supplies stock use and irrigation use down-gradient of the Scheme has not been addressed.

Livestock are also at risk from high levels of nitrates both from drinking water and eating plant matter which has accumulated high levels of nitrates or nitrites. Nitrate toxicity can lead to increased abortions, still births and low birth weight, also hyperthyroidism. Loss of weight, Vitamin A deficiency and reduced milk production in cows can also be a problem, and in extreme cases it can cause death.

- e. As farmers, we are concerned with the magnitude of the task of documentation required for the management plan implementation and the auditing of farm records, as well as the actual auditing. It seems onerous and extremely time consuming. We are not therefore convinced that farm management plans would actually eliminate any down-gradient adverse environmental effects.
- f. We know that in areas below the existing Rangitata Diversion Race Irrigation Scheme there has been issues in relation to high nitrate concentrations in domestic water supplies in Hinds.

Little information has been presented by the applicant's experts that relates to actual effects down-gradient of Schemes that have been operating for some time. Where there is some reference, Mr Lewthwaite refers to his previous work on the Amuri Scheme in his second brief of evidence, we note that this Scheme has an entirely different downstream land formation and groundwater system than our area i.e. the Amuri Scheme in the Culverden area has land down-gradient which is hills and not lowland plains that drain to the sea and an estuarine lake and associated lake catchment. We know from farmers in that area that even though Amuri has a different geological make up, the farms in the downstream area also now experience excessive groundwater levels.

- g. The applicants have only looked at the effect on nitrate levels under their own Scheme area and not how the changing groundwater level and increased drainage downstream of the Scheme will change nitrate levels. The increase in groundwater levels into the root zone of plants will cause the rooting system to move up into the unsaturated soil, losing the plants' ability to access the nitrates that were available in that zone previously. The majority of this nitrate will be lost directly to the ground water. The amount of nitrate that will enter the groundwater will be significant because the area that has groundwater levels within 1m of the ground surface will be 56,000ha in an average year, increasing to 95,000ha under wet conditions. The potential increase in nitrate levels outside of what CPW has looked at is significant and needs considerable further investigation.
- h. Testing for water quality has been undertaken on some of the local streams and the township from Southbridge for up to the last eight years. The purpose of this is to monitor Nitrate and Phosphate to ensure that our farming practices are not adversely affecting our streams water quality. As such, any future impacts on streams should not be attributed to the local farmers as has happened with respect to stream flows.

5.4 Based on the above, we consider that there is considerable potential for major adverse effects from increased nitrate levels in groundwater to occur. We also consider that the proposed mitigation measures will not effectively address these issues and will weigh the burden of proving the effect solely on those being affected. This is a seriously inappropriate way to handle such effects and indicates that the applicant has not dealt with these potential effects satisfactorily to justify granting these consents.

6. COMMENTS ON PROPOSED CONSENT CONDITIONS

- 6.1 We wish to reiterate here that we have major concerns regarding the effects this proposed Scheme will have on the groundwater levels and quality and the lowland streams in our area. Of the evidence that has been produced to date on behalf of the applicant we are not convinced that the proposed mitigation of the effects will be sufficient to minimise these effects in our area. As such we recommend that the applications should be declined in their entirety.
- 6.2 We feel it is prudent also to comment on the proposed consent conditions. The following are general comments on the conditions proposed:
- i. There is an overriding assumption made by the applicant throughout the proposed conditions that any down-gradient adverse environmental effects of the Scheme will need to be proven by those affected. To be straight on this point, we find this an arrogant, offensive and irresponsible approach. For the applicant to have spent considerable effort on assessing these effects in this hearing, we are somewhat surprised to see proposed mitigation measures which essentially say “if these effects occur they won’t be from the Scheme and you’ll have to prove they are the Scheme’s effects”. This is hardly in keeping with the purpose and principles of the Resource Management Act. The “Trust Me” approach from the applicant is contrary to the Resource Management Act and runs against the base values of New Zealand society.
 - ii. The conditions proposed, and as we have stated previously, are, at best, a very preliminary attempt to try and address the potential adverse effects on groundwater quantity and quality. They have not been thought through to any great degree and show a major lack of consultation and no practical understanding at all of how the known effects could actually be minimised.
 - iii. Overall, the conditions are too general and non-specific. They do not provide us with any certainty they would actually be effective and achieve their intended purpose to minimise the environmental effects we have most concern about and that are central to retaining our existing quality farming operations, not to mention our social and economic well-being.
 - iv. The monitoring of down-gradient effects does not provide a sufficient degree of base level, control state records from which to assess the effects of the Scheme on groundwater quantity and quality in the future. For any monitoring of groundwater quantity and quality to be of any use it needs to take place at locations outside and down-gradient of the Scheme area and be undertaken for a number of years. The applicant has the opportunity to undertake this monitoring from the time any consent/s is/are granted to the time the Scheme is commissioned. This may be up to 10 years. However in order to

understand the variability of groundwater in our area this period of time will be required to get a sound understanding/record of what happens in wet winters, dry summers and a combination of both and the more moderate years between. No shorter period would be plausible.

- v. Any Scheme pre-commissioning monitoring plan should specifically address how drainage, flooding, groundwater quantity and quality and lowland stream monitoring etc would work and that it would have to commence as soon as any resource consents for the Scheme were granted. It should not be at some time decided by the applicant/consent holder. In addition post-commissioning monitoring would be a necessity.
- vi. An Environmental Fund is proposed which would require irrigators in the Scheme to provide \$2 per ha of irrigated land per annum to be provided to a fund set aside to deal with environmental effects. To put it bluntly, this amount is considered an absolute insult. There is no realistic way that this amount could adequately pay for environmental monitoring let alone compensating for the loss of production and use of our land that we are likely to endure in years to come.

Factors to consider with respect to environmental funding are:

- Drainage, if this is an actual viable solution as in some areas drainage would not be possible due to the lack of fall;
- Drains that are already operating at capacity;
- Compensation for the loss of productive land – i.e. gullies that start to contain water and run again or more frequently or permanently, springs that start to run;
- Additional culverts into the sea to remove excess water;
- Water quality monitoring; and
- Domestic Septic tanks.

Potentially the affected area could be in excess of 2000 Hectares which equates to \$70,000,000 of farm value.

We would have thought that a Scheme that the applicants have touted as bringing major financial benefits to Canterbury and the nation, could have come up with a more realistic levy for environmental mitigation.

- vii. Independent arbitrators have been considered to deal with disputes over what the causes of adverse effects are and how they are to be

mitigated. This simply signifies a continued on-going bureaucratic and legal battle for probably the rest of our lives in this area and potentially the following generations. If this is to be the case then we would expect that the costs would fall on the applicant/consent holder given they are the perpetrators.

viii. We reiterate our comments on farm management plans as provided in paragraph 5.3e of this evidence.

6.3 We envisage that the Commissioners will be seeking a more comprehensive set of proposed conditions from the applicant before they close the hearing. These conditions need to be carefully considered as to their practical implementation. We strongly believe that the likely adverse effects that our area would be subject to could not be adequately mitigated to avoid, remedy or eliminate them.

6.4 We consider that if the Commissioners were of the mind to approve the applications then they should issue an interim decision and require any proposed conditions of consent to be consulted on and made available for public comment. It would be inappropriate to merely accept a new set of conditions at the end of the hearing by the applicant without giving affected parties the right to comment on them, particularly given the significantly inadequate nature of those conditions currently before the Commissioners.

7. CONCLUSION

7.1 Based on the above information we are strongly of the view that the proposed applications sought by CPW should be declined. This is because:

- The modelling on which the applicant has based its assessment of environmental effects does not recognise the variability and nature of the groundwater levels in our area;
- Any increase in the water table in our area will have significant adverse effects on our ability to farm our land to an efficient and effective level;
- The addition of further water to the ground and surface water systems in this area will have a major impact on the capacity of existing drainage facilities that may not be able to be successfully mitigated;
- Flooding events will become more extreme and impose further hardship than is already the case;
- There will be adverse effects caused by additional nitrates in the water systems that can not be adequately mitigated;
- Proposed conditions of consent are totally inadequate and incomplete; and

- A lack of adequate consultation in our area has led to sub-standard applications and associated assessment of environmental effects.

The Lowland Farming Group