
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 Susan Goodfellow and Derek Crombie

Dated: 13 October 2014
STATEMENT OF EVIDENCE OF SUSAN GOODFELLOW AND DEREK CROMBIE

INTRODUCTION

Derek Crombie

1 My name is Derek Crombie.

2 I am the CEO at Central Plains Water Limited (Central Plains).

3 I have been involved with the development of the Central Plains Water Enhancement Scheme (the Scheme) for over 10 years, leading the consenting and early investment stages of the scheme.

4 I am a Chartered Professional Engineer, and a Fellow of IPENZ. I have over 35 years' professional experience.

5 Since leaving my Consultancy (Director/shareholder) position to join Central Plains full time in early 2011 I have led the development of Stage 1, 20,000ha to investment ready and into the current construction phase, and am now overseeing preparations for the operation of Stage 1 and the development of Stages 2+

6 As part of my work I have been actively involved in the Canterbury Water Management Strategy, specifically in relation to ensuring that Central Plains’ infrastructure is being developed so the regional irrigation water infrastructure can 'plug into' the Scheme in the future.

Susan Goodfellow

7 My name is Susan Goodfellow.

8 I am the General Manager Environmental at Central Plains.

9 I have been involved with the development of the Scheme since early 2011.

10 I have a Masters of Landscape Architecture, and have over 20 years’ professional experience - 10 years of which was dedicated to working in an environmental consultancy on large scale infrastructure projects based in Asia.

11 Since joining Central Plains full time in early 2011, I have led, in a project management capacity, the implementation of consents, environmental compliance, and the stakeholder engagement processes for the Scheme. I am responsible for setting up and implementing the farmer compliance regime (as required by the Scheme’s resource consent to use water) - including Farm Management Plans and the required nutrient management regime. To that end, I have also been actively involved in the Council led
Selwyn Waihora Zone stakeholder engagement process that has informed the Solutions package underpinning Variation 1.

I have project managed Central Plains’ submission for proposed Variation 1 to the proposed Canterbury Land & Water Regional Plan (Variation 1). I have also coordinated Central Plains’ involvement (alongside a number of other submitters - together referred to as the Sustainable Land and Water Group (SLWAG)) in the integrated catchment model development process.

**SCOPE OF EVIDENCE**

In our evidence we provide:

13.1 an overview of the consenting history, scheme reliability and storage requirements, scheme development staging; and criteria to enable Stage 2+ development; including the implications of an insufficient scheme nitrogen allocation on the scheme’s viability;

13.2 a summary of the contribution Central Plains makes to the Selwyn Waihora zone committee Solutions Package;

13.3 an overview of Central Plains’ consent obligations with respect to farmer and Scheme compliance (to the extent that such obligations are also relevant the nutrient regime proposed by Variation 1); and

13.4 the Scheme’s nitrogen allocation requirements, in particular drawing together the outputs from the SOURCE model work undertaken by Jacobs, and the OVERSEER work undertaken by Mr Stuart Ford (and other experts engaged by Central Plains) to identify an effective nitrogen load for the Scheme to ensure the Scheme can viably develop the consented 60,000ha scheme.

**SCHEME SCALE AND LOCATION - OVERVIEW**

The Central Plains Water Enhancement Scheme (the Scheme) is located within the Selwyn Waihora Zone as shown in Figure 1.

The Scheme is a large scale local, regional and nationally significant irrigation scheme that will harvest surface water and distribute it across 60,000ha of irrigable land. The irrigable area sits within a command area of over 100,000 ha of the Canterbury Plains between the Southern Alps, State Highway 1 and the Waimakariri and Rakaia Rivers.
The Scheme is consented to take water from both the Waimakariri and Rakaia Rivers, which will be linked via a 56km headrace canal running around the foothills.

The run of river takes authorise a total take of what is effectively ~61 cumecs principally comprising:

17.1 ~25 cumecs of mainly lower reliability B Permit Water from the Waimakariri River; and

17.2 ~36 cumecs from the Rakaia River, including:

(a) up to 30 cumecs of what is typically referred to as lower reliability band 5 water.¹ This water represents Central Plains’ share of the water that is available to it as a first priority right under the water sharing agreement it has with the Ashburton Community Water

¹ Being water that has a minimum flow of 73 cubic metres per second above the variable monthly minimum gorge flow specified in clause 7 of the National Water Conservation Order (Rakaia River) Order 1988
Trust (ACWT)\(^2\) – although up to \(~36\) cumeecs may be available at times;\(^3\) and

(b) up to \(6\) cumeecs of subservient band 2 and 3 water. Although these bands are more reliable, Central Plains’ subservient water can only be taken in a manner that does not affect the reliability of the relevant primary consent holder. In practice this means there are significant volumetric restrictions on the take of water by Central Plains’ from bands 2 and 3.

18 Water from the main canal will be distributed by gravity feed through over \(500\) kms of underground piping to shareholders who join the Scheme.

19 Central Plains’ holds all the consents necessary for the construction, operation and maintenance of the Scheme.\(^4\)

**Development stages**

20 The scheme is a \$400\)M project (excluding on farm costs that amount to around a further \$395\)M - refer to Mr Andy MacFarlane’s evidence).

21 The scale and many complexities associated with farmer uptake, scheme funding, and reliability have resulted in the scheme being developed in stages.

**Stage 1**

22 Construction for Stage 1 commenced in March 2014 and water delivery is scheduled for 1\(^{st}\) September 2015.

23 Some photos showing the development to date are set out in Annexure 1.

24 For Stage 1, approximately 15,000ha of the area is currently irrigated with groundwater that will convert to Central Plains’ surface water. The total area that will be irrigated under Stage 1 is approximately 20,000 hectares.

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\(^2\) ACWT holds consents for yet to be constructed hydro-generation scheme on the true right (south) bank of the Rakaia River.

\(^3\) Noting that the total authorised take between the two entities is \(~36\) cumeecs and at such times ACWT is not taking Central Plains could potentially access the full 36 cumeecs. Central Plains and ACWT are in the final stages of negotiating a variation to the agreement that accommodates the first priority right for Central Plains. Under the existing agreement, \(~20\) cumeecs would be available as a first priority right to Central Plains.

\(^4\) In a very limited number of instances there will be minor/ancillary consents that may still be required once final designs are available for Stages 2+ of the scheme to cover activities such as construction lay-down areas or minor construction discharges. All core consents are held.
The key components of Stage 1 are:

25.1 an intake and headworks at the Rakaia River to bring water into the headrace;

25.2 a headrace alongside and traversing ‘up’ the northern bank of the Rakaia River to the top of the main Rakaia terrace;

25.3 a level headrace along the plains to convey water north and into the reticulation system; and

25.4 a piped reticulation system providing pressurised water to all shareholder properties in the Stage 1 scheme area.

With having committed to Stage 1 (which as noted includes the primary infrastructure for subsequent stages) from a financing perspective Central Plains is, subject to the matters discussed below, effectively committed to developing the wider scheme.

The Stage 1 (and Stage 2+) areas are shown in Figure 2.

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**Figure 2 – Scheme Development Stages**

**Stages 2+**

Stages 2+ cover the remaining 40,000ha which will be developed between 2015 and 2020 (‘Stage 2+’ is the description Central Plains has given the potentially several stages that will follow the development of Stage 1).
The actual timing of the development of Stages 2+ is dependent on either establishing scheme based storage or contracting additional stored water (see paragraphs 124 to 134 below) to achieve 95% reliability of supply.

Another key consideration will of course also be the nutrient management regime that applies to conversion of dryland properties within the Central Plains’ Stage 2+ scheme area to irrigation. With having now committed to a significant part of the distribution infrastructure of the whole Scheme (and not just Stage 1), Central Plains is very concerned to ensure that Variation 1 anticipates the full development of the Scheme.

In this regard, it is important to understand the commercial development constraints of the Scheme - and why certainty in relation to nitrogen allocation for the whole Scheme is fundamental not only to enable the development of Stages 2+ of the scheme, but also to ensure that Stage 1 that is currently being constructed remains viable (again appreciating that Stage 1 is currently carrying the consenting cost and intake/primary distribution cost for the wider Scheme).

Ultimately, Central Plains is a cost recovery company, providing the lowest cost surface water to farmers. It does not generate revenue and relies on shareholders and bank loans to fund the construction and the operation of the Scheme.

Only when water is delivered to farmers can Central Plains properly charge (beyond initial shareholder advances) for the costs associated with the Scheme. At the present point in time these include an obligation to repay its $150M debt for the Scheme (being bank and Crown Irrigation Investments Limited loans).

Any delays to delivering water for the wider Scheme will almost inevitably result in additional costs and an increase to the annual water charge for Stage 1. In the case of existing irrigated properties there is also a risk that if Stage 2+ remains uncertain or will not happen for some time, they may opt out of the scheme and retain the use of their existing groundwater.

In terms of going forward, Central Plains’ current development programme is contingent on the Stage 2+ Prospectus to be issued mid-2015. A confirmed nitrogen allocation for the 30,000ha of new irrigation (along with certainty that existing irrigators will be able to continue to irrigate in a manner that allows them to buy-in to the Scheme) will be required before this milestone can be achieved.

Central Plain’s existing bank lenders (ANZ and Westpac) have confirmed that any future bank debt to fund Stages 2+ will be
conditional on Central Plains having a confirmed nitrogen allocation to viably develop the full scheme.

37 Similarly, a key driver at a shareholder level in determining if converting to irrigation is economically viable is the certainty that an acceptable nitrogen discharge allowance at the property level is available to support the intensification and recognised increased leaching as a result of irrigation.

CONSENT OVERVIEW

38 The scheme was the subject of what is probably the longest and one of the most detailed consenting processes to ever occur for an irrigation scheme in New Zealand.

39 The original water take was applied for (jointly with ACWT) in December 2001. Further consents relating to the use of water and associated infrastructure/activities (along with a notice of requirement for the main head-race canal) were applied for in 2006.

40 The consents applied for were ultimately granted in early 2012 (after all appeals and priority challenges were resolved – including various appeals and declarations in the Environment Court, High Court, Court of Appeal and Supreme Court). As noted earlier in this evidence, all core consents required for the Scheme are held.

41 A copy of the key water use consent (along with the general and administrative conditions) is included in Annexure 2. The consent includes a comprehensive condition suite including conditions around matters such as the management of farm nutrients, groundwater mounding, and the provision of farm management plans.

42 In this regard, it is noted that there are also already extensive controls with the existing Central Plains’ resource consents that relate to nitrogen leaching and nutrient management. In simple terms, these include:

Farm Management Plan

42.1 A requirement for each property to prepare a Farm Management Plan (FMP) which is initially audited annually and has to comply to very specific objectives around nutrient management.  

5 CRC061973, condition 11
(b) maximise water application effectiveness while minimising excess drainage and runoff;

(c) minimise the incidence of wind and/or water erosion caused as a result of farming practices;

(d) minimise nutrient losses to surface and ground water through the use of nutrient budgeting;

(e) minimise nitrate leaching and/or run-off losses to surface and ground water through careful fertiliser management, management of drains, planting of buffer zones around surface water bodies (including drains), and the exclusion of stock from all water bodies;

(f) minimise phosphate run-off losses to surface water through careful fertiliser management, management of drains, planting of buffer zones around surface water bodies (including drains), and the exclusion of stock from all water bodies;

(g) apply nutrients where needed to maximise effectiveness and minimise losses to non-target areas;

(h) exclude all stock from waterways and wetlands (including drains, races and stockwater races);

(i) minimise soil loss and contamination of waterways; and

(j) avoid, remedy or mitigate effects on native plants and native animals and their habitats on individual farm properties and where possible enhance native plants and native animals and their habitats.

42.2 In addition to the objectives, there are a number of specific best management practices that must be incorporated within each FMP.\(^6\)

12 Each FMP shall include:

... 

(b) the best management practices implemented on the property to minimise the loss of nitrate-nitrogen to soil drainage water and minimise any loss of sediment, phosphorus or nitrogen to surface waters. The best management practices may include, but not be limited to:

(i) limiting the volume and rate of water used for irrigation to ensure that the application of

\(^6\) CRC061973, condition 12(a)
water to the property does not exceed that required for the soil to reach field capacity;

(ii) split applications of fertiliser;

(iii) timing of fertiliser application to match plant growth;

(iv) avoiding application of fertiliser to saturated soil;

(v) avoiding applying fertilizer when the soil temperature at 10 cm depth is less than 6°C;

(vi) using nitrification inhibitors;

(vii) planting winter cover crops;

(viii) limiting the average total nitrogen (fertiliser and effluent) application to that property.

**Annual reporting obligations**

42.3 For every 12 month period ending 30 June, Central Plains is also required to provide data from each shareholder property, including a nutrient budget that the average total nitrogen (fertiliser and effluent) application has been less than 200 kgN/ha/yr, or OVERSEER (or appropriate alternative model analysis).\(^7\) This also extends to collecting information for property as to its soil drainage concentrations.

**Direct controls on N loss**

42.4 In addition to the preparation of farm management plan and the annual reporting obligations referred to above there are a number of direct controls that then need to be implemented on each property depending on its actual level of discharge:

20 Where the average annual concentration of nitrate nitrogen in the soil drainage water below the plant root zone as calculated for the property in accordance with clause 18(b) or measured:

(a) is between 8 grams per cubic metre and 16 grams per cubic metre, management practices shall be implemented to reduce the loss of nitrate nitrogen to soil drainage water;

(b) exceeds 16 grams per cubic metre of nitrate nitrogen, the consent holder shall require the adoption of management practices to reduce the loss of nitrate-nitrogen to soil drainage water, including but not limited to:

\(^7\) CRC061973, condition 18
(i) a revision of the Farm Management Plan on that property to ensure best management practices are put in place;

(ii) a review of the on-farm practices to ensure implementation of the FMP,

(iii) the management practices specified in condition 12(b); and

(iv) the average total nitrogen (fertiliser and effluent) application to that property shall be limited to 200 kgN/ha/yr.

43 I note that the Central Plains scheme consents are based on concentration (as opposed to per hectare loads as might be derived from OVERSEER). **Mr Andy MacFarlane** confirms in his evidence that drainage concentrations are a very practical and robust method of measuring Nitrogen below the root zone.

44 At least in part, many of the practices and limits anticipated by Variation 1 are either directly or indirectly already provided for in the Central Plains’ Scheme consents.

45 Overall, Central Plains will manage delivery of water, and has the means to ensure farmers comply with the use of the water (such as ultimately turning the water off to any individual farmer who fails to comply with the Central Plains consent requirements). Without such a commercial entity in this role, it will be very difficult to achieve both the widespread improvements on farm, and ultimately the wider environmental outcomes sought for the Selwyn Waihora zone.

**CENTRAL PLAINS IN THE CONTEXT OF THE SELWYN WAIHORA ZONE IMPLEMENTATION PROGRAMME AND SOLUTIONS PACKAGE**

46 Central Plains has been actively involved in the stakeholder engagement process undertaken to assist with the development of the solution package informing the Selwyn Waihora Zone Implementation Programme (ZIP) and its Addendum since its inception in December 2011.

47 This process raised a wide range of issues, including the need to reduce nitrogen leachate and phosphates from farming activities within the Selwyn Waihora Zone to ensure that water quality within Lake Ellesmere/Te Waihora and ecological flows in lowland streams are improved.

48 Overall, Central Plains is supportive of the need to ensure that the management of water allocation and water quality is improved and enhanced, and the need for a regulatory regime that works to ensure improvements are achieved over time.
In brief:

49.1 the Solutions Package developed through the process and endorsed by the Selwyn Waihora Zone Committee (and which is adopted in Variation 1) relies on Central Plains introducing 300 million cubic metres of low nutrient alpine water into the catchment annually. It has been assumed this ‘new’ water will irrigate 30,000ha of existing dryland (new irrigation) and enable the 30,000ha of existing groundwater irrigated land to convert to surface water; ⁸

49.2 this new water and the transfer from use of ground to surface water, underpins the solution package that has been developed to deliver the environmental outcomes for the Zone, including the following:

(a) increased flows in aquifers;
(b) increased flows in lowland streams; and
(c) an increased volume of water within catchment that will dilute nitrogen concentrations in Lake Ellesmere/Te Waihora.

50 In addition to Central Plains delivering a key component of 'the solution', Central Plains has stringent contractual water use obligations for farmers to improve farm management practices. The effect of these obligations will be to *inter alia* significantly reduce and control nitrogen leaching and phosphate run off. This will be implemented and monitored through detailed the audited FMPs.

51 A summary of Central Plains Scheme contribution to the solutions package is set out in Figure 3.

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⁸ In terms of actual outcomes it is noted that a recent assessment of the likely final Central Plains’ shareholder land confirms that the actual existing irrigated area is closer to 33,000ha (rather than the Council’s assumed 30,000ha), which means there will be a greater volume of groundwater released with the conversion to alpine surface water.
In the following sections of my evidence I discuss Central Plains’ contribution in terms of some of the key elements of the solutions package outcomes being sought under Variation 1.

**Water allocation to deliver ecological and cultural flows, and the use of alpine water**

As discussed by Mr Ian McIndoe, there is a strong connection between shallow groundwater and surface water in the catchment.

Mr McIndoe confirms that the benefit to groundwater of the 300Mm$^3$ new alpine water to be 225Mm$^3$ (150Mm$^3$ + 75Mm$^3$), noting that 150Mm$^3$ of the new water will be lost to evapotranspiration. This new alpine water will result in the reduction of ground water takes and the improvement of flows in the aquifers, lowland streams and the lower reaches of hill fed streams.

This is shown in Figure 4
Monitoring water quality and water levels is also a significant focus of the consent to use water, noting:

56.1 Central Plains is already monitoring 20 groundwater monitoring bores across the Scheme area (over the past 2 years) to provide robust baseline data before irrigation commences in September 2015;

56.2 ground and surface water monitoring is a long term requirement of the water use consent; and

56.3 Central Plains is required under its consents to establish a Ground and Surface Water Expert Review Panel. This Group has already been established. It has a number of functions which are also of relevance to achieving the Solutions package. In particular, this group is to:

(a) review the required Groundwater and Drainage Plan;

(b) consult with Te Rūnanga o Ngāi Tahu in relation to monitoring and mitigation measures related to Te Waihora;

(c) review reports on environmental monitoring and mitigation undertaken by Central Plains; and
(d) determine likely cause of any problems with groundwater or drainage.

Variation 1 also contemplates that mitigation tools such as Managed Aquifer Recharge (MAR) and/or Targeted Stream Augmentation (TSA) will be implemented to further assist with improving lowland stream flows. It is likely that the Scheme will be the only mechanism whereby MAR and TSA can be achieved. Central Plains has indicated that subject to confirming funding from the relevant Council(s) (or another relevant source) and technical requirements, it could be possible for Central Plains to integrate delivery of these requirements within the irrigation scheme infrastructure (at least at times when the Scheme was not operating at peak irrigation demand).

The various FMP and environmental management requirements included in the Central Plains Scheme consents will assist more generally in achieving the sought outcomes under Variation 1.

**Lake rehabilitation – non regulatory interventions**

Central Plains is already committed to a number of indirect (or at least in part non-regulatory) methods aimed at enhancing Lake Ellesmere and mitigating the effects of the Scheme.

This includes, under the Scheme consents, a requirement to establish an Environmental Management Fund which, at full development, will amount to approximately $160,000 annually.

This money is to be used to support and encourage various environmental enhancements (for example, riparian planting and habitat restoration) within and downstream of the scheme. In addition, a Te Waihora enhancement fund (annual) of a similar value will be established to contribute to the rehabilitation of Te Waihora.

A contribution of 12.5% of the annual costs of opening Te Waihora will also be met by the Scheme.

Lake opening is understood to be a key mitigating factor to reducing N load within the Lake, and benefitting fish migration and recruitment in addition to supporting salt marsh vegetation (refer to Dr Greg Ryder’s evidence).

**Farming at better than Good Management Practice**

At full development, Central Plains will be responsible for ~380 farmer shareholders’ water use.

Each farm will also be required to have an FMP as discussed, in part, earlier in this evidence. These plans will detail the use and rate of
application of water and best management practices implemented to:

65.1 minimise the loss of nitrate-nitrogen to soil drainage water; and

65.2 minimise any loss of sediment, phosphorus or nitrogen to surface waters.

66 Annually, each property will provide a nutrient budget to illustrate the total nitrogen application to meet consent conditions. Each property will also be required to provide annual results of concentrations of nitrates in the soil drainage below plant root zone.

67 In addition, farmer shareholders are required to exclude all stock from waterways and wetlands, including drains and races.

68 The Scheme also already has a Sustainability Protocol that is used as the basis of the Farm Environmental Management Plans and details the practices and procedures to be put in place to operate the Scheme (with regular reviews to reflect best practice).

**WORK COMPLETED IN RESPECT OF VARIATION 1**

69 Even prior to the notification of Variation 1, Central Plains has been committed to better understanding the implications of landuse and nutrient controls on the Scheme.

70 This has led to two particular streams of work that are briefly discussed below:

70.1 the SOURCE modelling (that has been commissioned in association with a number of other submitters); and

70.2 a more accurate assessment of the likely future Central Plains’ Scheme load.

71 Each is discussed below.

**1) An integrated catchment model (the SOURCE model):**

72 Variation 1 has been developed off the back of modelling completed by the Canterbury Regional Council (the Council).

73 In this regard it is understood that the Council has assessed a number of assumed land use scenarios using a number of different models. Mr Nic Conland & Others and Mr McIndoe discuss these in their evidence but in general terms, the Council has then attempted to bring those models together with various assumptions around the extent to which various input and output factors interact.
The complexity of using multiple models aside, Central Plains has been advised that some aspects of the Council’s model have been over-simplified or are potentially subject to error.

Accordingly, a number of submitters engaged catchment modelling experts Jacobs (formerly SKM Jacobs) and groundwater experts Aqualinc to review the Council’s models and for Jacobs to also develop a single integrated catchment model (the SOURCE Model). The purpose of this exercise is intended to ensure all parties and the Hearing Panel:

75.1 have a better understanding of the interaction between the various factors affecting nutrient losses, nutrient loadings and water flows in catchment; and

75.2 can place greater confidence on the achievement of the wider objectives envisaged by Variation 1.

In this regard, it is important to emphasise that the purpose of Central Plains’ contribution to the SOURCE model exercise is not intended to ‘undermine’ the earlier Council modelling. The SOURCE model work is instead intended to provide further support to the Hearing Panel in terms of its confidence in the achievement of the final intended outcomes of Variation 1.

In the case of Central Plains it has focused on:

77.1 testing and validating the catchment nitrogen load by confirming land and irrigation use, and in particular confirming the nitrogen load calculated by the Council for the scheme;

77.2 testing the Council’s approach to the hydrological modelling; and

77.3 testing the impact of the validated catchment load on Lake Ellesmere/Te Waihora.

Although not relevant to the immediate process, the model will also be a useful tool post hearing to use in an ongoing compliance and management capacity - particularly for Central Plains to confirm scheme water and nitrogen usage and the impact on the catchment water levels and water quality over time.

It is also noted for completeness that Central Plains has already engaged with the Council around the SOURCE model. Central Plains considers there is value in the relevant experts (including the Council experts) discussing the outcomes the modelling exercise. The letter included in Annexure 3 from the Council outlines the Council’s interest in the SOURCE model approach.
2) Catchment N load calculation

Central Plains has recognised that confirming a viable Scheme nitrogen allocation for expansion depends, as much as anything, on confirming the existing nitrogen baseline for both:

80.1 Existing irrigation (i.e. areas that are already irrigated that will ‘convert’ from generally deep groundwater to alpine water from the Central Plains Scheme); and

80.2 New irrigation (i.e. areas that are not currently irrigated that will join the Central Plains Scheme).

Variation 1 currently joins these two together with a combined existing/new load in Table 11(j) of 1944 tonnes per year from 1 January 2017 and 1742 tonnes per year from 1 January 2022. The basis for the calculations of the Council load is set out in the summary table provided by it in Annexure 4.1.

As noted earlier in this evidence, the accuracy of these numbers is critical to ensuring the development of the whole Central Plains’ Scheme is able to occur.

The process of validating the catchment and scheme Nitrogen allocations involved initially inputting surveyed land and irrigation use for the catchment (at a high level) and Central Plains (at a detailed level) into the SOURCE model to generate the catchment and Scheme loads. This process utilised the Lilburne values for land use leaching used by the Council in their catchment load calculation. It is important to note that as per the Council catchment load calculation, OVERSEER was not used as the ‘catchment calculator’ for assessing land use leaching.

The results of this updated 2014 land and irrigation use assessment are set out in Annexure 4.2. This presents results in both N/kg/yr and N/Kg/ha/yr for:

84.1 Lilburne 2011 land use;

84.2 best info 2014 (Central Plains);

84.3 2017 up to 15kg;

84.4 2022;

84.5 2022 up to 15kg; and

84.6 2037 claw back.
85 Of particular interest to Central Plains is the table included in Annexure 4.3, which sets out the adjusted existing environment loads and confirms that the existing environmental load (best info 2014) is 1884t/year. This can be compared to the Council derived scheme load for Central Plains set out in Table 11(j) of 1944t at 2017 – meaning that in the notified version of Variation 1 the headroom available for Central Plains to develop further irrigation is a mere 60 tonnes (or an allowance of 2kg/ha/yr for 30,000ha of new irrigation). This would severely limit or more than likely prevent the development of the full Scheme.

86 It is however appropriate to note that the above is based on Lilburne values and the 2014 existing land and irrigation use to compare with the Scheme load included in Table 11(j) - it is not an OVERSEER generated load. Central Plains are required to report compliance by using OVERSEER on a per farm basis and aggregated, to report our scheme N load on an annual basis.

87 As such, the next step in Central Plains’ preparation for the Variation 1 process was to determine a Scheme load on the basis of OVERSEER N loss rates at the farm level. The purpose of this further exercise was to assist in deriving a Scheme load that would be more reflective of what Central Plains would be reporting to in the future.

88 Central Plains accordingly commissioned The Agribusiness Group (led by Mr Ford) to assess 40 Central Plains’ shareholder farms (50% dryland and 50% irrigated) totalling an area of 12,221 ha of the 60,000ha (i.e. over 20% Scheme area). The purpose of this exercise was to confirm nitrogen baseline leaching rates using OVERSEER.  

89 As set out in Mr Ford’s evidence, where there was a known ‘bug’ in OVERSEER and it was possible to devise a solution which worked around it then that was also done. In addition, Mr Ford ensured that in all cases the first choice best practice data entry guidelines have been followed and as is discussed further below, he used a more accurate assessment of existing landuse.

90 From a Scheme perspective, the three key issues that have been revealed through this work are:

90.1 the importance of using the correct version of OVERSEER with appropriate input protocols (noting that this is further supported by work done by Mr Hamish Lowe in respect of this hearing process);

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9 In addition, Mr Ford reviewed existing land use across the Central Plains command area for the purposes of informing the SOURCE Model.

10 See Stu Ford evidence, para 57.
90.2 the impact of a more accurate assessment of land use and irrigated land (at 2014 as opposed to 2011) on nitrogen losses; and

90.3 the likely under reporting of real-life nitrogen losses by OVERSEER.

91 The findings from this work can be divided between existing and new irrigation areas.

*Existing irrigation (substitution of groundwater for Central Plains’ water)*

92 Prior to discussing the assessed load of existing irrigation with the Central Plains’ Scheme area it is perhaps useful to briefly touch on the approach to grouping ‘existing’ and ‘new’ irrigation together for the purposes of Table 11(j).

93 Of note:

93.1 prior to the notification of Variation 1, the Council included an allocation of 520 tonnes specifically for the ‘top up’ of Nitrogen that would be required over and above the 30,000ha existing dryland baseline;

93.2 Central Plains was notified, in October 2013, that the proposed 520 tonnes was incorrect (due to calculation errors at the time). This was then increased to 850 tonnes, but subsequently reduced in Jan 2014 to 434 tonnes (again the reason for the calculation being possible calculation errors); and

93.3 following the correction of the errors, the Council at the same time also opted to re-package the Central Plains’ Scheme allocation as a total load (i.e. by joining ‘new’ and ‘existing’ together). This resulted in the amended nitrogen allocation of 1944 tonnes that is noted in paragraph 81 above.

94 Central Plains’ is not exactly clear on the Council’s reasons for re-packaging of the Central Plains’ nitrogen allocation. Although it might be an appropriate approach for pre-existing irrigation Schemes elsewhere in Canterbury (where all land is already irrigated and the actual N loss is known), Central Plains is not confident that giving a single load for the whole of the Scheme area is the most appropriate or the best mechanism to achieve the outcomes envisaged by Variation 1, noting that:

94.1 combining the existing and new allocation:
(a) without having the matrix of good management available (which will inform the appropriateness of the reductions in Table 11(j)); and

(b) without knowing the actual extent to which existing N losses will ultimately accord with modelled losses, significantly increases the risk of existing irrigated land use effectively ‘absorbing’ the total Scheme allocation (to the extent that there is no or inadequate headroom for the development of ‘new’ irrigation). This would unintentionally prevent the development of the wider Central Plains Scheme, and the benefits that would arise from the full Scheme development.

94.2 by combining existing and new irrigation (and requiring reductions over time), it appears that Central Plains would be placed in the position of ensuring existing irrigators reduce their N load over time (in circumstances where Central Plains is not a regulatory authority and is not responsible, for example, for implementation of whatever outcomes might arise from the matrix of good management programme). Although the Scheme has a very important role to play in terms of better land use practices and the implementation of FMP’s (such as those discussed in paragraphs 42.1 to 42.4 above), Central Plains considers that any strict reduction regime for existing irrigators might be better overseen, directly, by the Council as the ultimate regulatory authority; and

94.3 it also ensures that Central Plains can focus as much as it can on developing the Scheme and managing the load for ‘new’ irrigation. In this regard, from a financing perspective Central Plains’ bankers are likely to be particularly concerned to ensure that there is certainty around an adequate N load being available to accommodate the full development of the Central Plains’ Scheme.

95 In this manner, existing irrigation within the Scheme area would be treated just the same as any other existing irrigation within the Selwyn Waihora Zone.

96 Once both:

96.1 MGM is available and has been implemented; and

96.2 the Scheme has been developed and actual long-term N loss from the Scheme are known,
it will then be possible to calculate a very accurate total nitrogen load for existing irrigators, which Central Plains would manage through the consent/FMP compliance process. However, the actual total N loss limits applying to the Scheme at that time (were a total N loss limit desired) would more than likely need to be determined through a future plan change which is beyond the scope of the current hearing process.

97 Turning to what we do know in respect of existing irrigated landuse within the Central Plains Scheme area, it appears that the Council has relied on 2011 (Lilburn) landuse values and as is discussed in respect of ‘new’ irrigation’ below, it has not used the most appropriate OVERSEER assessment.

98 As set out in Mr Ford’s evidence it appears that if updated (2014) landuse is taken into account and a more appropriate OVERSEER assessment is undertaken, it appears that the nitrogen leaching for existing irrigators has been under-estimated by the Council.

99 Based on Mr Ford’s analysis the N loads that have been assessed by the Council and Mr Ford are set out below:

99.1 Council - Lilburn values (2011) for existing irrigation within the Central Plains Scheme area = 32.1 kg N/ha/yr

99.2 Central Plains - Lilburn values applied to updated Central Plains (2014) irrigated land use with a more appropriate approach to OVERSEER = 41 kg N/ha/yr

100 Against the above, the Council has assessed a total N load from existing irrigation within the Central Plains’ Scheme area of 964 tonnes based on an existing irrigated area of 30,000 hectares.

101 On the basis of Mr Ford’s evidence the predicted total N load from existing irrigation within the Central Plains Scheme area is 1353 tonnes based on an existing irrigated area of 33,000 hectares, (the area that Mr Ford considers better reflects the actual extent of existing irrigation in the Scheme Area).

102 In accordance with the approach being suggested by Central Plains this load would be managed in the exact same manner as other existing irrigation within the wider Selwyn Waihora area.

103 The difference in the two numbers (i.e. 964 versus 1353 tonnes) is simply a reflection of calculation error and the use of ‘best input data’ – the most significant being a greater area of existing irrigation within the Central Plains Scheme area.
**New irrigation**

Based on a reduced new irrigation area of 27,000ha,\(^{11}\) and using the relative N loss averages for land use as per Mr Ford’s assessment, the allocation required for new irrigation (including existing dryland baseline landuse) within the Scheme area is **979 tonnes** (or an average of 36.21kg N/ha/yr).

This has been based on the assumed land uses discussed in Mr Ford’s evidence and as set out in Figure 5.

**Figure 5 New irrigated land within Scheme area**

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Hectares</th>
<th>Kg/Ha/yr</th>
<th>Nitrogen (tonnes per year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40% Dairy</td>
<td>10,800</td>
<td>48.6</td>
<td>524.880</td>
</tr>
<tr>
<td>40% Arable</td>
<td>10,800</td>
<td>22.7</td>
<td>245.160</td>
</tr>
<tr>
<td>20% Sheep/Beef/Dairy Support</td>
<td>5400</td>
<td>38.7</td>
<td>208.980</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>979.020</strong></td>
</tr>
</tbody>
</table>

It is also understood from Mr Ford and Mr Macfarlane that the landuse mix for new irrigation as set out in the Figure 5 is relatively conservative – i.e. it might have been reasonable for Central Plains to seek a higher N load on the basis that the Scheme might have a higher dairy component (as would be consistent with the landuse within other irrigation Schemes in Canterbury). Central Plains has chosen **not** to take this approach.

In regards to the calculation it is further noted that:

107.1 the Council’s assessed (via Lilburne) new irrigation N allocation for 30,000ha was 902 tonnes with an average of around 30kg N/ha/yr;

107.2 Central Plains has had the benefit of a much better understanding of existing actual landuse mix and, as set out by Mr Ford, it has also been possible to use OVERSEER in a manner that more accurately reflects ‘best practice input protocols’; and

107.3 given the above, the 36.21kg N/ha/yr (assessed by Mr Ford) should be regarded as being the **equivalent** (in terms the same good management practices being met etc.) as the 30kg N/ha/yr (assessed by the Council). To expand on that

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\(^{11}\) See footnote 8 and paragraph 101 above.
point, Central Plains has not sought to, for example, assume less mitigation or poorer land use practices – the difference in numbers is instead a reflection of more attention to detail in terms of inputs and the more accurate use of OVERSEER.

108 Putting the corrected figure into context, 27,000ha (of currently dryland that will be irrigated as a result of Central Plains), when assessed on the basis of the Council assessed average of 30Kg N/ha/yr generates an N load of 810 tonnes.

109 Accordingly, the adjustment that needs to be made to correct the ‘new’ portion allocated to Central Plains under Variation 1 is 169 tonnes (i.e. 979 – 810 = 169 tonnes).

110 This is an increase of 3.06% of the adjusted catchment nitrogen load of 5521 tonnes – although it is again noted that the so called increase is a result of corrections and more accurate OVERSEER modelling rather than any outright desire to make ‘things easier’ for Central Plains shareholder farmers.

111 It is also further noted that the load of 979 tonnes also includes existing dryland land uses within the 27,000 ha currently dryland area. In this regard, for existing dryland land uses within the Central Plains Scheme area it is noted that the allowance made by the Council of 15.6 kg N/ha/yr is less than the actual result of 23 kg N/ha/yr assessed by Mr Stu Ford using best input data and the more appropriate use of OVERSEER. This means that of the 979 tonnes that Central Plains’ seeks to have protected for ‘new’ irrigation, 621 tonnes already forms part of the existing dryland baseline.

112 The true ‘new’ is therefore considerably less than the 979 tonne figure set out and in summary:

- the 979 tonnes includes 621 tonnes that is the dryland baseline and 358 tonnes for new irrigation;
- the average dryland baseline for 27,000ha is 23kg/ha/yr;
- the average ‘top up’ (over and above the existing baseline) for new irrigation 13.25gk/ha/yr; and
- on the basis of the above, the total per hectare allocation (average) for new irrigation is 36.26kgN/ha/yr

113 Until the outcomes of the matrix of good management practice are known, Central Plains also seeks that there is no further reduction regime applying to ‘new’ irrigation.
As a further matter it is appropriate to again note that the loads summarised in paragraph 112 are based on Mr Ford’s more OVERSEER assessment that is discussed in detail in his evidence and briefly touched on in paragraph 107.2 above. This provides a more robust indication of an OVERSEER based nitrogen allocation for the Scheme - but ultimately these numbers have not been generated on a farm by farm basis for all Scheme farms. The load is therefore still and ‘indication’ of the Scheme allocation (and not definitive or absolute final Scheme load). On that basis Central Plains considers that any Scheme allocation included in Table 11(j) needs to be supported by a process for re-calculating the Scheme allocation (using OVERSEER) to reflect future actual development of the Scheme (to ensure the Scheme load is neither inadequate or excessive).

This process needs also to include a regime to confirm the existing irrigation allocation, which Central Plains seeks to separate out from the new irrigation allocation. From 2022 (and assuming that the Scheme is fully operational at this time) existing and new irrigator N loss rates would be aligned at the improved good management practice level, potentially simplifying the compliance and reporting regime for the Scheme.

FURTHER ISSUES RELEVANT TO CENTRAL PLAINS’ RELIEF

In paragraphs 80 to 15, this evidence summarises Central Plains’ concerns with respect to Table 11(j) and the load assigned to the Scheme.

There are a number of other matters that are relevant to Central Plains that are discussed below.

1) Nitrogen allocation associated with a specific version of OVERSEER

As both Mr Lowe and Mr Ford identify in their evidence, OVERSEER is evolving as new farming systems are added, management systems evolve, science is acquired and modelling techniques improved. The release of further refined versions is therefore anticipated which, at least based on the versions released to date, is more likely to result in higher N loads for the same given inputs.

Given the above, and the fact that earlier versions of OVERSEER are not easy to access, Central Plains is very concerned to ensure that compliance against any limits within Variation 1 is actually able to be calculated.

In this regard, it is currently the policy of the owners of OVERSEER to update the online version of OVERSEER and to date stamp downloadable versions so that old versions of the programme
become unavailable after a short time. This creates an issue if catchment allocations are set in an older version of OVERSEER, and compliance is to be demonstrated using the same version of OVERSEER – as accessing the relevant version of OVERSEER is not possible unless an approach is made to the owners directly.

121 Accordingly, for individuals (which might extend to existing irrigators within the Central Plains Scheme area):

121.1 unless some form of arrangement can be reached (most likely by the Council) with the owners of the OVERSEER model, the operation of a farm should not be restricted to use of, and the results of, a single analysis in one particular version of OVERSEER (when that version will inevitably be superseded at an unknown point in time); and

121.2 if a subsequent version of OVERSEER is in fact used there is the potential for a newly computed output to be different from the initial output using the earlier version of the model. This would effectively mean that if a limit has been set using the earlier version of the model, a ‘non-compliance’ may occur without any of the farms input parameters being altered.

122 In the case of an individual that simply has to comply with its nitrogen baseline (or reductions relative to the nitrogen baseline), this may not be an issue provided it is appreciated that the nitrogen baseline might change over time – even without any actual change in farming operations. However, in the case of the Central Plains’ Scheme that has to comply at all times with the scheme limit in Table 11(j), Central Plains would either need to:

122.1 re-calculate the load for all existing shareholder properties using the same version of OVERSEER that was used in developing Table 11(j) (potentially problematic if that version cannot be accessed and shareholders within the Scheme are themselves using a different version); or

122.2 the plan needs to include a mechanism providing for compliance to be assessed against a revised Scheme load calculated using the most recent version of OVERSEER (i.e. such that the load expressed in Table 11(j) is not an absolute value).

123 The further alternative would be for a plan change to occur every time OVERSEER is updated but that would presumably be administrative cumbersome and could see proposed plan changes being taken over by yet further changes to OVERSEER.
2) Scheme reliability

Scheme storage is crucial to ensuring the scheme, or any stage of the scheme is viable. The 2004 Prospectus projected a base reliability of supply of 90% which would be increased to 99% with additional reserve water. At that time, it was assumed that the scheme would have a storage reservoir.

In 2009, in the face of an increasingly drawn out hearing process, Central Plains withdrew its original very large storage reservoir proposal (located in the Wainiwaniwa Valley above Coalgate) from its application. Central Plains has however made it clear at all times that the full development of the Scheme (at the reliability set out) would be dependent on building alternative storage or through being able to access other reliable water.

As it stands at the moment, and assuming a run-of-river supply without storage, the long term average reliability of supply across the Scheme is now estimated at approximately 60% on an average volumetric basis.

In terms of volume, it is however important to note that Central Plains has no issue with the total volume of water theoretically available to it under its consents – instead the concern is that inadequate water is typically available at the times it is actually required with the takes from both the Waimakariri and Rakaia Rivers often being restricted due to minimum flow requirements.

The assessed storage requirement for the Scheme under the original proposal (with the Wainiwaniwa Valley storage dam) was 280 million m$^3$. However, the storage requirement for the scheme has now been assessed at only ~50% of the original proposed volume through the Scheme now being able to access other water (such as the band 2 & 3 water discussed in paragraph 17.2(b)) and a more detailed assessment of likely final water demands within the Scheme area).

Overall, the full development of the Scheme will require around a 150 million m$^3$ of additional reliable (most likely stored) water.

In terms of the development to date, for Stage 1 Central Plains was unable to progress the development of Stage 1 (20,000ha) area of the Scheme until a storage solution was confirmed. This shortfall was made up by an agreement being reached with TrustPower Limited with regard to the release of stored water from Lake Coleridge. This agreement provides Central Plains with access to up to 50 million m$^3$ of reliable water from Lake Coleridge subject to certain terms and conditions (increasing the reliability of Stage 1 from 60% to 95% but not providing adequate stored water for Stages 2+). However, this agreement expires on the 31st
December 2031, with no right of renewal (although both parties have agreed to discuss its renewal in good faith).

131 For the development of Stages 2+ of the Scheme (as well as the continuation of Stage 1, post 2031) it is therefore inevitable that:\(^{12}\)

131.1 further agreement will need to be reached with TrustPower for the release of further stored water – noting again that TrustPower is under no obligation to make that water available and in any event, even if it were available, it would be on terms that are not yet known; or

131.2 some form of Scheme storage will be required.

132 Although Central Plains has no immediate plans for a storage proposal, it is very concerned to ensure that all possible sites are able to be considered for storage opportunities at whatever point in time the Scheme needs to again turn its mind to storage. In this respect, it is noted that Central Plains did considerable alternatives assessments as a part of the original hearing process that confirmed very limited opportunities for viable Scheme-based storage within the Selwyn Waihora area.

133 The Wainiwaniwa Valley and the Selwyn catchment were, as a part of that earlier process, key sites in terms of potential viable storage dams.

134 Central Plains therefore seeks to have the prohibited activity status relating to damming changed to discretionary. There is clearly a genuine need for further Scheme storage and although Central Plains’ fully anticipates that any future consenting process would be very challenging it is also emphasised that based on likely current demand assessments, it would be a considerably smaller storage dam (or potentially even a series of small dams) than that which featured as a part of the previous hearing process.

3) Transfer of groundwater consents

135 A number of aspects of Central Plains’ sought relief in respect to the transfer provisions is informed by an agreement Central Plains reached with Te Rūnanga o Ngāi Tahu and other cultural interests as a part of the original Central Plains’ resource consent appeal process.

136 It is also noted that throughout the consenting and prospectus stages of the Central Plains Scheme, a significant attribute that has

\[^{12}\text{Noting for completeness that shareholders could also choose to contract directly with TrustPower Limited. However, if shareholders opt in, it is likely to be on a take or pay basis the same as applies to the Scheme. Some shareholders may also choose to use their existing groundwater consent as top up to increase the run of river reliability from 60% to the 95% required.}\]
encouraged a number of shareholders to join the Scheme has been the ability (at least prior to Variation 1) for shareholders being able to transfer water within their own farming businesses. This would see, for example, a shareholder with a property in the upper plains area that was irrigated with deep groundwater transfer that consent to another property owned by that shareholder in a lower plains location.

Variation prevents such transfers occurring, something which is of concern to Central Plains. Although Central Plains does not seek a total relaxation of the proposed transfer regime, it is seeking some further accommodation of transfers to allow a Central Plains’ shareholder:

137.1 to transfer water between their farming properties (noting further that this might also be used in the future as means of addressing, on an individual property basis, any concerns around the reliability of Scheme water); and

137.2 to transfer groundwater consents to the Scheme (on the basis that this would then provide a potential source of alternative supply to make up any water shortfall during a restriction event).

In both cases these would be offset, at least in the large part, by the fact that the Scheme is introducing a very large volume of alpine water into the catchment and to a small extent reducing (but not removing) the need for further storage.

CONCLUSION

Central Plains is supportive of the outcomes envisaged by Variation 1 and accepts that over time farming and other land/water users within the wider catchment have a key role to play in terms of protecting (and, where appropriate, enhancing) Lake Ellesmere/Te Waihora and the various other water bodies in the catchment.

The Central Plains’ scheme consents already require a very vigorous level of environmental compliance and the Scheme takes its responsibilities very seriously. In addition, the Scheme is committed to a number of ‘non-regulatory’ matters that will assist in terms of meeting the wider outcomes envisaged by Variation 1.

On the whole, Central Plains is actually seeking relatively few amendments to Variation 1. Those that are essential are discussed in this evidence and include:

141.1 ensuring there is sufficient nitrogen allocation for new irrigation within the Central Plains’ scheme (with no specific further reductions to ‘new’ irrigation being contemplated until
the outcomes of the matrix of good management practice are known);

141.2 approaching existing irrigation within the Central Plains’ Scheme area on the same basis as irrigation outside of the Central Plains Scheme area (appreciating that existing irrigators within the Central Plains Scheme area will still need to comply with the various existing Central Plains’ consent requirements);

141.3 careful consideration being given to the use of OVERSEER, including ensuring the plan is ‘future proof’ in terms of the inevitable release of further versions;

141.4 protecting the basic ability to investigate scheme storage options within the foothills in the future, including the upper stems of the Waianiwaniwa River and Selwyn River; and

141.5 providing for the further (albeit still limited) transfer of groundwater consents within a farmer’s properties/farming enterprise.

142 Overall, Central Plains is very excited to be in the development phase of the Scheme and simply seeks certainty that full development be able to occur. The Scheme will, once fully developed, deliver significant environmental and economic benefits to the Selwyn Waihora zone.

Dated: 13 October 2014

________________________________________
Susan Goodfellow

________________________________________
Derek Crombie
Annexure 1

Construction photos

Intake site

Intake works (close up)
Rakaia Terrace earthworks to form headrace

Offtake structure
Off take structure (close-up)

Temporary Manufacturing Plant (to produce 130 km of HDPE pipe by February 2015)
Annexure 2

Resource consent to use water (including general and administrative conditions)
Annexure 3

Integrated Catchment Model Specification letter from the Council (Mr. Ken Taylor)

25 May 2012

Chris Keenan
Business manager
Natural Resources and Environment
Horticulture New Zealand
PO Box 10232
The Terrace
WELLINGTON

Dear Chris

Integrated model for Selwyn-Waihora catchment

In developing the Selwyn-Waihora sub-regional Land and Water Plan (Variation 1 of the LWRP) Environment Canterbury used a series of linked models that represent the current best-understanding of the catchment hydrology and nutrient dynamics. This type of component model approach is appropriate for the limit setting phase and Environment Canterbury supports the work that has been undertaken to date. However, this model framework is less well suited to the managing to limits phase.

We recognise that for ongoing management of the catchment, including plan implementation, it would be desirable to have a dynamic and integrated model for the catchment. The dynamic nature of this type of model allows resource managers to account for change in the catchment while the integrated nature removes the needs to transfer information between separate modelling systems. It is helpful for all resource users/managers if there is a single agreed model used for decision making in this context.

In designing an integrated model for the Selwyn-Waihora catchment it is critical to bear in mind the questions that the model will be used to answer. For plan implementation and future resource management the sorts of questions that Environment Canterbury is interested to include the following.

- How do large-scale intervention measures (e.g. managed aquifer recharge) affect quality and quantity fluxes across the catchment?
- How might new configurations of land use impact on community-derived outcomes at a reach, tributary or local water level scale?
- How might such configurations impact on the viability of enterprises, and cultural and social outcomes?
- Are the changes in land use across the catchment showing changes in water quality that match monitoring data?
- What impacts are new climate change predictions making on fluxes?
- How might new nutrient allocation mechanisms affect general water quality (e.g., consequent to plan changes)
A model for the Selwyn-Waihora catchment that is useful for ongoing catchment management needs to:

- integrate surface and ground water flows;
- link to or else integrate a lake model to represent Te Waihora (Lake Ellesmere);
- integrate water quantity and quality;
- be spatially explicit and temporally dynamic so that it incorporates land use change (i.e. both land cover and land practices);
- be able to incorporate lag times for groundwater fluxes (quality and quantity);
- incorporate attenuation components for water quality variables both spatially and temporally.

In other parts of the Canterbury Region we are using a MIKE-SHE modelling platform (from DHI), but it is unlikely that we will have the resources for a MIKE-SHE model of Selwyn-Waihora before 2020. Consequently we welcome any joint initiative to develop a model that meets the specifications outlined above, and would be pleased to have the opportunity evaluate its utility and functionality as it is developed.

Yours sincerely

Ken Taylor
Director Investigations and Monitoring
Annexure 4.1

Table illustrating the calculating of existing and new irrigation nitrogen leaching allocation – prepared by Environment Canterbury February 2014

<table>
<thead>
<tr>
<th>Apportionment</th>
<th>Existing irrigated</th>
<th>New irrigated land</th>
<th>New irrigated dairy support</th>
<th>New irrigated sheep and beef</th>
<th>New Dairy</th>
<th>New irrigable arable</th>
<th>Additional load for the new Dairy Support as a result of new dairy (which might occur outside CPW)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>964 t N (average 32.1kg N/ha)</td>
<td>1042 t N (average 34.8kg N/ha)</td>
<td>840 t N (average 28kg N/ha)</td>
<td>30,000ha</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>468 t N (as dryland) (average 15.6kg N/ha)</td>
<td>902 t N (average 30kg N/ha)</td>
<td>902 t N (average 30kg N/ha)</td>
<td>30,000ha</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>81 t N (average 38.7kg N/ha)</td>
<td>81 t N (average 38.7kg N/ha)</td>
<td>2100ha</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>89 t N (average 22.8 kg N/ha)</td>
<td>89 t N (average 22.8 kg N/ha)</td>
<td>3900ha</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>391 t N (average 32.6 kg N/ha)</td>
<td>391 t N (average 32.6 kg N/ha)</td>
<td>12000ha</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>272 t N (average 22.7 kg N/ha)</td>
<td>272 t N (average 22.7 kg N/ha)</td>
<td>12000ha</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>68 t N</td>
<td>68 t N</td>
<td></td>
<td></td>
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</tbody>
</table>
### Annexure 4.2

#### Landuse

<table>
<thead>
<tr>
<th>Landuse</th>
<th>Lilburne 2011 (N kg/ha yr)</th>
<th>Lilburne 2011 (N kg/yr)</th>
<th>Best Info 2014 (N kg/ha yr)</th>
<th>Best Info 2014 (N kg/yr)</th>
<th>2017 up to 15 (N kg/ha yr)</th>
<th>2017 up to 15 (N kg/yr)</th>
<th>2022 (N kg/ha yr)</th>
<th>2022 (N kg/yr)</th>
<th>2022 up to 15 (N kg/ha yr)</th>
<th>2022 up to 15 (N kg/yr)</th>
<th>80 Clawback down to 80 Clawback (N kg/ha yr)</th>
<th>80 Clawback down to 80 Clawback (N kg/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy</td>
<td>17084.4</td>
<td>43134.5</td>
<td>22652.5</td>
<td>51000.6</td>
<td>39660.9</td>
<td>68008.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dairy Support</td>
<td>6651.9</td>
<td>22655.6</td>
<td>9966.9</td>
<td>26455.4</td>
<td>2554.3</td>
<td>19042.8</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Irrigated Sheep, Beef or Deer</td>
<td>10481.7</td>
<td>30965.0</td>
<td>6056.4</td>
<td>24729.9</td>
<td>4052.5</td>
<td>22726.0</td>
<td></td>
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</tr>
<tr>
<td>Dryland Sheep and Beef or Deer</td>
<td>12390.8</td>
<td>48756.0</td>
<td>17150.4</td>
<td>52723.8</td>
<td>N/A</td>
<td>35573.4</td>
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<tr>
<td>Arable</td>
<td>9004.4</td>
<td>32504.8</td>
<td>3391.9</td>
<td>27346.5</td>
<td>13708.6</td>
<td>37663.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruit, Viticulture or Vegetables</td>
<td>77.2</td>
<td>1435.8</td>
<td>N/A</td>
<td>1689.7</td>
<td>N/A</td>
<td>1689.7</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Other</td>
<td>2836.7</td>
<td>28198.1</td>
<td>780.8</td>
<td>25175.6</td>
<td>22.7</td>
<td>24417.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>58527.1</td>
<td>207649.8</td>
<td>59998.9</td>
<td>209121.6</td>
<td>59998.9</td>
<td>209121.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>
## Annexure 4.3

### CPW Areas and Nitrogen Values (2011 & 2014)

<table>
<thead>
<tr>
<th>Year</th>
<th>Category</th>
<th>Area (hectares)</th>
<th>Nitrogen (tonnes per year)</th>
<th>E-Can 30:30 split 2011</th>
<th>E-Can 30:30 split 2017</th>
<th>E-Can 30:30 split 2022</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>Irrigated</td>
<td>39,910</td>
<td>1445</td>
<td>1281</td>
<td>1389</td>
<td>1117</td>
<td>*2011 CPW area was clipped out of the original 2011 land use layer using</td>
</tr>
<tr>
<td></td>
<td>Dry</td>
<td>18,617</td>
<td>509</td>
<td>290</td>
<td>559</td>
<td>559</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>58,527</td>
<td>1954</td>
<td>1572</td>
<td>1947</td>
<td>1676</td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>Irrigated</td>
<td>33,740</td>
<td>1306</td>
<td>1083</td>
<td>1174</td>
<td>945</td>
<td>*2014 NEW CPW irrigation data was based on Peter Brown's Irrigation work.</td>
</tr>
<tr>
<td></td>
<td>Dry</td>
<td>26,259</td>
<td>578</td>
<td>410</td>
<td>788</td>
<td>788</td>
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<tr>
<td></td>
<td>Total</td>
<td>59,999</td>
<td>1884</td>
<td>1493</td>
<td>1962</td>
<td>1732</td>
<td></td>
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<tr>
<td>2022</td>
<td>Irrigated</td>
<td>59,999</td>
<td>2363</td>
<td>1926</td>
<td>2088</td>
<td>1680</td>
<td>*This calculation is based on everyone irrigating.</td>
</tr>
<tr>
<td></td>
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<td>0</td>
<td>0</td>
<td></td>
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<tr>
<td></td>
<td>Total</td>
<td>59,999</td>
<td>2363</td>
<td>1926</td>
<td>2088</td>
<td>1680</td>
<td></td>
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</table>
RESOURCE CONSENT CRC061973
Pursuant to Section 104 of the Resource Management Act 1991
The Canterbury Regional Council (known as Environment Canterbury)

GRANTS TO: Central Plains Water Trust
A WATER PERMIT: Use water from the Rakaia River and Waimakariri River at maximum rate of 65m³/s.
COMMENCEMENT DATE: 25 July 2012
EXPIRY DATE: 25 July 2047
LOCATION: Rakaia River, CANTERBURY PLAINS

SUBJECT TO THE FOLLOWING CONDITIONS:

GENERAL

ADMINISTRATIVE CONDITIONS

1) This consent is also subject to the conditions listed in Schedule 2: Administrative Conditions.

LOCATION OF WATER USE

2) Water shall only be used for the irrigation of up to approximately 60,000 hectares of land shown on attached Plan CRC061973. Water taken under CRC100581 may also be used under this consent on the same area of land shown on CRC061973.

AUTHORISED PERSONS

3) The consent holder shall not authorise or permit any person to use water under this resource consent unless that authorised person provides a written undertaking that to comply with all the conditions of this resource consent, to the same extent as if the resource consent had been granted to that person as well as the consent holder.

WATER USE REQUIREMENTS

4) The consent holder shall measure bywash discharges and leakage from pipes and structures forming part of the reticulation system that delivers water from the Waimakariri and Rakaia Rivers to the farm supply points for comparison with the target of on average not more than 20% of water taken being lost by bywash discharges and leakage from the total reticulation system between 1 September and the following 30 April.

5) The consent holder shall require all water users supplied with irrigation water for irrigation under this consent to take all practicable steps to:
   (a) ensure that the volume of water used for irrigation does not exceed that required for the soil to reach field capacity; and
   (b) avoid the application of water onto non-productive land such as impermeable surfaces and river or stream riparian strips, and
   (c) avoid surface run-off from irrigation, and
   (d) avoid leakage from pipes and structures.

Note 1: For the purposes of this consent, "field capacity" is defined as being the moisture content of soils when the addition of further water would result in saturation and/or drainage of water from the

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6) (e) The maximum application rate shall not exceed 5.18 millimetres per day on a scheme-wide basis, provided that if this application rate is shown to result in a particular property exceeding field capacity then the consent holder shall ensure that the application rate is reduced accordingly.

(f) In the event that water authorised for use under this consent is applied to land concurrently with water abstracted from groundwater, the combined volume of water used on that land shall not exceed 6,250 cubic metres per hectare between the 1st July and the following 30th June.

7) Best management practices shall be implemented on all properties receiving water from the scheme to minimise the loss of nitrate-nitrogen to soil drainage water, and minimise any loss of sediment, phosphorus or nitrogen to surface waters. Best management practices shall be specified in each FMP.

8) All stock shall be excluded from waterways and wetlands (including drains and races) that are within or immediately adjoining land being irrigated.

FARM MANAGEMENT PLANS

NUMBER AND SCOPE

9) Prior to and during the use of water from the Central Plains Water Enhancement Scheme for irrigation on individual properties, there shall be a Farm Management Plan (FMP) prepared, produced, maintained and implemented for each property which shall cover the total farm property (including areas not using water authorised by this consent).

FILING AND IMPLEMENTATION

10) The consent holder shall:

(g) keep a copy of each FMP, and supply any such FMP to the Canterbury Regional Council, on request; and

(h) ensure the implementation and auditing of the Farm Management Plans (FMPs) as described in conditions (7), (9), (11) to (16), (18) to (22).

OBJECTIVES

11) Each FMP shall include the following objectives:

(i) ensure that all irrigation systems on the property are capable of operating to meet industry and scheme standards for best practice irrigation;

(j) maximise water application effectiveness while minimising excess drainage and runoff;

(k) minimise the incidence of wind and/or water erosion caused as a result of farming practices;

(l) minimise nutrient losses to surface and ground water through the use of nutrient budgeting;

(m) minimise nitrate leaching and/or run-off losses to surface and ground water through careful fertiliser management, management of drains, planting of buffer zones around surface water bodies (including drains), and the exclusion of stock from all water bodies;

(n) minimise phosphate run-off losses to surface water through careful fertiliser management, management of drains, planting of buffer zones around surface water bodies (including drains), and the exclusion of stock from all water bodies;

(o) apply nutrients where needed to maximise effectiveness and minimise losses to non target areas;

(p) exclude all stock from waterways and wetlands (including drains, races and stockwater races);

(q) minimise soil loss and contamination of waterways; and

(r) avoid, remedy or mitigate effects on native plants and native animals and their habitats on individual farm properties and where possible enhance native plants and native animals and

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their habitats.

WATER USE AND NUTRIENT BUDGETS

12) Each FMP shall include:
   (s) details of how the water user(s) will comply with conditions (4) to (8) and (10) of this consent;
   (l) the best management practices implemented on the property to minimise the loss of nitrate-
       nitrogen to soil drainage water and minimise any loss of sediment, phosphorus or nitrogen to
       surface waters. The best management practices may include, but not be limited to:
       (i) limiting the volume and rate of water used for irrigation to ensure that the application of
           water to the property does not exceed that required for the soil to reach field capacity;
       (ii) split applications of fertiliser;
       (iii) timing of fertiliser application to match plant growth;
       (iv) avoiding application of fertiliser to saturated soil;
       (v) avoiding applying fertilizer when the soil temperature at 10 cm depth is less than 6°C;
       (vi) using nitrification inhibitors;
       (vii) planting winter cover crops;
       (viii) limiting the average total nitrogen (fertiliser and effluent) application to that property.

ENVIRONMENTAL RISK ASSESSMENT

13) Each FMP shall include:
   (a) a site specific farm environmental risk assessment that shall identify local or on farm receiving
       environments and identify risks to those receiving environments from the farm activities,
       including but not be limited to, risks from soils, effluent, direct discharges, pesticides, run-off,
       stock, fertilisers and any transitional activities such as those that will occur as a result of
       construction of irrigation and related equipment or buildings.
   (b) a site specific farm assessment which shall identify any specific measures to be implemented
       to ensure that the cultural health objectives of the Ground and Surface Water Plan reviewed by
       GSWERP as set out within Schedule 2 Condition 26 can be achieved.
   (c) practical measures that will be implemented to avoid or minimise the risks identified in condition
       13(a).

14) A suitably qualified person shall write the part of the FMP that provides the site specific farm
    environmental risk assessment.

AUDITING

15) 
   (a) Each FMP shall be audited by a suitably qualified independent assessor appointed by the
       consent holder. The purpose of the audit shall be to ensure that the FMP demonstrates
       achievement of the objectives as set out in condition (11) and demonstrates compliance with
       conditions (4) to (10), (12), (13), (14), (16), (18) and (20) of this consent.
   (b) For the first two years of receiving and using scheme water for irrigation, each farm plan will be
       audited annually. Audits will continue annually if any of the following criteria apply:
       (i) any non-compliance with any of conditions (4) to (14), (16), (18), or (20); or
       (ii) the average annual concentration of nitrate-nitrogen in the soil drainage water below the
           plant root zone calculated in accordance with condition 12(b), or measured, exceeds 16
           grams per cubic metre.
   (u) When all the criteria in condition 15(b) have been met for two consecutive years each plan will
       be independently audited, including a site visit, at least once every three years. If there is a
       change in the farm ownership or change in key management staff or if the three yearly audit, or
       any of the annual reports any described in condition 21 of this consent, indicate a failure to fully
       implement the FMP or any non-compliance with any of conditions (4) to (14), (16), or (18) to
       (20) then annual independent audits will again be required until full compliance has been

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achieved for two consecutive years of independent audits.

(v) Following each independent audit, the consent holder shall identify any areas of non-compliance with any of conditions (4) to (10), (12), (13), (14), (16) or (18) to (20).

(w) In the event that the areas of non-compliance are identified, the consent holder shall take all practicable steps to ensure that the water users are fully compliant with all aspects of Conditions (4), to (14), (16), (18), (19) and (20) as soon as practicable and in any case prior to the next 31st August. If a water user is not fully compliant with any of conditions (4) to (14), (16), (18), (19) and (20) or if the average annual concentration of nitrate-nitrogen in the soil drainage water below the plant root zone calculated in accordance with Condition 18(b), or measured exceeds 16 grams per cubic metre for two consecutive irrigation seasons, then no water shall be supplied to that property until it can be demonstrated to the satisfaction of the Central Plains Water Limited, Attention Compliance Committee and Compliance and Enforcement Manager of the Canterbury Regional Council that changes are implemented to ensure that all practicable measures are in place to comply with the criteria specified in this clause.

(x) In the event that the areas of non-compliance are identified, the consent holder shall take all practicable steps to ensure that the water users are fully compliant with conditions (4) to (10), (12), (13), (14), (16), (18), (19) and (20) as soon as practicable and in any case prior to the next 31 August.

Note 2. For the purposes of this consent, "the Compliance Committee" is a committee of Central Plains Water Limited which is responsible for responding to and, if necessary, imposing sanctions for, incidences of non-compliance by water users with their water user agreement requirements, including compliance with the consent conditions and individual farm management plans.

Note 3. The Central Plains Water Limited, Attention Compliance Committee and Canterbury Regional Council may review any FMP to check compliance with conditions (4) to (10), (12), (13), (14), (16), (18), (19), and (20).

**REQUIREMENT FOR FMP ON LAND USED TO WINTER STOCK**

16) The consent holder shall obtain from water users who use any other land (other than a property within the CPWT Scheme) for the wintering of stock within the Waihora/Ellesmere Zone area of the Christchurch – West Melton Zone area (as defined in Figure 1 of the Canterbury Water Management Strategy Strategic Framework November 2009), an undertaking that the water user will only use land outside the Scheme where the property has an FMP or other requirement that incorporates best management practices for the management of the stock and nutrients.

**REPORTS**

**ANNUAL REPORT ON EXERCISE OF CONSENT ON ALL PROPERTIES**

17) The consent holder shall supply to the Canterbury Regional Council, by 31 August each year, information on the previous irrigation season, including:

(a) list of all water users;
(b) actual land areas irrigated from the scheme;
(c) water supplied to each property;
(d) land uses by property on the irrigated land.

**ANNUAL REPORT ON NUTRIENT BUDGET FOR PROPERTY**

18) For every 12 month period ending 30 June the Consent Holder shall obtain for each property data to demonstrate via either:

(a) a nutrient budget that the average total nitrogen (fertiliser and effluent) application has been less than 200 kgN/ha/yr; or
(b) approved methods undertake calculations or measurements of the average annual concentration of nitrate nitrogen in the soil drainage below the plant root zone and for the

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purposes of this condition, approved methods shall be:
(i) calculations using either the most recent version of the OVERSEER® model or the most recent version of the Soil Plant Atmosphere Model (SPASMO); or
(ii) any other method of calculation or measurement approved by the Canterbury Regional Council.

19) The consent holder shall collate the individual property assessments and supply this information, in a schedule and a map, to the Canterbury Regional Council by 31st August each year. The schedule and map shall show the area irrigated on each property and the nitrate-nitrogen soil drainage information classified as follows:
(a) properties that comply with condition 18(a);
(b) soil drainage concentrations calculated to be less than or equal to 8g/m³;
(c) soil drainage concentrations calculated to be greater than 8g/m³ and less than or equal to 12g/m³;
(d) soil drainage concentrations calculated to be greater than 12g/m³ and less than or equal to 16g/m³;
(e) soil drainage concentrations calculated to be greater than 16g/m³.

20) Where the average annual concentration of nitrate nitrogen in the soil drainage water below the plant root zone as calculated for the property in accordance with clause 18(b) or measured:
(d) is between 8 grams per cubic metre and 16 grams per cubic metre, management practices shall be implemented to reduce the loss of nitrate nitrogen to soil drainage water;
(e) exceeds 16 grams per cubic metre of nitrate nitrogen, the consent holder shall require the adoption of management practices to reduce the loss of nitrate-nitrogen to soil drainage water, including but not limited to:
(i) a revision of the Farm Management Plan on that property to ensure best management practices are put in place;
(ii) a review of the on-farm practices to ensure implementation of the FMP;
(iii) the management practices specified in condition 12(b); and
(iv) the average total nitrogen (fertiliser and effluent) application to that property shall be limited to 200 kgN/ha/yr.

ANNUAL REPORT ON COMPLIANCE

21) By 31 August each year, the consent holder shall provide the Central Plains Water Limited, Attention: RMA Compliance and Enforcement Manager with a report that summarises the following:
(a) For each property the results of the FMP review by the independent auditor,
(b) any non-compliance with the individual FMPs and conditions (4), (5), (6) (7) (8) and (10).
(c) any steps taken by the consent holder to ensure that corrective actions are put in place to address instances of non-compliance.
(d) The consent holder shall arrange for an appropriately qualified person to work with the water user to rectify any issues arising from items (b) and (c) above.

ADDITIONAL CONDITIONS

CONDITIONS OF SUPPLY

22) The consent holder shall not use water to supply any farm or group of farms, where the farm or group of farms is causing significant adverse localised effects resulting in:
(i) breaches of the Drinking Water Standards for New Zealand 2005 (revised 2008); or
(ii) land drainage problems; or
(iii) adverse environmental effects of surface waterways, including any breaches of relevant water quality standard defined in Tables WQL5, WQL6 or WQL16 of the Canterbury

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Natural Resources Regional Plan Chapter 4: Water Quality – Operative 11 June 2011; unless each of the effects listed above are adequately mitigated to an extent that is considered acceptable by Central Plains Water Limited, Attention Compliance Committee, the Groundwater and Surface Water Expert Review Panel and the Compliance and Enforcement Manager of the Canterbury Regional Council.

(f) For the purposes of this condition the farm or group of farms referred to at (a) of this condition shall be determined by the Compliance Committee of Central Plains Water Limited, Compliance and Enforcement Manager of the Canterbury Regional Council and the GSWERP (as defined in Schedule 2; Administrative Conditions, condition 20).

COSTS FOR LAKE OPENING

23) The consent holder shall pay 12.5% of the annual costs incurred by the holders of any consent to open Te Waihora/Lake Ellesmere.

Issued at Christchurch on 30 July 2012

Canterbury Regional Council

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Schedule 1: General Conditions

General Conditions

1. All practicable measures shall be undertaken to minimise and mitigate adverse effects on property, amenity values, wildlife, vegetation and ecological values.

2.

(a) The consent holder shall prepare an Environmental Construction Management Plan (ECMP) detailing the construction activities and the procedures that shall be undertaken to comply with the conditions of this consent and to minimise and mitigate effects of construction activities to the greatest extent practicable. The matters to be addressed in the ECMP shall include the following:

(i) General
   (A) Plan Purpose
   (B) The practices and procedures to be adopted to achieve compliance with the conditions of the designation
   (C) Plan Revision and Compliance Issue Resolution Processes
   (D) ECMP/Management Plan Certification Process
   (E) Roles and Responsibilities

(ii) Mitigation of Adverse Effects
    (A) Environmental Objectives and Principles
    (B) Environmental Management Approach and Methods

(iii) Plan Requirements and the annual environment report process

(b) ECMP there will be the following sub-plans to ensure compliance with specific conditions on each consent.

(i) Construction Phase Management Plan
(ii) Public Health and Safety Plan
(iii) Traffic Management Plan
(iv) Landscape and Rehabilitation Management Plan
(v) Noise and Vibration Management Plan
(vi) Terrestrial Ecology Protection Plan
(vii) Remediation Action Plan
(viii) Waste Management Plan
(ix) Hazardous Substances/Spill Contingency Management Plan
(x) Archaeological and Heritage Management Plan
(xi) Dust Control Management Plan
(xii) Mudfish management Plan
(xiii) Diversion and Discharge Management Plan

Note: That the Management Plans in conditions 2(b)(iv), (ix) and (x) to (xiii) relate to matters within the functions of the Canterbury Regional Council and not those of the Selwyn District Council.

3. The ECMP shall be submitted to the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager at least 30 working days prior to the commencement of works.

4. The consent holder may, at any time, submit to the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager an amended Environmental Construction Management Plan provided it is for the purpose of improving the efficiency and/or quality of the construction works, and/or better avoiding, mitigating or remedying adverse effects.
5. At least 20 working days prior to the start date of the works, the consent holder shall notify the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager, in writing, of the proposed start date.

Mudfish Management Plan

6.

(a) Prior to exercising this consent, the consent holder shall commission a suitably qualified expert with knowledge and experience with assessments of Canterbury Mudfish populations to prepare a Mudfish Management Plan in consultation with the Department of Conservation.

(b) The purpose of the Mudfish Management Plan is to ensure that the scheme effects on Canterbury Mudfish (*Neochanna burrowsi*) populations and their habitat within the Central Plains Water Enhancement Scheme area are no more than minor.

(c) The expert as defined in condition 6(a) shall survey the scheme area for Canterbury Mudfish populations and habitats prior to preparing the Plan.

(d) The Mudfish Management Plan shall include the following:

(i) a map identifying Canterbury Mudfish populations and potential habitats within the scheme area and their current state; and

(ii) an assessment of the potential effects on the Canterbury Mudfish populations and their habitat from changes in flows and water levels in wetlands, ponds, water races, rivers and streams, and from works within the beds of rivers, water races and or streams, or in wetlands; and

(iii) mitigation or offset measures that the consent holder shall adopt to ensure that the effects on the Canterbury Mudfish and their habitat will be no more than minor. Mitigation and offset measures may include, but not be limited to, the following:

(A) mechanisms to exclude predators/competitors from mudfish habitat in areas where predators/competitors are currently unable to regularly access the habitat prior to the Scheme being commissioned;

(B) mechanisms to manage beneficial water levels in mudfish habitats;

(C) enhancements of mudfish habitats through fencing, planting, and pest control; and

(D) proposed translocation or re-establishment of populations in suitable areas.

(iv) a strategy to make available and communicate the plan information and requirements to scheme landowners and operators; and

(v) recommended ongoing monitoring and reporting requirements to demonstrate that the plan implementation has been effective and that effects of the scheme on mudfish in the area are no more than minor.

7.

(a) The consent holder shall submit the Mudfish Management Plan to the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager to certify that the Plan meets the objectives set out in condition 6(b).

(b) The consent holder shall submit the name and qualifications of the author of the Mudfish Management Plan to the Canterbury Regional Council with the Mudfish Management Plan.

(c) The Canterbury Regional Council shall give written notice to the consent holder stating whether or not the Mudfish Management Plan complies with condition 6 within 20 working days of receiving the Mudfish Management Plan.
(d) Any amendments to the Mudfish Management Plan shall be submitted to the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager. The amendments shall be certified by a suitably qualified person with experience and knowledge with assessments of Canterbury Mudfish populations, that the amended Mudfish Management Plan meets the objectives set out in condition 6(b).

(e) The consent holder shall report on the effectiveness of the plan, and effectiveness of any mitigation or offset measures implemented, at least at five yearly intervals (by 30 June each fifth year), or more frequently if recommended in the plan. The report shall be submitted to the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager.

8. The consent holder shall adhere to the Mudfish Management Plan, or any amendments to the Mudfish Management Plan, at all times.

9. Where activities involve works in the beds and margins of rivers or water courses, the consent holder shall ensure:

(a) Fish and Game New Zealand - Central South Island Region and The Department of Conservation are notified of the intention to carry out works, and their intended type, no less than two working days prior to their commencement.

(b) all practicable measures shall be undertaken to:

(i) keep to established tracks and stream crossings; and

(ii) prevent debris, soil and vegetation entering the watercourse; and

(c) the activity shall not restrict access to flood control structures and/or flood control vegetation for the purposes of their repair or maintenance.

(d) Birds

(i) The consent holder shall ensure that prior to any mechanical works being carried out in the period 1 September to 1 February:

(A) a suitably qualified and independent person, with experience and expertise in the identification of avifauna that nest in riverbeds and their breeding sites, inspects the proposed area of works, no earlier than eight working days prior to any works being carried out, and locates any breeding sites of the bird species listed in Appendix A;

(B) the person carrying out the inspection prepares a written report that identifies all the located bird breeding or nesting sites and provides copies of that report to the consent holder and the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager;

(C) the name and qualifications of the person carrying out the inspection are provided to the Canterbury Regional Council with the report;

(D) any person carrying out works authorised by this consent are informed of any bird breeding or nesting sites located; and

(E) where work ceases for more than 10 days, the site will be re-inspected for bird breeding and nesting sites in accordance with parts (a) to (d) of this condition.

(ii) As far as practicable, vehicles and/or machinery shall not operate within 100 metres of birds which are nesting or rearing their young in the bed of the river. Where this is not practicable the consent holder will arrange either relocation as recommended by and under the supervision of the expert as defined in condition 9(d)(i)(A), or alternatively offset mitigation of equivalent value to avifauna as recommended by that expert.

For the purposes of this condition birds are defined as those bird species listed in Appendix A.
(e) Fish

(i) Prior to any works being carried out in the period 1 October to 30 March the consent holder shall:

(A) Commission a suitably qualified and independent person, with experience and expertise fish migration provides a report certifying that the effects from the proposed works on fish migration will be no more than minor; and

(B) submit the report to the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager, along with the name, qualifications and experience of the author of that report.

(ii) No works in flowing water shall take place in the Selwyn, Hororata and Hawkins River during the trout spawning period of 1 May to 30 September

(f) The activities, structures and any associated equipment, materials, or debris, shall not obstruct or alter the passage of water in a manner that causes:

(i) an increase in the risk or potential for flooding of surrounding land;

(ii) destabilisation of lawfully established flood control vegetation, flood control structures or any other lawfully established structures within the beds of rivers;

(iii) an increase in erosion of river beds or banks;

(g) The works shall not prevent the passage of fish, and all practicable measures shall be undertaken to prevent the stranding of fish in pools or channels.

(h) Machinery shall be free of plants and plant seeds prior to use in the riverbed.

(i) No plant species listed in Schedule BLR1 of Chapter 6 ‘Beds and margins of lakes and rivers’ of the Proposed Canterbury Natural Resources Regional Plan shall be planted.

(j) To prevent the spread of Didymo or any other aquatic pest, the consent holder shall ensure that activities authorised by this consent are undertaken in accordance with the Biosecurity New Zealand’s hygiene procedures.

Note: You can access the most current version of these procedures from the Biosecurity New Zealand website http://www.biosecurity.govt.nz or Canterbury Regional Council Customer Services.

(k) Within forty working days of the completion of the construction works, the consent holder shall supply the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager, a complete set of “as-built” plans confirming the location of the works.

(l) Within forty working days of completion of the construction works, the consent holder shall report to the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager, certifying that all construction debris or other materials from the construction works has been removed.

(m) The consent holder shall maintain and keep a complaints register for all aspects of all operations in relation to construction activities. The register shall detail the date, time and type of complaint, cause of the complaint, and action taken by the consent holder in response to the complaint. The register shall be available to the Canterbury Regional Council upon their request.

(n) All disturbed areas shall be stabilised and/or revegetated following completion of the works.

(o) No structure and/or site works shall preclude existing access to the riverbed.
Accidental Discovery

10. This protocol shall cover archaeological sites, historic sites and historic buildings classified under the Historic Places Act 1993. Where appropriate, all contractors, project managers and stakeholders shall be inducted into the protocol and made aware of their individual responsibilities under the protocol.

(a) In the event of any disturbance of Koīwi Tangata (human bones) or taonga (treasured artefacts), the Requiring Authority shall immediately:

(i) Advise the Te Rūnanga o Ngāi Tahu, Te Taumutu Rūnanga, or their representative, and the Canterbury Regional Council of the disturbance;

(ii) Cease earthmoving operations in the affected area until the area containing the Koīwi Tangata or taonga has been clearly demarcated, and Kaumatua and archaeologists have certified that it is appropriate for earthmoving to recommence.

(b) In the event of accidental discovery of archaeological remains, the following steps shall be taken:

(i) All activity affecting the immediate area shall cease and the Regional Archaeologist of the New Zealand Historic Places Trust shall be contacted;

(ii) The site shall be secured to ensure that the remains are not further disturbed;

(iii) Further works affecting the remains will not commence until either:

(A) The Regional Archaeologist of the New Zealand Historic Places Trust has confirmed in writing that the archaeological provisions of the Historic Places Act 1993 do not apply; or

(B) The requirements of the archaeological provisions of the Historic Places Act 1993 have been met, and if required, and archaeological authority has been granted by the New Zealand Historic Places Trust.

(c) If human remains / koīwi tangata are located, in addition to the above steps, the Runanga representative for the area and the New Zealand Police must be contacted.

(d) The above protocol shall only be amended in consultation with the New Zealand Historic Places Trust (NZHPT) Te Rūnanga o Ngāi Tahu and Te Taumutu Rūnanga. Once finalised, copies shall be lodged with those parties and the Canterbury Regional Council prior to any construction commencing.
Appendix A - list of bird species referred to in Schedule 1: Condition (9)(d)

South Island Pied Oystercatcher
Black Stilt
Pied Stilt
Wrybill
Banded Dotterel
Black-fronted Dotterel
Spur-winged Plover
Paradise Shelduck
Grey Duck
NZ Shoveler
Grey Teal
NZ Scaup
Black-billed Gull
Red-billed Gull
Caspian Tern
White-fronted Tern
Black-fronted Tern
White-winged Black Tern
Australasian Bittern
Marsh Crake
Spotless Crake
Cormorant/shag colonies
Schedule 2: Administrative Conditions

1. The lapsing provisions of Section 125 of the Resource Management Act 1991 shall not apply until after the expiry of eight years from the commencement date of the consents included in this decision.

Environmental Management Fund

2. Prior to the exercise of this consent, the consent holder shall establish:

   (a) an Environmental Management Fund (EMF) to be managed and distributed by an independent Environmental Management Fund Committee (EMFC) for the purpose of:

   (i) environmental mitigation of the effects of the operation of the water enhancement scheme which is not otherwise required by the individual Farm Management Plan or specific consent conditions; and

   (ii) environmental management projects within the area affected by the operation of the scheme as shown on Plan CRC061973A.

   (b)

   (i) a Te Waihora Environmental Management Fund (TWEMF) to be managed and distributed by Te Rūnanga o Ngāi Tahu.

   (ii) no later than 31 August each year, Te Rūnanga o Ngāi Tahu shall submit a report to the consent holder setting out the projects supported by the TWEMF.

3. Prior to the exercise of this consent, the consent holder shall establish an EMFC. There shall be at least six members on the EMFC and shall include representatives of:

   (a) Central Plains Water Trust or Central Plains Water Limited;

   (b) Te Rūnanga o Ngāi Tahu (being two individuals proposed by Te Rūnanga o Ngāi Tahu);

   (c) environmental and recreational interests;

   (d) community interests; and

   (e) Selwyn District Council, Christchurch City Council, Canterbury Regional Council and/or a representative from the Canterbury Water Management Strategy Selwyn-Waikoropupu-Waihora zone committee.

The nominated membership of the EMFC shall be submitted to the CRC attention Compliance Enforcement Manager, who will confirm their suitability prior to the EMFC being able to operate.

4. The fund shall not be utilised for any of the following:

   (a) measures required by conditions, the Sustainability Protocol or Farm Management Plans;

   (b) any administration or education associated with consent conditions, the Sustainability Protocol or Farm Management Plans.

5. The consent holder shall submit a report to the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Officer which details the following:

   (a) fund structure and management;

   (b) the level of levy (initially at least $0.40 per share per annum);

   (c) criteria for seeking, selecting and approving applications;
(d) criteria for a rebate of the levy to recompense water users for the capital costs of environmental enhancement work on water users' own properties, which is not otherwise required by their Farm Management Plan or the consent conditions (up to 50% rebate of the levy paid by any one water user in any one year).

6. By the time 10,000 hectares of land is irrigated under this scheme, the EMF shall have a minimum amount of $300,000. Each water user that enters a Water Users Agreement with the consent holder shall commence paying the levy from the date which the Water Users Agreement is signed.

7. The levy shall increase annually based on the all groups consumer price index as published quarterly by Statistics NZ. The initial rate of 40 cents per share shall be established as equivalent to the all groups consumer price index for 1 July 2010. The first annual adjustment of the levy shall take place on 1 July 2011.

8. The priority for the distribution and use of the scheme Environmental Management Fund, shall be the following environmental mitigation if it is not also required by the individual Farm Management Plans or consent conditions specified in CRC061973 and the Groundwater and Surface Water Plan:
   
   (a) Minimising nutrient losses to lowland streams and Te Waihora/Lake Ellesmere;
   
   (b) Excluding stock from wetlands, riparian margins and beds of rivers and streams,
   
   (c) Physical protection or enhancement of indigenous vegetation planting along riparian margins;
   
   (d) Indigenous wetland enhancement or indigenous wetland creation, including the development of indigenous wetlands along intermittent streams;
   
   (e) Permanent protection of wetland areas that may contain mudfish.

9. The consent holder shall facilitate the use of the Environmental Management Fund to implement and where appropriate maintain meaningful environmental enhancement projects which will commence as soon as practicable following the first exercise of the water use consent CRC061973.

**Sustainability Protocol**

10. (a) The consent holder shall comply with the Sustainability Protocol attached to this consent, which provides details of the practices and procedures to be put into place to operate the Central Plains Water Enhancement Scheme.

(b) The Sustainability Protocol shall be used to develop the Farm Management Plans as prescribed in accordance with resource consent CRC061973.

11. At least one year prior to the commencement of the scheme, and at least once every five years after the commencement of the scheme, the sustainability protocol shall be reviewed and updated to reflect best practice.

**Community Liaison**

12. The consent holder shall, prior to the exercise of this consent, undertake an open, public process to offer membership positions on a Community Liaison Group.

13. (a) The Community Liaison Group shall consist of a maximum of six persons with a preference for representatives who can each demonstrate skills or knowledge in at least one of the following:

   - Māori Tahu cultural values;
   - Management of indigenous biodiversity;
(iii) Recreational uses of the Waimakariri River or Rakaia River;
(iv) Sustainable irrigated agricultural practices;
(v) Water quality and sustainable land management;
(vi) Community and/or business in Central Canterbury;
(vii) Lowland drainage network operation.

(b) If required, the Community Liaison Group shall have an Independent Facilitator appointed by the consent holder and approved by the Compliance and Enforcement Manager of the Canterbury Regional Council, to facilitate the Group’s activities.

(c) The consent holder shall meet all the reasonable expenses involved with the running of the Community Liaison Group.

14. The members of the Community Liaison Group shall, at the consent holder’s expense, be offered:

(a) the opportunity to meet every six months, or less frequently as determined by the Community Liaison Group,
(b) an annual inspection of the Scheme area, and
(c) the provision of any information to which Canterbury Regional Council is entitled by virtue of this consent.

15. If the Community Liaison Group elects to hold a meeting in accordance with Condition 14, then the Scheme Manager or their nominated representative shall attend the meeting.

16. At least one representative from each of Canterbury Regional Council (in its resource consent regulatory capacity); Canterbury Regional Council (in its river and drainage management capacity); and Christchurch City Council and Selwyn District Council shall be invited to attend meetings.

17. The main purposes of the meetings of the Community Liaison Group are to:

(a) Provide input and feedback into the preparation, implementation, review and amendment of the Farm Management Plan templates as required by consent CRC061973;
(b) Be presented by, and discuss with, the consent holder the results of monitoring and reporting as required by the conditions of this consent, including the Annual Environmental Report and the annual overall audit report on compliance with the Farm Management Plans, prepared by the consent holder;
(c) Discuss, as far as practicable, any community concerns regarding the operation of the Central Plains Water Enhancement Scheme.
(d) Review and recommend to the consent holder projects for the distribution of funds from the environmental levy to environmental mitigation projects in accordance with Condition 2(b).
(e) To recommend projects to be considered by the Environmental Management Fund Committee.

The members of the Community Liaison Group shall be offered the opportunity to review and comment on:

the initial Scheme Environmental Management Plan; and
(ii) the initial Farm Management Plan templates,

(iii) the reviews of and any amendments to the Scheme Environmental Management Plan and Farm Management Plan templates; and

(iv) the consent holder's Annual Environmental Report including the annual overall audit report on compliance with the Farm Management Plans.

(b) The Community Liaison Group shall be provided with the opportunity to submit information to the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager annually in relation to the review of the Scheme Environmental Management Plan and the template for the Farm Management Plans.

**Ground and Surface Water Expert Review Panel**

19. The consent holder shall avoid, remedy or mitigate adverse effects on groundwater, gravel pit operations and lowland drainage which occur as a result of the exercise of this consent.

20. Ground and Surface Water Expert Review Panel

(a) Prior to the commencement of any activities authorised by these consents (including the finalisation of the Ground and Surface Water Plan listed in condition 21), the Canterbury Regional Council shall, in consultation with the consent holder, appoint a Ground and Surface Water Expert Review Panel (GSWERP).

(b) The GSWERP shall comprise of five to nine people. The panel members shall be selected so that collectively they provide expertise in the following areas:

(i) The operation of the Central Plains Water Enhancement Scheme;

(ii) Ngāi Tahu cultural values;

(iii) Lowland drainage network operations in Canterbury;

(iv) Hydrogeology;

(v) Land drainage;

(vi) Groundwater quality monitoring; and

(vii) Surface water monitoring; and

(viii) The Christchurch and Kaiapōl artesian aquifer systems.

Note: It is acceptable for one person to fill more than one of the roles listed above, provided that person has the appropriate experience and expertise.

(c) The GSWERP shall comprise at a minimum the following:

(i) a technical representative appointed by Central Plains Water Enhancement Scheme management;

(ii) a technical representative of drainage schemes management from the lower plains;

(iii) an engineer with expertise and experience in both large scale and localised solutions to land drainage needs;

(iv) an engineer or scientist with expertise and experience in Canterbury groundwater systems;

(v) a technical representative chosen by Te Rūnanga o Ngāi Tahu;

and may also comprise -

(vi) a technical representative from the Canterbury Regional Council;
(vii) a technical representative chosen by Christchurch City Council;
(viii) a technical representative chosen by Selwyn District Council.

provided that no more than one technical representative shall be an employee of, or shall otherwise represent, one of the entities listed in (vi) to (viii).

Note: It is acceptable for one person to fill more than one of the roles listed above, provided that person has the appropriate experience and expertise.

(d) The role of the GSWERP shall be to:

(i) review the Ground and Surface Water Plan described in condition 21, and recommend any amendments as it considers appropriate;

(ii) consult with Te Runanga o Ngai Tahu regarding:

A The monitoring and mitigation measures related to effects on Te Waihora/Lake Ellesmere as proposed in the Ground and Surface Water Plan; and

B The cultural monitoring to be undertaken.

(iii) receive and review reports on the environmental monitoring and mitigation undertaken by the consent holder and any other relevant monitoring results and reports prepared by the Canterbury Regional Council or other bodies;

(iv) review reports submitted by the consent holder and complaints referred to it in accordance with condition 32, and within two months of the receipt of these reports, convey recommendations to the consent holder regarding the validity of the interpretation of monitoring data and implementation of mitigation measures undertaken by the consent holder;

(v) determine the likely cause of reported problems with drainage, groundwater or localised surface water quality issues, including using information gathered in accordance with conditions 25 to 27; propose mitigation or remedial measures and determine the extent to which the consent holder must implement them; or contribute to the cost of implementing them, given the consent holder's degree of contribution to the problem. Where effects cannot be addressed by mitigation or remedial measures they shall be addressed by way of financial compensation;

(vi) advise the Canterbury Regional Council if there are grounds to review conditions of consent in the event that an adverse effect arises which is not mitigated or remedied by the consent holder to the extent recommended by the GSWERP;

(vii) address other matters that may arise from the exercise of consent CRC061973.

(e) The GSWERP shall:

(i) meet no less frequently than once a year; and

(ii) be funded by the consent holder; and

(iii) operate on a majority basis; and

(iv) report no less frequently than once a year on its conclusions and recommendations including any complaints referred to it to Te Rūnanga o Ngāi Tahu, Central Plains Water Limited, Attention Compliance Committee and the Canterbury Regional Council, Attention: RMA Compliance and Enforcement Officer and the consent holder.
(a) Prior to the first exercise of this consent, the consent holder shall develop a Ground and Surface Water Plan outlining the measures undertaken to monitor and mitigate potential adverse effects that may arise in regard to the following issues:

(i) Loss of Waimakariri River seepage on the Christchurch-West Melton and Kapaori aquifer systems; and

(ii) Increase in the concentrations of nitrate-nitrogen or other contaminants in the groundwater both beneath and downstream from the Scheme area; and

(iii) Raised groundwater levels both beneath and downstream from the Scheme area, including any effects on gravel pit operations; and

(iv) Increase in the concentrations of contaminants, including nitrate-nitrogen and phosphorus in surface water bodies, in particular lowland streams and Te Waihora/Lake Ellesmere.

(b) The key objectives of the Ground and Surface Water Plan shall be to outline the cultural and technical aspects of groundwater and surface water monitoring and reporting programme and to describe how the consent holder will avoid, remedy or mitigate adverse effects on groundwater quantity, groundwater quality, surface water levels, surface water quality and lowland drainage which occur as a result of the exercise of this consent.

(c) The Ground and Surface Water Plan shall be submitted to the Central Plains Water Limited, Attention Compliance Committee and Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager in two parts:

(i) Ground and Surface Water Plan: Part 1 (location and monitoring); and

(ii) Ground and Surface Water Plan: Part 2 (mitigation and trigger levels).

(d) Part 1 of the Ground and Surface Water Plan shall include:

(i) The location of all farms using water from the Central Plains Water Enhancement Scheme and the associated land use.

(ii) The location of all surface water quality monitoring sites.

A There shall be at least two monitoring sites in each of the following eight lowland streams that flow into Te Waihora/Lake Ellesmere: the Halswell River, LIL River, Selwyn River, Inwell River, Boggy Creek, Hamner Road Drain, Doyleston Drain, and Harts Creek. The monitoring sites on lowland streams shall include one site near the spring-fed source in the upper catchment and one site upstream of the discharge point to Te Waihora/Lake Ellesmere.

B Unless the GSWEP determines it impracticable to do so:

(i) There shall be a minimum of two water quality monitoring sites located to the west of State Highway 1 on each of the following rivers:

   o Waikirikiri/Selwyn River;
   o Hororata River;
   o Hawkins River;
   o Waihiwaniwa.

(ii) On each river, one monitoring site shall be positioned above the scheme area and one site shall be located within the Scheme area but west of State Highway 1, and located in areas that will be affected by the consent holder’s activity.
(iii) There shall be a water quality monitoring site located to the west of State Highway 1 on the springs which feed the Irwell River.

(iv) The location of each monitoring site shall be determined by the GSWEP and may be altered by the GSWEP from time to time to ensure compliance with condition 21(d)(B)(i) and (ii) above.

(v) In the absence of there being sufficient surface flow to undertake a valid water quality test, subsurface flow shall be measured.

C There shall also be at least four monitoring sites located at the terminus of the stockwater network which flows through the Scheme's command area.

Note: the lower stream sites are those currently monitored on a monthly basis by the Canterbury Regional Council.

Where feasible, the upstream monitoring locations shall be sited (or replaced with sites) located within the Scheme supply area where those locations are most likely to be directly affected by the consent holder's activities, as determined by the GSWEP.

D There shall be at least four monitoring sites in Te Waihora/Lake Ellesmere.

E The consent holder may rely on data collected on Te Waihora/Lake Ellesmere, lowland streams, other rivers/streams or drains and stockwater network by the Canterbury Regional Council or any other entity in lieu of establishing new monitoring sites. In the event that this third party monitoring is reduced, then the consent holder shall ensure that the sixteen lowland stream monitoring sites and the four Te Waihora/Lake Ellesmere monitoring sites are maintained.

(iii) The location, depth and screened interval of specific monitoring bores for assessing effects of the scheme activities on groundwater: specifically groundwater levels, groundwater quality, surface water flow and surface water quality. The minimum requirements for monitoring bores shall be as follows:

A There shall be at least twenty monitoring bore clusters within the scheme area. At least ten clusters shall be located at the down-gradient boundaries of ten different farms that are irrigated by the scheme. At least ten other clusters shall be located at the down-gradient boundaries of farms that are not irrigated by the scheme, including some areas that have no irrigation activities. The farms selected shall represent a variety of farm types.

Where feasible at least half of the monitoring bore clusters that are at the down-gradient boundaries of the farms that are irrigated by the scheme shall be installed in areas of shallow groundwater that could respond relatively quickly to the consent holder's activities, as determined by the GSWEP.

B Individual monitoring bores within each cluster shall have a maximum screen length of three metres.

C Each monitoring bore cluster shall include a sufficient number of individual bores to cover the fluctuations of the water table at that site, ensuring that the water table is intercepted by at least one bore screen at all times.

D The diameters of individual bores shall be sufficient to allow the bores to be purged and sampled according to the sampling procedure specified in condition 27(c).

E If one of the scheme farms associated with a monitoring cluster no longer irrigates using water from the scheme, a new cluster shall be established immediately down-gradient of another scheme farm. Similarly, if one of the
non-scheme farms associated with a monitoring cluster joins the scheme, a new cluster shall be established immediately down-gradient of another non-scheme farm.

F  A monitoring bore shall be replaced by a deeper monitoring bore if a monitoring bore is dry for more than six months.

An alternative monitoring programme recommended by the GSWERP may form part of the Ground and Surface Water Plan, to obtain representative samples of groundwater levels and groundwater quality across and down gradient of the scheme area.

ADVICE NOTE: An alternative monitoring programme recommended by the GSWERP may include additional monitoring related to the effects on groundwater quality from landfills and waste water systems as a result of increased water levels.

(iv) The frequency of groundwater level sampling in the monitoring bores identified in the Ground and Surface Water Plan, with measurements taken at least once per month or any subsequent frequency agreed upon by the GSWERP.

A  Groundwater level measurements shall commence at least one year prior to the use of water under resource consent CRC061973.

B  The frequency of the water level measurements may only be reviewed by the GSWERP two years after the commencement of the use of water under resource consent CRC061973.

(v) The frequency of groundwater quality sampling in the monitoring bores identified in the Ground and Surface Water Plan, and shall include the following as a minimum:

A  For two years prior to, and ten years after the use of water under CRC061973 commences, groundwater quality samples shall be taken from the bores identified in the Ground and Surface Water Plan in March, June, September and December each year.

B  Ten years after the use of water under CRC061973 commences, the frequency of groundwater quality sampling shall reduce to twice per year, where each sample shall be taken during August-September and April-May each year.

(e) Part 2 of the Ground and Surface Water Plan shall include:

(i) A description of the mitigation measures that may be implemented to address all the potential adverse effects related to groundwater level, groundwater quality and surface water flow and quality issues;

(ii) A description of the specific triggers that initiate the implementation of the mitigation measures in response to the monitoring outcomes for any effects that may arise related to groundwater levels, increased duration of high groundwater levels, groundwater quality, surface water flows and surface water quality;

(iii) A description of mitigation measures that may be implemented to address all the potential adverse effects related to lowland water quality and the reversal of the eutrophication of Te Waihora (Lake Ellesmere), within an integrated management approach;

(iv) The strategy for monitoring and reporting on the effectiveness of the mitigation measures to the Canterbury Regional Council, the GSWERP and the affected land owners.
22. The consent holder shall submit Part 1 of the Ground and Surface Water Plan to the GSWERP for its review and recommendations in accordance with condition 20(d)(i) to certify that the Plan meets the requirements set out in condition 21.

23. Prior to the implementation of the monitoring programme outlined in Part 1 of the Ground and Surface Water Plan, the consent holder shall submit the Plan: Part 1 to the Central Plains Water Limited, Attention Compliance Committee and Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager, including a report from the GSWERP certifying that the Plan meets condition 21.

24. Surface water monitoring
Prior to the finalisation of the Ground and Surface Water Plan: Part 2, the consent holder shall:

(a) use the existing recent surface water quality and appropriate groundwater quality data and data collected from the surface water monitoring prior to commencement of irrigation activity, to identify specific baseline nutrient and other contaminant concentration levels in the lowland streams, and annual average mass load of nutrients (Nitrate-N) from streams to Lake Ellesmere.

(b) Identify trigger levels as a percentage increase or an absolute concentration increase in nutrient (Nitrate-N) concentration from the agreed mean baseline levels at individual sites, and as a percentage increase or absolute increase from the annual average annual mass load to Lake Ellesmere calculated from the standard monitoring sites and previously determined as the baseline.

(c) The trigger levels shall be included in the Ground and Surface Water Plan: Part 2, and shall be submitted to the GSWERP for its review and agreement.

25. Groundwater levels
Prior to the finalisation of the Ground and Surface Water Plan: Part 2, the consent holder shall:

(a) Use existing groundwater level data, appropriate surface water quality data and data collected from the groundwater level monitoring to identify specific groundwater levels that shall trigger a response from the consent holder to avoid, mitigate or remedy any adverse effects related to increased groundwater levels, as a result of exercising this consent, including increased groundwater levels or increased duration of high groundwater levels.

(b) The trigger levels shall be included in the Ground and Surface Water Plan: Part 2, and shall be submitted to the GSWERP for its review and agreement.

26. Lowland Drainage
Prior to the finalisation of the Ground and Surface Water Plan: Part 2, the consent holder shall:

(a) undertake a baseline survey of the lowland drainage systems of the Central Plains taking into consideration historical data. The survey shall build on existing data, and include:

(i) An evaluation of the current cultural health and identification of the mahinga kai values of these waterways;

(ii) An inventory of drains and streams, their location, size and capacity,

(iii) An inventory of sewerage systems (reticulated and individual septic tanks),

(iv) The conditions of these facilities, their capacities, maintenance activities, dates of installation, histories of water-level related issues,

(v) Records of stream and drain flows and groundwater levels,
(vi) Existing management and administration arrangements for the drainage schemes,

(vii) Current costs of maintenance and operation of the drainage schemes.

(b) Identify groundwater levels that would trigger the implementation of mitigation measures as specified in condition 21(e). The baseline survey and trigger levels shall be incorporated into the Ground and Surface Water Plan.

27. Groundwater quality monitoring

(a) For two years prior to, and ten years after the use of water under CRC061973 commences, groundwater quality samples shall be taken from the bores identified in the Ground and Surface Water Plan in March, June, September and December each year.

(b) Ten years after the use of water under CRC061973 commences, the frequency of groundwater quality sampling shall reduce to twice per year, where each sample shall be taken during August-September and April-May each year.

(c) Water quality sampling shall be undertaken in accordance with the latest version of the Canterbury Regional Council guidelines for the collection of groundwater quality samples.

(d) As a minimum, the water quality analyses shall include E.coli, pH, electric conductivity, alkalinity, chloride, ammonia-N, nitrate-nitrogen, total-N, dissolved reactive phosphorus and sulphate.

28. Results of Monitoring

(a) The consent holder shall prepare a report describing the results of the environmental monitoring outlined in the Ground and Surface Water Plan, for the period from 1 July to the following 30 June for each year.

(b) The consent holder shall submit the report to the GSWERP by the following 1 September. The groundwater report shall include all the monitoring data and an interpretation of background conditions and impacts arising from the consented activities.

(c) The consent holder shall also submit the report to the Central Plains Water Limited, Attention Compliance Committee and Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager, by 1 September each year.

(d) Using the results from the environmental monitoring, the consent holder shall prepare Part 2 of the Ground and Surface Water Plan as specified in condition 21(e).

29. The consent holder shall submit Part 2 of the Ground and Surface Water Plan to the Central Plains Water Limited, Attention Compliance Committee and Canterbury Regional Council, Attention: RMA Compliance and Enforcement Officer prior to the use of water by the Scheme for irrigation. Written confirmation that the Ground and Surface Water Plan complies with the requirements of this condition must be obtained from the Canterbury Regional Council prior to using water for irrigation. Confirmation shall not be unreasonably delayed or withheld.

30. Prior to 1 October each year, the GSWERP shall review the monitoring report described in condition 28(a) and make recommendations to the Central Plains Water Limited, Attention Compliance Committee and the consent holder regarding the validity of the interpretation of monitoring data and the implementation of mitigation measures undertaken by the consent holder. The GSWERP shall also recommend additional mitigation measures that should be undertaken by the consent holder and/or enforcement or condition review actions that should be undertaken by the Central Plains Water Limited, Attention Compliance Committee and Canterbury Regional Council.
Within 20 working days of any meeting of the GSWERP, the consent holder shall provide the Central Plains Water Limited, Attention Compliance Committee and Canterbury Regional Council, Attention: RMA Compliance and Enforcement Officer, a copy of the recommendations made by the GSWERP.

31. Exceedance of Trigger Levels:

(a) If any bore within the area shown on the attached Plan CRC061973 exceeds a nitrate-nitrogen concentration of 11.3 grams per cubic metre and the bore supplies domestic water to a dwelling that has infants under the age of six months at the time of the exceedance, then the consent holder shall immediately supply an alternative drinking water supply to those dwellings until it can be demonstrated that the concentration of nitrate-nitrogen in the subject bore is below 11.3 grams per cubic metre, unless it can be demonstrated that the concentration of nitrate-nitrogen in the subject bore exceeded 11.3 grams per cubic metre on at least one occasion prior to the use of water by the consent holder or unless it is concluded that the use of water by the consent holder is not the likely cause of the exceedance.

(b) The Canterbury Regional Council may serve notice on the consent holder of its intention to review the conditions of this consent to deal with any exceedance of any surface water quality trigger level specified in the Ground and Surface Water Plan, which is due to the exercise of this consent.

(c) In the event that the groundwater trigger levels specified in the Ground and Surface Water Plan are reached, the consent holder shall undertake measures to avoid, mitigate or remedy any adverse effects related to groundwater levels that may arise as a result of exercising this consent. Mitigation measures may include but not be limited to:

(i) additional monitoring;
(ii) restricting the use of water for irrigation;
(iii) the widening and/or deepening of drains to increase their capacity;
(iv) the installation of more drains;
(v) providing pumped drainage for affected properties or facilities;
(vi) upgrading sewerage reticulation systems to reduce groundwater infiltration into pipes;
(vii) more frequent maintenance of existing drains, including cleaning;
(viii) financial compensation in lieu of remedial works; and
(ix) complementary enhancement measures which may include but are not limited to the construction of wetlands.

32. Response to Groundwater and Surface Water Complaints

When the consent holder is notified by a "complainant" of an adverse environmental effect, then:

(a) Within 10 working days of receipt of the complaint, the consent holder (or a suitably qualified nominee) shall commence an investigation of the complaint.

(b) Within five working days of completion of its investigation, the consent holder shall notify the complainant (and the CRC Enforcement and Compliance Officer) of:

(I) the outcome of the investigation, including a description of the assessment process that the consent holder has undertaken regarding the issue raised by the complainant;
(ii) descriptions of actions to be or that have been undertaken and/or mitigation options, including details of timing and cost sharing and time frames for the implementation of any actions;

(iii) the complainant's right to refer the complaint to the Central Plains Water Limited, Attention Compliance Committee and GSWERP, and the contact details of the GSWERP.

(c) The consent holder may offer to mitigate or remedy the situation immediately subject to the complainant agreeing to reimburse the consent holder for the relevant portion of the cost of any such remedy as in condition 32(b)(ii). Such reimbursement will not extend to the consent holder's cost in assessing the complaint or any costs of reviews of the complaint by the GSWERP.

(d) The consent holder may, instead of undertaking any remedial work or completing the assessment process, with the agreement of the complainant choose to negotiate with the complainant to undertake or pay the cost of those remedial works directly to the complainant, or agree to provide financial compensation to the complainant for losses, or otherwise reach agreement with the complainant in respect of any damage.

(e) Any agreement for the consent holder to pay costs directly to the landowner shall include a written undertaking from the property owner, that on the sale of the property, the property owner will advise the purchaser that the holder of this consent is no longer liable for any effects associated with the use of water that may occur on that property.

(f) For the purpose of this condition, mitigation or remedy shall include works to an extent that alleviates the significance of the adverse effects of the exercise of consent CRC061973.

(g) The consent holder shall notify the Central Plains Water Limited, Attention Compliance Committee and Canterbury Regional Council, Attention: RMA Compliance and Enforcement Manager of any complaints made, any recommendation made by the GSWERP, whether or not the consent holder and the complainant are satisfied with the recommendation, and any actions undertaken to remedy the situation.

**Bond**

33. Prior to the commencement of the activity authorised by this consent, the consent holder shall provide a bond in accordance Schedule 3 attached to this consent.

**Review**

34. The Canterbury Regional Council may in the last five working days in June and December during the first five years from the date of the first exercise this consent, or until the completion of construction works and thereafter annually on the last five working days of June each year serve notice of its intention to review the conditions of this consent for the purpose of:

(a) dealing with any adverse effects on the environment which may arise from the exercise of this consent, including on the operation of the Christchurch International Airport;

(b) ensuring the adequacy of sampling and/or monitoring programmes;

(c) dealing with any adverse effects or other issue identified in any report submitted as a condition of this consent;
(d) altering the rate of abstraction from the Rakaia and/or Waimakariri Rivers to correspond to the actual rate of water usage; and/or

(e) amending the minimum flow restrictions in the takes from the Rakaia and/or Waimakariri Rivers to reflect any changes in the abstraction rate of the other abstractors from the river;

(f) Altering the rate of abstraction from the Waimakariri River to protect the recharge into the Christchurch-West Melton and Kaiapoi aquifer systems;

(g) Altering the way in which water is use and/or the way in which mitigation measures are implemented if there is any failure to meet the Drinking Water Standards for New Zealand 2005 (revised 2008), or any future more rigorous standard, in any community water supply wells where that failure is materially contributed to by the activities authorised by this consent;

(h) Addressing any differences between actual calculated scheme-wide nutrient discharges and the catchment wide Nutrient Discharge Allowance (being provisions to limit the volumes of N or P that can be discharged into the catchment by land use) ("NDA") information being published as part of the work for the Canterbury Water Management Strategy.

35. Within six months of a regional plan becoming operative that sets catchment wide NDA within the areas to which the scheme supplies water, the consent holder shall apply to vary the conditions of their consents that relate to nutrient discharges in a way that is consistent with the catchment wide NDA that are defined in the regional plan.

36. In the absence of any operative regional plan having set NDA within the areas to which the scheme supplies water by November 2015, during the month of December 2015, or within six months of catchment wide NDA being published as part of the work for the Canterbury Water Management Strategy, the consent holder shall review and modify its individual Farm Management Plans and its scheme Sustainability Protocol to ensure that they describe the actual farm and scheme discharges in a manner that is consistent with the NDA methodology. Where such calculations indicate that the scheme may exceed the indicative allocations published, the consent holder shall instigate a scheme-wide review of the Farm Management Plans and Sustainability Protocol, to critically examine both land and nutrient management and to identify feasible options to minimise the exceedance of the published allocations. The outcome of such a review shall be made available to the Compliance and Enforcement Manager of the Canterbury Regional Council within six months of commencement of the scheme wide review. The feasible options to minimise the exceedences shall be implemented within two years of the review report being submitted to Canterbury Regional Council.

37. Charges, set in accordance with section 36 of the Resource Management Act 1991, shall be paid to the Regional Council for the carrying out of its functions in relation to the administration, monitoring and supervision of resource consents and for the carrying out of its functions under section 35 of the Act.