

Hurunui Community Water Development Project

Sustainable Farming Fund Grant #03/085

**Applicant Group: Hurunui Community
Water Development Project Working Group**

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Executive Summary

The Hurunui Working Group (HWG) comprises: the Hurunui Irrigation and Power Trust (representing some 200 farmers in the Hurunui and Waipara districts), Ngāi Tahu Property Ltd, MainPower NZ Ltd, the owner of Eskhead Station, and Enterprise North Canterbury. This Group is a cross section of the regional community interested in water development.

The HWG set out to plan and design a Water Development Project which would meet the needs of the Hurunui and Waipara communities, and be consentable.

After completing technical studies assessing 37 potential water storage sites, and community consultation involving a preferred development option of water storage at Lake Sumner by existing level management, and a dam on the South Branch of the Hurunui River, the HWG concluded that a viable opportunity exists to irrigate some 40,000 ha in the Hurunui and Waipara catchments, and to enhance water management for the region.

The Project continues to have a high level of regional support from within the Hurunui, but has some significant environmental issues to consider. The HWG is of the view that, at this stage, the environmental issues can be avoided or mitigated, and that the Project is financially viable.

The Project is the largest regional development initiative being contemplated for the Hurunui and, if implemented, would transform the regional economy with potential whole-of-district benefits approximating \$100m per annum.

As this Project study was nearing completion, preliminary findings for phases 2 & 3 of the Canterbury Strategic Water Study became available. While these findings supported the principle of water storage and irrigation for the Hurunui, some questions were raised over the two storage sites preferred by the HWG. The issue was further compounded by Ecan subsequently releasing a draft flow management regime for the Hurunui River that has significant implications for both the Canterbury Strategic Water Study and the HWG Project.

The HWG is committed to progressing the Project from the desktop studies already completed to date. This will involve further technical and environmental evaluations, and further consultation to identify a specific project able to proceed, with community support, to resource consenting and capital raising. Implicitly, this will also involve further engagement with Ngāi Tahu to ensure the Project design and outcome satisfies cultural objectives and achieves broad Ngāi Tahu support.

The HWG is indebted to the Sustainable Farming Fund (SFF) for their financial support for this Project to date, and has included recognition of the SFF's support in all its publicity and communication materials.

Recommendations For Subsequent Studies

The completed work plan, outlined in this report, and other initiatives the HWG has undertaken, have identified the need for further studies which are essential to advance this community project beyond the pre-feasibility stage. The following steps are recommended as the natural consequence of the work completed to date:

1. Investigate governance structures and funding arrangements which could support the Project through its future stages.
2. Maintain engagement in the Proposed Natural Resources Regional Plan submission process to advocate the advantages of developing the region's water resources for the benefit of the community.
3. Update the water supply and demand balance for the currently preferred development option. This will provide information on the sensitivity of reservoir capacity to changes in water availability, which is an essential input to negotiations on water allocation rules and environmental flow regimes.
4. Undertake detailed site investigations of the selected storage sites to provide information required for subsequent consultation.
5. Consult with conservation, recreational and environmental interests, and with Ngāi Tahu to understand their concerns and so mitigate adverse effects and enhance positive outcomes of the Project to the maximum extent possible. Identify specific environmental studies required to address specific concerns.
6. Undertake environmental investigations, including field work, to determine the potential environmental effects of constructing and operating the water supply system, and of increasing the irrigated area in the catchment.
7. Negotiate critical elements of the Project concepts with key stakeholders. Such elements will include water allocation rules, environmental flow regimes, sustainable farming practices, and community outcomes.
8. Refine construction methodology and reservoir design in light of field data obtained and key stakeholder agreements, and refine the development cost estimates.
9. Undertake a pre-feasibility level design of the distribution system, estimate its cost and consult with affected landowners.
10. Assess the socio-economic effects of the Project for the region and for a range of land uses against the bench-mark of 'doing nothing'.
11. Maintain continuous consultation and extension work with:
 - a. Farmers within the Project area (including those with existing water rights);
 - b. The wider regional community;
 - c. Environment Canterbury Councillors;
 - d. Hurunui District Councillors;
 - e. Central Government – Ministers and officials;to keep them all up to date with the Project plan as it is refined and developed.
12. Identify a specific community water development concept that will be viable and consentable, and which will result in more productive and sustainable land use in the District, increase the sustainability of existing irrigation schemes through the availability of water storage, and result in environmental enhancement from the adoption of best practice farming techniques through audited self-management of irrigated farms.

1. Introduction

1.1 Origin Of Project

The genesis of this project is in the separate endeavours by several parties interested in the problems faced by dryland farmers in the Hurunui and Waipara catchments. These problems fall into two categories:

1. The impact of dry and drought years on farm production and profitability.
2. The limited potential for higher value outputs, and intensive high land-use, due to climatic uncertainty.

The lack of reliable water for irrigation restricts the opportunity to intensify farming or convert to high value land-uses. Where irrigation has been possible, the productive potential of the area has been evident through the expansion of intensive dairy farming and award winning wine production. The socio-economic impacts of these developments are positive and substantial.

The Canterbury Strategic Water Study (Stage 1, 2002) had shown that there was sufficient water in the Hurunui catchment to meet all foreseeable water needs (environmental, irrigation, stock water and town supply), providing sufficient storage is developed.

This Project, therefore, addressed the need for a community-based water development strategy for the entire Hurunui catchment, and provided an opportunity to implement such a strategy and achieve widespread economic, environmental and social benefits.

In 2003, a group of farmers in the Hurunui District established the Hurunui Irrigation and Power Trust (HIPT), and retained consultants to scope the possibility of irrigation for the Hawarden, Waikari and Scargill areas. The Trust approached Enterprise North Canterbury (ENC) to assist with an application to the SFF. At about the same time, parties associated with Eskhead Station had established the Hurunui Water Management Trust (HWMT) and were assessing the potential for storage sites on that property, to make water available for irrigation and power generation. The HWMT also made application to SFF. SFF declined both applications and encouraged all parties to jointly reapply.

Two other parties were known to have an interest in land development in the Hurunui District:

- Ngāi Tahu Property Ltd (NTP) – who manage Balmoral Forest and who were looking to irrigate this land in the future;
- The region's lines network company, MainPower NZ Ltd (MNZ), had a strategic interest in the economic development of the region and had been assessing regional development initiatives in the Hurunui.

In August 2003, the HWG was established, and comprised the HIPT, MNZ, NTP, HWMT and ENC, each of whom signed identical letters of support to initiate the Project. In October 2003, SFF funding of \$225,000 (including GST) was approved for the Project promoted by the HWG. The SFF contract set out the objectives of the Project, along with the Work Programme and Milestones, all of which are the subject of this final report.

1.2 Objectives

The objective of this Project, as set out in the SFF contract, is “To plan and design a water development project which meets the needs of the Hurunui community in a manner that is consentable. To achieve this, the Project will:

- Demonstrate that the storage reservoirs, intakes, canals, hydro plant and water distribution systems that make up the development project can be developed and managed to meet developer expectations;
- Show that such a project is consistent with environmental and cultural values;
- Involve key stakeholders from a community of interest wider than the applicant group, early enough for them to influence project design and in a way that is intended to gain their support for the development project;
- Produce evidence that a water development project is an essential element for the socio-economic development of the Hurunui and Waipara areas.”.

“The main output from the project is to be a report, describing a recommended water development project, that has been designed and costed in sufficient detail for financial planning and decision-making purposes, and to enable an assessment of environment effects to be made post-Project.”

It was expected that the Project would lead into resource consenting, with more detailed investigations and feasibility studies, capital raising, scheme construction and commissioning to follow.

The Project Plan contemplated completion by June 2005, however, in the course of the project, two significant constraints emerged.

1.3 Extended Timeline

In the middle of 2004, just as consultants were completing their report on the first half of the SFF project, a substantial change occurred in the regulatory environment. Environment Canterbury (ECAN) formally notified its proposed Natural Resources Regional Plan (NRRP), with this document setting out proposed management regimes for Canterbury’s land and water resources for the future.

Many of the provisions were markedly different from the regulatory environment under which the consultants had commenced preparation of their report. Furthermore, given the statutory status of the NRRP, the HWG had to divert substantial time and resources into the evaluation of the NRRP, and participate in the subsequent submission and hearing processes.

All of this work falls outside of SFF's criteria for funding, but has had a profound effect on any potential water development project. HWG's engagement in the NRRP process is ongoing, as hearings are not expected to be concluded until 2008.

The second major impact arose due to the change in the parties representing Eskhead Station, where one of the key storage sites was known to be located. The property was placed on the market in 2004 and eventually there was a change in ownership. During the sale process, representatives of the former owner were unable to credibly involve themselves in the SFF work. It took almost 12 months for the position to be resolved as the new owners had to familiarise themselves with the Project and determine whether involvement in the SFF project was in their best interests.

In addition to the above two developments, there were other issues which compromised achievement of the original timeline. As a consequence, several extensions were sought from SFF to achieve the Work Programme over a longer period of time.

2. Approach

2.1 Governance Structure

In order to ensure that there was a clear basis on which the Project could proceed, the individual members of the HWG entered into formal agreements with each other. These agreements set out the principles to be adopted in the establishment of the HWG, its ongoing management, and performance of the obligations arising under the SFF contract. These principles included:

- Accountability for the receipt and use of funds and for achieving the planned Work Programme outcomes;
- Agreement that a range of development and management options would be identified and considered;
- Agreement on effective and timely consultation with a broad spectrum of stakeholders, to be achieved through the managed disclosure of issues and options;
- Maintaining confidentiality on materials, discussions and information provided to and for the Working Group;
- Providing support to the Working Group and sharing relevant material held by individual members.

A Board structure was established, which became the governing body of the Working Group.

While the HWG is not a legal entity in its own right, the Board met at regular intervals on an 'as required' basis to ensure appropriate governance and oversight over the Project. As the majority of the Work Programme required the engagement of consultants, each individual brief was prepared for review by the Board of HWG and, once accepted by all parties, was put out to competitive tender. Expert advisors were also engaged to assess the integrity of the tenders received to ensure that consultant capability was aligned with required outputs for each of the project briefs.

2.2 Work Programme Methodology

A series of nine 'Milestones' were proposed in the Work Programme. **Milestones One to Five** were combined into a single project brief which was put out to tender to a number of consultants. These five Milestones are:

1. *Strategic water supply and demand analysis.*
2. *Bulk water supply infrastructure development options.*
3. *Water reticulation and delivery infrastructure options.*
4. *Preliminary assessment of likely outcomes: agriculture, hydro power, environmental, socio-economic.*
5. *Define the envelope of water management and development options in terms of cost and net environmental effects.*

Tenderers formed consortia to meet the wider range of expertise necessary to satisfy the requirements of the Work Programme. Four proposals were tendered for evaluation.

The successful consortium was led by Tonkin and Taylor, who completed the majority of the engineering assessments, and also included:

- Aqualinc (water balance modellers);
- Boffa Miskell (environmental and landscape assessment);
- Crighton Andersen and Associates (financial analysts);
- Riley Consultants (additional engineering resources);
- Rob Greenaway and Associates (recreation advisors).

Milestone Six: *Key stakeholder analysis*, and **Milestone Seven:** *Develop sustainable development options through the managed disclosure of options and negotiations with key stakeholders*, was handled, in part, by the Tonkin and Taylor consortium, which had contact with several key stakeholders to complete the relevant sections of the Work Programme for Milestones One through Five. The HWG undertook substantial public and key stakeholder consultation of its preferred development option, with members of HWG interacting with the regional community.

Milestone Eight: *Updating the preferred water management and development concepts*, was undertaken internally by the HWG Board.

Milestone Nine: *Undertake appropriate further technical design*, became known as the “fatal flaws” assessment, for which a consultant brief was prepared and tenders were called from three parties. The successful consortium was led by Riley Consultants, and included:

- Kingett Mitchell Golder Ltd (environmental consultants);
- Rob Greenaway and Associates (recreation and landscape advisors);
- Bruce Riddolls (engineering geology).

The following sections of this report consolidate the findings arising from the variety of studies undertaken by the HWG and its consultants.

3. Milestones One To Five

Milestones One To Five included requirements to identify:

- Strategic water supply and demand;
- Bulk water supply infrastructure development options;
- Water reticulation and delivery infrastructure development options;
- Preliminary assessment of likely outcomes;
- Definition of the envelope of water management, and development options in terms of costs and net environmental effects.

Because of the inter-related nature of these Milestones, they were consolidated into a single brief. The consultants' brief was to undertake a desktop exercise, assessing all relevant information in the public domain or as provided by individual HWG members, and to supplement that with the consultant's own knowledge of the Hurunui. When assessing the parameters of the Project, they were to take a "first principles" approach and derive a series of options for the HWG to consider.

While the desktop nature of the study has limitations, it is a valid basis to provide an initial assessment of the potential development options, including relative cost-effectiveness and consentability.

3.1 Irrigation Potential And Demand

The total potential net irrigable area within the Hurunui District was estimated to be approximately 61,640 ha comprising 40,840 ha in the Hurunui catchment and 20,800 ha in the Waipara/Kowai catchments. A modest proportion of this total is presently irrigated, but very little has an adequate level of supply security.

Water demand for irrigation was assessed based on local climatic and soil type characteristics, together with the assumption that the irrigated land will be developed for pastoral use, except for a small portion in the Waipara catchment, which is assumed to be developed for viticulture. These assumptions are expected to waterproof ultimate development against future land use changes - pastoral irrigation having the greatest demand.

The water demand estimates may be summarised as follows:

Table 1: Assessed Demand ***

	Hurunui Catchment	Waipara / Kowai Catchment	Grand Total
Potential Irrigation Area	40,840 ha	20,800 ha	61,640 ha
Peak Water Demand	22.69 m ³ /s	9.44 m ³ /s	32.13* m³/s
Average Irrigation Season Demand	13.80 m ³ /s	5.77 m ³ /s	19.57 m³/s
Worst Drought Irrigation Season Demand	18.71 m ³ /s	7.79 m ³ /s	26.50 m³/s
90 % Security – Irrigation Season Demand	16.40 m ³ /s	6.75 m ³ /s	23.15 m³/s
90% Security – MCM** of Water Demand	306 MCM	128 MCM	434 MCM

Note:

* About 10.5 m³/sec of peak demand is currently drawn from the river and groundwater sources in the Hurunui catchment.

** MCM = Million Cubic Metres.

*** Demand is assessed against historical river flow and climate data over the period 1/6/1972 to 31/5/2003.

3.2 Water Sources

Principal water sources considered were:

1. The Hurunui River, including its principal tributaries:

With appropriate storage, the Hurunui River has more than the capacity needed to supply the estimated demand.

2. The Waiau River to the north:

Given that supply resources are adequate without the Waiau, that the Waiau catchment has severely restricted storage opportunities, and that there is significant future irrigation potential in the Waiau's own catchment, the Waiau has been excluded as a source. Transfer difficulties also constrained the potential for the Waiau to supply areas out of catchment.

3. The Waipara River to the south:

While a small amount of water may be harvestable from the Waipara, the reality is that the Waipara catchment will require supplementing from the Hurunui water sources to meet any irrigation demand in the Waipara catchment.

4. Groundwater sources:

Potential for groundwater as a source to sustain large scale irrigation is quite limited and, to be conservative, has been discounted.

For the above reasons, the water supply and storage potential has been assessed in terms of Hurunui catchment only, with a gravity based basin transfer required from the Hurunui catchment to the Waipara. Associated cultural issues are recognised and were assessed.

3.3 Water Storage Requirements

The volume of water storage required to supply irrigation water to the potential demand area of 61,640 ha is dependent upon the flow regime ultimately adopted by ECAN. The current flow regime was an initial basis for the study and includes flow sharing policies for the Hurunui and a minimum flow regime at Mandamus. In broad terms, the policy allows 50% of available flow to be taken for use, e.g. via storage, after first satisfying minimum flow criteria. ECAN's investigations have included consideration of a different policy, the so-called Mosley flow regime, which would allow greater capture and usage of river flows. The Amuri Irrigation Company currently utilises the major proportion of the current total river abstraction under their current consent based on the Jowett flow regime.

Under the “**Existing Flow Regime**”, a net storage volume of some $235 \times 10^6 \text{ m}^3$ is required to supplement the available run of river supply. This volume would increase to about $270 \times 10^6 \text{ m}^3$ when an allowance for system loss is made. The required storage per hectare irrigated increases progressively from around $1,430 \text{ m}^3/\text{ha}$ net at 14,690 ha to $3,810 \text{ m}^3/\text{ha}$ net at 61,640 ha.

If the proposed “**Mosley Flow Regime**” was adopted for the Hurunui River, the net storage volume requirement would reduce to about $185 \times 10^6 \text{ m}^3$, increasing to $215 \times 10^6 \text{ m}^3$ after allowing for losses. However, for irrigators to realise any benefits from the proposed Mosley Regime, significant storage must be provided. Implementing the Mosley Regime without water storage would be detrimental to the existing water extractors. The storage volume would increase if a flow sharing component was added to the assessed Mosley Regime.

3.4 Storage Sites And Volumes

Evaluation of potential storage sites commenced with a comprehensive map-based listing of potential storage sites of appreciable size (order of $20 \times 10^6 \text{ m}^3$ minimum capacity).

Storages considered unlikely to be consentable, such as on the main stem of the Hurunui, were discarded. Thirty seven sites were identified and ranked according to environmental and economic criteria, using a systematic and robust approach. From this initial list, seven sites able to be combined to achieve the higher total storage figure of $270 \times 10^6 \text{ m}^3$ were short-listed. None of the seven can achieve the required storage on their own and various storages have to be combined.

The seven short-listed storage sites and their indicative maximum storage capacities, based on ECAN's Existing Flow sharing regime, are as follows:

Table 2: Short-Listed Storage Sites

Water Source	Storage Site	Indicative Maximum Storage Volume
Hurunui Headwaters	Lake Sumner via lake level management without lake raising and operating within natural lake level fluctuations.	20 x 10 ⁶ m ³
	South Branch storage dam about 1.5 km upstream of the Esk confluence – capacity subject to adopted flow regime.	90 x 10 ⁶ m ³ to 175 x 10 ⁶ m ³
Hurunui Tributaries	Waitohi at Seven Hills primarily filled by pumping from the Hurunui – in the order of 40 x 10 ⁶ m ³ from the Waitohi catchment.	130 x 10 ⁶ m ³
	Mandamus near Glens of Tekoa, supplemented by pumping from the Hurunui above about 50 x 10 ⁶ m ³ .	120 x 10 ⁶ m ³
	Pahau , about 2 km above the plains, set primarily to meet AICL area requirements.	20 x 10 ⁶ m ³
Waipara River	Waipara at Greys Road vicinity filled mainly by gravity transfer from Hurunui but requiring pumping to higher levels.	25-30 x 10 ⁶ m ³
	Waipara at Clarke Hall Road vicinity filled by gravity transfer and sized to serve local demand in conjunction with Greys Road.	35 x 10 ⁶ m ³

All of the storages can release their outflows into substantial tributaries and, for the Waipara, directly into the main river, essentially in all cases above where water would be abstracted into irrigation supply networks. The Waitohi and Pahau storage site releases would feed directly into main races.

3.5 Distribution System

A preliminary spine distribution system was developed to service all of the identified irrigable areas, substantially by gravity flow in races and possibly in some stream beds, but with the Greta Valley area requiring a modest pump lift because of topographical constraints. This system would essentially be common to all storage combinations, with some limited variants.

3.6 Development Options

Six combinations (A to F) of the seven storage site developments have been assessed and compared in terms of environmental sensitivity, consentability and indicative costings. Four of the options (A, B, C & D) are based on achieving 270 x 10⁶ m³ of storage under the Existing Flow Regime. Two of the options (E & F) are based on achieving 215 x 10⁶ m³ of storage under the Mosley Flow Regime.

Table 3, following, details the indicative June 2004 costings, as follows:

1. The capital cost of each storage site.
2. The capital cost of each development option (A to F).
3. The capital cost of the water distribution system.
4. The resulting cost per irrigable hectare (at the farm gate).

3.7 Power Generation

A preliminary assessment of the hydro potential associated with storages and irrigation distribution was included. However, development options were derived on the basis that irrigation flows are of primary importance and any hydro potential is of secondary importance. There may be scope to generate hydro electric power as water is managed for irrigation and to suit the river flow regime. However, the economics of any hydro add-on would require a considerable amount of further analysis to confirm the reliability and magnitude of any available generation.

Table 3: Stage 1 Development Options - June 2004 Costings

Storage Site	Storage Capacity (million m ³)	Capital Cost (\$m)	Capital Cost per m ³ (cents/m ³)	Development Options & Estimated Capital Costs to Irrigate 61, 640 ha (\$m ± 30%)					
				A	B	C	D	E	F
Flow Regime (Existing, E & Mosley, M)				E	E	E	E	M	M
Storage Volume (Million m³)				270	270	270	270	215	215
Waitohi at Seven Hills	130	\$83.2	64		\$83.2		\$83.2		
Waitohi at Seven Hills	95	\$70.0	74			\$70.0			
Waitohi as Seven Hills	75	\$63.1	84	\$63.1					
Waitohi as Seven Hills	40	\$27.3	68						\$27.3
Mandamus Trib	70	\$23.1	33						\$23.1
Mandamus Trib	55	\$24.7	45				\$24.7		
Mandamus Trib	35	\$16.3	47		\$16.3				
South Branch	90	\$32.5	36	\$32.5		\$32.5			
South Branch	175	\$41.7	24					\$41.7	
Pahau	20	\$16.1	81	\$16.1	\$16.1	\$16.1	\$16.1	\$16.1	\$16.1
Waipara @ Greys Road Main	30	\$20.1	67	\$20.1	\$20.1	\$20.1	\$20.1		\$20.1
Waipara @ Clarke Hill Road	35	\$12.7	36	\$12.7	\$12.7	\$12.7	\$12.7		\$12.7
Managed Lake Sumner	20	\$3.0	15	\$3.0	\$3.0	\$3.0	\$3.0	\$3.0	
Total estimated storage cost (\$m ± 30%)				\$147.5	\$151.4	\$151.4	\$156.8	\$60.8	\$102.3
Storage Cost per Hectare (61,640 ha)				\$2,390	\$2,460	\$2,460	\$2,540	\$990	\$1,660
Distribution System, Primary & Secondary (\$m ± 30%)				\$118.9	\$118.90	\$118.9	\$118.9	\$118.9	\$118.9
Distribution Cost per Hectare (61,640 ha)				\$1,930	\$1,930	\$1,930	\$1,930	\$1,930	\$1,930
Total Estimated Equivalent Capital Cost				\$266.4	\$270.3	\$270.3	\$275.7	\$179.7	\$221.2
Total Estimated Equivalent Capital Cost per ha ± 30% (61, 640 ha)				\$4,320	\$4,390	\$4,390	\$4,470	\$2,920	\$3,590

3.8 Planning, Environmental And Consenting Issues

There are a range of planning provisions included in the relevant District and Regional Plans that apply, and a suite of resource consent applications will be required. A key planning instrument relevant to the Water Development Project is the Natural Resources Regional Plan (the NRRP) which ECAN notified in mid 2004. The planning provisions contained in this document have a significant bearing on the form of a Project in terms of whether the irrigation potential can be realised, and its costs. If storage sites are precluded in areas where they are most cost-effective, or if river flow and water application rules are adopted that are environmentally conservative, the extent of affordable irrigation may be severely constrained.

Other matters which are of high significance from the planning perspective are structures in the main stem of the Hurunui River, fish passage, sediment impediment, recreational use, landscape, and cultural values. Issues associated with securing land and river valleys for storage sites (or concessions in the case of DOC administered land), will also have a bearing on the ultimate development.

The desk level environmental assessment of potential storage sites was completed in 2004 and drew substantially on published information and backed by consultants' personal knowledge. Focus has been on terrestrial ecology, aquatic ecology, landscape and recreation, with the substantial storage reservoirs and impacts on changed river flow regimes through expanded irrigation, obviously creating the biggest impacts and receiving greatest attention. The preliminary spine distribution system has also been assessed, but the environmental issues here are relatively minor. It is important to note that the Project Work Programme provided for an assessment of environmental effects to be made post-Project – the following is a collation of known information compiled in the 2004 review.

Findings from environmental assessments are summarised as follows:

a. Terrestrial Ecology:

In the greater Hurunui catchment area there are few well-recorded areas with recognised botanical values. Well over a dozen specific sites were identified in the desktop study and additional areas were noted where potential values may occur. In particular, these could include river gorge areas, hard-to-access river terraces, and steep terrain where inventories have never been undertaken. Field work would be required to provide the information currently missing from known data bases.

The area for which there is detailed information is around the edge of Lake Sumner, where previous studies have evaluated the forest types and the potential for modifying the Lake's levels.

In the greater Waipara catchment area it was noted that a number of indigenous forest remnants, along some of the streams, are designated by the Hurunui District Plan, however, most remnants are on steeper hill country and the riparian systems are largely affected by weed issues and extensive modification from pastoral land management.

The terrestrial fauna of the lowlands is primarily exotic, with some of the foothill indigenous bush fragments likely to contain indigenous invertebrate fauna of common type, as well as common reptiles and common bush birds. Most abundant will be introduced animals and pests. Key bird species in the Hurunui area include the

nationally critical crested grebe, the nationally endangered Australasian bittern and blue duck, and the nationally vulnerable wrybill plover. Other bird species requiring particular assessment would include black fronted terns and the banded dotterel, both of which are found in braided sections of the Hurunui River.

Both the Waipara and Hurunui Rivers are of moderate to high values for wildlife, and some parts of both Rivers are important seasonal breeding grounds.

With the exception of Lake Sumner fringes, evaluated in detail in the 1970s and protected by the proposed lake management regime, few significant terrestrial ecological issues are anticipated in broad terms.

b. Aquatic Ecology:

There is a range of freshwater fish studies and data for the Hurunui and Waipara catchments dating back to the 1960s, however, in general, fish data is scarce and scattered. The Waipara is the best studied, with a moderate level of data.

The Freshwater Data Base, maintained by NIWA, shows that the fishery is dominated by brown trout, upland bully and Canterbury galaxiids, with areas in the uplands containing alpine galaxiids and koaro. Salmon, on the other hand, were not well recorded, and several problem fish (rudd, trench and goldfish) have been found.

The fishery (when compared to other East Coast South Island braided rivers) is relatively poorly represented in the Freshwater Data Base records maintained by NIWA. However, recreational fishers rate it highly, with significant spawning reaches known in the mid upper catchment. In respect of aquatic macro invertebrates, little data has been uncovered, and it is anticipated that not much data will exist. One of the main features of the Hurunui and Waipara Rivers is their flow variability, and the low main stream invertebrate diversity appears typical for gravel bed braided rivers that have high flow variation.

Aquatic ecology is perceived as being protected by the proposed flow regimes adopted in this study. Certain storages, however, may have adverse impacts on the sports fishery which will require mitigation, for example, in the form of fish passes or confirmation or enhancement of new sports fishery habitats – the potential effect of a South Branch storage on salmon is of particular note.

c. Landscape:

Potential landscape effects associated with possible storage sites and related works include visibility and public access; amenity (particularly scenic quality in popular destinations); natural character; and insensitivity to change. Sites identified as being outstanding natural landscapes do not necessarily mean that development is inappropriate, however, it is reasonable to assume that it would be necessary to protect those values from significant adverse effects under any development.

The landscape effects of the distribution system will depend on the proposed method of distribution and the flow regime. Some distribution is proposed to be via existing river systems, which would change as a result of the addition of irrigation water. Benefits to natural character and landscape amenity can occur when large flushes of water are released to result in removal of weed species, conversely, a reduced flow could result in an increase in vegetation within the river bed that would adversely affect the visual amenity of the waterway.

Structures, access roads, races and outflows can all impact on the landscape, but can be mitigated to a high degree if located sensitively in relation to landscape features or boundaries.

Some landscapes in storage areas are classed as “Outstanding” and some are “Significant”, however, it is perceived that, with attention to detail, the storages and a Lake Sumner outlet control structure can fit acceptably within local landscape forms.

d. Recreation:

The upper Hurunui River, above the Mandamus confluence, is clearly a significant recreational resource and, at least, the regional level for trout fishing, kayaking, tramping and camping and, arguably, of national significance for several recreational activities. A large proportion of the salmon spawning for the Hurunui River complex is reported to occur in the South Branch of the Hurunui River above the North Esk confluence. This single issue is likely to create the most interest in any proposal to modify the flow regime in this part of the Hurunui catchment. The middle section of the study area - between the Mandamus and Pahau confluences - is also significant at the regional level for camping and swimming.

In contrast to the Hurunui River, an appraisal of the relative value of North Canterbury rivers for angling does not identify the Waipara River as nationally, regionally or locally important.

With no barriers on the Hurunui main stem and no appreciable change in Lake Sumner levels from natural ranges, recreational effects are seen as modest, other than effects on the sports fishery from development in the South Branch. Summer flow releases from upland storage could be beneficial for kayakers and jet boaters, and new water storage reservoirs could provide new recreational opportunities and amenity values.

3.9 Ranking Of Consentability

An appreciation of the environmental acceptability and, therefore, consentability of the ten development options considered has, at this stage, been limited to a comparison of the seven individual storage sites. This appreciation ranks the South Branch storage site (one of the most cost-effective storages) as being the hardest to consent, the Waitohi and Mandamus storage sites to be the next hardest, Lake Sumner as easier, and the Pahau as probably the easiest.

It should be noted that all of the evaluations have been undertaken without the benefit of cultural considerations and when Te Rūnanga o Ngāi Tahu contributions are included, the scope and nature of potential development could change. Other stakeholder inputs may also alter the storage site rankings.

3.10 Socio-Economic Impact

The Work Programme prepared in August 2003 proposed a preliminary assessment of the socio-economic effects of each scheme option, however, as the assessment of options (as reported earlier) was being progressed, the Ministry of Agriculture and Forestry released, in 2004, its technical paper "The Economic Value of Irrigation in New Zealand".

While this paper was prepared on a national basis, it had regional data and included development scenarios for Canterbury involving 34,000 ha, 95,000 ha and 288,000 ha of additional irrigable land. The report also analysed a variety of land uses under a likely future irrigation scenario.

Also in 2004, ECAN released a report "Economic Impact Analysis of Options for the Flow Regime and Allocation of Water from the Hurunui River". In undertaking this study, ECAN wished to explore the economic effects of the proposed regime for the Hurunui River; explore the economic effects of increasing the so-called "A" Permit allocation, having regard to the costs and benefits of present and potential irrigators and to the region and nation; and to explore, in a general sense, the economic feasibility of providing storage to increase reliability of supply.

While the report should be read in its entirety to understand its conclusions, the summary states that "The proposed flow regimes have an unequal spread of impacts between existing and new irrigators, with differing preferences according to the perspective of the parties affected" and "The addition of the new irrigation capability under the expanded 10 cumec options mean that the net impact of new output would be a positive increase in total economic activity from a district and regional point of view."

In 2005, it became known that the Aoraki Development Trust was undertaking a detailed *ex post* study of the Opuha Dam. The purpose of the study of this irrigation scheme in South Canterbury was to investigate the impacts on the farms and community that it serviced. The study was based on surveys of individual properties, including the assessment of individual farm accounts, and was a statistically robust comparison of the performance of irrigated farms compared with dryland farms in adjoining catchments.

While, again, the full report should be read to understand its conclusions, the 15,000 ha of irrigated land was assessed to have a scheme-wide on-farm impact of an increase in cash farm surplus of approximately \$12.0m per annum. In terms of whole-of-community impacts for the entire economy in the study area, it was concluded that each 1,000 ha of irrigation adds \$7.7m in output, 30 FTEs, \$2.5m in value added and \$1.2m in household income each year.

The authors note that, in addition to the economic impacts, there was increased business confidence, improved infrastructure, and better utilisation of the capacity in downstream businesses. Social indicators showed that younger, better educated farmers and greater employment is associated with irrigation. The authors concluded that changes arising from irrigation are likely to result in more vibrant and sustainable rural communities.

In the light of the published data, which became available during 2004 and 2005, the Working Group concluded that it would be grossly inefficient to duplicate the specific studies undertaken by other parties given that the HWG proposals were still at a formative stage.

The HWG view was that following consultation and a determination of a preferred development option, these other studies could be used to provide indicative assessments of the socio-economic impact of the preferred development option.

3.11 Report on Milestones One to Five - Consultant's Conclusions

The consultant's Hurunui District Scoping Study provided valuable information to support the objectives of the Working Group.

The consultants concluded that "A sustainable water management regime that provided for community needs and the enhancement of in-river flows was possible. Not only was it possible, it would enable the efficient use of natural resources and may guide the acceptability and direction of future resource consent approvals".

The consultant's scoping study identified that:

- Up to 61,640 ha was able to be irrigated in the Hurunui and Waipara catchments using water from the Hurunui River;
- A combination of up to seven storage sites could be used to provide supply reliability in a cost-effective consentable manner.

The scoping study had, however, principally been a desktop study. Significant additional investigation is required to prove irrefutably the most appropriate technically and environmentally acceptable of the short-listed water storage sites, and to identify that combination of sites which best provides a sustainable water management regime for the district to suit the demand for irrigation water.

3.12 Report on Milestones One to Five - HWG Conclusions

The HWG had to decide a preferred option from the range identified by the consultant. A workshop was held with the consultants to debate their findings; add further local perspectives (principally the level of interest being shown in irrigation by landowners); and to understand recent developments in respect of the regulatory environment. These included the proposed NRRP which, at that time, was open for submission, and the release of an ECAN report proposing a new flow regime for the Hurunui River.

The HWG considered that a more modest and focussed staged scheme would be more effective than the maximum identified by the consultants because:

- A small demand area is able to apply water more reliably from the available run of river water supply on a per hectare basis;
- The cost of the primary distribution works is reduced for a demand area located immediately adjacent to the point of supply;
- The total size and associated cost of storage is reduced as more cost-effective storage is able to be utilised in the first instance.

The HWG identified its preferred development option to be:

- The irrigation of some 38,890 ha in the Balmoral, Hawarden, Scargill locations in the Hurunui and Masons Flat/ Pyramid Valley locations in the Waipara catchment;
- Water storage to be at Lake Sumner (by management of the lake's existing operating range) and a dam on the South Branch of the Hurunui River.

This preferred option was then to be the basis for subsequent public and key stakeholder consultation, although feedback on other options was to be encouraged in the consultation programme.

4. Milestone Six - Identification Of Key Stakeholders

4.1 Ngāi Tahu

In respect of Te Rūnanga O Ngāi Tahu, a cultural values assessment was undertaken. The purpose of the assessment was to:

- Provide a general overview of the resources and values of importance to Ngāi Tahu within the boundaries of the Project;
- Discuss how, in theory, these resources and values may be affected by tributary and out-of-catchment transfers.

While Ngāi Tahu identified and mapped areas of high concentration of resources and values of importance within the Project boundaries, this exercise occurred with the caveat that to Ngāi Tahu the entire landscape is significant, including all waterways and their associated tributaries, wetlands and riparian areas, as tangata whenua used all parts of this landscape.

For ngā Rūnanga, mixing waters from different environments affects both the integrity of each waterway and the unique web of life or ecology that the waterway supports and is supported by. Generic examples of possible mitigation measures, as part of other water-focussed proposals, were provided. Ngā Rūnanga saw the assessment as timely, and the HWG consultants were able to assess options and make informed decisions with a wider range of information to draw upon.

4.2 Stakeholder Consultation

Key stakeholders identified included:

- Farmers within the potential supply area of the irrigation scheme: 80 farmers were on an existing mailing list and approximately a further 100 were to be approached directly during the proposed consultation;
- Landowners with potential storage sites on their land: 15 were identified and were to be approached directly;
- Community organisations in the Hurunui District: 36 organisations were identified;
- Ngāi Tahu: 2 runanga identified;
- North Canterbury Forest and Bird;
- North Canterbury Fish and Game;
- Ecologic Foundation;
- Department of Conservation;
- North Canterbury Federated Farmers;
- Water Rights Trust;

- ECAN;
- Hurunui District Council.

The HWG considered that all the above parties had significant interest in the Project and required direct contact to inform them of the status of the Project and to solicit feedback.

5. Milestone Seven – Develop Sustainable Development Options

During April and May 2006, a significant consultation programme was undertaken with landowners and other key stakeholders. The consultation programme was based on the preferred development option identified by the HWG and had the following objectives:

1. Ensure that all affected landowners were aware of the preferred development option, and were consulted about the development possibilities.
2. Assess the level of support that exists amongst affected landowners and the local farming community for storage possibilities.
3. Ensure that affected stakeholders and relevant media were aware of the preferred option, and its implications, and ensure that they understood the benefits to the Hurunui District of the storage scheme.
4. Make information on the preferred option available to interested parties in a cost-effective and user-friendly fashion.

In addition, half-page advertisements were placed in all regional newspapers in circulation in North Canterbury, and media releases were made to Christchurch-based print and radio media. Publicity material was also placed at Council Service Centres and in the region's libraries.

All material promoted the availability of the HWG to meet with interested parties, and a number of conservation/environmental groups and farmers took advantage of this initiation.

The community consultation programme was very successful, with over 190 landowners in the potential supply area making written submissions.

Opinions were also received from North Canterbury Fish and Game, the New Zealand Recreational Canoeing Association and DOC, and from 15 members of the public.

5.1 Landowner Feedback

The landowners' interest was assessed with a simple questionnaire designed to ensure a high response rate to quantify the level of interest as an aide to the further design and development of the Project, and to provide an opportunity for comment on the Project.

The overall level of support from landowners for the project of 96% (by number) and 88% (by area) was very high. Seventy five per cent (by number) of respondents said they would be interested in contributing financially to a water storage scheme in the Hurunui District from which they could access water.

Consultation was on the basis of potentially irrigating 38,890 ha. Individual farmer responses totalled expressions of interest to irrigate 32,926 ha. Of the farmer responses, 3,461 ha were from the Omihi Valley, which was additional to the nominal consultation area.

The Amuri Irrigation Company also provided additional support for the storage scheme to provide more reliable water supplies to shareholders within its command area, and for additional water to be available for adjoining non-irrigating landowners.

Accordingly, the aggregate level of interest expressed by landowners, for the project to proceed, is 37,629 ha. By any measure, that is a resoundingly high level of support for the project at pre-feasibility stage of development.

5.2 Environmental/Conservation Feedback

Written submissions were received from three environmental/conservation organisations.

DOC, after describing its role, noted that, in respect of land management, any development of or commercial activity either on land managed by the department, or involving the inundation of public conservation land, would require some form of right being granted to use the land.

They also noted that Land Information New Zealand holds land within the Hurunui District and that it will be necessary to negotiate land access and/or land use agreements with that organisation separately.

In respect of environmental values, DOC noted that the Hurunui River and Lake Sumner catchment, at a national level through the Water Programme of Action, had been identified as a potential Water Body of National Importance for biodiversity. They noted that, in particular, threatened bird species found in the catchment include blue duck (Mandamus and Dove Rivers), banded dotterel (Hurunui River), black fronted tern and crested grebe. DOC also drew attention to the Freshwater Fisheries Regulations 1983, which require that fish passage is not impeded in any natural fresh waters.

Fish and Game New Zealand, after setting out their role and responsibilities, made the following points:

- The Hurunui River is a wonderful angling resource;
- They fail to see how the proposal will provide for fish passage and protect spawning grounds.

They were also concerned about:

- The taking of further water from the Hurunui River;
- The addition of further quantities of nitrates and phosphates to land in the Hurunui catchments;
- The quality of fish screens on any new intakes;
- The transfer of Didymo between catchments.

Fish and Game concluded their submission by stating that they believed that “the issues of fish passage and loss of spawning grounds (not to mention the other issues mentioned) will be significant enough to stop the granting of resource consents.”.

The New Zealand Recreational Canoeing Association is the national body representing white water kayakers and canoeists in New Zealand. Their submission was that:

- The Hurunui River is one of the most utilised white water kayaking rivers in the South Island, particularly for Canterbury kayakers;
- The river is characterised by a fairly dynamic flow, with the different flows producing substantial differences in the canoeing experience;
- They expressed concern that any smoothing of the natural flow would have detrimental effects on the river ecology, especially the potential build-up of Didymo and the build-up of algae in the river bed;
- They noted that there are multiple sections on the Hurunui River which have white water value.

In terms of general public submissions, 10 received were opposed to the scheme, with one of them making reference to, but not including, a petition. Five submissions were made in support of the scheme.

5.3 HWG Consultation Conclusion

The HWG concluded that the results of the farmer feedback were a clear statement that there is a strong landowner demand for the Project.

Submissions received from environmental/conservation organisations and the general public indicated some concerns about the Project in specific and general terms. These concerns had largely been identified in the earlier consultant's study.

After evaluating all the feedback, the HWG concluded that further resources should be committed to the project to refine the environmental and technical design of the Project.

6. Milestone Eight - Revise And Finalise Water Resource Development Plan

The consultants identified the potential to irrigate up to 61,640 ha in the Hurunui and Waipara catchments, and the potential suitability of some seven storage sites which could be used in combinations to meet the water requirements of the irrigable area.

After assessing the consultants' findings, the HWG identified its preferred development option of irrigating 38,890 ha, mostly in the Hurunui catchment, but with 5,500 ha in the Upper Waipara of the Mason Flat/Pyramid Valley locations. The preferred option was to utilise two of the seven storage sites identified, namely, existing level management of Lake Sumner, and a dam on the South Branch of the Hurunui River.

The feedback from landowners within the preferred irrigation area endorsed the level of interest within that area, however, farmers in the Omihi Valley, which was not included in the preferred development option, wished to have the potential for irrigation assessed for their location. Omihi Valley could potentially be serviced as an adjunct to the adjoining Scargill Valley of the Hurunui catchment. Expressions of interest of some 3,500 ha were received, and discussions were held with the farmers concerned to ensure that their needs were understood.

No expressions of interest or feedback were received from other landowners in the lower Waipara/Kowai River catchments, which had previously been included in the potential irrigable area identified by the consultants.

The HWG, therefore, decided that, for future planning, the Omihi Valley should be included in the potential irrigable area which, as a consequence, increases to some 42,500 ha.

The following table sets out the water demand requirements arising from the increased irrigable area.

Table 4: Revised Water Resource Development Plan Following Consultation

Area	Peak Flow Rate ¹ (m ³ /s)	Net Irrigable Area ² (ha)	Net Storage Requirement ³ – Mosley Regime (x 10 ⁶ m ³)	Net Storage Requirement ³ – Existing Regime (x 10 ⁶ m ³)
AICL Balmoral Scheme from the Hurunui River (Security of Supply)	5.0	5,240	9.3	9
Areas adjacent to the Balmoral Scheme	1.2	2,130		
Balmoral Forest	4.2	7,320	10.5	12
Hawarden – North of Waitohi River	2.9	5,030	9.2	11
Hawarden – South of Waitohi River	5.1	8,960	19	26
Scargill Valley	2.7	4,700	16	21
Upper Waipara Area Masons Flat and Pyramid Valley	3.2	5,510	19	26
Omihi Valley	2.0	3,550	15	19
Total	26.3	4,244	98	124

Note:

- 1 Peak flow rates include an allowance of 15% extra over the assessed reported on-farm demand to account for system losses and, aside from the AICL scheme, do not reflect current uses.
- 2 Per previous work net irrigable area is assessed as 80% of gross map area. The estimate of potentially irrigable area includes areas which are currently irrigated via existing consents. Due to the nature of the Hurunui, Waitohi and Waipara Rivers, many of the existing consents have a low level of reliability and, as such, it was assumed that existing consent holders will want to be part of any future storage scheme in order to improve their reliability of supply. This matter will be resolved as part of further studies.
- 3 Based on the adopted Stage 1 criteria and associated assessment to provide storage to meet the 90 percentile demand year, hierarchy of areas to be served determined by the Working Group.

The net storage requirements for the Amuri Regime will be less than that required by the Mosley regime.

In respect of the feedback received from parties other than landowners, little new technical or scientific information was made known to the HWG. The consultants had previously identified some significant issues arising from the development of several of the storage sites, and several of the submissions reinforced these views as noted earlier.

Given that the assessments done to date were of a desktop nature and no field work had been undertaken, the HWG decided that field work be carried out to assess, in a consistent manner, the environmental factors associated with the two preferred storage sites and with the proposed off-take site. This assessment is an integral part of Milestone Nine.

7. Milestone Nine - Undertake Appropriate Further Technical Design

Milestone Nine included requirements to identify:

- Appropriate further technical design;
- An assessment of environmental effects;
- Revision of cost estimates;
- The assessment of expected socio-economic and environmental outcomes.

The selected consultant was required to undertake geotechnical environmental risk and “fatal flaws” assessments of:

- The proposed South Branch dam site;
- The proposed weir located on the outlet of Lake Sumner;
- The proposed water off-take point on the south bank of the Hurunui River in the vicinity of the Mandamus confluence.

Undertaking ‘appropriate’ further technical design is an essential part of refining the Project as additional information comes to hand. Field assessments of this data for “fatal flaws” are necessary components of the pre-feasibility phase of the Project. The “fatal flaws” may be of a geotechnical, environmental or cost nature, as are parameters that were not necessarily apparent from the initial desktop review of the available literature and published resources.

In particular, the HWG required the field assessments to identify:

- Whether there are any fatal flaws evident at the proposed storage and off-take sites;
- Whether the required physical road access to the storage and off-take sites can be achieved at reasonable cost;
- If the construction of a weir control structure at Lake Sumner is viable from an engineering and environmental perspective;
- If the construction of a dam structure on the South Branch is viable from an engineering and environmental perspective;
- The type of dam structure seen as appropriate for the South Branch, and why;
- The viability, from an engineering and environmental perspective, of constructing an off-take structure at the proposed location on the south bank of the Hurunui River;
- Whether any of the evidence determined by the assessments is unexpected and, as a consequence, requires a reassessment of the desktop costings;
- Anything else that the studies identified as “fatal flaw” for the Project.

7.1 Fatal Flaws Methodology

The geotechnical, engineering and environmental risks to the project were based on site inspections and follow-up office-based work.

The preferred scheme involves storage at Lake Sumner and a new dam located on the Hurunui River South Branch above the confluence with the North Esk River. Water stored at these locations would then be released back to the river for irrigation off-take downstream of the confluence of the Hurunui River and Mandamus River.

A risk and “fatal flaws” assessment of geotechnical engineering and environmental issues has been carried out at the three sites. A different framework has been used for assessing engineering and environmental risks. The engineering risk assessment is based on the uncertainties in current understanding of the site conditions and whether risks can be remedied by standard construction methods and within reasonable cost. The environmental risk assessment is based on the ability to provide mitigation, and the consenting risk. The output of the assessments assigns a risk category from low to high.

7.1.1 Design Proposal

a. Lake Sumner Weir:

A gate structure could be located close to the outlet or, alternatively, 400m downstream. The structure is likely to include a bank of flap gates with a smaller radial gate for control of lower flows as well as a fish pass, control building, power supply, and armouring of the river downstream of the structure to dissipate energy from the flow.

b. Hurunui River South Branch Dam:

The dam site is located within a narrow gorge with a width of approximately 100m and height of 80m, located 800m upstream of the confluence with the North Esk River. The dam could be constructed as a Roller Compacted Concrete dam, which has significant benefits in regards to management of flood flows during construction and operation.

c. Hurunui River Off-Take:

The off-take structure is likely to be similar to others constructed on braided rivers in the South Island such as the Amuri, Rangitata Diversion Race and Lake Coleridge schemes, for example. The two main options at the River are a bund, diverting flows into a canal, or, a weir and pipe intake. The bund is the most likely option as it has the least impact on the river.

7.2 Engineering Risk Assessment

The risk assessment is based on a review of existing data available and inspection of each site. None of the engineering risks have been categorised as high, but there are a number of aspects at the Hurunui South Branch that are considered moderate to high. The uncertainty in the geological model is also considered moderate to high at the Lake Sumner outlet. The table below summarises the engineering risk for each component of the proposed scheme.

Site	Item	Engineering Risk
Lake Sumner Weir	Uncertainty in geological model	Moderate - High
	Construction aspects	Moderate
	Construction access	Moderate
	Sedimentation	Low
	Flows during construction / operation	Low - Moderate
Hurunui River South Branch Dam	Uncertainty in geological model	Moderate
	Construction aspects	Moderate - High
	Construction access	Moderate - High
	Sedimentation	Moderate - High
	Flows during construction / operation	Low - Moderate
Hurunui Off-Take	Uncertainty in geological model	Low
	Construction aspects	Low - Moderate
	Construction access	Moderate
	Sedimentation	Low - Moderate
	Flows during construction / operation	Low - Moderate

In general, the engineering risks are considered moderate at Lake Sumner, moderate to high at the South Branch Dam and low to moderate at the off-take site. No fatal flaws or significant risks were identified that can not be overcome by appropriate design and construction for the engineering aspects.

7.3 Environmental Risk Assessment

All three components of the proposed scheme have a chance of resulting in high potential for significant adverse environmental effects and difficult mitigation options for reducing effects. The table below summarises the categorisation of mitigation and consenting risk for each component of the proposed scheme.

Site	Item	Mitigation Risk	Consenting Risk
Lake Sumner Weir	Terrestrial ecology	Moderate	Moderate
	Water quality and aquatic ecology	Moderate	Moderate
	Groundwater	Low	Low
	Recreational values*	Low - High	Low - High
	Landscape values	Moderate - High	Moderate - High
Hurunui River South Branch	Terrestrial ecology	High	High
	Water quality and aquatic ecology	Moderate - High	High
	Groundwater	Low - Moderate	Low - Moderate
	Recreational values*	Low - High	Low - High
	Landscape values	Moderate - High	High
Hurunui Off-Take	Terrestrial ecology	Low	Low
	Water quality and aquatic ecology	Moderate - High	Moderate - High
	Groundwater	Moderate - High	Moderate - High
	Recreational values*	Low - High	Low - High
	Landscape values	Low - Moderate	Low - Moderate

* Varies depending on particular recreational activity.

The results presented in the table above show that, in general terms, the South Branch Dam has the highest mitigation and consenting risks. This is, in part, due to the limited range of options available to mitigate the significant adverse effects that would arise. Not providing adequate mitigation for the effects of the South Branch Dam is likely to result in the consenting of the dam becoming a fatal flaw for the proposed scheme.

The proposed changes to the operating conditions of Lake Sumner result in a moderate to high risk in terms of consenting and mitigation. There are a range of mitigation options available that would reduce the levels of risk associated with the proposed weir and its effects on lake levels.

The off-take results in a wide range of levels of concern and consenting risk (from low to high) across the different parts of the environment, although it is likely that mitigation could significantly reduce these concerns and the consenting risks.

8. Financial

8.1 Financial Control

Shortly after the SFF contract was signed, it was transferred to ENC to better meet the administration and structural needs of the HWG. Project finances are managed using the ENC accounting system. This system has formal delegated authorities in place. Management accounts are reviewed by the Board of ENC at each of its meetings. The annual accounts are prepared by an external accountant and are subject to annual audit by Audit New Zealand.

Calls for funds are made by ENC as and when necessary to meet the outgoings associated with the work of consultants. In addition to the SFF contract funds, Working Group members fully fund activities which fall outside of SFF criteria, and these monies are also handled through the ENC accounting system.

A recent audit report noted "The system used has excellent checks and balances, with good internal oversight of the Project and its performance. The cash contributions to the Project have been maintained and reflect the Working Group's total commitment to the Project. Given the amount of cash required, this is a significant commitment."

8.2 Financial Results

The following table sets out the Project budget, as contained in the SFF contract, and compares that with expenditure/receipts as at 31 March 2007.

Project Finances (Inc GST)	SFF Contract/Budget (\$)	Actual to 30 April 07 (\$)
Cash Costs		
Consultants & Contractors	382,500	416,630
Overheads	11,250	0 (1)
Dissemination Costs	<u>56,250</u>	<u>33,143</u>
Total Cash Costs	450,000	449,773
Source of Cash		
SFF Fund	225,000	203,458 (2)
HIPT	67,500	67,432
HWMT/Eskhead	67,500	67,432
NTP	45,000	44,955
MNZ	<u>45,000</u>	<u>44,955</u>
Total Source of Cash	450,000	428,232 (2)
In-Kind Costs		
Personnel – HWG	22,500	129,600 (3)
Personnel – Prof. Services	90,000	57,172 (4)
Dissemination Costs	<u>28,125</u>	<u>0</u>
Total In-Kind Costs	140,625	186,772
Source of In-Kind Contribution		
Working Group Members	22,500	97,200
MNZ & ENC	<u>118,125</u>	<u>89,572</u>
Total In-Kind Contributions	140,625	186,772
Total Costs/Contributions	590,625	636,545

- (1) The HWG members have carried their own costs, so Overheads have been In-Kind Contributions.
- (2) As provided in the SFF contract, the final instalment from SFF (\$21,541) will be made on receipt of a satisfactory final report.
- (3) Estimated – each party carries its own costs and does not charge the Project.
- (4) Project management provided by Enterprise North Canterbury.

9. Canterbury Strategic Water Study

The Canterbury Strategic Water Study (CSWS) has had an unexpected recent effect on the HWG project, just as it was drawing to a conclusion.

The CSWS was initiated by the Canterbury Mayoral Forum to:

- Determine the potential long-term requirement for water in Canterbury;
- Determine the capacity of the region to meet those requirements;
- Determine the water resources that would come under the most stress;
- Assess the reliability, over the long-term, of water supplied from natural systems for abstractive purposes.

The study was initiated because of the obvious and profound effects utilisation of water has in the regional economy. A report was released on the CSWS in 2002 and became known as the Stage 1 Report.

It concluded that:

- Under current abstraction methods both run of river and ground water bores were reaching sustainability limits;
- Many smaller rivers were under heavy abstractive pressure;
- Additional water was available on an annual basis, but would need storage;
- There was a need to assess storage options and their sustainability;
- There was a need to specify allocation limits for ground water and surface water; and
- It would be necessary to manage surface and ground water together in some areas.

Stage 1 was therefore “a regional water balance study which identified water storage as the key to the future joint development of economic, environmental and recreational interests in water.”.

Stage 2 was then initiated by the Canterbury Mayoral Forum to determine if it was practical to use storage to meet the potential long-term water needs of the region. Storage sites were identified and assessed in a largely quantitative basis. The modelling of water balances for the Hurunui was based on Lake Sumner and South Branch storages being assessed for adequacy to meet irrigation needs in the Hurunui and Waipara catchments, using the existing Minimum Flow Regime and a modified Mosley Regime. The report on Stage 2 is yet to be released.

For Stage 3, a Reference Group was set up comprising a wide cross-section of interests – fishermen, canoeists, wildlife experts, Māori, farmers, irrigators, recreationalists and environmentalists. This Reference Group developed an evaluation framework to assess the trade-offs that could be involved in the use of the various storage options identified and modelled in Stage 2. Their assessment was quantitative in respect of water availability and use, but largely qualitative and strategic in all other respects.

In a recent briefing of the HWG by the CSWS Reference Group, markedly different water balance modelling results were presented from that contained in earlier reports prepared by consultants reporting to the HWG. If the latest modelling is correct, it will have a major impact on the HWG's preferred development option - both economically and environmentally.

Furthermore, the Reference Group has provided a perspective on the environmental impact of the preferred development option that had not previously been available. As an important and immediate follow-on to the completion of this Project, it is essential that the impact of the latest modelling be assessed as to its assumptions, methodology and environmental impacts against those identified by the HWG. The resolution of these issues will be the first milestone in a further application currently being considered by SFF for the 2007/08 funding round.

10. Conclusion

The Project has met its objectives in a cost-effective and consultative manner, albeit over a longer timeframe than was originally contemplated. Investigations have narrowed down the wide range of potential water management regimes to one preferred option involving two water reservoirs and the irrigation of 40,000 ha. The reservoirs provide the opportunity to enhance reliability and provide for environmental flow requirements.

The Project has been developed to a pre-feasibility stage inclusive of desktop studies, initial field studies and environmental assessments, community consultation and indicative cost estimates. The studies have confirmed that the preferred option will deliver a viable water management regime for the Hurunui catchment. This has attracted widespread community support.

The next step in the development of the Project is to provide individual landowners, potential investors and the wider community with greater certainty about the environmental and technical feasibility, and the socio-economic benefits of the Project. This requires more detailed investigations, based on field studies and extensive consultations, to assess the environmental impacts and reduce the technical and financial risk of the Project to such a level that investors will commit to it. Such information is also required to secure environment support.

The Project is the largest regional development initiative being contemplated in the Hurunui. Arguably, it will transform the regional economy, with the increment in production from the irrigated land being significant to the whole of Canterbury.

The HWG is indebted to SFF for financial assistance with this Project. Obtaining finance for a pre-feasibility assessment of an irrigation scheme is very difficult and, without the support of the SFF, there would have been immense difficulties in advancing this project to the point where it is known that a viable project exists.

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