



**Central Plains Water Enhancement: an
assessment of potential environmental
effects of the Waianiwaniwa Reservoir
site**

**NIWA Client Report: CHC2002-033
October 2002**

NIWA Project: URS03501

Central Plains Water Enhancement: an
assessment of potential environmental effects
of the Waianiwaniwa Reservoir site

Gordon Glova
Dave Kelly
Jeremy Walsh
Julian Sykes

Prepared for

URS New Zealand Ltd

NIWA Client Report: CHC2002- 033
October 2002

NIWA Project: URS03501

National Institute of Water & Atmospheric Research Ltd
10 Kyle Street, Riccarton, Christchurch
P O Box 8602, Christchurch, New Zealand
Phone +64-3-348 8987, Fax +64-3-348 5548
www.niwa.co.nz

Contents

Executive Summary	ii
1. Introduction	1
1.1 Description of the Waianiwaniwa site	1
2. Water quality	3
2.1 Water level fluctuations	3
2.2 Limnological properties	3
2.3 Water clarity	4
2.3.1. Suspended sediment inflows	4
2.3.2 Sediment deposition and re-suspension	6
2.4 Eutrophication and weed growth	7
2.5 Stratification and anoxia	9
2.6 Drying out of reservoir	9
2.7 Water quality for irrigation	10
3. Fish populations	10
3.1 Sampling	10
3.2 Results	10
4. Implications of fish findings	13
5. References	15

Reviewed by:

Approved for release by:



Don Jellyman



Gavin James

Executive Summary

NIWA was previously subcontracted by URS to conduct a preliminary assessment of environmental issues associated with two options for the taking, storing, and distribution of water for irrigation in the Central Plains Water Enhancement (CPWE) study for the Selwyn District Council. This report is an extension of the previous investigation, examining the potential environmental effects at an alternative reservoir site – namely the Waianiwaniwa Valley.

In this scheme, water would be extracted from the Rakaia and Waimakariri Rivers mainly during high flows and stored in a reservoir in the Waianiwaniwa Valley for extraction for irrigation. In this report, the potential environmental issues associated with the Waianiwaniwa site are assessed and compared with those of the previously reported Wairiri site (Glova et al. 2001). The main points to summarise from the present study are as follows:

- Thermal stratification and low dissolved oxygen levels are likely to occur in the deeper layer of the Waianiwaniwa reservoir during summer, resulting in poor water quality in the deeper water. Careful consideration should be given to the depths of water withdrawal for downstream use especially during deoxygenated periods.
- It is expected that light penetration would be similar in the Waianiwaniwa option to that of the Wairiri; however, weed growth in the Waianiwaniwa may be slightly greater due to shallower conditions.
- The sediment load into the Waianiwaniwa Reservoir is estimated to be 26,150 t/year.
- The Canterbury mudfish (*Neochanna burrowsius*), a rare and endangered species, comprises a major population which is widely distributed in the Waianiwaniwa River; eels (*Anguilla*), a predator of mudfish, were not found in the river, most probably because there is rarely a surface-flow connection to the Selwyn River. Local knowledge indicates that eels are present in the catchment in minor numbers.
- The proposed reservoir would render the lower valley an unlikely site for mudfish, while the population upstream of the reservoir would be under threat from predation by eels, which would gain access to the Waianiwaniwa catchment via water pumped from the Rakaia and Waimakariri Rivers in which eels are present – screening of the intakes would not be practical because of the small mesh size required to exclude small migratory eels. Moreover, it would be very difficult to exclude eels from the catchment upstream of the reservoir. A desktop study is required to assess this possibility in greater depth.

1. Introduction

NIWA has been subcontracted by URS to conduct a preliminary assessment of environmental issues associated with the storage of water from the Rakaia and Waimakariri Rivers in the Waianiwaniwa valley for distribution for irrigation in the proposed Central Plains Water Enhancement (CPWE) scheme for the Selwyn District Council. A brief description is given of the valley, followed by an assessment of environmental issues that are likely to be associated with the scheme.

1.1. Description of the Waianiwaniwa site

Basically, the Waianiwaniwa catchment constitutes a broad, flat valley, surrounded by gently rolling hills dominated by pasture, with trees (willows, poplars) and shrubs (kanuka, gorse, broom) in the gullies and some pine plantations on the slopes (Fig. 1). With the exception of the valley floor, which is quite fertile with lush pasture growth, the topsoil layer is thin, overlying clay subsoils. The Waianiwaniwa River rises in the pasture-dominated foothills, then traverses through gullies (some of which are heavily overgrown with broom) before meandering along the valley bottom where the margin is dominated by willows and poplars, and finally flows onto the plains, where the bed is coarse and porous, to join the Selwyn River. The flow on the plains is subsurface, although during major floods, surface flow is likely. The river appeared to be stable, with no evidence of major flooding, and had good periphyton growth and an abundance of benthic invertebrates and fish.

The Central Plains scheme for this site would involve construction of a reservoir in the Waianiwaniwa Valley, which would be supplied by pumping up to 8 m³/s of water from the Rakaia River during high flows (i.e., flows >147 to 196 m³/s as defined by the rules of The National Water Conservation Order). In addition, a maximum 17 m³/s would be pumped from the Waimakariri River.

The proposed Waianiwaniwa Reservoir, at 100% storage capacity, would be approximately 6.5 km long, with maximum and mean depths of about 50 m and 24 m, respectively. It would store a maximum 290 x 10⁶ m³ of water and flood approximately 11.6 km² of the valley. Alternatively, the previously proposed Wairiri Reservoir would cover a slightly smaller area (10 km²) and be slightly deeper (mean depth 25 m) than the Waianiwaniwa Reservoir.