MODELLING STREAMFLOW INPUT FOR A PROPOSED IRRIGATION RESERVOIR AT KAINUI, NELSON

Tim Davie*[1], Andrew Fenemor[2] and Peter Thomson[3]
[1]Landcare Research, P O Box 69, Lincoln
[2]Landcare Research, Private Bag 6, Nelson
[3]Tasman District Council, Private Bag 4, Richmond

The Wai-iti Water Augmentation Committee, assisted by Tasman District Council (TDC) and AGMARDT, has carried out a feasibility study and assessment of community support for the construction of a water augmentation dam in the Kainui Stream. The proposed 815,000m^3 dam would capture winter runoff from the Kainui catchment. The water would be released to meet irrigation demand from the downstream Wai-iti catchment during the following summer (Fenemor et al 2003).

The objective of this project is to provide independent assessments of the volume of water that would enter the proposed Kainui reservoir, and of whether the volume would be enough to sustain irrigation demand in the Wai-iti catchment. The project also assesses the likely impact of land use and climate change on the reservoir inflows. This is achieved by:

- Calibrating a model of streamflow in the Kainui Stream;
- Using this model to further model reservoir storage using given irrigation demands;
- Altering input parameters within the model to simulate land use and climate change.

A water balance model has been developed at Landcare Research to examine the effects of land use on water yields and low flows (Fahey & Jackson, 2003). It is intended for use in situations where there is a limited amount of data on the climate, soils, and vegetation of a catchment, and is similar to the approach widely used for computing crop water requirements.

The model has been used to simulate the amount of water flowing into the Kainui reservoir, given a set land use and rainfall records from nearby rain gauges. This model has then been connected to a simple reservoir storage model to simulate the hypothetical reservoir storage for the periods 1958–1981 and 1982–2003. The main conclusions from this study are:

- The simulation model is able to reproduce flow records in the Kainui stream (downstream of the proposed reservoir site) with a reasonable degree of accuracy. It tends to underestimate the amount of stormflow during summer months, which means it provides a conservative (under)estimate of flow into the reservoir.
- The simulations suggest that the reservoir is able to be filled in the majority of years (see fig. 1).

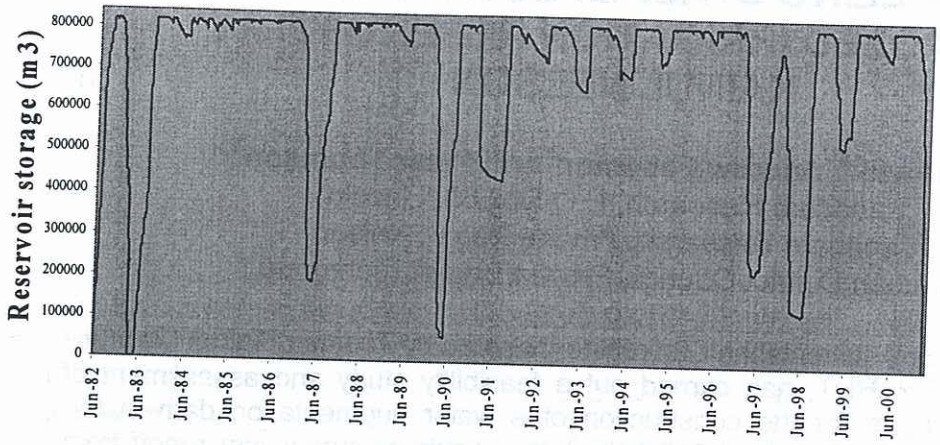

Figure 1: Kainui reservoir storage with current land use (forest in upper catchment) assumed over period 1982–2001. An irrigation demand for 700 ha and a residual Kainui flow of 1 L/s are assumed. Estimated from rainfall at Wairoa and Motueka Gorge.

- The simulations suggest that the reservoir is unable to cope with irrigation demand 5 times in the 44-year record simulated. When put into a frequency distribution this calculates as a 1:10.5 year event.
- The impact of forestry, as a major land use in the catchment area for the reservoir, is not significant in terms of reservoir capability, although it is in terms of general inflows.
- The impact of potential climate change is also not significant if there is no extra irrigation demand with climate change.
- The simulations indicate that there has not been an occurrence of a dry summer following a dry winter when the reservoir would not have filled, although this would very nearly have happened once (1998).
- The Kainui Stream does frequently dry up during the summer months. The hydrological record and the simulation model confirm this. However storms during the other seasons are sufficient to fill the reservoir with the reliability indicated above.

References

Fahey, B.D.; Jackson, R.J. 2003. Users' guide for the land use change water balance model (LUCWBM) SMF 2167. Landcare research report for MfE. In press, November 2003.

Fenemor, A.; Leong, D.; White, P.; Hong, T.; Baigent, E. 2003. Resolving Water Resource Over-Allocation – the Wai-iti Catchment Community Water Augmentation Initiative. Paper presented at APHW2003: First International Conference on Hydrology and Water Resources in the Asia Pacific Region, Kyoto, March 2003.

Tim Davie

The New Zealand Hydrological Society

Symposium 2003

18-21 November

Hydrology and the Community

Venue
Great Lake Centre
Story Place
TAUPO

Institute of GEOLOGICAL & NUCLEAR SCIENCES Limited

Environment Waikato REGIONAL COUNCIL

CONTENTS

Hydrology and the Community
Programme and Abstracts, New Zealand Hydrological Society 2003 Symposium, Taupo 18 –21 November 2003

Publication Date: November 2003

Publisher:
New Zealand Hydrological Society
P O Box 12300
WELLINGTON