Project: *Understanding groundwater flowpaths*

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Issue:
The setting of groundwater extraction limits is dependent on a good understanding of recharge rates for an aquifer. In the lower Moutere aquifer the mechanisms of groundwater recharge and the influence of vegetation cover on rates of recharge are poorly known. In the Upper Motueka the near surface storage ability is not well understood and how this links with the wider scale groundwater of the region.

Objective:
To establish the mechanisms and rate of groundwater recharge of aquifers from land in the lower Moutere aquifer recharge zone and the upper Motueka.

Progress:
Chemical and isotopic tracing techniques have been used to determine the age and source of water in the lower Moutere aquifer. This work has determined the age of water from the deep Moutere aquifers to be at least 20,000 years old. Recharge is most likely provided by modern water penetrating the groundwater system at shallow levels. Young recharge is observed only on the hills west of the valley floor, but observations are lacking in the most probable recharge zone (Rosedale Hills)

An empirical model of groundwater response to abstraction and precipitation has been developed using neural networks and fuzzy logic. The model is able to predict aquifer response to abstraction and precipitation. The borehole record and the modelled response suggest that rainfall recharge is likely to be the main recharge mechanism. Scenario modelling suggests that even with a greater extraction rate than has occurred over the last 10 years, the aquifer is likely to recover during the winter.

Analysis of water use by pasture and forests and its impact on seasonal water budgets has been initiated. Forest cover shortens the length of the time during the winter and spring when the surface store is fully wet (and therefore able to recharge groundwater). Modelling of possible recharge shows that the amounts are very small when shown as a depth of water but when converted into volume over an area have potentially large amounts of recharge. Analysis of streamflow from permanent structure gauges suggests that there may be a loss of flow from the Waiwhero streambed but the consistent nature of loss points to a calculation error rather than actual water loss. Spot gauging during the spring was not able to detect any losses

Soil water budget instrumentation has been installed in the Waiwhero catchment to extend the previous data set to gentle slopes and valley floors, which make up the majority of the terrain. This work is ongoing.

Outputs:
Davie, T; R. Jackson, L. Basher, M. Stewart, T. Hong, J. Thomas (2003) Recharge of Moutere aquifers: a report into investigations on recharge mechanisms. Draft report for the Integrated Catchment Management Programme. 51p.

Stewart, M.K.; Thomas, J.T. (2002) Moutere Valley groundwater: Nature and recharge from Isotopes and Chemistry. Institute of Geological and Nuclear Sciences science report 2002/22. 28p.

Future Directions:

This work is progressing in four directions:

- Completion of fieldwork in the Waiwhero catchment to investigate groundwater recharge mechanisms in eth lower Moutere aquifers. This includes soil water budget estimation on different terrain and the measurement of groundwater recharge from a water filled gravel pit. The field work will be completed by December 2004.
- Detailed modelling of groundwater in the upper Motueka and Motupiko valleys to investigate different abstraction scenarios. This work is being initiated during 2003/04.
- Field work on soil water budgets in the Upper Motueka region to provide information for the modelling described above. This will extend the results obtained from the lower Moutere work.
- Isotope and chemistry of river and groundwater to ascertain the flowpaths and age of water in the river at different scales. This is integrated into the field work component described above.

In the long term (2006 and beyond) this work is aiming to link into research on groundwater contribution to the Motueka river and it's importance to fish populations