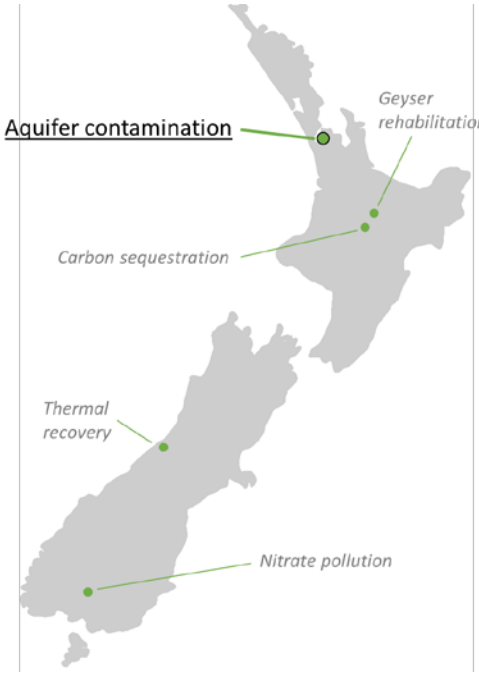
Contamination in the Onehunga Aquifer



Auckland's drinking water is sourced from large reservoirs in the Waitākere and Hūnua Ranges, the Waikato River, and groundwater aquifers beneath the city. In particular, the Onehunga Aquifer, an old fractured lava flow that contains fresh water in its pore space, has been permitted to supply up to 20 million litres per day since 2000 (Auckland demand is about 400 million litres per day).

Freshwater aquifers can be contaminated by chemicals that dissolve into stormwater at the surface and then leach down toward pressure lows in groundwater. The degree of contamination depends on the strength of the contaminant source and the severity of the pressure low drawing the contaminants in. Water that contains a high concentration of a contaminant may be unsafe to drink. However, if extraction is halted, then pressure in the aquifer will recover, normal flow directions will resume, and the resource will slowly recover.

Due to the recent drought, Watercare, the Auckland Council Organisation that manages "three waters" (drinking, storm, waste) in the city, are investigating the feasibility of additional extraction from the Onehunga Aquifer. Water is extracted through wells as it slowly flows across the aquifer under a pressure gradient. However, recent surveys indicate that levels of dissolved copper are increasing, likely due to pressure decline exceeding a threshold at which leaching from a nearby fertiliser manufacturer started to occur. The elevated copper levels have even affected local ecosystems, turning oyster beds in the Manakau Harbour green.

Watercare have applied to the Auckland Regional Council (ARC) for resource consent to double their maximum take from its current limit of 20 million litres per day. They claim that the aquifer can support the increased take without copper concentrations exceeding safe levels. The application is opposed by Ngāti Whātua whose priority is ecosystem restoration and sustainable harvest of mahinga kai. Furthermore, under the government's new National Policy on Freshwater, when granting consents there is a requirement that regional councils consider whether the quality of groundwater resources are being improved.

You have been retained by the ARC to undertake a computer modelling study on groundwater quality of the Onehunga Aquifer addressing *both* pressure and copper concentration changes. They will take your recommendation into account before supporting or opposing Watercare's consent application.

Possible outcomes of the consent hearing include approval of the expanded consent (a maximum of 40 million litres per day), no change, reduced consent (to a recommended safe level) or, more drastically, an indefinite moratorium on

aquifer usage. In the event of the latter, Auckland would likely experience water restrictions for several years.

To support your study, you have been provided the following data:

- Annual average daily extraction rates from the aquifer.
- Two-yearly pressure measurements in the aquifer.
- Five-yearly dissolved copper measurements.

Project expectations:

You should undertake a computer modelling study that will assist the applicant in their resource consent application, addressing the noted concerns of other stakeholders where they are relevant to the study. The model you develop should be defensible, reflective of reality, and take appropriate account of uncertainty. You will be required to communicate the model findings in both oral and written formats.

Recommended literature:

Donohue, J (2004). Copper in Drinking-water. WHO

Vujnovic, A. Onehunga Aquifer & 'Green Stream' Contamination. Presentation.

Strayton, G. et al. (2005). Sustainability Assessment for Stormwater Soakage in Auckland.