



# Groundwater Quality

State of Environment Summary

April 2009

## Water quality standards

The Drinking water Standards for New Zealand (Ministry of Health, 2000) are used when assessing the potability of groundwater. These standards have health-based maximums, and taste / smell / appearance aesthetic guidelines.

## How is groundwater quality determined?

In the ORC State of the Environment groundwater monitoring a trained technician visits all of the monitoring sites every 6 months. The bore is run for a period to make sure the sample is representative of the aquifer, rather than stagnant bore water. Water samples are taken and immediately bottled for dispatch to a certified laboratory for analysis. Results received from the laboratory are stored in a database at ORC.

## Why we sample groundwater?

Groundwater is a critical water source throughout Otago, particularly for domestic, community water supplies, stock water and irrigation uses. Groundwater quality is also exposed to substances, both natural and derived from human activities on the overlying land. Otago Regional Council (ORC) manages groundwater quality in terms of its responsibility under the Resource Management Act and has been monitoring ambient groundwater quality in groundwater intensive areas throughout Otago since 1995. Monitoring is to safeguard the quality of the region's groundwater from generalised rises in contaminants, identify any hotspots and understand the natural variation within quality parameters.

The Council monitors 70 bores throughout the region for water quality. There is significant site-to-site variation as a function of location, age of the groundwater, depth of bore and any direct connections with surface water.

## What we test for in groundwater

ORC monitors for many different determinants. One of the key changes made with the review of groundwater monitoring in 2007 was to standardise the suite of determinants tested for in every Otago State of Environment (SOE) bore. We now test for the following in every sample:

Parameters:	
pH	Nitrate-Nitrogen
Electrical Conductivity	Chloride
Alkalinity	Sulphate
Calcium	Total Ammoniacal-Nitrogen
Magnesium	Dissolved Iron
Sodium	Dissolved Manganese
Potassium	Boron
	Arsenic

This standardisation allows samples to be compared with other SOE samples from across New Zealand to determine the characteristics that define Otago groundwater. It also allows us to compare groundwater in the different basins within the Otago region. Nitrate levels in Otago were reported in the 2008 SOE Groundwater Quality report and Nitrate levels in 2009 were consistent with those reported last year.

## Case Study: Arsenic in Otago groundwater

The change to a standard testing suite has led to every monitoring bore around our region over the last year being tested for boron and arsenic, rather than just in areas where they were thought to be an issue.

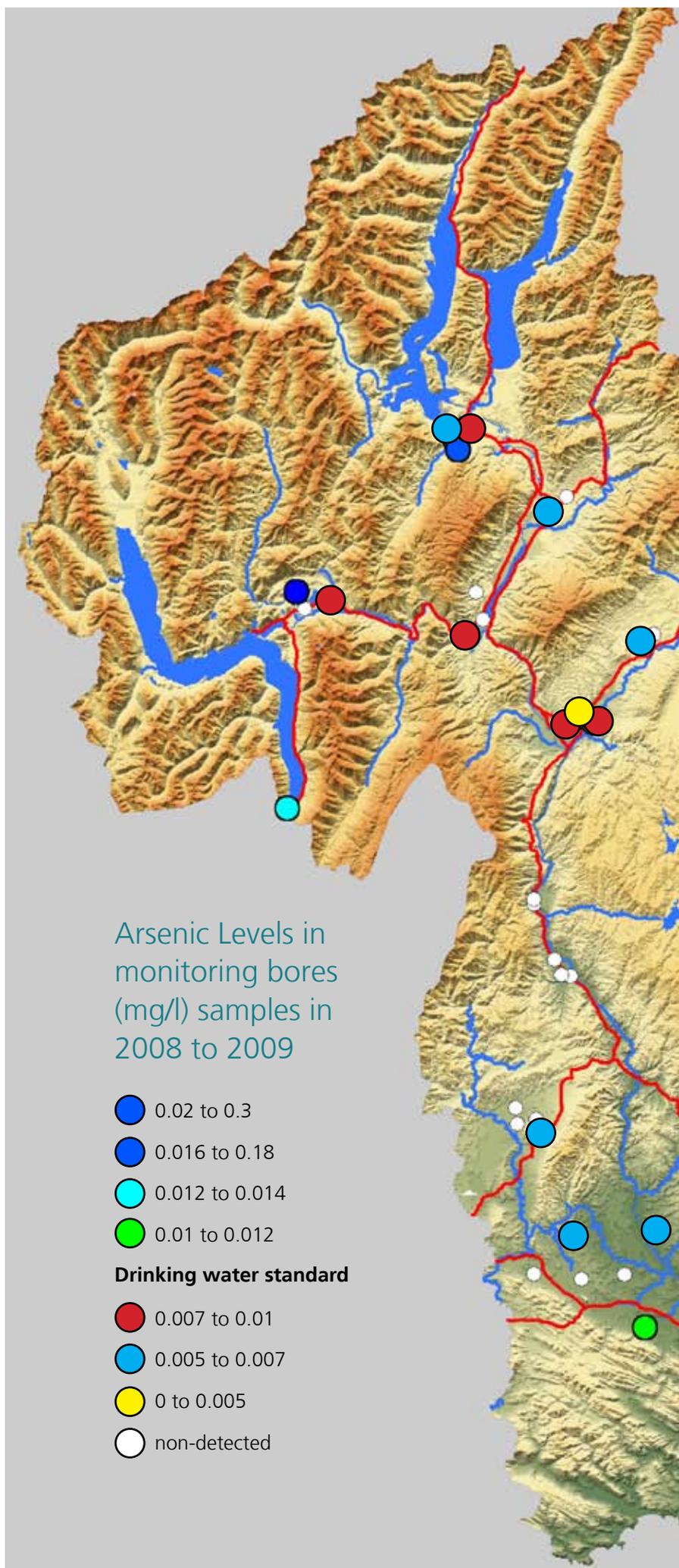
Arsenic levels in Otago groundwater are generally low and sit below the New Zealand Drinking water guidelines of 0.01 mg/l. However, there have been a few samples from different groundwater basins around Otago which have shown higher levels of Arsenic and even one sample that was 30 times the drinking water standard.

The schist rocks of Central Otago contain natural levels of arsenic that will slowly leach out of the rocks and into the surrounding groundwater. So often the levels are of natural origins. However, contaminated sites and old sheep dip sites can give high levels of arsenic in groundwater too.

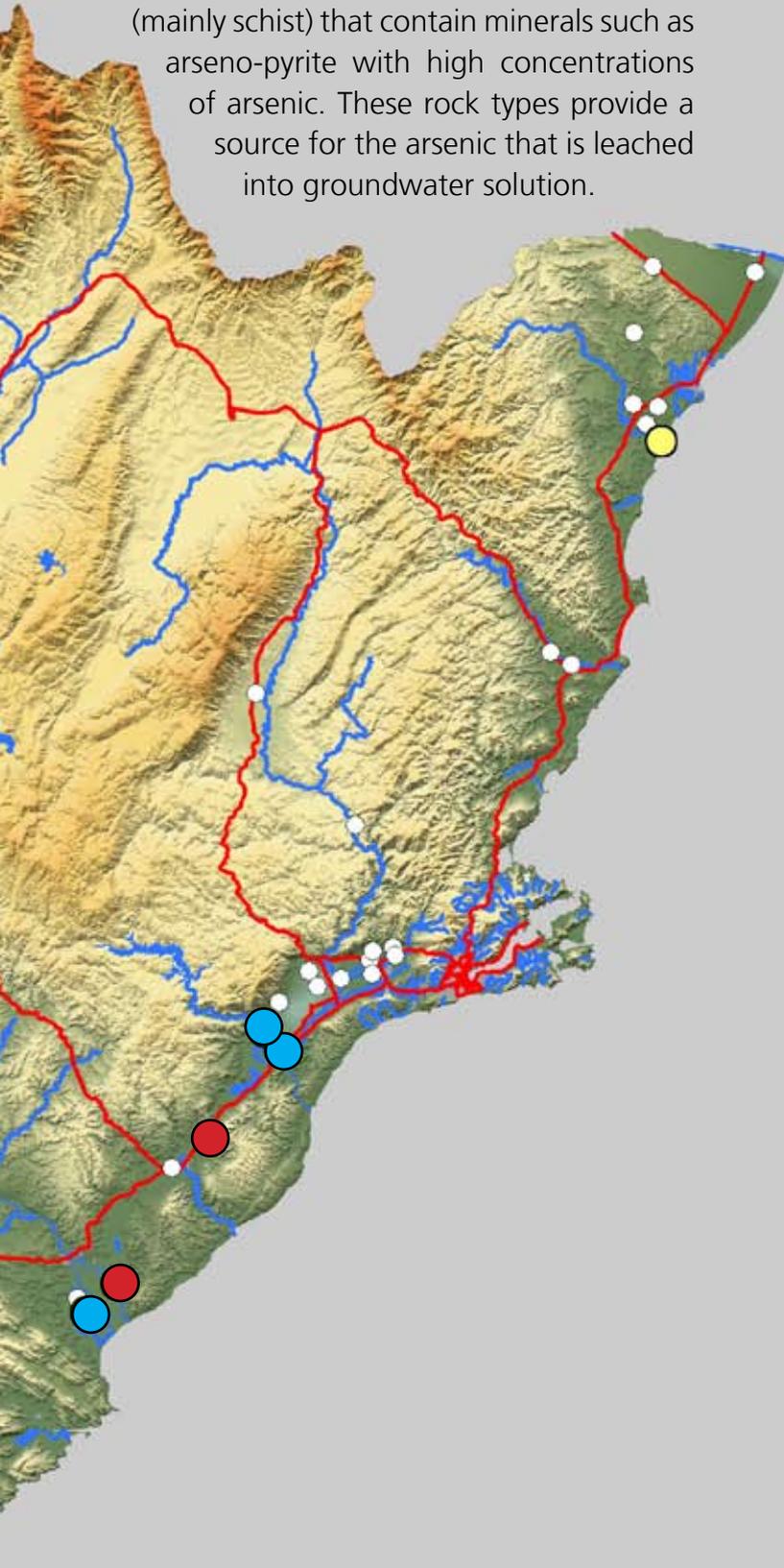
The distribution of high arsenic groundwater in Otago is patchy and levels can fluctuate throughout the year. Therefore it is important for bore owners to regularly test their water supply, especially in the Wakatipu and Wanaka basins.

Arsenic at elevated concentrations is considered toxic and a carcinogen for humans through consumption of drinking-water. There is some scientific uncertainty over the exact effects at very low levels, but at higher levels it is proven to be carcinogenic.

Removal of arsenic through filtering is possible, but fairly sophisticated techniques are required and it is recommended for bore owners to carefully check the specifications of any filtering system.



The areas of elevated arsenic occurrence in groundwater, such as the Wakatipu and Wanaka basins, coincide with rock types (mainly schist) that contain minerals such as arseno-pyrite with high concentrations of arsenic. These rock types provide a source for the arsenic that is leached into groundwater solution.



## Summary of other testing results

Groundwater quality is generally good throughout Otago. Monitoring indicates that most sites are within national water quality standards.

In some aquifer systems there are elevated concentrations of iron and manganese. As is frequently the case, there are variable results for faecal bacteria with some hotspots of high values, but most bores are below health guidelines for drinking water.

Average nitrate concentrations in groundwater are low to moderate throughout Otago. North Otago volcanic aquifer nitrate concentrations continue to exceed the drinking water standard, as they have since monitoring began. It is thought that this is a manifestation of the unique agricultural practices, soil properties and the low flushing rate of the underlying aquifer.

### More information

Further information on specific Otago aquifers is available on our website ([www.orc.govt.nz](http://www.orc.govt.nz)) under Plans & Publications, or by contacting us on 0800 474 082. The Regional Plan: Water is also available online.

### Recently published aquifer reports

North Otago Volcanic Aquifer Study 2008.



## In Progress

The Lower Taieri Groundwater Basin Investigation is currently underway. This study is being completed to determine an overall allocation limit for groundwater abstraction in the basin. It will also review the current restriction levels on the two reference bores in the basin.

To investigate the impacts of increased rates of pumping, a groundwater numerical model has been built. The affect on streams, rivers, groundwater levels and lakes are identified through the modelling. The allocation limit will take into account these potential affects of increased groundwater use.

The report is scheduled for publication in 2009.

### Contact

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