



Groundwater Quality

State of Environment Summary

2008

Water quality standards

The Drinking water Standards for New Zealand (Ministry of Health, 2005) 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 programme a trained technician visits all of the monitoring sites quarterly, six-monthly or annually depending on the site. The bore is pumped for a short 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 for 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 safe guard 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 just over a hundred bores or wells throughout the region. 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.

Key indicator

The key indicator parameter monitored in Otago groundwater is nitrate. The main reason is that nitrate as nitrogen is known internationally as a reliable indicator of non-point source effects on groundwater quality in shallow aquifers. The maps which follow present the average nitrate concentrations in Otago and other water quality parameters are discussed in the text alongside each area.

Nitrate is a natural component of the nitrogen cycle in soil and water. However, septic tanks, fertilisers, agricultural intensification and discharge of organic wastewaters can lead the nitrate concentrations in groundwater to rise, in some cases above levels that are safe to drink.

Natural concentrations of iron, manganese, arsenic and iron bacteria are sometimes a problem in deeper bores that can cause issues in terms of taste, smell or appearance. Arsenic is also a substance of health concern.

Microbes originally from the gut of mammals are of health concern if consumed. These are tested for under the class of faecal coliforms or E. coli and are more often associated with shallow wells, particularly where the well head is not sealed against accidental leakage from the surface.

Leaking underground petroleum storage tanks, landfills and contaminated sites in Otago have mostly been identified and in many cases are subject to resource consent if discharging to groundwater. These have highly specific key monitoring parameters and are not included in State of the Environment monitoring, which is more focused on defining the ambient and non-point source influences on groundwater quality.

Wakatipu Basin

1

The groundwater in the basin is characterised as slightly acidic, low nitrates (except Lake Hayes catchment groundwaters) and moderate iron contents.

Kingston

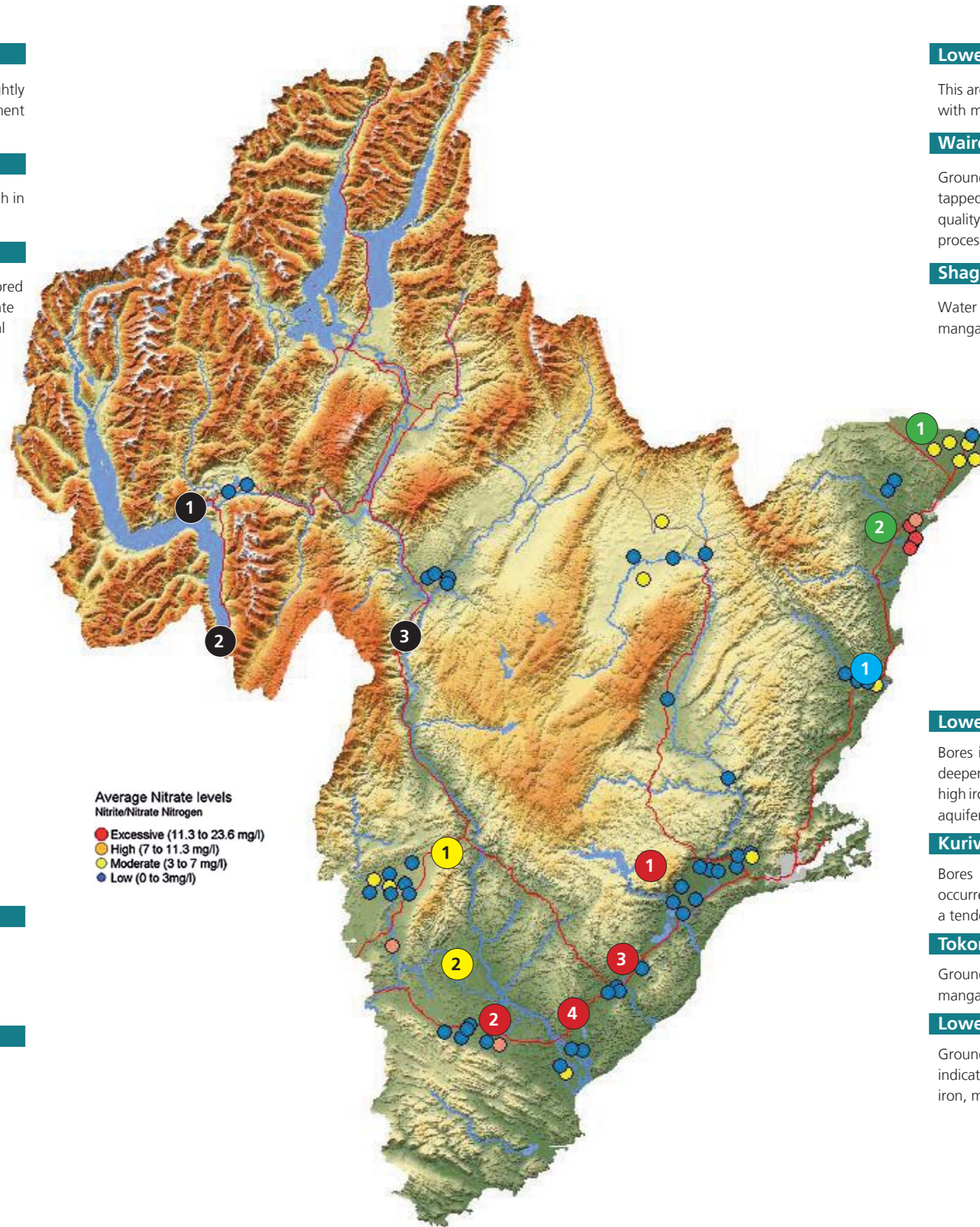
2

The groundwater in the Kingston area is generally high in iron, slightly acidic and low in nitrates.

Alexandra Basin

3

The groundwater, which has mostly been monitored within the Manuherikia Alluvium, is low to moderate in nitrates, low in iron and has recorded occasional bacterial contamination.



Average Nitrate levels
Nitrite/Nitrate Nitrogen

- Excessive (11.3 to 23.6 mg/l)
- High (7 to 11.3 mg/l)
- Moderate (3 to 7 mg/l)
- Low (0 to 3mg/l)

Pomahaka Basin

1

The bores in this basin are uniformly shallow, explaining the bacterial contamination and slightly elevated nitrate concentrations. Iron is generally low.

Clydevale/Wairuna Basin

2

Bores in this area are characterised by recurrent bacterial occurrences, low to moderate iron, almost neutral acidity and a tendency towards moderate nitrate content in some bores.

Lower Waitaki

1

This area's groundwater quality is dominated by shallow bores with moderate levels of nitrate.

Waireka/Deborah volcanic aquifers

2

Groundwater flows in fractured and fissured rock and is often tapped by uncased, open-hole bores. The area's groundwater quality is characterised by very high sodium from natural processes and excessively high nitrate.

Shag Valley

1

Water quality monitoring has shown elevated levels of iron, manganese and sodium, combined with slightly acidic water.

Lower Taieri Basin

1

Bores in the Taieri Basin draw on a significant proportion of deeper, confined aquifers. The confined aquifers tend towards high iron and low nitrate. The bores drawing on the unconfined aquifer have moderate nitrate and low iron.

Kuriwao Basins

2

Bores in this area are characterised by recurrent bacterial occurrences, low to moderate iron, almost neutral acidity and a tendency towards moderate nitrate content in some bores.

Tokomairio Basin

3

Groundwater in the basin is slightly acidic and high in iron and manganese.

Lower Clutha Plain

4

Ground water quality monitoring in Lower Clutha bores indicates occasional bacterial occurrences, slightly acidic, high iron, moderate manganese and low nitrates.

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 Otago 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

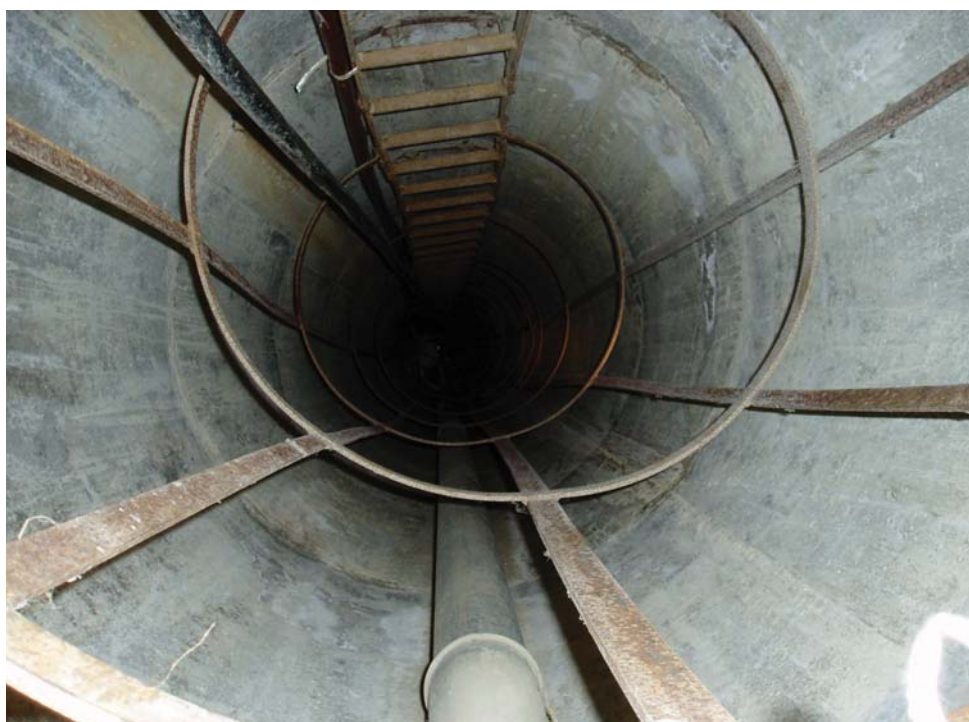
Further information on specific Otago aquifers is available on our website (www.orc.govt.nz) under Plans & Publications, or by contacting us on 0800 474 082. The Regional Plan: Water is also available online.

State of the Environment reports

- Surface Water Quantity SOE report 2007.

Recently published aquifer reports

- Groundwater allocation of Ettrick Basin 2006.
- Groundwater Quality in Kingston and Glenorchy 2006.
- Groundwater Allocation of the Alexandra Basin 2005.



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In Progress

The North Otago Volcanic Aquifers Project concentrates on the Waiareka and Deborah Aquifers. A report on this project, to be published in 2008, will include a detailed re-assessment of current monitoring bores, including the data quality.

The Lower Taieri Aquifers Investigation will also build on previous ORC investigations since 1994 and include analysis of the monitoring network. This report is scheduled for publication in 2009.



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