



Groundwater

Introduction

Groundwater is water that exists beneath the earth's surface in underground streams and aquifers. The quantity and quality of groundwater in Northland largely depends on the type of rock (geology) within which it is contained (called an *aquifer system*). In Northland, the main aquifer systems are contained in basalt rock, like Whangarei and Kaikohe, or in the Aupōuri sands. Rainfall is the main recharge source for these aquifers. Recharge refers to the amount of water that drains through the land and into groundwater.

The Council monitors groundwater in Northland in three main ways:

- ◆ State of the Environment (SoE) monitoring to record the general state of groundwater quality and quantity, and change over time.
- ◆ Monitoring of activities that may affect groundwater to prevent or minimise any adverse effects caused by these activities.
- ◆ Investigating individual aquifers where specific problems have been identified.

Groundwater monitoring in Northland during 2008-09

- ◆ 84 bores were monitored for groundwater levels.
- ◆ 7 groundwater quality sites were monitored as part of the National Groundwater Monitoring Programme.
- ◆ 32 groundwater quality sites were monitored as part of the Regional Groundwater Quality SoE Programme.
- ◆ 16 sites were monitored as specific groundwater investigations.
- ◆ 127 new bores (wells) were inspected for compliance and bore construction requirements.
- ◆ 216 resource consents for groundwater use were monitored for compliance with consent conditions.
- ◆ 3 specific groundwater investigations were done on aquifers — Ruāwai, Russell and Taipā.
- ◆ 2 additional investigations started in Whatitiri and Maungakarema.
- ◆ 8 sites were age-tested to determine the average age of the groundwater in certain aquifers in the region.

Groundwater quantity

Monitoring groundwater levels provides information on the effects of climate, land use and abstraction on groundwater resources, and can tell us how much groundwater is available for use. The Council undertakes this monitoring through a region-wide network of hydrometric stations. Levels are currently recorded continuously at nine sites, monthly at 28 sites and quarterly at 29 sites. The location of groundwater level monitoring sites is shown on the map opposite.

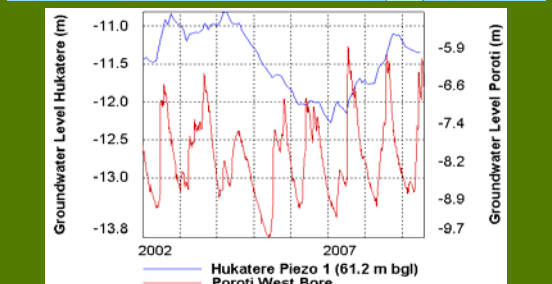
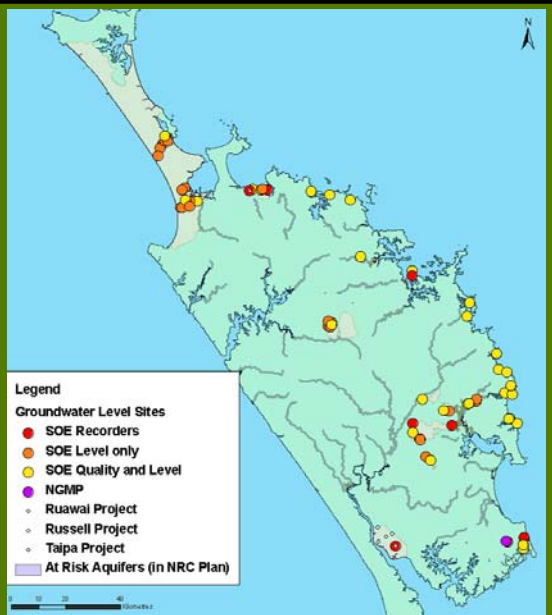
In 2008-09, groundwater levels were found to be at or above average compared to historic levels. These levels were the result of just above average rainfall for Northland.

The results of groundwater level monitoring for two sites from 2002 to July 2009 are shown in the graph (right). These sites are located in two different aquifers and respond differently to rainfall recharge. Poroti west bore is located in the fractured basalt aquifer which shows a strong seasonal rainfall recharge response. Hukatere piezo is a multilevel piezo located in the Aupōuri sand/shellbed aquifer. This aquifer buffers seasonal variations and shows long term rainfall variations with only minimum seasonal change.

Groundwater performance targets

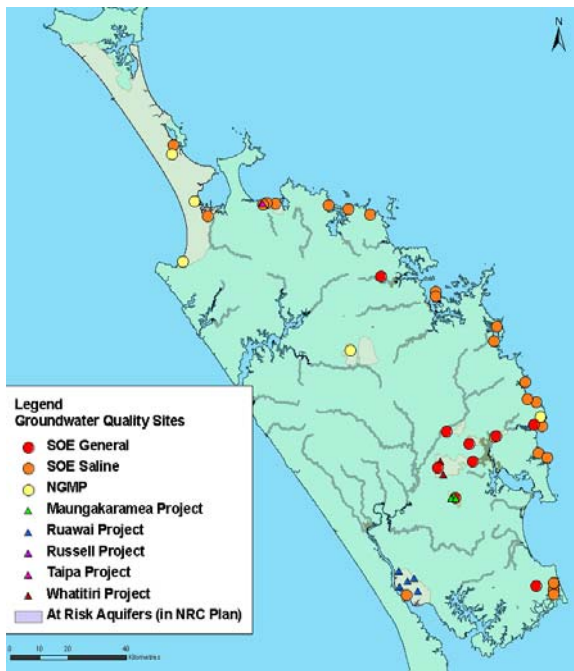
To continue to implement and improve a prioritised State of the Environment (SoE) monitoring programme and monitor compliance with, and the effects of, the exercise of resource consents and Regional Plans by:

- Carrying out investigations into the water resources of 'at risk' aquifers.
- Operating a region-wide water quality network for the measurement, recording and reporting of river, lake and groundwater quality trends.
- Collecting water use records and measuring stream flows, groundwater and lake levels associated with significant water abstractions.
- Reporting to the Council annually on environmental monitoring activities within three months of the end of the financial year.
- Making the results from the annual SoE monitoring programmes available on the Council's website at www.nrc.govt.nz/soe





State of the Environment monitoring



Compliance monitoring

Bore compliance monitoring

Bores are holes that are constructed/ installed to obtain water. All bore drillers have to provide the Council with details of bores they have drilled (a bore log), and these bores are then registered on the Council's database. There are in excess of 4000 bores registered on the database, 169 of which were logged during 2008-09.

All bores drilled under resource consent from the Council are monitored to ensure they comply with the conditions of their consent. During 2008-09, 126 consented bores were monitored and 96 were found to be fully compliant. Of the remainder, 30 were found to have minor non-compliance. Formal enforcement action was taken on 3 occasions in 2008-09, due to multiple and repeat non-compliance.

Groundwater-take compliance monitoring

The Council also monitors resource consents that are issued for groundwater take. In 2008-09, 216 resource consents were monitored and 176 were found to be fully compliant. Of the remainder, 38 were found to have minor non-compliance and 2 were found to be significantly non-compliant.

Groundwater quality
The Council monitors groundwater quality and change in water quality over time (trends). In Northland, the Council monitors seven sites through the National Groundwater Monitoring Programme. These sites have been sampled every three months since September 1996 and are located at Houhora, Paparore, Ahipara, Kaikohe, Tutukaka, Glenbervie and Tara. Samples are taken from each site and analysed for a range of components, such as nutrients, metals and bacteria.

In addition, the Council has its own State of the Environment (SoE) groundwater monitoring programme.

As part of this programme, 31 sites are sampled every three months. The aim of this programme is to collect information on water quality in each of the different aquifer systems in Northland and identify any changes over time, as well as the most likely cause of these changes.

In general, groundwater in Northland is of a high enough quality that it can be consumed without treatment. During 2008-09, the results of groundwater quality monitoring indicated that the majority of samples taken complied with the standards for drinking water in New Zealand. However, some sites were found to have elevated levels of iron, manganese, bacteria and nitrates. The elevated iron and manganese levels measured in some of Northland's bores are the result of natural groundwater processes, while the elevated bacteria and nitrate levels are due to land use/human activity. The elevated nitrate levels at two sites has prompted specific groundwater investigations.

Specific groundwater investigations

Aquifer systems

The Council undertakes a specific groundwater investigation where a potential issue has been identified, e.g. elevated nitrate or increased risk of salt water intrusion. There are currently five aquifers in Northland that are subject to further investigation – Ruāwai, Taipā, Maungakareama, Russell and Whatitiri.

Ruāwai and Taipā

Important for: irrigation, stock and public drinking water.

Issues: water quality degrading and the risk of saltwater intrusion.

Test results: Ruāwai (6 bores)

Saltwater intrusion on the south-eastern zone. No significant increasing trends.

Taipā (4 bores) Nitrate levels are below the NZ standard but elevated and the Council will continue to monitor.

Russell

Important for: a source of water for domestic use.

Issues: saltwater intrusion

Test results (4 bores) No increase in saltwater intrusion.

Maungakareama

Important for: domestic and stock drinking water and irrigation.

Test results: elevated nitrate concentrations. The Council is liaising with local property owners in an attempt to reduce levels.

Whatitiri: (7 bores) High nitrate levels in one isolated bore. The Council has been talking to the landowner.

Age Testing

During 2008-09, 13 bore sites were sampled to determine the average age of groundwater in each. Understanding the mean age of groundwater is important for interpreting the water quality results and the potential effects of land use on groundwater quality.