

Groundwater Quality



Why is groundwater quality important?

- Groundwater is an important resource that is utilised throughout the District. Much of our irrigation water and our drinking water comes from groundwater sources.

As well as being available, groundwater needs to be of a suitable quality for these uses.

- Groundwater quality can tell us about its history and where it is recharged from. Importantly, it can inform how land use activities and discharges to land may be affecting the underlying groundwater.
- Monitoring groundwater helps us to ensure that our land use activities are well managed and sustainable.

How are we doing?

- Overall groundwater quality across the Tasman District is very good and it is suitable for its intended uses.
- There are some areas where groundwater quality has been impacted in the past, notably elevated nitrates in the eastern Waimea plains.
- The more intensively the land use, be it residential or agricultural/horticultural, the greater the risk that groundwater quality is impacted.

Groundwater Quality

Groundwater quality is a measure of the physical, chemical and biological characteristics of a particular groundwater. Groundwater quality is influenced by both natural processes and human induced pressures.

Natural pristine groundwaters have a chemical signature that largely reflects the type of rocks that form the aquifer it resides in and the length of time the groundwater has remained within the aquifer.

The Groundwater Quality Monitoring Programme

Regular monitoring of groundwater quality is undertaken by Council to check that groundwater is suitable for its intended uses and to monitor the effects of our various land uses.

Council formalised a regular State of the Environment (SoE) Monitoring Programme for groundwater quality in 1990. This programme has expanded over the years and 16 sites are currently sampled four times per year for a range of chemical and physical parameters.

Often such natural influences do not limit the usefulness of the groundwater, though this is not always the case. The usefulness of some groundwaters is compromised by naturally occurring dissolved iron for example.

Human land use activities over aquifer recharge areas can impact groundwater quality. Contaminants discharged at the land surface can leach down to the underlying groundwater.

Ten of these sites are also part of the NZ National Groundwater Monitoring Programme coordinated by the Institute of Geological and Nuclear Sciences Ltd.

The results of Council's Groundwater SOE programme are summarised in *Groundwater Quality in Tasman District 2010* which can be found on the Council website.

<http://www.tasman.govt.nz/policy/reports/state-of-the-environment-reporting/>

Nitrates in Tasman's Groundwater

As well as the quarterly Groundwater SoE monitoring, Council has periodically monitored for nitrate in groundwaters across the District, but particularly in across the Waimea plains.

In general, groundwater nitrate concentrations are relatively low across much of the District, being either at or close to expected background concentrations (Figure 1). Excluding the eastern Waimea Plains, 75% of the sampled sites are below 2.7 g/m³-N. This is lower than the National level¹ of 75% of sites below 4.7 g/m³-N.

Nevertheless, there some areas that reflect human influence. Often these are in areas of intensive land use and include isolated "hotspots" attributed to localised point sources close to the sampling sites. Such point sources may include effluent or wastewater disposal systems, ofal pits, chicken coups etc.

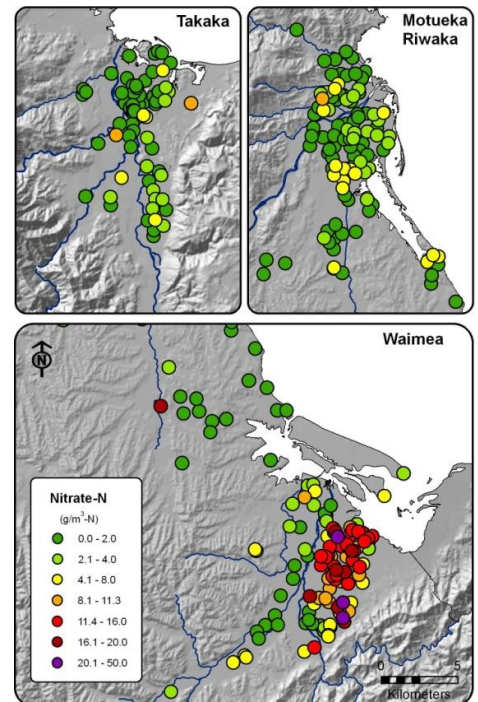


Figure 1: Average nitrate concentrations across the Tasman District (2000 to 2009).

¹ National Groundwater Quality Indicators Update: State and Trends 1995-2008, C Daughney and M Randall, 2009, GNS Science Consultancy Report 2009/145

What can we do to improve groundwater quality?

- Adoption of best practise fertiliser use in agricultural and horticultural activities. Use of comprehensive nutrient management plans to ensure fertiliser use avoids leaching to groundwater.
- Ensure that the land application of effluents (human and stock) and other discharges are treated to an appropriate level prior to discharge.
- Ensure that the timing and rate of effluent applications are appropriate for the site (especially soils) and the prevailing conditions.
- Ensure appropriate well head protection and back flow preventers on groundwater supplies to ensure surface water does not enter the aquifer.
- Maintaining and enhancing appropriate land cover and encouraging suitable land use over important recharge areas.



For more information contact Council's Environmental Information Section
ph. 03 543 8400
or visit www.tasman.govt.nz

Nitrates in Waimea Plains groundwater

High nitrate concentrations are present on the Waimea plains east of the Waimea River. These were first reported in the 1970's and have been monitored since this time. Nitrate data from the quarterly monitored groundwater SoE sites in the Waimea Plains are shown in Figure 2.

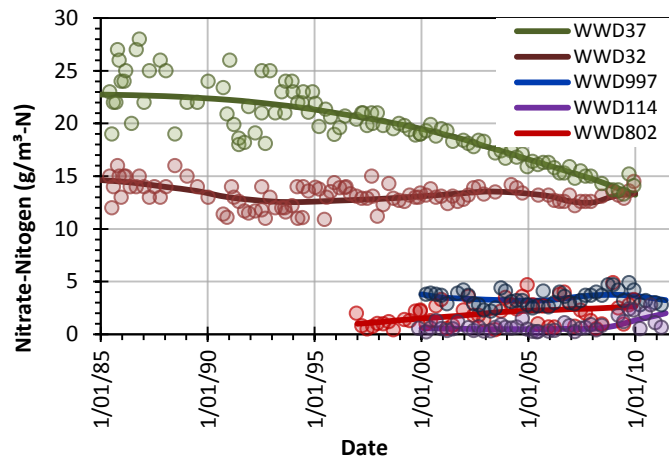


Figure 2: Nitrate concentrations, Waimea Plains Groundwater SoE sites.

The highest concentrations are found in the confined aquifers (WWD32 and WWD37). The other three sites are all relatively shallow and unconfined aquifers. They show much lower nitrate concentrations, but still indicate a degree of human impact.

Although there is spread within the data (the scatter of the "points") and some variation in the trend (fluctuations in the "smoothed" lines), the overall trend is of relatively stable or decreasing nitrate concentrations.

Council's current understanding is that there are at least two principle sources of nitrate in the eastern Waimea Plains. One significant input is a historic point source of effluent derived from a large piggery located near the foothills southeast of Hope, but which closed

in the 1980's. This has left a legacy of a "plume" of nitrate moving through the aquifer systems with the groundwater flow. Isotopic analysis and dating of the groundwater shows that this nitrate is still working its way through the system. Overall, this nitrate plume is expected to decrease over time, though in the

northern extent of the Lower Confined Aquifer this not predicted to occur until around the year 2030.

Secondly, widespread and diffuse nitrate inputs are likely to occur across the plains as a result of nutrient (fertiliser) use associated with intensive horticulture (including market gardening). The extent that this diffuse source represents an environmental concern is less clear. Nutrient use on the Waimea Plains is expected to be similar to

other intensively used areas of the District yet as Figure 1 demonstrates, it is only groundwater in the eastern Waimea plains where high nitrate concentrations are widespread. As farming practices improve, including better nutrient budgeting and timing of fertiliser application that avoids leaching, current diffuse nitrate inputs are expected to decrease.

Animal effluent and domestic wastewater systems overlying sensitive aquifer systems, including the Waimea Plains, have been required to meet higher levels of performance since the late 1990's. Consequently, nitrogen inputs to the underlying groundwater from these sources should also be decreasing over time.

Future work

- Council will continue with its State of the Environment Monitoring - Groundwater Quality programme (including participation in the GNS Ltd coordinated National Groundwater Monitoring Programme).
- Council will continue to support targeted monitoring of groundwater quality across the District, including the Waimea Plains. This may also include dating and isotopic analysis.
- Council will investigate numerical groundwater contaminant modelling of the Waimea Plains to:
 - quantify the known/postulated contaminant sources;
 - model the behaviour over time as the existing nitrate contamination works its way through the aquifer system; and
 - Optimise future land use, effluent disposal and fertiliser use management scenarios.
- Council will continue to provide advice and information to groundwater users and the general public regarding groundwater quality.