Groundwater quality

Minerals, salts and contaminants can easily be dissolved into, and transported by, water. Aquifers close to the earth's surface are more at risk of contamination from land use activities given the shorter, or more direct pathways to them. Deeper aquifers, or those separated from the earth's surface by geological material that restrict the flow of water (an aquitard), are at less risk from surface contamination. The quality of groundwater can also be adversely impacted by rocks and sediments in the aquifer through which it flows.

The Council has routinely monitored groundwater quality since 1994. We do this to gain a better understanding of how groundwater quality varies across the region and to assess how its quality is changing over time. We examine how our groundwater resources are affected by land use activities and how suitable groundwater is for various uses (such as drinking water). Because groundwater provides a pathway from land to surface water, we also assess the risk groundwater may pose to the health of sensitive environments such as streams, lakes and estuaries.

Our current monitoring network includes 32 wells and bores. They are sampled every three months and analysed for a number of physical and chemical indicators of water quality. We compare the results against accepted levels for environmental or human health, including attribute limits set out in the National Policy Statement for Freshwater Management 2020 (NPS-FM) and the Drinking-water Standards for New Zealand 2018 (DWSNZ).

Water chemistry tested quarterly at

32

bores and wells

Elevated levels

of ammoniacal nitrogen, iron and manganese **occur naturally** in regional aquifers

Tests results show that **pesticides** and **heavy metals** are generally not an issue in our groundwater

Median **nitrate nitrogen concentrations** in

97%

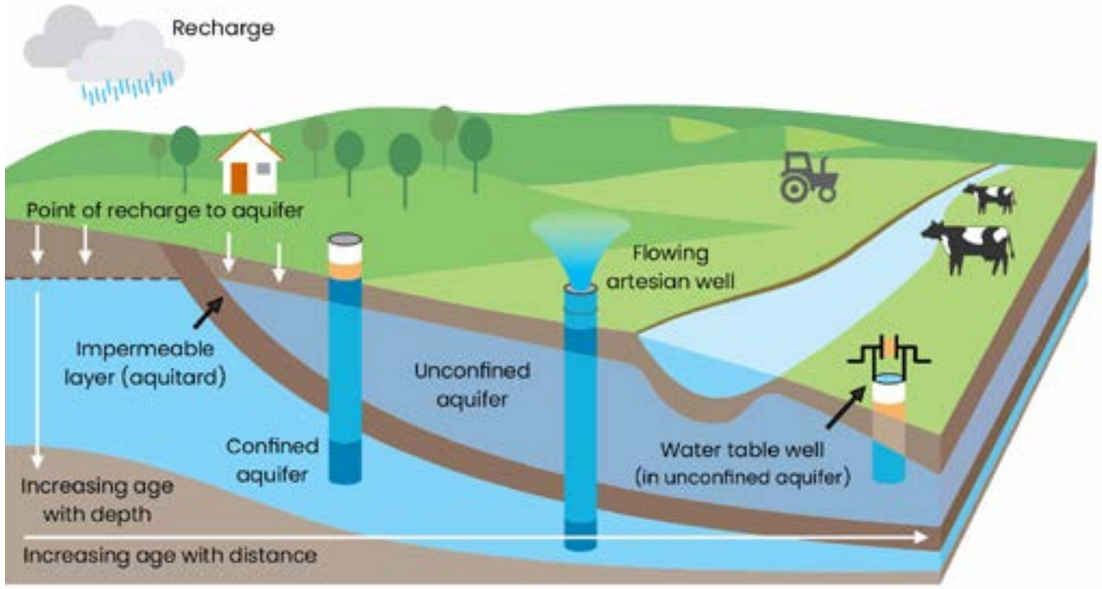
of groundwater bores were within accepted standards for drinking water in NZ

What we know

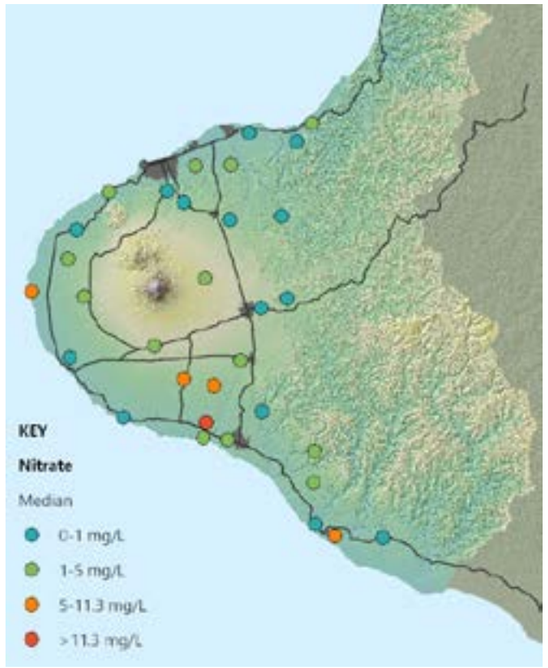
Council monitoring over the last five years shows indicators like *Escherichia coli* bacteria (*E. coli*), nitrate nitrogen (nitrate), ammoniacal nitrogen (ammonia), iron and manganese are occasionally found at levels considered unsafe for humans or stock to drink, or at levels that can make the water look or taste unpleasant. Acceptable levels are set out in the DWSNZ for a range of human health indicators.

People using private groundwater supplies are most at risk of drinking groundwater with *E. coli* bacteria and elevated levels of nitrate. Overall, median nitrate and *E. coli* bacteria levels in Taranaki groundwater are comparable to other regions where intensive agriculture is the predominant land use. Human activities and animal and industry wastewater discharged to land locally are both common sources of bacteria and nitrate. Poorly constructed wells and bores, or those that are not adequately isolated from direct sources of contamination, or surface run-off, are more likely to display elevated levels of *E.coli*.

At certain concentrations, nitrate can pose a health risk to babies and breastfeeding people. There is some discussion in the science community around whether a more stringent maximum acceptable value (MAV) should be set to protect our health, although there is not yet a strong consensus in New Zealand as to whether the science supports more stringent limits on nitrate levels in groundwater. In Taranaki, there was only one site where levels of nitrate exceeded the MAV for drinking water (11.3mg/L). At 27 of 32 sites (84%) the median nitrate concentrations were less than half of this limit.



An overview of aquifer types, recharge mechanisms, groundwater flow paths and residence times. In the unconfined aquifer, groundwater is pumped to the earth's surface. However, pressure in the confined aquifer can cause groundwater to flow to the surface without the use of a pump (flowing artesian well). Shallow, unconfined aquifers are more at risk from landuse impacts than deper, confined aquifers. (Source: modified from Environment Canada).



Median nitrate concentrations (as NO_3-N) at monitored groundwater sites in Taranaki (2015-2020). The safe drinking water limit for nitrate in New Zealand is 11.3mg/L.

The presence of *E. coli* is used as an indicator of the potential presence of pathogens that can make us sick. Monitoring during 2015 to 2020 showed that *E. coli* were detected on at least one occasion at 21 of the 25 (84%) sites located in aquifers most at risk from *E. coli* contamination. This highlights the importance of the proper construction of bores and treating groundwater prior to using it for household drinking water.

The presence of iron, manganese and ammonia in groundwater is mostly due to the local geology and natural processes that occur in aquifers with low levels of oxygen. The concentration of these contaminants in water at some locations can cause the staining of plumbing fixtures, clogging of pipes or result in the taste or look of groundwater being unpleasant, making it unsuitable for certain uses. Iron concentrations are a particularly common challenge for those utilising groundwater supplies in Taranaki.

Between 2015 and 2020, 12 of 32 monitored sites (38%) had concentrations of iron and/or manganese exceeding an aesthetic or heath-related standard set out in the DWSNZ. A further three sites (9%) had exceedances of the aesthetic standard for ammonia.

Test results show that pesticides and heavy metals are generally not an issue in our groundwater, although there have been isolated instances where contamination by chemical substances and herbicides/fungicides has been detected.

There was sufficient data available to assess trends in groundwater quality at 10 of the 32 sites monitored. In most cases, individual water quality indicators have shown little change over the last 10 years, or are changing at an insignificant rate. Meaningful changes were detected in only three bores, with levels of nitrate considerably improving in one bore and deteriorating in two others.

What we're doing

Protect yourself and your whanau

Where Council monitoring identifies a groundwater quality issue, the owner of that particular site is advised and directed to further information and/or support. Where the issue is significant, further investigations are carried out to establish potential sources of contamination and the appropriate remedial actions.

It is important to test a bore or well to ensure it is suitable for its intended use, particularly for drinking water supplies. There are also practical ways to reduce the risk of contamination of water supply, such as ensuring a well is covered and sealed from the ground surface, and keeping it securely fenced from stock. New bores should be installed to best practice construction standards, and older infrastructure maintained to address deterioration over time. Other measures include:

- Fixing leaking taps or pipes
- Keeping septic tanks and offal holes above the water table and well away from water abstraction points and streams
- Storing hazardous substances under cover, and on a sealed pad above ground
- Correctly using pesticides and fertiliser to prevent leaching
- Disposing of waste to appropriate recycling or landfill facilities
- Spreading effluent onto land at a rate soil and plants can absorb
- Not taking more water than is needed
- Telling the Council about bore locations

Where we're heading

The Council is reviewing its regional policy and plans to incorporate new guidance and thresholds for freshwater quality and health. Monitoring of groundwater quality in Taranaki may also need to change to help the Council meet rules in the new policy and plans, especially where relationships between groundwater and surface water may exist.

Monitoring shows that nitrate and ammonia are sometimes present at levels that could adversely affect receiving environments such as groundwater-fed lakes and streams. Groundwater rich in nitrate or ammonia can potentially affect the health of fish and insects in waterways connected to groundwater. More research is needed to find out where these connections may exist in Taranaki and the significance of any impacts from groundwater nutrient contributions in surface water systems.

Drinking water source protection

The security of New Zealand's drinking water has been a significant focus for resource managers since the outbreak of campylobacter in the Havelock North drinking water supply in 2016. The subsequent inquiry highlighted a number of areas for improvement in the management of public water supplies throughout New Zealand.

The Government recently consulted on a suite of proposed changes to the National Environmental Standards for Sources of Human Drinking Water (NES-DW) with a view to making drinking water safer. Proposed changes include:

- Standardising the way we define source water areas;
- Strengthening regulation of activities around water sources; and
- Including more water suppliers under the NES-DW.

The Council works in partnership with our region's district councils and Taranaki District Health Board to ensure our communities have safe and secure drinking water. In the coming months we will be working collectively to respond to any changes and new regulation, and provide advice and guidance to water suppliers on what these changes mean for us. This is likely to include reassessing source protection areas for drinking water supplies, and identifying activities within those areas that may pose a risk to each supply.