

Appendix 16: Rural Water Supply

1. Overview

Rural water supplies are currently compromised through high nitrate in groundwater and poor quality of surface (stream) waters. Nitrate concentrations exceeded the New Zealand Drinking Water Standard (11.3 grams $\text{NO}_3\text{-N m}^{-3}$) in 16 percent of 110 wells monitored in the Waikato regional network (Environment Waikato, 2008a)¹, but the situation is better amongst 82 community (school) supplies with two percent guideline exceedence². In the Waikato, areas of free-draining soils with intensive land use were most at risk, with 31 percent of groundwater samples from dairy farms exceeding the nitrate drinking standard, compared with just five percent from drystock farms and urban wells (Environment Waikato, 2008).

Surface water nitrate concentrations are generally well below the New Zealand Drinking Water Standard (11.3 grams $\text{NO}_3\text{-N m}^{-3}$), although concentrations during winter in some tributaries of dairy catchments can reach more than half of this level (Wilcock et al., 1999).

There is also the risk of contamination of groundwater through improper use of pesticides. This is an issue of concern in the Waikato River catchment. These are discussed below.

1.1 High nitrate concentrations

The high nitrate concentrations are mainly located in dairying catchments and reflect high nitrate leachate from intensively grazed pasture. In many areas groundwater quality is declining due to³:

- An increase in the amount of wastewater discharged onto land – to about 460,000 cubic metres per day.
- Increased use of nitrogen fertiliser.
- A doubling of stocking rates over the last forty years as animal waste from intensive farming contaminates groundwater with nitrate.

¹See map at <http://www.ew.govt.nz/Environmental-information/Groundwater/Monitoring-groundwater-quality/Nitrate-contamination-of-groundwater/Nitrate-concentrations---map/>

²<http://www.ew.govt.nz/Environmental-information/Environmental-indicators/Inland-water/Groundwater/gw1-report/>

³<http://www.ew.govt.nz/Environmental-information/Groundwater/>

1.2 Faecal contaminations

Shallow (less than 30 metres deep) unconfined groundwaters are also most likely to have faecal contamination (Sinton, 2001). At present there is little information on the extent of microbial contamination in individual rural groundwater supplies. However, a study of 40 wells in Matangi (near Hamilton) found five (12.5 percent) were contaminated with faecal coliforms⁴.

Faecal contamination of waters is discussed in more details in Appendix 10: Faecal Contamination.

1.3 Pesticides

There is a risk of groundwater contamination by pesticides. Large quantities of pesticides are used in the Waikato River catchment. Environment Waikato surveys found that 335 tonnes of herbicide, 84 tonnes of insecticide and 155 tonnes of fungicide were used annually between 1985 and 1987⁵.

Most pesticides break down at the surface or in shallow soil, but some mobile and persistent chemicals reach groundwater. In 1995, Environment Waikato investigated pesticide occurrence in groundwater at well sites where these chemicals were in regular use and the aquifers were considered vulnerable (Hatfield and Smith, 1999). Pesticides were detected in groundwater at 74 percent of this 'worst case' selection of 35 wells. Of the 20 different compounds detected, only dieldrin from sheep dip sites exceeded the drinking-water guideline.

More recent surveys of 40 randomly-chosen community supplies and 40 regional supplies considered potentially susceptible to contamination show that⁶:

- Pesticides are contaminating some groundwater (about 10 percent of randomly-chosen community supplies surveyed).
- The concentrations of most pesticides detected are well below drinking-water guideline levels, but the Ministry of Health's maximum allowable concentration was exceeded for one pesticide in one community supply in 2004.
- Pesticides are more likely to be found in vulnerable, shallow, unconfined aquifers where use of relatively mobile and persistent pesticide chemicals is high, as shown in the regional survey of potentially susceptible supplies. Most pesticide contamination is because of poor management practices and historic use.

⁴<http://www.ew.govt.nz/environmental-information/Groundwater/Monitoring-groundwater-quality/Microbial-contamination-of-groundwater/>

⁵ As above.

⁶<http://www.ew.govt.nz/Environmental-information/Environmental-indicators/Inland-water/Groundwater/gw2-keypoints/>

Health and environmental concerns have increased awareness of the need for careful pesticide management and have led to a decrease in use nationally in the last two decades. Also, much less persistent chemicals are now being used that more readily degrade to less environmentally harmful compounds.

2. A description of prioritised actions

On-farm management of nitrate contamination actions (outlined in Appendix 9: Farms) would reduce nitrate leaching as illustrated below (see Table 1).

Table 1: Impacts of on-farm management on nitrate leaching under an assumed infiltration rate of 400 millimetres per year.

	Current practice	Option 1	Option 2
Nitrate leaching rate (kg NO ₃ -N/ha/y)	39	17	15
Rainfall infiltration rate (mm/y)	400	400	400
Nitrate in groundwater (mg NO ₃ -N /L)	9.8	4.3	3.8

The estimates in Table 1 are only approximate because nitrate concentrations depend on many processes and other factors. Present day nitrate levels under dairying often approach and sometimes exceed the Water Quality Guideline of 11 milligrams NO₃-N per litre (as described in the introduction). The estimates of the impacts of proposed on-farm mitigations (Table 1) indicate that these will ‘arrest’ the trend for higher nitrate in groundwaters provided dairy intensification through increased stocking does not occur. Note that because of other factors some groundwater may still exceed the water quality guideline of 11 milligrams per litre, and so drinking-water supply wells must still be tested and, if necessary, water treatment installed or alternative water supplies found.

Delayed responses are expected between implementation of on-farm management practices and reductions in groundwater contamination because this requires the existing groundwater to be diluted by new (less contaminated) inputs. Response times are influenced by groundwater residence time, which varies markedly within the Waikato catchment. Groundwater residence time in the aquifer at eight bore locations within recharge zones in the Reporoa Basin, was between 11 years to 73 years (Piper, 2005), whereas in Waipa hill country, at Whatawhata, groundwater residence time is about nine years (Stewart et al., 2007). At Toenepi, near Morrinsville, the age of groundwater that emerges as stream baseflow varies with

season, from very young during winter (age ca. one year), when shallow groundwater flows laterally through subsurface drains and well-drained allophanic and granular soils, to a few decades old during summer, when deeper groundwaters supply the streamflow (Stenger et al., 2009).

Restoration actions to reduce faecal contamination of streams (fencing, riparian buffers, run-off controls) will substantially reduce the risk associated with drinking untreated surface waters, but will not eliminate them altogether because of feral animals (e.g., birds, possums), stock fence and effluent irrigation failures, and contaminated surface run-off still reaching streams in some situations. Therefore, surface water will still need to be treated to eliminate that risk.

Environment Waikato is undertaking the following actions in respect to pesticide contamination⁷:

- Research and monitoring (as described above) to better understand pesticide contamination of groundwater in the Waikato River catchment. A range of information has been developed, including risk assessment tools and fact sheets.
- Encouraging farmers and other users of pesticides to use New Zealand Standard for Agrichemical Users Code of Practice known as Growsafe, to encourage careful application, storage and disposal of chemicals, especially around wellheads and water supply infrastructure.
- There are a number of rules and policies related to pesticide use. They include the promotion of land-use practices that minimise pesticide residue leaching and soil contamination.
- Helping develop national guidelines for the management of contaminated sheep dip sites.

The most important actions in respect to drinking-water supplies and pesticide contamination is the safe and responsible use of pesticides and monitoring potential legacy issues. The Study team concludes that the actions currently being undertaken by Environment Waikato appear appropriate to address the potential risks.

3. References

Environment Waikato (2008). The condition of rural water and soil in the Waikato region. Hamilton, Environment Waikato, 55 p.

⁷<http://www.ew.govt.nz/Policy-and-plans/Regional-Policy-Statement/Regional-Policy-Statement-Review/RPSdiscussiondocument/2-Community-wellbeing/27-Hazardous-substances-and-contaminated-land/>

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