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EAST ASHBURTON GROUND WATER QUALITY – A COMMUNITY APPROACH

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Abstract

The Ashburton Zone Implementation plan identifies ground water quality as a key priority. This project is monitoring 50 randomly selected wells to identify the variability in nitrate levels in ground water throughout an area east of State Highway 1 and bounded by the Ashburton and Rakaia Rivers. Based on this data, farmers in the region will be better informed of the high risk zones, how the nitrate levels in water vary seasonally, sub-regionally, by depth and over time. This will enable the farmers to engage with ECan and the Ashburton Zone Committee with constructive dialogue to develop outcomes that meet the environmental, economic and social needs of farmers and the community. The wells were monitored quarterly in 2016 and monitoring will continue until the end of 2018. Results from the first season showed no seasonal change in average nitrate levels and no obvious differences by well depth. There was a trend to increasing nitrate concentrations closer to the coast. Five wells exceeded the Maximum Acceptable Level for safe drinking water at one or more sampling time. The project was initiated by farmers in the area and all farmers in the area can contribute financially to the project. It is also supported by MPI SFF, industry organisations, regional government and private companies. This whole community approach may be applicable to groups engaged in water quality work in other areas.

Background

The National Policy Statement for Freshwater will require limits to be in place in relation to both water quantity and water quality. In the Ashburton area there is a significant reliance on groundwater for irrigation, domestic drinking water and commercial use in food processing factories and it is important the quality of groundwater is understood and managed to ensure the quality is suitable for each use. Testing of groundwater in this region has indicated that nitrate levels in the water in some wells are relatively high with 25% of the 155 wells monitored exceeding the Ministry of Health Maximum Acceptable Value (MAV) of 11.3 mg NO3-N/l (mg/l) (Hayward &Hanson 2007). Wells were monitored from the commercial area towards the coast in both 2000 and 2002 and showed nitrate levels were high close to the commercial area on the edge of Ashburton and extended in a plume extends towards the coast (Hayward & Hanson 2007). As well as this there are testing in an agricultural area also identified some wells (5 of 37) where nitrate nitrogen levels exceed MAV in 2003. In a study in a similar area in 1990/1991 twenty two wells were monitored and the highest level of nitrate nitrogen was 10mg/l (Close et al. 1995). The wells used in these two studies were different but the data suggests an increase in nitrate nitrogen between 1990 and 2000.

This study focusses on the area bounded by the Rakaia River to the North the Ashburton River to the South and between SH1 and the Pacific Ocean which is an alluvial plain overlaying braided river deposits and greywacke, with free-draining soils. Alluvial aquifers at a range of depths from 2-3m near the rivers to over 70m in the middle of the study area form the ground water network in the region. Land use in the area is predominantly farming (cropping, dairy and sheep) with the urban areas of Ashburton and Rakaia on the western edge of the area. Some commercial food processors have facilities in the area.

This study aimed to review existing data ground water quality data from monitored wells and to create a network of wells sampled regularly for nitrate-nitrogen over a three year period and identify any trends by time, season, depth, area. This detailed dataset could be used to inform development of sub-regional plan and the process of community engagement and involvement used in this study could be used in other similar studies.

Methods

The literature relevant to the study area was reviewed to best understand the aquifers and historic data on ground water. The data for the sixteen Environment Canterbury monitored wells was collected and trends in ground water quality (nitrate nitrogen) over the time frame they have been monitored was assessed.

Fifty wells were randomly selected within the study area to be representative of both geographical and well depth of the region. Well depth varied across the region as wells did not always tap into the shallowest aquifer. Wells were not selected in relation to land use. In year one each of these wells was sampled quarterly using the same sampling methodology as that used by Environment Canterbury for their monitored wells. The sampling time frame was also selected to align with the sampling of the Environment Canterbury monitored wells. Sampling will be ongoing quarterly for at least the next two years. Water quality testing was carried out using the standard protocols used to test monitored wells.

Data from year one has been analysed to identify any trends for water quality regionally, seasonally by well depth or variance from the Environment Canterbury monitored wells.

Results and discussion

The 16 monitored wells in the study zone have been monitored for different time frames with an overall mean of 10.5mg/l. Of the 16 wells 43% were showing a significant increase over the period they have been monitored and 19% were showing a significant decrease over the period monitored. The highest level of any well is 21mg/l and the lowest was 0.5mg/l.

The mean for the 50 randomly selected wells in the study was 6.03mg/l, which is markedly lower than the monitored wells. Based on this result it appears the monitored wells have not been randomly selected and appear to be biased to higher nitrate levels in the water.

In this study there was no significant change in the mean nitrate levels in the randomly selected wells throughout the first year of sampling (Figure 1). The monitored wells tend to be increasing and ongoing testing of the wells in this study may also show a similar trend.

The highest level in this study was 16.3mg/l with three wells consistently over 11.3mg/l and two others over on more than one occasion. This level is markedly lower than the 21mg/l in the monitored wells.

There was no trend in nitrate level by the depth of the well or north to south in the study region. There was a significant increase in nitrate from west to east (Table 1), an increase that is not surprising as leaching losses would be expected to be cumulative from land use across the Canterbury Plain to the sea. There was also no indication that specific areas had higher nitrate levels in relation to land use.

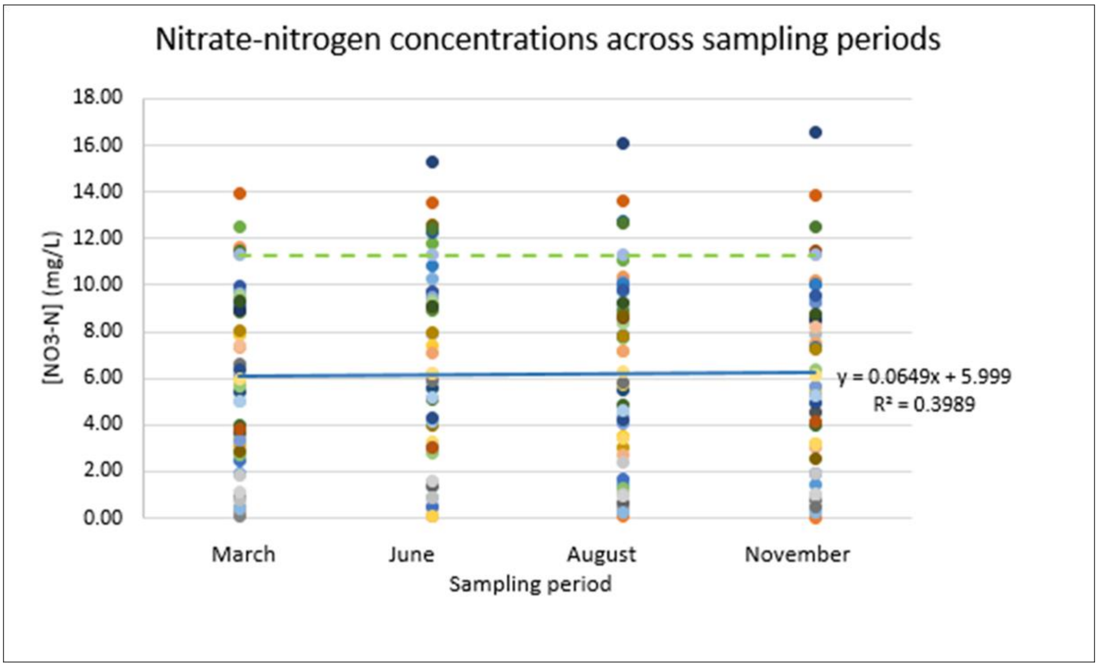
This research indicates that, although nitrate levels in ground water in the study area, that they are not as high as indicated form the monitored wells. Further work is required over the next two years to identify any seasonal or longer term trends.

This project is a whole of community approach to understanding groundwater in the area. Farmers within the zone have contributed voluntarily to the project, along with industry good organisations, companies and Environment Canterbury to help to ensure good quality information on water quality is available to guide the decision making process.

Table 1. Nitrate nitrogen levels (mg/l) through the year by region.

	March mean	June mean	August mean	November mean	Mean
North	6.0	6.7	6.6	6.9	6.5
South	6.0	5.8	6.1	5.6	5.9
East	6.7	7.6	7.3	7.1	7.2
West	4.6	3.8	4.3	4.5	4.3
Mean	5.8	6.0	6.1	6.0	

Figure 1. Nitrate- nitrogen concentrations across the sampling period of 2016 for each individual well. Solid line is the mean for all wells and the dashed line is the MAV 11.3mg/l standard.



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