DATA VISUALISATION FOR IMPROVED UNDERSTANDING OF LARGE WATER QUALITY DATASETS

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ABSTRACT

Deteriorating water quality is an issue throughout New Zealand and particularly in Canterbury. In recent years, there has been concern around the increase in contaminants, such as nitrates, due to intensified land use in both urban and rural contexts. The ability to predict groundwater quality issues before a drinking-water supply is affected would be a valuable tool that would allow drinking-water suppliers to proactively manage potential issues before the community is affected.

Christchurch City Council (CCC) and Environment Canterbury had a large amount of groundwater data but found that it was difficult to track incremental deterioration of raw water in the underground aquifers when data was stored and analysed in spreadsheets. Standard graphing techniques could be used to identify trends in a single bore, however, each bore was not monitored consistently over the entire data set. In many cases, one bore was monitored for a number of years and then monitoring swapped to another nearby bore. This meant that the trend in water quality for the area could not be easily identified.

CCC commissioned Beca to provide a data visualisation tool. The aim of this project was to compile and present available groundwater quality data to aid in early warning of any contamination risks to the drinking-water supply that may gradually develop over time. Microsoft Power BI was used to present two data bases (CCC and Environment Canterbury data) with a total of 12,474 data points dating from 1954 to 2017. Six parameter that are key to drinking water quality were selected for the visualisation tool: total coliforms, *E. coli*, ammonia nitrogen, total nitrogen, chloride and dissolved reactive phosphorous.

A tool was developed that presents the data geospatially to clearly illustrate what is happening with the water quality in and around Christchurch over time. Maximum acceptable values and guideline values were used to define the warning colour system so that significant data points could be identified. It is also possible to interrogated individual data points through the Microsoft Power BI platform. This project resulted in a tool that is valuable in informing an understanding of long terms trends in water quality, alerting CCC to shorter term water quality changes that could have impacts on the water supply, informing future investment considerations including location of new wells, and the need for treatment processes or other mitigation measures. The tool can also inform adjustments to the testing regime.

Data visualisation has applications throughout the country. Similar to Christchurch, there are many locations that would benefit from a geospatial tool to summarise their groundwater monitoring data. Data visualisation could also be used for many other uses such as allowing residents to track water levels in surrounding monitoring bores (as done by Kāpiti Coast District

Council), allowing efficient scheduling of inspections for a large number of assets (e.g. reservoirs or bores), for tracking the condition of assets, or any other application where there is a large data set and a geospatial element to the information.

KEYWORDS

Data, visualisation, drinking-water