

Memorandum

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Cadmium concentrations in shallow Taranaki groundwater

Cadmium is a naturally occurring, toxic, non-essential heavy metal, with the ability to bio-accumulate. Exposure has the potential to have adverse effects on human health (through foodstuffs as a public health pathway, and through direct exposure for industrial workers). Cadmium generally enters groundwater systems as a result of leaching from agricultural land which has been subject to fertiliser application, particularly superphosphate. It has therefore become the focus of some attention, within both scientific circles and public interest/media.

An initial investigation into cadmium concentrations in shallow Taranaki groundwater was conducted by the Taranaki Regional Council (the Council) in 2009. Samples of groundwater were obtained from 12 sites across Taranaki and analysed for cadmium concentrations. All samples analysed returned cadmium concentrations less than the laboratory detection limit of 0.005 mg/L. A report was subsequently prepared by the Council detailing the results of the sampling carried out (TRC, 2009). The report included a recommendation to conduct further cadmium sampling as part of the region-wide groundwater nitrates monitoring survey in five years' time.

In line with the recommendations made following the initial cadmium in shallow groundwater survey, a follow-up survey was undertaken over the period from late June to mid July 2015. Samples were collected from 30 shallow wells (<15 m total depth) in conjunction with the Council's established nitrates in shallow groundwater monitoring programme. The 30 groundwater sites sampled are geographically distributed across the region, with the majority of sites located in intensively farmed areas (being those with heaviest and longest fertiliser use). Figure 1 illustrates the location of monitoring sites sampled as part of the 2015 survey.

Where possible, groundwater samples were collected with either a peristaltic or bladder pump, using low flow sampling methodologies. Where no direct access to a well was possible, samples were obtained via a tap or hose at surface.

Cadmium analysis was carried out in the Council's IANZ accredited laboratory using the atomic absorption spectrometer method, with a detection limit of 0.0001 mg/L (or 0.1 parts per billion). Table 1 and Figure 2 present the results of the analysis.

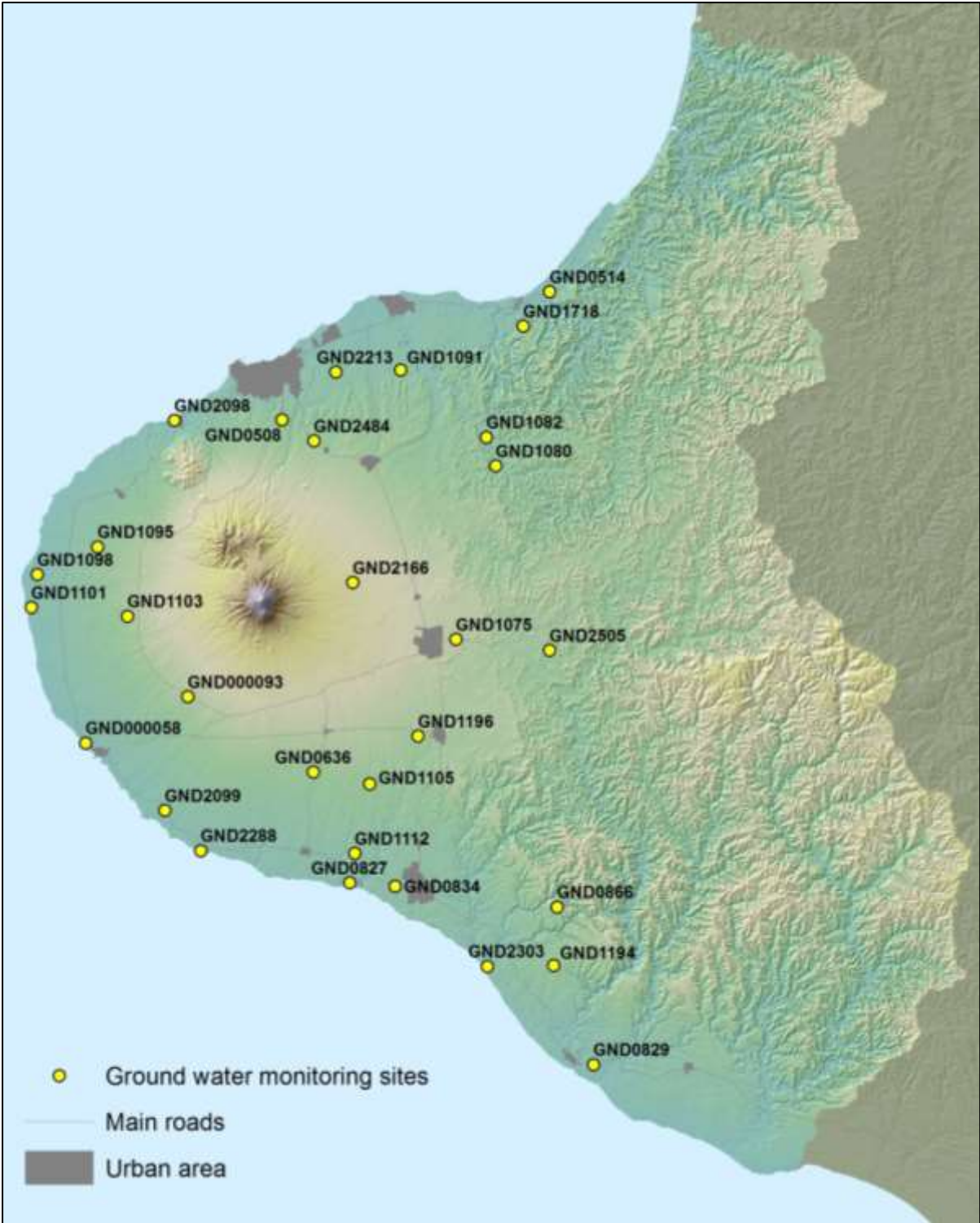


Figure 1 Location of groundwater sites monitored for cadmium during the 2015 survey

Table 1 Cadmium concentrations present in groundwater samples

Site code	Sample date	Cadmium concentration (mg/L)
GND000058	03 Jul 2015	0.0002
GND000093	09 Jul 2015	<0.0001
GND0508	07 Jul 2015	<0.0001
GND0514	06 Jul 2015	<0.0001
GND0636	02 Jul 2015	<0.0001
GND0827	23 Jun 2015	<0.0001
GND0829	02 Jul 2015	<0.0001
GND0834	01 Jul 2015	<0.0001
GND0866	14 Jul 2015	<0.0001
GND1075	01 Jul 2015	<0.0001
GND1080	01 Jul 2015	<0.0001
GND1082	01 Jul 2015	<0.0001
GND1091	06 Jul 2015	<0.0001
GND1095	02 Jul 2015	<0.0001
GND1098	02 Jul 2015	<0.0001
GND1101	02 Jul 2015	<0.0001
GND1103	02 Jul 2015	<0.0001
GND1105	07 Jul 2015	<0.0001
GND1112	07 Jul 2015	<0.0001
GND1194	02 Jul 2015	<0.0001
GND1196	02 Jul 2015	<0.0001
GND1718	06 Jul 2015	<0.0001
GND2098	02 Jul 2015	<0.0001
GND2099	07 Jul 2015	<0.0001
GND2166	01 Jul 2015	<0.0001
GND2213	06 Jul 2015	<0.0001
GND2288	03 Jul 2015	0.0004
GND2303	01 Jul 2015	0.0006
GND2484	14 Jul 2015	<0.0001
GND2505	07 Jul 2015	<0.0001

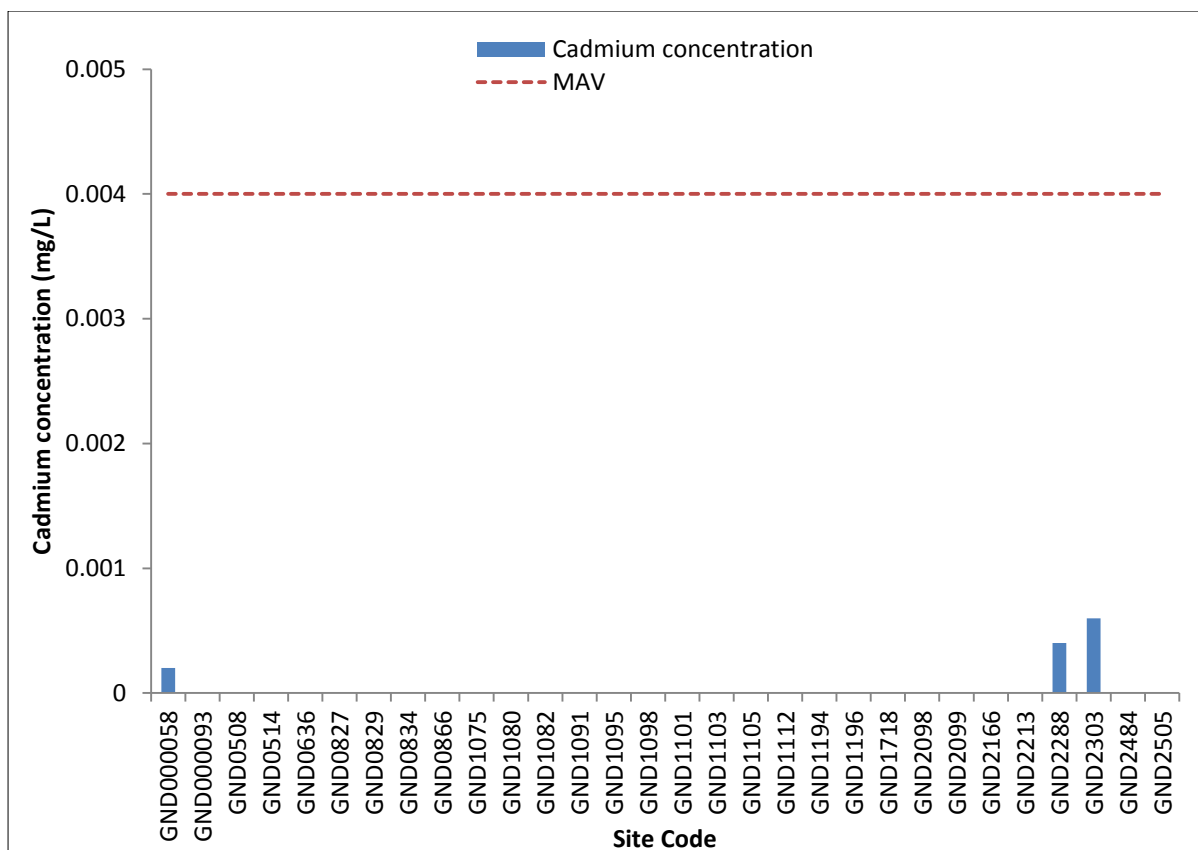


Figure 2 Measured cadmium concentrations compared to New Zealand drinking water MAV

The maximum acceptable value (MAV) for cadmium in drinking water is 0.004 mg/L, as outlined in the Drinking-water Standards for New Zealand 2005 (revised 2008). Of the 30 samples collected as part of the 2015 survey, 27 samples returned cadmium concentrations of less than the laboratory detection limit of 0.0001 mg/L, or more than 40 times below the Drinking-water Standard. The highest cadmium concentration detected was 0.0006 mg/L, which is still an order of magnitude lower than the MAV for cadmium in drinking water of 0.004 mg/L.

Only two sites (GND1112 and GND0834) were sampled during each of the 2009 and 2015 cadmium surveys. Both sites returned cadmium concentration below laboratory detection limits as part of each survey, indicating cadmium concentrations are showing no evidence of a trend at these locations despite ongoing use of superphosphate fertiliser.

In future, cadmium sampling will be continued in conjunction with the Nitrates in Shallow Groundwater monitoring programme, to enable results from each site to allow for temporal analysis. The sampling will next be repeated in 2025.

References:

Ministry of Health. 2005 (revised 2008). Drinking-water Standards for New Zealand. Wellington: Ministry of Health.

Taranaki Regional Council. 2009. Investigation into cadmium in shallow groundwater in Taranaki. Technical Report 2009-35. September 2009. ISSN:0114-8184 (Print). ISSN: 1178-1467 (Online).