

Groundwater quality at DPI Mangrove Mountain Poultry Burial Sites

December 2017

Background

Poultry carcasses and shed materials were buried in three containment pits in response to the Newcastle Disease Virus of Poultry Emergency at Mangrove Mountain on the Central Coast Plateau in 1999.

A project comprising three to four monitoring bores surrounding each pit to monitor potential impact from the sites on groundwater quality commenced in 2001.

Routine project activities also include:

- Landfill gas monitoring
- Design, installation and supervision of maintenance works
- Decision-support for impact mitigation options.

Key actions (2017)

1. Groundwater Monitoring Event 21 was completed in March 2017 and key results are reported in this information sheet.
2. Monitoring of pit surface soils for evidence of cracks, surface slumping or subsidence.
3. Extraction of waste-water (leachate) at the Waratah Road site (Total 2016 = 28,455 litres; To 30 Nov 2017 = 25,535 litres).
4. Routine site maintenance, including minor landscaping and grass mowing.
5. Groundwater monitoring and Waste-water services contracts continue.
6. Two new down-gradient monitoring bores installed at the Waratah Road site (Aug 2017).
7. Waratah Road automated leachate extraction system and on-site storage tank installed Aug/Sep 2017.
8. Core sampling and test-pitting of buried poultry shed litter contents and overburden materials for analysis and waste classification for Waratah Road site remediation planning (Sep 2017).

Groundwater monitoring results

Results for Event 21 (sampled March 2017) were received in September, 2017.

General comments

Zinc and copper concentrations reported in all project monitoring bores exceed the ANZECC (2000) trigger values for protection of freshwater aquatic ecosystems.¹ Concentrations are well below the Australian Drinking Water Guideline (ADWG, 2011) levels.¹

The nickel concentration exceeds the ANZECC (2000) trigger value in nearly all bores. Some bores at all sites exceed both guideline levels (ANZECC 2000 & ADWG 2011).

The aluminium concentration exceeds the ADWG (2011) (aesthetic) level in some bores. No health-based guideline level is established for acidic waters.

¹See notes on page 2 for background information relating to water quality guideline levels.

Bloodtree Road site

Groundwater flow direction (calculated from the Standing Water Level of monitoring bores) is generally west-south-west.

Nickel concentration exceeded the ANZECC (2000) trigger value in all bores on the site, except down-gradient bore BH1B. The ADWG (2011) level was exceeded in BH2 and the up-gradient bore BH3.

The ANZECC (2000) trigger value was exceeded for nitrate in all bores. The level is comparatively low, and has declined slightly since last round and seems to reflect a regional trend.

George Downes Drive site

Calculated groundwater flow direction in this round is to the west-north-west.

The ANZECC (2000) trigger value for nickel was exceeded in all bores on the site and the ADWG (2011)(health) level was exceeded in BH7. Variability in nickel concentration has increased in bores at this site since 2012 and levels have declined since last round. Similar variability in

copper and zinc has been seen in all bores since monitoring began.

The [manganese](#) level remains above the ADWG (2011)(aesthetic) level in BH5 and BH6. The level in BH7 exceeds the ADWG (2011)(health) level.

[Aluminium](#) exceeds the ADWG (2011)(aesthetic) level in bores BH5, BH6 and BH8H.

The nitrate level exceeds the ANZECC (2000) trigger value in BH4 and BH7, but levels are well below the ADWG (2011)(health) level.

Waratah Road site

Calculated groundwater flow direction remains generally east-south-east to south-east.

The ANZECC (2000) trigger value for [nickel](#) was exceeded in most monitoring bores on the site, aside from BH7W and BH12W. The level exceeded the ADWG (2011)(health) level in BH5W, BH9W, BH10W and BH11W.

The [lead](#) level in down-gradient bores BH5W and BH9W exceeds both the ANZECC (2000) trigger value, and the ADWG (2011)(health) level.

The ADWG (2011)(health) level for [manganese](#) was exceeded in the down-gradient bores BH5W, BH9W and BH12W in this event. The concentration reported in BH5W and BH9W also exceeds the ANZECC (2000) trigger value for manganese.

[Aluminium](#) exceeds the ADWG (2011)(aesthetic) level in down-gradient bores BH5W, BH9W and BH12W.

The ANZECC (2000) trigger value and ADWG (2011)(aesthetic) level for [ammonia](#) is exceeded in the down-gradient groundwater monitoring bores, BH5W and BH12W.

The ANZECC (2000) trigger value for nitrate is exceeded in all bores at this site. The ADWG (2011)(health) level for [nitrate](#) was exceeded in down-gradient bore BH5W. The concentrations in BH5W and BH9W have declined since GME20 (October 2016).

Liquid seepage from the poultry shed litter containment pit, along with the nutrient legacy from previous land use on this site (intensive piggery), are potential sources of the contaminants reported.

Next steps

- Groundwater Monitoring Event (GME22) was completed in October, 2017. A report is expected before GME23 (Mar 2018).
- Site maintenance actions, as required.
- Regular waste-water extraction and transport off-site for treatment and recycling to continue at the Waratah Road site.

¹ The [ANZECC \(2000\) Trigger Values for the Protection of Freshwater Aquatic Ecosystems \(95% level of protection\)](#) were developed for surface waters, not groundwater. NSW EPA *Guidelines for the Assessment and Management of Groundwater Contamination* indicate that the trigger values should be used as Groundwater Investigation Levels (GILs). The EPA guidelines also state that exceedance of GILs indicates a need for detailed assessment. This is because natural background concentrations, diffuse regional contamination, the fate and transport of contaminants in groundwater and potential exposure pathways must all be considered. For example, there is diffuse regional contamination by nitrate in the Mangrove Mountain area.

An increase in soluble metals is often associated with a decline in groundwater pH. Minor increase or exceedance of GILs for metals is not assumed to relate to contamination from the burial pits. Seepage from the pits would likely also result in a significant increase in ammonia, nitrate, Total Dissolved Solids and electrical conductivity, for example.

The National Health and Medical Research Council's Australian Drinking Water Guidelines are not specifically for regulation of groundwater quality. They are an excellent source regarding the health issues related to drinking water. They can be viewed on-line or downloaded at [Australian Drinking Water Guidelines \(2011\)](#). Fact sheets provide background regarding health considerations of key water quality parameters. Access the relevant Factsheet at the web hyperlink for each analyte where exceedance is noted.

More information

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Or via [Mangrove Mountain groundwater monitoring on the DPI web-site](#)

[Note:](#) Statistical analysis reports (1999-2015) are on the project web-page.

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