



Technical Fact Sheet: CSG Water Testing

Last updated: May 2014

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Sydney: 02 9262 6989

Northern Rivers: 1800 626 239

Rest of NSW: 1800 626 239

EDO NSW has published a book on mining and coal seam gas law in NSW. For a comprehensive guide to mining and CSG law in NSW, read [Mining Law in New South Wales: A Guide for the Community](#).

Overview

EDO NSW has prepared this information in response to community queries regarding water quality testing and coal seam gas (CSG) operations. This document is designed to provide some guidance for community members with limited resources on what water testing may be useful for identifying water impacts from CSG operations that are planned for an area.

Please note that this information is not designed to provide comprehensive baseline data on water quality and quantity in a region and does not replace the need for landowners to ensure any results from water testing done on their property is available to them.

¹ http://www.edonsw.org.au/legal_advice

Water Quality Testing Options

EDO NSW has identified four levels of groundwater testing that are available to individuals and community organisations in advance of coal seam gas operations entering an area. Each level comes with different costs, reflecting the different amount of information available. These testing options are not designed to be comprehensive but to provide options for individuals and groups wishing to obtain independent information.

Level 1 – Groundwater Levels

This level of sampling is designed to be low cost and relatively easy to complete without detailed technical knowledge. Results could be used to identify broad scale environmental changes that indicate the need for further research.

Changes in bore water levels outside the normal range can be indicative of changes in the aquifers in the region. To understand the significance of changes it is necessary to measure groundwater levels over as long a time as possible to account for natural variation due to seasonal and other changes. Measurements should be recorded to the nearest centimetre e.g. 5.32m below top of casing or ground level.

Water levels can be measured either manually or automatically using data loggers. To measure water levels manually use a water level dipper. There are a number of different types of water level dippers available varying from a tape measure with a weight on the end through to an electrical sensor that beeps when the tip hits the water level. These measurements should be taken at least monthly. Data loggers are able to measure water levels on a continual basis. The cost of data loggers has recently reduced, potentially making them affordable to the broader community. However, users will require some technical training in the use and maintenance of these instruments.

If the area of interest contains groundwater dependent springs, visual observation of these springs should also be recorded. Record information such as the location of springs, an estimate of flow rate and a visual assessment of the quality of water. Information on flow rate and quality should be collected on a monthly basis.

It can be useful to compare information from private landowner bores to those monitored by the NSW Government. To determine whether there are Government-monitored bores located near your property visit the NSW Office of Water Groundwater Bore records under the [Natural Resources Atlas](#). Additional

information on groundwater bore measurements can be obtained from [waterinfo.nsw](http://waterinfo.nsw.gov.au).

Summary

Type of test: Water level monitoring

Frequency: At least monthly

Cost: \$0-1000 (depending on the type of equipment used)

Level 2 – Basic Water Quality Sampling

Once off basic water quality sampling is of limited value as it would be difficult to demonstrate any statistically significant change to water quality over time. However, if there are limited funds available for water testing, the focus should be on testing for the major cations and anions found in groundwater.

The types of chemicals to test for include calcium (Ca), magnesium (Mg), sodium (Na), potassium (K), bicarbonate (HCO₃), chloride (Cl) and sulphate (SO₄).

Other parameters to test for include: pH, electrical conductivity (EC), and total dissolved solids (TDS).

Ideally this testing would be conducted in the same bore at least every three months over a one year period to give an indication of natural variation. To make this testing as effective as possible, consider working with your neighbours and collectively selecting bores for testing that are in the areas most likely to be impacted by future CSG operations and therefore indicative of what is happening in the different aquifer types which may be impacted in the region. Groundwater samples for testing should be collected after three well volumes have been pumped from the bore. Therefore, the ideal time to sample would be after the well has been pumped for an extended period.

The laboratory which is to analyse the samples will supply appropriate pre-prepared bottles in which to collect the samples (free of charge). They should also supply simple guidelines as to how to take the sample, how to keep the sample at home prior to delivery to the laboratory and how quickly the sample must be provided to the laboratory. Please note that these guidelines must be followed to ensure that the testing results are valid.

To identify an appropriate accredited laboratory visit the [National Association of Testing Authorities, Australia](http://www.nata.gov.au).

Summary

Type of test: Testing of ions in groundwater

Frequency: Ideally quarterly

Cost: Depending on the lab used, allow approximately \$100 plus transport costs for each bore tested.

Level 3 – Repeat Sampling

In 2011, the Queensland Department of Environment and Resource Management (DERM) developed a *Baseline Assessment Guideline for Coal Seam Gas*.² While taking a small number of measurements using these guidelines should not be considered a baseline study, the guidelines do provide a useful suite of testing recommendations. In the tables below, the DERM water quality testing parameters plus additional relevant parameters are listed to provide further details on the groundwater quality.

Ideally this testing would be conducted at least every three months for two years prior to any CSG exploration to give an indication of natural variation. Again, this would be most effective if individual landholders work with their neighbours and collectively select bores for testing that are in the areas most likely to be impacted by future CSG operations and therefore indicative of what is happening in the different aquifer types in the region.

Minimum water quality analytes for coal seam gas areas

Category	Parameters
Physical parameters	pH (field and laboratory) temperature (field only) electrical conductivity (field and laboratory) total dissolved solids (laboratory only) Sodium Absorption Ratio benzene toluene ethyl-benzene xylene (Total) naphthalene phenanthrene benzo (a) pyrene sodium hypochlorate

² Department of Environment and Resource Management (2011) Baseline Assessment Guideline Coal Seam Gas Regulatory Project, Queensland Department of Environment and Resource Management, pp 10-11.

	sodium hydroxide formaldehyde ethanol gross alpha radiation	
Ions	calcium chloride fluoride magnesium	potassium sodium sulphate
Metals (dissolved & total)	aluminium arsenic barium beryllium boron cadmium chromium cobalt copper iron caesium mercury strontium tin	lead manganese mercury molybdenum nickel selenium uranium vanadium zinc antimony lithium silver thorium titanium
Alkalinity and hardness	alkalinity - bicarbonate, carbonate, hydroxide and total as CaCO ₃ (field and laboratory) total hardness as CaCO ₃	
Dissolved gases	carbon dioxide (field) methane hydrogen sulphide	
Nutrients	ammonia nitrate as N nitrite as N nitrate + nitrite as N total nitrogen as N total phosphorus	
Organic Carbon	Total Organic Carbon (TOC) Total Petroleum Hydrocarbons (TPH): C6-C9 fraction Total Petroleum Hydrocarbons (TPH): C10-C14 fraction	

	Total Petroleum Hydrocarbons (TPH): C15-C28 fraction Total Petroleum Hydrocarbons (TPH): C29-C36 fraction
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Additional water quality analytes for coal seam gas areas

Category	Parameters
Phenols	Phenol 2 Methylphenol 3- & 4 - Methylphenol TRH Phenol d6 2-Chlorophenol D4
Microbiological	total heterotrophic plate count sulphate-reducing bacteria
Miscellaneous	ionic balance sodium adsorption ratio (calculated)

Summary

Type of test: Water quality testing

Frequency: Ideally quarterly

Cost: Depending on the lab used, allow approximately \$1,500 plus transport costs for each bore tested.

Level 4 – Borehole Yield Testing

A landholder may also wish to determine the sustainable yield of their groundwater bore or well prior to any CSG testing being undertaken close to the property. Such testing can establish a pre-activity value for the bore or well prior to any impacts occurring. There are a number of ways borehole yields can be tested, including drawdown testing where the bore is pumped for 12 hours to a number of days. The most appropriate test to use will depend on the local geology.

Summary

Type of test: Sustainable yield testing of each bore

Frequency: Once prior to any CSG activity in the area

Cost: Landholders are unlikely to be able to complete these tests alone and should allow \$10,000 - \$15,000 for consultants to complete such testing.

Useful web links

For more general information on water quality testing and evidence gathering please see our Fact Sheets on [Evidence Collecting and Environmental Investigations](#) and [Water Quality Assessment](#).

There are a number of publications available in the public domain looking at groundwater testing and coal seam gas. One useful document was commissioned by the Chief Scientist & Engineer in NSW and prepared by the Water Research Laboratory at the University of New South Wales: [*Background Paper on Groundwater Resources in Relation to Coal Seam Gas Production*](#).

To identify an appropriate accredited laboratory visit the [National Association of Testing Authorities, Australia](#).