Produced water and coal seam gas

What is produced water?

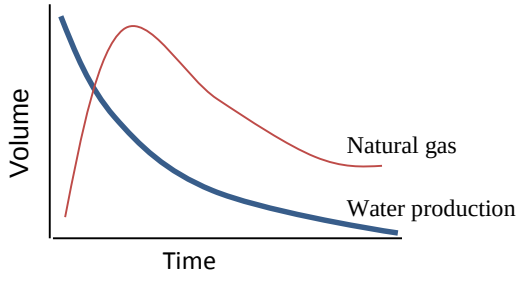
Natural underground oil and gas reservoirs often contain groundwater as well as oil and gas. *Produced water* is the term used to describe groundwater incidentally brought to the surface when coal seam gas (CSG) is extracted.

Produced water is different to the water returned from a gas well if the coal seam has undergone hydraulic fracture stimulation. When the water injected as part of the hydraulic fracture stimulation process is recovered, it is known as *flowback water.* This flowback water contains fracture stimulation fluids and is stored, handled and disposed of separately to produced water.

Produced water generation

Under natural conditions the hydraulic pressure of groundwater at depth keeps natural gas within the coal formation. To access the gas this groundwater is extracted, so that the pressure of the coal seam decreases and the gas is mobilised. This allows the gas to be extracted via the production well.

The volume of produced water varies depending on the coal depth, permeability, geology and the age of the CSG reservoir. Water production declines over the life of a project as the flow of produced gas increases. Groundwater extraction across NSW is assessed and licensed by the NSW Department of Primary Industries Water.



Relationship between natural gas and produced water production over the life of CSG projects

What is in produced water?

Water produced from coal seams has typically been underground for thousands, to hundreds of thousands of years. While this groundwater slowly moves through the subsurface it can react with or dissolve minerals. As a result, the composition of produced water and its quality varies considerably depending on the specific area's geology, age, the composition of the coal seam and the depth of the target coal seams.

Some coal seams contain water that is relatively fresh, while others may contain considerable quantities of dissolved salts such as sodium chloride and sodium bicarbonate. In many instances the water is brackish (salty) and may contain traces of other naturally occurring substances associated with hydrocarbon reservoirs, including BTEX chemicals (BTEX fact sheet).

Storage of produced water

Once produced water is brought to the surface, it is collected in above-ground storage tanks or ponds. In 2011, the NSW government banned the use of evaporation ponds as a disposal option.

Produced water from CSG activities must be properly and lawfully managed, stored, transported and disposed of in a way that protects the environment and community in accordance with the *Protection of Environment Operations Act 1997* and associated Environment Protection Licence (EPL) requirements.

Beneficial re-use and treatment options

The NSW government recommends a best-practice approach for deciding the most appropriate re-uses of produced water. The most appropriate beneficial re-uses depend on the quality and quantity of produced water, local climate, soils and geology, existing land and water use, industry and employment within the region.

Examples of beneficial re-use options include irrigation, dust suppression, re-injection, fire protection or a combination of several options. NSW government agencies are responsible for assessing and approving beneficial re-use options.

Multiple water treatment methods are available and can vary from simple dilution or blending to large purpose-built water and brine treatment plants. Depending on the beneficial re-use proposed, varying levels of treatment or a combination of treatments are required to ensure the water quality is fit for purpose. Some treatment options generate by-products and waste that must be disposed of in accordance with the EPA's Waste Classification Guidelines and EPL conditions.

Brine is a by-product of produced water treatment. Salt may be recovered for sale or re-use, or the brine can be disposed of to a licenced waste facility authorised to accept it.

Monitoring and compliance

All CSG operations in NSW must be covered by an EPL issued by the EPA. The EPL controls all aspects of produced water management including treatment processes, associated disposal arrangements, monitoring, and reporting mechanisms to ensure the EPA can actively monitor compliance. Produced water monitoring focuses on produced water storage, transfer and treatment infrastructure and discharge to beneficial re-use, where approved. Baseline surface and groundwater studies assessing site suitability and existing conditions are required before a project's commencement.

Reporting environmental incidents

The EPL also requires the company to immediately notify the EPA and all other relevant authorities of incidents causing or threatening material harm to the environment. These incidents may include potential spills and accidental mismanagement of produced water.

Environment Line handles general enquiries and takes reports of pollution. Environment Line can be contacted on 131 555 or email info@environment.nsw.gov.au .

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