Water is a key consideration for the Hume Coal project. The company has a comprehensive understanding of the groundwater and surface water environment, developed through years of monitoring, testing and observation. Hume Coal’s aim is to manage all effects on water resources around the project area within the frameworks and policies set by the government, including the Aquifer Interference Policy.

Within and around the project area there are two main rock units overlying the coal seam; these are the Wianamatta Shale and the Hawkesbury Sandstone. The sandstone is typically about 100m thick and is the main groundwater-bearing rock. It commonly overlies the target coal seam. Where the shale is present, it overlies the Hawkesbury Sandstone. As a general rule, to the west of the Hume Highway there is no shale present, and the sandstone extends to the surface.

A third rock type also exists in some areas between the Illawarra Highway and Exeter, known as basalt. This rock of volcanic origin generally overlies the shale, where it is present.

In all three rock types, the groundwater exists within tiny fractures and planar (flat) surfaces in the rock, as well as within pore spaces (tiny holes) within the rock itself. Generally, the fractures and planes within the rock provide the conduits and barriers that control how the water moves within the rock.

The flat surfaces in sedimentary rocks such as sandstone are generally horizontal, which means that water moves much more easily in a horizontal direction than it can in a vertical direction. This is important to understand when considering the effect of a mine beneath a groundwater-bearing sedimentary rock. Within the Hume project area, the groundwater typically flows up to 100 times more readily in the horizontal direction than it does vertically. This is why you will often see water seeping out of a road cutting along a horizontal line after a period of wet weather. (Examples of this may be seen near Mooney Mooney Bridge on the Newcastle Freeway or near the Appin Road onramp of the northbound lanes of the Princess Motorway.)
The Hawkesbury Sandstone rock formation is the main regional source of groundwater. It is generally fresh water and is accessed by bores that vary in their yields. It is also very high in iron and other natural minerals and generally requires treatment prior to household use. There are 1,954 registered bores in the Wingecarribee Shire, and the majority of these are in the Hawkesbury Sandstone.

Rainwater permeates into the groundwater system and recharges (tops it up) in the areas where the sandstone is exposed on the surface, and to a lesser extent, through the shale and basalt.

The natural water quality in the Hawkesbury Sandstone is generally suitable for irrigation and domestic and stock supply, and household use - if properly treated.

The iron content is around 25 times higher than recommended for drinking water, and this affects the water’s taste and aesthetic values.

MINING AND WATER

The Hume Coal Project will use a mine design which involves mining about one third of the coal reserve on average, and leaving behind large blocks of coal to support the rock strata above. About two thirds of the coal will be left in place. This will prevent the rock above the mined areas from collapsing, unlike many other mining systems. This is a key point of difference between the Hume Coal project and more traditional Southern Coalfield mines.

This means that the characteristics of the overlying rock will remain virtually unchanged from the pre-mining conditions, and the ability for groundwater to move vertically into the mine will continue to be much lower than its ability to move horizontally within the rock. This protection of the overlying rock strata greatly reduces the flow of groundwater into the mine. Many other mining systems do not achieve this outcome and this is yet another key point of difference with the Hume Coal project.

In addition to the low extraction ratio and stability of the overlying rock, the mine will be divided up into discrete mining areas, or panels. Once mined, the panels will contain open voids that will be partially backfilled with rock and stone material that has been separated from the raw coal in the coal preparation plant and returned underground. Once backfilled, the panels will be sealed and water will be allowed to flow into the sealed panels, resulting in lower groundwater inflows to the workings and faster recovery of the overlying groundwater system after mining. Once mining ceases permanently, groundwater inflow to the mined-out void will continue for approximately three years before ceasing. Water flowing into the mine voids will be available for other groundwater users as it will remain part of the greater groundwater resource.

Sealing the panels will also allow water to be transferred underground when there is too much water in the mine’s water management system, which aims to reuse as much mine water as possible on site.
GROUNDWATER MODEL

Hume Coal’s groundwater model allows us to predict the future changes in groundwater levels, and the effects this will have on landowner bores. This model was developed using data gathered over years of groundwater monitoring and testing, and geological data gathered over decades. This model has been peer reviewed by two of the most pre-eminent water experts in the field.

The model was designed to predict the influences of mining on the groundwater system, and registered bores in and around the project area.

Under the government’s Aquifer Interference Policy, Hume Coal is required to “make good” where the project’s effect on a bore exceeds the ‘minimum impact criteria’. This generally means that there is more than two metres decline in the water level in the bore.

The actual measures taken to ‘make good’ are devised on a case-by-case basis and depend on the amount of the effect, the type and construction of the bore, the usage patterns and other factors.

WATER LICENCES

The government requires coal mines to hold water licences for all groundwater and surface water that is used by the mining operation or enters the mine workings.

These licences are purchased on an open market, similar to other property transactions. The total amount of available licences in the area is equal to about 12 billion litres - or 12 gigalitres (GL) - per year.

The total sustainable yield (also referred to as the long-term average annual extraction limit) is the amount of water that can be extracted from the water source without any effect on the water source’s long term health (as determined by the government).

The total licence pool for the area is about 12% of the total sustainable yield for the region, which is around 100 GL per annum (or about 20% of the volume of Sydney Harbour). About a further 12% is held in groundwater entitlement in the adjacent zone. This leaves about 75% of the total sustainable yield for the two zones unallocated and unused.

In the second half of the mine life, Hume Coal will require a peak of about 2.2GL of annual groundwater licence allocation in order to satisfy the government’s licencing requirements. This is equivalent to 2.2% of the total sustainable yield for the region.

Hume Coal has already secured in excess of 60% of the peak licence volume needed. This is sufficient water licence volume to meet the licencing requirement of the mine until about 2028.

Owing to the mine design, however, more than two thirds of this groundwater volume will remain in the groundwater system for other users to access, since not all of the water that is used or enters the mining workings will be pumped out of the mine. Hume Coal currently holds more than the required licence volume to cover the water actually pumped to the surface and used by the mining operation.

Hume Coal will continue to buy water licences on the open market until the peak volume needs are satisfied. The rights of all other licence holders will not be affected.
GROUNDWATER QUALITY

Water quality is a science based on chemistry. Water quality can be tested, monitored and modelled using scientific techniques. It is important to recognise that groundwater is not pure water, and contains a range of natural impurities. These are generally dependent on the host rocks and surrounding rocks. These impurities can be dissolved (e.g. salts) or undissolved (e.g. algae and small particles).

Hume Coal has undertaken more than four years baseline groundwater quality monitoring and testing, in and around the project area. This work has found that the existing groundwater is currently high in certain compounds such as dissolved iron, and needs treatment before domestic usage. The average iron content in the groundwater is around 25 times higher than the aesthetic limit for household use. Other contaminants that occur naturally, but are above drinking water guidelines include copper (1.5 times), nickel (1.15 times) and selenium (14 times).

The natural groundwater is also slightly acidic. Groundwater in the sandstone is generally low in salinity, but in the shale is high in salinity. The level of salinity is indicated by the “conductivity” of the water.

These impurities can change their nature when exposed to air (e.g. iron, which oxidises to form a red stain. When this occurs, the iron goes from being dissolved, to being solid.)

Hume Coal will not make these natural groundwater impurities worse. In fact, the test work demonstrated that the mining operation will likely have a slightly positive effect on groundwater quality. The addition of a small amount of limestone to the waste rock returned to the mine void will help reduce acidity of the groundwater. As it moves closer to pH neutral this may help lower the levels of other natural suspended and dissolved impurities.

BORES AND GROUNDWATER QUALITY FACTSHEET

Some examples of make good arrangements include: financial contribution for increased pumping costs; changing the positioning of the pump so it is more efficient; and drilling a new bore in a different location on the property.

The groundwater assessment found that the project will have a “greater than minimal impact” on bores registered to about 70 landowners in the vicinity of the projects underground footprint. This is less than 5% of the total number of bores in the region.

There will be no effect on the remaining registered bores in the region.

Under the ‘make good’ provisions of the Aquifer Interference Policy, Hume Coal is required to ensure landowners have a continuous supply of water.

Around a third of these effected bores will need to be re-drilled because they are either too shallow or they intersect the coal seam which will be mined. The remainder of the bores will either require the pump to be deepened and/or compensation for increased pumping costs.

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