

1.1 Regulatory Approval Context

Bowdens is currently responding to revised Secretary's Environmental Assessment Requirements (SEARs) after the Director-Generals requirements were issued for the proposed Bowdens open cut pit Silver Project (Bowdens) SSD 5765 on 25/2/2013.

The exact nature of Bowdens plans for the site are unknown, however, the regulatory approval process can provide a guide. As a State Significant Development, Bowdens have been granted the rights to bypass the following requirements under Section 89J of the *Environment Planning and Assessment Act 1979*:

- Permit under section 201, 205 or 219 of the *Fisheries Management Act 1994*
- A water use approval under section 89, a water management work approval under section 90 or an activity approval under section 91 of the *Water Management Act 2000*

And is applying for

- An aquaculture permit under section 144 of the *Fisheries Management Act 1994*
- An approval under section 15 of the *Mine Subsidence Compensation Act 1961*
- An environment protection licence under Chapter 3 of the *Protection of the Environment Operations Act 1997*
- An aquifer interference approval under section 91 of the *Water Management Act 2000*

In August 2017, the Department for Planning revised the 2016 SEARs (lodged for a *Coal Mining Project Type*) with the following:

- Bowdens must establish and operate a Community Consultative Committee (CCC) following the *CCC Guidelines 2016*
- Bowdens should (rather than must) consult with relevant stakeholders
- Bowdens must describe the consultation that was carried out, identify the issues raised during consultation (including by the CCC), and explain how these issues have been addressed.

This post dates the Noller (September 2017) comments regarding the 2016 SEARs. With this context three groundwater matters are presented in this preliminary report, starting with a discussion of the groundwater sources in the area.

1.2 Groundwater Sources

Bowdens has not published how they may interfere with the groundwater sources in the area. Groundwater sources are shared amongst users and the environment. The NSW Murray Darling Basin **Fractured Rock** and **Porous Rock** Groundwater Sources are the aquifers of interest in the relevant **Water Sharing Plans** governed by the Department of Primary Industries Water (DPI Water) for the proposed mine site.

In 2017, strategies and rules for forthcoming **Groundwater Resource Plans** were released, including:

- GW10 Lachlan Alluvium (draft due in Feb 2018)
- GW11 NSW Murray-Darling Basin Fractured Rock (draft due in July 2018)

These Resource Plans will specify Sustainable Diversion Limits (SDLs) which are comparable to Long Term Average Annual Extraction Limits (LTAAELs) that should be available for shared use, and they will engage stakeholders and government agencies via a Stakeholder Advisory Panel. These Resource Plans will be available in 2018.

The proposed mine site lies within the Lachlan River Basin of the Central West Region of NSW and comprises over thirty land parcels. Almost half of these properties have at least one groundwater bore (Figure 1). Of twelve bores investigated, these are licensed under the *Water Act 1912*, including licences as recent as September 2017. Bowdens has not converted the licences to the *Water Management Act 2000*, and the conditions under the older Act are not as transparent as under the newer Act.

These were monitoring bores with no allocation for extraction of water. The monitoring bores on site include the fractured breccia of the Rylstone Volcanics from 5 to 90 m below natural surface (BNS). Between the mine site and Lue lies the Coomber Formation and Quaternary alluvium. Conceptually, there is no evidence of a barrier to groundwater flows between the Rylstone Volcanics at the site and the downgradient Quaternary alluvium or surface water bodies as described in Noller (2012).

The flow rates from bores within the breccia are 0.1-3 L/s which are low to moderate. Higher rates are available in bores in the Quaternary alluvium, however, this may be in hydraulic communication with Lawsons Creek. DPI Water (2012) states that the fractured rock aquifer of the Lachlan Fold Belt MDB has low-moderate connection between surface and groundwater, with years to decades of travel time between surface and groundwater.

Depending on the volume of water required by the proposed mine, a borefield could supply water to the mine from bores on or around the site if licences were granted by the NSW Office of Water.

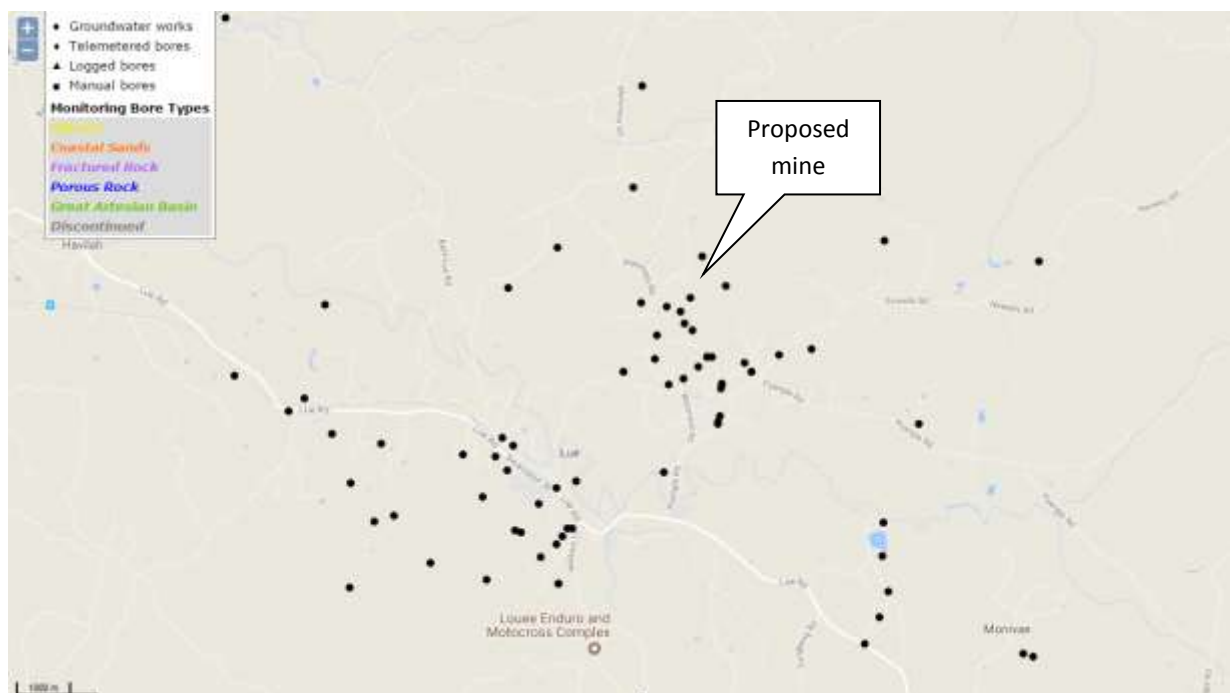


FIGURE 1: DPI OFFICE OF WATER GROUNDWATER BORES FROM DPI WATER (2017)

Results of interference in groundwater sources

Groundwater sources may experience

- Decreased water supply due to mine dewatering which may impact surface water;
- Compaction of the aquifer caused by subsidence after de-watering, resulting in less long term water storage capacity;
- Contamination of water quality due to
 - mine waste discharge, including acid mine drainage
 - poorly sealed exploration bores
 - mine workings that enable inter-aquifer flow
 this may damage ecosystem (including human) health due to mine waste discharge.

1.3 Groundwater Usage within 10 km of Lue

LAG is interested in water availability near the site. The groundwater availability can be assessed by reviewing the water sharing plans and the local subsurface infrastructure.

In addition to existing entitlements issued to take water, Controlled Allocations or the right to groundwater are sold periodically by DPI Water. On the 5th May, 2017, 37,723 ML/a of Lachlan Fold Belt MDB and 8,600 ML/a of Sydney Basin MDB Groundwater Source was offered to buyers at \$650/ML/a. The response to this offer has not yet been published.

1.3.1 NSW Murray Darling Basin Fractured Rock Groundwater Sources Water Sharing Plan

The Water Sharing Plan entitlement for the **Lachlan Fold Belt MDB** is 73,599 ML/a for irrigation and industrial purposes, and the estimated domestic and stock water requirements are 74,311 ML/a in DPI Water (2012). A further 5,101 ML/a comprises licensed town water supplies. Due to the high amount of LTAAEL in the Lachlan Fold Belt MDB Source, this may be a target for mine water supply.

Within the Fractured Rock Groundwater Source, the Lachlan Fold Belt MDB (Mudgee) and Lachlan Fold Belt MDB (Other) Water management zones govern groundwater trading. Over the past five years, between 130-400 ML/a of allocations have been traded within the Lachlan Fold Belt MDB Groundwater Source.

An entitlement of 300 ML/a from this Source was purchased for \$240,000 in 2013. The location of this entitlement in the Lachlan Fold Belt MDB Source has not been published.

1.3.2 NSW Murray Darling Basin Porous Rock Groundwater Source Water Sharing Plan

Water Sharing Plan entitlement for the **Sydney Basin MDB** Groundwater Source is 2,657 ML/a for irrigation and industrial purposes, and the estimated domestic and stock water requirements are 465 ML/a in DPI Water (2012).

NSW offered a Controlled Allocation of 37,723 ML/a at \$650/ML in the Lachlan Fold Belt MDB Groundwater Source and 8600 ML/a at \$650/ML in the Sydney Basin MDB Groundwater Source in March 2017.

There are over a hundred bores registered within 10 km of Lue that may have groundwater allocations. The depths range from 3 to 213 m below natural surface (BNS), with an average depth of 50 mBNS. 42 bores are deeper than 50 m, targeting the fractured rock aquifer at ~60 mBNS. Yields from these bores are reported at 3 L/s, which is a moderately good water supply.

Bowdens mine water use and dewatering requirements (see Figure 2) may interfere with groundwater sources. Both of these activities can redirect local groundwater flow towards the site. Receptors (other groundwater users) may be affected. The Mid-Western Regional Council has identified the town water supply to be potentially affected by mining operations.

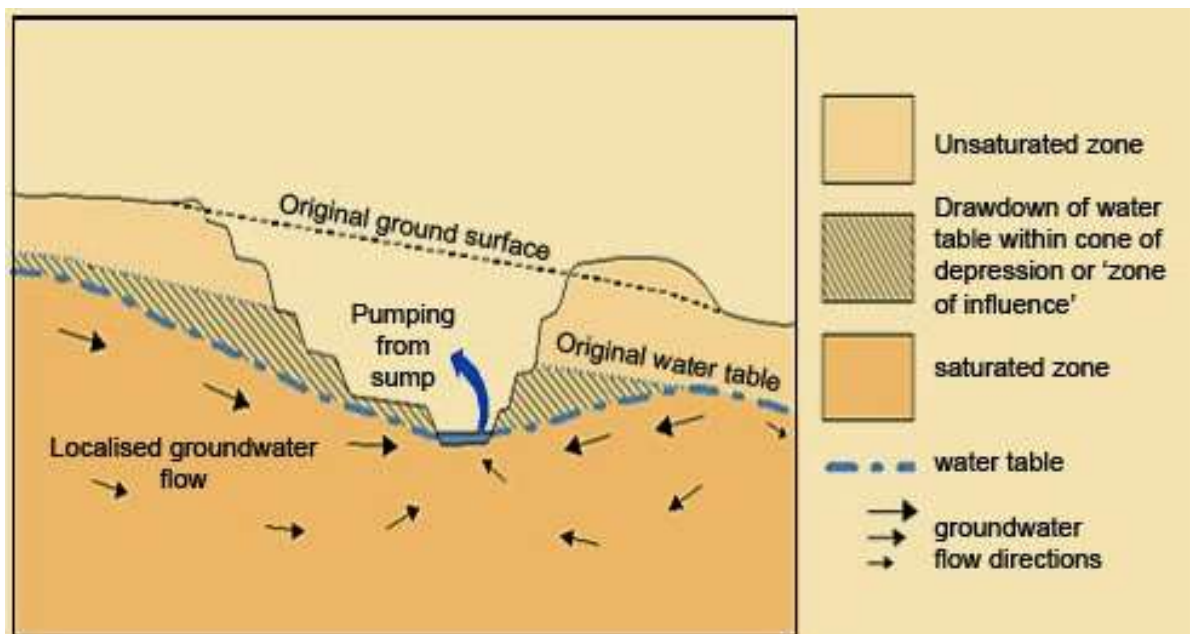


FIGURE 2: CONCEPTUAL MODEL OF GROUNDWATER FLOW AROUND AN OPEN PIT MINE

On September 2014, a continuous entitlement for 704 ML/a was purchased as a Controlled Allocation for \$563,200. The location of this entitlement in the Sydney Basin MDB Groundwater Source is not published.

LAG suggests that 600-900 ML/a may be required by Bowdens for water supply and more for dewatering. There are twenty extraction licences above 400 ML/a currently on issue for the Lachlan Belt Source and three for the Sydney Basin Source. Bowdens is likely to be able to purchase sufficient entitlement under Water Sharing Plans for the two groundwater Sources, however, Bowdens will still need to demonstrate that this level of extraction is acceptable at this location. If treated water is to be reinjected, appropriate management of the waste stream will be required even after the mine is abandoned.

Groundwater users can include natural ecosystems. Kellys Springs are a high priority groundwater dependent ecosystem (GDE) in the Sydney Basin MDB Groundwater Source ~80 km north of the proposed mine site. Ilford is another high priority karst environment GDE in the same source ~40 km south of the site. It seems unlikely that these GDEs would be affected by the mine, given their distances from the site.

1.4 Groundwater quality matters

Mines may impact groundwater quality due to

- salinisation of bores due to extraction or dewatering
- formation of hydrosulfuric acid and release of heavy metals due to oxygenation of rock in a process known as acid rock drainage or acid mine drainage as per comments in Noller (September 2017)
- discharge of solid and other wastes
- cross flow between aquifers due to poorly sealed exploration bores or mine workings
- cross flow between aquifers induced by de-watering

Consequential impacts from the release or leakage of groundwater flowing from the mine on surface water bodies are well documented. As well as indirectly supporting surface water ecosystems via pressure support, groundwater can also directly support ecosystems.

1.5 Recommendations

- There is potential for the fractured rock aquifer to communicate with surface water bodies. A **Class 3** numerical simulation model may help resolve this.
- Request chemical analyses of representative groundwater bores, including organic carbon, metals in ANZECC guidelines and antimony as a minimum for at least one year;
 - Request similar chemical analyses in surface water bodies;
- Obtain an estimate of net acid forming potential of the ore and overburden;
- Bowdens may have a groundwater entitlement for 300-700 ML/a. The proposed source of water supply and plan for a borefield should be clarified.
- Gather details of how acidic groundwater and seepage from tailings storage facilities will be contained at the mine for the next 100 years;
- Gather details of potential impacts to critically endangered species such as the Regent Honeyeater from groundwater disturbance;
- Request baseline studies of water quality for two years prior to exploration drilling;
- Gather background to the request for a mine performance bond from the Mid-Western Council
- Subscribe to a [RSS feed for the project at the Department of Planning and Environment](#)

Bibliography

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