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**Re: Hume Coal Project SSD 15_7172: Southern Highlands NSW – Objection to Project Approval**

## 1.0 INTRODUCTION

*Hydroilex* has been requested to provide a brief submission in conjunction with others lodged by, or on behalf of, *Coal Free Southern Highlands Inc*. in response to the proposed development of a large underground mine at Sutton Forest, NSW by Hume Coal. Our comments principally relate to the groundwater component of the EIS.

The submission relates to an EIS prepared for *Hume Coal Pty Ltd* by *EMM Consulting Pty Ltd* dated March 2017. The proposal is to develop a 3.5 million tonnes per annum underground coal mine having a mine life of 23 years encompassing an area of approximately 50km$^2$. The proposed mining of the Wongawilli Seam lies at relatively shallow depths in the range of 140m below ground level.

The proposed mine is located within a region of prime agricultural land, where arguably, the highest value rural lands and associated rural residential landholdings in regional NSW are located. The agricultural and 'lifestyle' values are supplemented by moderate to high-yielding groundwater resources, which provide a variety of water supplies for 'stock', 'domestic', 'irrigation', and 'industrial' purposes. Source aquifers from the Hawkesbury Sandstone are locally the most highly productive aquifers from within the Sydney Basin. The site encompasses one bore, for example ('Rosedale' GW107535), which is considered to singularly have the highest groundwater allocation of any 'fractured rock' aquifer source in the entire Basin. Ironically, the EIS states that this bore will suffer a predicted drawdown of 62m, and will take 53 years to attain 'near full' recovery.

The proposal is to mine a coal seam located immediately beneath the multiple layered aquifer system, within a region which possesses combined aquifer characteristics of enhanced porosity, permeability, fracturing and likely faulting, particularly in the basal part of the Hawkesbury Sandstone, in close contact with the coal seam.

Particular issues are: aquifer interference, impacts on licensed groundwater users, environmental impacts, mine safety (flooding), groundwater discharge and social economic factors which principally affect the approval process. These issues are apart from the visual and ancillary associated transport facility impacts.

It is apparent that various groundwater models have been generated by the proponent, and by *Pells Consulting* (on behalf of community interests), where very significant variations on regional drawdown impacts have been revealed, mainly associated with basic input data 'errors' from which the models have been created. In our opinion, there has been inadequate basic geological and rational hydraulic parameters adopted by the proponent. It is notable that models constructed by *Coffey* (2016) predicted groundwater inflows of 2.7ML/day, the EIS model predicted 6 ML/day, and that the *Pells* model predicts ten times greater that value.

We consider that there is greater confidence in the groundwater model developed by *Pells Consulting* 2017, and the associated risks generated by that model.

## 2.0 BACKGROUND STUDIES

*Hydroilex* has been involved in groundwater exploration and associated hydrogeological research in the Southern Highlands region of NSW for over twenty years, principally involved in the development of groundwater resources for irrigation purposes. The company is well-qualified to provide comment on the development proposal.

*Hydroilex* expertise in the region is supported by the following:

- Extensive local and regional experience in groundwater exploration in the region; the *Company* has been involved in several hundred individual groundwater assessments throughout the district; the proposed development of the Hume Coal Project is within an area where a number of high-yielding aquifer tests have been conducted;
- The development of a local and regional hydrostratigraphic framework over many years in conjunction with the accumulation of a large in-house geological and geophysical database. The *Hydroilex* stratigraphic nomenclature has been utilised extensively by Pells Consulting et.al in various studies in the region;
- Recognition of the importance of both stratigraphic and structural controls on high-yielding groundwater supplies in the region, where the main aquifer system rests directly on the coal resource;
- Local experience-based aquifer testing of numerous bores in the region;

## 3.0 VARIOUS ISSUES OF CONCERN

The principal objections for any approval of the proposal relate to the following main impacts which will be a consequence by the proposed operation:

1. A reduction of the water table by drawdown, affecting approximately four hundred groundwater users up to 8 km from the mine site, where the high-quality groundwater is reliant upon for 'basic rights' purposes and agriculture. The expected central drawdown has been modelled by Pells to have a central 120 metre drawdown cone above the mine, reducing to 5m drawdown at 6-8 km from the site;
2. The practical impossibility for the proponent to satisfy conditions of the Aquifer Interference Policy, where compensation, or any efforts to provide alternative supplies, or 'make good provisions' will be difficult to achieve. The need to deepen existing landholder

bores and re-equip them will be a costly outcome to effect, and many bores will be impossible to remediate due to their severe impact;
3. The likely aquifer depletion of groundwater supplies, with long-standing recovery;
4. The very significant safety risk associated with the proposed mining immediately below a regionally extensive high-yielding aquifer where fractures and faults combined with highly porous sandstone will likely cause mine flooding;
5. The proposed mining operations in an area of high agricultural productivity, coupled with the interference of these operations with groundwater depletion and associated financial losses;
6. The need to acquire large groundwater allocations from existing license holders to balance the disposal of mine waters, effectively creating a 'loss' of conventional access to that resource; the Water Management Act 2000 facilitates the assignment, transfer and purchase of groundwater rights. The project is likely to set precedents on the price per unit (currently 1 unit = 1 ML), and reduce the availability of water for trading purchases (and consequently the price). There too, is a risk that *NOW* may reduce the share ratio between WAL 'units' and ML within the water source.
7. Environmental damage by water discharge in watercourses;
8. Likely cementation of the aquifer by the precipitation of iron-rich oxides during dewatering, leading to its destruction and loss of primary porosity;
9. Significant interruption and interference with the lifestyle, agricultural value, and cultural character in one of the most significant rural regions in proximity to Sydney. The associated angst and disharmony towards the proponent, are important social factors where there is clearly an unprecedented opposition to the project.
10. The proposed development clearly creates a significant imbalance in mining rights vs landholder rights.

## 4.0 COMMENTS ON PETROPHYSICS AND AQUIFER TESTING

To our understanding, all drilling exploration activities have been conducted by core drilling, and only the monitoring bores by the rotary air drilling method. Consequently, very little groundwater aquifer yield data has been derived from a large number of drill holes.

In the EIS, *Pells* have adequately addressed the issue of an over-reliance of laboratory-derived petrophysical data, coupled with packer tests from which hydraulic conductivity data has been determined. They note the over-reliance on horizontal hydraulic conductivity determinations, and poor vertical hydraulic conductivity data, which reflect secondary fracture porosity groundwater contribution. They have also noted in the EIS the absence of useful data from within and directly above the coal seam.

The EIS states that only two formal aquifer tests have been conducted in the proposed mine area (one 24 hr test and one 7-day test. The lack of formal testing, and over-reliance on monitoring bore testing is considered a serious weakness in the groundwater assessment. In our experience, the Hawkesbury Sandstone exhibits much higher yields when formally tested, compared to air-lift measurements.

The absence of a thick overlying aquitard is clearly absent in the area. It is noted that at Illawarra Southern Coalfield mines, the Hawkesbury Sandstone is separated from the coal measures by a

several hundred-metre-thick sequence of Narrabeen Group (shales) which reduces groundwater ingress. At the Hume Coal site, the Narrabeen Group is absent. The proponent however maintains that a thin 2-metre-thick claystone horizon which overlies the coal will provide an effective barrier to groundwater ingress into the workings. The sealing integrity of that horizon is however questioned, as it has a variable thickness, is located at a disconformity between the Permian and Triassic, and that penetrative fractures, joints and faults are most likely to breach it.

The quantification of fracture, joint and fault intensity has not been quantified in the EIS. *Hydroilex* has recognised both regional and local faulting, and as example, at 'Rosedale', an open fracture system within the confines of the proposed mine is associated with massive pyrite. The bore was tested at 42 L/s with minimal drawdown (8.63m), discharging 3.63 ML/day. This bore will be dewatered if the mining operation is approved. The uncertainty of fracture distribution is a realistic risk for the operation. It is not evident in the EIS that any inclined drilling has been conducted to assess vertical / sub-vertical joint or fault features. The EIS does not adequately provide a strong geological component, where it is clearly evident from *Hydroilex* studies that the regional geology is quite complex. The region is characterised by significant multiple basic and acid Mesozoic intrusives, basaltic volcanics, and major faulting along the Mittagong Horst-Graben Complex. The impacts of these geological features are not identified within the project area. Although several faults have been identified, their attitude is not recorded, as are any details of the significant numbers of indicative diatremes defined in the mapping.

It is stated in the EIS that the average groundwater yield is approximately 2 L/s within a 9 km radius of the proposed mine. If that rate is correct, it does not reflect the absolute capacity of any bore, since most bores have not been constructed sufficiently deep to the higher-yielding aquifers in Hawkesbury Sandstone Unit A. It is also noted that the DPI groundwater database, upon which data has been derived, is highly inaccurate.

The simulated model drawdown impacts computed by *Pells* far exceed those predicted by the proponent, where twice as many bores will be impacted, compared to those defined in the EIS.

## 5.0 SUMMARY

The following is concluded from our review:

1. Social economic impacts should dominate any approval for development by the proponent. The project fails to meet basic environmental passes for a multitude of reasons, which in particular relate to groundwater issues of extraction, discharge, abstraction rates and exceptional impacts on current users.

2. The significant variances in groundwater models, coupled with the uncertainties of basic data used to generate the EIS model, coupled with a relatively poor understanding of the geological hazards of mining in the project area, demonstrate the extreme risks for any decision for development approval.

3. The project is clearly not conducive to the local environment, and should be rejected without further options.

## 6.0 REFERENCES

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*Pell Consulting* 2017. Groundwater Modelling of The Hume Coal Project, prepared for Coal Free Southern Highlands Inc. 22nd June 2017

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