NSW GOVERNMENT | Department of Primary Industries

OUT13/12566

29 MAY 2013

Mr Matthew Sprott
Mining Projects
NSW Department of Planning and Infrastructure
GPO Box 39
SYDNEY NSW 2001

Matthew.Sprott@planning.nsw.gov.au

Dear Mr Sprott,

North Wambo Underground Mine (DA 305-7-2003 Mod. 13)
Comment on the Response to Submissions Report

I refer to your email dated 18 April 2013 to the NSW Office of Water, a division within the Department of Primary Industries, in respect to the above matter.

Comment by NSW Office of Water
The NSW Office of Water had earlier evaluated the information provided in the Environmental Assessment against the Minimal Impact Considerations of the Aquifer Interference Policy. This assessment identified four areas where further information was required from the proponents:

(i) the potential for long-term salinity impacts to the alluvial aquifer of the Lower Wollombi Brook Water Source,
(ii) the distance of proposed mining operations from highly connected surface water sources,
(iii) cumulative impacts to nearby groundwater bores, and
(iv) impacts to groundwater dependent ecosystems (GDEs).

The proponents' Response to Submissions report provided responses to each of these concerns. These responses are reviewed in Attachment A.

For further information please contact Rohan Macdonald, Water Regulation Officer, Major Projects (Newcastle office) on 4904 2642, or at:
rohan.macdonald@water.nsw.gov.au

Yours sincerely

Phil Anquetil
Executive Director Business Services

Attachment A

North Wambo Underground Mine (DA 305-7-2003 Mod. 13)
Response to Submissions (RTS) Report

Comment by NSW Office of Water

---

1. Potential long-term salinity impacts

The Office of Water response to the Environmental Assessment stated:

- Fracturing to surface as a result of the proposed mining activity is predicted and acknowledged by the proponents. Such fracturing could exacerbate the degree of hydrological connection between the deeper and shallow coal seams and the alluvial aquifer which is a highly productive groundwater source.
- The groundwater of the Permian aquifer is saline and, as identified in the conceptual hydrogeological model, is driven under a pressure gradient to discharge to the alluvial aquifer and surface water drainage features. The post-mining Permian groundwater pressure levels will be still driven by aquifer recharge occurring in the elevated hills.
- The NSW Office of Water advises there is a high post-mining risk for the uncontrolled and increased release of poor quality saline groundwater into the alluvial and surface water sources. This would occur when the groundwater system re-equilibrates and groundwater discharge is no longer constrained by low permeability barriers that existed pre-mining. It is recommended these long term post-mining groundwater issues are quantified to enable appropriate consideration of mitigation and contingency requirements as set out in the Aquifer Interference Policy.

The proponent's have reiterated the Groundwater Assessment conclusion that the modification would not have a significant impact on the recovery of groundwater levels. The RTS states that "it cannot be considered that the alluvium and surface water sources would receive an increase in poor quality saline groundwater from the Permian aquifer post-mining". The justifications provided for this conclusion and the Office of Water's response to each are provided in Table 1 below.

Table 1. **Evaluation of potential long-term salinity impacts.**

RTS comment	Office of Water response
The conceptualisation of the groundwater regime included in the Groundwater Assessment cites the alluvium as a recharge source for the Permian aquifer (as opposed to the NOW conceptualisation). Section 2.6.1 of the Groundwater Assessment specifically states: *Evidence from temporal groundwater monitoring hydrographs (Attachment A) within the alluvium indicates that the shallow aquifer is responsive to rainfall recharge and it is likely that the alluvium plays an important role in supplying recharge to the underlying Permian strata as well as contributing to baseflow of the perennial surface water features.* [emphasis added]. Further, recharge from the Permian aquifer is not considered a significant recharge source for the alluvial aquifer. Section 2.6.3 states: *Groundwater may discharge to rivers and creeks and much of this discharge occurs due to shallow 'interflow' (i.e. movement of perched groundwater through regolith layers or alluvium after rainfall has*	The Office of Water has reviewed the bore hydrographs provided in the Groundwater Assessment. From the design of the monitoring network there are three instances where observations can be drawn on Permian levels and the alluvial water table: i. GW05 (shallow Permian) and GW11 and GW2 (alluvium). These three bores have similar AHD water levels/tables however GW05 was noted to be at a slightly higher elevation until North Wambo LW1 was extracted at which point a significant drop in GW05 occurred; ii. P202 (shallow Permian) and P106 (alluvium) express similar water table/level AHD elevations and are noted to have crossed over in several instances over the period of record; and iii. P104 (shallow Permian) and P114 and P116 (alluvium) show similar water table/level AHD elevations and are the closest bores to the proposed longwall panels.

RTS comment	Office of Water response
occurred). The discharge rates from deeper, hard rock aquifers to surface waters is limited due to the very low vertical permeability of the Permian strata. [emphasis added].	Thus, where the Permian and Alluvial bores are paired in close proximity to one another, the temporal hydrographs provide an alternative conceptualisation to that of the proponents. Of further note, the Groundwater Assessment states: *"Long periods of both open cut and underground mining within the WCPL-owned and adjoining mine leases has now created significant groundwater sinks. This is likely to have generated a regional zone of depressurisation within the Permian coal sequences."* (p 14) That is, the shallow Permian aquifers likely already exhibit a level of depressurisation not captured in the current hydrographs. Had mining not already occurred in this locality, the shallow Permian levels at the observation points noted above would be higher than observed. If recharge from the alluvium to the Permian could be inferred as the proponents assert, this would be an induced feature as a consequence of mining depressurisation. The mining and dewatering activities are on a temporary basis and Permian levels will re-pressurise in the longer term.
Further, recharge from the Permian aquifer is not considered a significant recharge source for the alluvial aquifer. Section 2.6.3 states: *Groundwater may discharge to rivers and creeks and much of this discharge occurs due to shallow 'interflow' (i.e. movement of perched groundwater through regolith layers or alluvium after rainfall has occurred). The discharge rates from deeper, hard rock aquifers to surface waters is limited due to the very low vertical permeability of the Permian strata.* [emphasis added].	The Groundwater Assessment states: "*...fracturing is expected to reach ground surface over the eastern 60% of the mine footprint*" and "[t]*he rocks in the connective-cracking part of the fractured zone will have a substantially higher vertical permeability than the undisturbed host rocks.*" (p 35) The alluvial areas will be part of the area where fracturing to surface occurs. The Office of Water retains the view that the pre-mining low permeability constraining vertical flow of saline groundwater will not exist post mining where fracturing to surface/base of alluvium is permitted. Goaf fracturing induces high permeability preferential flow paths for Permian saline groundwater to flow. On aquifer re-pressurisation, flow along induced preferential pathways poses a significant risk in the longer term for increased saline groundwater discharge in this locality.
In support of the conceptualisation, the Groundwater Assessment found that, although there would be upflow in places and downflow in other places, net groundwater leakage from the alluvium to the underlying rock occurred under pre-mining conditions. Section 5.5 of the Groundwater Assessment states: *Prior to mining, there was a natural downwards flow of groundwater of about 0.025 ML/day on average.*	The Groundwater Assessment states "*groundwater would flow from elevated to lower-lying terrain*" (p12). The Permian groundwater needs to discharge eventually and it is the alluvial areas that form part of the lower-lying terrain. The temporal hydrographs demonstrate this to be the case.

RTS comment	Office of Water response
The Groundwater Assessment included a post-mining recovery run simulation. This simulation found that groundwater levels in the Permian overburden would reach a new equilibrium at levels lower than those occurring under pre-mining conditions. On this basis, any discharge from the Permian system to the alluvial system occurring post-mining would be less than that occurring under pre-mining conditions.	The proponents' conclusion is drawn on a long term average recovered pressure level where realistically there are above and below average climatic conditions that can last decades or longer. This has a significant bearing on the duration and extent that Permian groundwater levels will fluctuate above and below the alluvial water table. The post-mining Permian groundwater pressure levels are still driven by aquifer recharge occurring in the elevated hills leading to the saline groundwater discharge in topographic low lying areas (alluvial). Furthermore: • the ground surface undermined is to be subsided; • the hydrographs show the Permian aquifer levels and alluvial water table are on par; • the vertical permeability will be dramatically increased; and • the shallow Permian aquifer levels likely already exhibit the effects of regional depressurisation, against which the groundwater model is calibrated. Collectively from this conceptualisation the risk for increased post mining salinity discharge is considered high.
The predicted incremental 20 millimetre subsidence contour due to the extraction of the Modification longwall panels is located well outside the estimated limit of alluvium for Wollombi Brook (Section 4.2.2 of the EA). As fracturing would not occur beneath the Wollombi Brook alluvium, the degree of hydrological connection between the coal seams and the Wollombi Brook alluvial aquifer would not be exacerbated.	As outlined in the Groundwater Assessment: "*The Project is subject to the Hunter Unregulated and Alluvial Water Sources Water Sharing Plan 2009. This Plan covers the unregulated rivers and creeks and highly connected alluvial groundwater within the catchment of the Hunter River. Part of the proposed mining will pass beneath the Lower Wollombi Brook Water Source, which includes several tributary creeks (e.g. North Wambo Creek) and the alluvium associated with those creeks.*" (p 16) The proponents make reference solely to the Wollombi Brook and not the Water Source as a whole. The proponents disregard that the alluvium of Wambo Creek forms part of the Lower Wollombi Brook Water Source. Should fracturing occur to the base of the alluvium associated with Wambo Creek, the degree of hydrological connection between the coal seams and the Lower Wollombi Brook Water Source would be exacerbated.

2. Distance to connected surface water sources

The Office of Water response to the Environmental Assessment queried whether the proposal would fall within Level 1 or Level 2 of the Aquifer Interference Policy's minimal impact considerations for water quality with respect to mining activity below the natural ground surface within 200 metres laterally from the high bank or 100 metres beneath of a highly connected surface water source that is defined as a reliable water supply.

The proponents have responded that "[t]*he Modification is located approximately 450 m from Wollombi Brook at its closest point and therefore would not result in a mining activity below the natural ground surface within 450 m of Wollombi Brook.*"

If the tributaries of the Wollombi Brook and associated alluvial aquifers are not considered a 'reliable water supply' then it is acknowledged the impacts will fall within Level 1, which is deemed acceptable according to the Aquifer Interference Policy.

3. Impacts to nearby bores

The Office of Water response to the Environmental Assessment stated that uncertainty exists as to whether groundwater drawdown and pressure changes within the alluvial and porous rock water sources will exceed 2m at neighbouring water users' bores. The Office of Water is satisfied that the 'make good' provisions of the Surface and Groundwater Response Plan, as outlined in the RTS, are adequate to address potential impacts to nearby bores.

4. Impacts to groundwater dependent ecosystems (GDEs)

The Office of Water response to the Environmental Assessment requested further information regarding GDEs.

The proponents have responded that "[t]*he Groundwater Assessment (Appendix B) concluded that the Modification would have no discernible impact on stream baseflow or natural river leakage beyond the effects of approved mining for Wollombi Brook, North Wambo Creek, Wambo Creek and Stony Creek*" and "*FloraSearch has advised that Central Hunter Paperbark Soak Woodland (Community 4) is the only vegetation community present above the Modification area that has any potential to be groundwater dependent*".

With the issues of concern raised by the Office of Water with respect to the potential long-term salinity impacts to the alluvium and connected surface water sources, it is difficult to assess what would be a 'discernible impact' on baseflow. Should it be found that the water quality discharging into Wambo Creek and Wollombi Brook would be altered due to mining then the ecological impacts would need to be reviewed.

For terrestrial vegetation, the Office of Water is currently preparing a high priority GDE layer for the Hunter Valley. It is currently unknown if the Central Hunter Paperbark Soak Woodland would be considered for listing as a High Priority GDE in the relevant water sharing plan.

Conclusions.

1. There remains some uncertainty in relation to assessment of the proposal against the minimal impact considerations of the Aquifer Interference Policy with respect to not changing the beneficial use of the groundwater source beyond 40 metres from the activity. The proponent should consider alternative conceptual models, consistent with the Australian Groundwater Modelling Guidelines, and consider the impacts where the Permian aquifers have both pre-mining and re-equilibrated Permian levels on par with the alluvial levels with the higher level of connectivity post mining so that the Office of Water can understand the potential impacts through the development of an associated water balance. The Office of Water would like to see:
   (i) consideration of collection of additional data to provide greater certainty to a particular conceptual model;
   (ii) a contingency plan to address what actions will be taken if the proponents' conceptual model is not correct, and how impacts will be mitigated; and
   (iii) a monitoring plan developed to ensure that we can improve our understanding of the connectivity as any activity progresses, and reassess the impacts on the water resources.

2. The Lower Wollombi Brook Water Source is categorised as a "reliable water supply". Although the proposed mining activity is a sufficient distance from the water source to satisfy the Level 1 minimal impact requirements of the Aquifer Interference Policy, there remains some risk of impacts to the water supply. The fracturing of strata at or close to the base of alluvial aquifers presents a risk of greater alluvial and surface water losses.

3. The Office of Water will advise when available if the Central Hunter Paperbark Soak Woodland is to be listed as a High Priority GDE in the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*.

End Attachment A