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16 July 2009

Our Reference: S03-L01b_09-07-16

Ashton Coal Operations Pty Ltd
PO Box 699
SINGLETON, NSW 2330

Attention: Mr Brian Wesley

Dear Brian,

Re: ASHTON UNDERGROUND MINE - IMPACTS ON RAVENSWORTH UNDERGROUND MINE

Following your request, we have considered potential impacts of the proposed LW/MW5-9 Pikes Gully Seam mining operation on the neighbouring Ravensworth Underground Mine (RUM).

We understand that RUM has expressed concern at the potential impacts of Ashton's proposal to extend the underground mine consent area close to the boundary of ML1533. The maingate headings of the westernmost panels (MW9 and LW9) will potentially be approximately 40m from RUM's main headings servicing their longwalls 11 to 15.

Areas of concern to RUM include *"…the impacts of potential subsidence on the 100 year flood line and subsequent impacts of flooding migrating through the predicted subsidence cracks as well as the level of potential hydraulic conductivity of the barrier between the mines."*

These concerns are addressed below.

While the current RUM mining schedule is not known, the schedule outlined in the RUM development consent suggests that the Ashton and RUM workings could be active in this area of proximity at around the same time (2011-2012). Nevertheless, our prediction of impacts from the Ashton LW/MW5-9 proposal was conservative, because it did not take into account the likely mutual interference effects of the two projects operating concurrently side by side. It assumed that only Ashton was operating, so the predicted inflows, drawdowns and baseflow impacts from the Ashton operations would have been overstated.

In the likely event that the two projects advance concurrently, the two mines will assist each other in achieving dewatering, and the full recovery of either mine will not be possible until both mines have ceased pumping. The following assessment of impacts of Ashton on RUM's operations is therefore very conservative, as it is based on unlikely worst case conditions.

Flooding of the Ashton Workings Following Completion of Mining

We have run the Ashton groundwater model to assess the potential rate of recovery if all pumping were to cease from the Ashton workings at the completion of extraction of the Pikes Gully Seam (ie completion of LW9). This would represent a worse case scenario, as under current plans to proceed to mining deeper seams after completion of the Pikes Gully, pumping would continue to keep the Pikes Gully workings dry until all subsequent mining of lower seams has been completed.

The modelling we undertook for the prediction of LW/MW5-9 impacts was conservative, in that we did not allow for any mining to be occurring concurrently from the RUM workings. Therefore, the only impact on groundwater conditions in the Ashton modelling was that induced by Ashton's operations. In the likely event that the RUM and Ashton mining operations continue on their current schedules, both mines would be concurrently collecting water inflows, and would create a mutual interference effect on each other, thus reducing the rates of inflow to each mine. Hence, the actual total groundwater inflows to the Ashton workings may be significantly less than predicted by the modelling.

In order to assess the impact of Ashton's mining on groundwater conditions in the RUM mining area, we nominated two locations near the SE and SW corners of the RUM workings as targets for predicting ongoing groundwater levels during the recovery run (shown on **Figure 1** as Target 1 and Target 2). The Ashton model predicted that groundwater levels in the Pikes Gully Seam at Target 1 and Target 2 would be +40 mAHD and -88 mAHD respectively, at the completion of mining of LW9 at Ashton. These levels, as stated above, assume no drawdown impact from RUM, as RUM was not included in the model. The pre-mining groundwater levels in the area would have been around +55 mAHD.

The recovery model run, using the final Pikes Gully Seam time slice model with all drain cells de-activated, predicted fairly rapid recovery of groundwater levels after completion of mining, such that at both Target 1 and Target 2, groundwater levels would have recovered to above +40 mAHD within about 10 years, after which time continued recovery is predicted to be more gradual. This prediction of course assumes no dewatering taking place in the RUM during the Ashton recovery period.

It is considered that the worst possible case for potential impact from Ashton recovery on RUM would be the case where RUM lagged significantly behind Ashton, and dewatering from this part of the RUM workings did not commence until at least 10 years after the pumps were switched off in Ashton. Otherwise, dewatering at RUM would slow down the rate of recovery at Ashton.

The greatest potential for impact would occur under conditions of fully pressurised (ie substantially recovered) Pikes Gully workings on the Ashton side of the 40m barrier, and fully drained workings on the RUM side of the barrier. The maximum head difference across the barrier would occur at the down-dip end of the RUM headings, ie at Target 2, where the head at Target 2 would be the seam floor level, ie around -115 mAHD, and the head at the closest point on the Ashton side of the barrier would be up to +55 mAHD. The head difference would thus be 170m, across the 40m barrier.

The rate of groundwater flow through this barrier under these hypothetical conditions would be determined by the use of Darcy's Law, viz

$$Q = K\ i\ A$$

where

Q = flow rate (m^3/d)

K = hydraulic conductivity (m/d)

i = hydraulic gradient

A = cross-sectional area of flow zone (m^2).

The hydraulic conductivity of the Pikes Gully Seam in the vicinity of LW9 and MW9 has been determined by packer testing at WML213, near the southern end of MW9 (**Figure 1**). This testing was reported by SCT (2008). A packer test at the Pikes Gully Seam in WML213 revealed a permeability of 0.0004 m/d (4.7×10^{-9} m/s). Although further away from this area and not in the Pikes Gully Seam, packer testing of one of the lower Lemington seams in WML210 (located within the LW4 panel area – see **Figure 1**) revealed a permeability of 0.002 m/d (2.3×10^{-8} m/s). For the purposes of the calculation of potential seepage flow through the barrier, the above two values have been used for K in Darcy's equation, to determine a conservative range of potential seepage rates.

The hydraulic gradient is the head difference across the barrier, divided by the width of the barrier. Hence the absolute maximum gradient would be 170m / 40m = 4.25. This would be the applicable gradient if the Ashton side were fully recovered and the RUM side were fully dewatered, in the vicinity of Target 2. At the northern end of the LW9 maingate headings, ie the northernmost end of the common boundary between the Ashton and RUM workings, the Pikes Gully floor level on the RUM side would be around -75 mAHD. The maximum hypothetical head difference across the barrier at the northern end would be 130m, and the maximum gradient would be 130m / 40m = 3.25. The average gradient along the common boundary would thus be approximately 3.75.

The cross-sectional area for flow through the barrier is assumed to be 2.5m (seam thickness) x 1900m (length of 40m barrier along the common boundary).

Applying these values to the calculation, the maximum total seepage rate through the 40m barrier under these hypothetical worst case conditions would be as follows:

a) Using K = 0.0004 m/d:

Q = 0.0004 x 3.75 x 2.5 x 1900

= 7 m^3/d (0.08 L/s).

b) Using K = 0.002m/d:

Q = 0.002 x 3.75 x 2.5 x 1900

= 35 m^3/d (0.4 L/s).

In the event that LW9 and MW9 were not mined, there would be a remnant 175m barrier between Ashton and RUM. For comparison purposes, the potential flow through a 175m barrier has also been calculated.

The K and A values would be the same as for the 40m barrier case, but the average hydraulic gradient would be 150m / 175m = 0.86. Hence the flow rates would be as follows:

c) Using K = 0.0004 m/d:

Q = 0.0004 x 0.86 x 2.5 x 1900

= 1.6 m^3/d (0.02 L/s).

d) Using K = 0.002m/d:

Q = 0.002 x 0.86 x 2.5 x 1900

= 8.2 m^3/d (0.09 L/s).

In summary, the hypothetical maximum seepage rate through the 40m barrier has been calculated at 7-35 m^3/d (0.08-0.4 L/s). The maximum comparative rate through a 175m barrier would be 1.6-8.2 m^3/d (0.02-0.09 L/s).

100 Year Flood Event

The potential for flooding of the Ashton workings during a protracted 100 year flood event is considered low. Again, the theoretical flow rates discussed below are extreme worst case scenarios.

The design of the LW/MW5-9 panels beneath the Bowmans Creek floodplain has been developed to prevent direct hydraulic connection between Bowmans Creek and/or the alluvium to the mine. Hence, the potential for floodwaters to drain into the mine beneath the floodplain alluvium is low.

There are some areas of Permian outcrop that also lie within the 100 Year flood line (using the 1955 flood line as a guide – see **Figure 1**). Theoretically, it is possible that some direct connected cracking could provide a flow pathway from the ground surface to the goaf of full width panels, however, experience at LW1 during the June 2007 major rainfall event suggests that the likelihood of this is low. The intense rainfall in June 2007 caused sheet runoff across the southern portion of LW1 at a time when there were large surface cracks still open, prior to rehabilitation. The depth of cover above the Pikes Gully Seam in LW1 in this area was around 70m. Sheet-flow was seen entering these cracks but no noticeable increase in water ingress to the underground workings occurred, indicating that the cracks were either discontinuous or had already self-healed by this time.

Hence, it is considered unlikely that a protracted 1 in 100 Year flood event would cause a significant ingress of water to the Ashton workings. However, in the unlikely event that it did occur, the maximum threat to the RUM workings would not be greater than that calculated above for the recovery condition. If the Ashton workings were to be fully flooded due to ingress from a 100 Year flood event, the maximum hypothetical head difference across the 40m barrier would be similar to that suggested in the post-mining recovery case, hence seepage rates across the barrier would be similar.

Summary

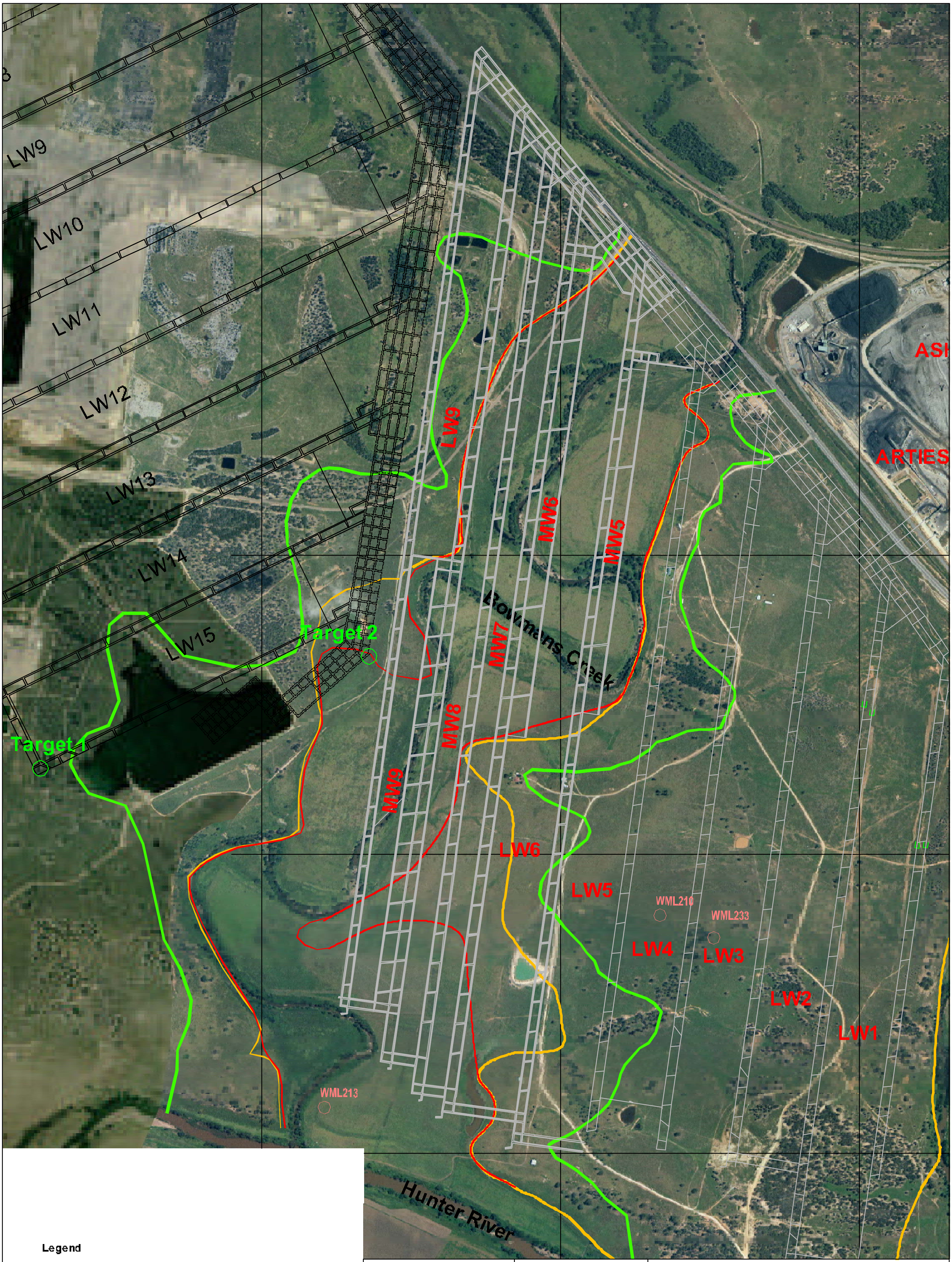
In both cases, ie post-mining recovery of water levels at Ashton while RUM remains actively dewatered, and potential flooding impacts from a 100 Year flood event, it has been calculated that the hypothetical worst case would arise if groundwater levels were fully recovered to pre-mining levels while the RUM workings remain completely dewatered. Under this condition, the potential seepage rate through the 40m barrier would be between 7 and 35 m^3/d (or between 0.08 and 0.4 L/s). It needs to be stressed that in both cases, the calculated hypothetical flow rates are extreme worst case scenarios. In the more likely event that both mines advance concurrently, the two mines will assist each other in achieving dewatering, and the full recovery of either mine will not be possible until both mines have ceased pumping. The potential seepage rates through the barrier would then be substantially less than these hypothetical maximum rates.

I trust these calculations are of assistance in quantifying the potential risk of adverse impacts on the adjacent RUM operations.

Yours sincerely
Aquaterra

Peter Dundon
Senior Principal Hydrogeologist

Enc.



Legend

- Packer Test Bores
- Extent Of Alluvium
- Extent Of Saturated Bowmans Creek Alluvium
- Extent Of Saturated Bowmans Creek Alluvium

Date: 21 January 2009	Scale: as shown	Ashton Coal Operations Ltd
Initials: PJD	Job No: S03	ASHTON UNDERGROUND MINE RAVENSWORTH UNDERGROUND MINE
Drawing No: S03 -236	Revision: 0	

Figure 1