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Phil Fletcher
Technical Services Manager
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Dear Phil,

SUBSIDENCE AND HYDRAULIC CONDUCTIVITY EFFECTS EAST OF LONGWALL 1 IN THE PIKES GULLY SEAM

A study of the subsidence and the hydraulic conductivity of the strata within and surrounding the extraction layout for the area of Longwall 1 to 4 in the Pikes Gully (PG) to Lower Barrett (LB) Seams, was undertaken in a previous report SCT ASH3560A. In this study, caving within the strata section was simulated within a computer model of various layout options in the four seams targeted for extraction.

The model was based on a geological and geotechnical section from Glennies Creek to the location of Longwall 5 in the PG Seam.

Overall, the impact on the conductivity within the PG Seam about Glennies Creek of extraction in the Upper Liddell (ULD) Seam, and subsequently lower seams down to the LB Seam, as per the planned extraction layout, was found to be essentially unmeasurable.

The model used is based on FLAC 4 code with SCT program routines used to control the material properties and rock failure properties of the ground. The model is calibrated to local geology and subsidence results as well as regionally calibrated to studies at other mines and through ACARP studies. The approach used in this study was that previously used within ACARP Project C13013 (Aquifer Inflow Prediction above Longwall Panels).

The section modelled is two dimensional and simulates the pre and post failure properties of the strata. The model couples mechanical and fluid interaction, such that the water pressure and flow is modelled together with mechanical ground movements. The water pressure within the model is assumed to be initially hydrostatic. The model has been used to inform and calibrate RPS Aquaterra work through consultation between SCT Operations and RPS Aquaterra.

The effect of mining of the ULD, Upper Lower Liddell (ULLD) and LB Seams was evaluated in the eastern area of the mine.

Mining of the ULD Seam is predicted to have minimal subsidence impact over the eastern side of PG Longwall 1. The impact predicted would be less than 30mm on the Longwall 1 panel edge and not measurable adjacent to Glennies Creek.

The ULD layout is below and inside the Longwall 1 footprint of the PG Seam. Modelling indicates that extraction of the ULD will not destabilise the PG Tailgate 1 pillar on the eastern side of the panel.

The layout assessed is presented in Figure 1 and shows that the ULD is located underneath the PG longwall panels. In this way, the caving effects and subsidence are typically contained within the foot print of the overlying extraction area. The offset layout was recommended on the basis of optimising roadway development conditions in the ULD and was seen as beneficial to ensure predictable long term chain pillar behaviour within the overall multi seam layout. The uncertainty with the stacked layout arose from the fact that the strata above chain pillars in the lower seams had fractured and therefore the long term stability of the system was less predictable than that of the offset layout. Any uncertainty of the long term pillar load capacity is eliminated in the offset layout, as the overall system is primarily controlled by goaf loading rather than pillar loading.

A range of layouts were evaluated and it was feasible to achieve the long term benefits with an option of offset mining under a stacked ULD layout, however overall maingate and travel road conditions were optimised in the offset layout.

The mining-related fracture type and distribution for the offset layout proposed is presented in Figure 2. In general, the impact of extraction of the ULD on the PG Seam is contained within the PG longwall footprint. There is some lateral shear along bedding planes adjacent and below the extracted seams, however this is typical of any longwall extraction panel.

The modelled hydraulic conductivity of the PG Seam between Longwall 1 and Glennies Creek was not impacted by extraction of the ULD Seam.

The predicted flow networks established in the fracture system created during extraction of the ULD is presented in Figure 3.

In fact, the horizontal conductivity along the PG Seam after extraction of the seams down to the LB within the offset layout will show no significant change, from the current PG status, which would impact on flow from Glennies Creek.

The fracture distribution and type, for the total extracted system, is presented in Figure 4 and shows the same form of bedding plane shear as noted for the ULD seam extraction.

The vertical conductivity and the flow networks established for the total system down to the LB is presented in Figure 5, and shows that the effects are typically within the mining footprint.

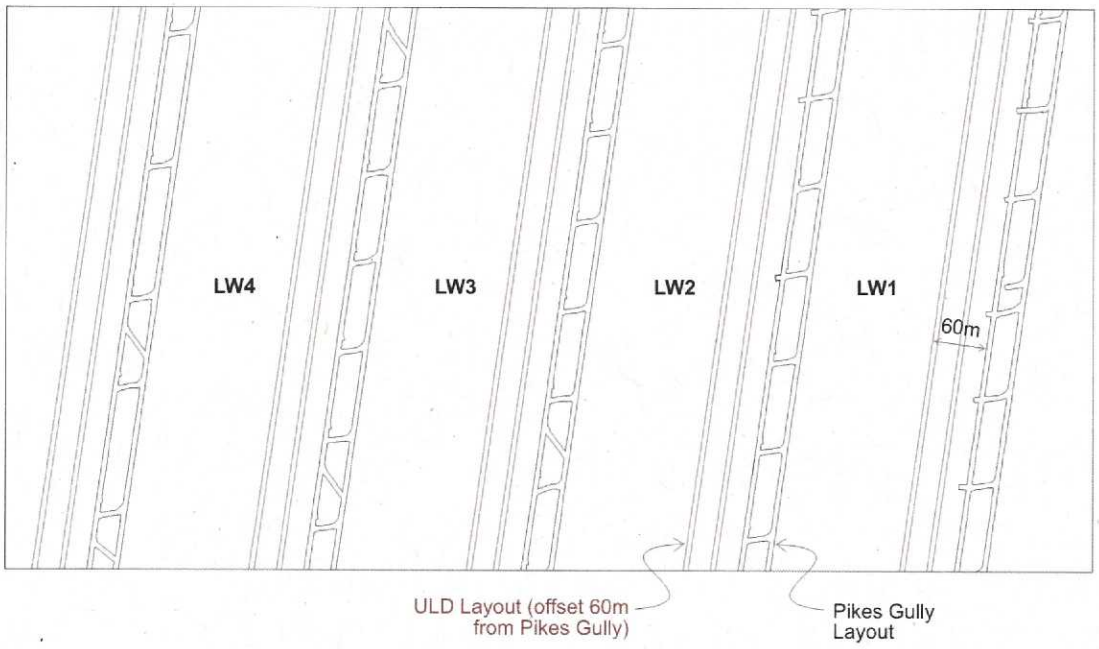


Figure 1: Offset layout assessed in the report.

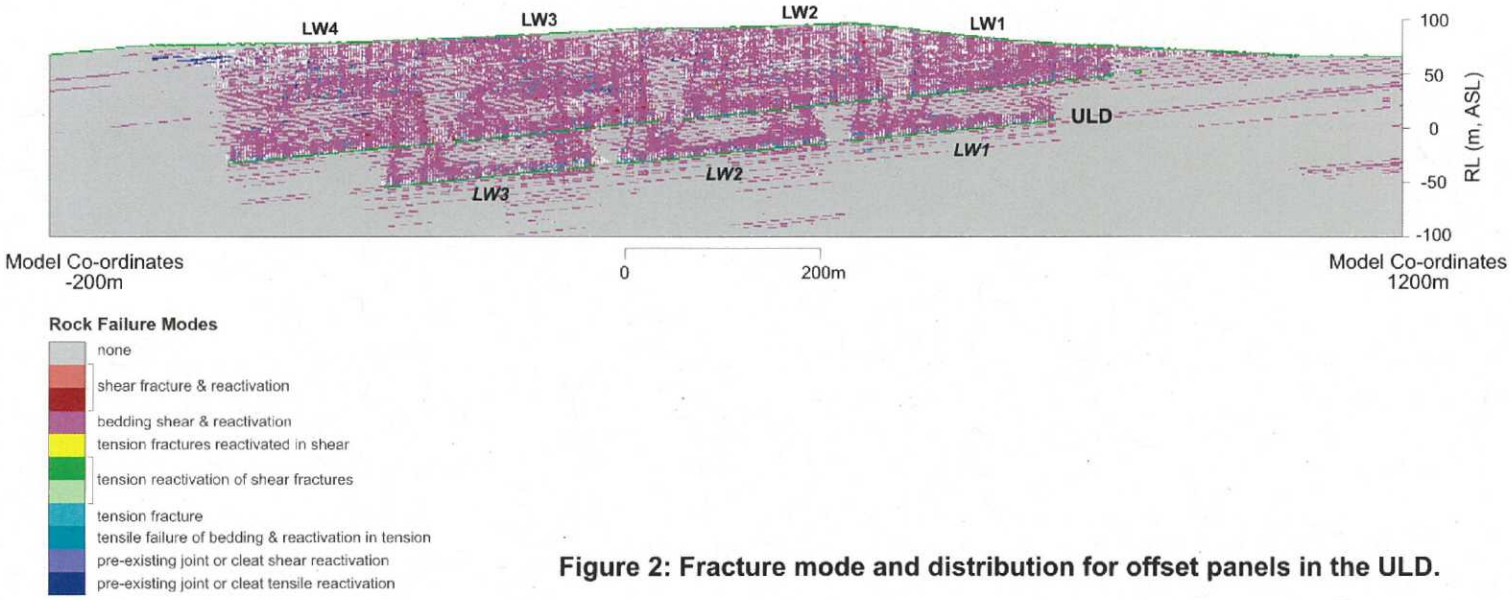
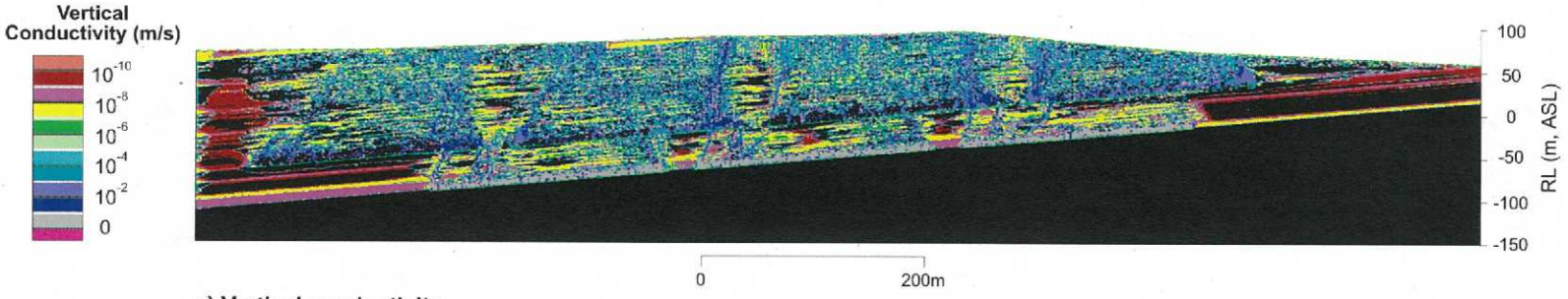
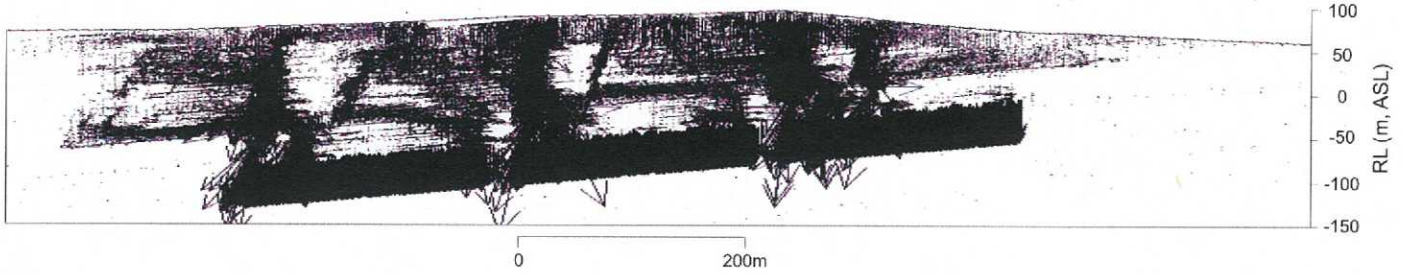


Figure 2: Fracture mode and distribution for offset panels in the ULD.

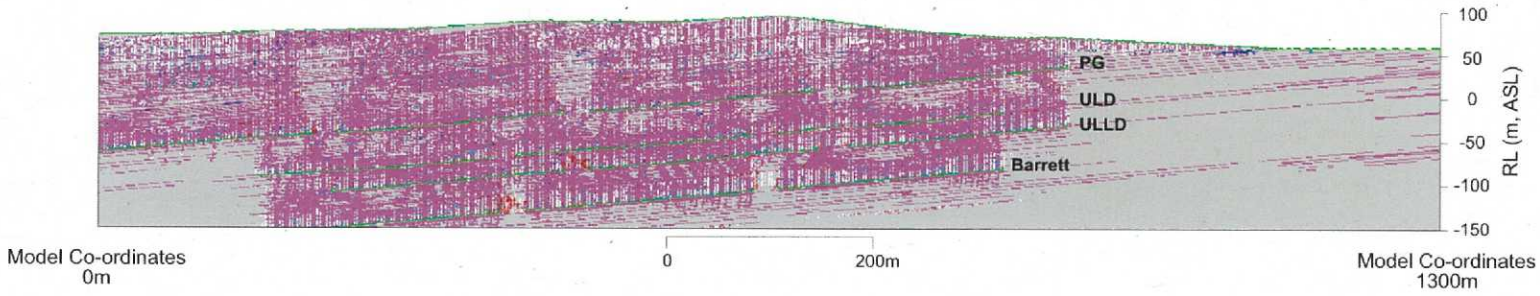


a) Vertical conductivity.



b) Flow patterns.

Figure 3: Vertical conductivity and flow patterns for offset ULD.



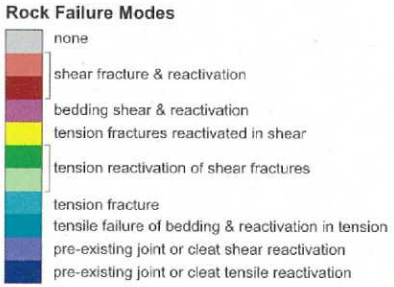
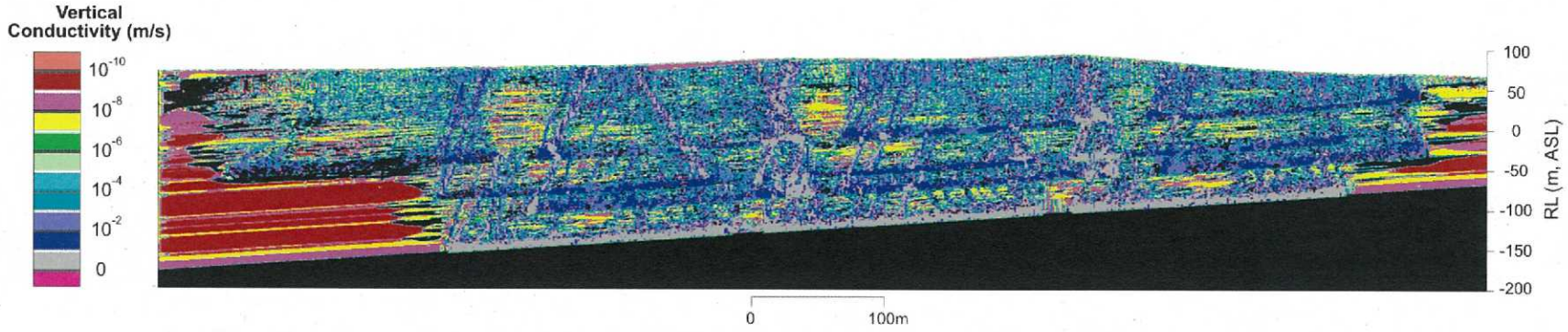
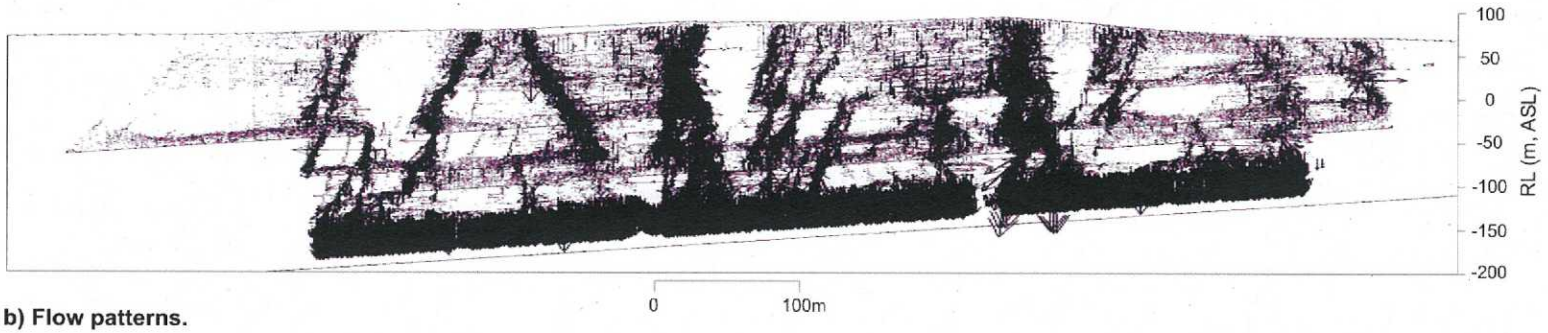


Figure 4: Fracture distribution for offset panels in the Lower Barrett.



a) Vertical conductivity distribution through the overburden.



b) Flow patterns.

Figure 5: Vertical conductivity for the Barrett Seam in an offset layout.

Extraction of the ULLD and LB Seams increased the subsidence impacts generally within the existing longwall panel extraction footprint, however subsidence about Glennies Creek will be less than typically measurable.

It was noted that the angle of draw increased marginally for the lower seams. This had the effect of marginally increasing the subsidence to the east of Longwall 1. However, the tailgate pillar of Longwall 1 will not be destabilised by mining under the PG Seam for the layouts analysed.

The modelled hydraulic conductivity of the PG Seam between Longwall 1 and Glennies Creek was not impacted by extraction of the seams down to the LB. The estimated horizontal conductivity along the PG Seam after extraction of the PG and the LB is presented in Figure 6 and shows no significant change.

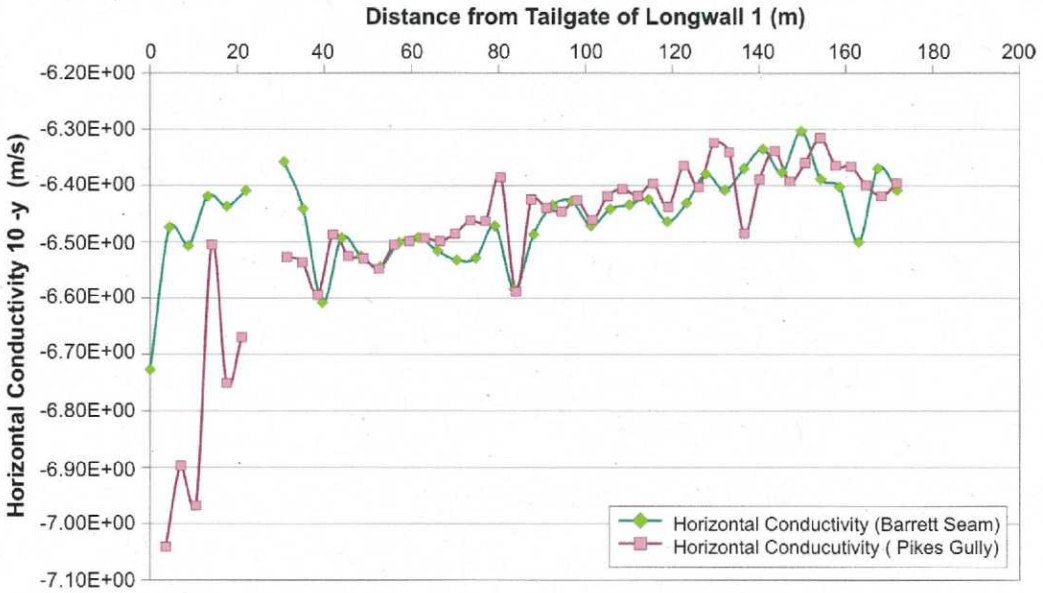


Figure 6: Horizontal conductivity east of Longwall 1.

In summary the impact on the conductivity within the PG seam about Glennies Creek of extraction in the Upper Liddell (ULD) Seam, and subsequently lower seams down to the LB Seam, as per the planned extraction layout, was found to be essentially unmeasurable.

Regards

Winton Gale
Managing Director