

21 July 2022

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Dear Jessie,

Appin Mine - Longwalls 709 to 711 and 905 Extraction Plan

I refer to the Bulli Seam Operations (BSO) Project Approval Condition 5, Schedule 3 requiring the development of an Extraction Plan which must be approved by the Secretary prior to Illawarra Metallurgical Coal (IMC) undertaking secondary extraction at Appin Mine. The following information is provided to the Department in response to the request for further information dated 20 July 2022.

1. Additional information regarding the Panel's recommendation 2 relating to the expected range of effects associated with modification of groundwater due to mining induced subsidence.

Groundwater and associated pore pressure represent elements that can have a negative impact on slope stability. Groundwater flow and deformation within a slope influence each other. Alteration of the near-surface groundwater table is potentially a mechanism that modifies the porewater distribution within sloping ground as a result of mine subsidence changing the rockmass permeability during accommodation of mine subsidence (GHD 2021). The expectation, which is informed by extensive experiencing mining in the general Appin area is that draining of the rockmass is more likely than increasing groundwater levels, and hence in the first instance that makes the mechanism unlikely. In short, the depressurisation at the near surface induced by subsidence cracking will likely reduce pore pressure and reduce the potential for slope instability for this particular mechanism. The depressurisation is observed in IMC monitoring boreholes and private bores in the vicinity of mining.

The alternative mechanism is that where straining of the surface materials in the plateau could lead to an increase in downward seepage into the rockmass, which could then be directed laterally at depth and thereby adversely increase porewater pressures beneath foothill slopes. This is a natural mechanism occurring within stratified near-horizontally bedded rockmasses (such as at the Illawarra Escarpment), and therefore also viable within the Razorback Escarpment rockmass, particularly given the presence of Bringelly Shale within the sequence.

Modification due to mine subsidence is feasible, but the magnitude of the modifying influence is challenging to realistically appraise. In the context of the natural phenomenon being present and viable, it is sufficient in terms of appraisal of likelihood to expect that mine subsidence is a minor modifying impact.

Additionally, a key finding of Coffee (2013) states “it is considered generally unlikely that the additional influence of mine subsidence will instigate new landslides or increase landslide activity within the study area. The most likely trigger event for landslide activity on the hillsides at all of these sites (other than oversteepening of the slope by manmade activities) will be significant rainfall events e.g. intense or prolonged rain.”

The groundwater monitoring data will be made available to independent geotechnical engineers assessing slope instability whilst undertaking the geotechnical assessments described in earlier submissions. To date, and prior to specific site appraisals following the GHD (2021) desk-top study, specific areas that would benefit from detailed assessment of pore pressure monitoring have not been identified. However, should specific sites be identified during the individual PSMPs development process, IMC and the independent geotechnical engineers will undertake these local studies with the agreement of the landowner.

Increased water ingress may result through tensions cracks resulting from movements (Coffee 2013). Tension cracks are a key early warning sign that a slope is moving and is likely increasingly unstable. As detailed in Section 6.5.5 of the *Longwall 905 Structures Management Plan*, weekly visual inspections which include looking for signs of tension cracks will be undertaken by IMC or suitability qualified consultants for those eight houses identified within the Study Area, provided the landowner provides access.

As rainfall was identified as a key influencing factor in slope stability, it is monitored locally at the IMC Ventilation Shaft 6 Site. In addition, data is available from two additional sites associated with the Main Southern Railway. The rainfall data is local and available in real time. Actual rainfall data and forecast rainfall are reviewed in the IMC Structural Review Group (SRG) and reported. Rainfall forecasts increase the level of awareness of significant rainfall events and assist in planning additional inspections. During rainfall events, daily updates of rainfall data is reviewed and distributed by GHD to the SRG. Rainfall is also included in the TARPs of the *Longwall 905 Structures Management Plan* with amounts of rainfall recorded within 24 hours leading to a trigger level with defined responses which will be undertaken by IMC or the SRG.

2. Property Subsidence Management Plans for Longwall 905

IMC is currently developing the PSMPs for Longwalls 905. The pre-mining geotechnical inspections for the five properties within the 20mm extent of subsidence of Longwall 905 have been completed, there are no declined or pending inspections. This is documented in the Longwall 905 Structure Management Plan section 6.5.2 which was provided to the Department.

Monitoring for Longwall 905 will include monthly survey, structural and geotechnical inspections for the five properties. Additionally monitoring established for Longwall 904 will continue for two further properties at the top of Razorback that are beyond the 20mm extent of subsidence.

3. Updated Groundwater Monitoring Plan

IMC has installed several groundwater monitoring sites across the Extraction Plan area. Details of the monitoring borehole design are shown in the table below. The attached figure shows four recently installed groundwater monitoring sites which will be routinely monitored (as described in the WMP) during the extraction of the longwalls included in the Extraction Plan. An additional two sites will also be installed which were requested by BCD in the response to submission stage of the application (aqua coloured symbols on the figure). The indicative locations are shown on the figure and may be subject to small locational changes to allow for site conditions during borehole construction.

Borehole	Piezometer Depth (m)	Established	East Co-ordinates (MGA Zone 56)	North Co-ordinates (MGA Zone 56)
S2536	15.6 (alluvium)	27/08/2021	288404.103	6218410.740
S2536A	136.6 (HBSS)	27/07/21	287932.473	6219544.165
S2537	129.5 (HBSS)	05/07/21	287168.910	6216357.397
S2538	129.5 (HBSS)	12/07/21	290840.833	6217822.027
Indicative location on Foot Onslow Creek	15 (alluvium)	N/A	N/A	N/A
Indicative location on Navigation Creek Tributary 1	15 (alluvium)	N/A	N/A	N/A

Should the Department require additional information or further discussion please contact the undersigned.

Yours sincerely



Gary Brassington
Approvals Manager
South32 Illawarra Metallurgical Coal