Attachment 8

Geotechnical Advice

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MEMO

To: Mal Edwards
Project Director – Wilpinjong Extension Project

Dear Mal

RE: WILPINJONG EXTENSION PROJECT – GEOTECHNICAL ADVICE

Project Background

Mining at Wilpinjong commenced in 2006 and the approved mine is a conventional (shallow) open cut mine with development of six contiguous open cut pits and involves mining in close proximity to the local public roads of Ulan-Wollar Road, Wollar Road and also the Sandy Hollow-Gulgong Railway.

The approved mine includes two final pit voids located in Pit 6 and Pit 3.

The mining operation uses bulk push dozers and hydraulic excavators to mine coal and waste rock in a strip mining configuration. Steady state mining consists of a combination of truck and excavator mining and dozer bulk pushing of blasted overburden into the previous strip void, followed by the removal of coal and interburden.

Mining strips are typically 70 metres wide and are generally oriented North East - South West and North West - South East.

With the exception of initial box-cut development, overburden and interburden or partings material is progressively placed back in-pit once the coal has been mined.

A combination of temporary and permanent waste rock emplacements are located adjacent to current open cut mining operations. Mine waste rock emplacements behind the advancing open cut are constructed to approximate the pre-mining topography. Some of the overburden has also been used to construct internal walls for the tailings emplacements.

Overburden material has also been placed along selected boundary areas of each open pit to act as a safety bund (i.e. to prevent accidental access).

WCPL is seeking planning approval for the extension of Wilpinjong Coal Mine, involving physical extensions to the mine footprint to gain access to significant additional ROM coal reserves and extension of the life of the mine.

The Wilpinjong Extension Project (the Project) also involves relocation of the two approved final voids and development of an additional final void in a proposed new open cut pit (Pit 8).

Geotechnical Background

The Project is located within the Western Coalfield.

Basement rocks comprise Early Permian Rylstone Volcanics of the Lachlan Foldbelt and the basin deposits include conglomerates, sandstones and siltstones of the Late Permian Shoalhaven Group which are overlain by sandstones, claystones and coal deposits of the Illawarra Coal Measures.

The Illawarra Coal Measures contain the prospective coal seams, and this formation is overlain by conglomerates and sandstones of the Triassic Narrabeen Group. The rocks of the Narrabeen Group have since been eroded to form the present day landscape, dominated by cliffs and extensive plateaus to the north and south of the mine.

The weathering depth is relatively shallow, typically being less than 8 metres (m) deep for most of the Project site. Quaternary alluvial deposits occur throughout the region and in some parts of the Project area Tertiary unconsolidated deposits occur within the coal measures that have been in-filled with alluvial deposits, consisting predominantly of sand and clay.

Lateral variations in the extent and depth of Tertiary deposits have resulted in areas of deeper weathering, and infill by alluvial channels. In these areas, the alluvial material, which can be free-dug, is laid back at approximately 45 degrees.

The geotechnical conditions for mining at Wilpinjong mine are relatively benign. Structural disturbances, such as faults and dykes, are present at the mine site; however the strata above the coal seams are strong.

Owing to the favourable geotechnical conditions, slope stability is typically not a significant design risk. Some minor highwall failures occurred in Pit 1 and Pit 2 in the vicinity of thrust faulting and associated fractured ground in 2010.

Although there is geological faulting present on the mining lease the impact on mining operations is inconsequential due to high rock strength and bedding characteristics. Several minor igneous features have been noted and are typically trending NE-SW to NW-SE.

Peabody Energy has developed a geotechnical process to address collection of geotechnical data. The site geologist also undertakes regular inspections of the walls to monitor cracking, spalling, loose material, presence of structures and groundwater inflow.

To monitor and manage geotechnical slope stability, geotechnical inspections are undertaken by the site geologist and provided to the Technical Services Manager and Mine Manager, and access is restricted to any areas where slope instability is observed. The Peabody Energy Principal Geotechnical Engineer conducts inspections and provides an overwatch of all geotechnical matters at Wilpinjong Mine. Stand-off distances of 10 metres are typically applied from the toe of highwalls to protect men and machinery from any potential rock fall. This is in line with the Wilpinjong Mine Geotechnical Hazard Management Plan.

In accordance with the Wilpinjong Mine Geotechnical Hazard Management Plan, geotechnical inspections are conducted by the Principal Geotechnical Engineer not less than annually.

Wilpinjong Coal Mine has successfully developed a significant length of open cut highwall adjacent to Ulan-Wollar Road and the Sandy Hollow-Gulgong Railway in mining Pits 1-4 to date.

Secretary's Environmental Assessment Requirements

The Secretary's Environmental Assessment Requirements (SEARs) issued by the Department of Planning & Environment outline the following requirements with respect to geotechnical stability for the Project:

> ***Land*** *– including:*
>
> ...
>
> - *an assessment of the likely impact of the development on landforms (topography), including:*
>   - *cliffs, rock formations and steep slopes; and*
>   - *the long term geotechnical stability of any new landforms.*

These requirements are considered below.

The impacts of blasting on buildings/structures and geological/heritage features are considered separately in the Noise and Blasting Assessment completed by SLR Consulting (2015).

Geotechnical Implications of the Project

The Project is a continuation and extension of the conventional open cut Wilpinjong Coal Mine.

Wilpinjong Mine operates largely in a steady state of mining whereby mined out voids are progressively backfilled with waste after they are created. The final landform generally approximates the pre-mining topography with the exception of final voids.

The Project would continue to employ current mining practices whereby geotechnical impacts on cliffs, rock formations and steep slopes are evaluated and mitigated. Mining of the extension areas would not result in additional forms of geotechnical impact above those of the currently approved mining operation. Where the open cut extensions adjoin steeper natural slopes, the open cuts will be progressively backfilled and the waste emplacement re-profiled to match into the existing residual landform/slopes.

Backfilled rehabilitated landforms for the Project would be designed and constructed with final landform gradients of no more than 1:6 (with the exception of slopes associated with final voids and safety bunds) and would therefore be considered stable from a geotechnical perspective.

Tailings dams at Wilpinjong Coal Mine have historically been located in-pit, however, the coarse and fine rejects are now co-disposed within the in-pit waste rock emplacements following dewatering of tailings. The use of in-pit emplacement for the disposal of coal reject material minimises any geotechnical concerns with respect to the long term stability of the emplacement of these materials.

Consistent with the existing operations, temporary open cut highwalls that are located proximal to public roads and railway infrastructure would be designed to factors of safety of 1.2 or more.

The highwall batter angle of 70° in competent rock reflects the favourable conditions that exist at Wilpinjong Mine and highwall designs are checked and adjusted as necessary to reflect the nature and the strength of the in-situ material. This is based on the ongoing collection of exploration and geotechnical data and the duration that the highwall would be left standing prior to backfilling.

While the open cut depths at Wilpinjong Coal Mine are relatively modest, final void highwalls would be subject to detailed geotechnical design and factors of safety would be adjusted to reflect that these voids would be a final landform feature.

Where necessary the lower final void slopes may also be buttressed with competent waste rock, or the upper slopes constructed with a series of benches to achieve a suitably stable final landform.

The final void design criteria would be detailed in the applicable Mining Operations Plan to the satisfaction of the NSW Department of Resources and Energy.

Conclusion

The Wilpinjong Extension Project does not raise any material additional geotechnical issues. Existing management measures and data collection would continue to be applied to manage geotechnical stability for the open cut extensions and associated final landform design and construction.

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