Dr Ian Baird
3 Waimea St
Katoomba NSW 2780

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Ms Genevieve Lucas
Senior Environmental Assessment Officer
Mining and Industry Projects
NSW Department of Planning, Infrastructure and Environment
Locked Bag 5022
Parramatta NSW 2124

Re. Angus Place Mine Extension Project (SSD 5602) Amended Development Application

I am strongly opposed to the proposed Angus Place Mine Extension Project due to the unacceptable risk of negative environmental impacts, both within the immediate project area and in the adjoining Greater Blue Mountains World Heritage Area.

The Amended Angus Place Mine Extension Project has one of the most destructive mine layouts in NSW, with 360 m wide longwalls proposed. The proposed longwalls are 55 m wider than the longwalls currently being extracted and proposed for Areas 5 and 6 at the Dendrobium Mine; and almost 100 m wider than the longwalls currently being extracted at Springvale Mine. This project will lead to extremely high levels of subsidence for the area. The proposal fails to address the underlying principles of the NSW and Commonwealth Offsets policies; namely, to first avoid and then mitigate impacts, prior to any offsetting. An obvious solution to mitigate impacts of subsidence, e.g. on groundwater dependent ecosystems, surface waters, geological surface features such as cliffs and internationally significant pagodas, and the adjoining World Heritage Area, is to revert to traditional Bord and Pillar mining, as is currently used successfully and profitably by the nearby Clarence Colliery.

Issues of serious concern include:

1. Potential loss of groundwater from endangered, groundwater-dependent, Newnes Plateau Shrub Swamp (NPSS) and Newnes Plateau Hanging Swamp (NPHS) ecological communities.

These NSW BC Act 2016-listed peat swamp communities form part of the Commonwealth-listed (EPBC Act 1999) Temperate Highland Peat Swamps on Sandstone Endangered Ecological Community and represent a unique assemblage of species which is restricted to the Plateau. Groundwater drawdown modelling of surface aquifers (referred to as "the uppermost watertable") at 38 years post mining[1] suggests that there could be significant groundwater drawdown associated with identified and mapped NPSS patches, including Twin Gully, Tristar, Trail Six, Crocodile and Birdrock swamps, as well as various smaller NPHS, in the mine project area, with a 5-10 m drawdown predicted for all swamps above or adjacent to the mine. Groundwater drawdown is also possible, albeit to a somewhat lesser degree, outside the mine project area in the adjoining World Heritage Area as a result of 'far field impacts' associated with geological lineaments. The effect of even a much smaller 1-2 m drawdown, however, will be devastating for any of these swamps reliant upon a

[1] Jacobs. (2019). Angus Place Amended Project. Centennial Angus Place Pty Ltd. Groundwater Impact Assessment IA161511-RPT-0006. Rev0 31 October 2019

high or emergent water table. This could potentially include swamps in the headwaters of tributaries of Deanes Creek, Rocky Creek and Nayook Creek to the east.

The impact of previous longwall mining on a number of the Endangered peat swamps on the Plateau (e.g. Narrow Swamp, East Wolgan Swamp, Junction Swamp, Sunnyside East Swamp, Carne West Swamp, Gang Gang West Swamp and Gang Gang East Swamp), which have been irreparably damaged, and on their associated populations of threatened species of plants and animals, provides dramatic evidence of the impacts of loss of groundwater on these groundwater dependent ecosystems[2]. Permanent and irreparable damage to Carne West Swamp, for example, resulted from so-called 'far field impacts' associated with geological lineaments draining surface waters. It is of serious concern that such far field impacts could extend to swamps outside the proposed Angus Place mine area.

Groundwater drawdown modelling for this Angus Place Extension Project did not appropriately consider the possibility of lineaments draining surface waters, the cumulative impact from drawdown associated with the Springvale mine, or appropriately consider surface to seam fracturing. Such fracturing is predicted to occur up to 340 m for extractions of 3.4 m; depth of cover ranges between 270 m to 450 m, so fractures are likely to reach the surface anywhere depth of cover is <340 m.

With lowering water tables, swamp soils dry out, the organic component of the peat swamp soils oxidizes, reducing the water holding capacity of the soils, reducing the soil bulk and depth, and increases their vulnerability to combustion and further degradation (e.g. erosion and channelization) during and subsequent to fire events. The evidence of fire impacts on dry peaty swamps has recently been starkly demonstrated in undermined swamps in the upper Wolgan River (e.g. Junction Swamp and East Wolgan Swamp) and Carne Creek (e.g. Caren West Swamp, Gang Gang West Swamp and Gang Gang East Swamp) catchments following the December 2019 fires. This process subsequently results in a loss of groundwater-dependent flora and fauna. These processes are likely to be compounded by a rapidly changing climate, with contractions in peat swamp habitat predicted[3]. These swamps then transition from being groundwater-dependent peat swamps to rainfall dependent drier communities on primarily mineral soils[4]. A significant proportion of the unique Endangered NPSS and NPHS have already been permanently destroyed by longwall mining by Centennial Coal.

The Angus Place Mine EIS states that:

> "Given the predicted impacts to a high priority groundwater dependant ecosystem, the project does not meet the Level 1 Minimal Impacts Considerations of the NSW Aquifer Interference Policy. However, it is the intention of Centennial to offset the predicted impacts via the environmental offset facility of the EPBC Act."

Since the environmental offset facility of the EPBC Act includes a requirement for direct offsetting of impacts and Centennial do not own equivalent areas of NPSS/THPSS to offset, the Amended Angus Place Mine Extension Project will lead directly to a significant additional loss of Newnes Plateau Shrub Swamps (NPSS) endangered ecological community

[2] Centennial Coal. (2020). Temperate Highland Peat Swamps on Sandstone Monitoring and Management Plan LW 415 to 417 Annual Report. Springvale Mine - March 2020.

[3] Keith, D.A., Elith, J. & Simpson, C.C. (2014). Predicting distribution changes of a mire ecosystem under future climates. *Diversity and Distributions*, 20, 440-454. doi:10.1111/ddi.12173

[4] Baird, I.R.C. & Burgin, S. (2016). Conservation of a groundwater-dependent mire-dwelling dragonfly: implications of multiple threatening processes. *Journal of Insect Conservation*, 20, 165-178. doi:10.1007/s10841-016-9852-3

2. Loss of populations of groundwater-dependent species which are restricted to these endangered peat swamp ecological communities.

These include, most notably, the Endangered Blue Mountains Water Skink (*Eulamprus leuraensis*) (BMWS) (EPBC Act, BC Act) and the Endangered Giant Dragonfly (*Petalura gigantea*) (BC Act). The Newnes Plateau supports an important complex of distinctive swamp patches which provide habitat for these patchily distributed species[5,6].

Both species are reliant on groundwater seepage areas in these swamps for reproduction and maintenance of populations[7,8]. Loss of these seepage areas, associated with consistently high water tables, will result in extirpation of individual swamp populations of these and other obligate swamp-dwelling species. Other groundwater dependent swamp fauna of concern include stygofauna[1] and the Vulnerable Red-crowned Toadlet (*Pseudophryne australis*). The Newnes Plateau swamps also provide habitat for a number of noteworthy montane mire plant species, including the Endangered *Carex klaphakei*, Vulnerable *Boronia deanei*, Vulnerable *Xerochrysum palustre* and rare and previously unrecorded *Gentianella cunninghamii*.

Longwall mining by the Springvale Mine has resulted in recent years in the destruction of a series of NPSS in the upper Carne Creek Catchment[2], each of which had populations of BMWS and Giant Dragonflies, and several with populations of *Boronia deanei*. These swamps no longer provide suitable reproductive habitat for Giant Dragonflies or suitable core habitat for persistence of BMWS. Both species can be expected to be extirpated from these former peat swamps (I. Baird, pers. comm.).

Loss of individual swamp populations or loss of groups of swamp populations can be expected to detrimentally affect long-term metapopulation dynamics of these species. BMWS populations on the Newnes Plateau have been identified as genetically distinct from populations further east in the Blue Mountains Swamps, with evidence of genetic differentiation among populations or groups of populations on the Plateau. It has been recommended that individual swamp populations be treated as distinct conservation units[9,10].

In addition to the existing swamps which have been destroyed as a result of loss of groundwater, all swamps in the proposed mine area can be expected to be permanently and irreparably damaged as result of longwall mining-related subsidence and subsequent groundwater drawdown. It is of considerable concern that ongoing loss of these populations within and, potentially adjoining the

[5] Gorissen, S. (2016). Conservation biology of the endangered Blue Mountains Water Skink (*Eulamprus leuraensis*). PhD thesis. University of Sydney.
[6] Benson, D. & Baird, I.R.C. (2012). Vegetation, fauna and groundwater interrelations in low nutrient temperate montane peat swamps in the upper Blue Mountains, New South Wales. *Cunninghamia*, 12, 267-307.
[7] Baird, I.R.C. (2014). Larval burrow morphology and groundwater dependence in a mire-dwelling dragonfly, *Petalura gigantea* (Odonata: Petaluridae). *International Journal of Odonatology*, 17, 101-121. doi:10.1080/13887890.2014.932312
[8] Gorissen, S., Baird, I.R.C., Greenlees, M., Sherieff, A.N. & Shine, R. (2018). Predicting the occurrence of an endangered reptile based on habitat attributes. *Pacific Conservation Biology*, 24, 12-24. doi:https://doi.org/10.1071/PC17027
[9] Dubey, S. & Shine, R. (2010). Plio-Pleistocene diversification and genetic structure of an endangered lizard (the Blue Mountains water skink, *Eulamprus leuraensis*) in south-eastern Australia. *Journal of Biogeography*, 37, 902-914. doi:10.1111/j.1365-2699.2009.02266.x
[10] Dubey, S. & Shine, R. (2010). Restricted dispersal and genetic diversity in populations of an endangered montane lizard (*Eulamprus leuraensis*, Scincidae). *Molecular Ecology*, 19, 886-897. doi:10.1111/j.1365-294X.2010.04539.x

mine project area as a result of far field impacts, may have a significant detrimental impact upon metapopulations of these species at a larger spatial scale (and in the case of the BMWS, genetic diversity), including within the adjoining World Heritage Area.

3. Reduced stream flow from the Newnes Plateau into the GBMWHA.

Groundwater modelling suggests a significant impact on groundwater levels in mapped swamps in and around the mine project area[1]. Groundwater drawdown resulting from fracturing of aquitards following subsidence and other ground movements, associated with the longwall mining operation, can be expected to result in potentially significantly reduced inputs to streams which are fed by water from the mining area, including from groundwater dependent peat swamps in and adjoining the mine project area. These swamps function as important slow release water storages which maintain base flows to receiving watercourses (Carne Creek and Wolgan River) and their associated aquatic and riparian communities in the World Heritage Area. Additional loss of base flows as a result of loss of surface waters, groundwater drawdown and loss of groundwater into the mine voids can be expected. Residual groundwater modelling at 38 years post mining suggests significant drawdown in the Lithgow Coal Seam extending well into the World Heritage Area, including in Gardens of Stone and Wollemi National Parks[1]. In addition to the ecosystems themselves, the maintenance of base flows is likely to be important to various aquatic and riparian species associated with these stream environments in the World Heritage Area, particularly in the context of uncertainty around predicted climate change impacts.

4. Damage to geological features in and adjoining the WHA.

The potential for damage to the dramatic cliff-faces and internationally significant pagodas in the adjoining WHA, including along the Carne Creek gorge, as a result of mining related subsidence, is of serious concern and the longwall panel design and mine layout must ensure that risk of subsidence related impacts is avoided. Past longwall mining in the region has resulted in significant and well documented damage to cliff-faces and pagodas.

To mitigate the above risks, traditional Bord and Pillar mining, instead of longwall mining, must be utilized. If approval is given for longwall mining, then the following amendments to the proposed mine design and layout are essential to minimizing mining impacts:

1. Significantly reducing longwall widths to avoid surface to seam fracturing;
2. Avoiding direct undermining of Twin Gully Swamp;
3. Avoiding undermining the Type 2 lineament under Tri Star Swamp that is connected to the Type 1 Wolgan River lineament zone;
4. Shortening LW1014 so that it does not undermine the Burralow aquifer that feeds Trail 6 swamp; and
5. Reducing the proximity of longwalls to Crocodile and the Birds Rock swamps so as to maintain the Burralow formation aquifers that supply these two swamps.