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UCML Modification 4 - Project Approval 08_0184 (PA08_0184)

This is an objection to Ulan Coal Mine Ltd (UCML) proposed Modification 4 development.

As a downstream water users, local business owners and landholders since 1973, my family are deeply concerned and personally devastated by the cumulative effect of coal mining that has degraded water quality and permanently altered the natural flow regime in the Goulburn River. Mining in the upper Goulburn catchment since the 1980s has caused significant observable impacts on surface and groundwater resources that are damaging the long term health and resilience of this river system. The Goulburn River is the largest western tributary to the Hunter River.

No more mining impacts to the surface and groundwater system can be permitted.

Current approval conditions applying to surface and groundwater management and the regulation of mine water discharge need to be amended to ensure essential base flows are returned to the river and groundwater systems are restored to pre-mining levels and connectivity as a priority.

Mine groundwater impact assessments and modelling do not accurately reflect <u>the cumulative loss of baseflow</u> to the river most evident during extended dry periods as currently being experienced. The required environmental offsets under the current conditions of approval are ineffective at mitigating the long term permanent damage to the natural water system. Coal Mines in the Ulan-Wollar area must acknowledge and take full responsibility for both the short and long term cumulative impacts on water resources in the Goulburn Catchment.

The proposed UCML Modification 4 includes:-

- The extension of long wall mining (LW 30-33) beneath Durridgere State Conversation Area requiring additional dewatering and land clearing
- Extended mining schedule for Ulan UG3 to 2029 causing further delay in the recovery of groundwater levels and restoration of river base flows (Table A2.3)
- An increase in base flow losses to the Goulburn River and 4.4% increase in total groundwater water inflows for the project.
- An increase to the maximum water surplus to 27.9 ML/day.
- No assessment of groundwater connectivity associated with the Curra Creek fault (adjacent to LW 33/32) which intersects Goulburn River at Peregrine Cliff GDE in the National Park.

- Insufficient monitoring of Triassic hydrological unit between (east of) UCML underground mine (UG3) and the Goulburn River. Mine depressurisation of the Triassic regional groundwater has caused a reversal and flattening of the hydraulic gradient and direction of flow (previously towards the river).
- Underestimate of the total groundwater interception from the Goulburn River Extraction Management Unit (groundwater divide is west of the Great Dividing Range)
- Insufficient licences for groundwater extraction to cover peak groundwater take from NSW Murray Darling Porous rock GW System (current licenses = 3,654ML/year - requires 6,629 ML/year)
- Insufficient historical and current streamflow monitoring above and below mining activities for assessing change in river behaviour and loss of baseflows. The re-establishment of an upstream continuous real-time flow monitoring (SW01) must be a priority
- Inadequate monitoring and reporting of groundwater seepage from old workings along the river diversion (UCML open-cut one) and between connected alluvium and the east pit.
- Discharge license conditions (EPL394) that do not adequately protect the river's natural regime (low flows and water quality).

Loss of Baseflows

Baseflow is considered to be the groundwater contribution to streamflow that helps maintain perennial surface flows in 'gaining' streams (Arnold *et al.*, 1995; Zhang *et al.*, 2017; Winter *et al.*, 1998). The hydraulically elevated Triassic regional groundwater sources discharge towards the Goulburn River providing baseflow and contributing to alluvial storage in the sand-sediment river bed. Mining operations since the late 1980s have progressively depressurised the regional groundwater system, and intercepted natural flows that provided essential baseflow in the river during dry times. The Goulburn River abruptly ceased to flow in late December 2017 when UCML stopped discharging treated groundwater, reducing the river to a dry bed with occasional shallow pools[1]. This was despite some high rainfall events in the catchment, including 117 mm rain recorded at Ulan in November, and 70mm in December. Mine water discharges had averaged 11 ML/day over the previous three months (UCML, 2017). It is during extended dry periods that the full impact of coal mining on the water system becomes most apparent.

It is now obvious that stream flow in the Goulburn has become predominantly controlled and dependent on mine water discharge, as determined by the vagaries of mine operational needs with regular mine discharges masking the underlying loss of baseflow. The level of mine interference to surface and groundwater sources have made natural river flow unsustainable in

[1] By comparison the minor tributaries of Ryan's Creek (above Moolarben Dam) and Bobadeen Creek and Murrumbline Creek continued to flow throughout this extended dry period while being rated as ephemeral streams in mine reports.

periods of low rainfall and unless some of this intercepted water is returned as environmental flows the river will be reduced to a dry sandy bed for many months of the year.

Cumulative interference to surface and groundwater

The cumulative loss of baseflow due to mining includes open cut removal of alluvial flats and severing of paleo channels with the river diversion; ongoing groundwater seepage between the diversion channel and the east pit via river alluvium; leakage along Ulan Creek due to stream-bed fracturing following the failure of a high-wall mine in the 1990s and increasing groundwater interference from neighbouring mines. The Moolarben Coal Complex (MCC) underground mine (UG1) recently reported over five times the predicted volume of groundwater inflow than initially modelled. The dewatering of the MCC-UG1 mine was predicted to produce around 1ML/day of groundwater inflows but instead has produced 4-6 ML/day (MCC, 2017). This significant unpredicted excess water-make is from groundwater sources. Fractured and porous rock groundwater storage in the Ulan area has been repeatedly underestimated and undervalued by both UCML and MCC. The impact of each new expansion and modification is minimised by evaluating add-on impacts rather than the cumulative change over time.

The mine estimated baseflow of 0.112 ML/day for the upper Goulburn does not reflect the observed, perennial low flows of this ‘gaining’ river. For example throughout the 1980s drought continuous surface flows were observed from upstream of The Drip gorge to past the Murrumbline Creek junction. The 1980s drought was the worst on record since the 1940s and occurred prior to the large scale expansion of the open cut and underground mining at Ulan. In addition the minor tributaries of Ryan’s Creek (above Moolarben Dam), Bobadeen Creek and Murrumbline Creek also continued to flow during the recent dry period.

The predicted cumulative volume of groundwater inflows in UCML and Moolarben Coal Complex (MCC) is currently around 20ML/day and predicted to exceed 45 ML/day over the next few years[2] (MCC, 2017). Over the recent dry most intercepted water was used for pasture irrigation (5-7 ML/day) and consumed for mine operational needs. Environmental flows must take precedence over pasture irrigation. The release of water of acceptable quality into the Goulburn River needs to be regulated to mimic the natural flow regime using environmental flow rules set by an independent scientific panel.

Modelling estimates of pre-mining base flow

The UCML numerical groundwater model assumes the pre-mining baseflow for the upper Goulburn[3] is a low 0.112 ML/day **(**Table A2.4) (AGE, 2018). The groundwater modelling is based on a series of conceptual hydrogeological layers, each with assigned parameters estimating the hydraulic conductivity, and horizontal and vertical hydraulic ratios. These permeability

[2] UCML 12-16 ML/day – max. 27.9 ML/d & MCC – currently 5-6 ML/d predicted max. 17.36 M/day
[3] to Murrumbline Creek including Ulan and Bobadeen Creeks

parameters can vary considerably according to modeller preference. For input the UCML model uses a rainfall recharge rate for the Triassic porous rock layers of 0-2% annual rainfall. This is considerably less than the DPI Water estimate of 5% for annual recharge in Triassic Narrabeen Group aquifers (Pearse – Hawkins *et al.*, 2015). With such complex range of variables there is significant uncertainty equivalent to many orders of magnitude. Vertical connectivity and flow pathways in Triassic hydraulic units are also influenced by secondary permeability characteristics such as vertical jointing and fracturing. These complex structural features form potential conduits for groundwater flow that are not included in the modelling.

Observed drawdown in Triassic strata monitoring bores (NMN)

A comparison of modelled simulated drawdown (predicted) to actual decline (observed 2017) in the level of Triassic groundwater reveals an overall poor fit indicating greater mining impacts on Triassic hydro-stratigraphic units than suggested (App E –Ulan Mod 4 GIA). Triassic piezometers that differ from the model include;

DDH336-102 simulated SWLs = 435mAHD – (2009) [4] observed decline **>40m** (400 mAHD)

PZ04A simulated 407 mAHD – (2001) observed decline **10.1 m** (408.7- 398.6 mAHD)

PZ10A simulated 424 mAHD – (2005/6) observed decline **39.8 m** (420.1m to 380.3 mAHD

R755A simulated 412-402 mAHD – (2001) observed decline **21.9 m** (412.4-390.5 AHD)

PZ08C simulated 412 mAHD – (2005/6) observed decline **13.7 m** 410.9 - 397.2 mAHD

PZ08C EC (2007) = 600 µS/cm increased to 1080 µS/cm (2017)

PZ24B EC (2007) = 360 µS/cm increased to 2521 µS/cm (2017)

Spatial and temporal monitoring of Triassic groundwater between the depressurised mined goaf and the Goulburn River have been minimal, making it difficult to assess and interpret the response of the upper groundwater system and deviations to flow direction as mining has progressed to the north. The potential interference and interception of Triassic groundwater discharging towards The Drip GDE requires scientific scrutiny, allowing for lag in the spread of drawdown affecting the upper groundwater system over time.

Location of groundwater divide

The majority of groundwater (fractured and porous rock) intercepted by UCML underground mining would naturally discharge to the Goulburn River based on piezometric contours and the dip in strata towards the north-east. That is the actual *groundwater divide*, between the Water Sharing Plans Murray Darling Fractured Rock Water Source (Talbragar River) and Goulburn River Extraction Management Unit[5] is further to the west of the

[4] Year installed
[5] Water Sharing Plans (WSPs)

topographical high of the Great Dividing Range. Modelling for groundwater take portioned to WSPs underestimates losses applicable to the Goulburn catchment (Table8.3p.35UCML-Mod 4).

Offset strategy

UCML current offset strategy to compensate for loss of baseflow is the passive spillage from Moolarben Creek Dam and retirement of water entitlements post mining (UCML Approval, Schedule 3Condition29). Up to 7L/s of upstream flows originating from Ryan's and Moolarben Creeks are '*allowed to pass through*' Moolarben Dam (WAL19047). The use of surface inflows from the upstream catchment to offset downstream loss of base flows is essentially a sleight of hand. These offsets are grossly inadequate considering the on-going cumulative impacts and the time span predicted for the groundwater system to return to some stability. The system will be permanently changed, with no real understanding of the level of ecosystem damage lasting centuries. Currently water discharges are regulated to suit mining operations and irrigation needs; this laissez-faire approach must be modified to secure environmental flows and hasten aquifer recovery[6].

Background salinity levels and salt exported in mine discharge water

The regulated permissible maximum salinity 900 µS/cm for water discharged by UCML is nearly twice the median ambient background EC7 upstream of the mine (2012-2016) and pre-mine expansion (1968-1982)(DPI-Water, 2018; NSW-Department-Water-Resources, 1994). An analysis of the total salt load exported in UCML discharges from May 2012 to December 2016 was estimated at 12,871 tonnes over 4.5 years or 60 tonnes/km2/year of salt exported from the mine footprint8 (UCML Annual Review 2012-2016). The average salt yield for the catchment above Coggan gauge (210006) was estimated at 5.2 tonnes/km2/year (DPI-Water, 2018). UCML occupies 1.4% of the catchment area but exports around 13% of the total salt load passing Coggan stream gauge (2012 to 2016). The Salinity (EC) limit for all mine water discharges should not exceed 500µS/cm to match the background, upstream salinity level and average salt yield for the upper Goulburn. The Goulburn River should not be used as a dumping ground for salt produced by coal mining.

[6] Condition 29 – refers to improved or additional hydrological data may lead to amendments to baseflow modelled losses.

[7]median EC at Ulan (210046) 2012-2016 was 539 µS/cm and pre-mining (1968-82) was 484 µS/cm

[8] Total UCML footprint 45 km^2 – mined 13 km^2

Conclusion

Enough is enough - no more mining expansions can be permitted in the Goulburn catchment if the long term health and resilience of this river system is to be protected and the degradation of the water system by mining is to be reversed. We recommend:

- An independent expert investigation to evaluate the cumulative impacts of mining on surface and groundwater resources in the Goulburn River catchment.
- Increased monitoring and scrutiny of impacts on the Triassic groundwater system between the mined goaf and the Goulburn river
- The re-establishment of an upstream flow gauge above the river diversion
- Mine plans prioritise the restoration of groundwater levels and surface groundwater connectivity to match pre-mining baseflows in the river.
- The regulation of mine water discharge to mimic the natural flow regime and background water quality in the upper Goulburn River and replace the loss of baseflows during dry climatic conditions (as determined by an expert panel).

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