Moolarben Coal Mine MODIFICATION 14, Stage 2 MOD 3

I would like to lodge my objection to the Moolarben Coal Operations (MCO) Modification 14, Stage 2, and MOD 3 proposal.

- The cumulative impact of the MCO modification on the Goulburn River water quality and ecology and interception of the groundwater system has not been adequately assessed.
- MCOs proposed increase of 20 ML/day mine water discharge into the river, if approved, will degrade water quality and cause additional pressure and stress on the Goulburn & Hunter River system.
- MCO subsidence and water monitoring; trigger settings and activation of response plans are deficient. They would not effectively, within a practical or proactive timeframe, avoid permanent degradation or damage to the groundwater system, the Goulburn River, or The Drip.
- There has been no independent study of the cumulative impact of mining on the headwaters of the Goulburn River

Context

The Goulburn River is a meandering stream within a wide sand-sediment dominated bed that travels 225 kilometres to its confluence with the Hunter River at Denman. Surface flows vary considerably along the length of the river and are subject to evapo-concentration allowing the accumulation of discharged salts and other pollutants in sand and peat lenses within the river alluvium until re-activated by storm runoff or flushed into the Hunter system during a high flow event. Discharging additional salts into the upper system has a detrimental effect on water quality affecting the Goulburn River National Park, downstream water users, irrigators and the Hunter River Salinity Trading Scheme.

Salinity in the Goulburn River is affected by the volume and EC of mine water discharged at Ulan. A comparison of pre-mining stream discharge (continuous) and salinity data (grab 1969-1982) for Coggan (GS 210006) (NSW-Office-Water, 2008) to recent online stream data at Coggan (2012-2016) reveals a rise in the volume of flows with EC levels ≥ 900 µS/cm. Pre-mining data indicates flow volumes up to 63 ML/day exceeded EC 900 µS/cm, while for the period 2012-2016 stream discharges up to 107 ML/day exceeded EC 900 µS/cm[1]. The increase in low flows with elevated salinity levels makes catchment objectives to hold river salinity below 900 EC increasing more difficult to achieve.

[1] The median stream discharge for the two monitoring periods were very similar (40 ML and 38 ML/day respectively) removing the possible influence of changing catchment yield on stream salinity.

There should be no increase in MCO discharge licence.

MCO is applying to alter their EPA license (EPL) to allow mine water discharge up to 20 ML/day of partially treated mine water directly into the headwaters of the Goulburn River (maximum EC 900 µS/cm, turbidity 50 mg/L).

Mine water discharges at 20 ML/day with an average EC 800 µS/cm would contain approximately 11 tonnes[2] of salt. The salt load in the Goulburn River at Coggan 2012-2016 was calculated to be 3.1 tonnes /day during low flows (10th percentile). A contribution of 11 tonnes per day to the river system is over 3 times the salt load at Coggan during low flows or 45% of the median daily salt load (24.4 tonnes /day) and 23% of the average daily salt load (47.7 tonnes /day) (DPI-Water, 2016). Salts and other contaminants are most likely to accumulate and concentrate in the river bed alluvium during low flow periods.

Ulan Coal Mine (UCML), one of three mines with discharge licences in the upper Goulburn discharged in the 5 year period 2012 -2016 an estimated 12,850[3] tonnes of salt (under EPL394). This was equivalent to 13% of the total salt load at Coggan (97,050 tonnes) and 6.6% at Sandy Hollow (195,300 tonnes) for the same period.

MCO Control Water Release Impact Assessment (App F - Table 4.4 p.38) provides scenarios for 'low' to 'high' flow' that include both UCML and MCO predicted mine discharges. The potential salt yield of discharge water would be:

"Low flow" (21.5 ML/day, EC 887µS/cm) = salt yield **12.96 tonnes per day**

'High flow' (50 ML/day, EC 789 µS/cm) = salt yield **26.8 tonnes/day**

The 'low flow' scenario would contributes approximately 50 % of the current average daily salt load at Coggan (2012-2016 – 24.4 tonnes/day)

Note: *These calculations do not include the contribution from unmeasured saline seepage and runoff from previously disturbed mining areas and buried waste rock and rejects. MCO has also not utilised its current discharge license (EPL 12932) for 10ML/day, max. EC 900 µS/cm, TSS =50 mg/L.*

It is both disappointing and surprising that the maximum salinity (EC) for mine discharges have been set at 900 µS/cm, when the ambient, pre-mining expansion median EC in the river above the mine at Ulan was below 500 µS/cm (NSW-Department-Water-Resources, 1994). The decision to set the maximum discharge EC at almost double the pre-mining expansion median EC has exacerbated salinity in the upper catchment below the mine discharge point. Reducing the salinity discharge EC

[2] Conversion based on site specific ionic composition TDS (mg/L) = EC. 0.68 x EC
[3] UCML AEMR 2012-2016

maximum to the pre-mining median value of 500 µS/cm, EC Ulan has the potential to reduce the salt load export by almost 50%.

Other Contaminants and RO waste products

The current EPL turbidity limits (TSS 50 mg/L, NTU 25) for mine discharge water also exceeds median and 80 percentile water quality levels based on site specific monitoring. Monitoring data for the Goulburn River at SW02 indicates a TSS average of 12 mg/l and 6 mg/l for 80 percentile levels; NTU 80th percentile level is less than 11 (App F, Table 2.11, p.23).

The chemical composition of saline mine discharge water can differ significantly to what naturally occurs in surface waters. Mine de-watering, seepage and the discharge of excess mine water in the upper Goulburn is not only increasing downstream salt loads and altering the natural flow regime, but is also changing surface and groundwater chemistry, turbidity, increasing sulfate and metal concentrations in surface waters. The relative proportion of ions in saline waters as well as other co-occurring environmental stressors (e.g. turbidity, organic compounds) can have a combined greater effect on ecosystem health than total salinity (Kefford et al., 2013; Krogh et al., 2013). There has been no research in the upper Goulburn on the impact of mine water discharge on groundwater stygofauna.

Monitoring of metals and organic compounds associated with Permian coal seams (BTEX, Phenols, TPH) should be included in any monitoring program of mine discharge water and brine waste from water treatment plants being used as dust suppressants.

MCOs proposed strategy for management of water treatment plant waste product/brine (~2.5 Ml/day) is ill-considered and carries a high risk of saline seepage and runoff contaminating surface and groundwater quality. The temporary storage in brine dams, dispersal for dust suppression, disposal in underground longwall panels or OC 2 & 3 pits (up dip from ongoing mining in UG4) all create potential hazards in both the short and long term.

References in Appendix H comparing mine water quality to ANZECC & ARMCANZ (2000) recommended guideline limits for Livestock Drinking is not a credible or relevant comparison for water discharging into the Goulburn River or Goulburn River National Park.

Summary:

- Licensed mine discharge levels should reflect pre mining water quality and not exceed the median percentile water quality parameters of the receiving waters (50^{th} percentile).

- NSW regulators should not approve any increase in the salt load of mine water discharge into the upper Goulburn. The accepted maximum EC of mine discharge water should be reduced to 500µS/cm for all current EPL licenses (as current for Wilpinjong Coal Mine EPL).
- Total suspended solids (TSS) maximum licensed discharge levels should be reduced to reflect the receiving waters downstream in the Goulburn River.
- Reporting of mine discharge water should include regular monitoring and analysis for major ions and other coal pollutants including organic compounds associated with Permian coal seams (BTEX, Phenols, TPH and other poly cyclic hydrocarbons).

ANZECC (2000) states:

> "*Key stakeholders in a region would normally be expected to decide upon an appropriate level of protection through determination of the management goals and based on the community's long-term desires for the ecosystem. The philosophy behind selecting a level of protection should be (1) maintain the existing ecosystem condition, or (2) enhance a modified ecosystem by targeting the most appropriate condition level"*

There has been no consultation with the community or downstream water users as to the level of appropriate protection required for downstream high conservation ecosystems including The Drip and Goulburn River National park

Groundwater assessment inconsistencies and concerns

MCO Mod 12 (S2.2.4) modelling assumes Triassic-age sandstone units overlying Stage 2 underground mines (UG1 and UG2) as dry (based on limited drilling) and there is no direct hydraulic connection between the goaf and base of the Triassic units overlying UG4. However the revised groundwater modelling of the Moolarben Coal Complex indicates that total inflows will be greater than those predicted by RPS Aquaterra (2011) and HydroSimulations (2015). Water make in UG1 is reported as significantly greater than the predicted <1 ML/day, and is currently >5 ML/day (~ 60L/s).

An outstanding concern is the repeated underestimation by groundwater modelling of water make. This was also the case at UCML before acknowledgement that the upper Triassic groundwater system was being depressurised by mine subsidence. The current disparity in MCOs modelling requires more detailed explanation and reappraisal of the potential source(s) and extent of intercepted groundwater; the implications for both surface and groundwater interaction and groundwater interception in UG4.

Some of the areas of concern include:

- Groundwater hydrographs provided only go as far as January 2017. The main increase in UG1water make appears to have occurred after this period.

- Modelled groundwater inflows to the underground mine from the year 2020 exceed MCOs groundwater maximum entitlement of 2,950 ML/year (Porous Rock Aquifer License - WAL39799) with predicted take increasing to 6,307 ML/year in 2025. These predicted mine inflows conflict with the embargo order on groundwater licences in the Hunter Water Shortage Zone introduced in 2016.
- MCO groundwater modelling uses questionable assumptions for hydraulic permeability concerning the potential impacts of subsidence and dewatering on the upper groundwater (Triassic). The hydraulic conductivity (K) of geo-hydraulic units in groundwater modelling is an estimate that can vary considerably dependent on modeller preference. MCO groundwater modelling use K values that differ by many orders of magnitude to UCML (Mackie 2015). e.g. assumed ratios for K_h/K_v for upper Triassic hydraulic unit used by UCML = 2; MCO = 5000). MCO assumes very little vertical groundwater flux despite characteristic vertical jointing in the Narrabeen Group of sedimentary rocks and proven leakage due to mine subsidence cracking at UCML.
- The modelling ignores demonstrated impacts on GW in the neighbouring Ulan Coal Mine (UCML) that clearly prove the total depressurisation of overlying Triassic aquifers due to mine subsidence whatever the width of the longwall face. UG4 is also be considerably shallower than UCML UG3

The community has little faith in the reliance on “model recalibration” to retrospectively address serious miscalculations in the MCO groundwater model which should be ringing alarm bells for the government regulators if the long term protection of the Upper Goulburn River system is to be taken seriously.

Changes to stream base flow

Modelling predictions related to loss of base flow and increasing inflows as mining progresses down-dip are also in question. Groundwater associated with Triassic/Upper-mid Permian hydrological units discharge towards the river providing base flows. The modelled changes (loss) to base flow and interference to groundwater-river interaction are not ground-truthed/verified and as such lack scientific rigor.

Groundwater Dependent Ecosystems (GDEs)

MCO has not collected any baseline data or carried out any specific on-ground monitoring of The Drip GDE. MCO often repeated description is based on generalised observations and assumptions as to the source, extent, character and permanence of the groundwater that feeds the

Drip GDE. MCO intends to commence early dewatering of UG4 using the Northern bore field (opposite The Drip and 500m from the River)

MCO GWA lacks independent mapping and assessment of GDEs. MCO assumes low potential for GDEs based on an incomplete GDEs Atlas spatial dataset (national scale) [4] of the upper Goulburn area (GWA 5.9 p.47). Current GDEs Atlas online maps for the upper Goulburn lacks detailed spatial and regional data for groundwater and native terrestrial vegetation mapping and should only be used as a basic indicator of GDE potential.

Proponent has not provided any information on Subsidence Impact Performance Measures to ensure the special features referred to as The Drip <u>and bed of the Goulburn River</u> experience

> *"Nil impact or environmental consequences" (Project Approval -Table 14 p.23 Subsidence Impact Performance Measures)*
> *74. Impacts to the Drip cannot be offset and consequently the proponent shall ensure that the project has no impact on the Drip or the water supply to the Drip.*

Summary

- An independent on-ground survey and assessment of GDEs should be undertaken and include riparian GDEs along the river corridor (above and below The Drip and NP), Saddlers Creek GDE, Bobadeen Creek, Wilpinjong Creek and other springs and seeps GDEs along the GDR and Munghorn).
- Fluctuations in river bed sand-sediment aquifer require real time monitoring as background and measurement of river height/response before the commencement of significant bore field extraction and longwall mining dewatering

Additional points and errors in the reports

- The agreement in The Drip Deed to protect additional areas of land as State Conservation Area has not been met under the agreed timeframe of March 2017

- Controlled Water Release Assessment (CWRA Appendix F p.11) MCO is incorrect when it assumes mine water discharges commenced in 2004 from Ulan.
  UCML has been discharging excess mine water from the late 1980s (ad hoc). Discharge volume was licensed in the 1990s; from 2004 licensed limits on salinity discharge were first introduced. At various times Nil discharge was enacted but regularly suspended during high rainfall events when onsite storage and management of excess mine water by irrigation were inadequate.

- MCO incorrectly assumes Bobadeen creek is ephemeral (CWRA-App F p.10) underestimating the contribution of groundwater to stream base flow. Bobadeen creek sustains permanent flow from groundwater seepage approximately 300m above the junction with Goulburn (EC 294 µS/cm DPI-Water Lab analysis Oct'2012).

[4] Groundwater Dependent Ecosystems Atlas http://www.bom.gov.au/water/groundwater/gde/map.shtml

- Incorrect caption Figure 2.9 *Goulburn River downstream of Bobadeen creek* (CWRA-App F p.17). This is actually a photo of Bobadeen creek taken from the foot bridge immediately upstream from the confluence with the Goulburn River.

Yours sincerely

Julia Imrie-Mullins BSc. Grad. Dip Water Resources.
PhD Candidate
Fenner School of Environment and Society
College of Medicine, Biology and Environment
Australian National University

DPI-Water, 2016. *NSW Real-time Surface and Groundwater Monitoring Database,* © State of New South Wales (DPI Water) Available at: http://realtimedata.water.nsw.gov.au/water.stm (accessed June 2016).

NSW-Department-Water-Resources, 1994. Station 210046 Goulburn River at Ulan, Newcastle.

NSW-Office-Water, 2008. In *PINNEENA New South Wales Surface Water Data Archive* Vol. Version 9.2 NSW Government Department Water and Energy, Australia.