

INDEPENDENT EXPERT ADVISORY PANEL FOR MINING

Jessie Evans
Director Resource Assessments
Department of Planning, Housing and Infrastructure
Via: Secretariat for IEAPM

18 March 2025

IEAPM Ref: IEAPM202503-01-I1

Dear Jessie,

IEAPM Advice on Springvale Water Treatment Facility (Modification Application SSD-7592-MOD-11)

On 18 February 2025, the NSW Department of Planning, Housing and Infrastructure (DPHI) requested the Independent Expert Advisory Panel for Mining (IEAPM, 'the Panel') provide advice in relation to Modification Application 11 from Springvale Coal Pty Ltd (Centennial) for changes to the Water Facility Treatment at Springvale Coal Mine (the 'Modification') (Centennial 2024).

The Modification requested approval to permit the transfer of poorer quality water from the Springvale Water Treatment Plant (SWTP) via the Coxs River Water Supply Pipeline to Thompsons Creek Reservoir (TCR) during a Mt Piper Power Station (MPPS) outage, when water usage at the MPPS is substantially reduced. The Modification was subsequently amended on 4 March 2025 (the 'Amended Modification') (Centennial 2025) to be time limited to just the planned power station outage scheduled to occur for a period of 54 days at MPPS in April/May 2025 (the 'Outage period').

The Panel was briefed by DPHI Planning Assessments on 5 March 2025.

Request for Advice

The Department sought advice from the Panel on the following:

- *the suitability of the approach applied within the Modification Report to predict the potential impacts on Thompsons Creek Reservoir (including lake hydrodynamics) and Cox's River catchment; and*
- *whether the conclusions regarding potential impacts on Thompson's Creek Reservoir and downstream environments are reasonable.*

The Panel was also invited to:

- *provide any other advice it considers would assist the Department in reviewing the modification application.*

Panel Members

The Panel members convened to prepare the advice comprise:

- i) John Ross – Panel Convenor, Groundwater Expert
- ii) Jim Galvin – Subsidence Expert & Chair, Ex-officio IEAPM
- iii) Neil McIntyre – Surface Water Expert
- iv) David Waite – Water Quality Engineer Expert

Process

Given the tight timeframe to provide this Advice to both DPHI and the Independent Planning Commission (IPC), the Panel's high technical level advice focuses on the two primary operational and environmental issues.

Background

The proposed Modification was to permit the transfer of surplus mine water from the SWTP to TCR as follows:

- Transfer of up to 42 ML/day of Blended Water consisting of up to 18 ML/day of Treated Water (filtered and desalinated output from the SWTP), and up to 24 ML/day of Filtered Water (filtered but not desalinated output from the SWTP), blended in the Coxs River Water Supply Pipeline (Blended Water Transfers);
- Transfers of Filtered Water up to 24 ML/day for short durations (Filtered Water Transfers). This is a contingency if desalination throughput is limited for any reason during an outage; and
- Filtered Water Transfers and Blended Water Transfers be transferred to TCR provided that the following are maintained:
 - Water quality in TCR achieves the agreed EC thresholds and does not exceed 650 $\mu\text{S}/\text{cm}$ at any time; and
 - TCR water level does not exceed the High Operating Level (HOL).

The Amended Modification seeks approval for:

- Periodic transfer of water from the SWTP to the TCR during the Outage, scheduled to occur at MPPS in April/May 2025;
- Water quality (electric conductivity (EC)) discharge limit in TCR be reduced from 650 $\mu\text{S}/\text{cm}$ to 600 $\mu\text{S}/\text{cm}$ and that the TCR notification trigger be 550 $\mu\text{S}/\text{cm}$;
- Transfer of up to 42 ML/day Blended Water to the TCR for a 60 to 75-day transfer period (the Outage period plus a buffer period of up to 14 days prior and seven days following the Outage period);
- Contingency transfer of 24 ML/day Filtered Water to the TCR for short duration periods (2-to-9-day transfers); and
- Riparian releases from TCR be restricted to 0.8 ML/day (between September and April) and 0.3 ML/day (between May and August) (as licenced) when water transfers from SWTP to TCR are occurring during the Outage period.

The following operational criteria are expected for transfers:

- Filtered water would have an indicative EC of less than 1,200 $\mu\text{S}/\text{cm}$; and
- Blended water would have an indicative EC range of between 600 and 900 $\mu\text{S}/\text{cm}$, depending on the mix of fully treated water and partially treated (filtered) water.

The Panel understands that the current EC of the stored water in the TCR is just under 500 $\mu\text{S}/\text{cm}$.

Analysis

Issue 1 – the suitability of the approach to predict the potential impacts on Thompsons Creek Reservoir and Cox’s River catchment

A TCR mixing model has been used to predict the electrical conductivity (EC¹) in the TCR. The model assumes full mixing of the reservoir, which is a widely used assumption in water quality modelling. The alternative approach would be to apply a hydrodynamic model, which is more time- and data-intensive. The full mixing assumption is reasonable provided the TCR does not stratify (i.e. does not separate into a denser lower layer and less dense upper layer). In temperate climate lakes, stratification is common in summer due to natural heating of the near-surface water. Stratification can also occur when saline water flows into a fresh water system. In the TCR, stratification is prevented by an artificial destratification (aeration) system. The depth profile data provided to the Panel indicate that the reservoir was well mixed up to the summer of 2020/21, stratified in January-March of 2022 and February-March 2023, and was again well mixed over summer 2023/24. These results suggest that the aeration system is operating somewhat sporadically. If effective mixing is to be achieved, attention should be given to the aeration system to ensure it is of sufficient capacity and is well-maintained.

In terms of the TCR salinity balance, the modelling is highly conservative, since it assumes 75 percentile or 95 percentile values of the initial TCR EC and the transferred water EC will occur.

The modelling assumes that EC is conservative (does not increase or decrease inside the TCR due to physical, chemical or biological processes) and that the transfer is the only introduced EC. The Modification Report (MR) (Centennial 2024) considers EC as the relevant indicator of water quality and no other water quality parameters are modelled. These are appropriate modelling assumptions for the purpose of assessing potential impacts of the single outage event proposed in the Amended Modification.

Concentrations of arsenic, copper and zinc in mine waters (as indicated by the filtered mine water (MWQ) results available) often exceed Australia New Zealand Guideline (ANZG) values for slightly to moderately disturbed ecosystems but these elements would be expected to be partially removed in the Springvale Water Treatment Plant (non-RO) filtration processes and will be reduced in concentration as a result of both blending with RO-treated water (when available) and dilution (by at least ten times) on mixing with the approximately 30 GL of water in TCR. The filtered mine water turbidity is also reasonably high but particulate matter in these waters should be effectively removed by the Actiflo, multimedia and cartridge filtration processes at the Springvale Water Treatment Plant. Nevertheless, while the focus on EC in the MR is sufficient for the Amended Modification due to dilution capacity of the TCR over the 60 to 75-day time scale, there are questions concerning removal efficiency of turbidity and metals that should be addressed as part of longer-term planning.

The modelling has not been updated to account for the Amended Modification; in particular, the modelling assumes that the maximum riparian release of 18.5 ML/day will be utilised throughout the Outage periods to control water level in the TCR, while the Amended Modification reduces the maximum release to 0.3 ML/day (May-Aug) or 0.8 ML/day (Sep-Apr). This change will not significantly affect the predicted EC concentration and the lower riparian discharge limits mean the modelling is conservative regarding the salt loading rate to Thompsons Creek; however, the new limits mean that the HOL volume threshold is more likely to be reached within the 60 to 75-day transfer period. The storage available between Low Operating Level (LOL) and HOL, allowing for the discharge limits of 0.3 to 0.8 ML/day over 60

¹ Electrical conductivity (EC) is a widely used indicator of salinity (total dissolved solids concentration)

days is approximately 1700 ML, while the volume predicted to be transferred to the TCR over 60 days is up to 2520 ML. To provide for sufficient storage and to compensate for reduced releases during the Outage period, the Panel understands that some 767 ML are proposed to be discharged from the TCR prior to 1 April. Furthermore, rainfall-runoff from the reservoir catchment (<9 km²) may exceed evaporation losses from the reservoir and further reduce the storage available. The volumes of water in the TCR can increase beyond HOL towards the Full Supply Level (FSL) under wet weather conditions; however, the Panel's understanding of the MR is that irrespective of wet weather, once HOL is reached then transfers are proposed to cease. The Panel notes that the cease-to-transfer HOL limit, although committed to in the MR, is not mentioned in the draft Consolidated Consent Modification 11.

Notwithstanding the uncertainty in the water balance associated with maintaining 18.5 ML/day as the riparian discharge rate, the Panel does not see a need to update the TCR modelling to account for the Amended Modification because it would not lead to significantly higher predicted values of EC or discharged salt loads.

The Panel concludes that the modelling of the TCR undertaken to predict the water quality in the TCR and in riparian discharges from the TCR is appropriate for supporting the Amended Modification if it can be assumed that the aeration system is operating effectively. The Panel notes that the model has not been updated to reflect the new, lower limits on riparian discharge rates and there appears to be uncertainty about whether the proposed HOL-LOL storage volume will be sufficient to prevent cessation of the water transfer under either dry or wet weather conditions.

Potential impacts to the Coxs River catchment have been assessed in the MR by:

- Comparison of measured treated and filtered water quality (EC and other parameters) against downstream water quality at two locations in the Coxs River (Cox 8A and WX9) and also against the relevant water quality (ANZG 2018) guidelines. WX9 is located closely downstream of the confluence of Pipers Flat Creek and Coxs River, where the riparian release will enter the Coxs River. From the information seen by the Panel, WX9 is representative of the upper Coxs River catchment and is a suitable site for this comparison.
- Comparison of the predicted riparian release EC during scenarios of transfer against the relevant triggers (550 µS/cm, 600 µS/cm, 650 µS/cm).
- Comparison of predicted salt loads from the TCR (assuming TCR riparian release of 18.5 ML/day) with baseline salt loads from the TCR and baseline salt loads in the upper Coxs River at monitoring point WX9.

The Panel considers that this approach is appropriate for the purpose of assessing the short-term outage covered by the Amended Modification. In particular, the reduction in water quality (as gauged by EC) of the TCR discharges due to the proposed transfer is minor compared to the baseline water quality at WX9 and, whatsmore, is temporary (75 days maximum). The predicted increase in salt loads is also minor and temporary.

Issue 2 – the reasonableness of the conclusions regarding potential impacts on Thompson's Creek Reservoir and downstream environments

Regarding potential impacts on Thompson's Creek Reservoir and downstream environments, the relevant conclusions from the MR (Executive Summary) are:

“The proposed modification will have no significant environmental impacts on the existing physical environment.”

“A Water Impact Assessment (WIA) concluded that the proposed modification will not present significant additional environmental impacts on water quality and salt load to the receiving waters from the riparian releases from TCR during Outage periods with the SWTP water transfers established.”

“The proposed modification has been designed to avoid and minimise adverse biophysical, social and economic impacts. Appropriate management measures have been identified to mitigate any residual impacts from the proposed modification. These management measures will help to ensure the proposed activities will have minimal additional environmental impacts.”

The Panel agrees with these conclusions in relation to the Amended Modification. As well as the modelling and impacts assessment being appropriate and indicating only minor impacts, the water quality is proposed to be monitored in real time at the discharge point, allowing for rapid identification of water quality triggers and, if necessary, the contingency of ceasing transfers.

Further, the Panel agrees with all the conclusions of the Water Impact Assessment (WIA) (as listed on p33 of that report – Appendix A of Centennial 2024) in relation to the Amended Modification, subject to some reservations and recommendations noted elsewhere in this advice.

However, looking beyond the timeframe of the Amended Modification, the Panel does not consider the MR conclusions regarding absence of significant impacts to be reasonable when considering the potential cumulative impacts of outages over a series of years (i.e. what was proposed in the original Modification 11 application), assessment of which would warrant further investigation. In particular, consideration should be given to the possible long-term change in major ion composition of TCR waters as mine waters are expected to contain significantly higher concentrations of calcium and magnesium than surface runoff waters with significant inputs of non-RO filtered water to TCR expected to lead to waters of increased hardness (though this concern should be mitigated by transfer of RO-treated water to TCR as divalent cations such as calcium and magnesium should be effectively removed by the reverse osmosis membrane filtration process).

The possibility also exists that elements such as arsenic, copper and zinc which, as noted above, are present at elevated concentrations in mine waters, may accumulate in TCR benthic sediments during periods of transfer of non-RO filtered water as a result of the tendency of these elements to adsorb to clays and iron oxides present in the sediments. While these elements should be removed to some extent by the (non-RO) filtration processes currently in place at SWTP, the effectiveness of these processes is unclear as the composition of the non-RO filtered waters does not appear to be reported. If significant loads of these elements are transferred to TCR, they may well be retained in the TCR sediments if the reservoir is well-aerated. However, the possibility also exists that they may be released from the sediments into the overlying water body during periods of sediment anoxia that may eventuate if reservoir stratification occurs (as may be the case during the warmer months of January to April if the aeration system is non-operational).

To more clearly understand the potential threats to TCR water quality during periods when the RO system at SWTP is non-operational and transfer volumes from SWTP to TCR are high (such as occurs during periods of MPPS outage), increased clarity on performance of the non-RO treatment processes at SWTP is required. Additionally, every effort should be taken to ensure that RO treatment of mine waters can be maintained. At present, the limited ability to manage RO brine if MPPS is non-operational and fly ash is unavailable to mix with the RO

brine appears to be a major constraint on operation of the RO filtration process. In accordance with advice from the NSW EPA, the Panel recommends that further attention be given to exploring possible options for managing brine streams such that RO filtration can be maintained, even if MPPS is non-operational.

Conclusions

The Panel has reviewed the Modification Report (MR) and the Amended Application and has concluded:

1. The mixing model described in the MR is fit for purpose assuming the destratification (aeration) system is operating effectively. Consequently, the mixing model application provides conservative estimates of EC in the Thompsons Creek Reservoir (TCR).
2. If the available TCR storage is the volume between the High Operating Level (HOL) and the Low Operating Level (LOL) as stated in the MR, then the HOL trigger would be reached within the 60 to 75-day outage period using the modelled transfer rate scenarios. To provide for sufficient storage, the Panel understands that some 767 ML will be discharged from TCR prior to 1 April. However wet weather has the potential to accelerate this trigger, and therefore there is some uncertainty about whether transfers will need to cease or be limited due to volume constraints in TCR.
3. The approach to assessing the potential impacts on the Coxs River catchment is appropriate.
4. The potential minor water quality impacts on TCR and negligible water quality and flow impacts on downstream environments are reasonable.
5. There are no obstacles to approving the Amended Modification.
6. Further investigation of baseline conditions, potential impacts and potential mitigation options would be advisable if discharges of filtered or blended water were to be proposed in the longer term.

Increased clarity on performance of the non-RO treatment processes at the SWTP is required, especially regarding removal of turbidity and potentially toxic elements arsenic, copper and zinc that are recognised to be present in mine waters.

Additionally, every effort should be taken to ensure that RO treatment of mine waters can be maintained. At present, the limited ability to manage RO brine if MPPS is non-operational and fly ash is unavailable to mix with the RO brine appears to be a major constraint on operation of the RO filtration process.

Particular attention should be given to possible options for managing brine streams such that RO filtration can be maintained, even if MPPS is non-operational.

Recommendations

The Panel recommends an additional clause could be added to the Consent Conditions:

- Schedule 2 Clause 6D
 - All water transfers from the SWTP must cease once water levels in TCR reach the high operating level (HOL) subject to a wet weather contingency plan, which the proponent should propose

For future SWTP operations and potential consent modifications, the Panel also provides the following technical/operational recommendations for Centennial's consideration:

Short Term (in respect of the scope of the original modification)

In accord with EPA recommendations, greater clarity should be provided on the composition of the following water streams potentially transferred to TCR:

- Treated water (i.e. waters that have been RO filtered).
- Partially treated water (i.e. waters that have been treated at SWTP but not RO filtered).
- Blended water (i.e. the mix of RO filtered and non-RO filtered waters).

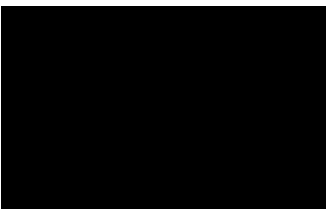
It is noted that the concentrations of major cations and anions of all waters of interest do not appear to be reported. As such, analyses of all waters of interest (including the above waters as well as those of TCR and downstream receiving waters) should include complete analyses of all major cations and anions as well as the minor species currently analysed.

Confirmation should be provided that the TCR artificial destratification system (i.e. the aeration facility) is capable of consistently maintaining TCR in a fully mixed state.

Long Term (in respect of future Modifications)

Every effort should be taken to ensuring that RO treatment of mine waters can be maintained for all future MPPS outages. At present, the limited ability to manage RO brine if MPPS is non-operational and fly ash is unavailable appears to be a major constraint on operation of the RO filtration process. In accordance with advice from the NSW EPA, the Panel recommends that further attention should be given to possible options for managing brine streams such that RO filtration can be maintained, even if MPPS is non-operational.

Yours sincerely



John Ross

Panel Convenor, Springvale Water Facility Treatment Modification Application 11

References

Centennial 2024, *Springvale Water Treatment Plant – Modification Report for Modification 11 to SSD-7592 (MOD 11)* dated 20 December 2024.

Centennial 2025, *SWTP SSD-7592 – Mod 11 Amendment Report*. Letter Report that included ERM report dated 4 March 2025.