

## Advice to decision maker on coal mining project

### IESC 2025-157: Maules Creek Coal Mine Continuation Project (EPBC 2024/09936) – Expansion

<b>Requesting agency</b>	The Australian Government Department of Climate Change, Energy, the Environment and Water
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<b>Advice stage</b>	Assessment

The Independent Expert Scientific Committee on Unconventional Gas Development and Large Coal Mining Development (the IESC) provides independent, expert, scientific advice to the Australian and state government regulators on the potential impacts of unconventional gas and large coal mining proposals on water resources. The advice is designed to ensure that decisions by regulators on unconventional gas or large coal mining developments are informed by the best available science.

The IESC was requested by the Australian Government Department of Climate Change, Energy, the Environment and Water to provide advice on the Boggabri Coal Pty Ltd's Boggabri Coal Mine Modification 10 in New South Wales. This document provides the IESC's advice in response to the requesting agency's questions. These questions are directed at matters specific to the project to be considered during the requesting agency's assessment process. This advice draws upon the available assessment documentation, data and methodologies, together with the expert deliberations of the IESC, and is assessed against the IESC Information Guidelines (IESC 2024a).

#### Summary

The Maules Creek Coal Mine Continuation Project (the 'project') is a proposed extension to the existing Maules Creek Coal Mine (MCCM), an open-cut pit 17 km northeast of Boggabri, New South Wales (Whitehaven 2025, p. ES-3). The project includes an additional 681 hectares (ha) of disturbance to the east of the existing (continuing) MCCM mining area (Whitehaven, p. 3-13) and a 10-year extension in mine life to 2044. It expects to extract an additional 117 million tonnes (Mt) of Run-of-Mine (ROM) thermal, coking and bypass coal (Whitehaven 2025, pp. ES-13, 1-10).

The project proposes to use the current infrastructure which includes a mine infrastructure area, coal handling and processing plant (CHPP), a rail loop, accommodation villages, ancillary infrastructure and access roads (Whitehaven 2025, p. ES-10). Water is to be managed using both existing and new infrastructure, with sediment dams, mine water dams, drains, pipelines and clean-water diversions to be

constructed (Whitehaven 2025, Table ES-1, p. ES-11). A bi-directional transfer pipeline is proposed to share water between the MCCM, the Tarrawonga Coal Mine and the Vickery Coal Mine. The pipeline is intended to facilitate water supply and storage requirements for the project (Whitehaven 2025, Table ES-1, p. ES-11).

The project area is in the Namoi River catchment in the Murray-Darling Basin, and adjacent to Back Creek (a tributary of Maules Creek), with the Namoi River approximately 8 km to the west (Whitehaven 2025, p. ES-18). The Namoi River and its tributaries, including Maules Creek and Back Creek, are part of the *Lowland Darling River Aquatic Ecological Community*, an endangered ecological community in New South Wales that includes all native fish and aquatic invertebrates in all surface waters of the Darling River in NSW (New South Wales Department of Primary Industries 2007).

Within the development footprint, the proponent has identified three communities listed as Threatened Ecological Communities (TECs) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), as well as six species listed as threatened (Premise 2025, p. 347). One TEC along Back Creek is identified as a potentially groundwater-dependent ecosystem (GDE), and may opportunistically rely on groundwater below the ephemeral creek bed (Premise 2025, p. 233). The proponent has also collected stygofauna from aquifers near Back and Maules creeks (Eco Logical 2025, p. 69).

Key potential impacts from this project are:

- clearing of 642 ha of native vegetation, some of which is habitat for EPBC Act-listed species such as Koala *Phascolarctos cinereus*;
- removal of approximately 10 river-km of ephemeral tributaries of Back Creek and their riparian zones that are within the mine footprint;
- reductions in abundance and/or condition of groundwater-dependent terrestrial vegetation and stygofauna communities due to lowering of the water table below Maules and Back creeks; and
- cumulative impacts from the proposed project and current operations, and regional impacts from the MCCM and surrounding mines, particularly due to increased groundwater drawdown in the coal seams and a continued water take from the Namoi River.

The IESC has identified areas in which additional work is required to address the key potential impacts, as detailed in this advice. These include:

- field investigations, including multi-level piezometers and hydraulic testing, to characterise the contact between the coal seams and the overlying alluvium beneath Maules Creek;
- estimating the post-closure groundwater conditions at equilibrium, taking into account the final landform and pit lake;
- incorporating climate-change scenarios (e.g., RCP8.5) into the water balance and flood modelling; and
- ongoing stygofauna monitoring to assess potential impacts from the proposed mining operations on existing communities.

## **Context**

The project is a proposed continuation of MCCM to allow mining to expand east of the existing mining complex. MCCM lies 17 km northeast of Boggabri in New South Wales and is within the Gunnedah Basin. The proponent plans to extract an additional 117 Mt of ROM thermal, coking and bypass coal over the

extended 10-year life of the mine to 2044 (Whitehaven 2025, pp. ES-11, ES13). It proposes to use existing infrastructure, including the CHPP, rail loop and ancillary infrastructure, and to develop a new water-transfer pipeline between the MCCM, Tarrawonga and Vickery Coal mines (Whitehaven 2025, pp. ES-10 - ES-11). The proponent plans to construct three additional sediment dams (Dams 14, 17 and 18) as part of the proposed project (WRM 2025, Table 6.1, p. 85).

The MCCM is bordered by Back Creek to the north and Boggabri Coal Mine (BCM) to the south (Whitehaven 2025, Figure 1-3, p. 1-5). The Tarrawonga Coal Mine (TCM) is south of the BCM and does not share a boundary with the MCCM. The Vickery Coal Mine (VCM) is approximately south of the MCCM and southeast of the town of Boggabri (Whitehaven 2025, Figure 1-2, p. 1-3).

The project area is in the Namoi River catchment, with Back Creek adjacent to the area's northern boundary. All surface waters in the Namoi River catchment are part of the *Lowland Darling River Aquatic Ecological Community*, an endangered ecological community in New South Wales (New South Wales Department of Primary Industries 2007).

Groundwater is present within three main water-bearing units: alluvial sediments, the Maules Creek Formation and the Boggabri Volcanics. All three units outcrop locally, and the regional water table is formed from combination of all three units. Groundwater generally flows from east to west towards the Namoi River and then north / northwest along the Namoi River alignment (AGE 2025, p. 71). The proponent has identified GDEs regionally with moderate- to high-potential GDEs located in the surrounding area, including along Back Creek, Maules Creek and the Namoi River to the west (AGE 2025, p. 91). Stygofauna have been collected from aquifers near Back and Maules creeks (Eco Logical 2025, p. 69).

An area of 681 ha is proposed to be disturbed, with 642 ha of native vegetation to be cleared (Premise 2025, p. 259). This native vegetation includes one critically endangered ecological community (CEEC: Box-Gum Woodland, 21.9 ha to be cleared) and two endangered ecological communities (EECs: Poplar Box Woodland (3 ha) and Inland Grey Box Woodland (3 ha)) as listed under the EPBC Act (Premise 2025, p. 300). Additionally, the project area contains six species listed as threatened under the EPBC Act: two plant species (*Dichanthium setosum* and *Vincetoxicum forsteri* (syn. *Tylophora linearis*)), three bird species (Brown Treecreeper (*Climacteris picumnus victoriae*), Painted Honeyeater (*Grantiella picta*) and Diamond Firetail (*Stagonopleura guttata*)), and one mammal species (Corben's Long-eared Bat (*Nyctophilus corbeni*)) (Premise 2025, p. 347).

## Response to questions

The IESC's advice in response to the requesting agency's specific questions is provided below.

Question 1: To what extent can decision makers have confidence in the predictions of potential impacts on water resources provided in the EIS, including in regard to surface water quality, groundwater drawdown, and potential impacts on groundwater dependent ecosystems and other users?

- a) Has an appropriate model been selected and used by the applicant? Are the assumptions used in the model reasonable, appropriately conservative and appropriately justified?
- b) Has the model been calibrated with sufficient monitoring data to provide meaningful predictions, including worst-case impacts on surface and groundwater resources?
- c) Has the model been appropriately conceptualised?
- d) Has appropriate sensitivity and uncertainty analyses been undertaken, including consideration of the potential effects of climate change?

e) Have the surface and groundwater assessments sufficiently assessed surface and groundwater interactions?

1. Decision makers can only be moderately confident about the proponent's predictions of the project's potential impacts on water resources. Although the groundwater modelling is generally appropriate for assessing drawdown, there is considerable uncertainty about how depressurisation in deeper layers will influence both project-specific and cumulative drawdown in the alluvium and how this may affect surface water flows, quality and aquatic and terrestrial GDEs in and along Maules Creek. The following text answers the five sub-questions (a-e) specifically and includes several recommendations for further improvements of this assessment.

#### Groundwater

2. Whilst a detailed conceptual hydrogeological model has been developed to underpin the assessment (AGE 2025, Section 7), there are three areas where it should be improved:
  - a. potential groundwater pathways from coal seam depressurisation into the alluvium beneath Maules Creek;
  - b. impacts of the pit lake on groundwater conditions post-mining and in perpetuity; and
  - c. existing geological features (e.g., the Conomos Fault) that have not yet been fully characterised by data.
3. Potential groundwater impacts of the project were assessed using the Boggabri, Tarrawonga and Maules Creek (BTM) Complex's revised AGE (2025) MODFLOW-USG (MFUSG) model. MFUSG is appropriate modelling software for developing a groundwater model of this scale. The assumptions and limitations (AGE 2025, App. F, p. 5) were appropriate and justified given the model's objectives. The 34-layer model used an appropriate range of hydraulic conductivity and storage values based on hydraulic testing across the project area, with upscaling and averaging of aquifer properties that was justified for the dimensions of the model grid cells.
4. The groundwater model was appropriately calibrated. An automated calibration process was adopted and used 247 monitoring points and 24,258 observations (collected between 2006 and 2024) to match groundwater levels measured during previous mining activities. Half of the observations were from the alluvial layers (AGE 2025, App. F, p. 33), which enables meaningful predictions given that most receptors of potential impacts are related to the alluvial sediments. Worst-case predictions were not explicitly made but the uncertainty analysis (Paragraph 6) indicates the possibilities for cumulative scenarios where all proposed mining occurs.
5. A traditional assessment of sensitivity was not undertaken. The model peer reviewer considered that this was appropriate given the calibration method used (AGE 2025, App. G, p. 10). Nevertheless, information regarding parameter sensitivity would have been generated through the calibration process and the uncertainty analysis. This information is valuable to understand which parameters are important to modelled outcomes and should be reported.
6. The IESC considers that the uncertainty analysis conducted on the numerical groundwater model is appropriate for this project, although the conceptual uncertainties raised in Paragraph 2 remain. The uncertainty analysis was undertaken through two steps: a Monte-Carlo approach to produce drawdown probability surfaces, and a data space inversion (DSI) approach to assess uncertainty in value predictions (AGE 2025, App. F, p. 108). The peer reviewer cautioned the use of the DSI until its practical credibility has been tested, particularly through comparison to traditional methods (AGE 2025, App. G, p. 12).

7. The proponent has taken a simplified approach to the potential effects of climate change in the groundwater model. This is considered adequate for this project. The estimation of long-term impacts by the groundwater model also depends on the water balance model (Paragraph 11) for the final void and its climate-change assumptions.
8. Assessments for Back Creek are generally sufficient to characterise surface water and groundwater interactions for the purpose of model development. Back Creek was assessed during the development of an ecohydrological model for the project (AGE 2025, App. E). The assessment indicated that groundwater was between 10 and 25 m below the base of the creek depending on the location. On this basis, it was concluded that groundwater was not able to discharge into Back Creek (AGE 2025, App. E, p. 24).
9. Improvements are needed for the Maules Creek assessment of surface water-groundwater interaction, because its terrestrial and aquatic GDEs may be impacted by the more than 50 m of depressurisation predicted in the coal seams subcropping beneath its alluvium (AGE 2025, App. F, Figure F71, p. 99).
  - a. The pathways between the Maules Creek alluvium and the underlying depressurised coal seams have not been directly investigated to date, nor their hydraulic properties. This is despite observed upwards or neutral gradients to support groundwater in the alluvium, identified at an upstream location (AGE 2025, p. 69), where potentiometric levels for the upper four water bearing units are close together prior to MCCM mining.
  - b. The GDEs may depend on episodic groundwater flow into creek reaches (Paragraph 19). This baseflow was identified via comparisons of groundwater levels with creek levels (AGE, Section 7.4.6, pp. 70-72). Other studies (e.g., Anderson and Acworth 2007, Anderson et al. 2008) provide geochemical evidence of groundwater discharge to reaches of Maules Creek.
  - c. The predicted timeframe of drawdown occurring below Maules Creek is at least 200 years post mining (Paragraphs 14b and 21). The long-lasting impacts mean that additional assessment is warranted commensurate with the risk of potential loss of groundwater flow.
10. The groundwater modelling predicted that there would be no reduction in flux to the Namoi River regardless of scenario, and the drawdown extent was not predicted to reach the river (AGE 2025, p. 149) (Paragraph 14a). However, the pit lake modelling indicates that 412 ML per year will be lost from the Namoi River catchment in perpetuity (WRM 2025, Figure 9.4, p. 142).

#### Surface water

11. The water balance model (GoldSim) selected by the proponent is an industry standard, with all assumptions appropriately justified in the discussion. However, the proponent has chosen an average selection with historical climatic data as a conservative approach, and does not present a range of possible outcomes. Multiple relevant Bureau of Meteorology stations and Scientific Information for Land Owners (SILO) data (WRM 2025, Table 4.1, p. 35) along with historical climatic data are used for confirming correct inputs of the model. As historical and current climatic conditions may not be representative when the proposed project is expected to operate (approximately 2029 to 2044 (WRM 2025, Figure 6.3, p. 90)), the proponent should incorporate representative climate-change scenarios (e.g., RCP8.5) into the water balance for climate-change modelling.
12. The flood models selected by the proponent are industry standards (United River Basin Simulator (hydrological model) and TUFLOW (hydraulic model), with all assumptions appropriately justified in the discussion. To be conservative, the proponent uses historical climatic data and adopts the 0.5% Annual Exceedance Probability (AEP) as a proxy for the 1% AEP to incorporate climate change considerations (WRM 2025, p. 111). As historical and current climate conditions (including higher

AEPs) may not be representative when the proposed project is expected to operate, the proponent should incorporate representative climate-change scenarios (e.g., RCP8.5) into the flood modelling.

#### Groundwater-dependent ecosystems

13. The proponent recorded stygofauna from bores along Back and Maules creeks and acknowledges that stygofauna have previously been collected from the Namoi River and Maules Creek alluvium (Eco Logical 2025, p. 55). The proponent suggests that the stygofauna identified near Back Creek were in alluvial sediments; however, the bore (MOR2) is variously described in the groundwater assessment report (AGE 2025) as monitoring regolith, alluvium and Boggabri Volcanics (with it mostly associated with the volcanics (e.g., AGE 2025, App. B, Table B1)). The potential presence of stygofauna in the volcanics has implications for predicting likely impacts of drawdown in the volcanics on resident stygofauna. Despite this, the proponent does not propose any further assessment or ongoing stygofauna monitoring (Eco Logical 2025, Table 18, pp. 66 – 67). Given the current uncertainty of the vertical distribution of stygofauna in the zone of predicted drawdown, together with the rather sparse sampling so far (Paragraph 30), the IESC recommends ongoing monitoring to validate the proponent's predictions of 'negligible impact' on stygofauna (Eco Logical 2025, p. viii).

Question 2: Does the EIS provide an adequate assessment of cumulative impacts to surface and groundwater resources during the mining operations and during the post-mining recovery phase – noting also that Boggabri Coal Mod 10 is also currently under assessment and under review by the IESC. Do these assessments adequately consider surface and groundwater interactions?

#### Groundwater

14. The assessments of cumulative surface and groundwater interactions are only partially adequate. Further work is required to improve understanding of potential risks and inform requirements for mitigation and management:
- a. The modelling outcomes predicted no reduction in flux to the Namoi River regardless of scenario, and the drawdown extent was not predicted to reach the river (AGE 2025, p. 149). Given that 412 ML/yr of groundwater is predicted to be perpetually extracted from the system via evaporation of the final pit lake (WRM 2025, p. 142), it is difficult to conceptualise that there will be no reduction in water flux to the Namoi River. This conclusion appears to be contradicted in the groundwater modelling report (AGE 2025, App. F, p. 88) (Paragraph 10). The ongoing groundwater extraction should be contextualised in terms of expected reduction in groundwater volume reaching the river in comparison to the volume flowing in the river.
  - b. The groundwater modelling predicts up to 1 m drawdown will occur in the alluvium beneath Maules Creek. This is predicted to occur 200 years after closure (AGE 2025, p. 127) (Paragraph 21). Further assessment of surface and groundwater for Maules Creek is required to provide a better understanding to reduce uncertainty in the potential risk posed by predicted drawdown (Paragraph 9c). With more than 50 m of depressurisation predicted in coal seams beneath the Maules Creek alluvium, detailed field investigations, including multi-level piezometers and hydraulic testing, are needed to characterise the contact between the coal seams and the alluvium.
  - c. The proponent does not specify how Goonbri Creek interacts with underlying groundwater along its length although drawdown below this creek's headwaters is predicted (AGE 2025, pp. 123-127). Given that high-potential terrestrial GDEs (e.g., *Melaleuca bracteata*) have been recorded from the riparian zone of this creek (Hansen Bailey 2021, Fig 3.1, p. 20), there should be more detailed assessment of surface water-groundwater interactions along Goonbri Creek in the zone of cumulative drawdown to provide a better understanding of the potential risks to these GDEs.

15. Post-closure groundwater conditions at equilibrium, including the influence of the pit void, have not been determined. Drawdown continues to expand beyond the end of simulated time period, 200 years after mine closure (AGE 2025, Figure 9.8-9.12, pp. 124-128). Scenarios should be extended until equilibrium is reached to determine the timing of equilibrium, the equilibrium water table and the equilibrium water balance. The proposed final pit void has a base elevation of around 60 m AHD (WRM 2025, p. 137), some 180 m lower in elevation in the Namoi River at its closest point to the MCCM project. The impact of the pit void on the surface and groundwater resources during the post-mining phase should be discussed.
16. The groundwater modelling considers 15 scenarios: 14 with variations of mining activity and a null case (without mining) against which impacts can be assessed (AGE 2025, Table 8.1, p. 111). The report provides comparisons of predicted water tables based on no mining (scenario 1), approved mining (scenario 2) and cumulative proposed mining (scenario 6) scenarios (AGE 2025, Section 9.2, pp. 113-121). The report also provides comparisons of predicted drawdown based on approved (scenario 2) and cumulative proposed (scenario 6) scenarios (AGE 2025, Section 9.3.1, pp. 122, 123-127), and for MCCM approved only (scenario 13) and MCCM proposed only (scenario 10) scenarios (AGE 2025, Section 9.3.2, pp. 122, 128). It is noted that there was no scenario comparing cumulative approved BCM and TCM with proposed MCCM. As such, a review of impacts attributable to the project on top of existing approved mining has not been performed, although it appears that approved and proposed activities account for most of the drawdown impacts. The proponent should include a comparison between scenario 7 (cumulative proposed – excluding MCCM) and scenario 6 to enable an assessment of the specific impact from the project should all other proposed mining be approved.

#### Surface water

17. The EIS does not adequately assess cumulative impacts to surface water resources during mining operations or during the post-mining recovery phase. The proponent has not discussed the potential hydrological impacts of the cumulative removal of the upper tributaries of Back Creek (up to 27% of the catchment for up to 30 years, WRM 2025, Figure 10.1, p. 150), particularly on ecologically important aspects (e.g., duration, timing of onset and cessation of flows) of the flow regime downstream (Paragraph 23). The proponent also does not provide a detailed discussion on the expected hydrological changes from the proposed reinstatement of 5% of the Back Creek catchment post-mining (WRM 2025, p. 149). Cumulative impacts to the downstream hydrology and geomorphology of Back Creek during current and post-mining operations should be discussed, including details about the likely responses to the proponent's proposed reinstatement of 5% of Back Creek's catchment.

#### Groundwater-dependent ecosystems

18. The proponent has not adequately considered cumulative impacts to GDEs within the zone of predicted cumulative drawdown. The proponent should provide a detailed assessment of the potential impacts of cumulative drawdown on stygofauna, aquatic GDEs (e.g., groundwater-fed reaches of Maules Creek) and terrestrial GDEs. This assessment should specify the predicted extents and durations of drawdown during and after mining in each area of known and expected GDEs (e.g., alluvial sediments, mapped terrestrial GDEs) and then infer, providing evidence where available, the likely cumulative impacts on specific GDEs in each area. These predicted impacts can then be assessed by ongoing monitoring of specific GDEs in the zones of cumulative drawdown (e.g., stygofauna sampling recommended in Paragraph 30).
19. Much research has been published on surface water-groundwater interactions along sections of Maules Creek and its tributaries, some of which is directly relevant to the proponent's assessments of potential environmental impacts of drawdown. For example, Korbel et al. (2022) present field evidence for the importance of flow in shaping microbial communities and biogeochemical cycling of intermittent reaches and their connected alluvial aquifers in Maules Creek. They also found that small

hydrological changes at Elfin Crossing (where perennial flow is maintained by groundwater entering the stream approximately 850 m upstream) seemed to impact aquatic community structure in the surface water and hyporheic zone of Maules Creek. This work indicates how responsive the aquatic biota of this system may be to minor changes in surface water-groundwater interactions along this hydrologically variable creek. The IESC recommends that the proponent uses this and other relevant published research from the Maules Creek catchment to improve their assessment of the potential project-specific and cumulative impacts of alluvial drawdown and altered surface flows on aquatic biota and biogeochemical cycling in this creek.

Question 3: Does the EIS provide reasonable strategies to effectively avoid, mitigate or minimise the likelihood, extent and significance of impacts, including cumulative impacts, to significant water-related resources?

#### Groundwater

20. The EIS provides high-level discussion of strategies to avoid, mitigate or minimise impacts with references to documentation, such as the current Water Management Plan (WMP), that was not provided for the assessment. This hampered the IESC's ability to adequately answer this question.
21. It appears that a significant portion of the groundwater drawdown occurs after mining has ceased (AGE 2025, Figure 9.8-9.12, pp.123-128) (Paragraph 14b). The EIS does not provide strategies to avoid, mitigate or minimise the long-term and ongoing drawdown of groundwater (Paragraph 26).
22. The hydrogeological conceptual model (AGE 2025, Section 7) does not discuss natural (or background) concentrations of metals or nutrients in the groundwater. The IESC's comparison of leachability results presented in the geochemical assessment (GEM 2025) to ANZG freshwater (95%) guidelines indicates that some metals may leach from overburden, interburden and/or coal seam floor and roof material (which is used as backfill) at concentrations exceeding these guidelines. The IESC's comparison of leachability results to concentrations detected in groundwater from surrounding licensed bores (AGE 2025, App. D) indicates that some metals (e.g., arsenic, antimony, selenium) may leach at concentrations above that in groundwater but acknowledges possible attenuation of leached metals. The geochemical assessment did not provide results for standard leach or column leach tests of coal and coal rejects. The proponent should use the geochemical information to inform potential risks from leachability causing groundwater quality impacts. These potential impacts on the groundwater and surface water environments (including proposed pit lakes on the adjacent mines) should be assessed and incorporated into appropriate management plans.

#### Surface water

23. The proponent proposes to remove some 10 river-km of ephemeral tributaries of Back Creek (WRM 2025, Figure 4.3, p. 31) as mining progresses. Any subsequent runoff will be captured into the water management system (WRM 2025, Figure 4.3, p. 31). The proponent stated that the water management system has been designed to minimise the amount of runoff being captured (WRM 2025, p. 149); however, the proponent will excise about a further 5% of Back Creek's catchment. It is noted that the proponent proposes to reinstate this amount of catchment post-mining (WRM 2025, p. 149). The proponent does not discuss how loss of these tributaries of Back Creek will alter the downstream geomorphology and flow regime of these ephemeral streams (Paragraph 17). Given it is likely that the progressive loss of catchment runoff will alter sediment transport and flow in Back Creek, the proponent should provide a detailed discussion of how potential impacts of these changes on aquatic and riparian biota will be avoided, mitigated or managed, including after establishment of the final landform. This is especially relevant given that Back Creek is part of the *Lowland Darling River Aquatic Ecological Community*, an endangered ecological community in New South Wales.



24. The proponent states that overflow from the sediment dams will continue to occur under the conditions of the Environment Protection License (EPL) (WRM 2025, p. 154). The water balance model predicts that these dams will overflow up to 23 times a year, totaling 21 ML of water potentially released each year. However, the EIS provided limited discussion on methods to prevent contaminated sediment being released into Back Creek. Further information on the regular removal of settled sediment from the dams and discussion about the prevention of contaminated sediment and metals (e.g., aluminium, copper, manganese, nickel) release should be provided to ensure that downstream receiving environments are not impacted from contamination.

#### Groundwater-dependent ecosystems

25. Strategies to mitigate project-specific impacts on GDEs and surface waters are outlined by the proponent (Eco Logical 2025, Table 6.1, pp. 66–67). It is acknowledged that drawdown in the Maules Creek alluvium could diminish available stygofauna habitat and reduce connectivity to the surface, affecting availability of nutrients, organic matter and dissolved oxygen. However, there are no plans to monitor stygofauna to confirm the prediction that impacts will not be significant, nor are any mitigation options proposed. The proponent should outline a suitable monitoring program (Paragraph 30) and specify how any impacts that it detects will be mitigated or managed.

Question 4: Are there any additional mitigation, monitoring, management or offsetting measures that should be considered by decision makers to address the residual impacts of the project on water resources?

26. The proposed pit lake final landform appears to drive ongoing groundwater drawdown (Paragraph 15) and may pose environmental risks in the future.
- a. The extent and magnitude of groundwater drawdown is predicted to continue increasing for over 200 years post-mining. For existing third-party bores, the timing of drawdown exceeding 2 m is between 6 and 141 years post-mining (AGE 2025, p. 134). The proponent should specify how “make good” provisions (AGE 2025, p. 136) will be implemented when the impacts occur many decades after mining ceases.
  - b. The proponent’s final landform will include a final void. Inflows to and outflows from the pit lake are predicted to equilibrate at approximately 200 years post-mining (WRM 2025, p. 142). Inflows will be predominantly from groundwater and outflows will be limited to evaporation. Evaporative concentration is predicted to increase TDS over time, with TDS being between 8,000 and 35,000 after 500 years depending on climate scenario (WRM 2025, p. 147). A review of the geochemistry report (GEM 2025) indicates potential for metals to leach from disturbed, rejected and backfill material at concentrations greater than background groundwater and above ANZG (2018) guidelines (Paragraph 22). The proponent should discuss how concentrations of other analytes, such as metals, may increase due to pit lake evaporation and what environmental risks this may pose.
27. The proponent has proposed additions to the monitoring bore network (AGE 2025, p.155) to monitor the potential cone of depressurisation development in the direction of Elfin Crossing where flow is perennial and groundwater-fed. The proponent should install multilevel piezometers or paired groundwater monitoring bores between the mine pit and nearest creek and/or alluvium to provide further information on the hydraulic connectivity between depressurising coal seams and overlying alluvium (Paragraph 9a).
28. The proponent should design and implement a field investigation to better define the hydraulic characteristics of the Conomos Fault (see Murray and Power 2021) (Paragraph 2c).

29. Surface water quality parameters are mentioned in Appendix B (WRM 2025, Table 3.4, pp. 24 - 25); however, the frequency and timing of sampling should be discussed and justified.
30. Over three sampling periods (summer 2022 and autumn in 2023 and 2024), the proponent sampled seven bores for stygofauna once and three bores twice (Eco Logical 2025, Table 4, p. 20) for a total of thirteen samples. The proponent does not explain this limited sampling effort even though two of the bores (three samples) yielded stygofauna. Ongoing annual stygofaunal monitoring is recommended to test the proponent's assertion that the impacts of project-specific drawdown will be negligible. Given indications that stygofauna are present in the Boggabri Volcanics aquifer near Back Creek (Paragraph 13), this assessment should be extended to all aquifers potentially impacted by the project and should include sampling from reference bores where drawdown is not expected. Furthermore, the proponent should consider using molecular approaches recommended in IESC (2024b and associated references) to refine their taxonomic resolution beyond genus level. Future assessment should consider sampling methods discussed in IESC (2024b) and associated reports.
31. Project-induced drawdown within the Maules Creek alluvium is projected to be between 0.5 m and 1 m, during and post mining (Eco Logical 2025, p. 65). The proponent states that the magnitude of this drawdown is within seasonal fluctuations (2 to 8 m) and therefore impacts will be negligible. However, drawdown will more likely shift the seasonal variation downward (e.g., the seasonal lows and highs would be up to 1 m lower) rather than be encompassed within the existing variation. Additionally, the proponent notes that minor changes to a groundwater system in which vegetation uses groundwater opportunistically could cause stress (e.g., dieback) where that change is prolonged or rapid, especially during drought (AGE 2025, Appendix E, p. 18). Further information, preferably supported by evidence from fieldwork and/or the literature, is needed to predict whether a shift of up to 1 m downwards from the seasonal variation in water table might have impacts on terrestrial GDEs, especially where this shift may exceed the limits of their rooting zones. The proponent should also outline a suitable monitoring program of the condition of potentially vulnerable GDEs to be able to detect any impacts of shifts in seasonal variation in water table. Options for mitigating or managing these impacts should also be described.

Question 5: Does the water balance model demonstrate that the proposed water transfer pipeline between Maules Creek, Vickery, and Tarrawonga mines would reduce the reliance on water from the Namoi Pump Station and groundwater bores?

32. It is not clear from the information presented that the proposed water transfer system will reduce reliance on water from the Namoi Pump Station over the life of the mine. The water balance model, which takes the average of 115 modelled realisations, suggests that the water transfer pipeline between Maules Creek (MCCM), Vickery (VCM), and Tarrawonga (TCM) mines would reduce the reliance on water from the groundwater bores (take from these trend to zero by 2040-2045); however, the Namoi River imports are unchanged between 2025 and 2045 at 636 to 779 ML/year (WRM 2025, Table 6.7, p. 102), indicating no change in reliance from the river. Further, the reduced reliance on the groundwater system does not account for potential groundwater take from the inflows into the Tarrawonga Mine final void (which the proponent plans to use for water storage as a part of the water transfer pipeline proposal). The proponent has not provided water balance modelling for the final void at the TCM. As such, it is not clear how much of the water transferred from MCCM to TCM is lost (e.g., to evaporation) before transfer back for reuse at the MCCM site. This use of the TCM pit may lead to groundwater being extracted from the pit rather than from the licensed bores. It is not clear whether this activity has been considered in groundwater modelling. A detailed description of how the water transfer system would work, including potential interaction of groundwater inflows and stored water at the TCM site, should be provided to better justify the need and suitability of this system.

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**Date of advice**      1 September 2025

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<b>Source documentation provided to the IESC for the formulation of this advice</b>	<p>Whitehaven 2025. <i>Maules Creek Continuation Project – Environmental Impact Statement</i>. Prepared for Maules Creek Coal Pty Ltd. 2025. (Includes Appendices A-R). Available [online]: <a href="#">State Significant Development – Maules Creek Continuation Project (nsw.gov.au)</a> accessed July 2023.</p>
<b>References cited within the IESC’s advice</b>	<p>Anderson MS, Acworth RI. 2007. Chemical and Geophysical Sampling Campaign at Maules Creek - Data Report for 2006. <i>WRL Research Report</i>, 229. University of NSW.</p> <p>Andersen MS, Meredith K, Timms W, Acworth RI. 2008. Investigation of <math>\delta^{18}\text{O}</math> and <math>\delta^2\text{H}</math> in the Namoi River catchment – elucidating recharge sources and the extent of surface water/groundwater interaction. <i>Integrating Groundwater Science and Human Well-being Congress of IAH 36<sup>th</sup></i>. Toyama City, Japan, January 2008</p> <p>ANZG 2018, <i>Australian and New Zealand Guidelines for Fresh and Marine Water Quality</i>. Department of Climate Change, Energy, the Environment and Water 2018. Available [online]: <a href="#">Australian and New Zealand Guidelines for Fresh and Marine Water Quality</a>. Accessed July 2025.</p> <p>Australasian Groundwater &amp; Environmental Consultants 2025, <i>Maules Creek Continuation Project Groundwater Impact Assessment</i>. Prepared for Maules Creek Coal Pty Ltd. 2025. 23 May 2025. (Appendix A of Maules Creek Continuation Project).</p> <p>Eco Logical 2025, <i>Maules Creek Continuation Project – Aquatic Ecology Assessment</i>. Prepared for Maules Creek Coal Pty Ltd. 2025. 23 May 2025. (Appendix D of Maules Creek Continuation Project).</p> <p>GEM 2025, <i>Maules Creek Continuation Project – Geochemistry Assessment</i>. Prepared for Maules Creek Coal Pty Ltd. 2025. March 2025. (Appendix P of Maules Creek Continuation Project).</p> <p>Hansen Bailey 2021. Boggabri Coal Mine Modification 8 to SSD 09_0182 Modification Report. Prepared for Boggabri Coal Operations Pty Ltd.</p> <p>IESC 2024a. <i>Information Guidelines for proponents preparing coal seam gas and large coal mining development proposals</i>. Available [online]: <a href="#">Information guidelines for proponents preparing coal seam gas and large coal mining development proposals   iesc</a> accessed August 2025.</p> <p>IESC 2024b. <i>Approaches to biomonitoring for groundwater ecosystems: Methods for sampling and using DNA for assessing mining impacts on groundwater ecosystems</i>. Available [online]: <a href="#">Metagenomic research project   iesc</a>, accessed 13<sup>th</sup> August 2025.</p> <p>Korbel KL, Rutledge H, Hose GC, Eberhard SM, Andersen MS. 2022. Dynamics of microbiotic patterns reveal surface water groundwater interactions in intermittent and perennial streams. <i>Science of the Total Environment</i>, 811, Article 152380.</p> <p>Murray TA and Power WL 2021. <i>Information Guidelines Explanatory Note: Characterisation and modelling of geological fault zones</i>. Report prepared for the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development through the Department of Agriculture, Water and the Environment, Commonwealth of Australia 2021. Available [online]: <a href="#">Information Guidelines Explanatory Note - Characterisation and modelling of geological fault zones   iesc</a> accessed August 2025.</p>

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New South Wales Department of Primary Industries 2007. *Endangered ecological communities in NSW: Lowland Darling River aquatic ecological community*. NSW DPI primefacts 173, 1-4. Available [online]: [Endangered ecological communities in NSW - Lowland Darling River aquatic ecological community](#).

Premise 2025, *Maules Creek Continuation Project – Biodiversity Development Assessment Report*. Prepared for Maules Creek Coal Pty Ltd. 2025. 29 May 2025. (Appendix C of Maules Creek Continuation Project).

WRM 2025, *Maules Creek Continuation Project – Surface Water Assessment*. Prepared for Maules Creek Coal Pty Ltd. 2025. 31 March 2025. (Appendix B of Maules Creek Continuation Project).

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