

Advice to decision maker on coal mining project

IESC 2014-048: Washpool Coal Mine – New Development

Requesting agency	The Australian Government Department of the Environment
Date of request	9 April 2014
Date request accepted	10 April 2014
Advice stage	Assessment

Context

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (the IESC) was requested by the Commonwealth Department of the Environment to provide advice on the Washpool Coal Project in Queensland.

The proposed project has been assessed under a bilateral agreement between the Australian and Queensland governments of 2012. The Interim IESC provided advice on a previous draft Environmental Impact Statement (EIS) for the Washpool Project in June 2012.

This advice draws upon aspects of information provided in the Jacobs SKM 2014, Water Resources IESC Submission and the EIS Addendum dated January 2012, together with the expert deliberations of the IESC. The project documentation and information accessed by the IESC are listed in the source documentation at the end of this advice.

The project proposed by Aquila Resources Ltd is a new open cut coal mine in the Bowen Basin, in Central Queensland near Emerald and Blackwater. Truck and electric shovel mining methods are proposed to extract up to 7.2 million tonnes per annum (Mtpa) of run of mine coal, to produce up to 2.6 Mtpa of product hard coking coal for export market. The proposed project will target the Scorpio seam within the Burngrove Formation over a mine life of 15 to 20 years.

The Mackenzie River is located to the west and north of the project site. The Bedford Weir is located 9.5 km downstream on the Mackenzie River. Outside of rainfall events, the water level in this reach of the Mackenzie River is controlled by Bedford Weir. Coal Mine Lagoon is an anabranch of the Mackenzie River and forms the western boundary of the mining area. Burngrove Creek is an ephemeral water course to the south of the project site that converges with the Mackenzie River immediately downstream of the break out to Coal Mine Lagoon. Water from Bedford Weir is used for several purposes including agriculture, stock watering, industrial use and potable water supply.

Assessment against the Information Guidelines¹

The IESC has considered the information available against the key points identified in the IESC's Information Guidelines¹.

Relevant data and information: key conclusions

Consistent with the Interim IESC advice² provided in July 2012, the project documentation does not provide sufficient detail and data to address potential impacts associated with the project. In particular, data to improve the regional and local geological and hydrogeological conceptualisation and to inform the interaction between surface water and groundwater is still needed. In addition, based on the information provided, potential impacts to the Fitzroy River Turtle have not been assessed and appropriate management options have not been considered.

Appropriate methodologies which have been applied correctly: key conclusions

The groundwater model construction and parameterisation is based on overly simplified and basic regional conceptualisation and limited data. The use of inactive no flow boundary cells to the north and west of the Mackenzie River needs to be justified. With respect to the site water balance, all relevant components have not been fully considered or explicitly represented, including rainfall and the project's site water demands. The targeted survey for the Fitzroy River Turtle was not consistent with Survey Guidelines for Australia's Threatened Reptiles³.

Reasonable values and parameters in calculations: key conclusions

The parameters used in the groundwater model, particularly for recharge and hydraulic conductivity, were based largely on literature values and were subsequently recalibrated within the model. Field 'slug' tests were carried out on only three bores, one in the coal seam and two in the Burngrove Formation. No tests were carried out in the alluvial sediment to support its parameter estimates. Water level measurements were not provided for all model layers, which would not enable sufficient calibration of the model. Hydrological information for Burngrove Creek was based on stream gauge data from an unspecified catchment in the Fitzroy River Basin. Flood modeling did not take into account the location of the amended rail line.

Advice

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

Question 1: Are the regional and site water balance models (provided by the proponent in Attachment D) adequate and do they inform the project's contribution to cumulative impacts in the region?

Response

1. The regional and site water balance models provided by the proponent are based on limited data and an overly simplified conceptualisation. These models do not provide for a sound basis to inform the proposed project's contribution to cumulative impacts.

Explanation

Regional Water Balance

2. In order to increase confidence in the regional water balance's predictions, an improved geological conceptualisation is needed, along with further hydrogeological data and details on the assumptions that underpin the groundwater model's construction and parameterisation. In particular, the following issues should be addressed:

- a. Areas along the Mackenzie River, Burngrove Creek and around Coal Mine Lagoon need further characterisation. The paucity of data in these areas, including alluvium thickness, groundwater level and hydrogeological parameters, has reduced understanding of the interaction of groundwater with these surface water features and their respective contributions to the regional water balance;
- b. The use of no flow boundaries (inactive cells) to the north and west of the Mackenzie River requires further justification as they have the potential to constrain groundwater flow that might otherwise be influenced by the Mackenzie River and/or project operations;
- c. Parameters for hydraulic conductivity in the alluvium are noted to be high (500m/day) and no field tests were carried out to support this estimate;
- d. Estimates for recharge (<0.01%) for all model layers appear low, particularly given the unconsolidated alluvial sediments that are prevalent within and surrounding the project site;
- e. The pre-development water balance schematic indicates net evapotranspiration from the alluvium, weathered material and Burngrove Formation. However, given the depth of the weathered material and Burngrove Formation, it is considered unlikely that these two formations would significantly contribute to evapotranspiration;
- f. The potential for all three formations (alluvium, weathered material and Burngrove Formation) to contribute to baseflow to the Mackenzie River is not discussed in any detail;
- g. There are too few groundwater monitoring bores on and around the site to adequately calibrate the model. Additional bores, including nested bores at adequate depths and spatial coverage, targeting specific formations, are required to increase confidence in the model's predictions; and
- h. The pre-development water balance schematic should detail the contribution of individual components (such as rainfall, the Bedford Weir, private water bores in the region and the other nearby mines). It is unclear whether these components were taken into consideration in the net volumes provided in the water balance.

Site water balance:

- 3. Key inputs and outputs for the site water balance have not been adequately identified. As a result, it is difficult to evaluate the adequacy of the site water balance or understand the proposal's contribution to cumulative impacts. Aspects of the site water balance which need further clarification and justification include:
 - a. Estimates for evaporation, collected on-site runoff and seepage, and groundwater inflows. In addition, a comprehensive list of mine site water demands has not been provided. These inputs and outputs should be quantified throughout the life of the mine on a seasonal basis;
 - b. Details of the capacity and use of mine water storage facilities including scenarios of when and how they will be used;
 - c. Obtaining details of the proposed water treatment facility would be prudent given the range of contaminants that could potentially be generated and discharged from the site; and
 - d. The proposed controlled release strategy used gauge data from an unspecified catchment within the Fitzroy Basin to simulate flows in Burngrove Creek. The appropriateness of this gauge needs to be demonstrated and the addition of a flow gauge on Burngrove Creek should be considered.

Cumulative Impacts

4. The proposed mine is located between three mines: Curragh Coal Mine to the east, Ensham Coal Mine to the west and Blackwater Coal Mine to the south. Based on the conclusions from an analytical model (for which limited detail is provided), the proponent assumes that drawdown is not likely to extend to these mines and so excluded the neighbouring mines from the numerical groundwater model. In addition, the extent or magnitude of drawdown associated with the three adjacent mines, in particular the nearby Curragh mine to the east, has not been provided in the drawdown estimated from the proposed project. As a result, based on the information presented, it is not possible to verify the proponent's claim that there is a low risk of cumulative groundwater drawdown associated with all the mines.
5. Up to 11 ML/year of loss in baseflow contribution and leakage from the Mackenzie River has been estimated. The proponent states that all losses to the river are proposed to be licensed; and as a result, no cumulative baseflow impacts will occur. Due to the lack of surface-groundwater characterisations, the estimated loss could be underestimated.
6. Given the presence of the Curragh West mine upstream on Burngrove Creek, clarification should be sought from the operators of this mine to determine whether discharges are made to Burngrove Creek. This will allow an assessment of potential cumulative flood impacts as well as cumulative impacts on downstream hydrology, water quality and other water related assets.

Question 2: Are the provided management options adequate to manage local and regional flooding? What modifications or additions would address any significant shortcomings?

Response

7. There is limited and conflicting information regarding flood impacts, in particular geomorphology and water quality impacts. In the absence of an adequate assessment of the flood impacts, it is difficult to determine the adequacy of proposed management options.

Explanation

8. The following details are needed to characterise and identify options for managing flood risks:
 - a. Spatial extent, depth and duration of local flooding so as to inform the design and placement of mine infrastructure, particularly in relation to siting and flood protection for product coal stockpiles and the water retention dam at the train-load out area. The transitional waste storage area should also be located away from, or protected from, local flooding;
 - b. Flood hydrology of the Coal Mine Lagoon anabranch. This is particularly important as water quality in Coal Mine Lagoon has been identified as posing a hazard to environmental values of the Mackenzie River, in particular, potable water supply and aquatic ecosystems. Quantification of the following elements is needed to evaluate flood risks to the environmental values of Coal Mine Lagoon and the Mackenzie River and options for managing them;
 - i. The rainfall or flood event needed to activate the Coal Mine Lagoon anabranch including the event needed to connect the anabranch to the Mackenzie River. The effect of the proposed flood levee on the frequency of connection to the Mackenzie River should also be assessed; and
 - ii. Potential impacts on water quality within the Lagoon and the Mackenzie River, including behind Bedford Weir, particularly if the proposed flood levee is assessed to alter the flood hydrology of the Coal Mine Lagoon anabranch. Where risks to

downstream environmental values are assessed to be significant, appropriate monitoring, mitigation and management measures should be developed.

- c. A pre-development geomorphology study to document existing channel and floodplain conditions within reaches of watercourses potentially affected by changes in flood behaviour. This should include a detailed assessment of potential geomorphic impacts on Coal Mine Lagoon given its stated environmental values and position above Bedford Weir;
 - d. Hydrologic and hydraulic models that incorporate both the levee and the rail line;
 - e. An operational phase geomorphic monitoring program to confirm the conclusions of the geomorphic impact assessment, verify the effectiveness of mitigation and management measures, and detect any unanticipated impacts; and
 - f. An assessment of increased turbidity and sedimentation due to flood and discharge events that may affect the Fitzroy River Turtle and its habitat. Appropriate measures to reduce turbidity and sedimentation during such events may also need to be developed.
9. The assessment documentation identifies several purposes for the levee, these being: flood protection; part of the dam wall for the Mine Retention Dam; and, a possible haul road. Given the multipurpose use of the levee, its design and construction should be supported by a comprehensive geotechnical assessment to ensure it is adequate for all its intended uses.

Question 3: Has the proponent adequately characterised the interaction between surface water and groundwater and taken this into account when assessing habitat requirements for the Fitzroy River Turtle?

Response

10. The interaction between surface water and groundwater is not well understood at a local or regional scale. Therefore, not all indirect and direct impacts associated with these interactions have been taken into account when assessing (the persistence of) Fitzroy River Turtle habitat requirements.

Explanation

11. There are conflicting statements throughout the assessment documentation in relation to the nature and extent of surface water and groundwater interactions. The proponent has predicted limited groundwater based flow contribution to the Mackenzie River on the basis that Cainozoic sediments are generally dry. This prediction is contradicted in a geological cross section which reveals elevation of the water table above the river water level, indicating some baseflow contribution from the Cainozoic sediments. In other parts of the assessment documentation the proponent has conceptualised the stretch of the Mackenzie River, adjacent to the proposed site, as 'losing'. Losses are expected to increase due to drawdown potentially increasing river leakage. Additional bores in strategic locations along the Mackenzie River would allow for a more thorough assessment of these interactions.

Assessment of turtle habitat

12. The proponent considers that the relative contribution of groundwater to flow is likely to be small in comparison to catchment runoff; however, in relation to habitat requirements for the Fitzroy River Turtle, the contribution of groundwater flow may be ecologically-relevant, especially during dry times.

13. The targeted turtle survey conducted in April 2010 did not reveal the presence of the Fitzroy River Turtle in the waterways associated with project, however the survey did not utilise Survey Guidelines for Australia's Threatened Reptiles.
14. Habitat requirements for the Fitzroy River Turtle are considered to include water quality, channel habitat, in-stream habitat and potential nesting banks. These attributes may be impacted by groundwater and surface water interactions that influence water quality, volume and flow. As such, these interactions can alter the occurrence and persistence of key habitat requirements in the waterways associated with the project, which include the stretch of the Mackenzie River adjacent to the project site.
15. Baseflow may be an important contributor to current flow in the stretch of the Mackenzie River and may also contribute to the persistence of habitat requirements (for example, riffle zone at site MR1). There may also be upstream and downstream impacts beyond the stretch of the river adjacent to the site. However, it is not possible to determine the full extent of these impacts without adequate characterisation of groundwater and surface water interactions and details on the volume and timing of releases. It is noted that the Bedford Weir is approximately 9.5 km downstream from the site. The migration and nesting behaviour of the Fitzroy River Turtle in response to the barrier is not well known.

Question 4: In addition to the Queensland Government's conditions to manage downstream impacts on water users, including the Fitzroy River Turtle, can the IESC suggest any further management actions to reduce downstream impacts?

Response

16. Further management action can be suggested to reduce downstream impacts. It is assumed that downstream users include ecological water related assets, users of water from Bedford Weir as well as Coal Mine Lagoon. In addition to the management actions suggested elsewhere in this advice, and proposed conditions contained in the draft Environmental Authority, the IESC suggests:

Groundwater

- a. The number of groundwater monitoring points should be increased and extend beyond and below the targeted coal measure and the alluvium. This will provide data for the local and regional groundwater regime and allow for the assessment of connectivity with the Mackenzie River. If connectivity is determined, an early warning trigger for groundwater fluctuations should be established. The hydrogeological information should be included in the proponent's Receiving Environmental Management Plan and the potential for the decrease of groundwater baseflow to in-stream flow (and associated impacts) should be considered;

Surface Water and Water Quality

- b. Additional monitoring should be undertaken within Coal Mine Lagoon, Burngrove Creek and the Mackenzie River to improve the characterisation of existing water quality. This should include a monitoring site upstream of the proposed rail line to provide a basis for establishing existing conditions outside of the proposed project site. Monitoring should be conducted in accordance with published guidelines⁴;
- c. Receiving water contaminant trigger investigation levels should be based on existing water quality and be established in accordance with published guidance methods, and/or water quality objectives for the Mackenzie River Sub-basin⁵. Where higher receiving water contaminant trigger levels are proposed, evidence should be presented to demonstrate that

these will not adversely impact on downstream environmental values, including aquatic ecosystems;

- d. An investigation of existing sediment quality within Coal Mine Lagoon should be conducted;
- e. Leachate from coal rejects and tailings material stored in the northern out of pit dump needs to be managed to reduce potential impacts to groundwater and the Mackenzie River;
- f. Water from the mine-affected water dam should be retained onsite and reused, where possible, to reduce environmental impacts;
- g. Water quality modelling should be undertaken on the Mine Retention Dam to inform the need for water treatment facilities and the design of those facilities, if necessary;
- h. Mine rehabilitation criteria should include water quality objectives for surface water and groundwater discharges from the site, which align with the most current version of DEHP's water quality objectives for the Mackenzie River at the time of closure;
- i. The location and number of gauging stations be revised based on a review of the likely impacts to the receiving environment, and the changes in volume and flow within the Mackenzie River be considered in the overall analysis of water quality;
- j. The flood levee should not be constructed using sodic waste rock materials. Clarification should also be sought on whether the flood levee will be retained post-mining to inform the evaluation of final void hydrology and water quality. If the levee is to be retained, post-mining monitoring and maintenance requirements should be considered; and
- k. Further investigation of the out of pit waste dump capping material and depth be undertaken to minimise the risk of acid and metalliferous drainage from out of pit dumps containing coal reject materials.

Fitzroy River Turtle

17. In relation to the potential persistence of the Fitzroy River Turtle and its habitat, possible improvements to the monitoring regimes and management responses associated with downstream impacts of the mine, relate to the monitoring of contaminants and water quality attributes, and the establishment of appropriate management responses, such as:
 - a. Contaminants and water quality exceedances of relevance to the persistence of the Fitzroy River Turtle and its habitat should be monitored more frequently, particularly during the period after a release event;
 - b. Given the sensitivity of the species to particular contaminants and water quality exceedances, increased monitoring points may also be beneficial. Currently, six downstream monitoring points are proposed. It may also be prudent to extend monitoring beyond five kilometres unless monitoring/modelling demonstrates no impact beyond the five kilometre range.
 - c. Wherever possible, management responses and discharge scenarios should maintain appropriate water quality and in-stream flows. The management responses should provide for the continuation of the Fitzroy River Turtle habitat requirements, particularly for channels and nesting banks; and
 - d. Erosion and sedimentation controls, along with saline, acid and/or metalliferous drainage and leachate management controls, are important mitigation/management responses to limit Fitzroy River Turtle habitat degradation. However, the current information does not provide a

sufficient level of information to evaluate the ability of these management plans to minimise and manage potential impacts on the Fitzroy River Turtle and its habitat.

Date of advice	14 May 2014
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Source documentation available to the IESC in the formulation of this advice	Department of Environment and Heritage Protection (DEHP) May 2012, EIS Assessment Report for the Washpool Coal Mine Project DEHP 2012, Draft Environmental Authority Jacobs SKM 2014, Water Resources IESC Submission (Ref QE0678 1) SKM 2013, Fitzroy River Turtle Habitat Survey, Washpool Coal Mine Washpool Coal Project January 2012, Environmental Impact Assessment Addendum,
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References cited within the IESC's advice	<p>¹ Information Guidelines for Proposals Relating to the Development of Coal Seam Gas and Large Coal Mines where there is a Significant Impact on Water Resources available at: http://iesc.environment.gov.au/pubs/iesc-information-guidelines.pdf</p> <p>² Interim IESC 2012, Advice to decision maker on coal mining project, Washpool Coal Project (EPBC 2009/5240), 29 June 2012</p> <p>³ DSEWPAC 2011, <i>Survey guidelines for Australia's threatened reptiles</i>, available at: http://www.environment.gov.au/system/files/resources/eba674a5-b220-4ef1-9f3a-b9ff3f08a959/files/survey-guidelines-reptiles.pdf</p> <p>⁴ ANZECC and ARMCANZ (2000) Australian Guidelines for Water Quality Monitoring and Reporting. National Water Quality Management Strategy (NWQMS). Document 4 and 7. Australian and New Zealand Environment and Conservation Council & Agriculture and Resource Management Council for Australia and New Zealand, Canberra.</p> <p>⁵ Department of Environment and Heritage Protection (2013) <i>Environmental Protection (Water) Policy 2009 – Mackenzie River sub-basin Environmental Values and Water Quality Objectives, Basin No. 130 (part), including all waters of the Mackenzie River Sub-basin</i>, State of Queensland, Brisbane</p>
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