

## Advice to decision maker on coal mining project

### IESC 2015-069: Drayton South Coal Project (EPBC 2014/7402) – Expansion

<b>Requesting agency</b>	The Australian Government Department of the Environment The New South Wales Department of Planning and Environment
<b>Date of request</b>	12 June 2015
<b>Date request accepted</b>	16 June 2015
<b>Advice stage</b>	Assessment

#### **Context**

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (the IESC) was requested by the Australian Government Department of the Environment and the New South Wales Department of Planning and Environment to provide advice on Anglo American Metallurgical Coal's Drayton South Coal Project in New South Wales.

The IESC has previously provided advice to the Commonwealth Department of Sustainability, Environment, Water, Population and Communities on the initial project proposal for the Drayton South Coal Project, EPBC 2011/5911 (IESC 2012-010, 1 February 2013). The previous advice was provided prior to the introduction of the 'water trigger' and should be read in this context. The IESC further provided advice to the New South Wales Mining and Petroleum Gateway Panel on the current (retracted) project proposal on 23 February 2015 (IESC 2015-064).

This advice draws upon aspects of information in the Draft Environmental Impact Statement, 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 currently proposed Drayton South Coal Project (the proposed project) is an extension to the existing Drayton Coal Mine and is located approximately 13 kilometres south of Muswellbrook in the Hunter Valley. The existing Mt Arthur coal mine is located about three kilometres north of the proposed project.

The proposed project will produce up to seven million tonnes per annum of thermal coal for a further 15 years, mining a resource of approximately 75 million tonnes. The proposed project will result in direct impacts to approximately 1470.9 hectares of land and the creation of a final void lake. It will require construction of a transport corridor to the new mining area; realignment of a section of Edderton Road; and installation of water management infrastructure.

## Key potential impacts

The key potential impacts resulting from the proposed project are predominantly of local importance and are likely to be similar in scale and significance to the impacts resulting from the existing Drayton Mine and the Mt Arthur Coal Mine. Noting the above, the proposed project will contribute to regional, mining-related and cumulative impacts to water resources within the Hunter Valley, including increased salt loads. Potential impacts include reduced stream flow in Saddlers Creek and a resulting decline in riparian vegetation, and increased salinity in the Saddlers Creek alluvium and Hunter River alluvium resulting from long-term groundwater seepage from the final landform.

## Assessment against information guidelines

The IESC, in line with its Information Guidelines (IESC, 2014), has considered whether the proposed project assessment has used the following:

### *Relevant data and information: key conclusions*

Inadequate baseline information for Saddlers Creek creates uncertainty in identifying the potential surface water quality and quantity impacts to Saddlers Creek, and to the Hunter River. The change to baseflow in Saddlers Creek has been predicted on an annual scale and does not consider the importance of baseflow during naturally occurring low-flow periods.

### *Application of appropriate methodologies: key conclusions*

The conceptual and numerical groundwater modelling assessment provides reliable estimates of the potential impacts to groundwater resources of Saddlers Creek and the Hunter River. Transient calibration of the proponent's groundwater numerical model has been undertaken as per the previous IESC advice (IESC 2015-064) and the conceptual and numerical groundwater models have been peer reviewed. This increases confidence in predictions of the scale and lateral extent of potential impacts.

### *Reasonable values and parameters in evaluation: key conclusions*

Following issues raised in the previous advice (IESC 2015-064), sensitivity analysis of the revised numerical groundwater model considered a greater range of parameter values than used in the 2012 groundwater assessment. This improves the understanding of the range of potential groundwater impacts.

## **Advice**

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

Question 1: To what extent does the IESC's previous advice to the Commonwealth Department on the original Drayton South Coal Project (2011/5911) continue to apply to the current project? Does the current project present a varied risk profile (including likelihood, extent and significance) of impacts to significant water related assets?

## Response

1. Some matters raised in the previous advice (IESC 2012-010) no longer apply to the current project, including discharges of mine-affected water to the Hunter River and the requirement for a regional water balance model. All other matters outlined in the previous advice continue to apply to the current project, although the modelling results of the revised mine plan suggests an increased risk of local-scale water quality and quantity impacts to Saddlers Creek.

## Explanation

2. A smaller area of the catchment contributing to Saddlers Creek will be impacted by the currently proposed project compared to the previous project, meaning overland flow to Saddlers Creek will not be reduced as much as previously predicted. However baseflow provides a greater contribution to stream flow in Saddlers Creek than overland flow. The groundwater modelling, which incorporates the revised mine plan and revised storage parameter values resulting from transient calibration of the groundwater model, predicts greater reductions in baseflow than previously predicted.
3. The revised numerical groundwater modelling underwent transient calibration as recommended in the previous IESC advice (IESC 2015-064), which increases model complexity, improves confidence in predictions of the scale and lateral extent of potential impacts and aligns with best modelling practice guidelines (Barnett et al., 2012).
4. Reduction of flow in Saddlers Creek due to the cumulative reduction in catchment runoff and baseflow is likely to alter the geomorphic characteristics, habitats and ecological values and is highly likely to adversely affect groundwater dependent riparian vegetation.
5. It is likely that baseflow plays an important ecological role in extending stream flow during dry periods and in providing refuge pools for aquatic fauna. The reduction in baseflow is highly likely to impair these processes and adversely affect groundwater dependent vegetation and associated water-dependent ecosystems.
6. The more robust transient groundwater numerical modelling undertaken for the current proposal indicates that the hydraulic gradients in the long term will result in groundwater through-flow within the Whynot spoil and void. This through-flow may result in an increased risk of saline seepage to the Hunter River, Saddlers Creek and their tributaries compared to the modelling predictions undertaken for the original proposal.
7. The assessment of the final landform should consider the likelihood of the generation of saline seeps in nearby tributaries (including ephemeral creeks developed as part of site rehabilitation) and should also include a sensitivity and uncertainty analysis of potential travel times of saline void water using a range of potential hydraulic conductivity and porosity values to better inform these potential risks.
8. The proposed project will result in a smaller disturbance area than the previously proposed project. The proposed project will remove 22 ha of partially groundwater dependent, Environmental Protection and Biodiversity Conservation (EPBC) Act-listed Critically Endangered Box-Gum Woodland (Upper Hunter White Box-Ironbark Grassy Woodland and Hunter Floodplain Red Gum Woodland), a decrease of 80 per cent compared to the original proposal. Despite the reduction in disturbance of vegetation, the proposed project is still likely to result in significant impacts to ecological communities, including Box-Gum Woodland, by lowering the groundwater table, exacerbating the degree of fragmentation of communities, reducing connectivity and habitat for fauna, and placing remaining vegetation under additional stress.

Question 2: Does the current EIS contain sufficient information to inform a sound assessment of potential cumulative impacts to significant water-related assets?

## Response

9. No, the cumulative impacts to Saddlers Creek, the Hunter River, the associated alluvium and the underlying Permian groundwater system cannot be assessed from the information provided.

### Explanation

10. As discussed in the previous advice (IESC 2015-064), the groundwater modelling does not include impacts to water resources from the adjacent Mt Arthur mine or other groundwater users. Instead, the assessment of cumulative impacts to the Saddlers Creek alluvium has been estimated by adding together the individual predicted loss estimates resulting from dewatering of adjacent mines which were derived utilising differing models with differing parameterisation. This limits confidence in estimates of cumulative impacts.
11. The cumulative reduction in flow in Saddlers Creek has not been quantified in the assessment documentation.
12. The degree of groundwater dependency and the impacts of cumulative groundwater drawdown on the Saddlers Creek riparian vegetation have not been assessed. The proponent states (EIS, App. M, p. M-159) that a high proportion of the water sustaining riparian vegetation is likely to be supplied by surface water flows and direct rainfall and therefore will not be significantly impacted by groundwater drawdown. This does not consider the importance of groundwater in maintaining baseflow in Saddlers Creek during dry periods.

Question 3: If not, what additional information could be reasonably required to inform this assessment?

### Response

13. As per the previous advice (IESC 2015-064), a sub-regional groundwater numerical model including all mines and major water users in the vicinity would better assess spatial and temporal cumulative impacts to water resources and dependent ecosystems in the vicinity of the proposed project. The model would need to be updated on a regular basis and be informed by ongoing dedicated monitoring to validate and reduce uncertainty in model predictions.
14. Baseline data on the magnitude and variability of surface flows (including baseflow) in Saddlers Creek is required in order to quantify the impacts of the proposed project and enable the impacts from the proposed project to be differentiated from impacts as a result of other groundwater users and/or climatic conditions. An assessment of the likely impacts to Saddlers Creek should include an assessment of the cumulative reduction in flow, the increase in no-flow periods, and the impact on in-stream fauna and EPBC Act-listed Critically Endangered riparian vegetation.
15. The cumulative impacts on groundwater-dependent vegetation communities including riparian vegetation along Saddlers Creek would be better informed through a study to determine the depth to groundwater (spatially and temporally), degree of groundwater dependency, and the reduction in groundwater and surface water availability from the proposed project and the Mt Arthur mine.

Question 4: Do the groundwater and surface water assessments, including the numerical models therein, provide reasonable estimations of the likely impacts to water resources (including water quality and quantity), with particular reference to Saddlers Creek and the Hunter River?

### Response

16. The numerical groundwater modelling for the revised project plan, which incorporates transient calibration and more robust sensitivity analysis as recommended in the previous IESC advice (IESC 2015-064), increases the confidence in the predictions of impacts to groundwater resources.

17. Some matters raised in the previous IESC advices (IESC 2013-010 and IESC 2015-064), particularly with respect to surface water resources, have not been addressed. Further information is required on the following matters:
  - a. An assessment of the potential for shallow saline groundwater seepage from the final void lake and the Whynot spoil area through the regolith towards the Hunter River, including the travel times, volume of seepage and salt loads of that seepage.
  - b. An assessment of the potential impacts of shallow seepage on any groundwater dependent vegetation located on the flow path between the proposed mine and the Hunter River.
  - c. An assessment of potential travel times, volume of seepage and salt loads from the Blakefield mining area to the Saddlers Creek alluvium; and the impacts of salt, metals and polycyclic aromatic hydrocarbons (PAHs) on the alluvium, Saddlers Creek and associated water-dependent assets over the long-term.
  - d. Current quantitative flow regime data (including seasonal, climatic high and low flow periods and contribution of baseflow) for Saddlers Creek and an assessment of the groundwater dependence of, and likely impacts to, Saddlers Creek riparian vegetation.
  - e. An assessment of potential seepage of leachate from the proposed emplacement of tailings from the proposed project tailings in the existing Drayton Mine North Void towards the catchment of Ramrod Creek. Groundwater quality and groundwater levels must be monitored near the tailings and reject emplacement areas located at the Drayton Mine to confirm if seepage is migrating away from the emplacement areas.
  - f. An assessment of ecological assets beyond the proposed project boundary, including the Upper Hunter White-Box Ironbark Grassy Woodland, to determine groundwater dependence (either fully or partially); their current condition; and how these assets may be impacted by both the proposed project and any cumulative impacts.

#### Explanation

18. It is likely that the local-scale impact on Saddlers Creek flows will be substantial and that cumulative impacts from adjacent mines will exacerbate this effect. Inadequate baseline stream flow data make it difficult to quantify the magnitude of impacts to Saddlers Creek and its riparian vegetation. There is a potential risk to water quality in Saddlers Creek from uncontrolled spills and releases from sediment dams, and from seepage from the Blakefield mining area, noting that Saddlers Creek is a moderately disturbed ecosystem and baseline water quality substantially exceeds ANZECC and ARMCANZ (2000) default trigger values for electrical conductivity.
19. No assessment has been undertaken of the potential impact of the project on the EPBC-listed Critically Endangered Upper Hunter White Box-Ironbark Grassy Woodland community mapped outside the project boundary but within the predicted zone of drawdown. The depth to groundwater in this region has not been provided.
20. Although this vegetation may not have complete dependence on groundwater, by definition (Richardson et al., 2011), GDEs include ecosystems that opportunistically use groundwater and potential impacts should be considered for all GDEs. Techniques from the Australian GDE Toolbox (Richardson et al., 2011) should be applied to confirm groundwater use by vegetation and other biota and identify groundwater discharge to the surface.

Question 5: Has the revised proposal included reasonable strategies to effectively avoid, mitigate or reduce the likelihood, extent or significance of impacts to significant water-related assets?

Response

21. Opportunities to avoid impacts to water resources are limited by the size of the extension, noting that the mine plan has been retracted twice previously to minimise the non-water related impacts to the Coolmore and Woodlands horse studs. The project area will not encroach within the 150 m buffer zone of the Hunter River alluvium, or within 40 m of the Saddlers Creek bed or bank.
22. Most mitigation measures are proposed to be implemented through management plans which have not been included within the assessment documentation. Without these, it is not possible to determine how effective the measures would be at mitigating or reducing impacts from the proposed project.
23. Proposed mitigation options if impacts to groundwater quality and quantity are more extensive or significant than predicted include: injection of water into the depressurised aquifers, grouting and cut off measures, sourcing of additional water from other sources or treatment of mine water. No information has been provided on these potential mitigation measures and their effectiveness cannot be assessed.
24. The proponent indicates that spoil will be shaped in a manner that promotes free drainage away from the northern and western mining areas but does not provide any detail on how the placement of the spoil will achieve this.

Question 6: Would the IESC recommend any other strategies available to avoid, mitigate or remediate the likelihood, extent or significance of these impacts? And if so, why?

Response

25. Yes, the IESC recommends additional strategies to avoid, mitigate and remediate the impacts, including the following:
  - a. The Saddlers Creek restoration programme must consider the impact of reduced baseflow and altered water quality on the current riparian vegetation and likely success of establishing new riparian vegetation along Saddlers Creek. Ongoing monitoring of the condition of riparian vegetation is required to determine if additional mitigation measures should be implemented.
  - b. The rehabilitation management plan should consider and address potential 'worst-case' scenarios, such as greater than predicted seepage from the final void and the Blakefield mining area reaching Saddlers Creek, the Hunter River or its tributaries.
  - c. Management of the tailings and rejects emplacement area should include a monitoring program to ensure that key water quality parameters remain within an appropriate range of values. A closure strategy for the emplacement areas could also consider options for a cover (i.e. capping) system.
  - d. The Water Management Plan should include a strategy to reduce the risk of spills from sediment dams impacting water quality in Saddlers Creek and the Hunter River including:
    - i. The location of particular sediment dams or water storages that are considered most at risk of regular spills.
    - ii. Water quality monitoring of the full range of contaminants (including PAHs) prior to, during and following spills, consistent with the recent findings of Krogh et al. (2013), to

provide evidence that spills have negligible impacts on the downstream water resources, including the Hunter River.

- iii. Alternative options, including redesign of dams and their storage capacity to avoid predicted bi-annual spills, or mitigate their impacts. Contingency measures should be developed to prevent the release of sediment dam water in extreme rainfall events if the water quality, particularly salt load and total suspended solids, is not suitable for release.

Question 7: What are the key features of a monitoring and management regime that would address any remaining key uncertainties and minimise the risks of the project to water-related assets?

Response

26. Suggested expansions to surface water and groundwater monitoring spatial and temporal coverage are identified below. Surface water and groundwater monitoring should be presented as part of a water management plan and should be consistent with the National Water Quality Management Strategy (ANZECC and ARMCANZ, 2000). Where additional sites have been identified, monitoring should begin immediately to establish baseline conditions before mining commences.

Explanation

27. The groundwater monitoring programme would be improved through the addition of the following:
  - a. Additional monitoring bores targeting the shallower layers between the project area and the Hunter River alluvium to identify any potential impacts from shallow saline groundwater seepage from the final void lake, the Whynot spoil area or the Blakefield spoil area towards the Hunter River.
  - b. Additional monitoring bores in the Saddlers Creek alluvium, such as near Bowfield Well and/or Bowfield House Well, to identify the extent and magnitude of potential groundwater drawdown impacts, improve estimates of mine take from alluvium and monitor any water quality impacts from potential seepages from the Blakefield mining area.
  - c. Installation of monitoring bores near the tailings and rejects emplacements at Drayton Mine capable of detecting the movement of seepage water away from the emplacement areas.
  - d. Established identification and monitoring regimes for GDEs, in particular along Saddlers Creek, as per techniques outlined in Richardson et al. (2011). Identification, finer-scale mapping and ongoing monitoring of potential GDEs that occur outside of the project boundary and may be impacted by the proposed project is also needed to determine the extent of the potential impacts of the proposed project.
28. The surface water monitoring programme would be improved through the addition of the following:
  - a. Continuous monitoring of flow to establish the flow regime in Saddlers Creek and monitor any changes to flow resulting from the proposed project.
  - b. Event-based water quality monitoring and continuous monitoring of electrical conductivity (EC) in Saddlers Creek to provide context for water quality measurements.
  - c. Water quality monitoring in Saddlers Creek at locations W1102 (Drayton Mine) and W1 (upstream of confluence with Hunter River) to distinguish impacts from the current proposal from other mining impacts.

- d. Inclusion of selenium, molybdenum and PAHs to the suite of parameters tested on a regular basis in Saddlers Creek to determine whether runoff from overburden emplacement areas presents any risk to water resources or water-related assets.
- e. Validation of the surface water quality data set and determination of appropriate local water quality objectives and trigger values.
- f. Water quality monitoring in Ramrod Creek to assess any additional impacts from disposing tailings and coal reject materials from the proposed project.

*Other matters*

- 29. The Northern Sydney Basin bioregion, which includes the Hunter subregion, has been identified as a Bioregional Assessment priority region. Data and relevant information from the proposed project should be made accessible to this Bioregional Assessment and related research projects.

<b>Date of advice</b>	24 July 2015
<b>Source documentation available to the IESC in the formulation of this advice</b>	<p>AGE 2012. Report on Drayton South Coal Project, Groundwater Impact Assessment. Project No. G1544 October 2012.</p> <p>Hansen Bailey 2015. Drayton South Coal Project. Environmental Impact Assessment for Anglo American Coal May 2015.</p> <p>Hansen Bailey 2015. Drayton South Coal Project. Gateway Certificate Application for Anglo American Coal January 2015.</p> <p>IESC 2012-010. Advice on Drayton South Coal Mine available at: <a href="http://iesc.environment.gov.au/committee-advice/proposals/drayton-south-coal-mine-project-advice">http://iesc.environment.gov.au/committee-advice/proposals/drayton-south-coal-mine-project-advice</a></p> <p>IESC 2015-064. Advice on Drayton South Coal Expansion Project – GA 6914 available at: <a href="http://iesc.environment.gov.au/committee-advice/proposals/drayton-south-coal-project-advice">http://iesc.environment.gov.au/committee-advice/proposals/drayton-south-coal-project-advice</a></p> <p>WRM 2012. Surface Water Impact Assessment, Drayton South Coal Project. October 2012.</p>
<b>References cited within the IESC's advice</b>	<p>ANZECC and ARMCANZ 2000. <i>Australian guidelines for water quality monitoring and reporting</i> [Online]. Available: <a href="http://www.environment.gov.au/system/files/resources/0b71dfb9-8fea-44c7-a908-826118d403c8/files/nwqms-monitoring-reporting.pdf">http://www.environment.gov.au/system/files/resources/0b71dfb9-8fea-44c7-a908-826118d403c8/files/nwqms-monitoring-reporting.pdf</a></p> <p>Barnett et al, 2012. <i>Australian groundwater modelling guidelines</i>, Waterlines report, National Water Commission, Canberra.</p> <p>IESC 2014. <i>Information Guidelines for Independent Expert Scientific Committee advice on coal seam gas and large coal mining development proposals</i> [Online]. Available: <a href="http://iesc.environment.gov.au/pubs/iesc-information-guidelines.pdf">http://iesc.environment.gov.au/pubs/iesc-information-guidelines.pdf</a>.</p> <p>Krogh, M., Dorani, F., Foulsham, E., McSorley, A., and Hoey, D. 2013. Hunter Catchment Salinity Assessment. Final Report. NSW Environment Protection Authority.</p> <p>Richardson et al. 2011. <i>Australian groundwater dependent ecosystems toolbox part 2: assessment tools</i>, National Water Commission, Canberra.</p>