



Planning
Assessment
Commission

NSW Planning Assessment Commission Review Report

Maules Creek Coal Project

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March 2012

The Maules Creek Coal Project PAC Review Report©
State of New South Wales through the NSW Planning Assessment Commission, 2012.

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Executive Summary

Aston Resources is seeking to develop an open cut coal mine in the Leard State Forest, in the Narrabri Local Government Area. The proposal is known as the Maules Creek Coal Project and would involve open cut mining of the Maules Creek Formation down to the Leard Formation. The mine would produce up to 13 million tonnes of coal a year, disturbing 2,178 ha of land over a 21 year period.

The Minister for Planning and Infrastructure requested the Planning Assessment Commission carry out a review of the merits of the Maules Creek Project and conduct a public hearing during the review.

The Commission was constituted by Ms Gabrielle Kibble AO, Mr Brian Gilligan and Mr Garry West. Emeritus Professor Jim Galvin and Dr Colin Mackie were engaged by the Commission to provide expert advice on the mine plan and groundwater issues respectively.

The Commission also received a separate request to review the Boggabri Coal Project, which is proposed to occupy an adjoining portion of the Leard State Forest. In considering both projects, and noting that the third mine in the cluster (the Tarrawonga coal mine) is also currently seeking to expand, the Commission notes there are significant opportunities to establish consistent and cooperative management across the three mines within this cluster. The Commission found that many of the issues arising from both the Maules Creek and Boggabri coal mines needed to be addressed at a regional scale, or at a cumulative level encompassing the whole cluster. Consequently many of the issues and the corresponding recommendations are at a strategic level and are common to both projects.

Notwithstanding the similarities, and the strategic focus of the review, there are also key differences between the two projects and the resulting impacts considered. Unlike the Boggabri coal mine proposal, where mining has already commenced, the Maules Creek site is a greenfield site and is less disturbed (although impacts of previous forestry activities and recent exploration drilling are evident). The Maules Creek proposal would involve mining almost twice the number of coal seams, excavating to a much greater depth than the Boggabri proposal. Additionally the local characteristics of the site and surrounds also differ. While this report follows a similar format to the Commission's Review Report on the Boggabri Coal Project, the Commission has taken care to ensure its consideration of the proposal has taken these local site variations into account in forming its views on the proposal.

The Commission examined the Environmental Assessment and other relevant documents, received submissions, held a public hearing, inspected the site and met individually with representatives of the proponent and the Office of Environment and Heritage (now the EPA). The Commission heard from both Narrabri Shire Council and Gunnedah Shire Council at the public hearing.

The Environmental Assessment was publicly exhibited from 30 August 2011 until 11 October 2011 and the submissions received by the Department of Planning and Infrastructure from this process were forwarded to the Commission. The Commission held a public hearing on Wednesday 23 November 2011 at the Boggabri Golf Club and received eight verbal and six written submissions on the proposal.

As with the Boggabri coal mine, the Commission found that in the context of coal mining across New South Wales, the proposal is not considered to be unusually complex or large, although the mine is relatively deep. Instead it is the potential cumulative impacts arising from the combination of multiple mines operating in relatively close proximity which requires some additional attention.

As noted in the Commission's review of the Boggabri coal mine, coal mining in the region has historically accounted for a relatively small portion of the region's economy, with agriculture and forestry being the more dominant land uses. A combination of higher coal prices and proximity to rail infrastructure has made the area a viable source of coal exports. Consequently regional land uses are currently shifting with coal mining clusters now forming within a traditionally agricultural landscape. Although, in this instance, the site is largely within the Leard State Forest, predominantly outside of productive agricultural lands, so impacts on the local community and agricultural sector relate more to residential amenity rather than direct impacts on agricultural production.

As mentioned above, the Commission has recommended a regional strategic framework approach to deal with the cumulative impacts of the growing mining sector. Regional strategies have been particularly recommended to deal with biodiversity and air quality, but also have relevance for noise, water and other long term regional issues such as stability of the agricultural sector, employment and population demographics more generally.

The Commission considers that strong community engagement is essential to ensuring mining can successfully coexist in any community. The likely scale of mining in this region, will make this issue even more significant. In this regard the Commission has recommended the local community should be involved in the development of the regional strategies as well as the detailed mine specific plans, for issues such as construction and blast management.

The project involves the clearing of 1665 ha of native vegetation, including 754 ha of critically endangered box gum woodland. The forest has been found to support 26 listed fauna species and has a moderate to high likelihood of supporting 15 others. Despite its landform of undulating hills and proximity to the forested lands of the Nandewar Range and Kaputar National Park, the State Forest is currently mapped as part of the Liverpool Plains subregion. Consequently, despite its marginal location within the subregion, the Leard State Forest is attributed particular conservation significance because of the extensive clearing of vegetation on the plains and the fragmented nature of the vegetated remnants.

The proponent proposes to restore and preserve certain areas of land for biodiversity, to mitigate the significant loss of biodiversity which would occur on site. If appropriately expanded and maintained, the Commission believes that this approach could improve the region's biodiversity, in the medium to long term.

In order to ensure the long term success of the biodiversity conservation areas and corridors, the Commission has recommended that a Regional Biodiversity Strategy should be developed and implemented. The strategy will need to set out the long term framework of management, monitoring and land use security to be applied consistently across all biodiversity conservation areas in the region.

The conservation corridors proposed to be developed would link directly to the Leard State Forest. Currently mining applications are seeking to mine from the north and the south of the forest only leaving a narrow strip of undisturbed vegetation between them. The Commission does not believe this narrow corridor is adequate, on grounds both of integrity of the biodiversity corridor and also in relation to the potential for groundwater interactions between the two mines. The Commission has

recommended that the 'barrier' between the two mines should be increased to include a minimum of 500 m of undisturbed vegetation, in line with advice from the Office of Environment and Heritage. Both mines should contribute equally to the barrier, with each company establishing a 250 m exclusion zone on its side of the boundary.

Although largely within the forest, agricultural properties (mainly to the north and west of the mine) have the potential to be impacted by the mine's dust, noise and blasting emissions. The Commission has assessed these issues and considers that they can be adequately managed through use of appropriate equipment and operational procedures. As mentioned previously however, the cumulative impacts of mining activities in the area will need to be carefully managed and monitored. In this regard the Commission has recommended that a number of regional strategies need to be prepared to ensure the mines work together to prevent emissions exceeding accepted levels.

In relation to water, the mine would inevitably result in some reduction in both ground and surface water flows. The groundwater impacts are predicted to be largely contained within the Permian coal measures with leakage or recharge losses from the alluvium predicted to be in the order of 128 Mega Litres (ML) a year. No irrigation bores that draw water from the alluvial lands are present within the zone of influence. Baseflow losses to surface drainage systems are predicted at around 18.5 ML a year. Total groundwater losses predicted are in the order of 147 ML a year.

The Commission is satisfied that water impacts are generally localised and are unlikely to have significant wider regional implications that would warrant waiting for the Namoi Water Study to be completed. Notwithstanding this, water is a critical issue for the region and the Commission does not support the long term water impacts that would result from the proposed final void and lake. The Commission understands it should be possible to ensure the final landform has the capacity to drain to the natural catchment and recommends the landform design is modified to prevent a pit lake from forming.

In other respects, the Commission is generally satisfied the mine plan is adequate. While submissions recommended that underground mining would be more appropriate, Emeritus Professor Galvin's advice to the Commission clearly articulates the problematic nature of the underground mining option for the site, particularly in relation to the safety and financial risks.

As with any open cut mine, the project will have environmental impacts. Submissions to the Commission during the public hearing raised many concerns about environmental impacts, but also indicated that mining has brought substantial economic benefits to the region. The Commission has considered the key impacts of the mine in this report and has found that on whole the project has merit.

The Commission's detailed recommendations are provided in full in the following section. In short the Commission recommends that with an appropriate regional management framework and mine specific management plans and conditions in place, the impacts of the project can be adequately minimised and managed. Consequently, subject to detailed assessment by the Department of Planning and Infrastructure, the Commission considers the project could be approved subject to stringent conditions.

Recommendations

1. Regional Biodiversity Strategy

In view of the regional nature of the biodiversity issues raised by this proposal and the regional scale of the measures proposed to minimise adverse impacts, the Department of Planning and

Infrastructure should commission a biodiversity working group to prepare a Regional Biodiversity Strategy. The group should comprise independent experts as well as representatives from all levels of government, including the Office of Environment and Heritage, the Office of Resources and Energy, the Namoi CMA and Narrabri Shire Council.

The proponent for this project and the mining companies seeking to mine other parts of the Leard State Forest should be required to pay for the preparation and implementation of the regional biodiversity conservation strategy, on a pro rata basis according to the proportion of land to be cleared by each company.

The strategy should:

- be prepared in consultation with the local community, the Aboriginal community, local landcare groups and the mining companies and operators;
- set out an appropriate framework for the strategic conservation of the biodiversity values and functions likely to be impacted by the mining of land within the Leard State Forest and surrounds;
- include options for strategic additions to the public reserve system;
- set out the measures to be used to secure areas of private land into the long term;
- set out the management regime for the conservation lands, including details of the funding mechanisms and management responsibilities to be implemented to ensure the ongoing maintenance of the land in the long term, including after the completion of mining.

The Regional Biodiversity Strategy should be completed to the satisfaction of the Director-General of the Department of Planning and Infrastructure, within 1 year of any new approval of mining within the Leard State Forest.

2. Mine Specific Biodiversity Management Plan

The proponent must also prepare a biodiversity management plan to cover the offsite areas to be rehabilitated and conserved, as well as the biodiversity on site (both remnant and rehabilitation areas). The Department's standard conditions relating to biodiversity management and rehabilitation, could be adapted to fulfil this purpose, but would need to also include:

- the Namoi Catchment Management Authority in the list of agencies to be consulted during the preparation of the plan; and
- requirements to describe the measures to be implemented to ensure the connectivity and corridor function fulfilled by the exclusion zone corridor is maintained; and
- requirements to demonstrate consistency with the Regional Biodiversity Strategy and consider any findings and recommendations within the strategy.

The mine specific Biodiversity Management Plan would need to be in place before the mine commences exporting of coal from the site.

3. Barrier Coal Corridor

The proponent should be restricted from clearing any land (or establishing and/or intensifying any dams, roads or other infrastructure) within 250 m of the southern lease boundary, to ensure that a viable biodiversity corridor can be maintained through the vicinity of the Leard State Forest.

4. Dust Control Measures

All measures for control of air pollution should deliver air quality outcomes that are equal to or better than the air quality outcomes identified in the EA and that correspond to best practice and the application of best available technology. This must include best practice coal loading and profiling, to minimise dust emissions from coal transportation.

5. Compliance with the air quality standards

The cumulative dust levels from the mine and any other sources must not exceed the national and state air quality standards at any occupied residential property, regardless of land tenure.

The proponent must ensure that the project does not contribute to any exceedence of the PM_{2.5} goal, and any PM_{2.5} criteria (when this is finalised nationally and/or at a State level) at any occupied residential property, regardless of land tenure.

In the event that any air quality standards are exceeded, the mine should be required to immediately shut down (where dust levels cannot be brought into compliance), or scale back activities on site (if this is sufficient to quickly bring dust levels down to within the criteria). Proactive management will be required to achieve compliance in variable weather conditions.

6. Regional Strategy and Project Specific Air Quality Management Plan

In order to prevent exceedence of the air quality standards, the proponent, in collaboration with the Boggabri and Tarrawonga mines (and any other mines to operate in the area) should develop and implement both a regional strategy and a project specific Air Quality Management Plan to ensure air quality standard (and goals) are achieved. The strategy and/or management plan should include:

- A shared environmental monitoring network and data sharing protocol between the proponent and the neighbouring mines, setting out the systems and processes to be implemented to ensure all mining operations are managed to achieve appropriate air quality standards.
- Monitoring and management arrangements that provide for:
 - A predictive, reactive and collaborative management system, using state-of-the-art technology to ensure the mine avoids, reduces and/or ceases activities as required.
 - Comprehensive, real time monitoring for TSP, PM₁₀, PM_{2.5} and deposition, both locally and regionally; and
 - Apportionment of emissions from the proponent's operations using a combination of dual synchronized monitors and meteorological instruments, supplemented by elemental or chemical methods of source apportionment, as appropriate.
- Commitments to provide summary reports and specific briefings on issues arising from the monitoring at the Community Consultative Committee meetings.
- Provisions to ensure there are ongoing improvements to the management systems, reporting provided and response mechanisms implemented, to maintain best practice over time.

7. Online communication of onsite activities and monitoring of dust

A risk/response matrix should be developed to clearly codify mine operational responses to varying levels of risk resulting from weather conditions and specific mining activities in sensitive locations. The risk/response matrix and real time monitoring data should be made available online and include:

- timely publication of monitoring data in a clearly understandable form;
- identification of mine operational responses to monitoring data and weather forecasts; and
- provision for online input/response by members of the community and real time engagement with regionally based regulatory compliance staff.

8. Noise Control Measures

All equipment and noise control measures should deliver noise levels that are equal to or better than the levels identified in the EA and that correspond to best practice and the application of best available technology. All equipment must be selected to minimise noise and must include state of the art noise attenuation or suppression.

9. Compliance with the Industrial Noise Policy

The noise levels from the mine must not exceed the noise levels prescribed under the Industrial Noise Policy, ie 35 L_{Aeq} 15 min and 45 L_{A1} 1 min, at any privately owned residential receiver, unless the proponent has the written agreement of the owner of the property.

The cumulative noise levels from the mine and any other sources must not exceed the amenity criteria at any privately owned residential property.

10. Measures to Minimise Transport Noise

The rolling stock used to transport the coal should be selected to minimise noise.

The loading and movement of trains (both on and offsite) should be scheduled and/or restricted to minimise sleep disturbance impacts for residents along the entire rail corridor.

11. Regional Strategy and Project Specific Noise Management Plan

In order to prevent exceedence of the noise criteria the proponent, in collaboration with the Boggabri and Tarrawonga mines (and any other mines to operate in the area), should develop and implement both a regional strategy and a project specific Noise Management Plan to ensure that both the project specific noise levels and a satisfactory amenity are achieved on neighbouring properties. The strategy and/or management plan should include:

- A shared environmental monitoring network and data sharing protocol between the proponent and the neighbouring mines, setting out the systems and processes to be implemented to ensure all mining operations are managed to achieve appropriate noise criteria.
- Monitoring and management arrangements that provide for:
 - A predictive, reactive and collaborative management system, using state-of-the-art technology to ensure the mine avoids excessive noise, reducing and/or ceasing activities as required.
 - Comprehensive, real time monitoring of noise and weather conditions, including real time monitoring of inversion effects.
- Commitments to provide summary reports and specific briefings on issues arising from the monitoring at the Community Consultative Committee meetings.
- Provisions to ensure there are ongoing improvements to the management systems, reporting provided and response mechanisms implemented, to maintain best practice over time.

12. Online communication of onsite activities and monitoring of noise

A risk/response matrix should be developed to clearly codify mine operational responses to varying levels of risk resulting from weather conditions and specific mining activities in sensitive locations. The risk/response matrix and real time monitoring data should be made available online and include:

- timely publication of monitoring data in a clearly understandable form;
- identification of mine operational responses to monitoring data and weather forecasts; and
- provision for online input/response by members of the community.

13. Construction Noise Management Plans

The construction noise management plans must:

- be prepared in consultation with nearby residents and document the preferences of the local residents (in terms of construction hours, etc);
- ensure construction noise impacts are minimised and managed both in terms of the intensity of the noise impact and the duration of the impact;
- set out the scheduling and timing of the various construction works and demonstrate how the proposed scheduling would minimise impacts and how local resident's preferences would be accommodated.

14. Blasting

Standard conditions relating to blasting should be adapted to cover the current proposal.

The Blast Management Plan should also:

- be prepared in consultation with the local community; and
- include measures to ensure that:
 - there are consistent blasting protocols for all mining operations in the area; and
 - blasting is coordinated to minimize disruptions to the community.

As with the recommendations for dust and noise a Regional Blasting Management Strategy may also be appropriate.

15. Water

The proponent should not be allowed to pursue the alternative rail bridge over the Namoi River, unless further justification and detailed plans and assessment have been provided and appropriately assessed by the Department of Planning and Infrastructure.

Along with the standard conditions relating to water, the conditions should also require:

- The proponent to be prohibited from discharging mine and contaminated water off site and should be required to ensure there is capacity to accommodate surplus mine and contaminated water in the mine pit, without impacting on operational and employment commitments, including during extreme weather events;
- The proponent to ensure that the project does not impact on the flood plain or flood dynamics along Back Creek;
- The proposed 17 additional monitoring bores to be equipped with water level or pore pressure monitoring transducers installed at vertical separations such that the future impacts of strata depressurisation can be adequately measured and mapped;
- Core tests to be conducted to assess the distribution and variability of hydraulic conductivities of (unfractured) interburden at a sufficient number of bore locations to quantify porous groundwater flow and storage contributions associated with interburden;
- XRD-XRF analyses to be undertaken on core samples obtained at a sufficient number of bore locations to establish the mineralogy of interburden likely to be exposed to pit re-saturation;
- Hydrochemical modelling to be undertaken in order to determine the long term void water quality. This study should include batch reaction (full saturation) trials on waste interburden (spoils) to confirm hydrochemical modelling outcomes;
- That reject materials or any potentially acid forming interburden materials must not be emplaced outside the pit shell or at elevations within the pit shell that are likely to promote acid or sulphate species generation and migration of such leachate beyond the pit shell at any future time;
- Any coal barrier between the pit shell and any future surrounding mining operations must remain intact in order to impede exchange of any contained groundwaters in the Maules Creek pit shell;
- A mine closure plan to be prepared prior to mining year 14 (at least 7 years before closure). An important part of this plan will be that it must address future stability of the proposed landform, long term groundwater recovery and void water quality characteristics to the satisfaction of the Director General. In particular the long term landform should not generate a pit (void) lake or salt scalding. Emplaced spoils should have a capacity to drain to the natural catchment and drained waters must not adversely impact upon the downstream environment. The hydrochemistry, hydrogeology and hydrology components of the mine closure plan must be subject to independent review and verification.

16. Aboriginal cultural heritage

Standard conditions relating to Aboriginal cultural heritage should be adapted to cover this proposal.

In addition to these standard requirements the proponent should be required to explore, with other mine owners and in consultation with Aboriginal stakeholders and the Office of Environment and Heritage, options to establish a Regional Keeping Place to house artefacts salvaged as part of the project.

17. Greenhouse Gas Emissions

The Department of Planning and Infrastructure should include suitable conditions to reflect Greenhouse Gas Emissions policy at the time the assessment is finalised.

18. Lighting

The conditions should include a requirement to ensure that, wherever possible, moving equipment is appropriately designed and/or retrofitted to prevent light being directed above the horizontal.

19. Socio-Economic

Conditions should include requirements to maximise the amount of agricultural land that remains in production on the properties acquired by the proponent.

Council and the proponent should work together to plan for the socio-economic adjustments that will need to occur in the long term.

20. Traffic

Conditions should include:

- requirements that the proponent minimise traffic impacts along the school bus route;
- requirements to undertake road upgrades and maintenance to the satisfaction of Narrabri Shire Council and Roads and Maritime Services; and
- requirements that all coal is transported from the site by rail.

21. Community Consultative Committee

The Community Consultative Committees for neighbouring mines should include some joint membership, including the chair if possible.

Contents

EXECUTIVE SUMMARY	I
CONTENTS	IX
FIGURES	X
TABLES	X
GLOSSARY	XI
1 INTRODUCTION AND TERMS OF REFERENCE	1
2 COMMISSION ACTIVITIES	2
2.1 PUBLIC HEARING AND SUBMISSIONS	2
2.2 DOCUMENTS, MEETINGS & SITE INSPECTIONS	2
3 PROJECT DESCRIPTION	3
4 BACKGROUND AND STRATEGIC CONTEXT	10
4.1 BRIGALOW AND NANDEWAR COMMUNITY CONSERVATION AREA	11
5 BIODIVERSITY	13
5.1 BIOREGIONAL CONTEXT.....	13
5.2 EXISTING FOREST	14
5.3 PREDICTED BIODIVERSITY IMPACTS	15
5.4 MANAGEMENT MEASURES	19
5.5 COMMISSION’S CONSIDERATION	21
5.6 RECOMMENDATIONS.....	24
6 DUST, NOISE, BLASTING AND WATER IMPACTS	26
6.1 DUST	26
6.2 NOISE	32
6.3 BLASTING.....	37
6.4 WATER.....	40
7 MERITS OF THE MINE PLAN	46
8 OTHER POTENTIALLY SIGNIFICANT IMPACTS	47
8.1 ABORIGINAL CULTURAL HERITAGE	47
8.2 GREENHOUSE GAS EMISSIONS	49
8.3 LIGHTING	49
8.4 SOCIO ECONOMIC.....	50
8.5 TRAFFIC AND TRANSPORT.....	52
8.6 COMMUNITY AND STAKEHOLDER CONSULTATION	53
8.7 COMPLIANCE	54
8.8 OTHER ISSUES	54
9 FINDINGS AND RECOMMENDATIONS	55
9.1 RECOMMENDATIONS.....	56
REFERENCES	61
APPENDIX A – TERMS OF REFERENCE	64
APPENDIX B – SUMMARY OF SUBMISSIONS TO THE PLANNING ASSESSMENT COMMISSION	65
APPENDIX C – DR MACKIE’S EXPERT ADVICE ON GROUNDWATER	70
APPENDIX D – EMERITUS PROFESSOR GALVIN’S EXPERT ADVICE ON THE MINE PLAN	78

Figures

Figure 3-1 Maules Creek Coal Mine Lease area and surrounds	3
Figure 3-2 Project site (outlined in red) and main disturbance area outlined in yellow	4
Figure 3-3 Leard State Forest looking south west	5
Figure 3-4 Leard State Forest looking north west.....	5
Figure 3-5 Geology of the site	6
Figure 3-6 Site Infrastructure (mine infrastructure areas shown in brown	7
Figure 3-7 Indicative cumulative landform (potential future open cut mine areas shown in brown) ...	9
Figure 4-1 Indicative layout of the original mine proposal approved in 1990	10
Figure 4-2 Existing Coal Titles shown in grey	11
Figure 5-1 Biogeographic Regional Context, showing the Australian Government’s Brigalow Belt South subregions	13
Figure 5-2 Leard State Forest and surrounding remnant vegetation	14
Figure 5-3 Leard State Forest from the air. The Boggabri Coal Mine is visible in the distance	17
Figure 5-4 – Proposed biodiversity conservation scheme	20
Figure 6-1 –train wagon cover examples	30
Figure 8-1 Extract from the map of the Brigalow and Nandewar Community Conservation Area	48

Tables

Table 5-1 Threatened and Migratory Fauna Species identified on site.....	16
Table 5-2 summary of threatened biodiversity impacts and proposed offsets.....	21
Table 6-1 Particulate Matter Emissions Criteria	26
Table 6-2 Deposited dust criteria.....	27
Table 6-3 Predicted annual average PM ₁₀ emissions.....	27
Table 6-4 Predicted Maximum 24 hour average PM ₁₀ concentrations	28
Table 6-5 Predicted number of days PM ₁₀ criteria would be exceeded by the mine	28
Table 6-6 Operational Noise Goals	33
Table 6-7 Road and Rail Traffic Noise Goals	33
Table 6-8 Maximum predicted noise impact at nearby residences.....	34
Table 6-9 Blast Criteria.....	37

Glossary

ARI: Annual Recurrence Interval

CMA: Catchment Management Authority

CO: Carbon Monoxide

Commission: Planning Assessment Commission constituted to review this project, comprising Ms Gabrielle Kibble AO (Chair), Mr Brian Gilligan and Mr Garry West

DP&I: Department of Planning and Infrastructure

EA: Environmental Assessment.

EPA: Environment Protection Authority

EPBC Act: *The Environment Protection and Biodiversity Conservation Act 1999*

EP&A: Environmental Planning and Assessment

IBRA: Interim Biogeographic Regionalisation for Australia

LGA: Local Government Area.

ML: Mega Litre

Mtpa: Million tonnes per annum

NO: Nitric oxide

NO₂: Nitrogen dioxide

NO_x: Nitrogen oxides

NOW: NSW Office of Water

OEH: Office of Environment and Heritage, formerly DECCW and now incorporating the Heritage Branch.

PAC: The Planning Assessment Commission of New South Wales.

PM₁₀: Particulate matter with an aerodynamic diameter smaller than 10 micrometres.

ROTAP: Rare or Threatened Australian Plant

The proponent: The applicant under Part 3A of the EP&A Act 1979, in this report being Aston Coal 2 Limited. 'Proponent' includes the proponent's EA consultants.

The proposal: The subject of the application under Part 3A of the EP&A Act 1979, in this report being the Maules Creek Coal Project.

Riparian Zone: The area of land adjacent to a river or stream. It includes the riverbanks and land immediately adjacent to riverbanks.

TSC Act: *Threatened Species Conservation Act 1995.*

TSP: Total suspended particulate matter

uS/cm: microSiemens per cm (Electrical Conductivity units)

1 Introduction and Terms of Reference

On 16 August 2011 the Minister for Planning and Infrastructure, the Honourable Brad Hazzard MP issued the following direction to the Chairman of the Planning Assessment Commission (PAC):

I, the Minister for Planning and Infrastructure request the Planning Assessment Commission (PAC) to:

1. Carry out a review of the merits of the Maules Creek Coal Project, which:
 - a. takes into consideration the environmental assessment of the project, issues raised in public and agency submissions and any other information provided during the review process;
 - b. assesses:
 - the potential cumulative dust, noise, blasting and water impacts of the project;
 - the potential biodiversity impacts of the project;
 - the merits of the mine plan, paying particular attention to the proposed overburden dump and future rehabilitation of the project; and
 - any other potentially significant impacts of the project.
 - c. recommends appropriate measures to avoid, minimise and/or offset these impacts; and
 - d. provides advice on the merits of the project as a whole.
2. Conduct public hearings during the carrying out of the review.
3. Submit its final report on the review to me by 16 December 2011, unless the Director-General of the Department of Planning and Infrastructure agrees otherwise.

A copy of the Minister's direction to the PAC is provided in Appendix A of this report.

Ms Gabrielle Kibble AO, Chairman of the PAC appointed Mr Brian Gilligan and Mr Garry West to the Commission for the project. Ms Kibble chaired the Commission for the project.

Emeritus Professor Jim Galvin and Dr Colin Mackie were engaged as consultants to provide advice on the merits of the mine plan and the groundwater issues respectively.

2 Commission Activities

2.1 Public Hearing and Submissions

In accordance with the Commission's terms of reference, a public hearing was held on Wednesday 23 November 2011 at the Boggabri Golf Club, Kamilaroi Hwy, Boggabri. A total of eight verbal submissions were made to the Commission at the hearing, comprising Narrabri Shire Council, Gunnedah Shire Council, four special interest groups (the Maules Creek Community Council, Namoi Water, the Boggabri Business Promotions Association and the Northern Inland Council for the Environment) and two individuals. All persons seeking to be heard were heard. Six written submissions were also made to the Commission. A summary of these submissions is listed in Appendix B of this report.

The Commission has also reviewed the 111 submissions made to the Department of Planning and Infrastructure during the public exhibition of the proposal. Of these submissions, the majority are concerned with the impacts of greenhouse gas emissions from the downstream use of the coal and the clearing of the forest and come from across NSW, as well as from other Australian states. Local submissions are more concerned with issues such as health, socio-economic and water, as can be seen in the smaller set of submissions made directly to the Commission and summarised in Appendix B of this report.

2.2 Documents, Meetings & Site Inspections

Through the course of the review the Commission accessed a wide range of documents including:

- The proponent's Environmental Assessment;
- The proponent's Response to Submissions;
- Submissions from government agencies, special interest groups and the public;
- Specialist reviews and studies commissioned by the Maules Creek Community Council;
- The proponent's response to Dr Mackie's questions relating to the groundwater impacts of the project; and
- The Boggabri Coal Project documents (described in the Commission's review report for that project).

During the review, the Commission met with the Department of Planning and Infrastructure (30 August 2011), the Office of Environment and Heritage (23 November 2011) and the proponent (22 November 2011).

The Commission visited the site on 22 November 2011. The Commission visited the Leard State Forest and drove along Leard Forest Road as part of its investigations. The proponent also arranged for the Commission to fly over the area by helicopter. During the helicopter flight the proponent pointed out the site and surrounds, the proposed northern conservation lands and the potential location of the associated workers village (which would be subject to a separate development application).

3 Project Description

Aston Coal (the proponent) proposes to develop an open cut mine within the Leard State Forest 20 km north east of Boggabri and approximately 5 km south of Maules Creek (see Figure 3-1). The mine would process up to 13 million tonnes of coal a year, extracting 240 Million tonnes of coal over a 21 year period.

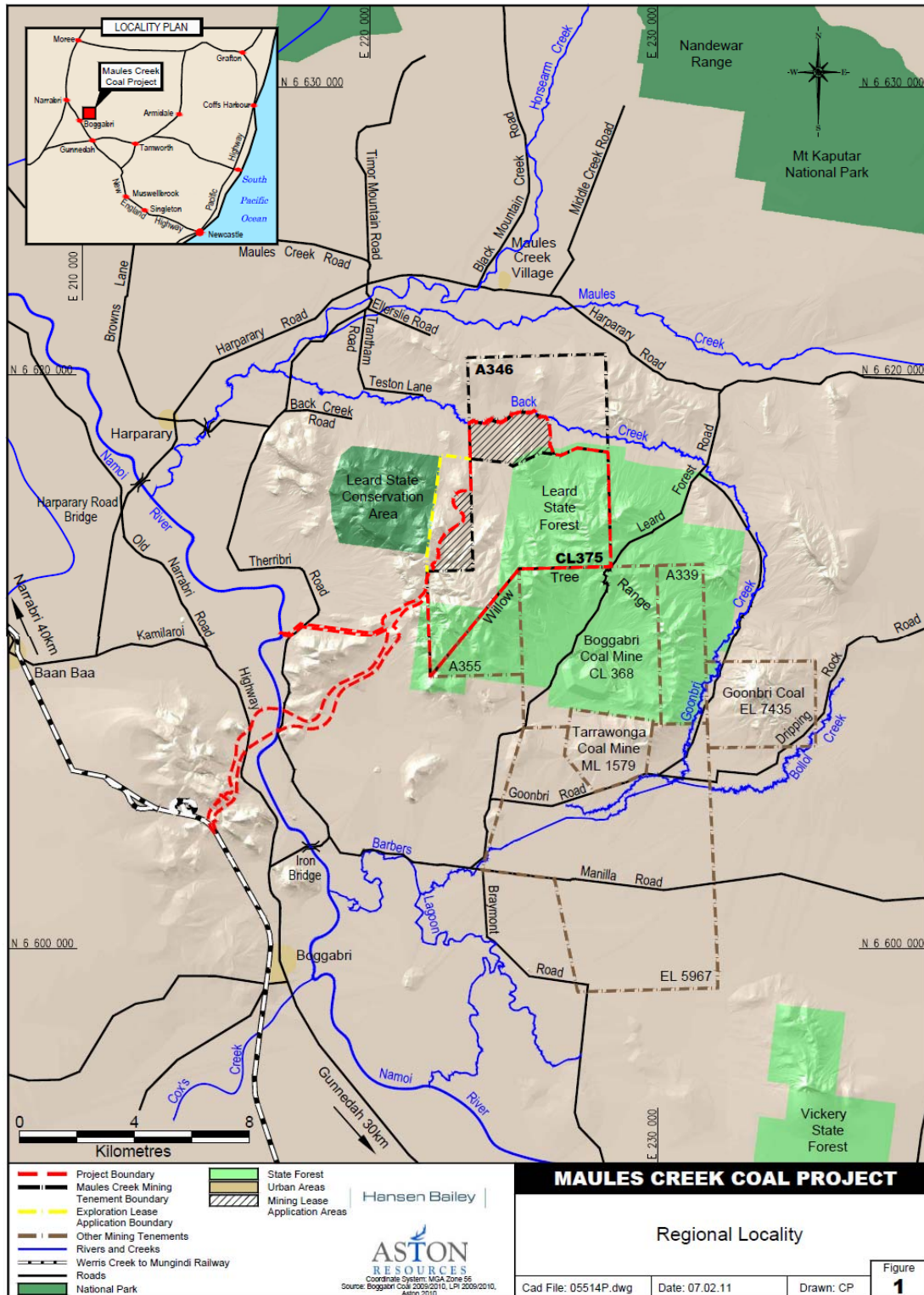


Figure 3-1 Maules Creek Coal Mine Lease area and surrounds

source: Hansen Bailey (2011a)

The project involves open cut mining of the north western part of the Leard State Forest, including:

- Mining of approximately 15 seams, down to the Templemore Seam;
- Extraction of 240 million tonnes of coal over 21 years;
- An annual production capacity of up to 13 million tonnes;
- A disturbance area of 2178 ha;
- A mine access road;
- A rail spur and loop ;
- A water pipeline, from the Namoi River; and
- Onsite infrastructure for coal processing and management.

The extent of the proposed disturbance area is shown (outlined in yellow) in Figure 3-2.

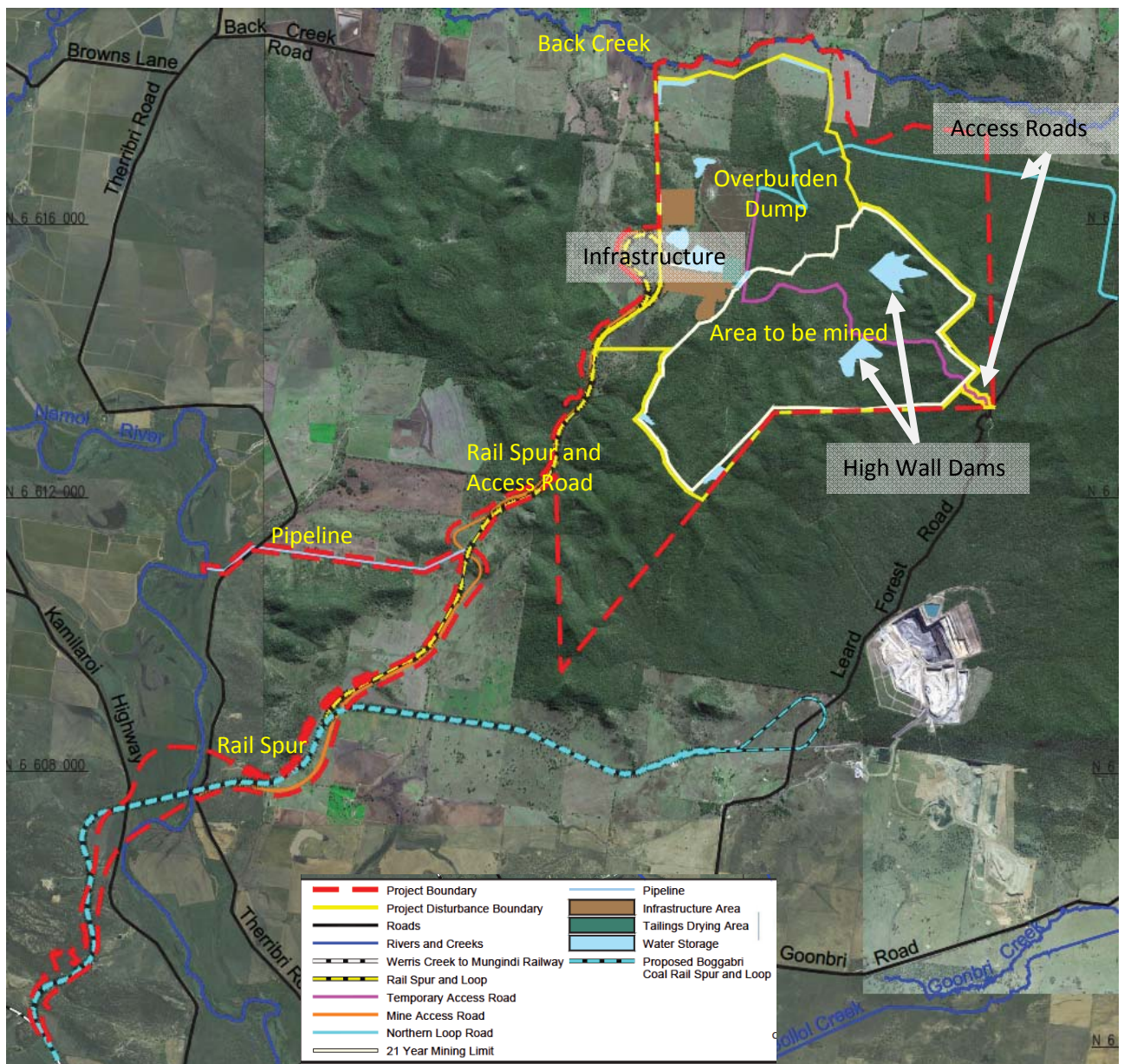


Figure 3-2 Project site (outlined in red) and main disturbance area outlined in yellow Source: Hansen Bailey (2011a)



Figure 3-3 Leard State Forest looking south west



Figure 3-4 Leard State Forest looking north west

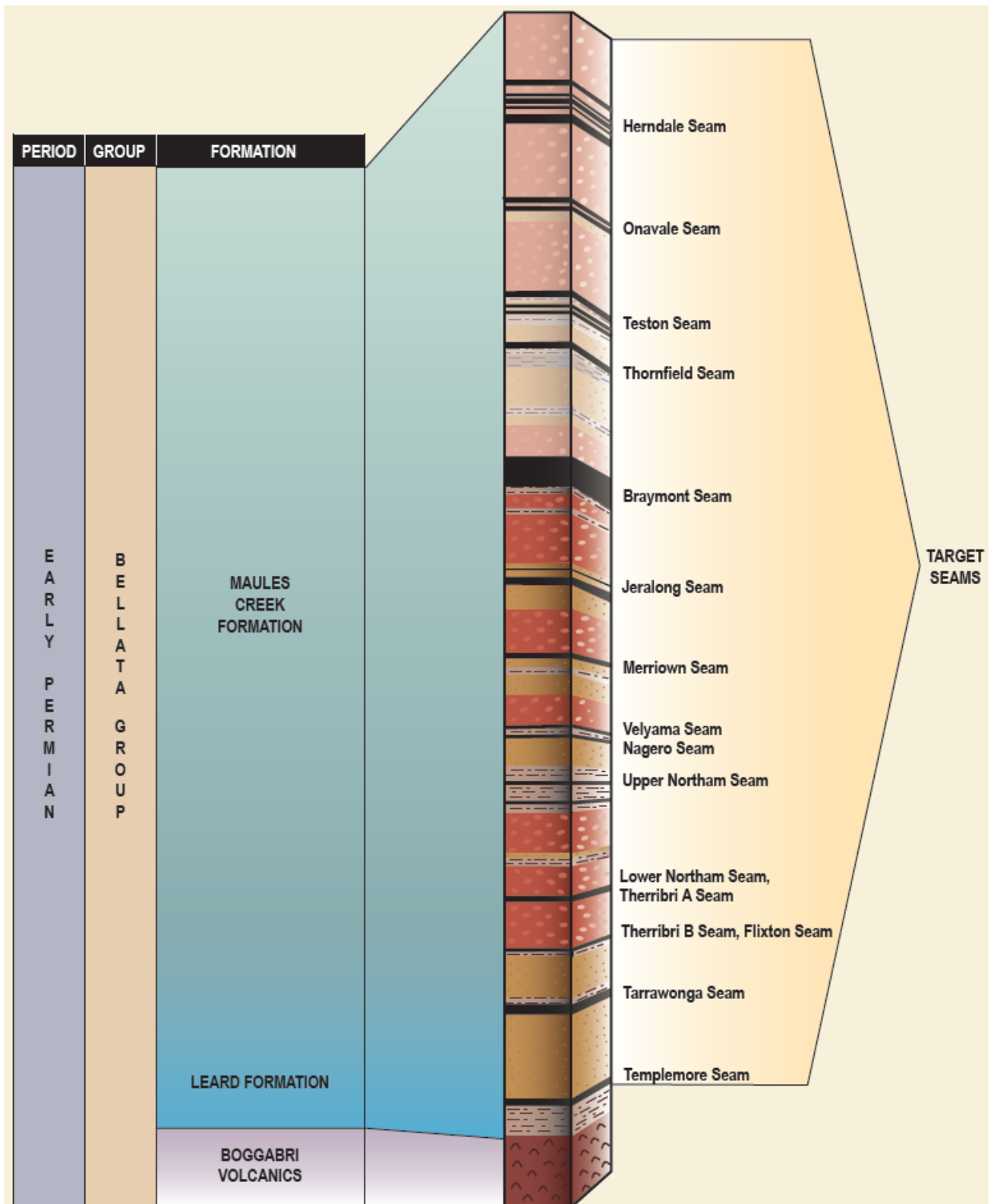


Figure 3-5 Geology of the site

Source: Hansen Bailey (2011a)

Figure 3-5 shows the geological stratigraphy of the Maules Creek formation. Under the proposal the proponent would mine all coal seams down to and including the Templemore coal seam. The Commission notes that the neighbouring Boggabri Coal Project proposes to only mine about half of these seams, down to the Merriown coal seam.

A number of facilities and infrastructure works would be required, to facilitate the mining operations, including:

- a coal processing plant;
- 2 product coal stockpiles, with a total capacity for 600,000 tonnes;
- a tailings disposal emplacement area and associated evaporation ponds;
- a water management system;
- a rail spur line, loop and load out bin;
- a 15 km mine access road;
- associated buildings and services such as fuel farms, wash bays, a workshop, and a helicopter pad.

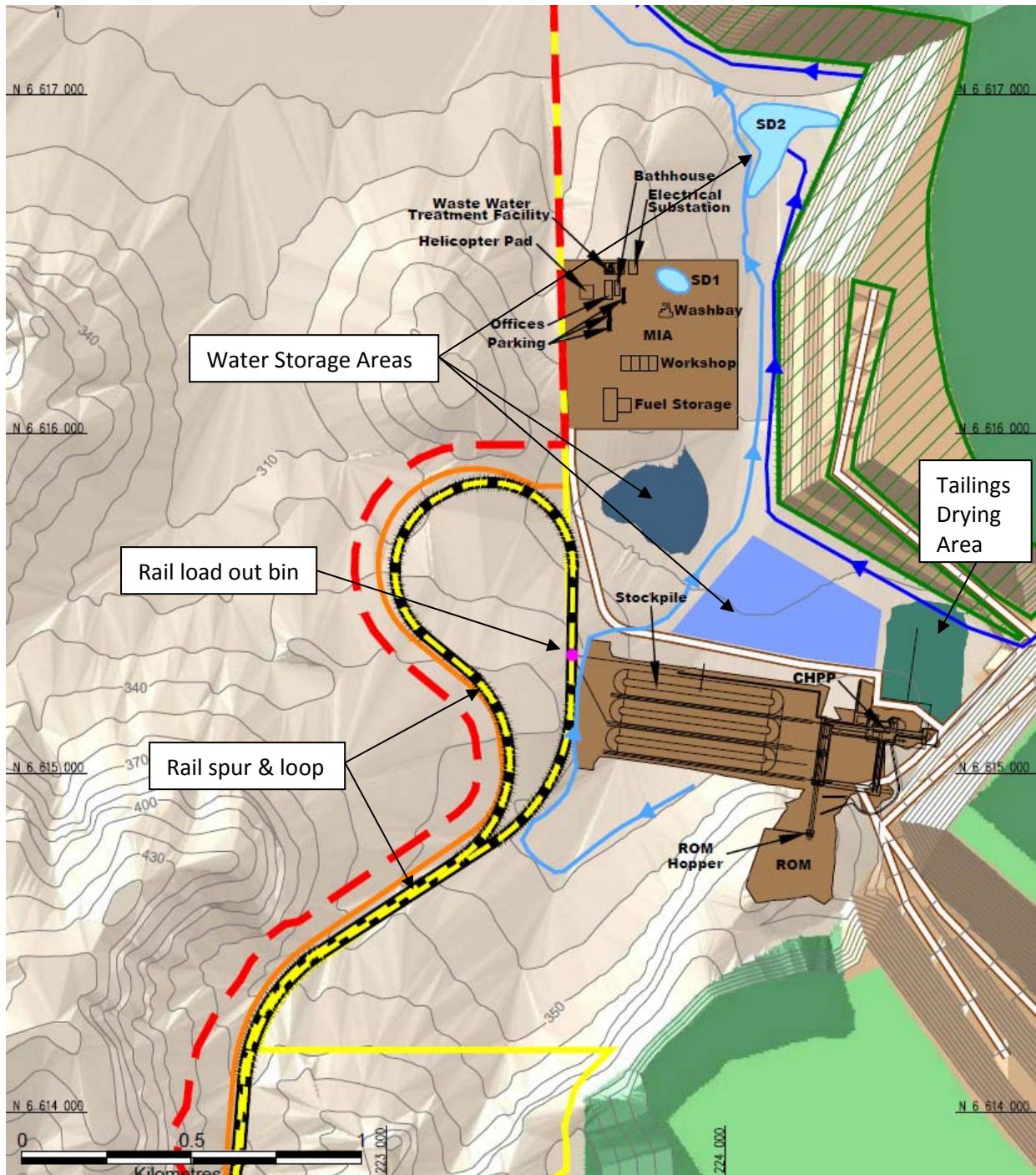


Figure 3-6 Site Infrastructure (mine infrastructure areas shown in brown

Source: Hansen Bailey (2011a)

3.1.1 Barrier Coal and future mining

The Boggabri and Maules Creek coal mine proposals share a common lease boundary. As proposed there is no plan to integrate or join the two mine pits and consequently some coal would remain in situ in the boundary or 'barrier' between the two mines.

Both mines have indicated this 'barrier coal' should be extracted. As proposed the Maules Creek coal mine would reach the southern coal lease boundary (which adjoins the Boggabri Coal Lease) between year 10 to 12 (Hansen Bailey, 2011a). On the other hand, at this stage Boggabri Coal has not sought to mine all the way to the lease boundary, but would leave a small triangle of undisturbed land along the boundary with the Maules Creek Coal Project at the end of its 21 year mine plan (see Figure 3-7). Notwithstanding this, Boggabri Coal has indicated it may wish to continue mining up to this boundary, but would not reach it till much later, around year 30.

Both companies have agreed to review this situation in 5 years, in order to develop a plan for the extraction of the coal along this boundary, with the intent of maximising the coal extracted from the boundary while minimising any adjoining voids between the two mines (Hansen Bailey, 2011a).

In its initial (February 2011) submission on the Boggabri Coal Project, the Office of Environment and Heritage recommended that a 500 m wide corridor should be maintained through the Leard State Forest. Dr Col Mackie's advice on groundwater issues has also highlighted the importance of maintaining an effective barrier between the two mines. In considering these issues, as indicated in its report on the Boggabri coal mine, the Commission determined that a 500 m wide corridor was appropriate and recommended that this corridor would need to run between the two mines. The Commission has recommended that both the Boggabri and Maules Creek mines contribute equal portions to the corridor (i.e. 250 m each). This is further discussed in both the biodiversity and groundwater/mine plan sections; see section 5 and section 6.4 respectively.

In addition to this issue regarding the mining of the lease boundary, there is also additional coal within the Maules Creek coal lease area, both under the overburden dump and in the undisturbed area to the north east of the mine (see Figure 3-7). The Proponent has indicated it may seek to continue mining into this area to the north east, beyond the currently proposed 21 year mine plan, in the future. The Commission notes that both of these areas are outside of the scope of this report and that any proposal to mine either site would need to be carefully considered in a separate application process as also discussed in section 5 and section 6.4.

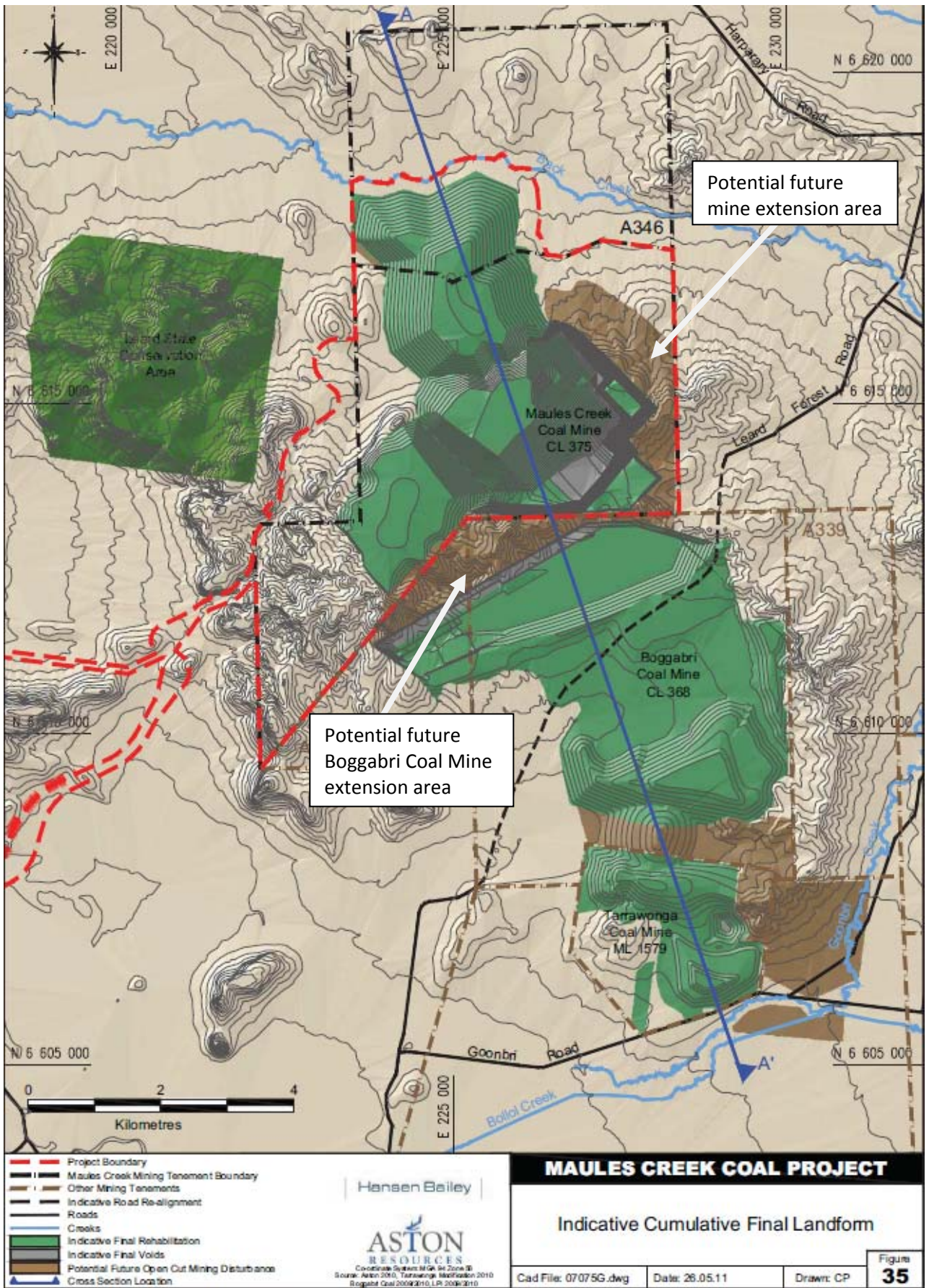


Figure 3-7 Indicative cumulative landform (potential future open cut mine areas shown in brown)

Source: Hansen Bailey, 2011a

4 Background and Strategic Context

A consent for mining on the site was originally granted in 1990. The development consent originally allowed mining down to the Lower Northam Seam, using a combination of open cut and underground mining methods, with a production rate of around 9 million tonnes a year. A coal lease was subsequently granted in 1991 and expires on 4 June 2012. Despite receiving development consent and a coal lease, the site has not been mined to date.

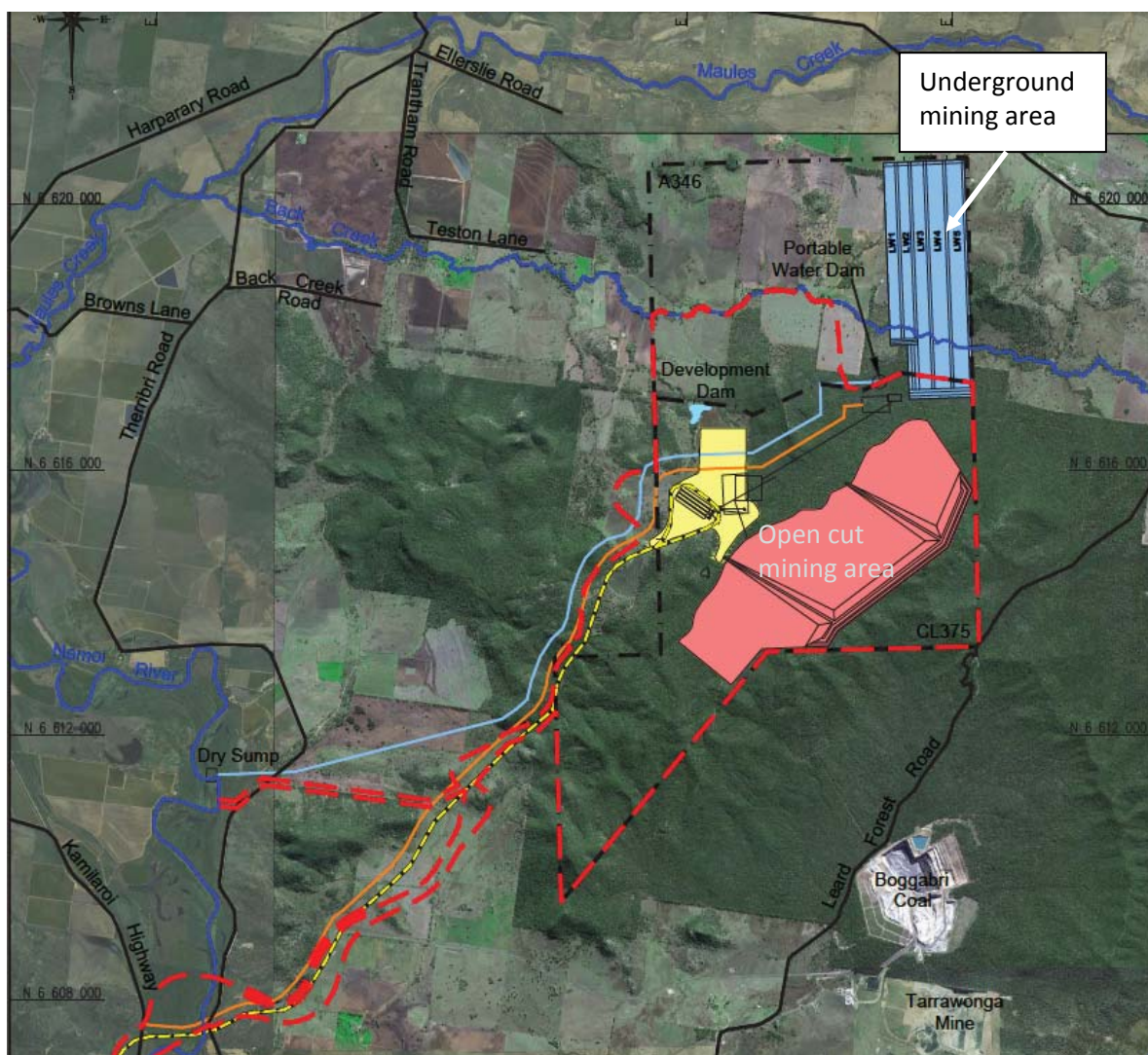


Figure 4-1 Indicative layout of the original mine proposal approved in 1990 (Source: Hansen Bailey, 2011a)

The mine site is within the Leard State forest and adjoins the Boggabri coal mine to the south, the expansion of which the Commission recently reviewed and recommended for approval. Although mining many of the same seams, the Boggabri coal mine proposal would only mine down to the Merriown Seam, and consequently would have a much shallower pit than that proposed here. Goonbri Coal holds an exploration lease for the area to the south east of the site, while the Tarrawonga mine is currently operating further south beyond the Boggabri coal mine.

The Commission understands the Tarrawonga mine's application to expand mining operations within its mining lease is currently on public exhibition. The Commission has not reviewed this application and did not have access to it during its review of the Maules Creek coal project. Nonetheless, where

possible the Commission has considered the possibility for cumulative impacts to arise from potential mines such as Goonbri and the Tarrawonga expansion.

A number of other coal mines are also operating in the region, including mines to both the north and the south of the site. Numerous coal exploration licences, some of which are preparing project applications, are also present in the region. NSW Trade and Investment records indicate that a coal title, of one sort or another, has been issued for almost the entire area between the Leard State Forest and the outskirts of Gunnedah (see Figure 4-2).

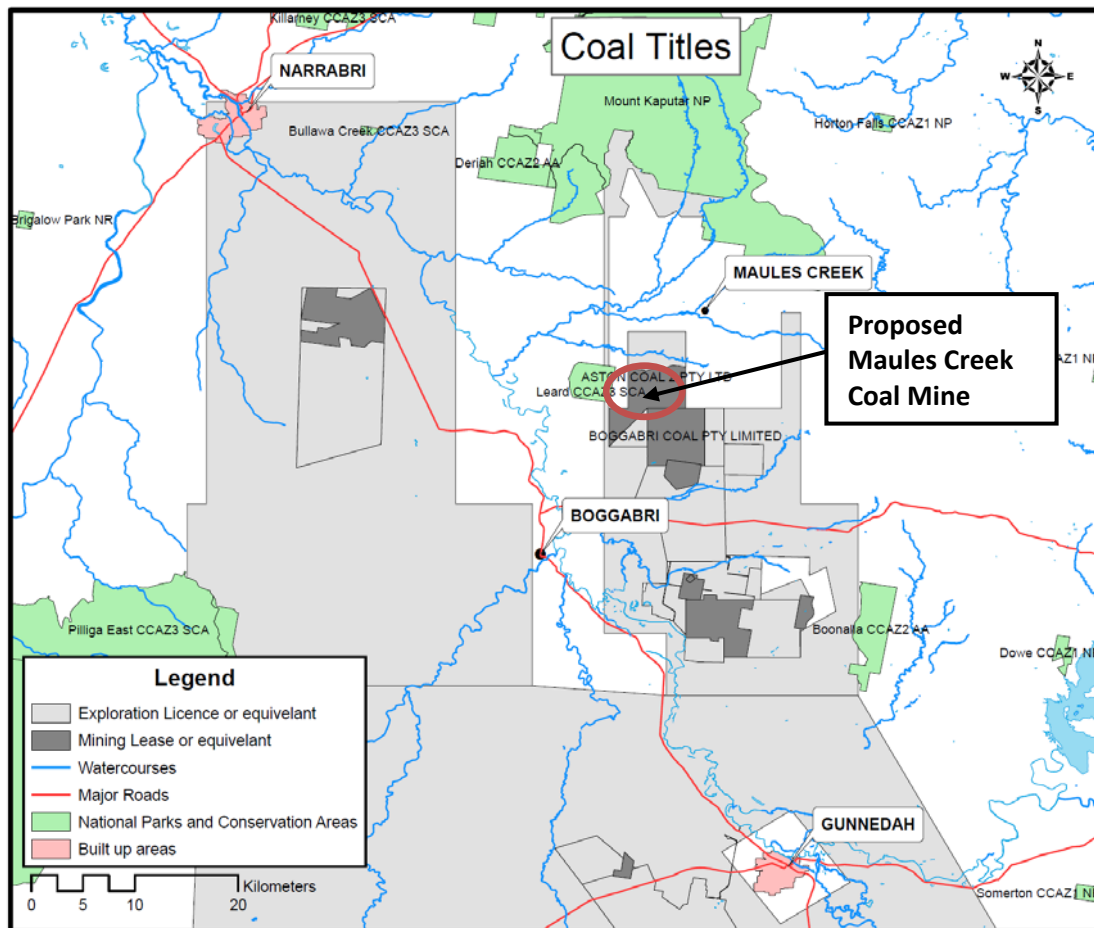


Figure 4-2 Existing Coal Titles shown in grey

The mining industry is expected to experience strong growth in the region and the Commission has taken this into account in considering potential cumulative impacts and in framing some of the recommendations it has made.

Notwithstanding the regional growth in mining, in the immediate area around the Leard State Forest the Commission understands that, there are no significant coal resources immediately to the west, between the site and the Namoi River. The Commission also expects that the alluvial systems associated with Back Creek and Maules Creek, to the north of the Leard State Forest, would be a significant constraint for mining in that direction. In this sense, the Maules Creek coal lease may represent the furthest northerly extent of mining likely in the local area.

4.1 Brigalow and Nandewar Community Conservation Area

In 2003 the Commonwealth Government announced the 'Brigalow North and South' region to be one of 15 biodiversity hotspots around the nation (Department of Sustainability, Environment, Water, Population and Communities, 2009). This region extends from south of Dubbo, north into

Queensland and within NSW, covers the region between Gunnedah and Narrabri, including the project site. In response to the declaration and the recently completed regional assessment process, the *Brigalow and Nandewar Community Conservation Area Act 2005* set aside significant tracts of land for conservation and recreation. The Act provided for the permanent protection of 352,000 ha of high conservation value forests in new reserves (Hansard, 2005). The land which is permanently protected under the bill contains the best of the region's remaining vegetation and biodiversity (Hansard, 2005).

In setting aside the additional conservation areas, policy makers were well aware of the potential impacts on the forestry industry and a range of compensation measures were provided. In the Second Reading, the Honourable Bob Debus Minister for the Environment also noted the high mineral and gas potential of the region and stated that "The Government's decision will preserve the full economic potential of the regions by ensuring the local coal and gas reserves can be accessed by the mining industry..."(Hansard, 2005). He went on to note the considerable job potential and investment that would be provided by the mining industry (Hansard, 2005).

The Leard State Forest was subsequently mapped as Zone 4 "for the purposes of forestry, recreation and mineral extraction" (Minister for Climate Change and the Environment and Minister for Primary Industries, 2009), having been seen as one of the areas that would contribute to the considerable job potential and investment that was predicted to come from the mining industry.

The precise form of any mineral extraction was not specified and when the Boggabri Coal proposal was being formulated the NSW Office of Environment and Heritage and the Department of Planning and Infrastructure (DP&I) required the proponent to justify the proposal with reference to: *'whether or not the proposal, together with actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts will maintain or improve biodiversity values'* (NSW Office of Environment and Heritage, 2011). The DP&I Director-General's requirements for the environmental assessment specify; *'an offset strategy to ensure the project maintains or improves the biodiversity values of the region in the medium to long term (in accordance with NSW and Commonwealth policies)'* (NSW Department of Planning, 2010).

5 Biodiversity

5.1 Bioregional context

Strategic planning at both national and state levels routinely reference a site's setting within its bioregion. The collaborative efforts of the Australian Government and relevant state agencies have identified 85 bioregions in the Interim Biogeographic Regionalisation for Australia (IBRA) based on geology, landforms and ecological characteristics. IBRA is updated from time to time as new scientific knowledge becomes available. In 2000, subdivision of Australia's 85 bioregions was undertaken and 403 subregions were identified.

Leard State Forest has been mapped within the Brigalow Belt South bioregion, just south of its narrowest east-west width where it is pinched between the Nandewar Ranges to the east and the Darling Riverine Plains to the west (see Figure 5-1). All of the subregion boundaries also come together in this area, suggesting it is at a junction of the bioregion in terms of the regional landscape and its ecological functions.

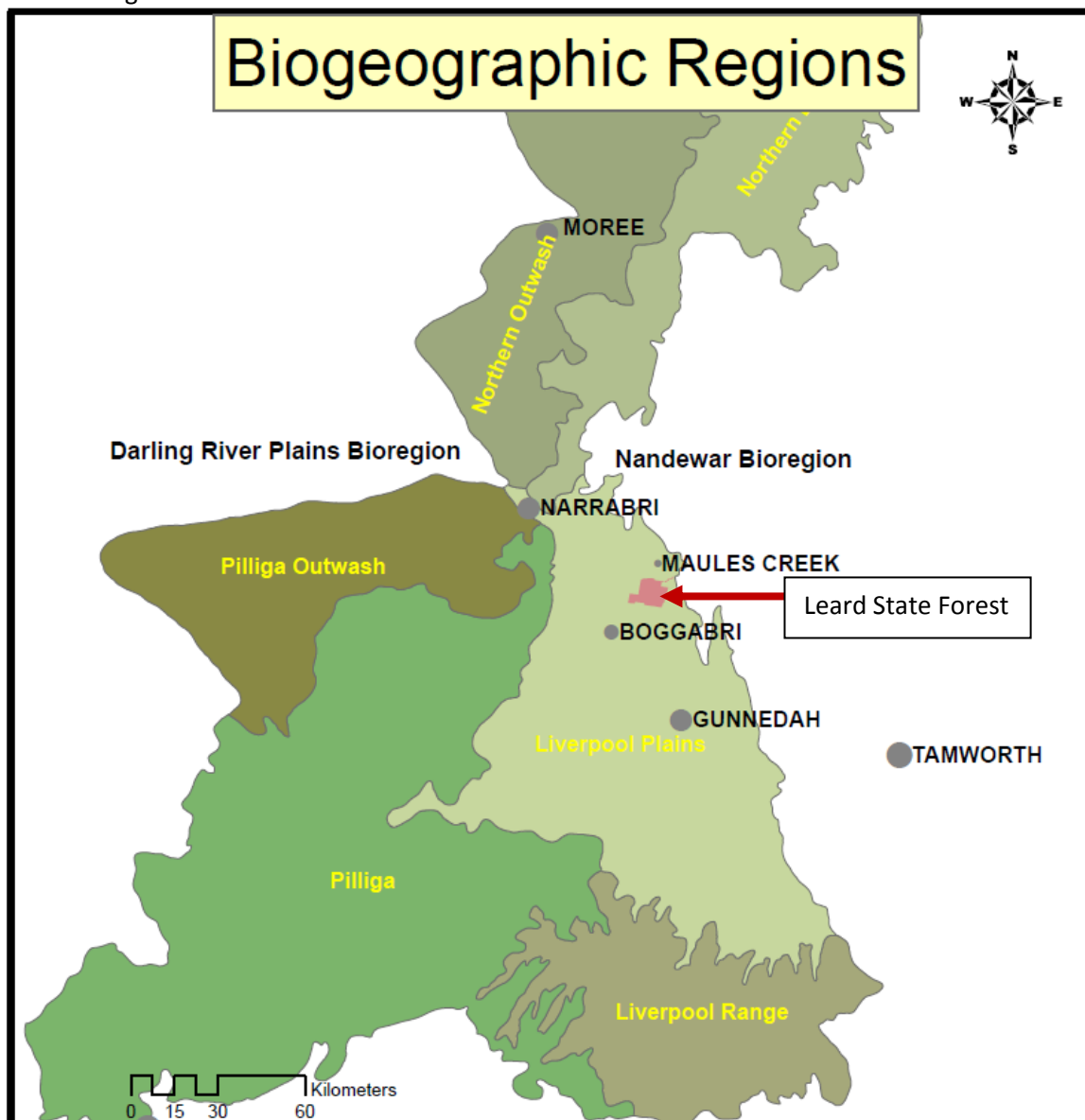


Figure 5-1 Biogeographic Regional Context, showing the Australian Government's Brigalow Belt South subregions Source: Department of Sustainability, Environment, Water Population and Communities, 2011

Despite its landform of undulating hills and its proximity to the forested lands of the Nandewar Range and Kaputar National Park, the State Forest is currently mapped as part of the Liverpool Plains subregion. As a result it is attributed particular conservation significance because of the extensive clearing of vegetation on the plains and the fragmented nature of vegetated remnants. This value has been highlighted in several detailed submissions to the exhibited proposal. While the proponent contests some of the comparative value assertions made about the site, its regional significance is acknowledged and a number of commitments have been made to minimise impacts and take specific actions to mitigate those that cannot be avoided.

Open cut mining, by its very nature will substantially alter the environment in and around the mine site, particularly the biodiversity and ecosystem values of the site. Some of these values and embodied ecosystem services are difficult to quantify. The Commission has carefully considered measures to identify them wherever possible and assess whether they can be mitigated as specific costs that might otherwise be externalised to be explicitly borne by the community and the environment.

5.2 Existing forest

The vegetation is significant in its own right, including critically endangered communities listed at both a state and national level. It includes individual plant species listed as nationally threatened or significant and/or threatened within NSW. The vegetation also provides habitat for nationally listed threatened and/or migratory species of native fauna as well as fauna species listed under NSW legislation.

The Leard State Forest is connected to the Leard State Conservation Area, via an adjoining area of (privately owned) remnant vegetation. And as a whole, the Leard State Forest, Conservation Area and privately owned land forms an 8,136 ha area of native forest (see Figure 5-2).

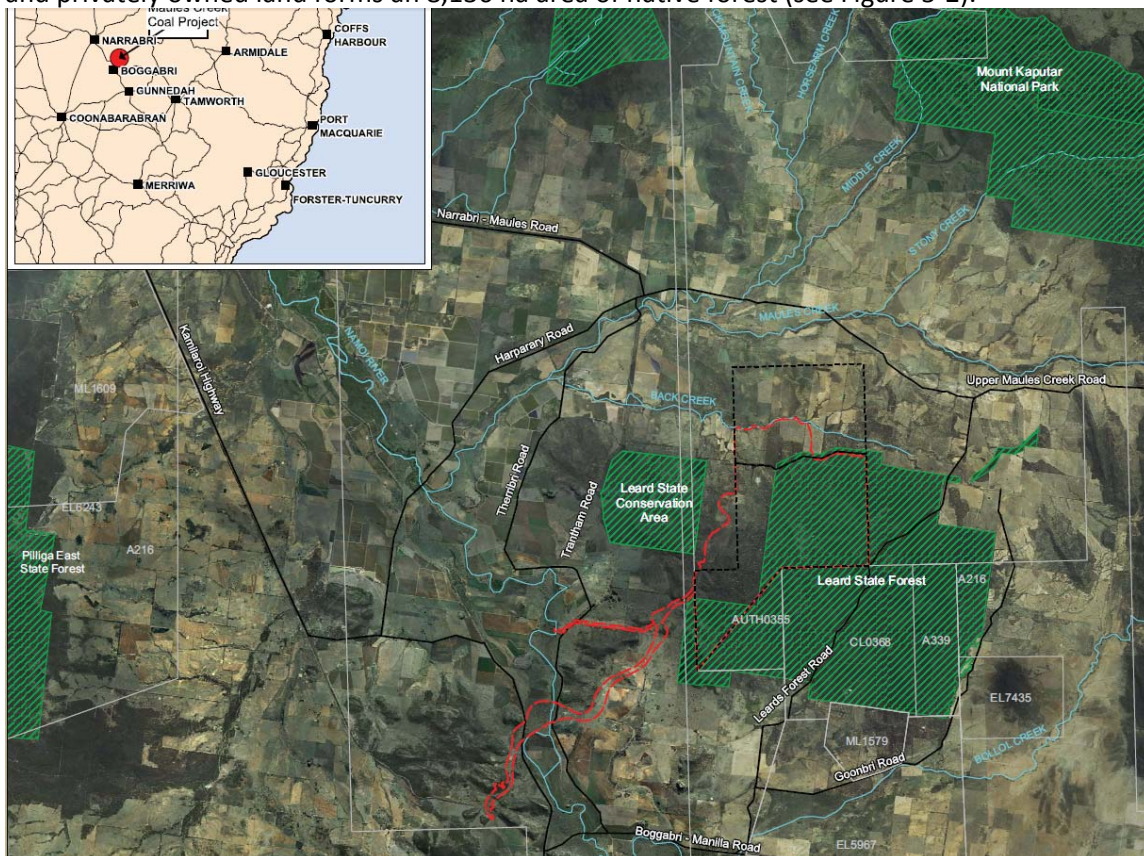


Figure 5-2 Leard State Forest and surrounding remnant vegetation

Source: Hansen Bailey, 2011b

The forest has also been identified as an important biodiversity corridor for the region and some submissions have gone as far as to suggest the forest is the 'lynch pin' of the Liverpool Plains.

5.3 Predicted biodiversity impacts

The project would involve the clearing of 1665 ha of native vegetation. One Endangered Ecological Community (EEC) is present within this area (as well as one outside the disturbance area). A total of 754 ha of EEC would be cleared as a result of the project. Twenty six threatened and/or migratory species have been identified on the site. Suitable habitat for other threatened species also occurs on the site so there is moderate to high likelihood of potential impacts on an additional 15 threatened or migratory species.

5.3.1 Endangered Ecological Communities

The most dominant EEC on site is the Critically Endangered White Box, Yellow Box, Blakely's Red Gum Woodland and Derived Native Grassland. Approximately 3,214 ha of this community occurs within the Leard State Forest. Over 944 ha of this ecological community occurs on the project site and the proponent has indicated that 544 ha would be cleared as a result of the mine (comprising 458 ha of woodland and 86 ha of grassland). The community is listed as critically endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and is also listed as an Endangered Ecological Community under the *NSW Threatened Species Conservation Act 1995* (TSC Act). The proponent's assessment concluded that the clearing of ~ 544 ha of this community in the Leard State Forest, would be significant under both the EPBC Act and the TSC Act.

A further 210 ha of native grassland to be cleared does not meet the EPBC Act criteria, but may meet the TSC Act criteria for this community. In the absence of further surveying to confirm whether this vegetation forms part of this community, the Commission has assumed this native grassland would be classed as an endangered ecological community under the TSC Act and consequently has considered the clearing of 754 ha of White Box Yellow Box Blakely's Red Gum Woodland.

One other endangered ecological community was identified on the site, but is not within the proposed disturbance area. Approximately 0.99 ha of the critically endangered 'Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland' community occurs on the project site, in the rail corridor. This community is listed under the EPBC Act and is also listed as an endangered ecological community under the NSW TSC Act (where it is described as the 'Native vegetation on cracking clay soils of the Liverpool Plains'). This area of grassland would remain in place and would not be directly impacted by the proposal.

5.3.2 Threatened and Migratory Species

Flora

No threatened plant species have been identified on the project site however, there is potential habitat for seven threatened plant species, three of which are known to occur in the surrounding forest. Suitable habitat for *Pomaderris queenslandica*, *Pultenaea setulose*, *Lepidium aschersonii*, *Bertya opponens*, *Swainsona recta*, *Dichanthium setosum* and *Digitaria porrecta* suggests these species have the potential to occur within the project site, however targeted surveys commissioned by the proponent have not found any individuals of these species (Hansen Bailey, 2011a).

Along with the potential impacts on listed threatened species, there is the potential for approximately 14 regionally significant plants to occur on site, although none have been identified within the project boundary (Hansen Bailey, 2011a).

Fauna

In relation to impacts on threatened fauna, 16 threatened birds, four listed migratory birds and six threatened bats have been identified within the forest, as listed in Table 5-1.

Table 5-1 Threatened and Migratory Fauna Species identified on site

	Family Name	Latin Name	Common Name	Listing status
Birds	Accipitridae	Hieraetus morphnoides	Little Eagle	Vulnerable
	Accipitridae	Circus assimilis	Spotted Harrier	Vulnerable
	Accipitridae	Lophoictinia isura	Square-tailed Kite	Vulnerable
	Apodidae	Apus pacificus	Fork-tailed Swift	Migratory
	Apodidae	Hirundapus caudacutus	White-throated Needletail	Migratory
	Ciconiidae	Ephippiorhynchus asiaticus	Black-necked Stork	Endangered
	Climacteridae	Climacteris picumnus	Brown Treecreeper	Vulnerable
	Dicruridae	Myiagra cyanoleuca	Satin Flycatcher	Migratory
	Estrildidae	Stagonopleura guttata	Diamond Firetail	Vulnerable
	Meliphagidae	Grantiella picta	Painted Honeyeater	Vulnerable
	Meliphagidae	Melithreptus gularis	Black-chinned Honeyeater	Vulnerable
	Meropidae	Merops ornatus	Rainbow Bee-eater	Migratory
	Neosittidae	Daphoenositta chrysoptera	Varied Sittella	Vulnerable
	Pardalotidae	Pyrrholaemus sagittatus	Speckled Warbler	Vulnerable
	Petroicidae	Melanodryas culullata	Hooded Robin	Vulnerable
	Mammals	Pomatostomidae	Pomatostomus temporalis temporalis	Grey-crowned Babbler
Psittacidae		Glossopsitta pusilla	Little Lorikeet	Vulnerable
Psittacidae		Neophema pulchella	Turquoise Parrot	Vulnerable
Strigidae		Ninox connivens	Barking Owl	Vulnerable
Tytonidea		Tyto novaehollandiae	Masked Owl	Vulnerable
Emballonuridae		Saccolaimus flaviventris	Yellow-bellied Sheath-tail Bat	Vulnerable
Vespertillionidae		Nyctophilus corbeni (or timoriensis)	Greater long-eared bat	Vulnerable
Vespertillionidae		Miniopterus schreibersii oceanensis	Eastern Bent-wing Bat	Vulnerable
Vespertillionidae		Vespadelus troungtoni	Eastern Cave Bat	Vulnerable
Vespertillionidae		Falsistrellus tasmaniensis	Eastern False Pipistrelle	Vulnerable
Vespertillionidae	Chalinolobus picatus	Little Pied Bat	Vulnerable	

Source: Hansen Bailey, 2011a

Although not observed during surveys, the proponent's assessment found there was a moderate or high likelihood that an additional 15 threatened and/or migratory fauna species occur within the project area. These were, *Crinia sloanei*, *Anthochaera phrygia*, *Haliaeetus leucogaster*, *Hamirostra melanosternon*, *Ardea alba*, *Ardea ibis*, *Calyptorhynchus banksii*, *Petroica phoenicea*, *Lathamus discolor*, *Chalinolobus dwyeri*, *Dasyurus maculatus*, *Petaurus norfolcensis*, *Phascolarctos cinereus*, *Anomalopus mackayi* and *Underwoodisaurus sphyrurus* (Hansen Bailey, 2011a). Three threatened fish species, *Maccullochella peelii peelii*, *Tandanus tandanus* and *Bidyanus bidyanus*, also have the potential to be impacted by the proposed extraction of water from the Namoi River (Hansen Bailey, 2011a).

The assessment concluded that the vegetation clearing involved would have a significant impact on threatened species of woodland and nectivorous birds as well as the Spotted Harrier, the Little Eagle, both the Masked and Barking Owl and certain Microchiropteran bats. The Commission notes that in undertaking the significance assessment, the proponent has assumed that the remainder of the Leard State Forest would be retained. The proponent also provided a separate estimate of the significance of the cumulative impacts from the additional clearing of Leard State Forest proposed for the Boggabri and Tarrawonga mining proposals. Estimates of the cumulative impact scenario confirm that the impacts on threatened species identified above would be greater, should each of these projects proceed, but also note that large areas of vegetation will still remain within the project boundary, as well as across the region (Hansen Bailey, 2011a).

5.3.3 Corridors, connectivity, fragmentation and edge effects

As acknowledged in the proponent's assessment, the patch size and connectivity of vegetation can affect the long-term viability of the ecosystem. In general terms larger and more intact patches are more diverse and more resilient. In particular, they are less susceptible to edge effects – for example from invasive weeds and pests; they are more likely to support a higher species richness; and also support larger populations of individual species, with greater genetic diversity and resilience to disease, natural disasters and human impacts. Larger and more connected patches are also more likely to be able to adapt to the impacts of climate change.

Conversely, clearing and fragmentation produces barrier effects and genetic isolation. These issues are currently the focus of National attention with the formulation of a National Wildlife Corridors Plan by the Australian Government (National Wildlife Corridors Plan Advisory Group, 2012).

Until recently, the Leard State Forest seems to have been reasonably intact and formed part of a larger forest remnant comprising the Leard State Conservation Area and a number of parcels of unreserved bushland. Although logging has previously occurred on a number of occasions, the flora and fauna surveys commissioned by the proponent suggest the area is still in reasonable condition. The Commission notes that since the commencement of mining on the Boggabri coal mine site in 2006 this situation is changing. As seen in the aerial photographs, a significant area of the forest has already been cleared to make way for the current mining activities.

It seems likely that the coal exploration activities have also impacted on the forest as, from the air, the Commission observed visible scarring of the north western portion of the forest (see Figure 5-3).



Figure 5-3 Leard State Forest from the air. The Boggabri Coal Mine is visible in the distance

Some of the areas the proponent proposes to set aside for conservation would assist to consolidate existing forest patches. There may be scope to improve the size and resilience of the patches, and minimise edge effects, if areas are carefully selected and restored. However the combined outcome, when both the Boggabri and Maules Creek conservation areas are considered, is to create a larger, but more exposed corridor. Regardless of the quality of the rehabilitation work that occurs on the conservation areas to be provided, the corridor is likely to need ongoing management as it will be exposed to significant edge effects. The proponent has not indicated how the ongoing management of conservation areas will be funded in the long term.

Notwithstanding this, on a regional scale, the proposed corridor has the potential to improve connectivity between current remnant forests and if secured under a sustainable management regime, may also provide some future capacity for species migration, in response to climate change.

5.3.4 Regional Woody vegetation cover

Objectors have raised concerns about the potential impacts on woody vegetation cover. Boggabri Coal and others have referenced the 30% woody vegetation cover figure as a meaningful threshold and the Boggabri Coal Project assessed the loss of remnant woody vegetation cover against the 30% threshold in a 1 km and 10 km radius around the site.

The proponent for this mine does not appear to have considered this issue in detail, nonetheless, the cumulative consideration provided in the Boggabri coal mine environmental assessment found that with other mining (both existing and proposed), the level of woody vegetation cover has the potential to fall below the 30% cover threshold when considered for the area up to 10 km from the forest. More detailed modelling indicates that as rehabilitation would be occurring throughout the life of the projects, this would compensate for the clearing – which would also occur on a progressive basis (Hansen Bailey, 2011c). However, objectors have pointed out that this does not appear to take account of any background rate of woody vegetation loss across the region. While there may also be some other localised additions to woody vegetation cover, the regional context is clearly important for forming a view on changes in the status of biodiversity values over time.

It appears that it is only possible to sustain a level of woody vegetation above the 30% threshold by including rehabilitation areas in the model, once they reach 10 years of age and are assumed to be viable stands, starting to function as sustainable ecological communities. These assumptions place particular onus on the proponents for both mines to ensure that rehabilitation is useful and sustainable habitat for the threatened species identified on the site.

5.3.5 Hollows and other habitat features

While the condition of the State Forest is variable as a result of previous forestry and mineral exploration activities, the proposal involves the destruction of some of the most valuable components of the vegetation including habitat for hollow-dwelling fauna species.

A range of habitat features are required to support the lifecycle of many fauna species. Hollow bearing trees are generally recognised as important breeding habitat for many birds, arboreal mammals and reptiles. Other features, such as fallen logs and debris, rocky outcrops, dense understoreys and nectar producing trees also provide important habitat for a variety of different species.

Rehabilitation will eventually restore some of these features, i.e. features such as tree hollows will eventually reoccur as trees mature. However other features, such as rocky outcrops and ephemeral drainage lines, would need to be deliberately reconstructed as part of the rehabilitation works.

Compensatory measures such as translocation of hollows and ground debris will need to be included in the rehabilitation works to be implemented, both on and offsite.

5.3.6 Impacts of mining on the biodiversity of adjoining areas

Dust emissions, noise, vibration, lighting and traffic from the mine are also likely to impact on the surrounding flora and fauna populations and their associated ecosystem assemblages.

These impacts will also extend onto neighbouring privately owned land, and measures to minimise these impacts are discussed in further detail in later sections of this report (section 6, 7 & 8). Nonetheless, the Commission acknowledges these impacts (even when minimised) will also have some detrimental effects on the surrounding forest and the ecosystems that it supports.

5.4 Management measures

The proponent has acknowledged the significance of the predicted biodiversity impacts (discussed above) and has committed to attempt to minimise them by:

- limiting the area of disturbance at any time;
- acquiring and securing areas of similar vegetation to be managed for biodiversity conservation; and
- accelerating and enhancing mine site rehabilitation so that rehabilitated areas might as quickly as possible provide habitat and movement corridors for some species.

The proponent proposes to undertake habitat management and/or restoration and corridor enhancement on a number of properties in the region. These properties have been categorised into 3 areas, the western offset area; the eastern offset area and the northern offset area.

Within these areas, 4,682 ha of the Critically Endangered White Box, Yellow Box, Blakely's Red Gum Woodland and Derived Native Grassland is proposed to be conserved (including 1,392 ha of derived native grassland) (Hansen Bailey, 2011b). This and other native vegetation occurring on these sites are likely to provide suitable habitat for many of the threatened species which have been identified on site.

Through the combined rehabilitation of offsite conservation lands and the onsite mine rehabilitation areas, the proponent argues that the project would eventually increase the amount of native vegetation in the region. The land has also been strategically selected in order to consolidate on existing areas of remnant forest, in the ranges (north east of the site), around the Leard State Conservation Area and adjoining the site itself see Figure 5-4.

The Office of Environment and Heritage's October 2011 submission expressed the view that the environmental assessment, in particular, the biodiversity offset strategy had insufficient detail and was likely to need additional protection and enhancement of existing remnant vegetation.

The proponent has since included additional information in the 'Response to Submissions' report with further details of impacts and conservation areas (see Table 5-2), although not to the same level as provided by the Boggabri coal mine. Of the 20 threatened or migratory bird species identified on the site, 9 threatened birds have been identified within the proposed biodiversity conservation lands (Hansen Bailey, 2011b). The proponent estimates that an additional 13 threatened or migratory birds are likely to occur in the proposed conservation areas.

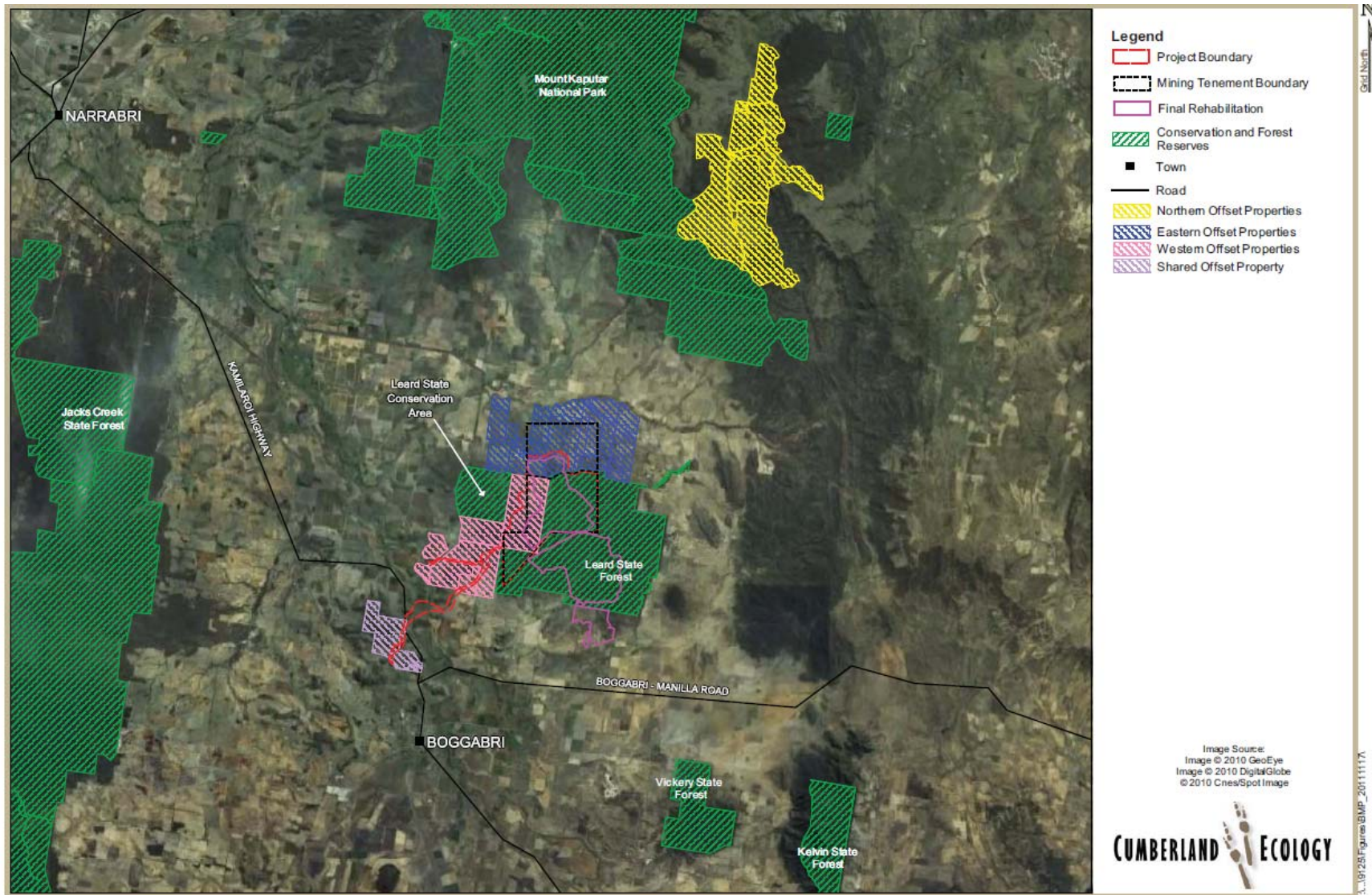


Figure 2.1. Location of Offset Properties with respect to the Project Location

Figure 5-4 – Proposed biodiversity conservation scheme

2,5 0 2,5 5 7,5 10 km

source: (Hansen Bailey, 2011b)

Table 5-2 summary of threatened biodiversity impacts and proposed offsets

Threatened Biodiversity	Area of direct Impact (ha)	Proposed vegetation offset (ha)
Box-Gum Woodlands	545	4682
Plains grassland	0	0
White-throated Needle-tail	2079	7218
Fork-tailed Swift	2079	7218
Black-necked Stork	0.5	<10
Square-tailed Kite	2079	7218
Spotted Harrier	2079	7218
Little Eagle	2079	7218
Grey-crowned Babbler	2079	7218
Speckled Warbler	1665	5310
Little Lorikeet	1665	5310
Swift Parrot	1665	5310
Turquoise Parrot	1665	5310
Barking Owl	1665	5310
Masked Owl	1665	5310
Rainbow Bee-eater	1665	5310
Brown Treecreeper	1665	5310
Black-chinned Honeyeater	1665	5310
Regent Honeyeater	1665	5310
Painted Honeyeater	1665	5310
White-browed Woodswallow	1665	5310
Satin Flycatcher	1665	5310
Hooded Robin	1665	5310
Diamond Firetail	1665	5310
Koala	1665	5310
Yellow-bellied Sheath-tail Bat	1665	5310
Little Pied Bat	1665	5310
Eastern False Pipistrelle	1665	5310
Eastern Bent-wing Bat	1665	5310
Greater long-eared Bat	1665	5310
Eastern Cave Bat	1665	5310
Scant Pomaderris	1665	5310

source: (Table 2.3 of Appendix E, Hansen Bailey, 2011b)

5.5 Commission's Consideration

Biodiversity issues at the regional scale

Submissions raised wide ranging issues on biodiversity, from concerns that some offset areas did not meet the criteria of 'like for like' biodiversity values, to broader and less tangible issues such as the valuation of ecosystem services. These considerations are complicated by the location of the Leard State Forest at a crossroads between subregions and bioregions. Some of these issues will only be resolved by some focused work at a regional scale to identify specific conservation objectives and actions to achieve them.

There are also ongoing concerns, both from government agencies and in the scientific community, about the quality and diversity of rehabilitation areas and the varying recolonisation abilities of different species (eg Ford, 2011). For example, woodland conservation modelling undertaken by Office of Environment and Heritage staff has shown that over a 30 year period, only shrub-dependent species, whose requirements could be rapidly grown, saw increases in suitable habitat in the landscape (Bedward et al., 2009). The habitat of the canopy-dependent species initially declined

and only began to increase towards the end of some simulations, while those dependent on old tree habitat declined (Bedward et al., 2009). In summarising available knowledge about the decline of woodland birds, Ford (2011) found that conserving remnant vegetation was a higher priority for declining woodland birds but that when replanting is undertaken, it is likely to provide improved functionality if clustered around existing remnants.

While the Commission acknowledges the revegetation of biodiversity conservation areas would eventually increase woody vegetation cover, the Commission is concerned about the short to medium term reduction in woody vegetation cover. As with the Boggabri Coal Project, the Commission considers that ongoing monitoring and audit of the rehabilitation areas will need to include routine analysis and public reporting to address this issue in a regional context.

The Commission notes that the configuration and functionality of regional woody vegetation cover in protecting biodiversity values is not well documented. The assumptions implicit in the proponent's assessment should be tested over time. The Commission considers that as part of its measures to minimise biodiversity impacts the proponent should be required to support adaptive management and documentation of the effectiveness of habitats secured and movement corridors provided, consistent with the requirements for the Boggabri Coal Project.

The task of acquiring and securing regionally significant areas of remnant vegetation to be managed primarily for biodiversity conservation is complicated by the scarcity of suitable areas where maintenance or improvement of biodiversity values is not threatened by nutrient enrichment and/or weed infestation as a legacy of past land use. Efforts are also constrained by the imperative of minimising impacts on productive pastoral and agricultural enterprises.

The consolidation of existing areas of remnant forest, both in the ranges adjoining the Mount Kaputar National Park and the area around the Leard State Conservation Area has merit. In the long term, the land might also improve the forest's resilience and ability to adapt to climate change. The transitional nature of this regional landscape, between the Brigalow Belt subregions to the north and south and between the contrasting bioregions of the Nandewar Ranges in the east and the Darling Riverine Plains in the west already ensures that it will remain biogeographically dynamic.

The Commission has carefully examined the regional scale biodiversity conservation measures proposed by the proponent and considers they have the potential to be expanded to address specific issues raised by the Office of Environment and Heritage (EPA, 2012) and ensure that the biodiversity values and functions are maintained or improved in the medium to long term. A key component of these measures will be the rehabilitation of partially degraded remnants, to replace the key biodiversity values and functions impacted during mining and secure these areas to be managed explicitly for biodiversity conservation in perpetuity. The most recent advice from the Office of Environment and Heritage (EPA, 2012) lists issues which in the agency's view remain outstanding. It is the Commission's view that these matters of detail will only be resolved through the process of formulating a sound Regional Biodiversity Strategy.

Regional Biodiversity Strategy

As already recommended in its review of the Boggabri coal mine, in order to ensure the long term success and security of the biodiversity conservation areas and corridors, a Regional Biodiversity Strategy will need to be devised and implemented. The strategy will need to set out the long term framework of management, monitoring and land use security to be applied consistently across all biodiversity conservation areas in the region. It should have the scope and flexibility to accommodate new areas, as they may need to be provided to respond to future mining proposals or other significant land use changes.

The Commission considers that the Department of Planning and Infrastructure would be best placed to ensure the timely completion of the strategy. The Office of Environment and Heritage, the Namoi Catchment Management Authority and Narrabri Shire Council should also be involved in the development and oversight of a regional strategy to ensure it aligns with the relevant Catchment Action Plan, statutory land use plans and related regional programs. The development of the strategy should be undertaken by a working party comprising independent experts and representation from all levels of government. This work would need to be funded by the mining companies, but should be commissioned and coordinated by the Department of Planning and Infrastructure.

The strategy should set out the mechanisms to be used to select, secure and fund the rehabilitation, management and monitoring of the biodiversity conservation areas both during mining and after the mines have ceased.

Biodiversity impacts

The Commission understands that the Office of Environment and Heritage has outstanding concerns regarding the level of impact assessment undertaken (EPA, 2012). The Commission is satisfied the potential biodiversity impacts have been broadly identified and has assumed the worst case scenario in relation to the level of impact on the endangered White Box Yellow Box Blakely's Red Gum Woodland community. The Commission considers that some additional compensatory measures will be required in order to ensure these worst case impacts can be appropriately managed. The Regional Biodiversity Management Strategy and the Biodiversity Management Plan, discussed below will be best placed to identify and enforce the implementation of these measures.

Biodiversity Management Plans

Within the framework provided by the regional biodiversity conservation strategy, each mine should be required to prepare its own biodiversity management plan covering the specific lands for which it is responsible, to demonstrate that each of the biodiversity functions and values it would impact on would be adequately restored/replaced and secured. In relation to the Maules Creek coal mine, the Commission considers that each of the biodiversity features and values discussed in the EA and Response to Submissions need to be cross checked against the proposed conservation areas, to demonstrate that they would provide adequate replacement and long term security of those biodiversity values and features at risk from mining operations. While some of the threatened species predicted to be impacted have been identified within the offset areas, the proponent will need to address this further, as well as the potential impacts on regionally significant plants and the 15 threatened and/or migratory species found to have a moderate to high likelihood of occurring onsite.

Barrier Coal Corridor

In its submission on the Boggabri coal mine proposal, the Office of Environment and Heritage noted the importance of any regional corridors maintaining a minimum width of 500 m. The Office of Environment and Heritage cited a number of studies which support the need for corridors of at least 500 m in order to ensure they are not dominated by edge effects and aggressive species that specialise in edge habitat. Wider corridors are also able to provide greater species diversity. While some studies and strategies have recommended regional corridors should have a minimum width of 1000 m, the Commission notes that the rehabilitation of the proposed mine sites will eventually provide for a much wider corridor. The Commission is satisfied that a 500 m wide corridor is appropriate and that as a consequence, both the Boggabri and Maules Creek coal mines would each need to set aside a 250 m wide exclusion zone along their common boundary.

The Commission notes that the proponent's plans indicate that 2 existing tracks (the Temporary Access Road (shown on the plans in pink) and the Northern Loop Road (shown in blue)) through the forest are proposed to be used for initial site access, while the mine access road is being constructed. The Commission does not support the use of the Temporary Access Road, as it runs through the recommended biodiversity corridor. Rather than intensifying other tracks through the forest the Commission considers that access should be restricted to the Northern Loop Road. The construction of the Mine Access Road should also be expedited.

As discussed in section 6.4, this barrier is also important from a groundwater perspective, in order to impede exchange of groundwater contained in the pit shell.

The Commission acknowledges that the companies may wish to mine this area in the future and considers that this would require very careful consideration in a separate application, rather than as a modification of any approval which may exist at the time. Should either or both mining companies seek to mine the barrier coal in the future, as a minimum, the Commission would expect the mining company would need to demonstrate that an alternative biodiversity corridor was available, of the same or better quality than the 500 m wide exclusion zone. This issue should be explicitly addressed in the Regional Biodiversity Strategy. In this regard the Commission notes both mines have committed to establishing an agreement regarding who would seek to mine the exclusion zone (also referred to as the 'barrier coal'), within 5 years. Consequently, the Commission recommends that the Regional Biodiversity Strategy should be reviewed after 5 years, as this could then respond to any additional knowledge about the long term plans for mining of the exclusion zone.

With these safeguards in place the Commission is satisfied that an improvement to the region's biodiversity, in the medium to long term can be achieved, despite the immediate impacts of the mines.

5.6 Recommendations

The Commission recommends that:

1. Regional Biodiversity Strategy

In view of the regional nature of the biodiversity issues raised by this proposal and the regional scale of the measures proposed to minimise adverse impacts, the Department of Planning and Infrastructure should commission a biodiversity working group to prepare a Regional Biodiversity Strategy. The group should comprise independent experts as well as representatives from all levels of government, including the Office of Environment and Heritage, the Office of Resources and Energy, the Namoi CMA and Narrabri Shire Council.

The proponent for this project and the mining companies seeking to mine other parts of the Leard State Forest should be required to pay for the preparation and implementation of the regional biodiversity conservation strategy, on a pro rata basis according to the proportion of land to be cleared by each company.

The strategy should:

- be prepared in consultation with the local community, the Aboriginal community, local landcare groups and the mining companies and operators;
- set out an appropriate framework for the strategic conservation of the biodiversity values and functions likely to be impacted by the mining of land within the Leard State Forest and surrounds;
- include options for strategic additions to the public reserve system;
- set out the measures to be used to secure areas of private land into the long term;

- set out the management regime for the conservation lands, including details of the funding mechanisms and management responsibilities to be implemented to ensure the ongoing maintenance of the land in the long term, including after the completion of mining.

The Regional Biodiversity Strategy should be completed to the satisfaction of the Director-General of the Department of Planning and Infrastructure, within 1 year of any new approval of mining within the Leard State Forest.

2. Mine Specific Biodiversity Management Plan

The proponent must also prepare a biodiversity management plan to cover the offsite areas to be rehabilitated and conserved, as well as the biodiversity on site (both remnant and rehabilitation areas). The Department's standard conditions relating to biodiversity management and rehabilitation, could be adapted to fulfil this purpose, but would need to also include:

- the Namoi Catchment Management Authority in the list of agencies to be consulted during the preparation of the plan;
- requirements to describe the measures to be implemented to ensure the connectivity and corridor function fulfilled by the exclusion zone corridor is maintained; and
- requirements to demonstrate consistency with the Regional Biodiversity Strategy and consider any findings and recommendations within the strategy.

The mine specific Biodiversity Management Plan would need to be in place before the mine commences exporting of coal from the site.

3. Barrier Coal Corridor

The proponent should be restricted from clearing any land (or establishing and/or intensifying any dams, roads or other infrastructure) within 250 m of the southern lease boundary, to ensure that a viable biodiversity corridor can be maintained through the vicinity of the Leard State Forest.

6 Dust, Noise, Blasting and Water impacts

As discussed earlier in this report, the region is currently undergoing a significant transition from an area predominantly focused on agricultural land uses, to a more diverse range of land uses associated with mining and agriculture. Growth in mining has the potential to generate significant regional impacts not only on biodiversity, but on other resources such as air quality and water. Without careful management, impacts on these resources could threaten the stability of the existing agricultural sector and the local community.

The Commission is mindful of the relatively short term nature of the mining industry and the need to maintain the agricultural sector within the region's economy. In this regard, the Commission notes that best practice mining techniques and technologies, coupled with strong programs for community consultation and reporting will be essential for the preservation of agriculture in areas influenced by mining. The Commission has examined these issues in detail in its consideration of the potential impacts of mining and in framing its recommendations for regional strategies to manage these issues.

The terms of reference request that the Commission assess the potential cumulative dust, noise, blasting and water impacts of the project. The Commission's consideration of each of these issues is set out below. Detailed discussion on the importance of establishing an effective and independently chaired Community Consultative Committee (CCC) is provided in section 8.6 - Community and Stakeholder Consultation.

6.1 Dust

Open cut mining by its nature involves numerous dust generating activities and has the potential to generate considerable particulate air pollution. The impact of dust on the environment is generally assessed by two broad parameters:

- suspended particle concentrations, expressed as total suspended particulates (TSP) or particulate matter smaller than 10 micrometres (PM₁₀) or smaller than 2.5 micrometres (PM_{2.5}); and
- deposited particulate matter or 'dust fall', expressed as a deposition rate in terms of grams per square metre per month (g/m²/month).

6.1.1 Current Goals and Standards

The particulate matter standards that apply in NSW are set out in Table 6-1.

Table 6-1 Particulate Matter Emissions Criteria

Pollutant	Standard or Goal	
	24 hours	Annual mean
Total suspended particulate matter (TSP)		90 µg/m ^{3b}
PM ₁₀	50 µg/m ^{3a b}	30 µg/m ^{3b}
PM _{2.5}	25 µg/m ^{3c}	8 µg/m ^{3c}

Notes:

a National Environmental Protection Council (NEPC) standard (exceedences allowable - 5 days a year)

b NSW EPA impact assessment criteria

c National Environmental Protection Council (NEPC) advisory reporting standard

These standards are derived from two sources:

- the National Environment Protection Council (NEPC), which sets national air quality standards for environmental pollutants; and
- the NSW Environment Protection Authority which also specifies other relevant air quality assessment criteria.

At the time of writing, regulation of PM_{2.5} levels only exist as an advisory reporting standard, yet to be formally adopted at either a state or national level. Nonetheless, the 24 hour advisory level of 25 µg/m³ is consistent with World Health Organisation guidelines and the Commission considers that the project should be considered and monitored against this PM_{2.5} goal.

Dust deposition rates must also be assessed under the EPA air quality assessment criteria and are specified in Table 6-2, below.

Table 6-2 Deposited dust criteria

Pollutant	Maximum increase in deposited dust levels	Maximum total deposited dust level
Deposited dust	2 g/m ² /month	4 g/m ² /month

6.1.2 Predicted impacts

Estimates of the dust emissions have been calculated by the proponent's consultants at four different stages of the mine's proposed operations. These estimates are for year 1, 5, 10 and 21. The Environmental Assessment then combined this with estimates of emissions from the existing operations of the Boggabri and Tarrawonga mines, to predict cumulative impacts on surrounding privately owned land (those properties not owned by mining companies). Emissions from other, non mining, sources (such as dust generated by local traffic on unsealed roads) has been assumed to be included in the background air quality levels for the area.

The modelling found that various air quality criteria would be exceeded at a number of residential receivers, as a result of the proposed mining. The predicted exceedances are described against each of the criteria, below.

Annual Average PM₁₀ Levels

The modelled outcomes indicate that cumulative dust levels would exceed the annual average PM₁₀ criteria of 30 µg/m³ at three residential receivers over the course of the mine's operations. All other receivers are predicted to remain below the 30 µg/m³ criteria during all stages modelled (i.e. year 1, 10, 15 and 21). The exceedences during year 10 are predicted to be worst and occur at all three residences. The project's contribution and the cumulative annual average PM₁₀ levels modelled, for the most affected privately owned residences, are presented in Table 6-3 below.

Table 6-3 Predicted annual average PM₁₀ emissions

Receiver	Project only (µg/m ³)				Project and other sources (µg/m ³)			
	Yr 5	Yr 10	Yr 15	Yr 21	Yr 5	Yr 10	Yr 15	Yr 21
118a	13	17	14	15	27	31	29	30
118b	17	21	16	18	32	35	32	33
126	15	21	17	19	30	36	32	35

(source: Hanson Bailey, 2011a)

Maximum 24 hour PM₁₀ Levels

The model also indicated that emissions from the project may exceed the maximum allowable 24 hour PM₁₀ levels at seven nearby residential receivers during various stages of the mines operations. Table 6-4 below shows the maximum 24 hour average PM₁₀ concentrations predicted by the model

during years 5, 10, 15 and 21, at properties where impacts were highest. Predictions for all other private receivers were within the accepted criteria ($50 \mu\text{g}/\text{m}^3$).

Table 6-4 Predicted Maximum 24 hour average PM₁₀ concentrations

Receiver	Project only ($\mu\text{g}/\text{m}^3$)				Project and other sources ($\mu\text{g}/\text{m}^3$)
	Year 5	Year 10	Year 15	Year 21	Not modelled
108a	44	51	43	46	
108b	42	49	41	45	
111a	50	60	44	52	
116	41	52	37	41	
118a	54	69	59	58	
118b	68	80	62	70	
122	36	55	35	44	
126	70	97	58	77	

(source: Hanson Bailey, 2011a)

The National Environmental Protection Council (NEPC) standard for 24 hour average PM₁₀ concentrations allows exceedences on up to five days a year. Consequently, for the seven properties where exceedences are predicted, the proponent's consultant calculated the number of days that emissions from the project would exceed the criteria ($50 \mu\text{g}/\text{m}^3$). Emissions from the project are expected to exceed $50 \mu\text{g}/\text{m}^3$ at residential properties on up to 18 days a year, under worst predicted scenario (year 10) as shown in Table 6-5.

Table 6-5 Predicted number of days PM₁₀ criteria would be exceeded by the mine

Receiver	Number of days the projects PM ₁₀ emissions are likely to exceed $50 \mu\text{g}/\text{m}^3$			
	Year 5	Year 10	Year 15	Year 21
108a		1		
111a		3		1
116		1		
118a	1	7	1	3
118b	6	18	2	12
122		1		
126	1	18	2	7

(source: Hanson Bailey, 2011a)

Cumulative maximum 24 hour average PM₁₀ concentrations were unable to be modelled or assessed using standard practices due to a lack of suitable background monitoring data (Hansen Bailey, 2011a). Instead the proponent's consultants calculated the probability of the cumulative emissions exceeding $50 \mu\text{g}/\text{m}^3$ criteria under various scenarios. These calculations suggest that there is a small chance the criteria could be exceeded at all 15 residential receivers considered by the proponent (Hansen Bailey, 2011a). The probability of exceeding at most residential receivers is less than 5%, however probabilities for receiver 126 (closest to the mine) and 281a (representative of residences south of the Boggabri Mine) would reach 8% and 60% respectively.

Other dust parameters

Total Suspended Particulate levels and dust deposition levels were predicted to remain within the relevant criteria during all of the stages modelled. Detailed PM_{2.5} levels were not provided in the Environmental Assessment for the project; however contour lines suggest that when considered on its own, the project would not exceed the guideline levels at any residence.

Model Limitations

The Commission notes that the 'cumulative' levels predicted do not include potential emissions from other proposed and potential mining in the area including:

- the proposed extensions to the Tarrawonga mine; and
- the potential for mining of the Goonbri Coal exploration lease area (to the east of the site).

However, the Environmental Assessment does briefly consider the potential for interactions with the Tarrawonga and Goonbri proposals. This study concluded that additional cumulative impacts from the Goonbri and Tarrawonga proposals are predicted to be minor at the residential areas that are predicted to be most affected by the Maules Creek Coal Project (Hansen Bailey, 2011a).

The Office of Environment and Heritage raised some concerns about the assumptions used to model these cumulative impacts. Consequently, as with any modelling, the Office of Environment and Heritage highlights that the findings and predictions made should be used with caution.

6.1.3 Commission's Consideration

Given the limited assessment provided in relation to cumulative impacts, the Commission considers it is likely the predictions made understate the potential dust levels, should each of the potential mining proposals in the area proceed.

More detailed modelling of the potential cumulative impacts would be ideal, however the Commission acknowledges that mining proposals for the area will continue to evolve. By the time any further modelling was undertaken, further changes may have occurred.

The Office of Environment and Heritage (OEH) has considered both the Boggabri and Maules Creek proposals in detail and has recommended conditions of approval that would require both project specific and regional air quality management plans, as well as a Reactive Particulate Management Strategy. The Commission agrees with this approach.

In carefully considering the potential dust impacts from the project, the Commission notes that the project has the potential to exceed health based criteria for exposure to particulates at neighbouring properties including both privately owned properties and properties which have been purchased by various mining companies in the area. Proponents have sometimes argued that predicted exceedences of the PM₁₀ health criteria that are caused by the mine on fewer than 5 days a year, are acceptable. However, the Commission considers that the exceedences allowed in the NEPC standards should be considered as exceptions to provide for uncontrollable events such as dust storms or bushfires, beyond the control of the mines.

The Commission considers that any exceedence of the 24 hour 50 µg/m³ PM₁₀ or 25 µg/m³ PM_{2.5} standards, caused by the mine or any combination of mining and other factors would be unacceptable. The Commission also expects that by combining real-time monitoring with sophisticated, predictive, reactive and collaborative management and shut down procedures for all the mines in the region, dust impacts from mining could be minimized and exceedences as a result of mining could be avoided. The Commission understands that the Office of Environment and Heritage and the mining companies with proposals in the Leard State Forest and surrounds are actively working to achieve this goal. The Commission agrees there is a need for a regional strategy to address cumulative impacts.

The Commission notes that this region can sometimes experience particularly dry conditions and understands the proposed overburden dump has the potential to become a significant dust source during extreme weather conditions, if not suitably managed. In this regard the Commission

considers it will be important to ensure that every effort is made to provide for the successful and early establishment of the vegetation on the overburden dump (as well as other rehabilitation areas, as they become available). In circumstances where permanent rehabilitation cannot be undertaken, dust control measures should include requirements to provide temporary vegetation cover.

Dust emissions from coal trains

Submissions on the project also raised concerns about dust emissions generated from the uncovered coal trains travelling between the site and the Newcastle coal terminal. The submissions noted that when trucks are used to transport coal, they are generally required to cover their loads. It was suggested that this requirement should be extended to trains as well.

Work undertaken for QR National found that the coal rail system can be a source of coal dust emissions (Connell Hatch, 2008). Sources of emissions include the coal surface in the loaded wagons, coal leakage from wagon doors and residual coal in unloaded wagons (Connell Hatch, 2008). While coal trains are generally not thought to be a major source of dust, the Connell Hatch (2008) study found that:

“Although atypical, observations and photographs taken by the study team and others show that visible dust is emitted by some trains and this dust has been observed to travel beyond the rail corridor. Such occurrences suggest that coal dust emissions are not under control in certain circumstances”.

In relation to the suggestion that coal wagons should be covered. The Commission understands that this is undertaken in some areas of North America, but that this is to protect the coal from the impacts of weather events such as snowfall, rather than for the purposes of dust management. Examples of wagon covers are shown in Figure 6-1.

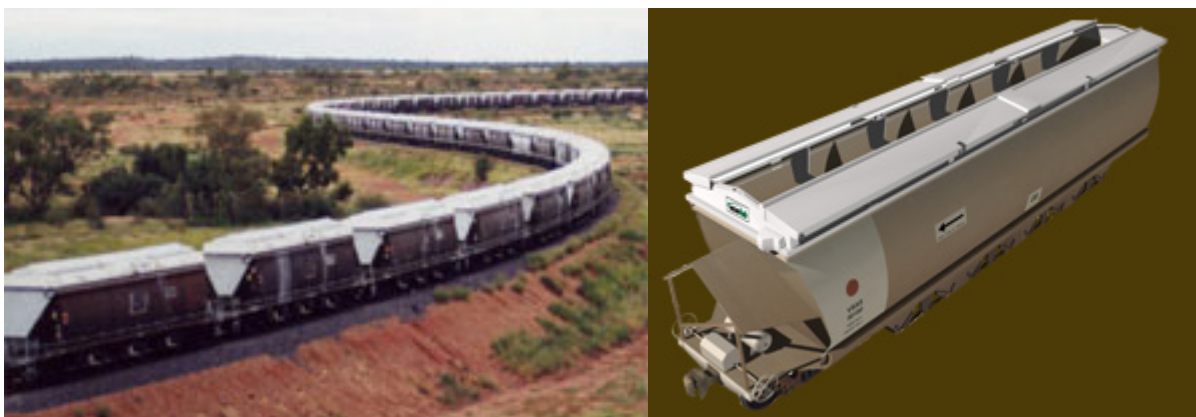


Figure 6-1 –train wagon cover examples

Source: Ecofab (<http://www.ecofab.com/index.html>)

The Connell Hatch study (2008) found that while wagon lids would be likely to substantially reduce coal dust emissions, the potential operational impacts and costs were unknown. The Commission agrees that the introduction of wagon lids or covers would impact on operations and equipment requirements at both the mine site and the coal terminal. Nonetheless, the Commission notes that:

- covers are already used for the rail haulage of some minerals in Australia;
- covers have the potential to reduce aerodynamic drag; and
- there are ongoing plans for expansion and/or duplication of the Newcastle Coal Terminal facilities, which could be designed to accept covered coal wagons.

While it may not be reasonable to require coal wagons to be covered in this instance, the Commission considers that this option should be further explored, with the view to determining

whether any new or expanded coal terminal should be required to have the capacity to accept covered coal wagons.

In the interim, Connell Hatch (2008) found that a combination of coal surface veneering, load profiling and improved train loading and unloading techniques provided a practical and cost effective way to reduce coal dust emissions from open rail wagons. The Commission considers requirements to implement measures to minimise rail coal dust should be included in any approval conditions.

6.1.4 Recommendations

The Commission recommends that:

1. Dust Control Measures

All measures for control of air pollution should deliver air quality outcomes that are equal to or better than the air quality outcomes identified in the EA and that correspond to best practice and the application of best available technology. This must include best practice coal loading and profiling, to minimise dust emissions from coal transportation.

2. Compliance with the air quality standards

The cumulative dust levels from the mine and any other sources must not exceed the national and state air quality standards at any occupied residential property, regardless of land tenure.

The proponent must ensure that the project does not contribute to any exceedence of the PM_{2.5} goal, and any PM_{2.5} criteria (when this is finalised nationally and/or at a State level) at any occupied residential property, regardless of land tenure.

In the event that any air quality standards are exceeded, the mine should be required to immediately shut down (where dust levels cannot be brought into compliance), or scale back activities on site (if this is sufficient to quickly bring dust levels down to within the criteria). Proactive management will be required to achieve compliance in variable weather conditions.

3. Regional Strategy and Project Specific Air Quality Management Plan

In order to prevent exceedence of the air quality standards, the proponent, in collaboration with the Tarrawonga and Boggabri mines (and any other mines to operate in the area) should develop and implement both a regional strategy and a project specific Air Quality Management Plan to ensure air quality standard (and goals) are achieved. The strategy and/or management plan should include:

- A shared environmental monitoring network and data sharing protocol between the proponent and the neighbouring mines, setting out the systems and processes to be implemented to ensure all mining operations are managed to achieve appropriate air quality standards.
- Monitoring and management arrangements that provide for:
 - A predictive, reactive and collaborative management system, using state-of-the-art technology to ensure the mine avoids, reduces and/or ceases activities as required.
 - Comprehensive, real time monitoring for TSP, PM₁₀, PM_{2.5} and deposition, both locally and regionally; and
 - Apportionment of emissions from the proponent's operations using a combination of dual synchronized monitors and meteorological instruments, supplemented by elemental or chemical methods of source apportionment, as appropriate.
- Commitments to provide summary reports and specific briefings on issues arising from the monitoring at the Community Consultative Committee meetings.

- Provisions to ensure there are ongoing improvements to the management systems, reporting provided and response mechanisms implemented, to maintain best practice over time.

4. Online communication of onsite activities and monitoring

A risk/response matrix should be developed to clearly codify mine operational responses to varying levels of risk resulting from weather conditions and specific mining activities in sensitive locations. The risk/response matrix and real time monitoring data should be made available online and include:

- timely publication of monitoring data in a clearly understandable form;
- identification of mine operational responses to monitoring data and weather forecasts; and
- provision for online input/response by members of the community and real time engagement with regionally based regulatory compliance staff.

6.2 Noise

Open cut mining and its associated activities use many different types of moving machinery and equipment with the potential to generate significant environmental noise.

For most noise sources encountered in open cut mining, proven techniques have been developed for mitigation of noise impacts. In general noise from fixed-position machinery can be mitigated by measures, such as noise barriers, sound attenuators and silencers. The noise generation capacity of equipment used is well characterized for application in noise modelling. For moving equipment some mitigation of noise can be achieved by design of the engine exhaust systems and alarms. However, most mitigation for moving equipment relies on providing sound-absorbing barriers and optimizing vehicle movement. In the case of rail movement and loading, the design of track and rolling stock is important, as well as ensuring locomotives have low noise ratings and are appropriately operated.

Noise impacts are readily monitored by noise measurement instruments used according to established protocols and as defined in regulations and industry standards (such as the Industrial Noise Policy and Australian Standards).

Regulatory requirements

The NSW regulatory authority for environmental noise, the EPA, has established guidelines for noise assessment, the Industrial Noise Policy and the Environmental Criteria for Road Traffic Noise, all of which apply to this project. The Environmental Criteria for Road Traffic Noise was recently replaced by the NSW Road Noise Policy, however the transitional provisions in place mean that the Environmental Criteria for Road Traffic Noise still apply to the assessment of this project. There are two objectives in environmental noise control:

- Protection of amenity noise levels suitable to specific land uses, and
- Protection against intrusive noise.

In any situation the more stringent of the requirements or goals must be met.

An assessment in accordance with the guidelines involves identification of nearby residential dwellings (and any other sensitive receptors), assessing the existing ambient noise levels, setting noise goals from the EPA guidelines, establishing noise emission levels for all equipment and operations in the project and modelling the predicted noise levels to assess compliance with the noise goals at the receptors under all weather conditions. Where compliance proves difficult, appropriate ameliorative measures must be designed to reduce the noise levels to meet the goals.

Modelling must take account of local meteorology and topography. Noise predictions are made for daytime, evening and night (including night time sleep disturbance).

6.2.1 Noise Goals

Noise monitoring data from both 1986 and 2010 indicates that background noise levels in the area are generally low at all nearby properties. Consequently the lowest noise goals have been adopted for all sensitive receivers, as shown in Table 6-6. Standard road and rail traffic noise goals have also been adopted as shown in Table 6-7 below.

Table 6-6 Operational Noise Goals

	Day 7 am – 6 pm	Evening 6 pm – 10 pm	Night 10 pm – 7 am	Sleep Disturbance 10 pm – 7 am
Adopted Noise Criteria	35 L _{Aeq} 15 min	35 L _{Aeq} 15 min	35 L _{Aeq} 15 min	45 L _{A1} , 1 min

Table 6-7 Road and Rail Traffic Noise Goals

	Road Traffic Noise Goals		Rail Traffic Noise Goals (<i>currently under review</i>)			
	Day 7 am – 10 pm	Night 10 pm – 7 am	Day 7 am – 10 pm		Night 10 pm – 7 am	
Adopted Noise Criteria	55 L _{Aeq} 1 hour	50 L _{Aeq} 1 hour	65 L _{Aeq} 15hour	85 L _{Amax}	60 L _{Aeq} 9hour	85 L _{Amax}

Note: Rail Noise goals are currently under review, with draft requirements now requiring assessment against trigger levels : L_{Aeq,15hr} 60 dB(A), L_{Aeq,9hr} 55 dB(A), and L_{Amax} (95th percentile) 80 dB(A) (NSW Office of Environment and Heritage, 2012)

6.2.2 Predicted Impacts

A number of nearby properties, including residences, would experience noise impacts from the mine during both construction and operations and also from traffic and rail movements.

Construction

The construction works required to establish the mine site would likely occur during the first year and would generate additional noise that would need to be considered. This would include noise from machinery required for site establishment, construction of the coal processing plant and other infrastructure such as the water pipeline and pumping stations and the private rail spur and rail loading facilities. Impacts from infrastructure works such as construction of the pipeline from the Namoi River and the road upgrades would have relatively short term impacts beyond the general area of affectation.

Construction noise levels are predicted to exceed 55 dBA at residential receivers 264 and 259 and would exceed 50 dBA at residential receivers 256 and 61. The proponent has indicated that noise at receiver 264 would primarily be associated with the road maintenance activities on Therribri Road. Given the location of the noise contours in around the other heavily impacted properties, the Commission assumes most of this noise would be associated with the construction of the rail spur. Residence 126 is also predicted to receive noise levels over 45 dBA, presumably mainly from construction activities occurring on site. Impacts from construction of the water pipeline would be less intense, with noise levels of approximately 40dBA at the nearest residential receiver.

Construction activities are predicted to generate high levels of noise for at least five residential receivers in the area, as well as some properties owned by Boggabri Coal. The proponent has not

indicated how long these works would take, but acknowledges that some short term construction noise impacts may be unavoidable.

Operations

Modelling undertaken by the proponent’s consultants indicates that, over the life of the mine, the project would produce noise levels in excess of the projects operational noise goals on 26 properties surrounding the mine site (only those lots where exceedences would occur on at least 25% of the lot where included). Four residential properties near the mine would be heavily affected, with noise levels in excess of 40 dBA during the evening or night and possible sleep disturbance impacts. Up to 9 residential receivers are predicted to be impacted by noise levels over the 35 dBA noise goal (see Table 6-8). The proponent’s assessment considered the use of additional engineering controls to minimise noise and found that this would generally reduce noise levels by 1dBA, as compared to the proposed scenario (where some controls are proposed).The proponent has indicated it would not pursue these additional control measures, given they are only predicted to make very small improvements to the noise levels. The Commission understands that the proponent has agreements with the owners of some of the properties predicted to be impacted and that other negotiations are also progressing.

Table 6-8 Maximum predicted noise impact at nearby residences

Residence #	Maximum Predicted Noise Level (dBA)	Years where exceedences are predicted	Cumulative Noise Level (LAeq, 9hr Night), where available
61	43.1	All years modelled	42.9
108	39.1	All years modelled	NA
118*	44	All years modelled	NA
120*	39.1	All years modelled	40.5
126*	48.4	All years modelled	NA
134*	35.8	5, 10	NA
236*	35.9	1, 5, 10, 15	NA
256	40.1	All years modelled	NA
259	39.1	All years modelled	NA

NA = Not Available * = proponent has indicated it has an agreement with property owner Source: Hansen Bailey, 2011a

Modelled noise levels were found to be highest at most residential receiver locations during sample year 5. Mining activities would be focused in the north western part of the site and around the overburden dump during the early years and as mining moves to the south east, noise levels at most residential receivers would gradually diminish. Nonetheless noise levels are still predicted to exceed the criteria at a number of residential receivers during the year 21 scenario.

Some of the properties to the south west of the mine have the potential to experience cumulative impacts receiving noise from both the Boggabri and Maules Creek mining operations. The proponent has briefly considered this issue and indicated that no additional residences would be affected.

Road and Rail Traffic Noise

Most workers and delivery trucks would access the site via Therribri Road, although there may occasionally be some traffic on Harparay Road. Up to two truck, four bus and 40 car movements per hour are predicted on Therribri Road, with resulting noise impacts of 48 LAeq, 1 hour at the two residential properties closest to the road (Hansen Bailey, 2011a). These levels are within the applicable road traffic noise goals for both the day and the night. Traffic on Harparay Road is expected to be minimal.

Coal is proposed to be transported from the site by rail. As part of this proposal the proponent is seeking to construct and operate a private rail spur from the coal processing plant to the main line (approximately 15 km away). The proponent is seeking to share part of this rail spur with the Boggabri coal mine (which also intends to transition to a rail system), but would build its own line, if this shared option was not possible.

The proponent has estimated that, at full production, an average of five trains would be needed each day to transport the coal from the site, using 72 wagons per train (Hansen Bailey, 2011a). This would result in an average of 10 train movements each day. It may be possible to use 96 wagon trains in the future and this would reduce the number of train movements to 8 per day. Noise from trains using the private rail spur were included in the mine's operational noise levels. The proponent has proposed a number of train noise mitigation measures it would implement along the private rail spur, such as continuously welded (rather than jointed) rails.

Once the trains move off the private rail spur and onto the existing rail lines noise levels must be considered against the rail traffic noise goals, which are currently under review (see the rail traffic noise goals in Table 6-7). The proponent has predicted that the additional rail traffic would increase noise levels (LAeq, 24hr,) by 1.3 dBA, reaching 60.9 dBA, but noting that on a busy day, increases of 2.3 dBA would be possible (Hansen Bailey, 2011a). This exceeds the draft rail noise assessment trigger levels and draft project related increase guidelines which require increases of more than 2 dBA to be strongly justified (NSW Office of Environment and Heritage, 2012).

6.2.3 Commission's Comments

The Commission agrees that some short term construction noise impacts are unavoidable. Nonetheless, without a clear schedule of works, and resulting noise levels, it is not possible to determine whether these impacts would be appropriately minimised.

The Commission recommends that construction noise management plans should be prepared. The plans must demonstrate how the proponent would optimise the scheduling and timing of the various construction works, and must be prepared in consultation with nearby residents to ensure construction noise impacts are minimised and managed both in terms of the intensity of the noise impact and the duration of the impact. The Commission recommends that the preferences of the local residents (in terms of construction hours, etc) should be documented and accommodated wherever possible.

While the Commission understands the proponent has agreements with some of the owners of properties likely to be most heavily affected there are still a number of privately owned properties which are expected to be affected by significant noise exceedences, even after construction is completed.

The Commission acknowledges that train movements on the proposed spur line will represent a significant additional noise source to be included as part of this project and recommends that any approval should include requirements to ensure the rolling stock used to transport the coal is selected to minimise noise. There should also be scope to require management measures such as noise bunding, should further work on the detailed plans indicate that noise levels are likely to be excessive.

Cumulative noise impacts have the potential to exceed the predictions, should all the surrounding mining proposals proceed. In this regard the Commission understands that real time noise monitoring, along with cumulative management protocols are currently proposed. The Commission considers that this issue will need to be carefully managed and has recommended requirements for a regional noise strategy to be prepared setting out the systems and processes to be implemented

to ensure all mining operations are managed to achieve appropriate noise levels. The Commission considers that real time monitoring and management, in conjunction with the timely reporting of these results should ensure that noise levels are managed transparently.

In relation to rail noise, the Commission recommends that any approval should include requirements to ensure the loading and movement of trains (both on and offsite) is scheduled and/or restricted to minimise sleep disturbance impacts for residents along the entire rail corridor. The Commission's earlier recommendation regarding the selection of rolling stock, will also assist to minimise rail noise offsite.

6.2.4 Recommendations

In summary the Commission recommends:

1. Noise Control Measures

All equipment and noise control measures should deliver noise levels that are equal to or better than the levels identified in the EA and that correspond to best practice and the application of best available technology. All equipment must be selected to minimise noise and must include state of the art noise attenuation or suppression.

2. Compliance with the Industrial Noise Policy

The noise levels from the mine must not exceed the noise levels prescribed under the Industrial Noise Policy, ie 35 L_{Aeq} 15 min and 45 L_{A1} 1 min, at any privately owned residential receiver, unless the proponent has the written agreement of the owner of the property.

The cumulative noise levels from the mine and any other sources must not exceed the amenity criteria at any privately owned residential property.

3. Measures to Minimise Transport Noise

The rolling stock used to transport the coal should be selected to minimise noise.

The loading and movement of trains (both on and offsite) should be scheduled and/or restricted to minimise sleep disturbance impacts for residents along the entire rail corridor.

4. Regional Strategy and Project Specific Noise Management Plan

In order to prevent exceedence of the noise criteria the proponent, in collaboration with the Boggabri and Tarrawonga mines (and any other mines to operate in the area), should develop and implement both a regional strategy and a project specific Noise Management Plan to ensure that both the project specific noise levels and a satisfactory amenity are achieved on neighbouring properties. The strategy and/or management plan should include:

- A shared environmental monitoring network and data sharing protocol between the proponent and the neighbouring mines, setting out the systems and processes to be implemented to ensure all mining operations are managed to achieve appropriate noise criteria.
- Monitoring and management arrangements that provide for:
 - A predictive, reactive and collaborative management system, using state-of-the-art technology to ensure the mine avoids excessive noise, reducing and/or ceasing activities as required.
 - Comprehensive, real time monitoring of noise and weather conditions, including real time monitoring of inversion effects.
- Commitments to provide summary reports and specific briefings on issues arising from the monitoring at the Community Consultative Committee meetings.

- Provisions to ensure there are ongoing improvements to the management systems, reporting provided and response mechanisms implemented, to maintain best practice over time.

5. Online communication of onsite activities and monitoring

A risk/response matrix should be developed to clearly codify mine operational responses to varying levels of risk resulting from weather conditions and specific mining activities in sensitive locations. The risk/response matrix and real time monitoring data should be made available online and include:

- timely publication of monitoring data in a clearly understandable form;
- identification of mine operational responses to monitoring data and weather forecasts; and
- provision for online input/response by members of the community.

6. Construction Noise Management Plans

The Commission recommends that construction noise management plans must:

- be prepared in consultation with nearby residents and document the preferences of the local residents (in terms of construction hours, etc);
- ensure construction noise impacts are minimised and managed both in terms of the intensity of the noise impact and the duration of the impact;
- set out the scheduling and timing of the various construction works and demonstrate how the proposed scheduling would minimise impacts and how local resident’s preferences would be accommodated.

6.3 Blasting

Regular explosive blasting would occur throughout the mining operations. Up to 160 blast events would be carried out each year, i.e. 3-4 blast events per week (Hansen Bailey, 2011a). Blasting is generally assessed in relation to amenity and structural impacts from ground vibration and airblast overpressure. Blasting also has the potential to generate safety risks for people or infrastructure in the vicinity of the blast. Blasting can also sometimes produce emissions of nitrogen dioxide (NO₂), nitric oxide (NO) and carbon monoxide (CO) (QLD DEEDI, 2011).

6.3.1 Ground Vibration and Airblast Overpressure

Ground vibration and airblast produced by blasting falls into two categories—

- a) those causing human discomfort; and
- b) those with the potential for causing damage to structures, architectural elements and services. (AS 2187.2-2006)

Blast criteria for amenity and structural impacts are prescribed in the Australian Standards (AS 2187.2-2006) and in the ANZEC "Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration" (ANZEC, 1990). The relevant criteria are presented in Table 6-9 below.

Table 6-9 Blast Criteria

<i>Blast Impact</i>	<i>Amenity Criteria</i>	<i>Structural Damage Criteria</i>
Airblast Overpressure	115 dB for 95% of blasts in any year 120 dB for 100% of blasts	133 dB
Ground Vibration	5 mm/second for 95% of blasts in any year 10 mm/second for 100% of blasts	10 mm/sec

Sourced from: (see over page)

The Australian Standard (AS 2187.2-2006) for the use of explosives specifies that:

The area surrounding the blast site should be inspected and assessed to determine appropriate means of minimizing environmental impacts. Regulatory limits may apply. In conducting the risk management, foreseeable factors should be considered, including, but not limited to the following:

- a) *Distances to buildings, structures, and other environmental effects.*
NOTE: See Appendix J for guidance.
- b) *Identification of monitoring requirements and the requirement for monitoring locations, systems and instruments.*
- c) *Ground vibration and airblast overpressure.*
NOTE: See Appendix J for information and guidance on the environmental effects of ground vibration and airblast overpressure.
- d) *Effects of various weather patterns and wind directions.*
- e) *Effects of dust, fume, sediment run-off, noise.*

The proponent's consultants have calculated the ground vibration levels likely to occur during the proposed mining activities. These calculations found that ground vibration levels are not expected to exceed 2.8 mm/second at the closest residences (Hansen and Bailey 2011a), and consequently would be well within the 5 mm/second criterion.

Airblast Overpressures were calculated to reach 108 dBL at the nearest privately owned residential property during a well confined bench blast (Hansen Bailey, 2011a). Most residents are further away and are predicted to experience levels of below 102 dBL (Hansen Bailey, 2011a). However there is potential for the criteria to be exceeded at the three nearest residential receivers, during throw blasting (Hansen Bailey, 2011a).

The Commission expects that with careful management, selection of blasting methods and reduction of the Maximum Instantaneous Charge, where necessary, blasting could be managed to ensure airblast overpressure levels remained below the amenity criteria of 115 dB.

The Commission notes that there is the potential for the cumulative impacts of the existing and proposed mining operations in the area to result in blasting events occurring every day. Alternatively, although unlikely, it is possible that blasts at two or more mines may occur simultaneously, increasing the vibration and airblast overpressures experienced in the area around the mine.

Conditions on mining operations generally require a Blast Management Plan, including a protocol to minimize cumulative blasting. In addition to this, the Commission considers that in order to minimize annoyance from blasting, all active mining operations in the area should be required to consult with the local community to determine the preferred blasting protocol. For example the community may prefer that all mines conduct blasting on the same day, in order to minimize the number of days they are disturbed by blasting. Equally it may be preferable to spread blasting across all days, in order to reduce the impact of disruptions on any one day. The Commission also notes that the community's preferences may change over time. The Commission believes that, wherever possible, the mining operators should be required to accommodate the prevailing preference of the local community.

While the proponent has identified a number of heritage structures in the area, the closest of these structures is over 2 km from the mine and is predicted to receive vibration levels of 4.4 mm/s and 111dBA, well below the criteria for structural damage.

6.3.2 Surface Blasting Gas Emissions and other Safety Risks

Under ideal conditions explosive reactions do not produce NO_x emissions, however conditions encountered during mine blasting are never ideal (QLD DEEDI, 2011). Blasting produces a sudden localised release of gases with potentially high concentrations of oxides of nitrogen (AEISG Inc, 2011). These gas emissions generally dissipate quickly resulting in air quality impacts being short lived and limited to the immediate area of the mine site. The emissions constitute a small proportion of Australia's total NO_x emissions (electricity generation and motor vehicles are Australia's highest sources of oxides of nitrogen (National Pollution Inventory, 2010)). Nonetheless, in some circumstances blast gas emissions can take some time to disperse and, at high concentrations, have the potential to impact on human health (AEISG Inc, 2011).

There are a number of mitigation or control measures that can be implemented to minimize NO_x emissions. Both the Australian Explosives Industry and Safety Group Inc *Code of Practice – Prevention and Management of Blast Generated NO_x Gases in Surface Blasting*, as well as the *Queensland Guidance Note QGN 20 – Management of oxides of nitrogen in open cut blasting* include guidance on blast management practices. These guidelines cover a range of management areas, including blast preparation practices; exclusion and management zones; and monitoring, reporting and investigation procedures.

Blasting can also generate other more obvious safety risks for people and infrastructure that might be in close proximity to the blast area, such as flying debris.

The Leard State Forest surrounding the mine is currently publicly accessible and public access will need to be progressively restricted as mining operations move through the forest. Otherwise, the mine is relatively distant from privately owned and occupied property.

6.3.3 Commission's Consideration

The Commission is satisfied that with appropriate management plans and practices in place, blasting on the site can be managed within the amenity criteria for both ground vibration and airblast overpressure. The Commission is also satisfied that gas emissions and other safety risks can be minimized and managed through the adoption of appropriate operating procedures and a Blast Management Plan.

Mining operations at the neighbouring Boggabri coal mine are presently covered by 8 conditions relating to blasting, ranging from blast limits, to management plans and requirements for repairing any damage to property.

The Commission is satisfied that, with some minor adjustments, these standard conditions could be applied to the Maules Creek coal mine.

6.3.4 Recommendations

The Commission recommends that standard conditions relating to blasting should be adapted to cover this proposal.

The Commission also recommends that the Blast Management Plan should:

- be prepared in consultation with the local community; and
- include measures to ensure that:
 - there are consistent blasting protocols for all mining operations in the area; and

- blasting is coordinated to minimize disruptions to the community.

As with the recommendations for dust and noise a Regional Blasting Management Strategy may also be appropriate.

6.4 Water

A number of submitters raised concerns that the project was being considered ahead of the findings and recommendations of the Namoi Catchment Water Study, which was initiated by the NSW Government and commenced in 2010. Phase 1 and 2 reports are publicly available, but the Commission understands the final outcomes of the study are not expected till later in 2012.

The Commission notes that the study and its associated models are not currently available and are not considered vital to the Commission's consideration of the water impacts of the mine. The Commission engaged Dr Colin Mackie to provide expert assistance in reviewing the potential groundwater impacts of the project. The Commission considers Dr Mackie's expert advice on the cumulative impacts of the Boggabri and Maules Creek mines is both specifically relevant and adequate to inform its deliberations.

6.4.1 Surface Water

Surface water is an important resource that contributes to the ecological functions of creek systems and the livelihoods of rural landholders within the catchment. The mine is mainly within the catchment of Back Creek an ephemeral stream which flows into Maules Creek, a tributary of the Namoi River. Some small gully catchments on the southern side of the ranges are also within the project boundary (along the rail and pipeline routes) and drain directly to the Namoi River floodplain (Hansen Bailey, 2011a). The mine has the potential to impact on both the quantity of water delivered to the catchment as well as the quality of this water resource. The mine would also extract water from the Namoi River under a high security water licence.

The volume and quality of surface water entering the catchment is expected to change as a result of the proposed mining operations. For example rain that falls within the project site would be classed as clean, dirty, mine or contaminated water, depending on whether it has been exposed to areas of disturbance and the potential for it to have become contaminated. Water in each of these classes would be treated differently, for example, where possible clean water would be diverted around the disturbance area and then discharged to natural drainage lines.

Water that falls in the pit and on the coal stockpiles would be classed as mine water and would be captured on site. Groundwater that leaks into the pit would also be classed as mine water. Mine water is predicted to contain relatively high levels of suspended solids (Hansen Bailey, 2011a). The water management system would aim to use mine and contaminated water on site, for dust suppression and in the washery, however during periods of high rainfall, there is the potential for the mine and contaminated water supplies to exceed the mines water requirements. Surplus mine and contaminated water would be stored in the Mine Water Dam in the first instance, and then diverted to the mine pit (if the Mine Water Dam reaches its operating capacity). The proponent has indicated that mine and contaminated water would cease to be diverted to the Mine Water Dam once it reached its operating capacity (890 ML) and that there would be no uncontrolled release from the Mine Water Dam (Hansen Bailey, 2011a).

Dirty water includes runoff from overburden dumps and haul roads and may contain high levels of suspended solids. This water would be captured in sediment dams to allow suspended solids to settle. The water would then be released offsite, or reused on site, depending on the quality of the water and the needs of the mine.

The quantity of water to be managed through each of the four classes would vary over time, depending on the stage of mining and its associated water needs, the quantity of rainfall received and the quantity of groundwater intercepted in the mine pit. Modelling of the mine's water balance, in mine years 1, 5, 10, 15 and 21, indicates that in very wet years it may be possible to obtain all water required for mine operations from local runoff and groundwater inflows, however the mine would typically require at least 1,000 ML of make up water, to be extracted from the Namoi River (Hansen Bailey, 2011a). The maximum simulated offsite water demand was 2,730 ML, which is less than the proponent's existing high security water licence volume (3,000 ML) (Hansen Bailey, 2011a).

Under the high rainfall scenario modelled the Mine Water Dam would be full about 7% of the time (or for a total of 1.5 years of the 21 year life of the mine (Hansen Bailey, 2011a). Over 600 ML of water would be stored in the pit, about 5% of the time (Hansen Bailey, 2011a). Unlike the Boggabri coal mine proposal, where excess contaminated water would be disposed of by irrigation, the proponent has not described any contingency measures, but notes that wet conditions have the potential to affect coal production (Hansen Bailey, 2011a).

The mine will inevitably reduce the runoff volumes flowing into Back Creek. The proponent has estimated that the mine would result in reductions to the Back Creek catchment of between a 9% and 25% during the various mine stages modelled (Hansen Bailey, 2011a). As proposed, the final void would have a catchment of 887 ha, representing a permanent 14% reduction in the Back Creek catchment (Hansen Bailey, 2011a). Rain falling in this catchment (along with groundwater inflows) would slowly fill the void, forming a lake and permanent water sink. As discussed in the following section on groundwater, the mine's impacts on groundwater would also impact on baseflows in drainage systems in the area, particularly Back Creek. Baseflow losses to surface drainage systems attributed to the mine are predicted to be in the order of 18.5 ML a year and are consistent with expected outcomes (Mackie, 2012).

Flooding

The proposed site runs parallel to Back Creek and has some potential to impact on the flood conditions. The proponent has indicated that the proposed area of disturbance is outside the 100 year ARI flood event and consequently the project would not have adverse impacts on flood levels or flood behaviour along Back Creek for events up to the 100 ARI event (Hansen Bailey, 2011a).

The proponent also proposes to construct road and rail access, which have the potential to impact on flood conditions on the Namoi River floodplain. Details of the rail spur have not been finalised as the proponent is seeking to connect to Boggabri Coal's proposed rail spur, before crossing the River, but would construct its own river crossing, should the companies fail to reach an agreement (Hansen Bailey, 2011a). Details of the potential alternative rail spur and river crossing have not been provided, however the proponent has indicated that both the road and rail access to the site (as well as the extraction pipeline) would be designed to ensure no adverse impact on local catchment drainage and Namoi River flooding (Hansen Bailey, 2011a).

Commission's Consideration

The Commission has reviewed the predicted water balance and proposed water management system. The Commission notes that the modelling currently provided only considers historical rainfall patterns. The Commission notes that the final water balance and water management systems, strategies and contingencies for the site would need to cater for extreme weather events which may exceed those in the historical records used in the proponent's modelling. Notwithstanding this, the Commission is satisfied that adequate water management systems could be put in place to ensure that the mine and contaminated water streams are appropriately

contained on site and that the clean and dirty water streams are treated to an appropriate standard before being released into Back Creek.

Should high rainfall events cause the Mine Water Dam to reach its operating capacity, the proponent will need to have adequate provision to store excess water in the mine pit. The Commission notes that although unlikely, there is a small chance that rainfall could cause the Mine Water Dam to spill into the Back Creek catchment. The Commission considers there would need to be adequate contingencies in place to ensure that water was pumped out of the Mine Water Dam, back to the Mine Pit, should the dam have the potential to spill.

The water management system will also need to be appropriately designed and managed to ensure the pit can accommodate this water storage function without impacting on the mine's ability to continue operations and associated employment. The Commission has recommended this requirement should be incorporated into any conditions of approval, along with a condition to prohibit mine and contaminated water from being discharged from the site.

In relation to the impacts of extracting water from the Namoi River, the Commission understands the proponent currently has a water licence for this extraction, but recommends that the proponent should be required to minimise water extraction as far as possible.

Standard conditions for mining projects require that, if necessary, the applicant is to adjust the scale of mining operations to match the available water supply. The Commission agrees with this approach and acknowledges that, although unlikely, the mine may need to scale back activities on site during dry periods, in order to minimise its water requirements.

The Commission acknowledges that the mine will reduce flows in Back Creek, both through groundwater depressurisation and reductions to the creek's catchment, during mining and in the long term. The final void proposed to be retained would result in permanent losses to Back Creek and is not supported by the Commission. The Commission considers that the final landform should be designed to be free draining to Back Creek, avoiding the generation of a pit lake and its associated impacts on water movement.

Standard conditions also require a comprehensive water management plan to be prepared and implemented. The plan covers water management, including water storage, and offsite discharges. The conditions also require the mine to provide compensatory water in the event that a landowner's water supply is adversely affected by the mine. The Commission is satisfied that these contemporary requirements could be adjusted to adequately manage the mine's impacts on surface water.

The Commission is satisfied that flooding impacts can be adequately minimised and managed through appropriate conditions, but considers that given the limited assessment and detail regarding any proposed duplicate river crossing, the proponent should not be allowed to pursue this option at this stage. The Commission considers that multiple rail bridges across the Namoi River should be avoided if at all possible. Any proposal to pursue the rail crossing further would need to be further justified and supported with detailed plans and assessment.

In summary, as described and recommended in the following section on groundwater, the Commission considers that the final landform should not be allowed to generate a pit (void) lake and that emplaced soils must have the capacity to drain to the natural catchment.

Recommendations

Aside from recommendations about the final landform, made in section 6.4.2 below, the Commission recommends that:

- The proponent should be prohibited from discharging mine and contaminated water off site and should be required to ensure there is capacity to accommodate surplus mine and contaminated water in the mine pit, without impacting on operational and employment commitments, including during extreme weather events;
- The proponent should not be allowed to pursue the alternative rail bridge over the Namoi River, unless further justification and detailed plans and assessment have been provided and appropriately assessed by the Department of Planning and Infrastructure;
- The proponent should be required to ensure that the project does not impact on the flood plain or flood dynamics along Back Creek; and that in other respects,
- Standard conditions relating to water should be adapted to cover the current proposal.

6.4.2 Groundwater

The Commission engaged Dr Colin Mackie to provide specialist advice on the groundwater impacts of the proposal. The Commission has carefully considered Dr Mackie's advice, provided in full in Appendix C.

In summary Dr Mackie's advice indicates that the groundwater issues are generally localised and unlikely to have wider regional implications. Groundwater losses attributed to the mine, are predicted to be around 146.5 ML a year, comprising 128 ML leakage or recharge loss from the alluvial aquifers and 18.5 ML as baseflow losses to the surface drainage systems and Dr Mackie has advised this is consistent with expected outcomes. The impact zone at completion of mining is predicted to extend up to 7 km from the pit shell and is likely to affect 27 boreholes (Mackie, 2012). The majority of these bores are owned by mining companies and 15 are used for groundwater monitoring purposes for either the Boggabri or Tarrawonga mines. No irrigation bores that draw water from the alluvial lands are reported to be present within the zone of influence (Mackie, 2012).

As proposed the mine's final rehabilitated landform includes a final void. Two options have been considered for the management of the void, either leaving the void open to form a pit lake, or backfilling and reshaping the void to an elevation of RL 310 m (1 to 3 m above the predicted groundwater recovery level).

Option 1 would form a pit lake, with water levels reaching equilibrium in about 1,000 years. The lake is predicted to form a permanent groundwater sink with water migrating to the pit and then evaporating, eventually in a balanced manner. The lake would gradually become saline, with salinity levels predicted to start relatively low but eventually increasing to over 15,000 uS/cm.

The backfilling proposed under option 2 would ensure that water levels would reach equilibrium faster, taking approximately 300 years to reach equilibrium 1-3 m below the final landform surface. However Dr Mackie (2012) advises that if evapotranspirative losses were underestimated, ground saturation would lead to surface salt scalding or salinisation of a shallow pit lake in the backfilled void.

Dr Mackie (2012) suggests that the option 2 design could be modified to promote discharge to a spill point. The quality of the water discharged would be relatively benign, with salinity levels of less than 250 uS/cm. Consequently Dr Mackie encourages this approach.

In relation to geochemistry, the majority of the overburden and interburden were found to have a negligible risk of acid generation and a high factor of safety (Mackie, 2012). Most reject materials are

also expected to have a high factor of safety, however some seams exhibit potential for acid formation and are also more likely to generate saline leachate. As these materials would be placed deep within the pit shell, they are reported as unlikely to represent a risk to the regional shallow groundwater systems (Mackie, 2012).

Dr Mackie has made a number of recommendations in relation to the analysis, modelling and emplacement of interburden and reject materials to minimise acid and sulphate species generation and migration. The Commission agrees with Dr Mackie's recommendations and has adopted them in this review.

Cumulative impacts associated with the adjoining Maules Creek coal mine proposal were examined by Dr Mackie and in this regard he has recommended:

Any coal barrier between the pit shell and any future surrounding mining operations must remain intact in order to impede exchange of any contained groundwaters in the Maules Creek pit shell.(Mackie, 2012).

The Commission supports this recommendation which is also consistent with the Commission's recommendations on the biodiversity corridor, as well as its recommendations for the Boggabri coal mine. The importance of the barrier between the Boggabri and Maules Creek coal mines is clear. The Commission considers that any future plan to mine the barrier coal would require very careful consideration in a separate application rather than being contemplated as a modification of any approval which may exist at the time.

Finally, the need for early consideration of the mine closure plan covering final landscape, drainage patterns and long term water quality protection is highlighted. It will be particularly important to ensure emplaced spoils have the capacity to drain to the natural catchment avoiding the generation of a lake within the pit, as also found in the Commission's consideration of surface water issues.

The Commission is satisfied Dr Mackie has considered the potential groundwater impacts of the project in detail.

Recommendations

The Commission agrees with Dr Mackie's advice and recommends that conditions of approval require:

1. The proposed 17 additional monitoring bores be equipped with water level or pore pressure monitoring transducers installed at vertical separations such that the future impacts of strata depressurisation can be adequately measured and mapped;
2. Core tests to be conducted to assess the distribution and variability of hydraulic conductivities of (unfractured) interburden at a sufficient number of bore locations to quantify porous groundwater flow and storage contributions associated with interburden;
3. XRD-XRF analyses to be undertaken on core samples obtained at a sufficient number of bore locations to establish the mineralogy of interburden likely to be exposed to pit re-saturation;
4. Hydrochemical modelling to be undertaken in order to determine the long term void water quality. This study should include batch reaction (full saturation) trials on waste interburden (spoils) to confirm hydrochemical modelling outcomes;
5. That reject materials or any potentially acid forming interburden materials must not be emplaced outside the pit shell or at elevations within the pit shell that are likely to promote acid or sulphate species generation and migration of such leachate beyond the pit shell at any future time;

6. That any coal barrier between the pit shell and any future surrounding mining operations must remain intact in order to impede exchange of any contained groundwaters in the Maules Creek pit shell;
7. A mine closure plan to be prepared prior to mining year 14 (at least 7 years before closure). An important part of this plan will be that it must address future stability of the proposed landform, long term groundwater recovery and void water quality characteristics to the satisfaction of the Director General. In particular the long term landform should not generate a pit (void) lake or salt scalding. Emplaced spoils should have a capacity to drain to the natural catchment and drained waters must not adversely impact upon the downstream environment. The hydrochemistry, hydrogeology and hydrology components of the mine closure plan must be subject to independent review and verification.

7 Merits of the Mine Plan

The Commission engaged Emeritus Professor Jim Galvin to provide expert advice on the merits of the proposed mine plan. As well as addressing the Minister's terms of reference relating to the mine plan, the Commission particularly requested E/Prof Galvin consider the underground versus open cut mining issue raised in submissions. The Commission has carefully considered E/Prof Galvin's advice on these issues, provided in full in Appendix D.

Underground or open cut mining

In relation to the issue of whether underground mining would be more appropriate for the site, E/Prof Galvin has provided detailed consideration of this option. Based on this advice the Commission understands that:

- At best underground mining would only extract coal from four of the 15 coal seams.
- Only 60% of the coal in those four seams would be extracted.
- The underground mining option would have a net present value of ~ \$0.4 billion, compared to \$5.7 billion for the open cut mining option.

E/Prof Galvin (2012) concludes that ultimately decision making reduces to a comparative consideration of environmental and economic impacts. In terms of economic and financial risk, the benefits of surface mining considerably outweigh those of underground mining (Galvin, 2012).

The safety and financial risks associated with underground mining on site have also been highlighted by the proponent. The Commission does not consider there are sufficient grounds to require the proponent to further consider the underground mining option for the currently proposed mining area.

Mine Plan

As requested, E/Prof Galvin has reviewed the mine plan and proposed overburden emplacement areas as well as the final void and landform. E/Prof Galvin advises that the mine layout is generally appropriate (and indicates that the mine layout has the flexibility to accommodate any necessary modifications to safeguard environmental values, through the environmental and mining operational management plans). The overburden emplacement area was also considered adequate, subject to the recommendations made previously relating to groundwater. E/Prof Galvin also found that from a technical perspective the final void could be appropriately designed and managed to satisfy public safety, landform and aesthetic requirements.

Commission's Findings

Subject to conditions requiring appropriate design and rehabilitation of the final landform, already recommended in previous sections, the Commission found the mine plan to be adequate and does not have any further recommendations in regards to the Mine Plan.

8 Other potentially significant impacts

As well as the issues specifically mentioned in the Minister's terms of reference (discussed above), the Minister also requested the Commission assess any other potentially significant impacts of the project. The Commission briefly considers some of the other impacts raised in submissions below.

8.1 Aboriginal Cultural Heritage

The proponent's environmental assessment includes an Aboriginal archaeological and cultural heritage impact assessment of project site as well as copies of the responses received from the Aboriginal stakeholder consultation conducted. As part of the assessment, the project site was surveyed to identify artefacts and sites within the project area and the scientific value of those finds was then considered. On the other hand, as with consultation undertaken for the Boggabri coal mine, although perhaps less unanimously, the submissions provided through the Aboriginal stakeholder consultation emphasise the significance of the broader forest and the landscape settings as links to Aboriginal culture and history.

Sixteen Aboriginal stakeholder groups provided an expression of interest and were involved in the study surveys and the draft assessment report. A total of 103 Aboriginal archaeological sites have been identified on the project site, including artefact scatters, isolated finds, scarred trees and grinding groove sites. The project is predicted to impact on 35 of these sites including six found to have a high scientific value (Hansen Bailey, 2011a).

The majority of sites in the project boundary were considered to be of low or moderate scientific significance. Two sites of high significance (an artefact scatter and a scarred tree) occur in the proposed area of the mine pit and four others (a grindstone, a grinding groove and two artefact scatters) are within the footprint of the rail spur (Hansen Bailey, 2011a). However, significant artefacts along Back Creek would be avoided, through the creation of a buffer from this area of the watercourse (Hansen Bailey, 2011a).

Six scarred trees have been identified within the vicinity of the water pipeline route and were found to have high significance (Hansen Bailey, 2011a). These trees would need to be appropriately protected, to ensure they are avoided during the installation of the pipeline.

The rail spur corridor also contains a number of sites outside of the direct disturbance zone, including a scarred tree of high scientific significance (Hansen Bailey, 2011a). These sites outside the rail footprint, but within close proximity to the disturbance area, would need to be suitably protected during construction works.

The proponent proposes that 35 sites are to be salvaged, collected and/or removed and stored in a keeping place, or at the Australian Museum, with salvage excavation to occur at three of these sites (Hansen Bailey, 2011a). Other sites within close proximity to the disturbance areas would be fenced to ensure the areas are avoided during works (Hansen Bailey, 2011a).

The submissions provided in the Aboriginal stakeholder consultation process are opposed to the destruction of sites that are of cultural significance to the Aboriginal community. A number of submissions identify the need for artefacts and scarred trees to be salvaged, further analysed and then appropriately stored.

In relation to the management of salvaged artefacts, the Commission notes the mine should be required to prepare and implement a Heritage Management Plan in consultation with the Office of

Environment and Heritage and relevant Aboriginal stakeholders, including a strategy for the storage of heritage items salvaged. The Office of Environment and Heritage has also provided comments on relevant requirements and considerations for establishing a keeping place for salvaged items. The Commission agrees that detailed plans for an appropriate keeping place will need to be prepared in consultation with the Aboriginal community.

Some of the submissions provided in the Aboriginal stakeholder consultation process raise concerns that much of the significance of the artefacts lies in landscape and that the landscape context is lost through the salvage process. Several submissions expressed general concerns about open cut mining.

A separate submission made through the Department’s consultation process raises a number of concerns about impacts on Aboriginal cultural heritage. The submission raises concerns with the level of survey effort undertaken; the level of background research on significant historical events such as a potential massacre in the area; and the proposed salvage of artefacts and the resulting loss of context and significance (rather than avoidance of the significant objects such as scarred trees and grinding stones). The uncertainties surrounding how salvaged artefacts would be managed and the need for them to be stored in a funded keeping place that allows for appropriate access, presentation, interpretation, maintenance and research of the objects were also highlighted in the submission.

The Commission acknowledges the concerns raised in these submissions and agrees the management of salvaged artefacts will need to be carefully considered and that these details have not yet been resolved.

As noted in the Commission’s report on the Boggabri coal mine, the *Brigalow and Nandewar Community Conservation Area Agreement*, established four dedicated management zones. “Zone 2 is reserved as Aboriginal Area under the *National Parks and Wildlife Act 1974* for the purposes of conservation and Aboriginal culture” (Minister for Climate Change and the Environment and Minister for Primary Industries, 2009, page 5). As shown in Figure 8-1, three areas have been reserved as zone 2 – for conservation and Aboriginal culture. The Commission notes the Leard State Forest and Conservation Area were not mapped as Aboriginal Areas through this process.

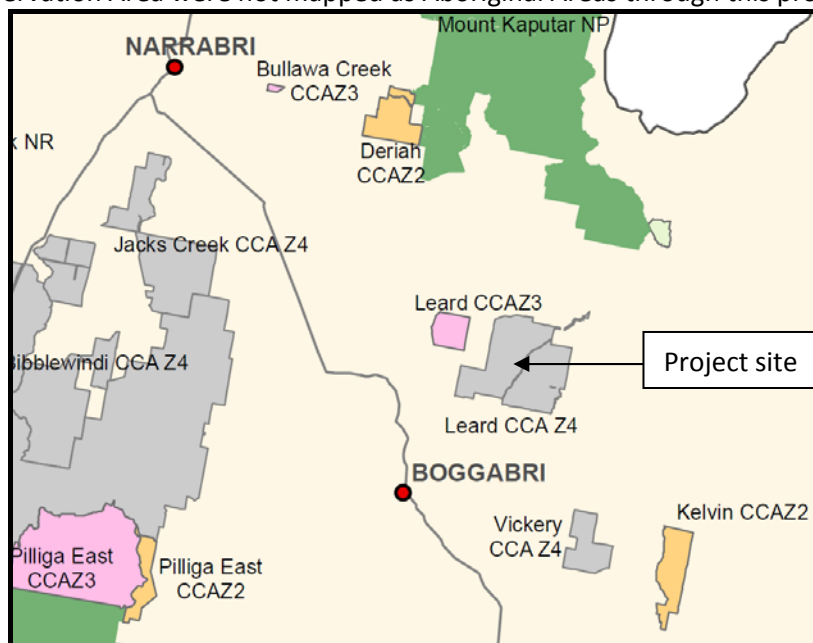


Figure 8-1 Extract from the map of the Brigalow and Nandewar Community Conservation Area (Zone 2 shown in orange)

Earlier in this report the Commission has recommended that a Regional Biodiversity Strategy needs to be prepared to identify the strategic framework for identifying, managing and conserving areas of land in order to secure the region's biodiversity values. The Commission has recommended that the Aboriginal community should be consulted as part of this process. Through this process substantial tracts of land will be set aside for conservation purposes and the Commission considers that efforts in this regard may also go some way towards preserving the region's natural landforms. Should any of the areas set aside for biodiversity conservation also be identified as culturally important for the Aboriginal community, then it may be possible to reserve these areas as zone 2 Aboriginal Areas under the *Brigalow and Nandewar Community Conservation Area Act 2005*.

The Commission notes that standard conditions for mining cover the contemporary requirements for the protection, monitoring and/or management of heritage items associated with a mining project. The Commission recommends that these conditions relating to Aboriginal cultural heritage should be adapted to cover this proposal.

In addition to these standard requirements, the Commission recommends that the proponent should be required to explore, with other mine owners and in consultation with Aboriginal stakeholders and the Office of Environment and Heritage, options to establish a Regional Keeping Place to house artefacts salvaged as part of the project.

8.2 Greenhouse Gas Emissions

The Commission notes that both National and International policy on climate change and greenhouse gas emissions continues to evolve. Discussion centres around three levels of emissions, Scope 1, 2 and 3 emissions. Scope 1 emissions are generally defined as direct emissions, i.e. those emissions produced on site, whether through the burning of fuel or through the generation or release of methane, from a coal seam for example. Scope 2 emissions are those offsite or indirect emissions produced to support an operation, such as emissions produced from the generation of electricity used on site. Scope 3 emissions are those emissions associated with the downstream use of a resource or product produced on site. For example greenhouse gas emissions produced from the burning of the mine's coal at an overseas power station are considered to be scope 3 emissions.

The Commission acknowledges that the mining and downstream use of the coal would generate greenhouse gas emissions that will contribute to climate change. The Commission notes however that the mine would only supply a very small portion of the global demand for coal. In the event that the project did not proceed, the coal proposed to be extracted would be sourced from elsewhere. Further, given the high quality of Australia's coal resource, it is possible that alternative coal used in the place of this coal would be of a poorer quality and could produce other environmental impacts.

Nonetheless, the Commission is concerned about the potential contribution to climate change, it acknowledges that this project will produce greenhouse gas emissions and considers that the scope 1 and 2 greenhouse gas emissions should be appropriately minimised.

The Commission notes that policy on Greenhouse Gas Emissions is evolving on a number of fronts and that the Department of Planning and Infrastructure should include suitable conditions to reflect the policy at the time the assessment is finalised.

8.3 Lighting

Lighting is an important issue in regional areas where lower population densities tend to result in less light spill, making lighting from industry more obvious and intrusive. The Commission understands lighting from mining in this particular region has the potential to impact on the Siding Springs Observatory (which includes Australia's largest optical telescopes). In this regard the

Commission considers that it is particularly important to ensure lighting is not directed above the horizontal. Standard conditions on mining operations include requirements to ensure lighting complies with the relevant Australian Standard (AS4282) and that no outdoor lights shine above the horizontal.

The Commission supports these conditions but notes that moving equipment such as trucks have the potential to direct light above the horizontal during certain operations. Consequently the Commission recommends that conditions include an additional requirement to ensure that, wherever possible, moving equipment is also appropriately designed, selected and/or retrofitted to prevent light from being directed above the horizontal. The Commission understands this could be done by fitting self adjusting lights or shades to moving equipment.

8.4 Socio Economic

Agriculture and forestry have been primary employment providers for the region historically, however recent increases in employment in the mining sector are changing this. During the Commission's visits to the region, it was evident that the mining industry is providing a substantial boost to the local economy, but that this is also putting pressure on the regions existing community and local services.

Gillespie Economics undertook an economic assessment for the project that is detailed in Appendix Q of the EA. The assessment is based on 21 years of mining involving production of up to 13 Million tonnes of run of mine coal a year and utilising up to 470 employees.

A Benefit Cost Analysis of the project identified the potential economic costs and benefits. The net production benefits of the project were estimated at \$8,728 million (Hansen Bailey, 2011a). External benefits associated with employment provided by the project have been estimated at \$194 million (Hansen Bailey, 2011a). Overall the project is estimated to have net benefits of \$8,618 million (Hansen Bailey, 2011a). The Commission also acknowledges that the project would have considerable costs, some of which have been discussed in other sections of this report.

A regional economic impact analysis, using input-output analysis, estimated that in total, the project's contribution to the regional economy would comprise up to:

- \$1,899 million in annual direct and indirect regional output or business turnover;
- \$1,022 million in annual direct and indirect regional value added;
- \$54 million in annual household income; and
- 753 direct and indirect jobs. (Hansen Bailey, 2011a).

At the State level the project would make up the following contribution to the economy:

- \$2,815 million in annual direct and indirect output or business turnover;
- \$1,558 million in annual direct and indirect value added;
- \$303 million in annual household income; and
- 4,029 direct and indirect jobs. (Hansen Bailey, 2011a).

The Commission reviewed submissions in response to the economic assessment arguing the public benefits were inflated and the public costs were underestimated. While the Commission acknowledges that many costs, particularly the externalities, have not been quantified in this instance, the Commission is largely satisfied that the regional and statewide benefits identified would be significantly greater than the likely costs of mining.

As discussed in various sections of this report, the project is located adjacent to a number of private landowners and the residential communities within the Narrabri and Gunnedah LGAs. The tiny

Maules Creek community consists of agricultural properties centred around a very small school and hall, approximately 6 km north of the site. Boggabri is the nearest rural township approximately 17 km from the project boundary. Boggabri is approximately 60 km and 40 km respectively from the larger centres of Narrabri and Gunnedah.

Over the past 20 years these LGAs have both experienced a loss of population, relatively high unemployment rates and also contain large indigenous populations made up of a large proportion of youth with a relatively high unemployment rate (Hansen Bailey, 2011a). The population is also ageing.

Recent statistics show that unemployment in the Narrabri LGA is now low, but gradually rising (from 4.2% to 5.3% between 2006 and 2010) (ABS 2011a) and slightly higher in Gunnedah LGA (rising from 6.3 to 7% between 2006 and 2010) (ABS 2011b).

Both Councils and local residents credited the existing mines for recent rejuvenation and growth in the areas. The Narrabri LGA has faced changes in the employment profile with a reduction in employment in the agriculture and forest industries, significant reduction in the manufacturing and wholesale trades and a corresponding significant increase in employment in the mining industry, with minor increase in employment in the education, health care and administrative services industries.

These LGAs will likely face a number of potential challenges associated with the expansion of the local coal mining industry including:

- Housing availability;
- Servicing the needs (health, educational, childcare, recreation, transport) of the resident populations; and
- Balancing the needs of the affected agricultural and residential communities with the demands of the mining industry.

It needs to be noted that a development application has been lodged for the development of accommodation for mining employees in Boggabri. Expansion of similar accommodation in Narrabri, has also recently been approved.

The Commission reviewed written submissions and heard verbal submissions at public hearing regarding social impacts on neighbours concerning air quality, noise, visual and traffic. The Commission regards these as impacts that can and should be addressed through appropriate development conditions but also not losing sight of the need to maintain a balance between the need to produce agricultural products and the mining of resources.

Companies operating mines have a social responsibility to work with their neighbours to minimise the potential impacts. As outlined in other sections of this report the Commission recommends conditions to address these impacts. The proponent has acknowledged its obligations in this regard in its EA and response to submissions.

The Commission however, strongly recommends that the proponent should be required to maintain as much agricultural land as possible in production on the properties acquired, as also requested by Narrabri Shire Council.

As highlighted in the proponent's environmental assessment recruitment strategies for all coal mining companies in the area will shift from local labour to imported labour as more mines move into production (Hansen Bailey, 2011a). Many of these workers are proposed to be housed in

workers accommodation and will travel to the region by air. This has the potential to produce transient populations which can have a range of social impacts on regional communities. The Commission recommends that Council and the proponent work together to plan for the adjustments that will need to occur.

The Commission understands that the proponent is negotiating a Voluntary Planning Agreement with Narrabri Shire Council as a community infrastructure contribution and this should be appropriately conditioned.

In its submission Gunnedah Shire Council identified the cumulative impacts in its area on housing and infrastructure services such as health, education, childcare and law enforcement.

The Commission notes that the benefits of the project are likely to flow across the broader subregion, while the impacts and costs will mainly be concentrated locally, within the Narrabri Local Government Area.

8.5 Traffic and Transport

The traffic and transport impact assessment provided by the proponent concluded that:

- The most significant road traffic impacts would be experienced during the peak construction period, but the modelled impacts would not be major;
- A number of potential road safety risks were identified and would need to be managed and mitigated through management plans, access restrictions, signage and road improvements;
- The impacts of additional coal trains at railway level crossings was found to warrant the provision of additional signage and markings at certain crossings in Gunnedah and Breeza; and
- The capacity of the rail network may become an issue if network wide rail improvements (particularly the Liverpool Ranges realignment) are delayed.

The Roads and Maritime Services submission to the Department of Planning and Infrastructure requires that the intersection of Manilla Road and the Kamilaroi Highway is to be upgraded to provide an improved right turn lane, in accordance with the relevant standards.

The Commission acknowledges that the mine will generate additional traffic on the surrounding road network.

The proponent has indicated it will transport mine employees by bus from Boggabri to the mine site. The Commission supports this approach and considers that it is likely the service should also be extended to Narrabri and Gunnedah, if adequate numbers of workers are commuting from these towns. The Commission also acknowledges concerns about the location and management of any parking areas required to support the bus and notes that this will need to be appropriately minimised (e.g. through extension of the bus service to the appropriate towns) and managed.

The Commission received submissions and heard concerns from the local community regarding safety issues for both school buses and other local road users. The proponent has indicated that traffic from the project will not be using the roads the school bus follows. However, should circumstance change and the school bus route is altered, contingencies should be in place to require the proponent to minimise traffic impacts along the school bus route during pick up and drop off times.

The proponent's traffic study included a safety audit and made a number of recommendations for improvements to safety for road users. Conditions should include the requirements to undertake

road upgrades and maintenance to the satisfaction of Narrabri Shire Council and Roads and Maritime Services.

Effect of increased train movements on Gunnedah, Curlewis and Breeza

Gunnedah Shire Council raised concerns with the cumulative impact of additional train movements through Gunnedah, Curlewis and Breeza and indicated there was a need for a more in depth assessment.

Conditions currently require the Boggabri coal mine to liaise with Gunnedah Shire Council in relation to the recommendations in the Gunnedah Traffic Study for mitigating impacts of coal rail transportation on road safety and congestion. The conditions note that any contributions should be on an equitable basis with other coal project rail users. The Commission agrees with this approach, noting the Maules Creek coal mine may also need to be required to contribute to any measures to mitigate impacts on road safety and congestion.

The Commission also notes that in the medium to long term there may well be impacts beyond the immediate region, extending the full length of the rail corridor to the port of Newcastle. These wider implications require consideration at the state level.

8.6 Community and Stakeholder Consultation

Community and stakeholder consultation is an important component of major developments. The Department of Planning and Infrastructure sets out consultation requirements to be undertaken by the proponent for the project through the Director-General's requirements for the environmental assessment.

Community and stakeholder consultation for major mining projects generally continues as a condition of approval through a Community Consultative Committee (CCC).

The purpose of a Community Consultative Committee is to provide for a forum for open discussion between representatives of the operating company, the community, local councils and other local or regional stakeholders on issues directly relating to the mine's operations, environmental performance and community relations.

The social licence to operate a mine in the modern operating environment is largely influenced by the transparency with which it deals with the local community and the Community Consultative Committee. Documents provided to the committee should be generally available to the community, via the company web-site and other public places such as the local library, except where the information may be considered commercial-in-confidence. The minutes of the Community Consultative Committee should also be published and freely available.

The expansion sought by the Boggabri coal mine and the Tarrowonga mine, along with this new project, if all approved, would significantly impact on the local community and an effective Community Consultative Committee would be vital in providing local input into the mine's operation with community acceptance.

The Department of Planning and Infrastructure has published guidelines for establishing and operating Community Consultative Committees for mining projects.

An important aspect in the success of a Community Consultative Committee is the selection of the independent chairperson. As this project, together with the existing mines, will have cumulative environmental impacts the Commission considers it useful to have a joint chairperson for these regional projects.

The Commission recommends that the Community Consultative Committees for neighbouring mines should include some joint membership, with certain individuals involved in each of the committees. In particular the appointment of the same chairperson and some consistent representation from the community and council would be valuable in ensuring the cumulative environmental impacts arising from the operations of the mines are clearly understood and transparently accounted for.

8.7 Compliance

In the course of its consideration of this application and the adjoining Boggabri Coal Project, the issue of monitoring and compliance has been raised by a number of individuals, as well as Council and some of the government agencies. The Commission heard several verbal submissions highlighting the need for the compliance with the relevant conditions and standards to be monitored and enforced.

The Commission is aware that the mining sector is expected to grow substantially in this area. As already identified in its review of the Boggabri coal mine, in order to ensure that cumulative impacts can be appropriately managed the Commission considers that there will be a need for the state government to take a more active role in monitoring the sector as more mines are developed.

The Commission has found that there is a strong case for a dedicated monitoring and compliance resource to be based in the area. The Commission considers that the Department of Planning and Infrastructure should examine options to increase its monitoring and compliance resources in the area, in line with the mining industry's growing presence in the area. One option for doing this could be the creation of a new compliance officer position to be based in this region, to work with the Office of Environment and Heritage and the local councils to manage mine related compliance and responses to complaints.

8.8 Other issues

The Commission has sought to address the issues identified in the Minister's terms of reference, as well as the major issues raised in submissions to the Commission. The Commission's consideration of these issues, particularly the ones identified in this section, has been at a strategic level and the Department of Planning and Infrastructure will still need to conduct its detailed assessment, in consultation with the relevant government agencies, in order to ensure appropriate conditions are devised.

The Commission has not sought to identify every issue raised by the application, however those which are not addressed in this report were considered to be of less significance and the Commission is satisfied they can be adequately minimised and managed through conditions of approval. Nonetheless those issues will need to be further considered by the Department in its final assessment of the application.

9 Findings and Recommendations

The Commission has carefully considered the application, especially with regard to the terms of reference provided in the Minister's request for the review.

The Commission found that at a strategic level regional land uses are currently shifting. Each new mining application in the area represents an incremental step towards a new economic and land use structure for the region. The Commission was asked to consider the potential cumulative impacts of the project and in doing this found that in order to address the potential growth in cumulative mining impacts a number of regional strategies should be prepared.

If carefully developed, this regional framework should ensure that cumulative impacts can be appropriately managed and monitored to meet environmental standards. While these plans are considered to be crucially important, the Commission is satisfied that the preparation of these plans can be completed in parallel with the application process and need not delay the decision on the application.

The Commission is also of the view that strong community engagement, including through the Community Consultative Committee, transparent management practices and timely publication of monitoring results will be essential.

In this regard, the Commission has found that there is a strong case for a dedicated monitoring and compliance resource to be based in the area. The Commission considers that the Department of Planning and Infrastructure should examine options to increase its monitoring and compliance resources in the area, in line with the mining industry's growing presence in the area.

The Commission notes that three distinct areas of mining operations now occur in the region between Narrabri and Gunnedah. The first is the Narrabri coal mine, which is approximately 20 km south east of Narrabri. Mining clusters now also occur around both the Leard and Vickery State Forests. The Commission notes that mapping of exploration leases suggests there is potential for the Leard and Vickery clusters to eventually merge into one larger mining area. The Commission notes the difficulties in managing larger mining areas, within which the scale of impacts potentially escalate and environmental protection accountabilities can become confused. The Commission considers that in order to manage cumulative impacts, it will be important to keep these clusters distinct. With three mining clusters already established, the Commission considers that any further mining outside of these existing clusters would need to be considered by further strategic planning.

In regard to the specific issues raised in the terms of reference, the Commission found that the air, noise and blasting impacts would need to be carefully monitored and managed to prevent exceedances of the relevant standards (particularly in relation to cumulative impacts). The impacts on water would need to be carefully managed and the final landform should be designed so it does not generate a pit (void) lake. In other respects the Mine Plan is considered adequate.

In relation to the impacts on biodiversity, with expansion of conservation areas, consistent with a Regional Biodiversity Strategy and with appropriate management plans in place, the Commission is satisfied that an improvement to the regions biodiversity can be achieved in the medium to long term.

After careful consideration, and while acknowledging the environmental impacts of the project, the Commission considers that overall, the project has merit. The Commission's recommendations are provided in full in the following section. Subject to these recommendations and detailed assessment by the Department of Planning and Infrastructure, the Commission is satisfied the project could be approved, subject to stringent conditions.

9.1 Recommendations

1. Regional Biodiversity Strategy

In view of the regional nature of the biodiversity issues raised by this proposal and the regional scale of the measures proposed to minimise adverse impacts, the Department of Planning and Infrastructure should commission a biodiversity working group to prepare a Regional Biodiversity Strategy. The group should comprise independent experts as well as representatives from all levels of government, including the Office of Environment and Heritage, the Office of Resources and Energy, the Namoi CMA and Narrabri Shire Council.

The proponent for this project and the mining companies seeking to mine other parts of the Leard State Forest should be required to pay for the preparation and implementation of the regional biodiversity conservation strategy, on a pro rata basis according to the proportion of land to be cleared by each company.

The strategy should:

- be prepared in consultation with the local community, the Aboriginal community, local landcare groups and the mining companies and operators;
- set out an appropriate framework for the strategic conservation of the biodiversity values and functions likely to be impacted by the mining of land within the Leard State Forest and surrounds;
- include options for strategic additions to the public reserve system;
- set out the measures to be used to secure areas of private land into the long term;
- set out the management regime for the conservation lands, including details of the funding mechanisms and management responsibilities to be implemented to ensure the ongoing maintenance of the land in the long term, including after the completion of mining.

The Regional Biodiversity Strategy should be completed to the satisfaction of the Director-General of the Department of Planning and Infrastructure, within 1 year of any new approval of mining within the Leard State Forest.

2. Mine Specific Biodiversity Management Plan

The proponent must also prepare a biodiversity management plan to cover the offsite areas to be rehabilitated and conserved, as well as the biodiversity on site (both remnant and rehabilitation areas). The Department's standard conditions relating to biodiversity management and rehabilitation, could be adapted to fulfil this purpose, but would need to also include:

- the Namoi Catchment Management Authority in the list of agencies to be consulted during the preparation of the plan; and
- requirements to describe the measures to be implemented to ensure the connectivity and corridor function fulfilled by the exclusion zone corridor is maintained; and
- requirements to demonstrate consistency with the Regional Biodiversity Strategy and consider any findings and recommendations within the strategy.

The mine specific Biodiversity Management Plan would need to be in place before the mine commences exporting of coal from the site.

3. Barrier Coal Corridor

The proponent should be restricted from clearing any land (or establishing and/or intensifying any dams, roads or other infrastructure) within 250 m of the southern lease boundary, to ensure that a viable biodiversity corridor can be maintained through the vicinity of the Leard State Forest.

4. Dust Control Measures

All measures for control of air pollution should deliver air quality outcomes that are equal to or better than the air quality outcomes identified in the EA and that correspond to best practice and the application of best available technology. This must include best practice coal loading and profiling, to minimise dust emissions from coal transportation.

5. Compliance with the air quality standards

The cumulative dust levels from the mine and any other sources must not exceed the national and state air quality standards at any occupied residential property, regardless of land tenure.

The proponent must ensure that the project does not contribute to any exceedence of the PM_{2.5} goal, and any PM_{2.5} criteria (when this is finalised nationally and/or at a State level) at any occupied residential property, regardless of land tenure.

In the event that any air quality standards are exceeded, the mine should be required to immediately shut down (where dust levels cannot be brought into compliance), or scale back activities on site (if this is sufficient to quickly bring dust levels down to within the criteria). Proactive management will be required to achieve compliance in variable weather conditions.

6. Regional Strategy and Project Specific Air Quality Management Plan

In order to prevent exceedence of the air quality standards, the proponent, in collaboration with the Boggabri and Tarrawonga mines (and any other mines to operate in the area) should develop and implement both a regional strategy and a project specific Air Quality Management Plan to ensure air quality standard (and goals) are achieved. The strategy and/or management plan should include:

- A shared environmental monitoring network and data sharing protocol between the proponent and the neighbouring mines, setting out the systems and processes to be implemented to ensure all mining operations are managed to achieve appropriate air quality standards.
- Monitoring and management arrangements that provide for:
 - A predictive, reactive and collaborative management system, using state-of-the-art technology to ensure the mine avoids, reduces and/or ceases activities as required.
 - Comprehensive, real time monitoring for TSP, PM₁₀, PM_{2.5} and deposition, both locally and regionally; and
 - Apportionment of emissions from the proponent's operations using a combination of dual synchronized monitors and meteorological instruments, supplemented by elemental or chemical methods of source apportionment, as appropriate.
- Commitments to provide summary reports and specific briefings on issues arising from the monitoring at the Community Consultative Committee meetings.
- Provisions to ensure there are ongoing improvements to the management systems, reporting provided and response mechanisms implemented, to maintain best practice over time.

7. Online communication of onsite activities and monitoring of dust

A risk/response matrix should be developed to clearly codify mine operational responses to varying levels of risk resulting from weather conditions and specific mining activities in sensitive locations.

The risk/response matrix and real time monitoring data should be made available online and include:

- timely publication of monitoring data in a clearly understandable form;
- identification of mine operational responses to monitoring data and weather forecasts; and
- provision for online input/response by members of the community and real time engagement with regionally based regulatory compliance staff.

8. Noise Control Measures

All equipment and noise control measures should deliver noise levels that are equal to or better than the levels identified in the EA and that correspond to best practice or the application of best available technology. All equipment must be selected to minimise noise and must include state of the art noise attenuation or suppression.

9. Compliance with the Industrial Noise Policy

The noise levels from the mine must not exceed the noise levels prescribed under the Industrial Noise Policy, ie 35 L_{Aeq} 15 min and 45 L_{A1} 1 min, at any privately owned residential receiver, unless the proponent has the written agreement of the owner of the property.

The cumulative noise levels from the mine and any other sources must not exceed the amenity criteria at any privately owned residential property.

10. Measures to Minimise Transport Noise

The rolling stock used to transport the coal should be selected to minimise noise.

The loading and movement of trains (both on and offsite) should be scheduled and/or restricted to minimise sleep disturbance impacts for residents along the entire rail corridor.

11. Regional Strategy and Project Specific Noise Management Plan

In order to prevent exceedence of the noise criteria the proponent, in collaboration with the Boggabri and Tarrawonga mines (and any other mines to operate in the area), should develop and implement both a regional strategy and a project specific Noise Management Plan to ensure that both the project specific noise levels and a satisfactory amenity are achieved on neighbouring properties. The strategy and/or management plan should include:

- A shared environmental monitoring network and data sharing protocol between the proponent and the neighbouring mines, setting out the systems and processes to be implemented to ensure all mining operations are managed to achieve appropriate noise criteria.
- Monitoring and management arrangements that provide for:
 - A predictive, reactive and collaborative management system, using state-of-the-art technology to ensure the mine avoids excessive noise, reducing and/or ceasing activities as required.
 - Comprehensive, real time monitoring of noise and weather conditions, including real time monitoring of inversion effects.
- Commitments to provide summary reports and specific briefings on issues arising from the monitoring at the Community Consultative Committee meetings.
- Provisions to ensure there are ongoing improvements to the management systems, reporting provided and response mechanisms implemented, to maintain best practice over time.

12. Online communication of onsite activities and monitoring of noise

A risk/response matrix should be developed to clearly codify mine operational responses to varying levels of risk resulting from weather conditions and specific mining activities in sensitive locations.

The risk/response matrix and real time monitoring data should be made available online and include:

- timely publication of monitoring data in a clearly understandable form;
- identification of mine operational responses to monitoring data and weather forecasts; and
- provision for online input/response by members of the community.

13. Construction Noise Management Plans

The construction noise management plans must:

- be prepared in consultation with nearby residents and document the preferences of the local residents (in terms of construction hours, etc);
- ensure construction noise impacts are minimised and managed both in terms of the intensity of the noise impact and the duration of the impact;
- set out the scheduling and timing of the various construction works and demonstrate how the proposed scheduling would minimise impacts and how local resident's preferences would be accommodated.

14. Blasting

Standard conditions relating to blasting should be adapted to cover the current proposal.

The Blast Management Plan should also:

- be prepared in consultation with the local community; and
- include measures to ensure that:
 - there are consistent blasting protocols for all mining operations in the area; and
 - blasting is coordinated to minimize disruptions to the community.

As with the recommendations for dust and noise a Regional Blasting Management Strategy may also be appropriate.

15. Water

The proponent should not be allowed to pursue the alternative rail bridge over the Namoi River, unless further justification and detailed plans and assessment have been provided and appropriately assessed by the Department of Planning and Infrastructure.

Along with the standard conditions relating to water, the conditions should also require:

- The proponent to be prohibited from discharging mine and contaminated water off site and should be required to ensure there is capacity to accommodate surplus mine and contaminated water in the mine pit, without impacting on operational and employment commitments, including during extreme weather events;
- The proponent to ensure that the project does not impact on the flood plain or flood dynamics along Back Creek;
- The proposed 17 additional monitoring bores to be equipped with water level or pore pressure monitoring transducers installed at vertical separations such that the future impacts of strata depressurisation can be adequately measured and mapped;
- Core tests to be conducted to assess the distribution and variability of hydraulic conductivities of (unfractured) interburden at a sufficient number of bore locations to quantify porous groundwater flow and storage contributions associated with interburden;
- XRD-XRF analyses to be undertaken on core samples obtained at a sufficient number of bore locations to establish the mineralogy of interburden likely to be exposed to pit re-saturation;
- Hydrochemical modelling to be undertaken in order to determine the long term void water quality. This study should include batch reaction (full saturation) trials on waste interburden (spoils) to confirm hydrochemical modelling outcomes;
- That reject materials or any potentially acid forming interburden materials must not be emplaced outside the pit shell or at elevations within the pit shell that are likely to promote acid

or sulphate species generation and migration of such leachate beyond the pit shell at any future time;

- Any coal barrier between the pit shell and any future surrounding mining operations must remain intact in order to impede exchange of any contained groundwaters in the Maules Creek pit shell;
- A mine closure plan to be prepared prior to mining year 14 (at least 7 years before closure). An important part of this plan will be that it must address future stability of the proposed landform, long term groundwater recovery and void water quality characteristics to the satisfaction of the Director General. In particular the long term landform should not generate a pit (void) lake or salt scalding. Emplaced spoils should have a capacity to drain to the natural catchment and drained waters must not adversely impact upon the downstream environment. The hydrochemistry, hydrogeology and hydrology components of the mine closure plan must be subject to independent review and verification.

16. Aboriginal cultural heritage

Standard conditions relating to Aboriginal cultural heritage should be adapted to cover this proposal.

In addition to these standard requirements the proponent should be required to explore, with other mine owners and in consultation with Aboriginal stakeholders and the Office of Environment and Heritage, options to establish a Regional Keeping Place to house artefacts salvaged as part of the project.

17. Greenhouse Gas Emissions

The Department of Planning and Infrastructure should include suitable conditions to reflect Greenhouse Gas Emissions policy at the time the assessment is finalised.

18. Lighting

The conditions should include a requirement to ensure that, wherever possible, moving equipment is appropriately designed and/or retrofitted to prevent light being directed above the horizontal.

19. Socio-Economic

Conditions should include requirements to maximise the amount of agricultural land that remains in production on the properties acquired by the proponent.

Council and the proponent should work together to plan for the socio-economic adjustments that will need to occur in the long term.

20. Traffic

Conditions should include:

- requirements that the proponent minimise traffic impacts along the school bus route;
- requirements to undertake road upgrades and maintenance to the satisfaction of Narrabri Shire Council and Roads and Maritime Services; and
- requirements that all coal is transported from the site by rail.

21. Community Consultative Committee

The Community Consultative Committees for neighbouring mines should include some joint membership, including the chair if possible.

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Appendix A - Terms of Reference

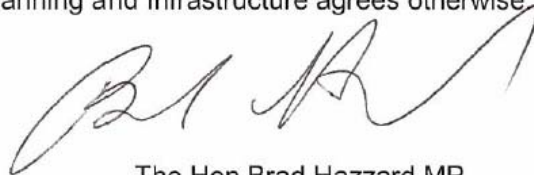
Request to the Planning Assessment Commission

Maules Creek Coal Project

Section 23D(1)(b)(ii) of the *Environmental Planning and Assessment Act 1979*.
Clauses 268R(1)(a) and 268V of the *Environmental Planning & Assessment Regulation 2000*.

I, the Minister for Planning request the Planning Assessment Commission (the PAC) to:

1. Carry out a review of the merits of the Maules Creek Coal Project, which:
 - a. takes into consideration the environmental assessment for the project, issues raised in public and agency submissions and any other information provided during the review process;
 - b. assesses:
 - the potential cumulative dust, noise, blasting and water impacts of the project;
 - the potential biodiversity impacts of the project;
 - the merits of the mine plan, paying particular attention to the proposed overburden dump and future rehabilitation of the project; and
 - any other potentially significant impacts of the project
 - c. recommends appropriate measures to avoid, minimise and/or offset these impacts; and
 - d. provides advice on the merits of the project as a whole.
2. Conduct public hearings during the carrying out of the review.
3. Submit its final report on the review to me by 16 December 2011, unless the Director-General of the Department of Planning and Infrastructure agrees otherwise.



The Hon Brad Hazzard MP
Minister for Planning & Infrastructure

Sydney 16. August 2011

Appendix B – Summary of Submissions to the Planning Assessment Commission

<i>Name</i>	<i>Issues raised</i>
Narrabri Shire Council	<ul style="list-style-type: none"> • Welcomes the employment and business opportunities the project offers • Construction work will impact on council’s road network, alternatively road access could follow the rail line • The proponent should contribute to the upgrade of Narrabri Airport and other facilities such as the pool and waste management facilities through a Voluntary Planning Agreement as well as a 20cent per tonne annual contribution and child care places. • Agricultural activities on buffer zone properties should continue to operate • Biodiversity offset lands require management and also result in loss of rates for council, the land should be designated as National Parks • Workers should be encouraged to permanently move to Narrabri Shire with their families. • Need for a Regional Plan for the Gunnedah Basin • Pressure on rail facilities may cause grain transport to revert to road • Social impacts such as housing availability and on services such as police, medical and aged care, as well as the need for additional government staff to be located in the region. • Cumulative impacts need independent monitoring and an ombudsman should be appointed.
Maules Creek Community Council	<ul style="list-style-type: none"> • Changes to the mine’s ownership and management would impact on communication strategies currently in place with the community. • Local people should co own the assets • Unequal distribution of costs and benefits, should require a net benefit for all stakeholders, not just NSW as a whole • Adequacy of studies undertaken and information available • Cumulative impacts (also compounded by topography and prevailing weather), particularly on water, air quality, biodiversity, social infrastructure and health • Uncertainties regarding the impacts of the mine • Greenhouse gas emissions • Product stewardship • On balance underground mining would be best for the site
Mr Peter Mort	<ul style="list-style-type: none"> • Concerns about the stability of the company • Inadequate information on the proposed environmental offsets • Rehabilitation measures need to include filling the void and reapplying both subsoil and topsoil • Rail traffic disruptions to the communities along the rail line and the road network and dust from uncovered loads • The need for rail passing loops funded by the mines • Social impacts including childcare, housing, employment, fly in and fly out workforce • Pressures on local services and availability of skilled workers • Stability of the mining industry and impacts should the mining industry contract

<i>Name</i>	<i>Issues raised</i>
	<ul style="list-style-type: none"> • Water security • Management of the tailings dam • Integrity of mine compliance and auditing practices and need for adequate resourcing • Cumulative impacts
Boggabri Business Promotions Association	<ul style="list-style-type: none"> • Generally positive for business and the population in Boggabri • Growth in mining has put pressure on some areas including, housing, services such as policing and availability of skilled tradespeople • Social impacts of fly-in fly-out and preference for permanent residents • Impacts on neighbouring properties need to be managed, e.g. dust and roads
Gunnedah Shire Council	<ul style="list-style-type: none"> • Housing pressure, particularly impacts on affordable housing • Cumulative impacts of all rail movements through towns • Cumulative dust emissions from all industries need to be managed across the region • Groundwater impacts • Generally supportive of the project, but there need to be adequate measures in place to minimise impacts
Northern Inland Council for the Environment	<ul style="list-style-type: none"> • The Laird State Forest is a high priority for additional conservation, as the largest of the few reserves within the Liverpool Plains province. • The project would have a significant impact on biodiversity, given: <ul style="list-style-type: none"> ○ The magnitude of the clearing proposed (includes 544 ha of critically endangered Box-Gum Grassy Woodland); ○ Cumulatively mining will reduce the amount of woody vegetation below the 30% threshold; and ○ The conservation significance of the Leard State Forest; • The proposed biodiversity offsets are inadequate and are not equivalent to the losses as: <ul style="list-style-type: none"> ○ The vegetation in the offset areas is sparse and heavily cleared; ○ Vegetation communities are not all in the same bioregion; and ○ Offsets have an inferior spatial configuration. • Success of proposed regeneration and mine rehabilitation efforts is uncertain • The impacts are considered so significant that the project could not genuinely meet the requirements of the EP&A Act • No need for further mines in the Gunnedah Basin • Mining will only create a boom bust cycle, agriculture and tourism would support a stronger economy • If any mining is to occur it should be underground mining • Open cut mining is only cheaper when value of existing environment is ignored
Mr Peter Watson	<ul style="list-style-type: none"> • Underground mining would have less impacts than the proposed open cut mine • Baseline monitoring data has not been made public

<i>Name</i>	<i>Issues raised</i>
	<ul style="list-style-type: none"> • Impacts of the rail spur including: <ul style="list-style-type: none"> ○ use of uncovered carriages ○ wheel squeal ○ noise from night time train movements • Traffic impacts on local roads and potential conflicts with the school bus • Water, including groundwater impacts, water quality, impacts on flooding • Dust impacts • Impacts on native vegetation and double standards as farmers would not be allowed to undertake this clearing • Amenity impacts • Impacts on land values around the mine site • Impacts of population growth, particularly on the limited medical services available • Availability of skilled staff • Health, including the need for baseline and ongoing health checks • Ongoing operations of the mine need to be independently and transparently assessed and audited • Monitoring results and meeting minutes need to be made available to the community
Namoi Water	<ul style="list-style-type: none"> • Impacts of mining much greater than those from agriculture • Social impacts of fly in fly out employment arrangements • Inadequate groundwater study, including data gaps, calibration issues, transmissivity issues, impacts on the alluvial aquifer and inflows to mine pit • Lower recharge rates into Back Creek will reduce the reliability of this water source, particularly access for farmers • The mine should be required to measure and pay for all groundwater use as is required of irrigators • Should wait for the Namoi Catchment Water Study which is due in less than four months
Cumberland Bird Observers Club	<ul style="list-style-type: none"> • Concerns regarding the clearing of endangered and rare vegetation communities; • Impacts on vulnerable bird species and on declining populations of woodland specialist bird species; • Impacts on bird habitat such as 100-150 year old hollow bearing trees; • Land clearing is a key threatening process for many of the vulnerable birds on site; • The forest represents one of the few remaining areas of viable western slopes woodland; • Concerns regarding the viability of rehabilitating of the mine site to a self sustaining level; • Object to the risk the clearing would pose to the woodland community and associated fauna; • Concern that the proposed offsets are inadequate and that there is insufficient vegetation of an equivalent standard to be able to provide a sufficient offset area.

<i>Name</i>	<i>Issues raised</i>
Mr Lochie Leitch	<ul style="list-style-type: none"> • Health impacts • Prevailing weather conditions will exacerbate dust impacts • Noise • Lighting • Inadequate background monitoring • Water quality and availability impacts on both surface and underground aquifers • Associated impacts on the viability on neighbouring agricultural enterprises • Neighbouring private properties should be compensated and used as biodiversity offsets • Impacts of vegetation clearing, displacement of animals and increase in feral animals occurring on neighbouring properties as a result of the mines • Blasting and potential health impacts as well as impacts on nearby buildings, structures and infrastructure • Increased rates of crime and associated safety issues
Patricia Leitch	<ul style="list-style-type: none"> • Fauna impacts including: <ul style="list-style-type: none"> ○ dislocation of the wildlife currently occupying the site, with no replacement habitat available ○ Many of the offsets proposed are already conserved under other schemes, so do not represent a new conservation area • Ground and surface water – lack of scientific knowledge and data to fully understand the outcome on water • Dust and other air pollution and the potential for health impacts • Noise impacts • Land devaluation • Dislocation of families • Health (physical and mental) • Creation of displacement/replacement zones would have the potential to alleviate and avoid the issues with the mine

The Commission also received a submission from the Namoi Catchment Management Authority appended below.



25th November 2011

NSW Planning Assessment Commission
GPO Box 3415
Sydney NSW 2001

Dear Ms Poon

Re Planning Assessment Commission hearing for Maules Creek Coal Project

Prior to attending the public hearing on Wednesday 23rd November for the above project, Namoi CMA had decided to not to submit a submission to the PAC for the Maules Creek Coal project, preferring to wait for the 'Response to Submissions' from Aston Resources, the proponent.

Namoi CMA has previously provided detailed comments and concerns regarding the Maules Creek Coal Project during the exhibition phase of the Environmental Assessment and are now waiting for those comments and concerns to be addressed in the 'Response to Submissions'.

Following the hearing at Boggabri, discussions with the PAC chair, Ms Gabrielle Kibble, and the short timeframes available to the PAC as set by the Minister, Namoi CMA has decided to submit a brief submission mainly in relation to recommendations for the conditions of consent (presuming that the development is granted consent).

At this stage, Namoi CMA's main concern (once the EA concerns are addressed) is that it is consulted during the development of the Environmental Management Plans. Consequently, Namoi CMA requests that when the PAC provides it's report to the Minister that it emphasises the consent condition requirement that Namoi CMA be consulted during the development of the Biodiversity Management Plan, Rehabilitation Management Plan, Biodiversity Offset Management Plan and the Water Management Plan.

Namoi CMA looks forward to working with the PAC, Department of Planning and Infrastructure and with Aston resources on the Maules Creek Coal Project. If you would like to discuss this matter further please do not hesitate to contact Glenn Bailey, Catchment Coordinator, Namoi CMA on (02) 6742 9204 or email glenn.bailey@cma.nsw.gov.au

Yours Sincerely

Bruce Brown
General Manager
Namoi Catchment Management Authority

All Correspondence - PO Box 546 GUNNEDAH NSW 2380
Tel: 02 6742 9220 - Fax: 02 6742 4022 - Email: glenn.bailey@cma.nsw.gov.au

Appendix C – Dr Mackie’s Expert Advice on Groundwater



Mackie Environmental Research Pty. Ltd.

ABN 62077235164

193 Plateau Rd.
Bilgola NSW 2107

Telephone: (02) 89190182

Department of Planning
Planning Assessment Commission
GPO Box 3415
Sydney NSW 2001

22/02/2012

Att. G. Kibble AO

Re: Proposed Maules Creek Coal Mine – Environmental Assessment, 2011

Further to instructions, I have conducted a review of the likely groundwater impacts associated with the proposed mining of coal resources at the Maules Creek Project (Aston Resources Limited). I have not conducted an exhaustive review but rather focused on key areas of concern that relate to the regional impact of groundwater depressurisation associated with development of a coal pit, and the long term likely impacts of the mining operations after pit closure.

Documents reviewed include:

- Maules Creek Coal Project – Environmental Assessment, July 2011 (main volume) authored by Hansen Bailey P/L;
- Maules Creek Coal Project – Environmental Assessment (Appendix L) Surface Water Impact Assessment, February 2011 authored by WRM Water and Environment P/L;
- Maules Creek Coal Project – Environmental Assessment (Appendix M) Groundwater Impact Assessment, June 2011 authored by Australian Groundwater and Environmental Consultants P/L;
- Maules Creek Coal Project – Environmental Assessment (Appendix N) Geochemical Assessment of Overburden and Potential Coal Rejects Materials, November 2009 authored by RGS Environmental P/L;
- Maules Creek Coal Project -Transient Groundwater Model, December 2011 authored by Australian Groundwater and Environmental Consultants P/L
- Maules Creek and Boggabri Groundwater Assessments, Groundwater Modelling Information – Letter response to Planning Assessment Commission Questions, 18/01/2012.

Review of hydrogeological and groundwater flow models

The proposed mining at Maules Creek provides for a maximum coal production rate of 13 Mtpa over a period of 21 years. Coal will be mined from numerous seams, the lowermost being the Templemore seam. As mining progresses to the east then south-east, the pit shell will be back filled with waste rock material to a proposed maximum elevation of RL430 m. As a consequence of mining, the groundwater contained within the coal seams intercepted by the pit will flow into the pit thereby leading to loss of seam and interburden strata pore pressures. Depressurisation of strata will extend beyond the pit shell. Inevitably this will lead to regional depressurisation of the coal measures with maximum loss of pressure at the coal face, and zero loss of pressure at some distance from the coal face which is governed by the permeability and storage properties of the regional rock strata.

The alluvial lands associated with the Namoi River catchment host an extremely important groundwater resource which has been historically exploited for town water supply and agricultural activities in the region. These lands are typically more than 3 km distant from the proposed mining operations.

The alluvial groundwater resources are managed within the regulatory framework of the Water Management Act 2000 and the relevant Water Sharing Plans for prescribed areas defined within the Namoi Alluvial Aquifer. The Maules Creek project is situated in proximity to three groundwater management zones - Zone 4 to the south, Zone 5 to the west and Zone 11 to the north as illustrated on Figure 1 below.

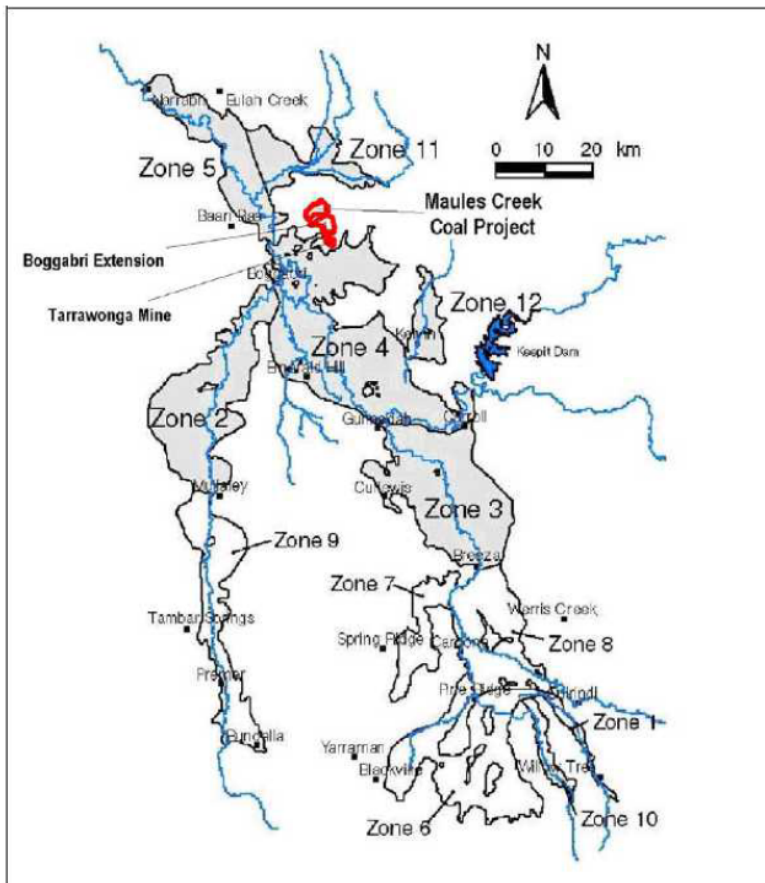


Figure 1: Upper Namoi alluvial aquifer zones¹

Assessment of the probable extent of regional groundwater depressurisation induced by the proposed open cut mining operation, has been undertaken using a groundwater flow simulation model. The specific code adopted by Australian Groundwater and Environmental Consultants (AGE) for this modelling is known as Modflow-Surfact which can handle variably saturated flow conditions in a robust manner. It is an acceptable code for the simulation of the proposed mining operations providing that groundwater flow systems can be reasonably represented as porous media systems. That is, the systems are not dominated by fracture flow or if they are, then the model is divided into cells that are sufficiently large that the fracture network behaves in a manner consistent with porous media flow. In assimilating the available data, I believe these conditions have been met.

The material properties (permeability, porosity and elastic storage) assigned to Permian strata in the model have been assessed from studies undertaken in 1982 and 1986, and test work completed as part

¹ AGE 2011 – Appendix M in EA, Page 5 (Figure 1)

of the Environmental Assessment. These studies appear to lack any measurements on rock core, relying instead on a packer testing conducted in exploration boreholes over intervals which include both coal seams and non coal (interburden) strata². Data generated from hydrogeological studies conducted at the adjacent Boggabri Coal project have also been included. Alluvium material properties are apparently based on previous studies and groundwater flow modelling undertaken by CSIRO.

The proponent has simulated the progression of mining from pre-mining conditions (taken to be the second quarter of 2006) through to the completion of the proposed 21 years mining period in the fourth quarter of 2032. Simulations include the adjacent Boggabri Coal mine and Tarrawonga mine further to the south which are both simulated as active mining operations before the commencement of mining at Maules Creek.

Model output has been provided as a sequence of drawdown contours which show the cumulative effects of Maules Creek and Boggabri Coal operations. Figure 2 below illustrates the predicted impact extent for drawdowns equal to or greater than 1m at various stages of mining. I consider the use of a minimum impact level of 1m to be appropriate. Often the 2m drawdown impact zone is regarded as appropriate based upon typical borehole construction and behavior of bore water levels over time.

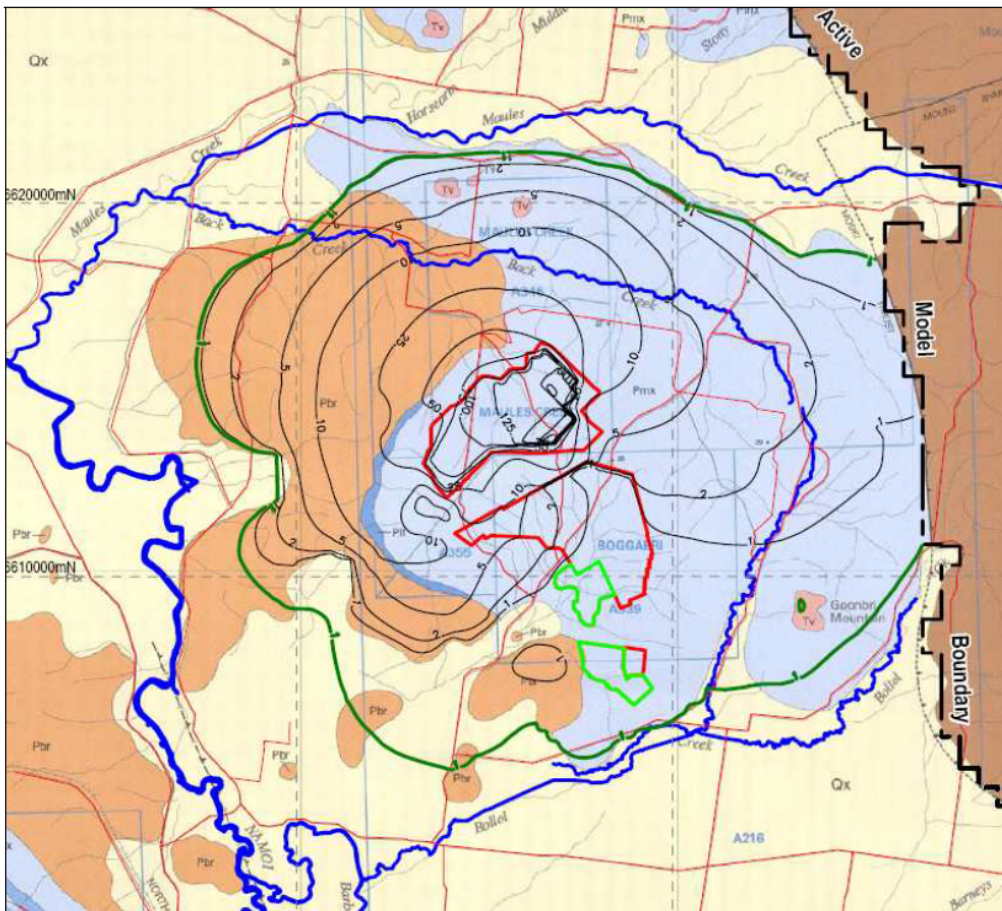


Figure 2: Extent of groundwater depressurisation at the completion of mining³

Depressurisation leads to a reduction in sub-surface groundwater flows from the Permian strata, to the alluvial lands to the south-west and north. The calculated reduction attributed to the Maules Creek

² AGE 2011 – Appendix M in EA, Page 29

³ AGE 2011 – Appendix M in EA, part of Drawing 20 with legend added

project at the end of mining is reported to be of the order of 128 ML/year with 56% applicable to Zone 11 to the north, 32% applicable to Zone 4 to the south and the remaining 12% applicable to Zone 5 to the west.

The impact zone at the completion of mining in Year 21, is predicted to extend between 5 and 7 km beyond the pit shell⁴ and is likely to affect some 27 boreholes identified on the NSW Office of Water (NOW) borehole register. The majority of these bores are reported to be situated on land owned by Aston Resources or other neighbouring mining companies and most are used for monitoring purposes⁵. No irrigation bores that draw water from the alluvial lands, are reported to be present within the zone of influence.

Final void options

At the completion of mining a void will remain at the north-eastern end of the pit shell. Two options have been considered for mine closure – (1) the final void will either be left as an open void pit lake or (2) the void will be backfilled and reshaped with waste rock spoil to an elevation of RL 310m.

Option 1 means there will be minimal reshaping of the mine pit. Groundwater will continue to seep into the pit from the coal measures, rainfall will infiltrate and percolate down through the emplaced spoils, and direct rainfall (and runoff) will all contribute to void filling. The void will be about 240m deep before recovery of water levels commences. Modelling predicts approximately 900 to 1000 years for the void to recover to an equilibrated pit lake water level of about RL 220m. This elevation is below the pre-mining groundwater table and implies that a groundwater sink will be maintained in perpetuity; groundwater from surrounding areas will continue to migrate towards the pit and evaporation will continue to remove water from the pit in a balanced manner. This scenario will result in increasing salinity of the pit lake water in the course of time due to the progressive increase in concentration of ionic species like common salt (Na and Cl). The salinity is predicted to rise from a starting value of about 500 mg/l to more than 9000 mg/l⁶.

Option 2 provides for backfilling and reshaping of the final void to an elevation of RL 310m. Because the spoils have a lower storage (porosity) than open water conditions, recovery of water levels within the spoils is expected to be faster than for Option 1. It is predicted to take about 300 years to recover to an equilibrated water level somewhere between RL 307m to of RL 309m⁷ or 1 to 3 metres below the final landform surface. This equilibration range is attributed to the expected evapotranspiration associated with rehabilitation of the reshaped land surface (RL 310m). The rehabilitated surface is below the most likely spill point in the pit shell which is located at the north-eastern end of the pit in the headwaters of Back Creek at an elevation of about RL 340m as shown on Figure 3. Hence any under-estimation of evapotranspirative losses could lead to ground saturation in the back filled void and the subsequent development of surface salt scalding or salinisation associated with a shallow pit lake. Increasing the backfilled void floor to an elevation sufficient to promote subsurface drainage of spoils to the spill point would mitigate the potential for pit lake development and salinisation. The same outcome could also be achieved by modifying the mine plan to reduce the elevation of the spill point.

Long term void water quality

The long term quality of groundwater-leachate has been assessed by the proponent in terms of acid generating potential determined via leach column tests and short term dissolution trials. Long term batch reaction-dissolution trials to determine void water chemistry appear to be absent.

Results of tests to determine acid generating potential of percolating rainwater in contact with overburden⁸ indicate that most of the tested overburden (non coal) samples have negligible risk of acid

⁴ AGE 2011 – Appendix M in EA, Page 58

⁵ AGE 2011 – Appendix M in EA, Page 59

⁶ WRM 2011 – Appendix L in EA, Page 51 Figure 5.13

⁷ AGE 2011 – Appendix M in EA, Page 69

⁸ RGS 2011 – Appendix N in EA, Page 26

generation and a high factor of safety. These would be the materials that dominate higher elevations in the spoils profile and are likely to be associated with the rehabilitated land form.

Results of similar tests conducted on potential rejects materials indicate that most of the samples tested also have a low risk of acid generation and a high factor of safety. The few samples that exhibit some potential (Braymont, Hermdale and Onavale seams) may however, constitute a significant percentage of the rejects materials at different times during the mining process. They are also likely to generate a more saline leachate when compared to overburden. These materials are proposed to be located deep in the pit shell⁹ and presumably intended to be placed well below the long term recovered water table. Accordingly they are reported as unlikely to represent a risk to the regional shallow groundwater systems (beyond the pit shell) post closure.

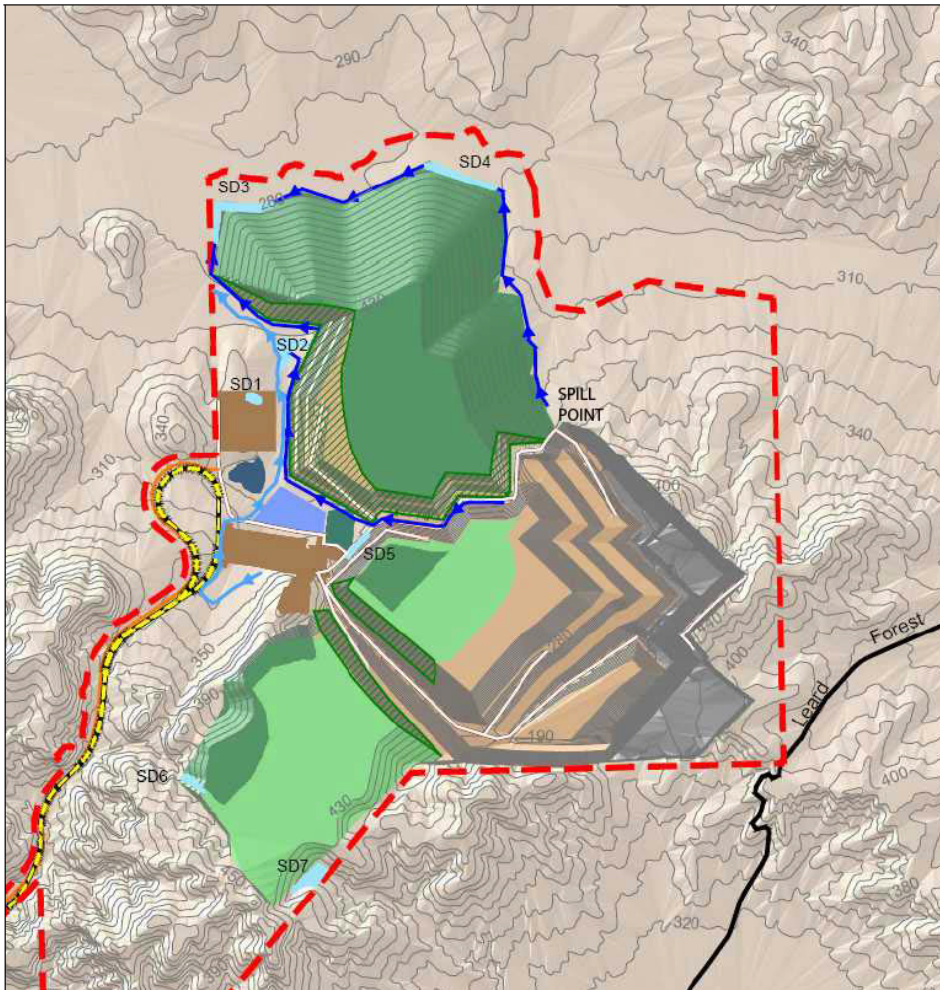


Figure 3: Interpreted pit shell spill point¹⁰- Year 21 mine layout before reshaping

If closure Option 1 is adopted, the evolution of a pit lake will generate increased salinity in the void waters to a long term electrical conductivity (EC) value probably in excess of 15000 uS/cm (9000 mg/l). Containment of saline waters and mitigation of any adverse impacts regionally, will rely entirely upon the long term maintenance of an hydraulic sink.

⁹ RGS 2011 – Appendix N in EA, Page 31

¹⁰ extracted from EA, Main volume, Page 36 Figure 13

If Option 2 is modified to promote discharge to the spill point then the characteristics of the discharge are predicted to be pH neutral, slightly alkaline and relatively low salinity with ionic species dominated by sodium bicarbonate, chloride and sulphate¹¹. The EC value to be likely to be lower than 250 uS/cm. I consider this EC/salinity to reflect relatively benign conditions and therefore encourage this approach to pit closure.

Impact plots have been prepared by AGE for mining year 21. Figure 4 shows the predicted drawdowns specifically calculated for Maules Creek project and excluding Boggabri and Tarrawonga coal projects. That is, the cumulative drawdown impacts from all mines are not represented. Only the 1 m drawdown contour is presented for cumulative assessment purposes¹². This contour is shown on Figure 4 as the green 1m contour.

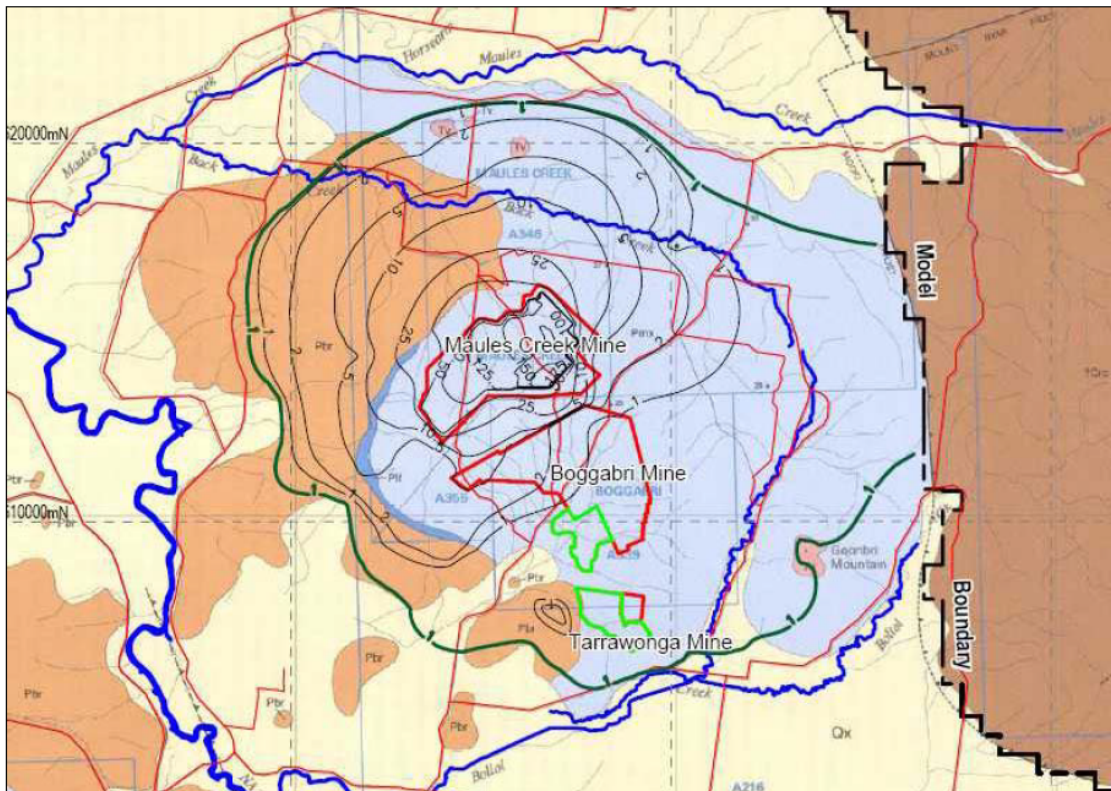


Figure 4: Cumulative extent of groundwater depressurisation at the completion of mining

PAC Additional questions in relation to regional impacts

While the reported impacts of proposed mining on regional groundwater systems are assessed to be largely contained within the Permian coal measures and volcanics, it is considered important to understand the impacts on surface drainage systems by examining the predicted changes to baseflows. Accordingly, a number of questions were asked of the proponent in relation to the additional groundwater flow modelling and the predicted outcomes. Specifically, baseflow changes were requested for seven stream reaches in the area. These flows were extracted by the proponent from the Version 2 model output and subsequently reported¹³. Table 1 provides a useful summary and is represented below.

¹¹ RGS 2011 – Appendix N in EA, Page 25

¹² AGE 2012, Drawings 10 and 11

¹³ AGE 2012, Table 1 and Appendix 1

Table 1: Summary of river and creek flow loss due to mining

Zone	Total Cumulative Loss over 21 Years	Proportion of Cumulative Loss over 21 Years	
		Boggabri Project	Maules Creek Project
D1 - Back Creek in Permian Ridge area	0	0	0
D2 - Back Creek traversing the alluvial aquifer	0	0	0
D3 - Maules Creek from Namoi River to Back Creek	23.4	3.6	19.8
D4 - Namoi River – Bollol Creek to Maules Creek confluences	377.4	58.6	318.8
D5 - Upper Goonbri to Bollol Creek confluence	0	0	0
D6 - Bollol / Namoi confluence to Goonbri Creek	56.7	6.5	50.2
Totals	457.5	68.7	388.8

Results indicate no change to baseflows in drainage systems traversing the Permian coal measures and volcanics, and some elevated parts of the alluvial lands (largely because they are reported as ephemeral). Negligible change to baseflows is predicted in drainages systems hosted within the alluvial lands. Highest losses attributed to the Maules Creek project are apparently associated with the D4 reach of the Namoi River. These losses are identified as 318.8 ML over the term of 21 years or about 15.2ML/year. Summating all losses attributed to the Maules Creek project:

$$\begin{aligned} \text{Leakage or recharge losses to alluvial aquifers} &= 128.0 \\ \text{Total baseflow losses to surface drainage systems} &= 18.5 \\ \text{Total groundwater losses} &= 146.5 \text{ ML/year} \end{aligned}$$

I consider these findings to be consistent with expected outcomes. In respect of constraints imposed by the Water Sharing Plan, the proponent has indicated that these losses are likely to be offset through the acquisition of existing licences in the same region.

Recommended conditions

In addition to any considerations by NSW Planning and Infrastructure, it is recommended that:

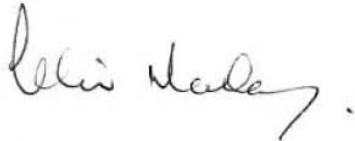
- The proposed 17 additional monitoring bores¹⁴ be equipped with water level or pore pressure monitoring transducers installed at vertical separations such that the future impacts of strata depressurisation can be adequately measured and mapped;
- Core tests be conducted to assess the distribution and variability of hydraulic conductivities of (unfractured) interburden at a sufficient number of bore locations to quantify porous groundwater flow and storage contributions associated with interburden;
- XRD-XRF analyses be undertaken on core samples obtained at a sufficient number of bore locations to establish the mineralogy of interburden likely to be exposed to pit re-saturation;
- Hydrochemical modelling be undertaken in order to determine the long term void water quality. This study should include batch reaction (full saturation) trials on waste interburden (spoils) to confirm hydrochemical modelling outcomes;
- Reject materials or any potentially acid forming interburden materials must not be emplaced outside the pit shell or at elevations within the pit shell that are likely to promote acid or sulphate species generation and migration of such leachate beyond the pit shell at any future time;

¹⁴ AGE 2011 – Appendix M in EA, Page 79 Table 17

- Any coal barrier between the pit shell and any future surrounding mining operations must remain intact in order to impede exchange of any contained groundwaters in the Maules Creek pit shell;
- A mine closure plan should be prepared prior to mining year 14 (at least 7 years before closure). An important part of this plan must address future stability of the proposed landform, long term groundwater recovery and void water quality characteristics to the satisfaction of the Director General. In particular the long term landform should not generate a pit (void) lake or salt scalding. Emplaced spoils should have a capacity to drain to the natural catchment and drained waters must not adversely impact upon the downstream environment. The hydrochemistry, hydrogeology and hydrology components of the mine closure plan must be subject to independent review and verification.

Yours sincerely

Mackie Environmental Research Pty. Ltd.



Dr. C. Mackie

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Australian Groundwater and Environmental Consultants P/L. (AGE), 2011. Maules Creek Coal Project – Groundwater Impact Assessment.

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Appendix D – Emeritus Professor Galvin’s Expert Advice on the Mine Plan

Galvin and Associates Pty Ltd

ABN 27 086 258 871

10 March 2012

Ms G Kibble AO
Chair
Planning Assessment Commission
GPO Box 3415
Sydney NSW 2001

Dear Gabrielle

Subject: Review of the Maules Creek Coal Project

I refer to your request of 15 November 2011 to review aspects of the EA for the Maules Creek Coal Project, specifically in respect of the Minister's terms of reference to *assess the merits of the mine plan, paying particular attention to the proposed final void and future rehabilitation of the project*. You also requested that I consider the underground versus open cut mining issue raised in submissions and whether there are any principles that might be used to consider the appropriateness of open cut mining compared to underground mining.

My advice is based on the following select material provided by the Commission Secretariat:

- Main Report: Maules Creek Coal Project EA, July 2011
- Appendix B – Mine Justification: Maules Creek Coal Project EA, July 2011
- Appendix N - Geochemical Assessment: Maules Creek Coal Project EA, July 2011
- Appendix Q - Economic Impact Assessment: Maules Creek Coal Project EA, July 2011
- Maules Creek Community Council Letter, dated 16 September 2011, addressed to Minister Hazzard re Aston Resources EA – Lack of an Underground Mining Option.

Subsequently, Mackie Environmental Research Pty Ltd was engaged by the Planning Assessment Commission (PAC) to assist in responding to your request. This prompted additional questions of the Proponent in regards to groundwater. Therefore, my advice is premised also on discussions with Dr Mackie and on the responses to his questions contained in the following document:

- Maules Creek and Boggabri Coal Mine Proposals: Responses to Groundwater Modelling Questions from the NSW Planning and Assessment Commission. Hansen Bailey Pty Ltd. 16 January 2012.

The Maules Creek Coal Project is not described in my review, having been adequately described in the EA. In reviewing the proposal, regard has been had to what community expectations and environmental best practice standards might be at the time of mine closure in years to come.

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Project Context

Maules Creek coal mine is currently approved under DA 85/1819 to produce up to 9 million tonnes per annum (Mtpa) of product coal by surface mining down to the Braymont Seam and thence by underground mining down to the Lower Northan coal seam. To date, major development has been limited to the construction of a surface dam, with mining yet to commence.

The new development application seeks to extract 15 seams down to and including the Templemore Seam, some five seams below the Lower Northan seam. The seams split into a number of individual plies, variously reported in the EA to number 39 and 51. A number of mining options were assessed in deciding to extract all seams by open cut mining.

The initial excavation, known as a *box cut*, in an open cut coal mine is concerned with exposing the seams by removing the top soil and overburden. In the early years of operation, the overburden from the box cut and subsequent mining operations has to be disposed of out of the pit, in a surface dump referred to in the Maules Creek Coal Project (MCCP) EA as an *Overburden Emplacement Area (OEA)*. Once mining has progressed some distance, a greater proportion of the overburden can be disposed of by backfilling areas from which coal seams have already been extracted. Ultimately, this can result in a large void remaining at the site where mining operations finally cease.

Matters for which the new Development Application seeks approval include:

- a further 21 years of operation;
- an increase in mining depth down to the Templemore Seam;
- an increase in coal production to 13 Mtpa;

Features of this development would include:

- an out-of-pit OEA constructed to a maximum RL of 430 (reduced ground level of 430m);
- leaving of a void when mining operations cease at the expiration of the 21 year approval period.

Because the approval period is defined by administrative requirements and not by coal reserves or economic considerations, there is potential for coal mining to continue beyond 21 years. This has implications for the size and shape of the final void that may ultimately be formed.

Surface -v- Underground Mining

One of the mining options evaluated by the Proponent involved utilising underground mining methods to extract down to the same depth as that of the proposed open cut mine. The evaluation was based on a conceptual study commissioned by the Proponent. The underground mining option was evaluated in an attempt to reduce surface disturbance and the resulting impacts on Critically Endangered Ecological Communities (CEECs).

The conceptual study was undertaken by Minarco Mine Consult, a company with specialist skills, knowledge and experience in mine planning studies. Consistent with studies of this nature, it has a reported accuracy of $\pm 35\%$. The major objectives of the Study were to compare open cut and underground mining at Maules Creek on the basis of:

- resource utilisation - % coal resources recovered;
- environmental impact - primarily land disturbance;
- project value - i.e. Net Present Value (NPV) analysis;
- risk - level of confidence in both methods.

In relation to the alternative mining options for the project, the Maules Creek Community Council (MCCC) has requested that:

- *Underground Mining studies to the standard produced by Boggabri Coal in their EA be completed and released.*
- *Cost Benefit Economic analysis that compares the underground and open cut mining methodologies be prepared that outlines Net Benefit by stakeholder.*
- *The alternative underground mining report should provide an assessment of the benefits to the community and the environment of not disturbing the environment and fragmenting the community. These benefits have not been properly considered in the underground mining report as an economic and social assessment has not been undertaken.*
- *Department of Planning consider the alternatives from the perspective of the NSW and local communities.*

The MCCC commissioned Economists at Large Pty Ltd to undertake an Underground Mining Cost Benefit Analysis for the adjacent Boggabri Coal Project. Based on figures taken from the EA for this project, the MCCC has concluded that the Underground Mining Option is more profitable in Australia and that, *without evidence to the contrary, we believe that the Aston Mine Underground Option is likely to be more profitable and less destructive as well.*

The criteria applied in the conceptual study to identify coal seams for extraction by underground mining were that workings sections must:

- be a minimum of 2.0 m thick;
- not include more than 0.3 m of parting (waste) material between adjacent aggregated coal plies;
- be sufficiently continuous and laterally extensive; and
- be separated by a vertical interburden distance of not less than 50 m.

The reserve estimates were based on a maximum working height of 3.25 m. This is considerably less than the capability of modern longwall mining technology. Furthermore, there are many instances where adjacent seams have been successfully extracted by longwall mining at a parting thickness less than 50 m. The conceptual study does not provide the basis for selecting these criteria.

The study concluded that the Braymont, Merriown and Tarrawonga seam groups have potential for longwall mining. It also concluded that whilst:

the Merriown working section is continuous over approximately half of the area of interest, it is important to note that, in general, it is less than 50 m below the Braymont floor. Whilst its close proximity to Braymont does not exclude it from mining activities, the fact that it exists over half of the area of interest, in combination with the lack of geotechnical analysis or gas characterisation for this area, means that the risks associated with including this working section as a target for underground mining outweigh the potential benefits.

The Tarrawonga Seam was also excluded on the basis of the small reserves available for longwall mining. In my opinion, the exclusion of these two seams is reasonable given that the coal reserve within them is very likely too small to justify the cost of gaining access to the seams.

Other relevant aspects relating to the underground mining option include:

- There is an apparent absence of geotechnical information on which to base an underground mine design, with no allowance having been made in the conceptual mine layout for some critical geotechnical factors, such as the direction of horizontal stress. Hence, reserve estimates are likely to be an upper bound.
- Additional risk factors were identified in the conceptual study relating to:
 - Adequacy of depth of cover.
 - Dip of the seams.
 - Safety.
- Annual underground production is only 3.8 Mtpa as compared to 13 Mtpa for the surface mining option.
- Underground mineable reserves are only 28 million tonnes as compared to 313 million tonnes for open cut mining options. Thus,
- The underground mining option only has a life of 10 years, as compared to +21 years for the surface mining option.
- Simultaneous extraction of multiple seams by surface mining methods enables blending to produce a range of marketable coal products. Extraction of one underground seam removes this flexibility.
- The underground mining option is estimated to have a Net Present Value (NPV) at an 8% discount rate of \$0.4 billion as compared to \$5.7 billion for the surface mining option.

The financial outcomes are not surprising given the large number of seams and huge reserves available for surface mining. At best, underground mining is only likely to extract some 60% of the overall reserves from no more than 4 of the 15 seams available for extraction. Against this background, it is very unlikely that more relaxed criteria in selecting seams for extraction by underground mining would significantly change mining option decisions when based on financial outcomes. The difference in the number of seams to be mined in the Maules Creek Project (15) as compared to the Boggabri Coal Project (6) also results in significantly different financial analysis outcomes. Ultimately, decision making reduces to a comparative consideration of environmental and economic impacts. Table 1 summarises these for the conceptual study.

Against this background, it is my advice that in terms of economics and financial risk, the benefits of surface mining considerably outweigh those of underground mining. (Comment on the consequences of surface mining for CEECs falls outside my areas of expertise.)

Table 1: Minarco-Mine Consult Conclusions from Conceptual Underground Study

Issue		Open Cut	Underground
Environmental Impacts	Land Disturbance and Clearing	Significant Impact	-
	Hydrology and Flow Redirection	Groundwater lowering and depressurisation will occur	Groundwater lowering and depressurisation will occur
	Dust Emissions	-	Rate and total emission of dust negligible in comparison to open cut
	Noise, Blasting and Vibrations	Increased noise emissions	-
	Visual and Landscape	Significant although localised	-
	Community Impacts and Amenity	Greater potential viewshed and zone of affectation	-
	Water Management	Differences in water balances between open cut and underground	Differences in water balances between open cut and underground
Risk		-	Inherently more risky
Project Value	Resource Utilisation	>90%	~10%
	NPV - 8% DR*	\$5.728 billion	\$0.388 billion
	NPV - 10% DR	\$4.606 billion	\$0.297 billion
	NPV - 12% DR	\$3.765 billion	\$0.222 billion

*Discount rate

Mine Plan

Three stages of mine planning were selected for modelling in the EA on the basis that they represent a combination of mining at the extremities of the Project mine life and the greatest intensities of mining. Mine planning has utilised a range of well accepted contemporary computer software packages. This is essential as simultaneously extracting 15 seams requires diligent sequencing and scheduling of multiple overburden removal and coal extraction operations to ensure that coal of the correct quality is always available for extraction. A range of specialist consultants were engaged in undertaking the mine planning and a number of mine options were evaluated. The Proponent had the selected mine plan reviewed for

compatibility with coal reserve estimates by an external third party, who considered it to be technically achievable and viable.

Features of the mine plan are stated to include:

- utilising natural topography when positioning facilities and disposal of wastes;
- maximising coal recovery by mining the full coal sequence to the basement;
- maximising in-pit dumping effectively and minimising surface waste dumping;
- minimal land disturbance footprint.

Based on this information and my knowledge and experience, it is my advice that:

1. The general layout for the mine is appropriate.
2. Should the project be approved, any further modifications to the overall mine layout required to safeguard environment values should be able to be addressed effectively through the various environmental and mining operational management plans associated with approval conditions.

Overburden Emplacement Area

The application seeks to construct a so-called Northern Overburden Emplacement Area (NOEA). Six locations and footprints were investigated with a view to:

- minimising the amount of CEEC to be disturbed;
- minimising property acquisitions;
- minimising volumes of material to be emplaced within the NOEA;
- restricting overall height of the NOEA to within 50m of the surrounding terrain;
- utilising existing water management structures.

The selected option impacts 137 ha of CEEC, one hectare more than the option with the least footprint, and sterilises 3.6 million tonnes of underlying coal. Between 18% and 54% of overburden per annum will still be disposed of in-pit up to Year 10, after which all waste is scheduled to be dumped in-pit. The NOEA is to be progressively rehabilitated such that the area is largely rehabilitated by Year 15, with final slopes generally designed to 10 degrees. The EA reports that the only exceptions will be the western and southern faces, which will remain at 37 degrees until mining operations cease, when they will then be shaped down to 10 degrees as part of the final rehabilitation process. In the interim, temporary rehabilitation is to be undertaken on these faces to minimise windblown dust and to reduce visual effects. Residual visual impacts, classified as moderate to low in the EA, will remain for some residences when the NOEA is in a rehabilitated state.

Overburden materials at the Project have been assessed to have negligible (<0.1%) total sulphur and are classified therefore as Non Acid Forming barren. It is stated that the overburden also appears to have excess acid buffering capacity typical of a moderate Acid Neutralising Capacity value. Overburden materials are also predicted to be non sodic (and as such non dispersive) and may be suitable for revegetation and rehabilitation activities.

Most potential coal reject materials are classified as Non Acid Forming. A small proportion of the potential coal reject materials located near the Braymont, Fixton, Herndale and Onavale seams (roof and floor samples) have a relatively high total sulphur content and negligible buffering capacity and are classified as Potentially Acid Forming - High Capacity (PAF-HC). It is claimed that most Non Acid Forming potential coal reject materials will generate slightly alkaline and relatively low salinity runoff and seepage following surface exposure. However, it is recognised that PAF coal reject materials may generate acidic and more saline runoff and seepage if exposed to oxidising conditions.

I have consulted with Dr Mackie regarding the potential for leaching, leachate properties and disposal methodologies for potential acid forming (PAF) materials disposed of in the OEAs and agree with, and defer to, his advice and recommendations in these regards.

Against this background, it is my advice that:

1. Provided Dr Mackie's recommendations are enacted and commitments given in the EA are honoured (having regard to refinements arising from Dr Mackie's advice), experience confirms that the NOEA is very unlikely to present an unacceptable risk to environmental values.
2. The various environmental and mining operational management plans associated with any Approval Conditions should include provisions for monitoring compliance with commitments given in the EA regarding:
 - a. the location, footprint, timing, and height of construction of the NOEA; and
 - b. the progressive rehabilitation of the NOEA.

Final Landform Including Void

Nine soil types were identified, of which seven are suitable as top dressing material. Selective stripping is proposed to ensure that the higher quality soils are not mixed with the lower quality soils. All areas which are not proposed to be disturbed by mining are to retain the same land capability as the pre mining class. No Class 2 land is proposed to be disturbed by the Project and a commitment has been given that following cessation of mining and completion of rehabilitation, all disturbed areas are to be returned to a combination of Class 3, 4 and 5 land. It is claimed that *Overall the percentage of each class of agricultural suitability will remain relatively similar to that of the existing environment.*

A conceptual final landform design has been developed in the event that an approval for the continuation of mining beyond the 21 Year Mining Limit is not sought or granted. The EA states that the conceptual final landform design *indicates the presence of a lower lying area in the eastern extent of the mine plan.* This so-called *lower lying area* constitutes the final void created by the mining operation. To ensure long term stability and sustainability, the slopes of the final landform within the mine disturbance area are planned to have a final landform slope of 10 degrees. It is proposed to rehabilitate all mine areas *except for the final void which will be shaped appropriately.*¹ Features related to the final void include:

- *The final void will have a catchment area of approximately 887 ha with an approximate surface area of 170 ha.*²
- *In the event that open cut or highwall mining does not proceed beyond this point [21 years], the final void will be blasted to a slope of approximately 37 degrees*

¹ Main Report, page 175

² *ibid*

*to ensure that the land form is safe, stable, non erosive and re-vegetated as is practical.*³

- *The model indicates that should mining cease at Year 21, the final void water level will rise quickly to a depth of about 160 m Australian Height Datum. The final steady state water level of about 200 m Australian Height Datum will not be reached until 300 to 400 years following cessation of mining operations. The steady state water level is more than 100 m below the overflow level of about 340 m Australian Height Datum and as such, water will not spill from the Final Void.*⁴
- *...the void will gradually fill to form a lake from rainfall and groundwater inflows until it reaches a stable water level;*⁵
- *As the ground water gradient between the open void and the coal seam aquifers reduces, the rate of inflow would decrease until a 'quasi' equilibrium is reached.*
- *As the lake surface is exposed, recovery is likely to be impeded by the effects of evaporation and would be expected to reach equilibrium conditions at a lower than pre mining potentiometric surface elevation.*
- *This will result in the groundwater levels reaching equilibrium conditions of approximately Reduced Level 225 m after about 1000 years of pit lake recovery, indicating that the final void will remain a sink to local groundwater flow.*⁶
- *Catchment areas that are not free draining will report to the final void, as will any discharge from disturbed areas.*⁷
- *The final void will also be screened with native vegetation and fenced for public safety.*⁸
- *Should a further Project Approval be granted in the future for mining to continue, the proposed final void would be significantly reduced in size and potentially could be rehabilitated with limited void remaining in the landscape.*⁹
- *Further refinement to the conceptual final landform may occur during the preparation of the Mining Operations Plan for the Project. This will allow the landform to be blended with neighbouring mining projects as the operations progress. Should further approvals for the continuation of mining be granted, the landform conceptually illustrated within this EA would not be required.*¹⁰

Advice on the impacts that the formation of a lake may have on groundwater fall outside my areas of expertise and I defer to Mr Mackie on this issue.

Against this background, it is my advice that:

1. Provided Dr Mackie's recommendations are enacted and commitments given in the EA are honoured (having regard to refinements arising from Dr Mackie's advice), it

³ *ibid*

⁴ Main Report, page XV

⁵ Main Report, page XVI

⁶ *ibid*

⁷ Main Report, page 177

⁸ *ibid*

⁹ *ibid*

¹⁰ Main Report, page 31

is highly likely that the final landform, including the void, will be safe and stable and blend into the natural environment.

2. The recommendation of Dr Mackie to prepare a mine closure plan prior to mining year 14 should serve as an adequate safeguard for ensuring that the proposed void does satisfy public safety, landform and aesthetic requirements of the day at the time of mine closure.
3. If any Approval Conditions incorporate those EA commitments that have been premised on the phrases '*as is practical*' or '*as far as practical*', performance measures and/or outcomes should be assigned to these commitments.

Barrier Pillar

Maules Creek mine expects to mine up to the southern barrier of this lease between Years 10 and 12. The EA reports that discussions with Idemitsu Boggabri Mine indicate that Boggabri Mine will not reach this boundary until Year 30. The Proponent has stated that it is their intention to develop a barrier pillar agreement with Boggabri Mine within the first five years of operation, with the intent of maximising the coal extracted from this barrier pillar whilst minimising any adjoining void between the two mines.

The matter is not discussed in the EA for Boggabri Mine, presumably because it falls outside the timeframe of that EA. This raises questions as to whether the negotiation of an agreement between the Proponent and Boggabri Mine within 5 years can be assured.

In light of subsequent developments, the issue may turn on matters other than the maximisation of coal extraction. I refer, in particular, to recommendations of PAC in relation to the Boggabri Coal Project and to the advice to PAC of Dr Mackie in relation to the Maules Creek Coal Project.

Should you have any queries arising from this review, please do not hesitate to contact me.

Yours sincerely



Emeritus Professor JM Galvin