

BYLONG COAL PROJECT

Environmental Impact Statement Response to Submissions

March 2016



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Main Report

BYLONG COAL PROJECT

RESPONSE TO SUBMISSIONS

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BYLONG COAL PROJECT
RESPONSE TO SUBMISSIONS
for
WorleyParsons Services Pty Limited

1 INTRODUCTION

This section outlines the status of the Bylong Coal Project (the Project) in the approvals process and explains the purpose and structure of this Response to Submissions (RTS) document.

1.1 BACKGROUND

KEPCO Bylong Australia Pty Limited (KEPCO) owns the Bylong Coal Project (the Project) which is located within the Mid-Western Regional Council (MWRC) Local Government Area (LGA) approximately 55 km to the north-east of Mudgee. The Project involves the construction and operation of a coal mine utilising open cut and underground mining methods to recover up to approximately 6.5 Million tonnes per annum (Mtpa) of Run of Mine (ROM) coal for a period of approximately 25 years.

KEPCO submitted an Application for State Significant Development (SSD) Development Consent under Division 4.1 of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) on 23 July 2015 to facilitate the development of the Project (SSD 14_6367).

KEPCO also submitted a Referral to the Commonwealth Department of the Environment (DoE) for the Project under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 12 February 2014. The Project was determined to be a 'Controlled Action' under the EPBC Act on 12 March 2014. At this time it was confirmed that the EPBC assessment would be undertaken in accordance with the Bilateral Agreement between the Commonwealth and NSW Governments. Following the determination of the Development Consent, the Federal Minister for the Environment will review the Project to confirm whether an 'Approval Decision' can be made under Section 133 of the EPBC Act with or without conditions.

The NSW Department of Planning and the Environment (DP&E) issued the Secretary's Environmental Assessment Requirements (SEARs) for the Project on 23 June 2014 which consolidated responses from the Mining and Petroleum Gateway Panel (Gateway Panel) and other State and Federal regulators. Minor amendments were made to the SEARs on 11 November 2014.

The *Bylong Coal Project Environmental Impact Statement* (EIS) (Hansen Bailey, 2015) was prepared in accordance with the SEARs and deemed adequate for public exhibition and was subsequently placed on public exhibition between 23 September 2015 and 6 November 2015.

A total of 383 submissions were received by DP&E during the public exhibition of the EIS. Further details on the submissions are described in **Section 2**.

1.2 DOCUMENT PURPOSE

This RTS has been prepared by Hansen Bailey Environmental Consultants (Hansen Bailey) on behalf of KEPCO to support SSD 14_6367 under section 78A(8A) of the EP&A Act. The document responds to the issues raised in submissions by stakeholders during the public exhibition period.

1.3 DOCUMENT STRUCTURE

This RTS is structured as follows:

- **Section 2** outlines the submissions received from stakeholders;
- **Section 3** provides a summary of the supporting submissions received from the public;
- **Section 4** provides comprehensive responses to the issues raised by regulatory agencies;
- **Section 5** provides comprehensive responses to the issues raised by Special Interest Groups (SIGs), organisations and private stakeholders;
- **Section 6** provides a consolidated list of any additional primary commitments made in this RTS;
- **Section 7** lists the abbreviations utilised in this RTS; and
- **Section 8** outlines all materials referenced within this RTS.

Appendix A provides a matrix identifying the stakeholders who made submissions over the EIS and denotes the relevant environmental or socio-economic issue raised by the stakeholder. A response to each issue is provided in **Sections 4** and **5**. Each stakeholder has been assigned a stakeholder reference number which is referenced throughout the responses.

Technical specialists involved in the preparation of the EIS have provided additional expert advice during the preparation of this RTS. Where applicable and as referenced, this RTS should be read in conjunction with **Appendix A** to **Appendix N**, which provides additional detailed technical information.

2 STAKEHOLDERS AND SUBMISSIONS RECEIVED

DP&E provided a total of 383 submissions to KEPCO from various stakeholders, including: 18 regulatory agencies, 27 SIGs, eight organisations and 330 individual stakeholders.

The 330 submissions were received from 309 individuals, as 21 submissions were considered duplicates as advised by DP&E. Of these, 168 were comprised of forms letters with the remainder being unique submissions.

Twelve submissions were received in support of the Project, including 11 submissions from 10 individuals and one submission from an organisation. A summary of the supporting submissions is provided in **Section 3**.

A list of the stakeholders who provided submissions is presented below in the order that these were provided to the proponent by DP&E.

2.1 REGULATORY AGENCIES

The following regulatory agencies provided a submission in relation to the Project EIS:

- Australian Rail Track Corporation (ARTC);
- MWRC;
- NSW Department of Industry – Division of Resources and Energy (DRE);
- NSW Department of Primary Industries – Water (DPI Water);
- NSW Department of Primary Industries – Lands (DPI Lands);
- NSW Department of Primary Industries – Fisheries (DPI Fisheries);
- NSW Department of Primary Industries – Agriculture (DPI Agriculture);
- NSW Environment Protection Authority (EPA);
- NSW Rural Fire Service (NRFS);
- Forestry Corporation of NSW (FCNSW);
- Office of Environment and Heritage (OEH);
- Heritage Council of NSW (Heritage Council);
- Roads and Maritime Services (RMS);
- Independent Expert Scientific Committee (IESC);
- Transport for NSW; and
- NSW Department of Health (NSW Health).

A response to each of the issues identified by the above mentioned submissions is provided in **Section 4**.

DP&E engaged independent Groundwater and Economics Peer Reviews. These reviews were undertaken by Kalf and Associates and The Centre for International Economics (CIE). Any issues raised in these reviews are also addressed within **Section 4**.

It is noted that a late submission was received from the Muswellbrook Shire Council (MSC) on 16 March 2016. A response to this submission will be forthcoming in the near future.

2.2 SPECIAL INTEREST GROUPS

The following SIGs provided a submission in relation to the Project EIS:

- Blue Mountains Conservation Society Inc.;
- Capertee Valley Alliance Inc.;
- Central West Environment Council;
- Climate Change Australia – Hastings Branch;
- Coombadri Ecclesia Society, Sandy Hollow;
- Correct Planning and Consultation for Mayfield Group;
- Denman, Aberdeen, Muswellbrook and Scone Healthy Environment Group;
- Hunter Communities Network;
- Hunter Environment Lobby Inc.;
- Hunter Thoroughbred Breeders Association;
- Lock the Gate Alliance;
- Merriwa Healthy Environment Group;
- Mudgee District Environment Group;
- Nature Conservation Council;
- Newcastle Public Health Professionals, Redhead;
- NSW Farmers Association;
- Orange Field Naturalist and Conservation Society;
- Running Stream Water Users Association, Kandos;
- Ryde-Hunter's Hill Flora and Fauna Preservation Society;
- Rylstone District Environment Society;
- Anglican Diocese of Bathurst Parish of Rylstone - Kandos;
- Stop Coal Seam Gas Blue Mountains, Springwood;
- The Australian Institute;
- Wollar Progress Association;
- Bathurst Community Climate Action Network;
- Birdlife Australia; and
- Bylong Valley Protection Alliance (BVPA).

2.3 ORGANISATIONS

The following organisations (some of which represent local landholders) provided a submission in relation to the Project EIS:

- Peabody Energy Wilpinjong Coal Mine;
- Barrett Industry Consulting;
- Brocman Eco-Consulting
- Carleon Mudgee Pty Ltd;
- Murrumbo Station;
- Nexus Law Group on behalf of Locaway Pty Ltd;
- Timnath Pty Ltd – Budden Property (including DVD containing video of interview with Mr Cook, property manager); and
- Glencore Ulan Coal Mine.

2.4 PRIVATE STAKEHOLDERS

A total of 330 submissions were received from 309 private stakeholders in relation to the Project EIS. This includes 90 submissions received from stakeholders associated with the 'Battle for Bylong' campaign and 78 submissions received from stakeholders associated with the BVPA. The majority of these submissions were in the format of a standard form letter.

Further information regarding the submissions received and the broader approvals process for the Project can be found on the DP&E website:

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=6367.

3 SUPPORTING PUBLIC SUBMISSIONS

There were 12 individual submissions received in support of the Project. Supporting public submissions were received from both within (58%) and outside (42%) of the MWRC LGA, where the Project impacts will be discernible and a significant proportion of the socio-economic benefits will occur.

Individual community supporters of the Project have stated reasons why the Project should be approved, however there are several common themes throughout the submissions, which can be summarised as follows:

- The Project will provide for a source of future direct and indirect employment and wider diversity of business and industry opportunities;
- The Project will provide ongoing material socio-economic benefits to the local community;
- Recognition of the importance of the industry attracting and retaining people to live and raise their families in the region, which then generates demand and support for local businesses and other key community services such as schools, health care providers, etc.;
- The Project will provide economic growth in the region and NSW more generally, including tangible economic benefits through the provision of taxes and royalties to the NSW Government, as well as from locally sourced consumables;
- The need for thermal coal whilst the market place transitions from a coal dependent electricity production to alternate sources;
- The economic value from the flow on of goods traded with Australia and utilised by Australians, and the importance of the 'Trade Agreement' with South Korea;
- The Project is vital to keep Kandos and Rylstone alive which are currently suffering from previous job losses;
- The Project already provides community funding and donations to local charities and community based projects;
- Mining and agriculture can work together; and
- A tarred road (referring to Wollar Road upgrade) will be an asset to Rylstone and Kandos.

Whilst some submissions described general support for the development of the Project, there are a few submissions that outline quite specific supporting messages regarding the Project. A few examples of such messages are provided below.

- *"The oversight and compliance requirements by government will ensure that the Bylong Project will be developed in a sensible and sensitive manner. I am personally aware of many of the consultants used by the proponent and have the highest respect for these organisations (and individuals) – MSEC, SCT, RGS, DP etc. These organisations have high ethical and technical standards and their work add to the overall credibility of the project."* (P18)

- *"The Kores use supercritical coal fired power stations that are efficient and produce low levels of atmospheric pollutants." (P19 and P20)*
- *"The coal is being used to power the economy of our largest trading partners.....KEPCO's ultra-supercritical power stations use the latest advance emissions control technology and are therefore some of the cleanest in the world" (P20)*
- *"Australia and the world needs coal, to sustain our standard of living, to supply reliable base load power and contribute to the resolution of energy poverty. I am a supporter of renewable energy, however at this point, these sources are not able to economically or reliably meet our needs.*

KEPCO is a leader in power generation, with their stations using the latest advanced emissions control technology, to ensure that the generation of power is leading practice. There are economic benefits this mine will have on the Australian economy, such as local wages and salaries, state and national taxes and royalties and locally sourced consumables from the established suppliers already in the Mudgee region. Recent agreements between the Australian government and the Korean government will have significant benefits for all Australians. This coal mine will only strength these bonds. I look forward to a sensible outcome regarding the Bylong Project, and the positive impacts this mine will have on the community on a regional, state and national scale."
(P2)

- *"For the state of NSW to continue to grow and develop infrastructure there is a need for governments to promote and nurture industries which generate significant revenue streams for government and provide employment opportunities for its peoples." (P158)*
- *"I think that the proposed mine will bring about a new phase of this cycle seen in many rural communities (even those without the prospect of exploration and mining). There will be workers with families who choose to live in Mudgee, and there will be those like mine who prefer a rural setting.
KEPCO's proposal will bring money and jobs to an area that desperately needs a boost."*
(P206)
- *I believe the regulations imposed by the government on KEPCO Project is sufficient in the protection of water and environment. I can only see the KEPCO project as an advantage to the district providing they abide by the conditions set down by the DP&E."*
(P225)

4 REGULATORY SUBMISSIONS

This section responds to the submissions received from regulatory authorities.

*A response to each of the issues identified by the above mentioned submissions is provided below. Each regulatory agency listed in **Section 2.1** has been assigned a reference number, commencing with RA. A summary of the issues raised by each regulator is outlined in **Appendix A**.*

4.1 AUSTRALIAN RAIL TRACK CORPORATION – RA1

4.1.1 Train Movements

Issue

ARTC advises that the proponent has initiated reviews with ARTC and will be required to undertake and submit modeling and any relevant changes to ARTC to determine the impacts on the overall operations of the Hunter Valley rail network particularly resulting from the proposed Mine development.

Response

Noted. KEPCO has been in ongoing consultation with ARTC throughout the planning and design stage of the Project in light of rail access being an integral component of the Project. As part of these consultations various modelling results have been provided to ARTC for their consideration of how the Project's demand is able to be satisfied on the existing Sandy Hollow to Gulgong Railway line.

Since the receipt of this submission, ARTC has completed a separate analysis using an assumed 8,428 net tonne train, with a current 88 wagon train at 98% loading, which is the smallest of the units servicing the Sandy Hollow to Gulgong Railway Line and would have the greatest impact on the lines capacity. ARTCs analysis concluded that the use of this train size would equate to an average of 1.1 round trips per day, or 2.2 trains per day. **Appendix B** provides a copy of a letter from ARTC dated 27 January 2016 confirming the results of this modelling.

KEPCO will continue to liaise with ARTC and commission any further required train path modelling requested.

4.1.2 Rail Noise

Issue

The proponent should assess any additional train movements on ARTC's network in accordance with the Rail Infrastructure Noise guideline.

Response

Noted. Section 8 of the Noise and Blasting Impact Assessment (NBIA) (Appendix Q of the EIS) provides the assessment of noise from Project-related train movements on the ARTC network in accordance with the Rail Infrastructure Noise Guideline.

This assessment indicated that rail movements caused by the Project is predicted to increase noise levels at receivers along the Bylong to Mangoola and Bengalla to Muswellbrook sections of the track. The rail noise assessment considered the impact of Project-related movements with both existing movements and existing and approved movements.

The assessment concluded that up to three additional receivers are predicted to be impacted on the Bylong to Mangoola section as a result of the Project compared with existing movements and up to four additional receivers when compared to existing and approved movements. Further, up to four additional receivers are predicted to be impacted on the Bengalla to Muswellbrook section as a result of the Project when compared with existing movements. No additional receivers will be impacted by the Project-related movements on the Bengalla to Muswellbrook section when compared to the existing and approved movements.

The requirement and provision for mitigation measures is not generally borne from one user of the track and would be subject to further investigation and consideration by ARTC.

4.2 MID-WESTERN REGIONAL COUNCIL – RA2

4.2.1 Justification for WAF and No WAF Scenarios

Issue

During the course of the past 12 months Council have met with the proponent on a number of occasions to receive an update in terms of the Bylong Coal Project to the extent that the Council had a reasonable understanding of the scope, scale and scheduling of the proposed project. This was served as a useful background in approaching the review of the final EIS documents. There has been a consistent message from Council to the proponent and that is there is no support for a Temporary Workers Accommodation facility (TWA) (it is noted that the EIS refers to a Workers Accommodation Facility, however, to maintain consistency with Council's planning instruments this use will be herein referred to as a TWA). This will be possible as it is Council's intention to complete a full seal upgrade of the Wollar –Bylong Road underfunding received from the NSW Government's Royalties for Regional Program. As a result of this upgrade the commute to Mudgee and Rylstone will be less than one hour.

In light of the above MWRC require that the traffic impact, economic and social impact assessments be updated to include a scenario where there is no TWA.

This submission is concerned with the Workforce Accommodation Facility (WAF) and in particular the requirement for an assessment of the traffic, economic and social impacts associated with the exclusion of a WAF from the Project. MWRC seeks further justification for the inclusion of a WAF in the Project.

Response

The Social Impact Assessment (SIA) (Appendix AC of the EIS) described the potential social impacts of the Project under the following three workforce accommodation scenarios, in which varying proportions of the workforce are accommodated in the Workforce Accommodation Facility (WAF) and in the Local Area (that is the geographical area within a one hour commute of the Project site):

- Scenario 1 (base case scenario) - The WAF operates from Project Year (PY) 1 to the end of underground construction in approximately PY 6;
- Scenario 2 - The WAF operates for Construction Phase 1 (PYs 1 and 2) only; and
- Scenario 3 - The WAF operates for the life of the Project and accommodates all non-local hires (NLHs).

Given the concern raised by stakeholders in relation to the inclusion of the WAF in the Project, Hansen Bailey has assessed the social, traffic and economic impacts of the Project under an additional scenario:

- Scenario 4 - There is no WAF provided for the Project and all employees across all phases of the Project, over the life of the Project are accommodated in the Local Area (i.e. within a one hour commute of the Project site).

A key assumption in defining the Local Area for scenarios 1 to 3 is that the remaining section of Wollar Road which is currently gravel sealed will be upgraded to bitumen seal before the end of PY 1. Scenario 4 requires the upgrade to be completed prior to PY 1. This assessment is predominantly applicable to Construction Phase 1 and Construction Phase 2 of the Project, as the base case accommodation scenario assessed in the EIS assumes that 100% of the operations phase workforce will reside permanently in the Local Area. The assessment has also been undertaken using the revised Construction Phase 1 workforce requirements (**Section 4.2.2**).

The outcomes of the further assessment requested by MWRC are described in the following reports:

- **Appendix C** – SIA of No WAF Scenario; and
- **Appendix D** – The Revised Traffic and Transport Impact Assessment (TTIA).

The potential economic impacts assessment with this additional scenario are also considered within this section.

Hansen Bailey has also undertaken a further detailed Workforce Accommodation Study (the Study). The Study provides further evidence in support for the inclusion of a WAF in the Project. The findings of the Study have been used in the assessment of scenario 4. The Study was undertaken in November and December 2015 and included:

- Survey of tourism accommodation providers within the Local Area;

- Survey of real estate agents in communities within the Local Area;
- Targeted consultation with the MWRC; and
- Review of relevant housing market data for the Local Area.

The methodology and findings of the Study are described in **Appendix E**. Further detailed analysis of the Project workforce accommodation demands has been conducted based on the revised Construction Phase 1 workforce numbers (as described in **Section 4.2.2**). The revised accommodation demands predicted for the Project are described in **Appendix C**.

4.2.1.1 Accommodation Availability

Based on the findings of the Study, the following accommodation is available to the Project within the Local Area:

- An estimated 901 rooms of short term accommodation consisting of:
 - 565 rooms in hotels, motels and guesthouses; and
 - 336 rooms in Furnished (F) and Self Contained (SC) accommodation;
- 13 houses in the Bylong Valley owned by KEPCO;
- 8 FSC private rentals with an estimated occupancy of 24 persons, at November 2015; and
- 103 unfurnished (UF) SC private rental properties with an estimated occupancy of 261 persons at November 2015.

It should be noted that a review of historical rental availabilities in the Local Area has indicated that the number of UFSC private rental properties fluctuates significantly throughout the year. The supply of private rental accommodation in Mudgee is currently anticipated to be affected by the demand associated with construction work at Moolarben Mine. In April 2015, when the SIA was being finalised, there were a total of 148 properties available for rent in Mudgee, nine in Rylstone and 15 in Kandos. The current (November 2015) supply of private rental accommodation in Mudgee is equal to an approximate 4% vacancy rate. If this vacancy doubled to 8%, the number of private rental properties in Mudgee is anticipated to be approximately 220.

Further, the *Mudgee and Gulgong Urban Release Strategy* (HillPDA Consulting 2014) suggest an average of 104 lots/dwellings will be required per year to meet demand over the next 20 years. This assessment included consideration of Project operations phase workforce accommodation demand. As these dwellings are approved and developed, it is likely that some of the supply may in turn become investment properties rather than owner occupied, thus the stock of rental accommodation in Mudgee may increase as Construction Phase 1 progresses. When the total supply of accommodation within the Local Area is considered in the context of Project demand, there are sufficient accommodation options to meet workforce accommodation demands for the Project.

However, in reality accommodation availability is affected by a range of factors including:

- Occupancy rates and fluctuations in these rates;
- Willingness on behalf of the proprietor to accommodate mine related workforces and provide accommodation on week-long rosters;
- Suitability of the accommodation; and
- Cumulative demands for accommodation.

KEPCO requires a secure source of accommodation throughout Construction Phase 1 to completely accommodate the Project's temporary construction workforce. KEPCO must avoid the implication of delaying construction as a result of not being able to accommodate its workforce when accommodation availability is affected by low vacancy rates and/or key regional tourism events such as *A Day on the Green* and the *Mudgee Small Farm Field Days*.

The inclusion of a WAF is essentially a risk management strategy for the Project in the event that an adequate supply of suitable accommodation cannot be secured during the peak periods of Construction Phase 1. The WAF will provide accommodation for the construction workforce for the Project in the event that:

- The supply of short term accommodation is adversely affected by regional tourism events (e.g. *A Day on the Green*) and high weekend occupancy rates;
- Cumulative demands from other projects e.g. Wilpinjong Expansion Project impact all forms of short and long term accommodation; or
- The supply of SC private rental accommodation is limited.

4.2.1.2 Findings of the SIA for the No WAF Scenario

The following discussion summarises the key findings of the assessment of the 'no WAF' scenario in relation to housing and accommodation. Further detail is provided in **Appendix C**.

The potential housing and accommodation impacts associated with the absence of a WAF in the Project were predicted based on the findings of the Study (**Appendix E**) and an understanding of the workforce arrangements for the Project. Impacts have been predicted for two sensitivity assessment scenario's in which varying occupancy rates are applied to the supply of accommodation in the Local Area (that is, the geographical area within a one hour commute of the Project site, assuming Wollar Road upgrade completed prior to PY 1). Only NLHs have been considered in the accommodation assessment, as all local hires are assumed to have their own accommodation already secured within the Local Area.

Table 1 shows the number of rooms of accommodation required for the Construction Phase 1 NLHs based on the following key accommodation assumptions:

- All NLHs require a room of accommodation for the duration of their employment on Construction Phase 1;

Table 1
Construction Phase 1 - Accommodation Demand Total Rooms

Accommodation Type	Month 1	Month 6	Month 9	Month 13	Month 17	Month 20
Short term accommodation	15	10	105	10	50	90
Long term accommodation	34	219	372	390	530	351

- Any worker employed for less than three months would be accommodated within hotel, motel, or guesthouse accommodation. This accommodation generally provides for a room with private facilities and limited cooking facilities e.g. microwave. This accommodation is referred to herein as short term accommodation;
- Any worker employed for more than three months would be accommodated in long term accommodation defined as either:
 - Furnished (F) self-contained (SC) accommodation such as rental houses, holiday homes, self-contained cabins in caravan parks etc.; or
 - Unfurnished (UF) SC private accommodation such as properties available on the private rental market e.g. through www.realestate.com;
- All workers are entitled to their own bedroom;
- Technicians and trades workers will be accommodated in FSC share houses e.g. FSC accommodation available on the private rental market, holiday homes, caravan park cabins or apartments;
- A small number of mid-ranked personnel will be accommodated in FSC private rental accommodation or holiday homes. Mid-ranked personnel will not share accommodation. These roles are long term roles with workers anticipated to be employed on the Project for the duration of the 24 month construction phase; and
- Senior personnel will be accommodated in UFSC private rental accommodation. These roles are typically long term roles with workers anticipated to be employed on the Project for the duration of the 24 month construction phase.

Table 1 shows that long term accommodation is likely to experience the greatest demand during Construction Phase 1.

In addition to the direct demand for accommodation generated by the workforce, a float of additional rooms, estimated at 10% of the NLHs workforce, will need to be available for the Project to accommodate any unforeseen accommodation demands (**Table 2**).

Figure 1 summarises the total accommodation demand anticipated to be generated by the Construction Phase 1 NLH workforce for six select construction months.

The potential housing and accommodation impacts of the Project have been assessed using the two Sensitivity Assessment Scenarios described in **Table 3**. Each sensitivity assessment uses a different average occupancy rate across accommodation types.

Table 2
Construction Phase 1 - Accommodation Float

Accommodation Type	Rooms of Accommodation					
	Month 1	Month 6	Month 9	Month 13	Month 17	Month 20
Float (10% of NLH Workforce)	5	23	48	40	58	44

Table 3
Construction Phase 1 - Sensitivity Assessment Scenarios

Sensitivity Assessment	Assumptions
Scenario 1	- An annual average vacancy rate of 25% across identified tourist accommodation located within Mudgee and Rylstone. - An annual average vacancy rate of 50% across identified tourist accommodation located in other areas of the MWRC LGA and those located outside the MWRC LGA. 90% of vacant, private rental accommodation is available for use by the workforce, leaving a very limited supply for other sectors of the community e.g. service industry, medical and teaching staff etc.
Scenario 2	- An annual average vacancy rate of 40% across identified tourist accommodation located within Mudgee and Rylstone. - An annual average vacancy rate of 70% across identified tourist accommodation located in other areas of the MWRC LGA and tourist accommodation located outside the MWRC LGA. 70% of vacant, private rental accommodation is available for use by the workforce, leaving 30% available for other users.

Figure 1
Construction Phase 1 - Workforce Accommodation Demand



4.2.1.3 Short Term Accommodation Demand and Supply

The Project related demand for short term accommodation, and the supply of short term accommodation based Sensitivity Assessment Scenarios 1 and 2 are shown in **Figure 2** and **Figure 3**.

The figures indicate that there is ample short term accommodation located within the Local Area, with an estimated surplus of 61 rooms of accommodation at peak demand (Month 9) under Scenario 1 and 150 rooms of accommodation at peak demand (Month 9) under Scenario 2.

It should be noted that this assessment is based on average occupancy rates and does not consider the fluctuating accommodation demands generated by the tourism industry. Feedback from respondents to the Accommodation Survey indicates that when events such as *A Day on the Green* or the *Small Farm Field Days* are held, occupancy rates are 100%. This would result in no available supply for the Project workforce (which is unacceptable to KEPCO due to the risk associated with the construction phase), or alternatively a shortfall in accommodation for major tourism events in the MWRC LGA.

Figure 2
Project Demand and Regional Supply of Short Term Accommodation
(Sensitivity Assessment Scenario 1)

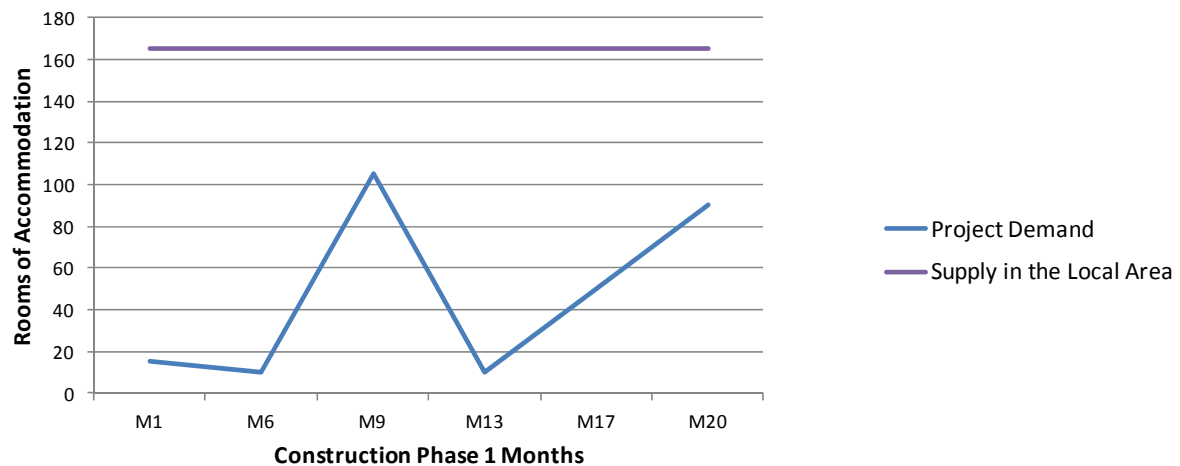
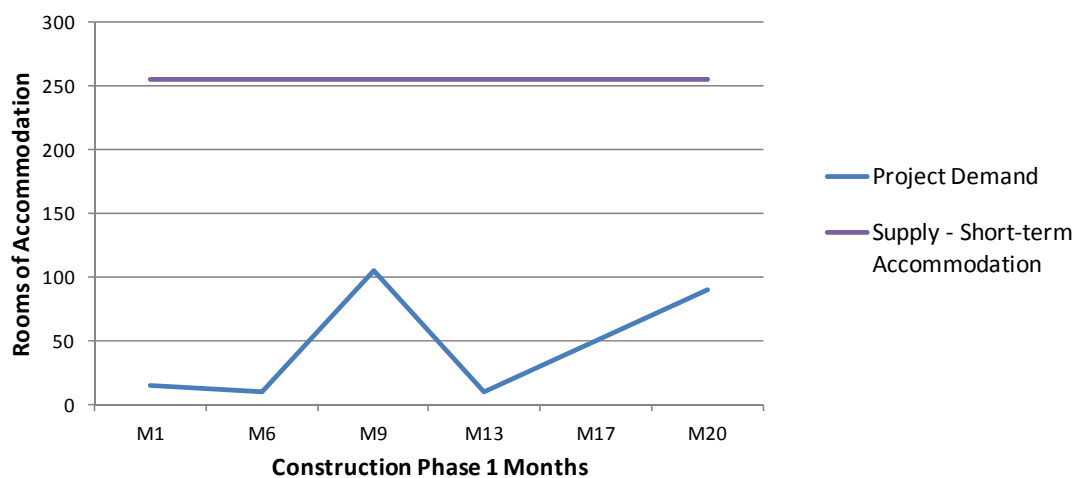


Figure 3
Project Demand and Regional Supply of Short Term Accommodation
(Sensitivity Assessment Scenario 2)



4.2.1.4 Long Term Accommodation Demand and Supply

Table 4 presents the predicted shortfall in long term accommodation supply under Sensitivity Assessment Scenario 1 and Scenario 2. It is important to note that this shortfall includes a 10% float for workforce accommodation and does not take-up the available surplus in short term accommodation. It is not practical for the workforce requiring long term accommodation to reside within short term facilities. The assumed occupancy rate of the dwellings in **Table 4** is three persons per dwelling.

Table 4
Sensitivity Assessment Outcomes - Additional Dwelling Requirements

Sensitivity Assessment	Number of Additional Dwellings Required					
	M1	M6	M9	M13	M17	M20
Scenario 1	0	0	22	32	99	34
Scenario 2	0	0	25	35	102	37

Table 4 shows that at peak construction (Month 17), a total of 99 dwellings (295 rooms of accommodation) would be required under Sensitivity Assessment Scenario 1 and 102 dwellings (306 rooms of accommodation) under Sensitivity Assessment Scenario 2. If both assessments considered a 9% vacancy rate (220 dwellings) in the supply of private rental accommodation in Mudgee, then there is still likely to be a small shortfall in accommodation under Scenario 2. Noting that under Scenario 1, 90% of all available private rental accommodation is assumed to be utilised by the Project, leaving 10% for other users such as new comers to the region, teachers, medical staff etc.

Whilst the assessment of short term accommodation supply indicates existing capacity in the Local Area to accommodate Project related accommodation demands, the assessment does not consider the highly variable nature of occupancy rates in short term accommodation in the Local Area. Accommodation establishments have noted that occupancy rates are generally at 100% during peak major events such as *A Day on the Green* (anytime between October-March) and *Mudgee Small Farm Field Days* (mid-July). If Construction Phase 1 commences in January 2017, then it is likely that the peak demand for short term accommodation in Month 9 will occur during late winter or early spring, the same time as a number of regional tourism events occur. This will place significant pressure on accommodation providers in the Local Area and is likely to result in either the Project workforce or tourist visitors to the Region missing out on accommodation.

4.2.1.5 Revised Traffic and Transport Impact Assessment

A revised TTIA (**Appendix D**) has been completed to include a separate scenario where there is no WAF. Whilst under this scenario, additional Project related traffic will be utilising the regional road network associated with the construction phase, the existing intersections and road network is predicted to operate with sufficient capacity.

4.2.1.6 Revised Economic Impact Assessment

Gillespie Economics notes that in the Benefit Cost Analysis (BCA) framework in the Economic Impact Assessment (Appendix AE of the EIS), the provision of the WAF represents a capital and operating cost to KEPCO. A reduction to these costs will increase the net production benefits of the Project to Australia and NSW. However, Gillespie Economics notes that there is a question over whether there is sufficient capacity in the short term and long term accommodation market to meet the requirements of the Project.

A capacity shortfall would result in economic costs on tourism and other activities and may result in significant accommodation price rises. This assessment is further discussed in **Section 4.2.6.**

4.2.1.7 No WAF Scenario Conclusions

The use of the WAF for the construction activities associated with the Project provides a suitable strategy to manage the risk identified in relation to maintaining appropriate accommodation for the workforce. However, KEPCO understands MWRC's position of seeking to maximise local economic stimulus flowing from the Project to the MWRC LGA. This is demonstrated by KEPCO's previous commitment that will encourage its permanent workforce to be housed within Mudgee and the surrounding region.

To meet MWRC's expectation that the temporary construction workers are housed in existing available accommodation, KEPCO now proposes to seek approval for a temporary WAF for the workers that the most recent accommodation survey has identified cannot be housed within Mudgee and its surrounds. This is based on the key assumption in defining the Local Area that the Wollar Road upgrade is completed prior to PY 1, which will place Mudgee within the Local Area.

If the current expression of interest and subsequent tender processes confirm a peak construction workforce of 665 full time equivalent (FTE) employees, the accommodation survey would indicate the requirement of a temporary WAF of a minimum of approximately 300 beds. If the final forecast workforce is more or less than 665 FTE employees at the peak then a commensurately larger or smaller temporary WAF will be constructed.

Further, KEPCO is considering the operation of the WAF for Construction Phase 1 only (i.e. PY 1 and PY 2) if there is enough housing available in the MWRC LGA. KEPCO will update the Workforce Accommodation Study at the end of PY 2 in close consultation with MWRC and DP&E to confirm continuing use of WAF for PY 3 and PY 4. Otherwise, the WAF will be demobilised (excluding services) at the cessation of Construction Phase 1 (PY 2).

KEPCO seeks consent to retain all servicing (including, but not limited to water, power, sewage facilities, first aid room, etc) to the site of the WAF until PY 4, with an option to re-instate the WAF for Construction Phase 2 in the event that cumulative mining and tourism demands result in a constrained accommodation market in the Local Area. KEPCO will undertake a new Workforce Accommodation Survey, similar to the one recently undertaken, to inform the need or otherwise for a WAF for Construction Phase 2. This assessment will be completed in PY 4 prior to the commencement of Construction Phase 2.

4.2.2 Size of the Construction Workforce

Issue

Council questions size of the construction workforce and how these numbers have been determined. The region has managed to accommodate a mining construction workforce for a proposal larger than the BCP coupled with concurrent expansion at two other mines. The estimated construction workforce for Moolarben was 220 and while this may have fluctuated, the construction phase was similar to that proposed in the BCP. The claim that there will be a peak of 800 employees is inflated and unsubstantiated in the EIS.

This submission seeks further justification for the size of the Construction Phase 1 workforce.

Response

WorleyParsons has reviewed the Construction Phase 1 workforce included in the EIS on behalf of KEPCO in light of queries raised by MWRC. **Figure 4** illustrates the revised Project workforce by Project phase following this review. The anticipated Construction Phase 1 workforce has been reduced as a result of further detailed planning conducted by WorleyParsons in relation to workforce arrangements and scheduling of construction activities. WorleyParsons is undertaking detailed construction planning in parallel with the EIS assessment process. This detailed planning has informed the revised workforce numbers and will continue to inform further revisions as WorleyParsons proceeds through the construction planning phase.

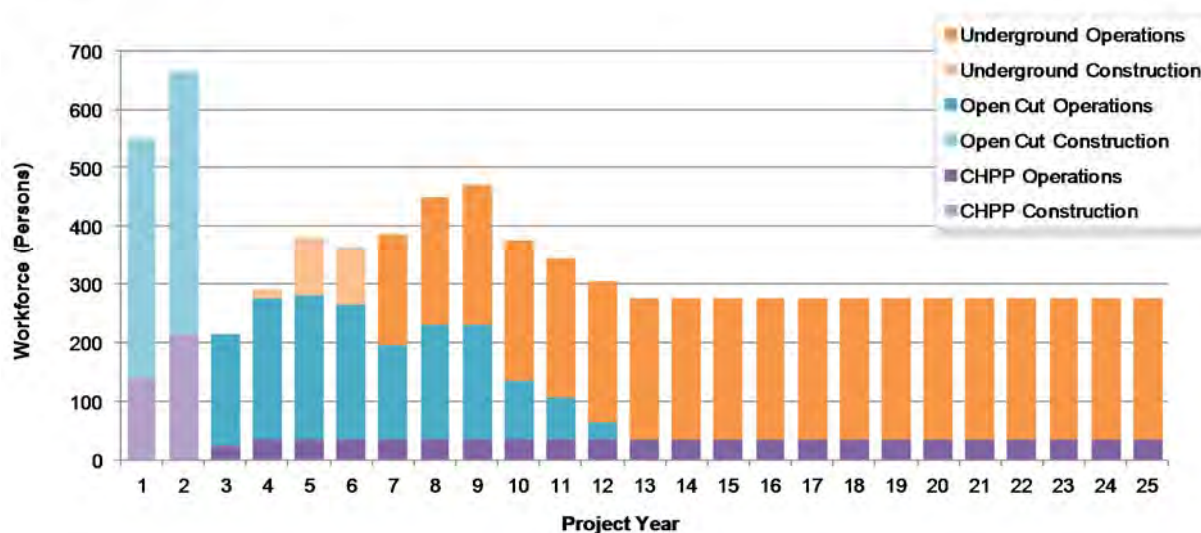
The Construction Phase 1 workforce has been reduced from a peak of 800 (presented within the EIS) to a peak of 665 workers (including 20 workers associated with the operation of the WAF).

The workforce for all other phases of the Project remain unchanged from that presented within the EIS. The Project schedule is unaffected by the revised Construction Phase 1 workforce arrangements.

During each construction phase, the size of the workforce will rise and fall to adjust to the requirements of the Project. **Figure 5** presents the Construction Phase 1 workforce by month for the Project. The peak construction workforce during Construction Phase 1 will be approximately 665 FTE occurring during PY 2 Month 17. However, this peak is anticipated to last for only one month, as the construction phase for open cut mining areas and CHPP winds down and initial open cut development coal is produced. The peak workforce of 665 FTE includes 20 workers involved in the operation of the WAF.

Further details of the revised Construction Phase 1 workforce are presented in **Appendix C**.

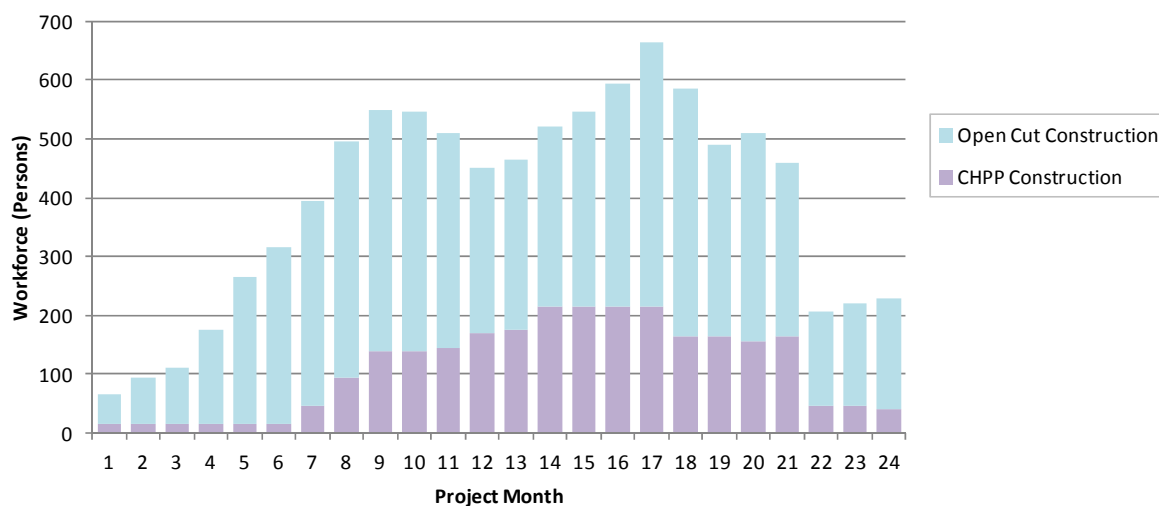
Figure 4
Revised Indicative Peak Workforce, by Project Phase¹



Notes:

1. Annual underground operations workforce data was compiled and averaged PY 9-PY 25.
2. The workforce presented in the graph includes the workforce associated with the construction and operation of the WAF.

Figure 5
Revised Indicative Peak Workforce – Construction Phase 1



4.2.3 Social Effects of WAF

Issue

Further, it is this inflated figure on which the justification for the TWA hinges. Council questions the need for a TWA for a brief period to accommodate a peak workforce that will exist for less than six months....

Council believes the social impact assessment fails to consider a no TWA option and the analysis that has been undertaken does not quantify the "significant increase in demand" but does acknowledge that it would be only short term. Council believes there is no risk that the workforce anticipated in the first 6 years of the project cannot be accommodated in the community.

There is no evidence to suggest that the TWA is required in terms of housing availability in the short or longer term. The EIS does not address the social and psychological impacts on residents and families in a TWA environment and this needs to be addressed before any decision can be made as to the suitability of and need for this form of accommodation at this location.

Response

Section 4.2.1 provides a justification for the need of the WAF for the Project and presents the outcomes of the revised assessments completed on a no WAF scenario. The outcomes of this assessment clearly demonstrate that in the absence of the WAF, the construction workforce will not be able to be accommodated within the Local Area.

KEPCO proposes to accommodate only the Construction Phase workforces in the WAF (as described within Section 3.11 of the EIS). The operations phase workforce will be accommodated in accommodation available within the Local Area.

Subsequently any discussion in relation to social and psychological impacts of the WAF is relevant only to the construction phase workforce (and potentially only for Construction Phase 1 as described in **Section 4.2.1**). Further, studies (WALA 2015, Commonwealth of Australia [COA] 2013, Infrastructure Planning and Natural Resources Committee [IPNRC] 2015) indicate that the commuting arrangements (long-distance commuting) of the workforce and associated rosters can be drivers of potential social and psychological impacts amongst workers, not the manner in which workers are accommodated. Although there is evidence (WALA 2015) to suggest WAF accommodation arrangements reinforce the social and psychological impacts of these commuting arrangements.

The term long-distance commuting is used to refer to a set of work arrangements for resource operations that are typically located at a distance from other existing communities. Long-distance commuting can involve fly-in, fly-out (FIFO), drive-in, drive-out (DIDO) and bus-in, bus-out (BIBO) practices or a combination of these.

Long distance commuting practices have become prevalent across the resource sector for a number of reasons including:

- The remote location of some resource operations;
- Availability of local labour (local hires), particularly during construction phases;
- Limited skilled labour availability within the proximity to the resource project; and
- Preference for many employees and their families to live in areas with greater amenities or where they have existing social and family networks (IPNRC, 2015).

The SIA has already demonstrated that it is not possible to recruit all Construction Phase 1 workers from within the Local Area primarily due to the size of the labour pool, competition from other resource projects (e.g. Wilpinjong Expansion Project) and skilled labour availability in Local Area (Appendix AC of the EIS). The duration of employment for construction phase workers varies from less than three months to more than 12 months. However, with the exception of senior employees the majority of construction phase workers will be employed for approximately 12 months (refer to **Appendix C** for further discussion of this topic).

The duration of employment together with a lack of any significant future employment opportunities related to construction projects in the region means that the majority of construction workers are unlikely to move permanently to the Local Area for the construction phase of the Project. The proximity of the Project to the Hunter Valley and Newcastle areas suggests many NLHs may be drawn from these areas. It is therefore likely that the majority of construction phase NLHs will undertake a commute of between one and a half hours and four hours at the start of each block shift rotation during the construction phases.

Over the past three years, a significant body of research has been amassed in relation to the impacts of long-distance commuting on workers and communities, and the associated influence of worker accommodation arrangements on the magnitude of these impacts. Significant research includes:

- *House of Representatives Standing Committee on Regional Australia Inquiry into Fly-in, fly-out and drive-in, drive-out workforce practices in Regional Australia* (COA 2013);
- *Western Australia Legislative Assembly (WALA) Inquiry into the impact of FIFO work practices on mental health* (WALA 2015);
- *Queensland Parliamentary Committees Inquiry into fly-in, fly-out and other long distance commuting work practices in regional Queensland* (IPNRC 2015); and
- *Queensland Ministerial Inquiry into FIFO* (Department of State Development [DSD] 2015).

Based on the body of research available, the factors likely to affect the mental health and wellbeing of employees and their families involved in long-distance commuting jobs include:

- Shift roster arrangements;
- Workforce accommodation arrangements;
- Accommodation arrangements offered within WAFs;
- Location and design of WAFs; and
- Policies and practices of the proponent.

The following discussion draws on the findings of research to demonstrate KEPCO's commitment to the management of potential social and psychological impacts associated with the use of a long-distance commuting workforce.

Long-distance commuting and extended and frequent periods away from home can put pressure on family relationships and employee mental health (COA 2013, IPNRC 2015, DSD 2015, and WALA 2015). Long-distance commuting activities take individuals away from their regular home activities, isolating them from family and other social supports. Research conducted by the COA (2013) found that informal social controls as well as the lack of sense of belonging to a community can have negative impacts on the well-being of workers involved in long-distance commuting. The key findings of the WALA inquiry into mental health (WALA 2015), was *"the typical FIFO resource worker comes from the highest risk demographic (male aged 18 – 44) for mental illness and suicide."*

However, the absence of a WAF in the Project does not resolve these issues. Construction phase workers will be required to reside within existing accommodation in the Local Area, however it is likely that they will return home to their place of residence at the conclusion of each block shift period, in the same way they would if accommodated in a WAF. The same issues around social isolation, family pressures and mental health remain relevant.

The construction workforce will be engaged in long shifts (approximately 12 hours). At the end of these shifts and in the absence of a WAF, workers will be required to drive between 30 minutes and one hour to their temporary place of residence in the Local Area. They will then be required to find a meal for themselves, before sleeping in readiness for the next shift. For the majority of workers accommodated within the Local Area, a minimum of 14 hours could pass between leaving their place of residence for work and returning at the end of shift.

Reliance on accommodation in the Local Area by the construction workforce is likely to substantially increase travel times for workers with resultant economic, health and safety costs associated with:

- Increased vehicle operating costs;
- Increase travel times;
- Increased accident costs; and

- Increased road maintenance costs.

The “No WAF” scenario does present the construction workforce with a greater opportunity to become involved in the communities within which they reside, however the long work hours together with the daily commute will restrict the extent to which workers will become involved. Construction Phase shift rotations will also impact on the ability of workers to involve themselves in community groups or recreation and sporting activities.

In responding to the Federal FIFO Inquiry (pp 56, COA 2013) BHP Billiton noted that:

“... people who work 12-hour shifts are not too boisterous post the 12-hour shifts. They go in there, they have their meals and they tend to want to sleep and be ready for the next days shift, especially when they are working those long rosters ...”

In WALA (2015), the highly compressed rosters associated with the construction phase of projects were found to potentially increase the risk of health and wellbeing issues amongst workers. One of the key findings of WALA (2015) in relation to rosters, was an even time, or a two weeks on, one week off roster compression best supports mental wellbeing. As explained in Section 4.5 of the SIA, the final shift rosters for Construction Phases 1 and 2 will be at the discretion of the appointed lead contractor. However, it is anticipated that the construction workforce will operate on a seven day rotating roster for both construction phases, at the discretion of the appointed lead contractor.

A number of the mental health issues raised during the various inquiries across Australia relate to the accommodation arrangements in WAFs. In relation to the design of temporary WAFs and the bedding arrangements for construction workforces, submitters to the WALA inquiry (2015) identified the practice of ‘motelling’¹ as having the potential to contribute to an increase in stress and sense of isolation in workers.

“Workers spending significantly more time on site than at home with their family can become disconnected from a sense of place and belonging. Having a dedicated room allows workers to identify with that space, get to know their neighbours, and make it their home away from home.” (pp 86 WALA 2015).

In WALA 2015 (pp 86), the Committee heard that motelling “disrupts the community fabric and social cohesiveness of accommodation villages”. The issue of safety and security was also raised in WALA 2015 in relation to motelling arrangements.

¹ Occupant A is allocated an accommodation room for their roster cycle. When they are on ‘R and R’ that room is allocated to Occupant B. When Occupant A returns to the accommodation village they are allocated a different room for the roster cycle. For returning occupants a limited number of personal effects may be stored on site, this is generally through lockers or in a centralised storage facility (Extract from Submission No. 112 from Chamber of Minerals and Energy Western Australia, 12 February 2015, p. 16 in WALA 2015).

In WALA (pp 86 2015), the Committee heard from Unions that their female members had raised concerns around *'some issues with young women getting billeted close to the wet mess and having issues around potential harassment'*. KEPCO is not proposing motelling arrangements in the WAF.

In WALA 2015 (pp 93 2015), the Committee found that the *"highly regulated nature of FIFO work, while necessary on the worksite to ensure health and safety, can impact on a person's sense of agency and self-determination."* and further *"Workers who are exposed to this intense level of control for a significant period of time can begin to lose their sense of self and purpose"*.

The safety of the workforce is a top priority for KEPCO. A high level of restriction and control in the workforce is necessary to maintain high levels of safety. However, KEPCO acknowledges the findings of WALA (2015) in relation to worker mental health and will review the relevance and necessity for relevant control measures proposed to be implemented for off-shift resident workers at the WAF.

KEPCO understands the concerns of the MWRC and other stakeholders in relation to the health and wellbeing of the workforce as is demonstrated by KEPCO's commitment to accommodate the operations phase workforce as permanent residents in the Local Area. However, given the distance of the Project site from Mudgee, the proposed accelerated construction phase and the duration of workforce employment on the construction phase, KEPCO considers that a WAF at the Project site as one element of a wider accommodation strategy will improve health and wellbeing outcomes for some in the construction phase workforce.

Further, KEPCO is willing to implement additional measures to reduce the risk of health and wellbeing issues in the workforce. The majority of these additional measures are consistent with the findings of WALA (2015) and for example may include:

- Acknowledgement by KEPCO and WorleyParsons of the potential impact of fatigue on mental health of the workforce;
- Establishment of key policies around employee health and wellbeing, particularly mental health to manage issues arising in the workplace;
- Improved management of employee health and wellbeing, particularly mental health within the workplace rather than trying to screen for and recruit workers able to withstand the challenges of a long-distance commuting role;
- Ensuring construction management personnel and supervisors are trained in managing employee health and wellbeing problems amongst colleagues and workers, this includes providing support to workers on site;
- Supporting the establishment of peer based support programs such as "Mates in Construction" on site to assist in breaking down stigma related to mental health issues;

- Ensuring construction workers and their families are informed of available mental health literature and support programs relevant to long-distance commuting practices;
- Encouraging a workplace culture that are supportive of good mental health and wellbeing;
- Inclusion of high quality, reliable and accessible communications technology in the WAF;
- Further consideration of the workforce control measures to be applied at the WAF in an effort to ensure such controls do not adversely impact employee health and wellbeing. Particular consideration will be given to controls applied when workers are off-shift and residing in the WAF;
- Commitment to not using 'motelling' practices in the accommodation of the construction workforce;
- Where possible, incorporation of improved linkages into the Bylong community from the WAF to reduce the highly regulated nature of WAFs and enable greater interaction between the community and workers. This will be undertaken in consultation with the Bylong Community; and
- Engaging further with the Bylong Community in relation to the design of the WAF to ensure that the facility brings benefits to the Bylong Community, as well as benefits to the mental health of workers.

4.2.4 Investment in Local Housing

Issue

The costs that the company have committed to the construction of the TWA should be diverted into investment in the local housing industry and on-going maintenance of the local road network between the BCP and Rylstone and the BCP and Mudgee.

Response

The construction of the WAF forms a capital component of the Project. KEPCO has maintained a consistent position throughout Project discussions with the MWRC in relation to the provision and/or funding of local housing for the Project workforce. KEPCO will not be directly investing capital into the local housing market, however will continue to engage with MWRC and local land developers and inform them of the Project's progress in order to enable the timely release and development of land for housing.

As explained in **Section 4.2.1.2**, in the scenario assessed with no WAF for the construction phase, KEPCO will likely not have sufficient housing for its workforce and will potentially experience other costs not anticipated with the preferred scenario. If the no WAF scenario were to be imposed on the Project, KEPCO would not redirect any saved capital into the local housing industry.

Since the exhibition of the EIS, KEPCO has reached agreement with MWRC over a Voluntary Planning Agreement (VPA) in relation to the Project. Spending initiated through the VPA and also KEPCO's Corporate Investment Fund may be directed at local housing initiatives.

KEPCO is in ongoing discussion with MWRC in relation to an agreement for the contribution to road maintenance on the road network utilised by Project-related traffic. The inclusion or exclusion of the WAF for the construction phase of the Project therefore has no bearing on funding arrangements for local road maintenance.

4.2.5 Life of WAF

Finally, consideration of the TWA as part of the BCP approval is of a concern in terms of the ease in which the life of a TWA should it be approved can be modified by the state government once the initial approval is in place. Council is concerned that should the TWA aspect of the proposal be approved in any form it will remain in place for the duration of the project and any economic benefit that the region would otherwise experience will be lost.

This submission is concerned with the life of the WAF and in particular the likelihood of the WAF life being extended as the Project progresses.

Response

MWRC has questioned the assumptions provided in the EIS over peak construction workforce numbers. As a consequence of this, KEPCO commissioned WorleyParsons to undertake a review of construction workforce requirements. This review has resulted in a downward revision of the estimated peak construction workforce from 800 to 665 FTE being required on site during the period of construction.

KEPCO is currently preparing to initiate an expression of interest process from contractors to build the mine. Once these expressions of interest are received over the next several months, more accurate required construction employee numbers will be available.

In the meantime, discussions with MWRC have confirmed their desire that all available rental accommodation in the MWRC LGA should be relied upon to house the construction workforce with the completion of upgrading Wollar Road prior to the mine construction.

KEPCO understands MWRC's position of seeking to maximise local economic stimulus flowing from the Project to the MWRC LGA. This is demonstrated by KEPCO's previous commitment that it will encourage its permanent workforce to be housed within Mudgee and its surrounds.

To further meet MWRC's expectation that the temporary construction workers be housed in existing available accommodation, KEPCO now proposes to seek approval for a temporary WAF for the workers that the most recent accommodation survey has identified cannot be housed within Mudgee and its surrounds. This is on the key assumption which defines the Local Area that Wollar Road upgrade is completed prior to PY 1.

If the current expression of interest and subsequent tender processes confirm a peak construction workforce of 665 FTE employees, the accommodation survey would indicate the requirement of a temporary WAF with a minimum of approximately 300 beds. If the final forecast workforce is more or less than 665 FTE employees at the peak then a commensurately larger or smaller temporary WAF will be constructed.

It is further proposed that the nominal 300 bed temporary WAF will operate for PY 1 and PY 2. The temporary WAF will then be decommissioned at the completion of construction phase 1 (~ start PY 3), if there is enough available housing in MWRC LGA. KEPCO will update the Workforce Accommodation Study at the end of PY 2 in close consultation with MWRC and DP&E to confirm continuing use of WAF for PY 3 and PY 4.

It is proposed that the supporting services to the temporary WAF (i.e. power reticulation, water supply and sewage facilities etc.) will remain in place until PY 4. At this time, prior to the commencement of construction phase 2 (i.e. approximately end of PY 4), KEPCO proposes to commission a new Workforce Accommodation Study (similar to the recent surveys). This survey would confirm whether at that time there is availability in Mudgee and its surrounds to house the underground mine construction workforce over and above the operational workforce who now live in the LGA for this two year construction period. This Workforce Accommodation Study will be undertaken in close consultation with MWRC and DP&E to confirm whether there is a requirement for the temporary WAF for this second construction phase.

If the temporary WAF is required for the underground construction workforce, this will be decommissioned at the end of construction phase 2 (~PY 6). Consistent with the EIS, some services, first aid room and some car parking capacity, etc. will be retained for the life of the Project.

The response provided in **Section 4.2.6** addresses the issue raised in relation to potential lost economic opportunities associated with the WAF operation.

4.2.6 Economic Benefits of the WAF

Issue

To a large extent the economic benefit for the region as a result of this project proceeding is around the employment and business opportunities generated. The potential direct and indirect impacts of the project (ie. the multiplier effect) are significant and would contribute to the overall strength of the local economy and neighbouring regions. Local businesses have adapted to the growth of major mining projects in the region in the last 5 years and are well positioned to continue to grow and prosper as new projects such as BCP commence. New businesses have also established themselves in the region over a similar timeframe to cater for mining activities and maximise the potential economic benefits available.

However, the potential economic benefits of the project will be significantly diminished in the first 6 years of the project based on the proposal to establish a TWA as part of the BCP.

Whilst it is recognised that it is difficult to capture the direct workforce benefits during the construction phase of a major project because of the transient nature of the workforce (ie. the income benefits largely accrue outside the region), there are still potential benefits from construction whereby the workforce utilises local accommodation and services. As discussed above, local businesses have already planned for continued mining expansion in the Region and there is sufficient accommodation capacity to cater for both the construction needs of the mining industry and traditional forms of tourism activity. The proposed TWA not only takes away the income effect, but also eliminates the opportunity for local businesses to provide accommodation and hospitality services to the construction workforce. Combined with the negative impact on local agricultural production (i.e. loss of \$3Mpa), the TWA does not deliver any economic benefit to the region at all.

It is important to note that the 800 construction workers associated with the BCP are considered as visitors to the region. According to Destination NSW, each visitor to the region contributes an average \$145 per day in additional expenditure. This represents potential income for the region of up to \$42.3 million per annum, depending on the length of stay and number of construction workers. This income generating opportunity for the region will not occur with a TWA.

This submission is concerned with the potential economic benefits lost to the MWRC LGA under the 'WAF scenario' and seeks clarification as to the potential economic benefits accrued to the MWRC under a 'no WAF scenario'.

Response

The Project includes a WAF because there is a question over whether there is sufficient capacity in the short term and long term accommodation market to meet the requirements of the Project, particularly during Construction Phase 1 (refer **Section 4.2.1**). A capacity shortfall is likely to result in economic costs on tourism and other activities and may result in significant regional accommodation price rises. Avoiding these potential effects are economic benefits of the WAF.

In addition, the WAF which is proposed to be located in close proximity to the Project would substantially decrease travel times for workers compared to reliance on accommodation in the Local Area (i.e. Mudgee, Rylstone, Kandos and Denman). Economic benefits from this include decreased:

- Vehicle operating costs;
- Travel times;
- Accident costs; and
- Road maintenance costs.

Gillespie Economics has reviewed the potential economic implications of the Project under the 'No WAF' scenario. The construction and operation of the WAF will provide additional economic activity to the region via expenditures captured by the region during WAF construction and operation and expenditure in the region by those domiciled in the WAF.

4.2.7 Cumulative Impacts

Issue

The project has failed to adequately address the "likely interactions between the development and other existing, approved or proposed mining development in the vicinity of the site" as required by the SEAR's. In particular the activities at Wilpinjong and Moolarban have been overlooked. For example, there has been no investigation as to the cumulative impact of education and a statement in the documentation that the government considers that it can manage this impact as part of the natural growth is insufficient. The social impact assessment also fails to identify the cumulative social impact on the communities of Wollar, Ulan and now Bylong in terms, for example of the loss of identity through the closure of schools and loss of volunteers as properties have been acquired and communities shrunk. Similarly the traffic and transport impacts having regard to the existing mine traffic have not been considered, in particular from the intersection of Wollar Road with Ulan Road and into Mudgee. All of these issues should be examined in the social impact assessment.

This submission is concerned with the prediction and assessment of cumulative social impacts (and also cumulative traffic issues) of mining activity in the Bylong Valley and adjoining rural areas, notably Wollar.

Response

The SIA (Appendix AC of the EIS) assessed the potential impacts of the Project on social aspects of the community in association with other mining related projects within the MWRC LGA.

The SIA (Appendix AC of the EIS) identifies population change as one of the key drivers of Project related cumulative impacts. Project induced population change is driven primarily by:

- The use of a NLH workforce and the associated incoming population; and
- Project related property acquisition activities that have resulted in the displacement of population.

The cumulative impacts of this population growth have been assessed in Sections 5 to 9 of the SIA (Appendix AC of the EIS). Potential cumulative impacts associated with population growth and considered in the SIA include:

- Overloading of existing community infrastructure and services;
- Population increases that create a critical mass for better services and facilities;

- Price inflation in housing prices and rental accommodation and the disproportionate impacts on non-mining residents;
- Increased employment and economic investment;
- Road and infrastructure upgrades;
- Changes in traffic volumes on the local and regional road network; and
- Regional and community development benefits from Project related community investments.

Mining activity in the rural area surrounding Bylong Valley, Wollar and Ulan has resulted in population change across these rural communities. This population change is a result of the cumulative property acquisition activities of the multiple mining operations. Existing and potential population decline in the Bylong Valley is discussed in the SIA (Appendix AC of the EIS). The Project's property acquisition activities are the principal driver of population change (decline) in the Bylong Valley. The cumulative impact of this population change on the Bylong Valley potentially includes:

- Loss of existing community infrastructure and services;
- Changes in social capital; and
- Loss of social sustainability.

These cumulative impacts also have the potential to impact the broader rural area, sometimes in different ways.

A description of how the following matters are addressed within the SIA is provided in this section:

1. Defining and identifying cumulative impacts;
2. Cumulative population growth;
3. Cumulative impacts on community infrastructure and services in Mudgee;
4. Cumulative impacts occurring in the Rural Area including issues of:
 - Cumulative population decline;
 - Reduction in access to services and facilities;
 - Changes in social sustainability; and
 - Changes in rural amenity; and
5. Cumulative traffic impacts.

Further discussion of cumulative impacts is provided in **Appendix C**.

1. Defining and Identifying Cumulative Impacts

Franks et al (2010) defines cumulative impacts as *“the successive, incremental and combined impacts of one, or more, activities on society, the economy and the environment. Cumulative impacts result from the aggregation and interaction of impacts on a receptor and may be the product of past, present or future activities.”*

All impacts have a cumulative dimension. It is therefore necessary to consider how individual Project impacts overlap or interact with other impacts being experienced by communities in the Local Area. Understanding and analysing the cumulative dimensions of an impact requires consideration of the various activities occurring within the area of interest. Vanclay et al (2015) suggests that *“Impacts may aggregate and interact as a result of actions within and between projects, and from past and future activities.”*

In the case of the Project, it is the current and future activities associated with the existing and proposed mining projects in the SIA study area that have the greatest influence over whether a Project impact has a cumulative dimension. There are also natural processes occurring in the Study Area which interact with predicted Project impacts to produce cumulative impacts.

There are a number of new mine expansions and projects proposed in the MWRC LGA, all of which have the potential to generate cumulative housing and accommodation impacts. The anticipated timing and personnel requirements for projects approved and projects in the advanced approval stages within the MWRC LGA were presented in the SIA (Appendix AC of the EIS).

2. Cumulative Population Growth

Table 3 of the SIA (Appendix AC of the EIS) presents the mining related projects within the MWRC LGA that have been considered in the prediction and assessment of cumulative impacts. It is noted that this table includes the Wilpinjong Mine Expansion, Moolarben Mine Expansion and the Cobbora Project. The Cobbora Project has since been placed on hold by the NSW Government.

Cumulative population growth is presented within Section 6.3.8 of the SIA (Appendix AC of the EIS). The size of the predicted cumulative population growth is also described in Section 6.3.8 of the SIA (Appendix AC of the EIS). Table 38 of SIA (Appendix AC of the EIS) demonstrates that cumulative population growth associated with the mining and resources sector in the MWRC LGA will be significantly greater than the population impacts of the Project alone.

3. Cumulative Impacts on Community Infrastructure and Services

Population growth associated with the Project and other mining activity in the MWRC LGA will impact community infrastructure and service provision across the MWRC LGA. The potential cumulative impacts of population growth on the availability and accessibility of community infrastructure and services is discussed in Section 11.3.1 of the SIA (Appendix AC of the EIS).

The cumulative impact of population growth on education services in Mudgee is discussed in Section 11.3.2 of the SIA (Appendix AC of the EIS). This section acknowledges that there will be impacts to education services from Project induced population increase, however it also predicts that population growth from cumulative mining activity (as described in Table 38 of the SIA) will have a far greater impact than the Project on its own.

Section 11.2.1 of the SIA documents the findings of consultation conducted by Hansen Bailey with representatives of the NSW Department of Education and Communities (DEC) in relation to managing demand for education services in Mudgee and the broader region as a result of cumulative mining activity. Section 11.2.1 of the SIA states:

"The DEC conducts internal population modelling to determine the need for capital investment at State government schools across NSW. Population modelling conducted by the DEC for the MWRC LGA predicts the following population trends between 2016 and 2031:

- *A very stable population of primary school age children; and*
- *A stable (with some growth) population of secondary school aged young people.*

On the basis of the population modelling the DEC considers it unlikely that the NSW government would provide a new primary school in Mudgee into the future, or that there would be a need for a new high school. This is further reinforced by current government actions in relation to school sizes which indicates a move towards significantly larger schools e.g. high schools of 2,000 enrolments and primary schools of 1,000 enrolments, rather than the previous position of substantially smaller schools."

Discrepancies between NSW Government population modelling for the MWRC LGA and MWRC's population modelling are acknowledged and discussed in Section 6.2.4 of the SIA. Consultation has been conducted with the relevant government agency for the provision of education services as required by the SEARs. If the MWRC disagrees with the policy decisions of the NSW DEC, then this is an issue for further discussion between the MWRC and the DEC.

4. Cumulative Impacts occurring in the Rural Area

The following section describes the potential cumulative impacts of mining in the rural area surrounding Bylong and Wollar including:

- Population decline - this is the principal cumulative impact to which other impacts are linked;
- Reduction in access to facilities and services;
- Changes in social sustainability;
- Changes in rural amenity; and
- Increased risk to health and safety.

The Rural Area is defined using the Australia Bureau of Statistics (ABS) geographical areas of Breakfast Creek State Suburb (SS) and Wollar SS. The Breakfast Creek SS includes the Bylong Village. The Wollar SS includes the villages of Wollar and Ulan.

Population decline across the communities of Wollar, Ulan and to a lesser extent Bylong has been the primary driver of social changes. There is evidence of a chain of cumulative impacts across the Rural Area associated with population decline. These impacts include reduced availability of and access to community infrastructure and services, reduced social sustainability, reduced rural amenity and changes in rural character. Population decline in the Rural Area is a result of a combination of exploration and mining activity (including the Project) and a national trend in rural population decline. The issue of national trends was presented in Section 6.2.3 of the SIA.

There is also evidence of cumulative impacts associated with the reduced availability and access to community infrastructure and services in the Rural Area. These impacts include a reduction in social capital and social sustainability.

Population Decline

Population decline in the rural area surrounding Bylong Valley, Wollar and Ulan is a result of a combination of historical change, exploration and mining activity (including the Project) and a national trend in rural population decline. The issue of national trends is discussed in the SIA (Appendix AC of the EIS).

Mining activity has resulted in population change across these rural communities. This population change is a result of the cumulative property acquisition activities of multiple mining operations. Population decline across the communities of Wollar, Ulan and to a lesser extent Bylong has contributed to social changes in these communities.

The following attempts to quantify the cumulative population decline experienced across the Rural Area that encompasses Bylong Valley, Wollar and Ulan.

Evidence from recent consultation conducted with residents of Bylong Valley and Wollar (Section 6.2.3 of the SIA and Section 2.2.1 of Peabody Energy 2015) highlights the considerable fluctuation in the population of the rural area over the past 20 years.

Historically, Bylong and the Bylong Valley have only ever comprised a small population. The findings of SIA consultation suggest the population of Bylong and the Bylong Valley peaked during the early 1980s with the construction of the Sandy Hollow to Gulgong Railway line. During this period, a workers camp was constructed in Bylong Valley and Bylong saw an influx of workers and their families who moved away when works ceased. *"The completion of the railway line in the 1980s heralded a slow decline in Bylong's population"* (Historic Heritage Impact Assessment (Appendix T of the EIS)).

During SIA consultation, residents of the Bylong Valley reported steady population decline in the area since the early 1980s. Residents identified changing community structures and relationships dating back more than 10 years resulting from population decline.

Residents of the Bylong Valley who participated in the SIA interviews identified the following features of Bylong Valley as evidence of population decline:

- Reduced enrolment numbers at the Bylong Upper Public School;
- Reduced participation in village activities;
- Loss of key community events, notably the famed 'Mouse Races';
- Significantly reduced number of volunteers for the Bylong Brigade of the Cudgegong Rural Fire Service; and
- Evidence of vacant properties, particularly those owned by KEPCO.

Participants in SIA consultation (all of whom were existing Bylong Valley residents) attributed historical population decline in the Bylong Valley to a number of factors including:

- Consolidation of small landholdings into single large landholdings with a Property Manager, resulting in the loss of families (landholders) and farm hands;
- Challenging economic conditions particularly in the agricultural industry resulting in changing property management dynamics and a decrease in demand for farm labour;
- Changing family dynamics and associated lifestyle needs e.g. families with teenagers departing Bylong Valley in search of secondary schooling options;
- The completion of the construction phase of Sandy Hollow to Gulgong Railway line; and
- A general trend of population decline across rural Australia.

More recent (mid 2000's) property acquisition activities associated with the former Mt Penny Project also had an impact on the population in the Bylong Valley.

Similar issues were identified by the Wollar community during consultation conducted for the Wilpinjong Expansion Project and reported in Peabody Energy (2015).

Based on the findings of the SIA interviews conducted with Bylong residents, historical population decline across the Bylong Valley has resulted in a reduction in social capital, reduced involvement in community events and a reduction in the number of events. A number of participants in SIA interviews suggested the cumulative impact of these changes was a reduced sense of community in the Bylong Valley.

Participants in the SIA consultation suggested the rate of population decline in the area surrounding the Project has increased in the past two years as a result of the KEPCO's property acquisition activities. In the Bylong Valley, this increased rate of population decline has had a cumulative impact on the sense of community in the Bylong Valley. Anecdotal evidence suggests a similar situation in Wollar as a result of property acquisition activities associated with the operation of the Wilpinjong Mine.

It should be noted that whilst KEPCO has purchased properties in the Bylong Valley, some accommodation is currently still occupied by the original owners, or are being used by Project personnel. The KEPCO Farm Manager and family, two farm hands, subcontractors and families occupy nine of the KEPCO owned properties. Further, in the case of the Bylong Valley, KEPCO is seeking to offset population loss associated with property acquisition by encouraging members of the Project workforce to relocate to the Bylong Valley and reside in one of the residences owned by KEPCO.

There are numerous examples of mining operations in NSW where workers and their families reside permanently in mine owned housing in immediate proximity to the mine site. KEPCO anticipates that approximately 13 of the KEPCO owned properties in the Bylong Valley will be occupied by mine employees and their families during the Operations Phase of the Project.

ABS data does not provide population trend data at a consistent geographic level suitable for interpreting population decline in small rural communities. It is therefore difficult to quantify the population change in the Bylong Valley and Wollar and determine what if any impact cumulative mining activity has had on the population.

The best available data is presented in **Table 5**. Comparable data is available for the 2001 to 2006 ABS Census periods for the Wollar SS and the Breakfast Creek SS. 2011 ABS Census data is generally not comparable to earlier years, however it is included in **Table 5**. It is not possible to provide specific data for Ulan. The township of Ulan forms part of the Wollar SS.

Table 5
Population Trends in the Surrounding Area

Census Area	2001		2006		2011		Change (%)	Change (%)
	Pop	No Families	Pop	No Families	Pop	No Families	01-06	01-11
Wollar SS	327	100	304	84	260	62	-7%	-20.5%
Breakfast Creek SS	247	74	230	69	273	82	-7%	Not comparable

Notes:

1. 2001 data for Wollar SS is generated by adding together population data for Collection District (CD) 1032606 and CD1032602. The 2001 and 2006 geographic ABS Census areas are comparable. The 2011 Census area of Wollar SS is larger than the 2006 Wollar SS: 962.6 km² compared to 794.5 km².
2. 2001 data for Breakfast Creek SS is drawn from CD1142501. The 2001 and 2006 geographic ABS areas are comparable. The 2006 and 2011 ABS Census areas are not comparable. The 2011 Breakfast Creek SS at 1046.7km² is much larger than the 2006 Breakfast Creek SS at 477.1 km².

Notable trends evident in **Table 5** include:

- Population decline of 7% in both the Wollar SS and Breakfast Creek SS in the period 2001-2006;
- Decline in the number of families in both the Wollar SS and Breakfast Creek SS between 2001-2006;
- Significant population decline (14.5%) between 2006 and 2011 in the Wollar SS, this is despite the 2011 Wollar SS including a substantially larger area of land; and
- Population decline of 7.5% across the combined area of Wollar SS and Breakfast Creek SS between the period 2001 and 2006.

Both the 2006 and 2011 Wollar SS areas include land affected by the Ulan Mining Complex, the Moolarben Mine and the Wilpinjong Mine. The population decline experienced in Wollar SS between 2001 and 2006 is unlikely to be a result of cumulative mining expansion in the area. Until 2006, the Ulan Mining Complex was the only operating mine in the Rural Area. Expansion of the Ulan Mining Complex is understood to have involved property acquisitions that are likely to have resulted in a loss of local residents (reflected in the 7% decline between 2001 and 2006). The majority of property acquisition activities associated with the Wilpinjong Mine did not commence until around 2006 (Peabody Energy 2015). Property acquisition associated with the Moolarben Mines is also understood to have occurred post 2006.

The population decline (14.5%) experienced in Wollar SS between 2006 and 2011 is predicted to be the result of cumulative mining activity with the construction of Wilpinjong Mine and Moolarben Mine during this period, and the associated property acquisition activities. This population decline of 14.5% is significant, and more than double the preceding ABS Census period. One visible impact of this population decline is the reduced enrolments at Wollar Public School (**Table 6**) and a gradual decline in enrolments at Ulan Public School. Other impacts include a reduction in local services notably rates of volunteerism at the Wollar Rural Bushfire Service (Peabody Energy 2015). Anecdotal evidence also suggests there has been a significant reduction in turnover at the Wollar shop.

There is little potential for any significant population growth in Wollar into the future. Peabody Energy (pp 71 2015) states:

“Wollar’s character values and amenities have been reduced by PEA’s property purchases, and remaining residents noted that the village offers a less attractive appearance and less amenity than it did ten years ago. Also, people seeking a quiet rural lifestyle are less likely to move to an area with existing cumulative impacts from mining operations...”

Table 6
School Enrolment Numbers

Census Area	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Wollar Public School	20	17	9	9	16	9	6	5	5	8
Bylong Upper Public School	9	8	10	8	7	5	4	5	6	0
Ulan Public School	32	29	20	27	22	14	12	18	17	15

Source: (DEC) 2012, 2015

Population decline in the Breakfast Creek SS is more difficult to quantify than in the Wollar SS due to changing ABS geographic areas. The 2006 Breakfast Creek SS does not include the majority of land affected by the Project. It does however include land affected by property acquisition activities associated with the former Mt Penny Project. The 2011 Breakfast Creek SS includes land potentially affected by both the Project and the former Mt Penny Project.

The population increase in the Breakfast Creek SS between 2006 and 2011 is attributed to an increase in the geographic size of the Breakfast Creek SS between 2006 and 2011 and the inclusion of previously excluded areas to the east of Bylong Valley Way rather than growth in the population of the 2006 Breakfast Creek SS.

Property acquisition activities for the former Mt Penny Project are understood to have occurred between 2006 and 2011². These property sales are likely to have adversely affected the 2011 ABS Census population of Breakfast Creek SS, however it is not reflected in the ABS data due to the geographic boundary changes. It is also not possible to accurately determine the net number of people who moved out of Breakfast Creek SS as a result of the former Mt Penny Project. Anecdotal evidence suggests property acquisition associated with the former Mt Penny Project did result in a net reduction in the number of people residing on the purchased properties.

The majority of property acquisition activities associated with the Project have occurred post the 2011 ABS Census (conducted 9 August, 2011) and will ultimately be reflected in the 2016 ABS Census scheduled for August 2016. One of the first property acquisitions by KEPCO was Bylong Station, purchased in February 2011 followed by Harley Hill and Glenview which were purchased in June 2011.

² The sale of Cherrydale Park was recorded in 2007 and Donola and Cogan Creek were understood to be purchased not long thereafter.

Between 2011 and April 2015 property acquisition activities associated with the Project have resulted in a net population loss of ten people in the Bylong Valley (Section 6.3.5 of the SIA).

Since April 2015, there has been eight people who have vacated the Bylong Valley as a result of the Project. A further 13 residents are anticipated to be required to move off land affected by the Project prior to the commencement of Construction Phase 1.

Predicted population decline between 2011 and 2016 is estimated at 31 people or 11.3%. This rate of decline is significant and higher than the rate recorded for the Breakfast Creek SS prior to the introduction of mining.

Determining the cumulative population decline across the Rural Area is problematic due to changing ABS geographic boundaries. However, it can be estimated that between 2006 and the end of 2016, a minimum of 75 local people (31 from Bylong and 44 from Wollar) will have been displaced from the Rural Area as a result of mining. This is equal to a decline of approximately 14% on the 2006 population of the combined area. These numbers should be treated with caution however as it is likely there have been additional non-mining related population movements in and out of the combined area over the same period (consistent with trends across rural NSW).

Table 7 shows comparable population data for a number of NSW rural agricultural communities, that are currently unaffected by mining. This data is presented to demonstrate that the population decline experienced in the Rural Area pre-mining is not dissimilar to the rate of population change occurring in other non-mining communities. Comparable data is available for the 2001 to 2006 ABS Census periods for the Urban Centre/Localities (UCL) of Trangie, Condobolin, Cowra, Walgett and Deniliquin. The area of land included in all subject UCL's for the 2011 ABS Census period is larger than in earlier years with the exception of Deniliquin which is smaller.

Table 7
Population Trends in the Other Rural Communities

Census Area	2001		2006		2011		Change (%)	Change (%)
	Population	No Families	Population	No Families	Population	No Families	01-06	01-11
Trangie UCL	940	237	867	221	849	215	-7.7	-9.7
Condobolin UCL	3,050	751	2,847	715	2,755	706	-6.7	-9.7
Cowra UCL	8,691	2,293	8,430	2,244	8,107	2,035	-3.0	-6.7
Walgett UCL	1,821	435	1,735	385	1,625	390	-4.7	-10.7
Deniliquin UCL	7,781	2,076	7,431	1,967	6,441	1,695	-4.5	-17.2

Source: ABS Census Data 2016a,b,c

All communities of interest show a declining resident population between 2001 and 2006. Both Trangie and Condobolin UCLs show similar rates of decline between 2001 and 2006 to Wollar SS and Breakfast Creek SS.

School enrolment trends also offer some insight into population trends of small communities. School enrolments from 2006-2015 for Bylong Upper, Wollar and Ulan Public Schools (**Table 6**) show a steady decline in enrolment numbers. Enrolments at Wollar Public School declined by 60% between 2006 and 2015, matched by a 53% decline at Ulan Public School and a 100% decline at Bylong Upper Public School. Enrolment numbers at Bylong Upper Public School have remained low across the timeline presented in **Table 6**. This is despite the absence of any significant mining-related activities in the Bylong Valley until 2011.

Rural population decline driven by cumulative mining activity is likely to continue into the immediate future. The Wilpinjong Extension Project may require additional property purchases (Peabody 2015) in the Wollar SS contributing to further decline in the population of the Rural Area. In the Bylong Valley, 13 existing residents will be required to move off land affected by the Project prior to the commencement of Construction Phase 1 (these movements are already considered in the predicted 14% decline in Rural Area population). In the case of the Bylong Valley, KEPCO is seeking to offset population loss by encouraging members of the Project workforce to relocate to the Bylong Valley and reside in one of the residences owned by KEPCO. KEPCO already has nine houses occupied with farm hands, Farm Manager, subcontractors and families.

Reduction in Access to Services and Facilities

Gradual population decline across the Rural Area has resulted in reduced accessibility to community infrastructure and services, notably:

- Education services - primary schools; and
- Emergency services - Rural Fire Services.

Population decline across the Rural Area has resulted in a reduction in the number of families and a corresponding reduction in school enrolments. Bylong Upper Public School was closed in 2015 and Wollar Public School is understood to be under review by the NSW DEC due to a reduction in enrolments. It is understood one child from the Bylong Valley transferred from Bylong Upper Public School to Wollar Public School for the 2016 school year. Whilst the loss of Bylong Upper Public School has resulted in one new enrolment at Wollar, stakeholders remain concerned in relation to the potential cumulative impacts should Wollar Public School also close. Further cumulative population decline across rural areas of the MWRC LGA may result in rationalisation and consolidation of existing education services in future years with resulting impacts on accessibility for existing residents.

Families generally require ready access to education facilities. The presence of a primary school in a community makes the locality attractive to families. The presence of an education facility also tends to attract other services such as adult learning experiences, playgroups, mothers and babies groups, art and craft groups. All of these services contribute to a localities social capital, and all of these services are at risk of being lost when an education facility is closed.

The recent closure of Bylong Upper Public School follows a trend of closures in small rural communities experiencing small school enrolment numbers. The long term sustainability of small primary schools across NSW is an issue currently been considered by the DEC. The reduction in education services in the Bylong Valley is a result of the combination of historical population decline, cumulative impact of mining activity and a national trend in rural population decline, driven by population gravitation towards larger centres. A decline in enrolment numbers at Bylong Upper Public School is also the result of an aging population in the Bylong Valley and a desire by some people to send their children to large schools in Rylstone, Kandos or Mudgee.

It should be noted that KEPCO has always maintained a position of relocation rather than closure of Bylong Upper Public School. The decision to close the school was a decision made by the NSW DEC following a review of both current enrolment numbers but also the potential for future enrolments. KEPCO lodged a submission to the Government prior to the decision to close the school. KEPCO's submission noted that the community will benefit from the relocation of the school and offered to assist in the school's relocation in an attempt to avoid its closure.

Emergency Services

KEPCO acknowledges that the combination of aging resident population in Bylong, population decline in Bylong, together with the Project's property acquisition process has resulted in a reduction in capacity at the Bylong Rural Fire Service (RFS). There is also evidence (Peabody Energy 2015) to suggest a similar impact has occurred in Wollar in relation to the Wilpinjong Mine. This issue is discussed in Section 11.2.5 of the SIA (Appendix AC of the EIS). The Wollar Rural Fire Brigade has amalgamated with the Cook's Gap RFS to secure a long term service for the Wollar area.

There is potential for further rationalisation of rural fire services across the Rural Area as a result of cumulative population decline. However, KEPCO and a number of other mine proponents in the MWRC LGA (e.g. Peabody Energy at Wilpinjong Mine) have either committed to or are currently engaged in activities that seek to support the existing emergency service operations. Activities include funding necessary equipment and/or supporting employees in volunteer roles to ensure services can continue to operate effectively. Peabody Energy has established a working protocol with the Cooks Gap RFS (which includes former members of the Wollar RFS) to respond to fire incidents at the Wilpinjong Mine site and in the local area (Peabody Energy 2015).

Table 82 of the SIA (Appendix AC of the EIS) describes the commitments made by KEPCO to manage predicted Project impacts and cumulative impacts on emergency services.

Changes in Sense of Community

The findings of consultation conducted with residents of the Bylong Valley to inform the EIS together with information presented in Peabody Energy SIA (2015) suggest historical population decline and the growth in mining activity (including exploration) has resulted in a loss of social capital across the Rural Area. There is a perception by some residents of Wollar and the Bylong Valley that the social sustainability of the Rural Area is threatened by the cumulative impacts of mining activity.

Social sustainability occurs *“when the formal and informal processes; systems; structures; and relationships actively support the capacity of current and future generations to create healthy and liveable communities. Socially sustainable communities are equitable, diverse, connected and democratic and provide a good quality of life”* (McKenzie 2004). Elliot Whiteing in Peabody Energy (2015) suggests social sustainability is affected by *“population size and composition, and by adequacy of key resources such as locally relevant skills, community networks and housing”*.

Peabody Energy (2015) also suggests that the current social sustainability of Wollar is a result of the declining population which in turn is a result of property acquisition associated with the Wilpinjong Mine.

In the context of the Bylong Valley, there is potential for the following Project related activities to result in adverse cumulative impacts on social sustainability:

- Property acquisition activities and the associated displacement of population;
- Construction and operation of the WAF and associated temporary population influx and demographic changes; and
- Project construction and operation and the resulting changes to the character, amenity and identity of the village of Bylong.

However, there are also the potential for the following Project related activities which together may have a positive cumulative impact on social sustainability:

- Use of KEPCO owned housing in the Bylong Valley to accommodate some of the Project workforce. This will draw population to the Bylong Valley and offset the population lost through Project related property acquisition;
- Implementation of social investment programs to support improvements in social capital;
- Employee education and training initiatives which develop human capital (skills, employment and training);
- Road upgrades in the Local Area will improve accessibility to nearby centres and improve emergency access; and

- Employment and economic investment initiatives that enable local people to be employed on the Project or deliver services through the local procurement program.

There is anecdotal evidence to suggest the population of Bylong Valley has fluctuated historically and that population decline commenced prior to the introduction of mineral exploration into the area (refer Section 6.2.3 of the SIA). There is also evidence to suggest that levels of social sustainability in Bylong Valley have fluctuated in line with the changing population. For example, the Historic Heritage Impact Assessment (Appendix T of the EIS) notes the historical existence of numerous schools across the Bylong Valley. Consultation with Bylong Valley residents to inform the Social and Historic Heritage Impact Assessments for the EIS highlighted the range of activities and events that occurred in the Bylong Valley in the late 80's and early 90's and note the absence of such events now. The findings of SIA interviews conducted with residents of the Bylong Valley suggest changing community structures and relationships dating back more than 10 years. In more recent times, adverse changes in social sustainability are evident in the demise of the Bylong Mouses Races in 2014, reduced rates of volunteerism at the Bylong RFS and the recent closure of the Bylong Upper Public School.

Property acquisition associated with the Project will result in a loss of existing residents from the Bylong Valley. It is likely that some loss of relationships has occurred between residents of different communities as existing residents of the Rural Area depart in the wake of property acquisition activities. Cumulative population loss across the Rural Area is likely to speed up the rate of adverse change in social sustainability, particularly if this population decline results in a contraction in services such as education (e.g. Wollar Public School) and commercial (Wollar Store).

KEPCO is seeking to encourage mine employees to relocate to the Bylong Valley and take up residence in a number of KEPCO owned houses. Many of these houses are located in areas that will be largely unaffected by mining operations. It is acknowledged that some employees with families will not be interested in residing in close proximity to an operating mine. Despite this, as underground mining progresses and the initial open cut mining area is rehabilitated, the Bylong Valley is likely to be attractive to employees as a residential location, particularly given the considerable daily commute time from the Project site to Mudgee (almost one hour). There are examples of other mining operations where mine owned housing located in proximity to an operating mine are occupied by personnel associated with mine operations. Examples in NSW include Ulan Mine, Bengalla Mine, Boggabri Mine and Mt Arthur Coal Mine.

Changes in Rural Amenity

Section 10.3.1 of the SIA (Appendix AC of the EIS) discusses the changes in character and rural amenity associated with the Project. The following section discusses the cumulative impact of mining on rural character.

Mining has existed in areas to the north-east of Mudgee since the early 1920's with the operation of Ulan No. 1 Colliery (Glencore 2016). The commencement of the Wilpinjong Coal Mine in 2006 and Moolarben Coal Mine in 2009 marked the start of a gradual process of change in the rural character of the area around Wollar. Not only has the area transitioned from solely being a rural environment to also including an industrial landscape, there have been changes in traffic volumes on local roads (with an increase in mine vehicles) and the introduction of a significant working population of a predominantly male demographic.

The Bylong Valley remains largely unaffected by these changes, attributable to the topography of the Bylong Valley, the distance from and an absence of any direct line of sight with the existing mining operations at Wollar. The Sandy Hollow to Gulgong Railway line which passes through the Bylong Valley is one of a only a few mining related elements in the landscape of the Bylong Valley.

Should mining commence in the Bylong Valley, the scale and nature of changes in the rural character is likely to be significant and similar (to some extent) to those that have occurred in Wollar. These changes would be driven not only by the open cut and underground mining elements of the Project but also by the potential operation of a WAF in Bylong, the traffic generated by the workforce and the introduction of mine vehicles and 'fluro' clothing. These issues have already been discussed in Section 10.3.1 of the SIA (Appendix AC of the EIS).

The magnitude of the change in the rural amenity of the Bylong Valley is predicted to be less than that at nearby Wollar due to the life of the proposed open cut operations associated with the Project, the specific location to minimise visual amenity impacts to the Bylong Village and the life of the WAF (maximum of 6 years). Open cut mining operations are proposed to be undertaken for less than ten years in the Bylong Valley and will be followed by a period of rehabilitation. Underground mining will occur from PY 7 to PY 25, followed by mine decommissioning and final rehabilitation. Underground mining will have a significantly smaller impact on rural character than the initial open cut mining operations. Whilst the landforms of the open cut mining areas will be modified from those pre-mining, the final rehabilitated landforms will be contiguous with and similar to the existing elevated and ridgeline landforms. Further, the proposed rehabilitation strategies seek to create a landform with similar to or better than the pre-mining land capability and therefore will be suitable for use by existing agricultural activities. Achieving these objectives will substantially reduce the potential amenity impacts of the Project post-mining.

Increased Risks to Community and Employee Health and Safety

A reduction in RFS services across the Local Area has the potential to increase the threat of unattended fires and road accident emergencies in the north-eastern area of the MWRC LGA. This may have health and safety implications for existing residents and road users including tourists, residents and mine employees.

KEPCO has identified this issue and has committed (as per Management Commitment 63 of Table 98 of the EIS) to *“Encourage employees who are residents of Bylong Valley to volunteer for the Bylong RFS Brigade. Develop employee policies that enable emergency services personnel to be released from duties to attend emergency calls and to allow release of employees to perform crucial volunteer actions outside of the Project Boundary. Indeed, Project staff and family members are already volunteering for the Bylong RFS.”*

5. Cumulative Traffic Impacts

The Project will result in additional traffic movements on the local and regional road network. The cumulative impact of increased traffic movements on the regional road network is described in **Section 4.2.9** and detailed in the revised TTIA (**Appendix D**).

4.2.8 Voluntary Planning Agreement

Issue

The EIS makes reference to a Community Needs Assessment (CNA). The role of the CNA is not clear in the EIS and there were initial concerns as to the CNA particularly given the reference to commitments throughout the SIA. It has been confirmed by Worley Parsons that the CNA will outline the company's investment strategy to 2017. Council has a Community Plan (CP) developed out of the IP&R process and endorsed by the council and the community for implementation through the operational and delivery programs. As has been the case with previous VPA agreements, council intends to use the additional contribution to deliver community infrastructure in accordance with the commitments of the CP. There are concerns then that reference in the SIA to the CNA and numerous opportunities citing VPA is inconsistent with negotiations to date.

The community infrastructure fund set up under various planning agreements and via conditions of consent (in the case of Moorlarben) will support the roll out of priorities in the Community Plan. Those areas of greater concern are around health and education where local government is not primarily responsible for the delivery. It has been our experience that the service providers are reactive to pressure in these areas and council will need financial assistance from time to time to address this. It should also be noted that Council has made an allowance for a new primary school site should the thresholds require it in the longer term. The SIA proposes an increase in school aged children of around 250 in Mudgee alone in project year 9 and this highlights the importance of having strategies in terms of monitoring the actual impacts of all mining activities on social infrastructure on an ongoing basis and to remain ahead of change in demographic trends, particularly in health and education.

Response

Noted. KEPCO is currently undertaking a Community Needs Assessment (CNA) to define the community's needs. The CNA will assist in refining KEPCO's values and principles regarding community investment.

The purpose of the CNA is to provide an information and decision-making platform for KEPCO to facilitate:

- Defining contextually-relevant investment priority / focus areas;
- Identifying what type of community development initiatives are likely to be supported by local and regional communities (individuals, government and the private sector); and
- Identifying potential community and government partners to implement some and relevant community development initiatives.

The CNA will expand on the findings of the SIA and MWRC's Community Plan to identify strategic investment opportunities for the Project, in close consultation with MWRC and local community groups. The CNA will be updated annually and the outcomes of the assessment will inform the Project's investment strategy until 2017 or until the VPA is initiated. The assessment will set out the nature and scale of investment in line with community expectations. It will also describe any capacity building initiatives that may need to take place ahead of implementation. KEPCO will discuss the outcomes of the CNA with MWRC to assist in the ongoing monitoring and refinement of priority community investment areas.

Since the exhibition of the EIS, KEPCO has reached agreement with MWRC over a VPA for the Project. It is anticipated that the VPA will be publically notified and exhibited in the near future.

4.2.9 Traffic and Transport

4.2.9.1 MWRCs Commitment to Wollar Road Upgrade

Issue

In relation to Wollar Road and as stated below, Council has received \$14M funding from the State Government for the upgrade of this road. The funding was granted on the back of a business case that included the need for the work as a direct result of the BCP should it go ahead. It is also a strategic alternative route between Mudgee and the Hunter Valley. Work has already commenced on the project under the terms of the funding agreement and is due for completion in 2017. The upgrade will put the BCP which is already only 40 minutes from Rylstone, within a one hour commute of Mudgee. Therefore any reference to the road being unsealed should be removed as it is misleading.

...

The Wollar Road upgrade presently being undertaken by Council is a project funded on the premise that the road would be heavily utilised by the mine, including commuter traffic. Indeed Section 3.5.4 of the report states that once the upgrade is complete the traffic will be in the vicinity of 500-1000 vehicles per day. This was an estimate provided to the proponent by Council on the basis of a commuting workforce. If the TWA is not built, and it is the position of Council that it cannot be justified and should not proceed, the traffic impact forecasts provided in the EIS will be substantially lower than in reality.

Response

Noted.

KEPCO acknowledges that the Wollar Road upgrade will provide the preferred route for Project-related traffic to the township of Mudgee. The Project has been designed on this basis.

As explained in Section 3.11 of the EIS, KEPCO acknowledges that MWRC is in the planning process for the section of Wollar Road between Bylong and Wollar to be fully sealed in 2017 on completion of their proposed road works. The EIS correctly acknowledged that at present, there are sections of Wollar Road which are unsealed at this location.

As explained in Section 3.11 of the EIS, the WAF is required for the construction workforce to avoid impacts on the local housing and short term accommodation market; provide a risk management approach to ensure that the critical construction workforce is able to be accommodated; and to manage the risk to the Project should Wollar Road not be upgraded as anticipated.

KEPCO is in ongoing discussions with MWRC in relation to an agreement for the contribution to road maintenance on the road network utilised by the Project-related traffic.

As explained in **Section 4.2.1**, KEPCO has demonstrated that the Project continues to require a WAF as originally anticipated within the EIS to ensure that suitable accommodation is available for its construction-related employees despite the plans for Wollar Road to be upgraded.

The EIS proposed the construction and operation of a WAF for the initial six years of the Project until the end of construction phase 2. The RTS is suggesting a smaller WAF for the first two year construction period and then a further accommodation survey in PY 4 to determine if an even smaller WAF would be required for the Phase 2 construction activities. Any unforeseen future changes to the life of the WAF beyond that which is sought to be approved for the Project would (if it were required) need to be subject of a Development Consent modification.

4.2.9.2 Level of Service

Issue

Not considering a scenario that excludes the TWA also has implications for the level of service of intersections. In all the scenarios posed in Section 5 of the report, all intersections operate at the 'A' level of service indicating a free flow condition. Section 5.2.1 recommends basic intersection treatments on the basis of warrants that assumes an accommodation facility is in service.

Response

The revised TTIA (**Appendix D**) provides a description of the wider area assessment of intersection performance completed which includes a no WAF scenario. The no WAF scenario will generate the largest volume of Project traffic onto the regional road network.

The assessment indicates that all intersections analysed will continue to perform at good levels of service (A, B or C) during weekday AM and PM peak periods under the cumulative traffic scenarios.

The peak traffic volumes generated by the Project is predicted to occur during construction phase 1 in PY 2 (2017), with the no WAF scenario. Peak traffic volumes are predicted at approximately 478 vehicles per day on the Wollar Road to and from the Project site. Peak traffic volumes on Wollar Road for the WAF scenarios were predicted at approximately 262 vehicles per day.

As explained in Section 6.2.1 of **Appendix D**, a review of intersection layouts based upon future traffic demand indicates that the Type BA intersection layouts at Bylong Valley Way and Wollar Road and Bylong Valley Way and Upper Bylong Road would still be sufficient based on Austroads Guide to Road Design guidelines.

4.2.9.3 Change of Shift

Issue

However, the assessment has not considered how these intersections will perform at change of shift with all the workforce attempting to enter/leave the site within a short space of time. It is likely that motorists would experience queues and delays in this circumstance and the assessment will have failed to identify a much lesser level of service. Council concurs with the consultant's recommendation to conduct a formal safety audit to identify and prioritise road safety treatments. This should form the basis of any negotiation relating to contributions towards capital upgrades particularly for the section of road between Wollar Village and the Ulan Road intersection with Wollar Road.

Response

The TTIA (Appendix Z of the EIS) did consider how intersections within the Study Area will perform at the change of shift with workforce both entering and leaving the site within a one hour period.

The revised TTIA (**Appendix D**) has conducted further intersection analyses on the regional study area and based on the revised assumptions and scenarios. The revised assessment consistently indicates that all study intersections will continue to operate at good levels of service with minimal delay and queuing as a result of the Project related traffic.

Further to the information presented within **Appendix D** on the safety deficiencies of road network within the regional study area, KEPCO will conduct the required road safety audits prior to the commencement of construction activities in consultation with MWRC. It is noted that KEPCO is in ongoing discussions with MWRC regarding contributions for ongoing road maintenance over the life of the Project.

4.2.9.4 Baseline Traffic Data

Issue

Table 5.11 provides daily traffic projections for mid-block road sections. Baseline figures appear to be based on Section 1.6 of the report which outlines traffic surveys and 'referenced' previous traffic counts from 2011. The counts from 2011 indicate a higher level of traffic movement than from the survey, which was not conducted over a 24 hour 7 day period as was the case for the 2011 counts. It is Council's view that using the higher counts would have been a more conservative approach to forecasting AADTs once the mine commences production.

Response

Noted.

4.2.9.5 Road Maintenance

Issue

Accurate predicted traffic volumes in any event provides Council the opportunity to adequately assess the increased maintenance needs of public roads. It is suggested that once the mine commences construction and progresses to operation that the Bylong Valley Way and the Wollar Road, between Wollar and the intersection of the Ulan Road, will require a higher levels of maintenance. Negotiations with the proponent to date have not included a contribution to Council for the ongoing maintenance of these sections of road due to mine related traffic. This maintenance cost will be strongly linked to traffic volumes, which in turn are affected by reliable baseline estimates and the implementation of accommodation facility.

Response

Additional traffic surveys were conducted in December 2015 for various intersections and also mid-block count locations as discussed in Section 1.6 of **Appendix D**. These survey volumes have been utilised as the baseline volumes and are presented in Section 2 of **Appendix D**. Project related traffic volumes and cumulative traffic volumes have been segregated and clearly show the increased traffic due to the Project on both Bylong Valley Way and Wollar Road.

KEPCO is in ongoing discussions with MRWC in relation to an agreement for the contribution to road maintenance for the road network utilised by Project related traffic.

4.2.9.6 Southern Roads Strategy – North Link Road

Issue

The report identifies two alternative routes for landholders located to the south of the project area to utilise when the Upper Bylong Road is re-aligned resulting in the isolation of private holding to the south of the lease area. These are the Budden Gap and Lee Creek Roads. Whilst neither route is ideal for the affected parties, the latter is Council's preferred option as the road is already formed and traverses comparatively moderate terrain. The Lee Creek Road alternative is a considerably simpler road to upgrade from a constructability point of view. The access for the affected landholders should be negotiated prior to any approval being issued for the project.

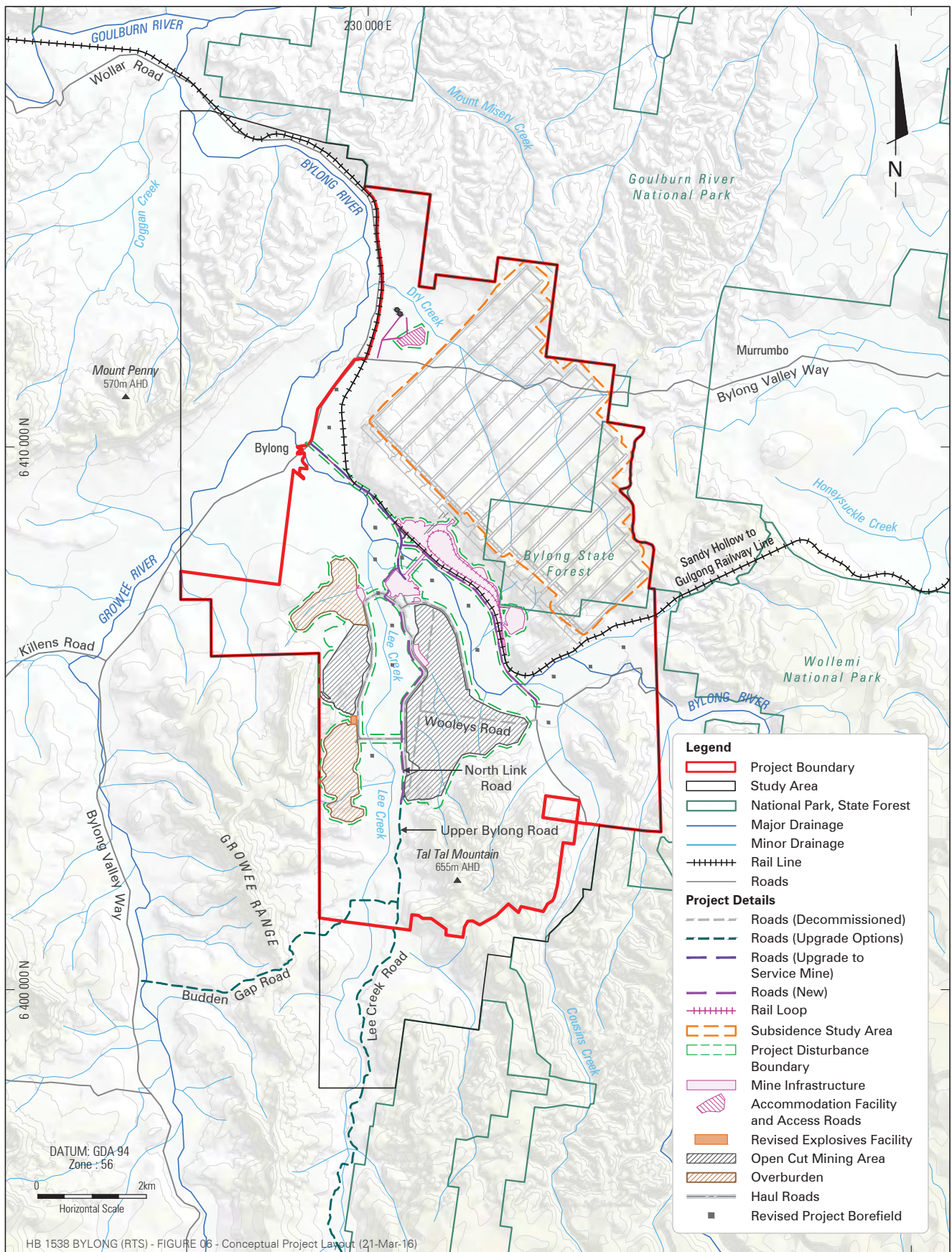
Response

Since the lodgement of the EIS, KEPCO has developed a third option to provide alternate access for landholders located to the south of the Project. This option is the preferred option and comprises the construction of a new road named the North Link Road. KEPCO seeks approval for the construction and operation of this new road as part of the Project.

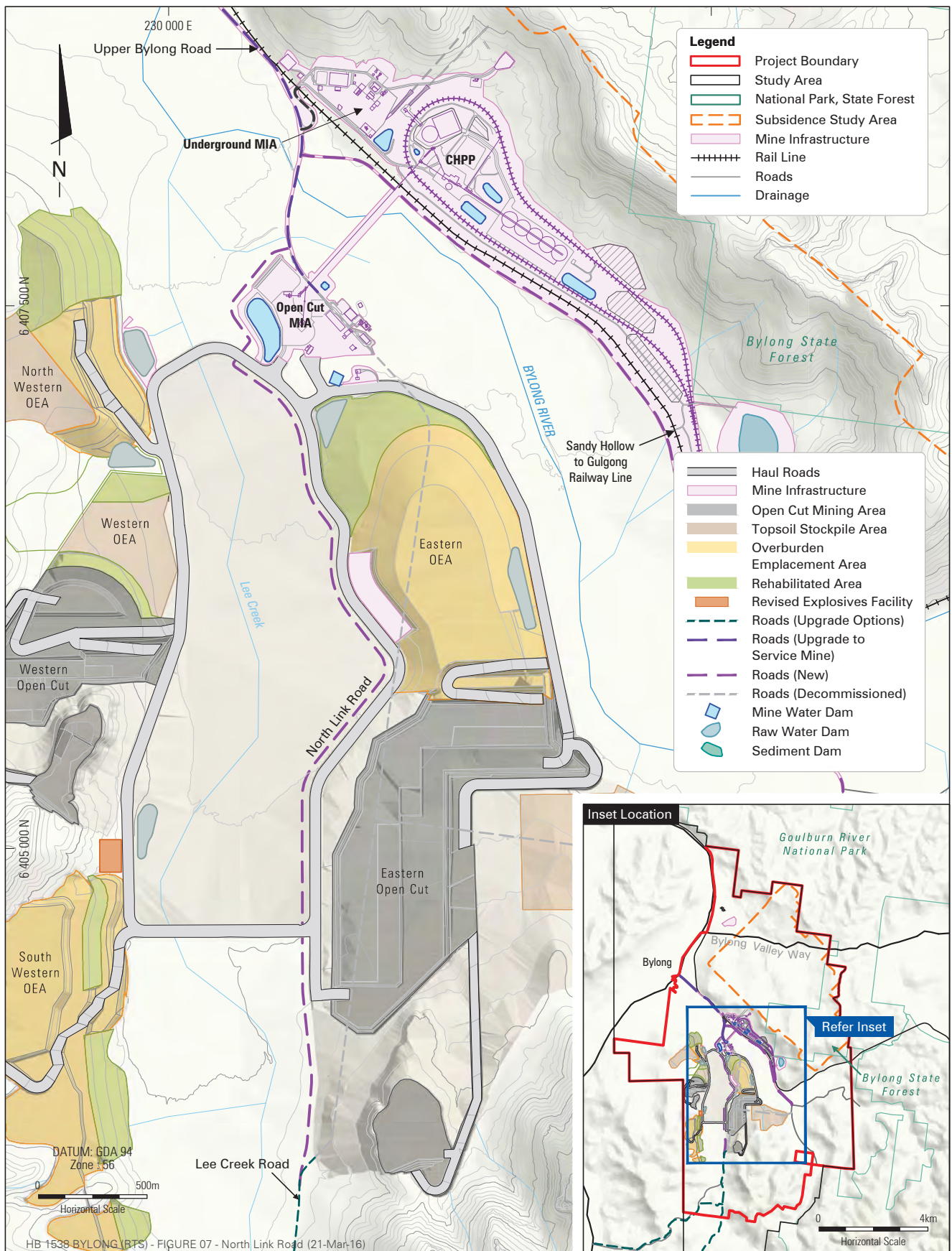
The North Link Road alignment will follow the western limit of the Eastern Overburden Emplacement Area (OEA) and Open Cut Mine Infrastructure Area (MIA) before joining the existing Upper Bylong Road to the north of the Open Cut MIA as conceptually illustrated on **Figure 6** and **Figure 7**. The North Link Road is proposed to be constructed entirely within the Project Disturbance Boundary assessed within the EIS.

The North Link Road constitutes a realignment of the central section of the southern portion of Upper Bylong Road to the northern portion of Upper Bylong Road as the central portion of Upper Bylong Road is to be decommissioned due to mining activities.

The North Link Road will be designed and constructed to meet the relevant regulatory requirements and will cater for relatively low traffic numbers including light vehicles and the occasional livestock truck movements (i.e. double-deck cattle trucks). The North Link Road will contain grade separations in two locations, where the proposed mining haul roads will cross over via pre-cast concrete structures. Depending on final alignments and road serviceability requirements, certain sections of road may require suitable earthworks within a designated floodplain (equal to or better than the existing Upper Bylong Road). The new road section will be designed as a sealed road, consistent with that of part of the existing Upper Bylong Road to be decommissioned. KEPCO is in discussions with the affected landholders regarding acquisition or compensation for the potential impacts associated with the proposed decommissioning of Upper Bylong Road.



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KEPCO has presented the conceptual alignment of the North Link Road to the MWRC who indicated that they were in support of this proposed road alignment.

4.2.9.7 Amended Noise Assessment

With the construction of the proposed North Link Road, a modification to the originally proposed haul road designs crossing Lee Creek was required. This includes raising the level of the two mine haul roads higher than the proposed North Link Road to accommodate double-deck cattle trucks underneath the haul roads. The two crossings are located to the west of the ROM pad (northern crossing) and the west of the eastern open cut / emplacement area (southern crossing). The revised haul road design will raise the haul roads by approximately 4.5 m and 3.9 m for the northern and southern haul roads, respectively.

An addendum to the NBIA has been completed by PEL to assess the potential implications in the noise emissions from the Project as a result of the proposed increase in height of the two haul roads. This addendum is provided in **Appendix F**.

The revised modelling assessment has found that changes to noise impacts are marginal for all scenarios modelled and that the noise impacts were consistent with the findings of the NBIA (Appendix Q of the EIS).

4.2.9.8 Relocated Explosives Storage Facility

Furthermore, due to the location of the proposed North Link Road, the proposed explosives storage and reload facility needs to be relocated to an alternate location. The proposed explosives storage and reload facility was originally to be constructed adjacent to the haul road to the west of the Eastern Open Cut (as illustrated on Figure 19 of the EIS). The explosives storage and reload facility is proposed to be relocated to the north-eastern corner of the south-western OEA, as illustrated on **Figure 6**. The quantity and types of explosives materials proposed for the Project will remain consistent with those presented in the EIS.

The proposed new location has been nominated because it meets the relevant legislative separation distances of a minimum of 500 m from a public place. The proposed location is approximately 2.3 km from the Open Cut MIA and 730 m from the nearest public road, which will be the proposed North Link Road. A storage and reload facility will be located approximately 40 m from the explosives storage facility for the handling and management of materials in preparation for blasting events.

As described in the EIS, a Hazard Management Plan will be developed for the Project which will include procedures for the transport and storage of explosive substances, management of storage locations and detailed response procedures should an event such as fire, explosion or spill occur. The management of explosives will also be considered in the Bushfire Management Plan developed for the Project with the Management and Monitoring commitments made for the Project (as detailed in Table 102 of the EIS).

KEPCO will develop a Security Plan in accordance with "Security Plan for Storage and Handling of Explosives and Security Sensitive Dangerous Substances", WorkCover 2013, to accompany its application for a blasting explosives users licence containing permission to store explosives. The compound will be surrounded by a 2.45 m high access-proof fence, including barbed wire extension and security gates and will be connected to the site wide electrical and communications networks. The explosives storage facility will be electronically monitored.

4.2.9.9 Economic Implications

The economic implications of modifying the Southern Roads Strategy have been considered for the Project. The Economic Impact Assessment, p. 38, identified that:

"Three properties located to the south of the proposed Open Cut Mining Areas will be affected by the closure of Upper Bylong Road as this is their primary access route to the properties. Whilst Lee Creek Road in its current condition will continue to provide a viable access to these properties, following this route will add time travelling to and from these properties. KEPCO is considering a number of options to address this impact, including upgrade of Lee Creek Road, upgrade of Buddens Gap Road or KEPCO entering into compensation agreements with the three landholders who may be affected. An allowance is included in the capital costs of the Project for the cost of upgrading Budden Gap Road."

The provision of a North Link Road instead of the upgrade of Budden Gap Road is estimated to reduce capital costs by approximately \$2 Million, while making the immediate properties located to the south of the proposed Open Cut Mining Areas off Lee Creek Road no worse-off. The North Link Road will also result in a minor increase in the net social benefits of the Project, provided there are no additional externalities associated with the North Link Road option relative to the upgrade of Budden Gap Road.

4.2.9.10 Traffic

The revised TTIA (**Appendix D**) considered the construction of the North Link Road as the preferred options to provide ongoing access for landholders to the south of the Project because it provides the most direct route which is similar to the existing Upper Bylong Road.

4.2.9.11 Subsidence Impacts on Bylong Valley Way

Issue

It is further noted that there is a real potential for subsidence in parts up to 3m over more than 3km of Bylong Valley Way affecting 12 culverts. The EIS makes reference to remediation by re-levelling culverts where cracking and tilts sufficient to cause a grade reverse and progressive road maintenance and repair work as mining progresses.

Erosion protection may also be required to stabilise slopes. This would necessitate the implementation of speed restriction along the road and directly impacting the level of service of the infrastructure over a significant time period. Council is very concerned about the risk to public safety that this poses as well as an ongoing maintenance burden for Council. Any approval should ensure that the proponent is responsible for the ongoing cost associated with the maintenance and repair of this part of Bylong Valley Way. A full condition report of this road should be undertaken to determine the current condition of the asset as part of the approval process.

Response

Noted. Subsidence impacts to Bylong Valley Way and proposed management of this road is discussed in further detail in **Section 5.4.10**.

4.2.10 Road Dilapidation Report

Issue

As discussed in the traffic section above, the lack of data around a development option that excluded the TWA is a serious concern not least because it then fails to then provide accurate traffic data against which to determine the initial adequacy of the transport route and maintenance contribution for the Wollar road over the life of the project. Council anticipates that any approval would include provision for such a contribution as a direct impact of the development on the local road network.

Further in the response to the SEARs Council articulated that the EIS should include a Road Dilapidation Report and complete audit of local road infrastructure including the Bylong Valley Way, Wollar and Lue Roads.

Again the TIA fails to address the full impact of the proposal on the local road network, in particular Wollar Road from Wollar to Mudgee which will likely be the transport route.

Response

The revised TTIA (**Appendix D**) includes a no WAF scenario for the Project which indicates that the road network and associated intersections will sufficiently accommodate the Project traffic generations. The revised TTIA presents traffic volumes along Wollar Road under baseline conditions and with Project-related traffic.

The revised TTIA highlights the existing road safety deficiencies and condition of various roads within the regional study area and notes that the road dilapidation inspections should be undertaken prior to the commencement of construction and after construction is complete. KEPCO is in ongoing discussions with MWRC in relation to an agreement for the contribution to road maintenance on the road network utilised by the Project-related traffic.

Issue

The Traffic Impact Assessment should be reviewed to include a scenario in which the TWA is not built as an option.

Council has some concerns regarding the Bylong Coal Project Traffic and Transport Impact Assessment (TIA) prepare by Parsons Brinckerhoff (Appendix Z), the most obvious being that a scenario without a TWA was not considered. This is despite the indication given by Council on numerous occasions that such a facility is unlikely to be favoured by Council or considered necessary with the upgrade of Wollar Road. The report does however acknowledge in Section 5.2 that the uncertainty surrounding the life of the facility will generate quite different outcomes in terms of traffic volumes. The TIA is therefore significantly flawed and should be reviewed to include a scenario in which the TWA is not built as an option.

Response

A supplementary SIA has been completed of the key social impacts associated with the Project under a scenario where there is no WAF (refer to **Section 4.2.1** and **Appendix C**). **Section 4.2.9** presents further information on the TTIA completed for the Project.

Traffic from the Project will be at peak levels in 2017 (PY 2) during the construction phase. Under the no WAF scenario in 2017 and including cumulative traffic, results from intersection performance are shown in **Table 8** below. **Table 8** shows that all study intersections analysed will operate well within capacity at good levels of service.

A revised road traffic noise assessment has been completed as part of the Bylong Addendum Noise Report (**Appendix F**). This assessment considered the no WAF scenario and associated impacts of the Project on receivers neighbouring the public road network. Once the construction phase is completed, road traffic noise impacts consistent with the EIS are anticipated. Road traffic noise levels were predicted using the US Federal Highway Administration's Traffic Noise Model 2.5 (TNM) (FHWA, 2004), consistent with the EIS.

The result of this assessment demonstrated that noise impacts in the absence of the WAF will result in increased road noise levels at a number of receivers compared to the WAF scenario. Noise levels at receiver 69 are expected to increase by up to 8 dB during the day period and 5 dB during the night period, compared to noise levels on this road without the Project. Noise levels at receivers 44 and 68 will experience increases of up to 4 dB during the day and between 7 and 12 dB during the night, compared to noise levels without the Project. Noise levels at other receivers are expected to increase marginally, compared to the WAF scenario.

Upon completion of the construction period, road traffic impacts will be consistent with the predictions for the Year 9 and Year 13 predictions presented in Section 9.5 of the NBIA (Appendix Q of the EIS). Noise levels from Project traffic noise levels are expected to comply with relevant Road Noise Policy (DECCW, 2011) criteria, consistent with findings of the NBIA.

Table 8
2017 Without WAF – Intersection Performance Summary

Intersection	Peak hour	DoS	Average Delay (seconds)	LoS	Queue (m)
1. Bylong Valley Way/ Wollar Road	AM peak	0.025	9.6	A	0.6
	PM peak	0.016	9.6	A	0.5
2. Bylong Valley Way/ Upper Bylong Road	AM peak	0.024	5.1	A	0.6
	PM peak	0.019	5.0	A	0.5
3. Golden Highway and Bylong Valley Way	AM peak	0.046	8.4	A	0.4
	PM peak	0.029	8.2	A	0.1
4. Golden Highway and Ulan Road	AM peak	0.024	8.5	A	0.8
	PM peak	0.016	8.7	A	0.5
5. Wollar Road and Ulan-Wollar Road	AM peak	0.021	4.8	A	0.4
	PM peak	0.015	5.0	A	0.2
6. Wollar Road and Ulan Road	AM peak	0.227	10.3	B	1.0
	PM peak	0.188	9.7	A	1.5
7. Castlereagh Highway and Bylong Valley Way	AM peak	0.024	8.5	A	0.7
	PM peak	0.026	9.5	A	0.8
8. Ulan Road and Ulan Wollar Road	AM peak	0.408	18.3	C	17.8
	PM peak	0.320	6.7	A	11.2

4.2.11 Noise

Issue

Any approval needs to be responsive to noise impacts beyond those anticipated in the EIS. As has been the experience in Wollar with the Wilpinjong project, the modelling in some instance does not adequately account for the actual local conditions particularly where topographic features are variables to the way noise travels.

Response

The NBIA (Appendix Q of the EIS) included noise modelling which was undertaken utilising detailed topographical information for the Project Boundary and data at a contour interval of 5 m for the surrounding locality. This is presented in a representation of the local topography in Section 2.2 of the NBIA. The noise modelling domain included topographic data over a 14.5 km by 22 km area as shown in the noise contour maps (Appendix E of the NBIA).

A site specific assessment of the potential reasonable worst case noise emissions generated by the Project under prevailing localised meteorological conditions is presented in **Appendix F**. Ten model runs representing the prevailing meteorological conditions were completed for all scenarios for the construction and operational phases of the Project.

These modelling scenarios have resulted in detailed noise predictions for receivers in the vicinity of the Project under a range of prevailing meteorological impacts (including inversions and drainage flow conditions). The prevailing meteorological conditions modelled were identified to have the potential to increase noise transmission from the source to receiver when compared to neutral meteorological conditions. The results of the various modelling scenarios undertaken are presented in **Appendix F**.

4.2.12 Vibration

Issue

Vibration will have a significant impact of the remaining buildings and those identified as significant (see heritage impacts below). This could only be addressed by repositioning the open cut pits or excluding open cut mining from the project.

Response

Vibration impacts on buildings and structures were assessed in Sections 6 (operation) and 7 (construction) of the NBIA (Appendix Q of the EIS). Vibration related impacts associated with the Project have been assessed with consideration to limits presented in German Standard DIN 4150-3-1999 "Structural Vibration – Part 3 Effects of vibration on structure and Australian and New Zealand Environment Council (ANZEC) Guidelines (ANZEC, 1990). These limits have been adopted in the absence of an Australian Standard, as is common industry practice for noise assessments for mining activities.

The potential impacts of blasting associated with the Project have been assessed generally in accordance with the ANZEC Guidelines (1990). In light of there being no specific vibration limits within these guidelines, the potential impacts on the structural integrity of heritage buildings has been assessed with reference to the following:

- British Standard 'BS 7385-2 1993 Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration'; and
- 'Australian Standard AS 2187:2006, Explosives – Storage and Use – Part 2: Use of Explosives: Part 2'.

Section 6 of the NBIA concludes that potential operational vibration impacts from non-blasting activities to neighbouring receivers were expected to be imperceptible.

Section 7.4 of the NBIA (Appendix Q of the EIS) provides the assessment of the potential construction vibration impacts. The results of this assessment indicated that safe working distances from sensitive receivers of 20 m for equipment such as dozers, vibratory rollers pile boring and 30 m for compactors would be acceptable to avoid adverse vibration impacts.

Works within these safe working distances would necessitate the need for trial vibration measurements to ascertain appropriate safe working distances.

KEPCO proposes the development of a construction noise and vibration management plan in order to adequately manage the potential noise and vibration impacts of construction activities on buildings and structures.

Blast calculations completed in Section 10 of the NBIA indicate the heritage receptors including Tarwyn Park, Harley Hill Cottage, Swiss Cottage and Cottage Chimney Remains were predicted to potentially exceed the AS 2187 vibration and overpressure limits for structural damage due to proximity to operations within the Eastern Open Cut.

As noted in Section 7.10.4 of the EIS, KEPCO will prepare a Blast Management Plan (BMP) which will include specific receiver mitigation measures for those sites assessed as having conservation values. This will include trial blasts to develop site specific blast laws and suitable Maximum Instantaneous Charge (MIC) to inform blast design to meet vibration limits. The Blast Management Plan will also specify the requirements for monitoring and ongoing condition surveys.

Consistent with the blast management commitments, KEPCO has commenced some baseline dilapidation surveys of particular structures within the vicinity of the Project. These surveys will continue as the Project develops.

As explained in Section 3.17 of the EIS, the proposed locations of the open cut mining areas and associated OEAs have been selected during extensive mine planning and feasibility studies including considerations of environmental constraints, location of the coal resource and economic evaluation studies for extraction. Mine Advice has completed a Supplementary Mine Plan Justification Report (**Appendix G**) which provides further justification and logical information in relation to the proposed open cut mining operations.

Due to the implications on the Project's viability KEPCO is not accepting further adjustments to the open cut mining areas to manage issues which can be appropriately managed utilising appropriate blasting methods and receiver mitigation measures. As concluded in Section 9.3 of the EIS:

“‘Underground Mining only’ is not economically appropriate given the extensive costs of developing an underground mine in relation to the limited value of the thermal coal resource. ‘Underground Mining only’ would also result in material sterilisation of a NSW Government owned coal resource which can only be safely and economically recovered via open cut mining methods. It is further constrained by its need for an environmentally appropriate receptacle for the emplacement of reject materials from the washing of ROM coal.

The 'Open Cut Mining only' option was rejected as it would sterilise the vast majority of the coal resource within the Authorisations due to the topographical and physical constraints to parts of the resource which could only be recovered by underground mining methods.

The Project, involving limited open cut and more extensive underground mining operations presents the logical solution to coal recovery by maximising the efficient and safe extraction of the coal resource from the Authorisations, while at the same time avoiding significant environmental and social impacts. The Project also avoids the permanent sterilisation of other coal reserves known to occur within the locality."

4.2.13 Heritage Impact

Issue

Council supports the Bylong community in concerns raised as to the impacts on environmental heritage and the nomination of Tarwyn Park for an Interim Heritage Order.

Response

The NSW Office Guidelines Local Government Heritage Guidelines (2002) Schedule 1 (3) state "A Council must not make an IHO in relation to item(s) that are located on land: which is subject to a development declared to be State Significant Development under the Environmental Planning & Assessment Act 1979".

Therefore, as the Project has been declared SSD, the Council may support but not make an IHO for Tarwyn Park. However, it is noted the Minister for Planning may recommend an IHO.

The Historic Heritage Impact Assessment (HHIA) includes thorough assessments of the conservation values of the Tarwyn Park Farm Complex and other sites on KEPCO's land. The assessments have concluded the sites are of local significance.

As such, KEPCO has made a number of commitments within the EIS regarding the conservation and management of these items, including Tarwyn Park, through a comprehensive conservation management regime.

The proposed conservation management regime will be based upon the principles of the Burra Charter (the Australia ICOMOS Charter for Places of Cultural Significance, 2013) and Kerr's Conservation Plan (Kerr, 2013). In turn, the regime is supported by and relies upon inputs from other specialist areas, in particular the Visual Impact Assessment (VIA) and the Rehabilitation Strategy and Biophysical Strategic Agricultural Land (BSAL) Reinstatement Strategy.

Issue

Further community consultation should be undertaken with the key stakeholders (including Council) again exploring the option of relocating -

- *Bylong Upper Public School*
- *Our Lady of the Sacred Heart Catholic Church*
- *Upper Bylong Post Office and Store*
- *Bylong Upper Hall*

If the community does not respond to the invitation for the relocation of these items, they should be relocated and moth balled on the mine site until such a time an opportunity arises for relocation as opposed to demolition, particularly given the relatively short term open cut operation.

Response

KEPCO has an “open door” policy to facilitate ongoing consultation with the local community and all relevant parties interested in the Project. KEPCO has maintained regular dialogue with the MWRC’s senior and executive officers in relation to heritage matters.

KEPCO welcomes comments on the practical relocation and or adaptive reuse of those structures listed by MWRC from stakeholders. However, the structural integrity of these structures as determined by a dilapidation survey, will be a key determining factor in relation to ascertaining the practicality of their relocation and/or adaptive reuse. At the same time, there are practical limitations of timing for reaching agreement over whether some of these structures should be relocated or not.

As set out in the Historic Heritage Impact Assessment (HHIA) (Appendix T of the EIS), KEPCO has established a rigorous management regime to guide it in all decisions involving items of heritage value that are either within or within the vicinity of the site of the proposed development.

KEPCO has already commenced implementing its conservation management regime as described within the HHIA, including the preparation of dilapidation studies of the sites.

Issue

The curtilage of those items identified as partially impacted (table 10 - Impact Assessment Summary) items should be further clarified in more detail.

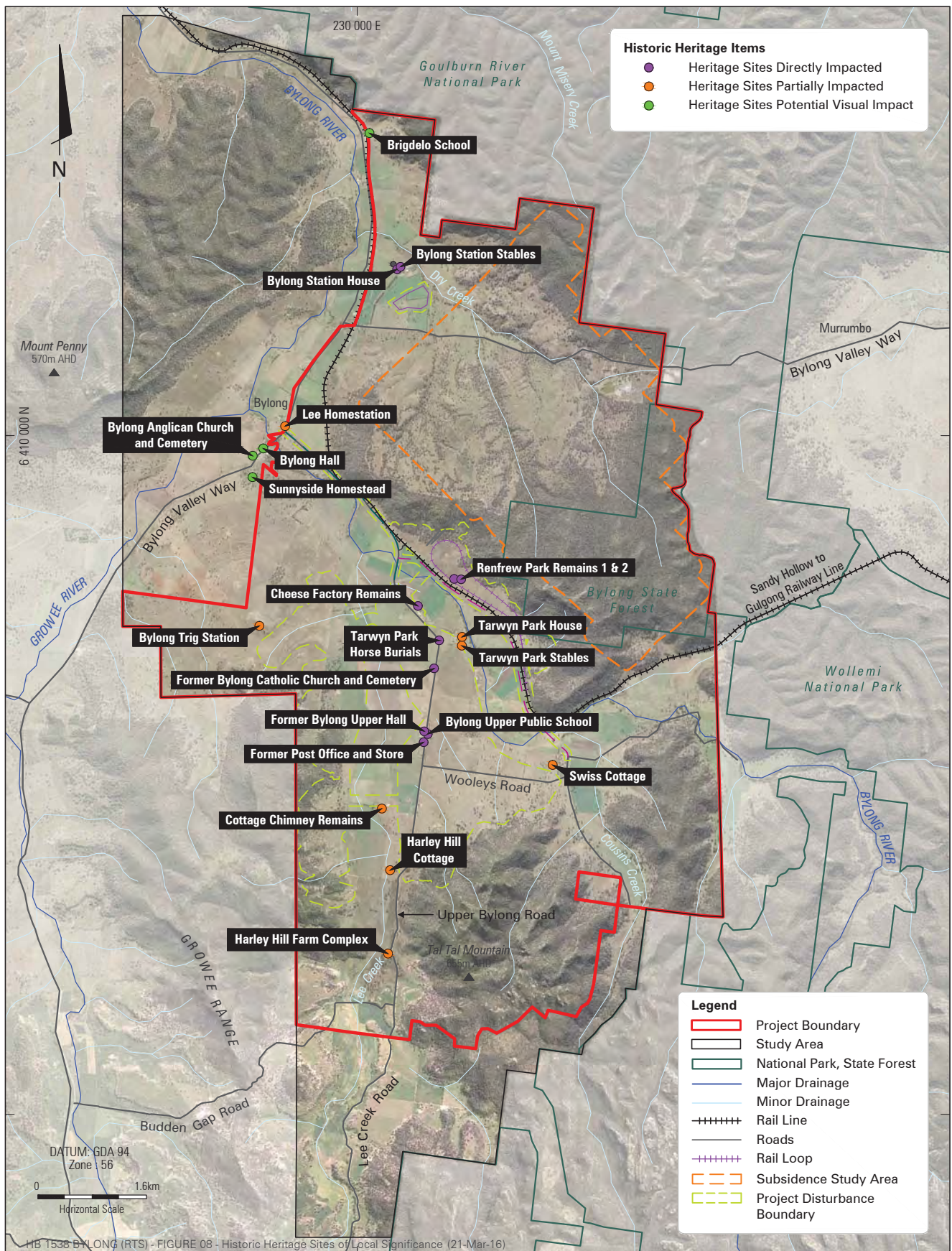
Response

Partial impacts are indirect impacts which may include visual impacts, potential vibration impacts or where physical impacts will occur to part of an item.

The curtilages of partially impacted items and a brief description of impacts from the Project (as outlined in Table 10 of the HHIA) include:

- Homestation – 40 m x 40 m area of fenced land in the north-east portion of Lot 2 DP 1075816. Visual impacts predicted;
- Bylong Station Farm Complex – Lot boundary of Lot 3 DP 222796. Visual impacts to structures and direct physical impacts to farmland from construction of the WAF predicted;
- Bylong Anglican Church – Lot boundary of Lot 51 DP 1142227. Visual impacts predicted;
- Harley Hill Farm Complex – 150 m x 120 m area of land occupied by farm buildings on a portion of Lot 68 DP 198907. Visual impacts predicted;
- Harley Hill Cottage – 20 m x 20 m area of land occupied by cottage on a portion of Lot 51 DP 755438. Visual and potential vibration impacts predicted;
- Bylong Trig Station – 130 m x 100 m area of land located on crest of a prominent hill on a portion of Lot 44 DP 755438. Visual impacts predicted;
- Swiss Cottage – 20 m x 20 m area of land occupied by the cottage on a portion of Lot 67 DP 755420. Visual and potential vibration impacts predicted;
- Bylong Hall – 50 m x 20 m area of land occupied by the hall on a portion of Lot 2 DP 803563. Low visual impacts predicted;
- Tarwyn Park Farm Complex – Lot boundary of Lot 2 DP 1094509. Visual impacts, potential vibration impacts and direct physical impacts to farmland predicted; and
- Cottage Chimney Remains – 30 m x 20 m area of land occupied by the structure on a portion of Lot 99 DP 704724. Visual impacts predicted.

Figure 8 illustrates the location of the Historic Heritage sites in relation to the Project.



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Location of the Historic
Heritage Sites

FIGURE 8

Issue

Council concurs with the proposals for the management of historic burial sites, however, suggests that should they be relocated out of the locality a memorial site should be dedicated including all the information on the headstones and the new burial site. The location of such a memorial should be identified in consultation with the Bylong community and Council.

Response

The arrangements for the reburials and the relocation of grave markers is being determined in close consultation with the various stakeholders including descendants. KEPCO is also continuing consultation with the Catholic and Anglican Dioceses of Bathurst, the NSW Health and MWRC. There will be ongoing consultation with other interested parties as necessary.

Provided that the identified relatives and descendants of those buried at the Catholic Cemetery in Upper Bylong support MWRC's proposed initiative, KEPCO will facilitate the establishment and meet the cost of the erection of such a memorial.

4.2.14 Extent of Mining Beyond the Approval

Issue

There are real concerns about the "concessions" made by KEPCO since the purchase of the authorisations in 2010 (Mine Justification Report p 37). This only highlights that there remains a significant coal resource well beyond the horizon in the present application with the combined measured, indicated and inferred resource being 391.6Mt for the open cut (this approval is seeking to recover 33 Mt) and 482.7 Mt for the underground (91 Mt under this approval). It is not only the experience of the MWRC community but other communities around the state that the initial approval for a mining project provide a platform for continuous expansion through Modifications invariably extending the life of the project well beyond the 25 year limit under regulation with economic feasibility then becoming the most significant determinant to ongoing production. This is not to discount the rigorous environmental and social impact assessment that is required for a modification to proceed but to simply identify that if this proposal is approved as is over 85% of the resource is still in the ground. Council has concerns that arguments as to efficient resource recovery verses the social and environmental impacts and loss of additional agricultural land are unable to be adequately addressed under the current statutory approval process.

Response

The intention of the EP&A Act is to provide a legal platform for promoting and co-ordinating environmental, planning and assessments within the state to meet the object of the Act. Section 5, Part 1 of the EP&A Act contains the object of the EP&A Act. How this Project, as currently proposed, meets the object of the EP&A is included in Section 9.5 of the EIS.

Section 5 a (i) of the EP&A Act encourages: *“the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment”*.

The Project will facilitate the efficient recovery of 124 Mt of ROM coal reserves within the Illawarra coal measures together with the progressive rehabilitation of the disturbed land. At the same time, the Project will provide for the management of land owned by KEPCO and the establishment of a BOS to conserve the biodiversity values of the region. The Project will not result in any material impacts on the availability of water on surrounding private landholdings or significantly impact on surface water and groundwater resources in the longer term. The Project will generate additional employment within the region which will assist in sustaining the socio-economic viability of the MWRC LGA.

Further, section 5 (a)(ii) of the EP&A Act encourages: *“the promotion and co-ordination of the orderly and economic use and development of land”*.

As stated in the EIS, the Project will result in the recovery of a valuable coal resource from within NSW's identified coal reserves. The recovery of this coal resource has been designed to occur with identified, manageable and acceptable environmental and social impacts as well as resulting in material social and economic benefits to NSW.

It was concluded within the EIS that the Project will maximise the economic and social value from the extraction of the coal resource by utilising a mine plan that will appropriately address the identified environmental and socio-economic constraints and the objects of the EP&A Act, including the principles of Ecologically Sustainable Development (ESD).

The DRE supports the Project as a *“responsible utilisation of the State's coal resources”*, *“large areas of low strip ratio open cut resources have been excluded from mine planning predominantly to avoid defined Biophysical Strategic Agricultural Land. Other constraints to open cut mine design include the Bylong Village, infrastructure and rivers, creeks and associated alluvials”* and *“given the constraints outlined in the proponent's EIS, the Division considers the Project mine plan for both open cut and underground operations to adequately recover coal resources”* (DRE 2015).

Mine plan justification is further discussed in the supplementary report included in **Appendix B**.

In regard to the potential for any further future applications to extend mining operations, this will depend on both the demand for thermal coal and the ability to demonstrate that additional mining (open cut or underground) would be in the 'public interest' as determined under the EP&A Act. The potential for further future applications is not a matter to be considered as part of this application.

4.2.15 Agricultural Land

Issue

Council questions the figures used throughout the EIS in relation to the value of Agricultural land and would like to see these clarified in terms of both the source and accuracy of the data.

Response

The Agricultural Impact Statement (AIS) (Appendix X of the EIS) in Table 39 (page 71) states that the agricultural production lost per annum is \$2.66 Million. This is based on the annual agricultural production of the Study Area and assumes that it is all taken out of production at the same time. As such, this does not reflect the progressive nature of the mining development with continual rehabilitation as the Project progresses over time. Therefore, the comparison made in the AIS (Section 8.1.5, page 71) that the value of agricultural production impacted by the Project is 4.12% of the total agricultural production of the MWRC LGA is a conservative comparison as it over states the annual value of agricultural production impacted by the Project in any one specific year.

The methodology used to determine the quantum and value of agricultural production from the Study Area is outlined in Sections 4.1 and 5.1 of the AIS (Appendix X of the EIS). Explicitly the quantum and value of agricultural production relied on site visits and individual land manager interviews with licensees of KEPCO owned land and non-KEPCO owned land by Scott Barnett of Scott Barnett & Associates to ascertain current and potential agricultural production levels on Study Area land. The basis of quantum production that the individual land manager was asked to use was an average carrying capacity and yield over a 5 year period with a bias, if any, on the upper side of production expectations. In short, Scott Barnett & Associates were told not to underestimate the level of production.

During these interviews the land owner/manager was guaranteed that their individual responses would not be made available to any party other than Scott Barnett & Associates and that all information would be aggregated and only presented in an aggregated format so individual owner, manager or property information and details would not be identifiable.

The land managers were told that the value of agricultural production was to be valued using NSW DPI gross margin budgets as published on the NSW DPI (agriculture) website. The land manager was asked if they thought this would realistically reflect their business and if it did not, proportional adjustments would be made. All respondents concurred with the concept of using the NSW DPI gross margin budget as the basis for calculating the value of agricultural production.

NSW DPI Agriculture did not raise concerns with this methodology and indeed has accepted this same methodology as appropriate in previous AIS for mining developments.

With regard to lucerne and cereal hay the quantum of production applied was based on the land manager interviews which covered production systems and outputs, including the utilisation of hay (lucerne and cereal) for sale and for utilisation within the various livestock enterprises. These are outlined in Appendices 1, 2, 3, 4 and 6 in the AIS (Appendix X of the EIS). The value add of any hay utilised on farm is recognised in the quantum of cattle turned off the study area.

Issue

The objective of the Strategic Regional Land Use Plans is to protect the states \$12 billion agricultural industry from mining and coal seam gas industries. The issues raised by the Gateway Panel in terms of the potential for direct and significant impacts on verified BSAL by the Bylong Coal Project (BCP) are still not adequately addressed. Agricultural land, like coal is a finite resource, however, unlike coal if managed will continue to deliver net production indefinitely so while economically in the short term the net value of coal eclipses that of agriculture it is just that; short term.

The BCP has an impact on valuable and productive land beyond that which has been experienced in association with mining in the MWRC LGA in the past. There is 440.8ha of verified BSAL within the project disturbance area alone. The agricultural land lost to mining as a result of this project equates to \$2.66M annually which is significant representing over 4% of the total production of the LGA. Council has noted the examples in the Hunter Valley cited in the Rehabilitation Strategy (Appendix W) where land has been restored, however, despite the best undertakings Council remains sceptical about the future reinstatement of land to production. The success of the rehabilitation will hinge on the soils stripping, handling and stockpiling all of which would be rigorously scrutinised and conditioned in any approval. In addition, Council questions the assumption that the impacts on land within the subsidence area will be indirect and temporary particularly in areas that are subject to subsidence which impacts the surface hydrology.

Response

A detailed response to the impacts on BSAL is provided in **Section 4.4.2**.

With regard to rehabilitation KEPCO is committed to best practice mine rehabilitation including soils stripping, handling and stockpiling and acknowledges that its rehabilitation management strategy will be rigorously scrutinised and conditioned in any approval. As outlined in the EIS (Appendix W) ongoing monitoring and assessment of rehabilitation performance will be carried out to ensure rehabilitation is achieving its desired objectives and targets.

With regard to subsidence impacts based on the modelling and study of the proposed underground mining (Appendix H of the EIS) and outlined in the AIS (Section 9.3 Page 95) "... it is unlikely that subsidence would result in changes to surface micro-relief or significantly alter the chemical or physical comparison of the soil profile to the extent the land and, where applicable, associated agricultural productivity is significantly impacted and cannot proceed without remediation."

Further the AIS also states *“upon progressive settlement of each subsided long wall panel it is expected that the land will be able to retain its pre-mining land capability characteristics”*.

It is noted that the only agricultural activity that is undertaken on land overlying the underground mining area is cattle grazing. It is not used for cropping. As such any minor changes to surface hydrology will have only negligible changes to agricultural productivity.

4.2.16 Groundwater and Surface Water Assessments

Issue

The BCP relies on security of water from the Bylong River alluvial aquifer accessed by a number of groundwater bores. There is concern that the BCP in this assessment fails to adequately account for contingencies around water supply and fully address the Office of Water requirements for the EIS. In the submission to the SEARs, Council raised concerns about the allocation and security of water resources within the project area and beyond and the need to identify actual availability rather than assumptions as to the existing water licences.

In addition the EIS in relation to groundwater, like subsidence, proposes measures to manage impacts only if they occur, for example in relation to water security above and aquifer interference, rather than taking a precautionary approach.

Council would like to see an independent hydrologist engaged to assess both the ground and surface water assessments with particular attention to their adequacy around water security, the importance of ascertaining accurate data from ALL the existing groundwater bores and including any perceived anomalies identified in the EIS.

Response

The Groundwater Impact Assessment (GIA) (Appendix M of the EIS), was peer reviewed by Dr Noel Merrick of Hydro Simulations (Appendix N of the EIS). The peer review concluded *“that the model underpinning the groundwater assessment is ‘fit for purpose’, where the primary purpose of the model is the prediction of environmental impacts in the context of the Aquifer Interference Policy and estimation of water takes for licensing. A very thorough analysis of the uncertainty in the estimates has been conducted.”*

Further, the DP&E commissioned Dr Franz Kalf of Kalf and Associates Pty Ltd, Hydrogeological, Numerical Modelling Specialists to conduct an independent peer review of the Groundwater Impact Assessment and the associated Hydro Simulations peer review. Dr Kalf’s review stated *“overall the hydrogeological description of the region and modelling work described in the AGE (2015) report is detailed and extensive”*. Departmental Officers from DPI–Water have also conducted an internal review of the groundwater and surface water assessments. Clarification on a number of aspects was requested. These are summarised in **Sections 4.3 and 4.16** with further detail provided in **Appendix H**.

The IESC was requested by the DP&E to provide advice on the Project in regards to the assessment of impacts to water resources.

The IESC's overall inclusion stated *".....Relevant data and information have been used to support the assessment of impacts to water resources. Values and parameters used in hydrological and hydrogeological calculations are consistently justified (based on measured data) or referenced...."*.

A response to any outstanding issues raised by the IESC is discussed in **Section 4.15**.

4.2.17 Biodiversity

Issue

The Ecological Impact Assessment (EIA) will need to be amended to include the impacts on any changes that may have been made and come into force under the EPBC Act since March 2014. The BCP will have significant direct and indirect ecological impacts with the removal of up to 753ha of native vegetation, however, it is noted that the offset areas proposed are populated with similar habitat. There is some concern that the Biodiversity Offset Sites are simply properties the ecological value of which are already protected through a combination of legislative controls at Commonwealth and State level together with land use zoning and associated provisions under the MWRC LEP 2012 all of which provide a reasonable level of protection from destruction and the offset areas should include identifying areas that are under threat. Further, Offset Areas 4 and half of Yarran View result in the loss of an additional productive agricultural land as a direct result of the project. In addition there is a failure to identify the mechanism proposed to conserve the offset sites and Council is concerned about the impact on rate income if land is taken out of production and sterilised in perpetuity.

Response

Since the commencement of the Project, a number of listings for threatened species, populations and communities listed under the EPBC Act have changed (either new listings or up-listings), some of which are relevant to the Project.

As noted within Section 1.4.1 of the EIS Ecological Impact Assessment, the discussion and assessment of threatened species, populations and communities listed under the EPBC Act relates to the listings as they were at the time of the Project being deemed a Controlled Action on 12 March 2014.

Section 158A of the EPBC Act provides that listings that occur after the Controlled Action Decision may be disregarded in making any further approval process decisions in relation to the Project under the EPBC Act. The practical effect of this provision is that the Project is not affected by listing events made after the determination of the Project as a *"Controlled Action"*.

4.2.17.1 Selection of Offset Sites

Section 1.3 of the EIS BOS details the process and consultation undertaken to develop the offsets package for the Project. This included several high level desktop analyses and site specific field surveys of suitable offset sites.

The offset sites were selected for inclusion within the offsets package based on a number of strategic values, including:

- Proximity to the Project Disturbance Boundary;
- Presence of like-for-like vegetation communities to those impacted, including Box Gum Woodland and Derived Native Grassland;
- Presence of known habitat for threatened flora and fauna species; and
- Potential to improve biodiversity values through appropriate management actions.

The 'NSW Biodiversity Offsets Policy for Major Projects' (NSW Offsets Policy) requires offsets to be additional to other legal requirements. The 'Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy' (EPBC Offsets Policy) requires offsets to be additional to what is already required, determined by law or planning regulations, or agreed to under other schemes or programs.

As noted within Section 8.3.2 and Section 8.3.3 of the EIS Ecological Impact Assessment and Section 5.5.2 and Section 5.5.3 of the EIS BOS, the offsets sites are proposed exclusively for the Project are not already funded or being managed for biodiversity value. The management actions proposed within the offset sites are in addition to other legal requirements for conservation of the land.

4.2.17.2 Agricultural Land within Offset Sites

A number of the vegetation communities impacted by the Project, including Box Gum Woodland and Derived Native Grassland occurs within fertile landscapes that are also agricultural lands. This creates an issue for determining offsets for these vegetation communities and associated habitat because to create such offsets additional areas of agricultural land is required.

One of the vegetation communities impacted by the Project, Box Gum Woodland and Derived Native Grassland, is threatened because extensive areas of grassy woodland have historically been cleared and modified, largely as a result of agricultural practices. This is due to their higher soil fertility and typically flat or gently undulating land form, which is suitable for cropping and grazing. In order to recover grassy woodland communities that occur as isolated patches amidst an extensively cleared agricultural setting, and increase the ecological integrity and biodiversity of the locality and region it is essential to recover some agricultural land. It should also be noted that conservation and management of these agricultural areas will also provide future habitat for species such as the Regent Honeyeater, which have a strong association with feed trees growing on the more fertile valley floor and slopes.

4.2.17.3 Mechanism for Offsetting

KEPCO continues to consult with OEH and DP&E regarding defining the appropriate mechanism to secure the offset sites for the Project. It is anticipated that Offset Areas 1-4 and the Yarran View Offset Area may be able to be secured utilising BioBanking Agreements.

KEPCO has undertaken further consultation with OEH and DP&E regarding the inclusion of Offset Area 5 within the offset strategy for the Project. Due to the potential for subsidence-related impacts to approximately 70% of Offset Area 5, it has been suggested that during the transitional period for the NSW Offsets Policy and associated Framework for Biodiversity Assessment (FBA), the land within Offset Area 5 could be managed under a conservation agreement (or similar mechanism) during the life of the Project. Following completion of the Project, it has been suggested that Offset Area 5 will be secured through a BioBanking Agreement (or other appropriate mechanism at the time). KEPCO will continue to consult with DP&E and OEH in relation to these matters to confirm the most appropriate mechanism(s) to secure the offset strategy.

4.2.18 Representations from the Community

Issue

In its Open Day immediately prior to the commencement of the Ordinary Meeting of Council on 21 October 2015, Council heard submissions from a number of Bylong residents. The issues raised included;

- *Impacts on environmental heritage and the call for Council to support an Interim Heritage Order on Tarwyn Park as well as concerns about loss of local heritage generally;*
- *Surface and Groundwater impacts and the inadequacy of the impact reports and mitigation measures;*
- *Loss of agricultural land to mining and questioning the feasibility of returning the land to its current state post mining;*
- *Loss of agricultural land through biodiversity offset areas;*
- *The long term value of agriculture in the region against the short term destruction as a result of open cut operations that will only recover a fraction of the coal resource;*
- *Noise and dust;*
- *Access for land holders who will be isolated by the closure of Upper Bylong Road without any firm option for an alternative;*
- *Loss of community and social impacts associated with land acquisition including volunteer services such as RFS; and*
- *Cumulative social impacts as a result of closure of schools leading to a loss of focal point for small rural communities.*

Response

Heritage related issues raised in MWRCs submission have been addressed in **Section 4.2.13**. Concerns in relation to the loss of agricultural land and the rehabilitation plans are addressed in **Section 4.2.15**. Queries on the groundwater and surface water impacts within the submission are addressed in **Section 4.2.16**. The impacts on agricultural land as a result of the proposed Biodiversity Offset Strategy are addressed in **Section 4.2.17**.

The access arrangements to properties located along Upper Bylong Road are clearly described in the Section 3 of the EIS. In addition, a new North Link Road is proposed to be constructed which will provide a similar outcome and travel time to the current road network. Both the Upper Bylong Road realignment and North Link Road are proposed to be constructed prior to Upper Bylong Road being closed. Further details in relation to the conceptual North Link Road are provided in **Section 4.2.9**.

4.2.18.1 Loss of Community and Social Impacts Associated with Land Acquisition

A response to this issue is discussed in **Section 4.2.7**.

4.2.18.2 Cumulative Social Impacts as a Result of School Closures

A response to this issue is discussed in **Section 4.2.7**.

4.3 NSW DEPARTMENT OF PRIMARY INDUSTRIES – WATER – RA3

4.3.1 Aquifer Interference Policy

Issue

Drawdown impacts from the mine related impacts onto nearest users cannot be reliably predicted. This issue is compounded in that the details of the proposed borefield location have not been presented and it is unclear how this extraction is considered within the groundwater model. Further, the alluvial aquifer is of limited thickness and any additional decline in water levels, particularly during a drought would impact significantly on adjoining groundwater users. Any additional water table decline as a consequence of the mine, particularly during a drought, could make many wells non-viable.

To address this concern, upon commencement of mining, implementation of “make good provisions” should apply to all impacted users within the alluvial area of the project boundary. Applicable make good provisions should be detailed by the proponent prior to the commencement of operations.

There is potential for salinity change and contamination transport from overburden emplacement areas. Whilst the geochemistry has been thoroughly addressed, the supporting documentation to mark the boundary between colluvium and alluvium is minimal. This is because the soil mapping is produced at a broad scale and will have inaccuracies. The consequence being that there is potential for mining and mine spoil emplacement to be located within alluvial boundary where such inaccuracies exist.

To address this concern further supporting documentation is required delineating at a local scale the alluvial/colluvial boundary from which the 150m setback will apply. This should therefore be verified by field work using the proponent’s mine plans to ensure the alluvium setbacks are maintained in the field.

Response

As explained in Section 7.6.4 of the EIS, should monitoring indicate there are changes in groundwater levels and quality more extensive than predicted at any privately owned bore, then mitigation measures will be discussed with the landholders. This may include the implementation of “make good provisions” to compensate for any adverse impacts to neighbouring landholder bores determined to be a result of the Project. **Appendix H** outlines the process of developing the required “make good provisions” which will be documented within the Water Management Plan (WMP) for the Project.

Appendix H also provides a description of the detailed field work and remote sensing which was completed by Douglas Partners in 2011 to improve the definition of the alluvial/colluvial boundary. As explained in Section 5 of the Mine Plan Justification Report (Appendix E of the EIS), this detailed work was included within the mine planning process as a mine planning constraint to ensure that the adopted mine plan was set back by a minimum of 150 m from the edge of the alluvial boundary.

4.3.2 Mine Water Security

Issue

Water supply reliability of the proposed borefield including planned expansions during extended drought periods is unknown and insufficient detail about the borefield was provided for review. Section 13.6 from the EIS summarises the precarious capacity of the alluvial aquifer to meet mine water demands, both during open cut and underground operations.

“During the dry season, it is likely that many of the irrigation wells are unable to sustain high abstraction volumes, and the groundwater modelling confirms this.”

The security of mine’s water supply warrants detailed consideration and reporting.

Response

KEPCO and its consultant have undertaken an extensive work program to provide further certainty in relation to the groundwater modelling predictions, including the reliability of the alluvial borefield. This issue is discussed in further detail in **Section 4.3.6**.

4.3.3 Aquifer Conceptualisation

Issue

Conceptual hydrogeology could not be adequately assessed due to the proponent not providing bore logs and groundwater contour maps for each aquifer.

Response

Appendix H provides more detail on the key geological formations within the Project Boundary, including their hydrogeological properties. **Appendix H** provides:

- The requested borehole logs that graphically illustrate the monitoring bore construction and lithological layers intersected during installation of each borehole;
- An updated stratigraphic column;
- Figures of the groundwater monitoring network, including monitoring bores and vibrating wire piezometers and the geology of the screen and sensor zones;
- More detail on the construction specifications of each monitoring bore and geological unit which is targeted by the monitoring;
- Geological cross sections for the alluvium and the Triassic/Permian sequences;
- Maps showing 'rest' water levels in monitoring bores/VWPs, interpreted water level equipotential and spot estimates of the saturated thickness of the alluvial material;
- Hydrographs for each monitoring bore separately showing water level trends over the baseline monitoring period; and
- Further information on the connectivity with surface water and the behaviour of the rivers and creeks over the baseline monitoring period.

4.3.4 DPI Infrastructure

Issue

DPI Water requires ongoing access to network infrastructure which is situated within the Project area. These bores are to be used as part of the ongoing regulation of the Bylong River Water Source.

Response

Noted. Access to network infrastructure on land owned by KEPCO is able to be arranged via the KEPCO site personnel and this will continue, provided it is safe to access these areas.

4.3.5 Groundwater Assessment

Issue

Insufficient information is supplied in the report with respect to the proposed borefield and other aspects of the groundwater assessment. The independent groundwater modelling reviewer has assessed the model and concluded the model to be fit for purpose according to the framework of the Australian Groundwater Modelling Guidelines. There are however, a number of limitations that DPI Water noted below [in their submission] which need to be resolved via provision of a supplementary report.

Response

Noted. **Appendix H** provides the relevant responses to limitations raised by DPI Water. This is also discussed in the following sections.

4.3.6 Groundwater Model

Issue

- *No groundwater level outputs from the model for layers between the Alluvium and Coggan seams were provided to understand the model behaviour in these layers.*
- *The sensitivity analysis was not thorough enough in terms of varying the ratio between horizontal to vertical hydraulic conductivity nor was justification for the magnitude difference provided.*
- *The model is over predicting water levels which means there is too much water in the model that is then potentially available to attenuate the water levels in the alluvium aquifer (with low vertical K values) resulting in dampened drawdown predictions due to mining.*
- *The likely presence of multiple semi-confined aquifers separated by aquitards and the potential for several distinct, largely unrelated shallow water tables to be present within the modelling domain suggests that other model codes could be better suited to the site.*

It is suggested therefore that the model should be used with care when assessing drawdown effects and the propagation of the drawdown cone outwards from open cut and underground mines.

Response

Appendix H provides a description of the additional modelling undertaken by Australasian Groundwater and Environmental Consultants (AGE) utilising the MODFLOW USG code to address these queries. Section 5 of **Appendix H** provides further detail on the following additional modelling tasks undertaken for the Project:

- Verification using recent water level measurements;
- Recalibration of the model to improve the match between measured and modelled groundwater levels to ensure the water levels within the alluvium were appropriate; and
- Uncertainty analysis to further consider the sustainability of extracting groundwater from the alluvium via the Project borefield to supplement water supplies for the mine water management system.

Appendix H includes the results of a linear uncertainty analysis conducted to demonstrate that the proposed Project borefield will be capable of supplying required water throughout the life of the Project based on the results of numerous model scenarios conducted utilising a range of likely values for key aquifer properties. Additional pre-mining water levels are compared with modelled levels for key layers within the model, along with the predicted drawdown for additional sensitivity analyses.

The results of the supplementary modelling work fall within the bounds of predictions presented within the EIS GIA (Appendix M of the EIS) and confirm this work is sufficiently robust upon which to consider the potential range of impacts on the groundwater regime as a result of the proposed mining operations for the Project.

4.3.7 Water Licensing

Issue

The proponent does not currently hold a licence under Part 5 of the Water Act to account for the take of water from the Permian aquifer. The predicted maximum take of groundwater from the Permian aquifer is approximately 2093ML. The proponent will be required to apply for a licence under Part 5 of the Water Act 1912 and provide sufficient modelling and supporting information to justify the requested volume. The application is subject to assessment and there is no guarantee that the requested entitlement can be granted.

The proponent holds total licensed entitlement of 2535 shares within the Bylong water source. The maximum total take of surface and alluvial water from the Bylong water source is predicted to be 1149ML, with an average take of 491ML per annum. Therefore, it appears that sufficient entitlement is held to account for take of surface and alluvial waters. However there are significant constraints on the availability of water within the alluvial aquifer, meaning that it may not be possible for the proponent to access the full entitlement in dry periods during high demand.

Response

The EIS GIA estimated the take of water from the Permian groundwater systems at up to approximately 2,093 ML per year. Since the public exhibition of the EIS, KEPCO has lodged an application for a water licence under Part 5 of the *Water Act 1912* (Water Act) and DPI Water is currently considering this application.

It is also relevant to note that since submission of the application for a water licence, DPI Water has changed the approach to water management in the Hunter Valley in preparation for commencement of the '*Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources*'. This Water Sharing Plan (WSP) is planned to commence in July 2016 and will replace provisions under the Water Act, bringing the management of all remaining groundwater to the north of Sydney under the *Water Management Act 2000* (WM Act). This legislation separates water and land rights and allows trading of water via the market. In the interim period, until the new WSP commences, DPI Water will allow trading of groundwater entitlements on a market basis, rather than seeking a new licence from the Government. An embargo for new licences has been issued in these areas, meaning that new licences will no longer be issued by the Government, however it is understood existing applications will be granted under the Water Act.

KEPCO appreciates that there is some uncertainty regarding the ability to abstract water from the alluvial aquifer to supplement water supplies for the Project. This was identified within the EIS and the GIA which proposed further testing work to optimise the design of the borefield to maintain the yields required for the Project. This testing work is in process of being completed by KEPCO. In light of DPI Water's comments, supplementary modelling has been completed to further highlight the potential yields from the alluvial aquifer. This additional modelling indicates that whilst the alluvial aquifer is suitable of being used to supply the water required for the Project, during an extreme period of extended drought, it may fail to supply the Project's needs. In this case, it is likely that the Project will not be the only mine in the Hunter Valley experiencing water stresses.

KEPCO will prepare and implement a WMP for the Project. The WMP will detail a program to monitor water yields and availability from the borefield, particularly if there are extended periods of drought. The WMP will detail trigger levels to monitor against and if reached, the Project will implement a contingency plan to ensure the supply of water to the Project. The contingency plan may include the expansion of the borefield (subject to approval), temporarily reducing KEPCO's agricultural activities (and temporarily transferring associated water entitlements to the Project) and in a worst case scenario, progressively adjusting mining-related activities (such as coal processing) to match the available water supplies.

4.3.8 Harvestable Rights

Issue

Calculated harvestable rights of the lands held by KEPCO is 355ML. KEPCO currently have 63 dams on minor streams with a combined estimated volume of 89ML. Additional harvestable rights water is therefore potentially available.

Response

Noted.

4.3.9 Water Allocations

Issue

Section 9.2.5 states that 'further water allocations under the HUAWSP may also be secured by KEPCO into the future through a new water licence application under Part 5 of the Water Act'. It is noted that an application under Part 5 of the Water Act can only be accepted for the Permian aquifer, which is not covered by the HUAWSP. Any entitlement obtained in this manner will not be able to be used to account for take of water from the alluvial aquifer. Further, the Permian aquifer will be covered by the Water Sharing Plan for the North Coast Fractured and Porous Rock Water Sources in the near future.

Response

See detailed response to water licencing in **Section 4.3.12.2**.

4.3.10 Water Measure Device

Issue

In order to ensure that all water use by the proponent is adequately monitored, including mining and agricultural enterprises, the proponent will be required to fit an appropriate measurement device to all extraction points and any relevant transfer or pump locations on the mine site.

Response

Noted. As explained in Section 7.6.4 of the EIS, monitoring of flow rates and extraction rates into the mining areas will be undertaken to assist in accounting for water take from the various water sources. This monitoring will also take place from the extraction from borefield in line with regulatory requirements. The WMP for the Project will provide additional detail on the monitoring regime to be undertaken in this regard.

The response in **Section 4.16.3** also discusses this item.

4.3.11 Subsidence

Issue

DPI Water notes in its submission that the “EIS states that sections of Dry Creek have potential to be impacted by surface cracking as a result of subsidence. The EIS states that “...stream bed surface cracking that occurs as a result of mining will be remediated by infilling and regrading (where accessible) as soon as practical after being identified”.

DPI Water is concerned that: No remediation technique has been proposed for sections of creek that are not accessible by machinery. It is requested that additional strategies be identified to avoid, minimise and manage surface cracking in less-accessible sections of Dry Creek.

Response

As outlined in Section 7.4.4 of the EIS, strategies for the management of surface cracking and subsequent impacts in Dry Creek and associated tributaries may include:

- Allowing natural infilling to occur;
- Infilling with surface soils or other suitable materials;
- Locally regrading and compacting the surface;
- Erosion protection;
- Relining the beds of the drainage lines; and
- Grouting of cracked stream beds to restore integrity of pools.

Further strategies will be developed as part of the management plan process in order to best manage impacts to Dry Creek. Data will be gathered during mining operations to assess and refine the management strategies for Dry Creek and other water courses.

Surface cracking which occurs as a result of subsidence will be identified during the surface monitoring to be undertaken as mining progresses through a particular longwall panel. Surface cracking identified within Dry Creek and its associated tributaries will be assessed in terms of size and extent of the impact, the risk it poses to water flows and the accessibility for earth work equipment. Appropriate remediation measures will be implemented in an attempt to minimise or avoid impacts to flows. It is anticipated that depending upon the size of surface cracks, over time, these surface cracks will fill with soil and debris and essentially self-repair.

However, KEPCO will monitor cracking and surface impacts during operations to ensure the cracks do not pose an unacceptable risk to water flows, wildlife or livestock.

When cracks appear in areas inaccessible to machinery, any attempt to provide access for machinery to the site will likely cause more damage to the vegetation and soils than the subsidence impacts. Therefore, if deemed appropriate, the crack will be left to self-repair over time.

Surface cracking which has been assessed to pose unacceptable risk to the condition of Dry Creek and associated tributaries, alternate remediation measures will be considered for implementation. This may include attempts for personnel to access the impact site by foot and attempt to remediate the cracking without mobile equipment.

4.3.12 Recommendations

4.3.12.1 Groundwater Monitoring and Management

Issue

DPI Water recommended a variety of ongoing monitoring and management measures including:

- *Make good agreements;*
- *Setback of mining from the alluvial boundary;*
- *Measurement of groundwater extraction;*
- *Monitoring bore networks and access to DPI–Water infrastructure;*
- *Measurement of stream aquifer connectivity;*
- *Monitoring of groundwater dependent ecosystems; and*
- *Post closure monitoring.*

Response

As explained in Section 7.6.4 of the EIS, KEPCO will prepare and implement a WMP in order to ensure that the predicted impacts to water resources are appropriately monitored, validated, recorded and licenced throughout the life of the Project. The management and monitoring measures suggested by DPI Water will be addressed within the WMP.

Appendix H provides further information in respect of how the measures will be addressed within the WMP, including:

- Conducting test pumping of the alluvial aquifer to optimise the design of the borefield;
- Entering make good agreements with potentially impacted landholders before commencing mining;
- Ongoing groundwater modelling at five yearly intervals;
- Direct measurement of all groundwater extraction;
- Maintaining and upgrading monitoring bore networks to address gaps raised such as a limited number of bores in the Triassic sandstones and Tertiary basalts;
- Maintaining access to DPI Water infrastructure (and replacing if required);
- Monitoring of evaporation;
- Ongoing measurement of stream aquifer connectivity by installing seepage metering downstream of the existing freehold property (Receiver ID 68 and 69 on Figure 12 of the EIS) to gauge whether the river is losing or gaining and see if seepage correlates with water use by other users in the area;
- Monitoring of groundwater dependent ecosystems (GDEs); and
- Monitoring of salinity generated from the backfilled final landform throughout the life of the Project.

4.3.12.2 Water Licensing Recommendations

Issue

With regard to this EIS proposal for the Bylong mine, insufficient information has been provided for DPI Water to assess the overall impacts and additional information is required:

With regards to Water Licensing it is recommended:

- *The proponent must obtain a licensed entitlement of at least 2093ML under the Water Act 1912 to account for predicted take from the Permian aquifer. The proponent must submit an application to DPI Water for such a license.*
- *The proponent must supply a plan for monitoring actual take of water and how any changes from the predictions will be accounted for with water licences and remediation, as required by Recommendation 5 of Section 17H4(a)(iv) of the Gateway Certificate Recommendations.*

Response

Noted. KEPCO has applied for a water licence under Part 5 of the Water Act, as required.

A Monitoring Plan will be included in the WMP that will be prepared for the Project, if approved, as outlined in Section 7.6.4 of the EIS.

4.3.12.3 AIP 'Minimal Impact Considerations'

Issue

With regard to the AIP "minimal impact considerations", it is recommended:

- *A hydrogeological assessment report of the borefield extraction proposal, including a detailed local scale map showing the proposed water supply borefield location and borefield expansion locations along with a proposed take from each individual bore.*
- *Perform appropriately designed aquifer pump testing of key individual aquifers with monitoring of nearby bores.*
- *The proponent commits to implement "make good provisions" for all existing landowners reliant on the alluvial aquifer within the project boundary upon commencement of the mine. These provisions must be described by the proponent prior to commencement of operations.*
- *To manage contamination transport from the coal spoils areas, implement RGS Environmental Pty Ltd management measures with additional appropriate groundwater and spoil seepage monitoring.*
- *Supporting documentation is required delineating at a local scale the alluvial/colluvial boundary from which the 150m setback will apply. Perform field mapping within a 200m setback vicinity of pits, spoil or overburden emplacement areas that are in proximity to the DPI mapped alluvium.*

Response

Section 4.3.5 provides a description of the additional groundwater modelling which has been completed to assess the capacity of the borefield to supply water requirements for the Project. This additional modelling and analysis is detailed in **Appendix H**. The additional work undertaken has refined the Project borefield presented within the EIS required refining to ensure efficient yields during the extreme dry climatic conditions. Figure 37 of **Appendix H** presents the optimised location of the Project borefield containing 16 bore locations.

Following the receipt of the relevant licences and approvals, KEPCO has recently commenced the work associated with borefield pump testing within the alluvial aquifer. The results of this program will assist in further refining the modelling scenarios completed in **Appendix H**.

AGE has confirmed that testing of other aquifers using this methodology is not appropriate given the low yields from these aquifers to sustain pumping at any useful rate. In this case, packer tests are a more appropriate technique for measuring hydraulic conductivity. Douglas Partners conducted a significant program of packer testing within the Triassic and Permian bedrock units for the purposes of characterising hydraulic conductivity, which was used to guide development of the numerical model.

Section 4.3.1 explains KEPCO's intentions to apply "make good" considerations to neighbouring landholders potentially affected by the Project.

The WMP for the Project will include further details on the groundwater and surface water monitoring program to be implemented to monitor potential contamination from the OEAs.

Section 4.3.1 and **Appendix H** provide further detail on the setback on the Project mine plan from the alluvial aquifer.

4.3.12.4 Mine Water Security

Issue

With regard to mine water security, it is recommended:

- *That intensive borehole water level monitoring is relied upon during mining to monitor drawdown impacts.*

Response

Noted. See detailed response in **Section 4.3.12.1**.

4.3.12.5 Aquifer Conceptualisation

Issue

With regard to Aquifer Conceptualisation it is recommended:

- *Provide bore logs, drilling reports and bore construction details including any downhole geophysical logs, where applicable, for all groundwater monitoring bores or other bores that provided reliable information about the state of water saturation in the subsurface.*
- *A sufficient number of legible cross-sections to be provided in all orientations to adequately describe the geology.*
- *A map showing recharge zones/areas for each individual aquifer.*
- *Proponent to revisit the groundwater level and geological data obtained from field work and provide local scale groundwater contour maps (described below) for each individual aquifer, limited to within their geological extent, with bores labelled with a representative rest water level. Provide a summary table of all the bores screened within the individual aquifers and provide an additional map showing locations of the named bores at a local scale.*
- *Provide maps that separate the shallow water table for the hilly areas, especially in the north east of A287, from the shallow water table in the valley floor Alluvium aquifer. The groundwater contour map of the Alluvium aquifer is to be provided without amalgamation of other water level data from the Basalt, Permian or Triassic Aquifers. The thickness of the saturated zone and unsaturated zones in the Alluvium is also to be provided.*
- *Provide separate groundwater contour maps for the Coggan and Ulan Coal Seam Aquifers unless they can be shown to be hydraulically well connected.*
- *A map depicting the depth of the weathered zone within the Project boundary and comment in greater detail on the water bearing capacity of this zone.*

- *Provide a separate groundwater contour map for the Basalt aquifer beneath Dry Creek. The thickness of the saturated zone and unsaturated zones in the Basalt is also to be provided.*
- *Provide a water balance for each of the aquifers in the project area and quantify the volumes available for use as a water supply source to understand the availability of water during extended drought periods.*
- *Due to uncertainty with the current hydrogeological conceptual model, future drilling and construction of a limited and reasonable number of monitoring bores into sandstones may be required should a data gap be recognised (Farmers Creek Formation, the Gap Sandstone, Watts Sandstone or other aquifers).*
- *Proponent to standardise a naming convention for the geology and hydrogeology (aquifers or aquitards) on site and to clear up uncertainty about the basement geology on site.*

Response

Noted. **Appendix H** provides further detail in relation to the site geological conditions and the above items relating to aquifer conceptualisation.

4.3.12.6 DPI Infrastructure

Issue

With regard to access to DPI Infrastructure, it is recommended:

- *The proponent commit to the continued access to DPI Water monitoring bores.*

Response

Noted. Access to network infrastructure on land owned by KEPCO is able to be arranged via the KEPCO site personnel and this will continue, provided it is safe to access these areas.

Issue

With regard to groundwater model, it is recommended:

- *Re-run the model with a lower order of magnitude difference between the vertical and horizontal hydraulic conductivity and report on the results.*

Response

Noted. As explained in **Section 4.3.6**, further detailed groundwater modelling has been completed in consideration of comments received by stakeholders. **Appendix H** provides further detail on the groundwater modelling completed.

4.3.12.7 Additional Recommendations

Issue

Additional recommendations include:

- *A seepage meter be installed further downstream of ID5 on the existing freehold property to gauge whether the river is losing or gaining here and see if there is a correlation with water use by other users in the area.*
- *That further streamflow measurement locations are located at the confluence of the Bylong River and Growee River to measure upstream contributions from each of these rivers respectively. In addition, a further stream flow measurement location is recommended at the confluence of Lee Creek and the Bylong River.*
- *An automated Class A pan for measuring evaporation is installed on site.*

Response

The recommendation from DPI Water for additional stream flow monitoring stations on the Bylong River, Growee River and Lee Creek will be considered in the development of the WMP. The stated purpose of monitoring the Bylong River and Growee River is to “*measure upstream contributions from each of these rivers*”. Given that the Project occupies a relatively small fraction of these catchments, any impact of the Project on surface runoff would be undetectable compared to natural variability in flow. There may be some value in monitoring very low seepage flows to detect any impact caused by changes in the water table.

A significant proportion of baseflow is likely to travel as sub-surface flow and hence surface flow monitoring may not be sensitive enough to detect small changes in a very small seepage flow. The need for additional surface flow monitoring will be discussed with DPI Water during development of the WMP.

DPI Water also recommended the installation of a Class A pan for measuring evaporation. This would be useful in quantifying evaporation losses from site storages during operations. However, a similar result could potentially be achieved by monitoring water levels in site storages, as proposed.

Further details of the proposed surface water monitoring program will be determined during development of the site Water Management Plan. The monitoring program will consider event based monitoring, the National Water Quality Management Strategy (ANZECC and ARMCANZ, 2000) and will include determination of appropriate local water quality objectives and guideline values.

4.3.12.8 Additional Strategies

Issue

Additional strategies should be identified to avoid, minimise and manage surface cracking and subsequent impacts in Dry Creek and other water courses affected by surface cracking.

Response

This is discussed in **Section 4.3.11**.

4.4 NSW DEPARTMENT OF PRIMARY INDUSTRIES – AGRICULTURE – RA4

4.4.1 Biophysical Strategic Agricultural Land Verification

4.4.1.1 Presentation of Soil Data

Issue

The BSAL assessment has been conducted by the proponent which the Gateway Panel described as insufficient. It was not independently verified by the Gateway process. Notwithstanding, this verification should provide a better estimate than the mapped BSAL available so where possible, DPI has used the KEPCO verified BSAL. All references to BSAL within the project area refer to KEPCO verified BSAL and all references to BSAL outside the project area refer to mapped BSAL.

The way the soil data has been presented makes it impossible to verify their statements with the results for a number of reasons:

The salinity measurements have been (presumably) presented as EC1:5 in the soil laboratory results in Appendix C. However, although particle size analyses have been provided, there is no presentation of soil texture. Thus a conversion from EC1:5 to ECe is not possible, meaning that no verification could be made of soils culled due to salinity. The only soil this refers to is 31.3 ha of Eutrophic Black Dermosol in the Bylong Soil Landscape within the project boundary, but 574.4 ha is contained within the study area.

Response

Soil textures are presented in the description for each soil unit within the Soil, Land Capability and Strategic Agricultural Land Assessment report (Appendix V of the EIS). These soil textures were used to convert the EC results from the laboratory data in Appendix C to ECe using the conversion tables from Hazelton and Murphy (2007). Therefore, the conversion to ECe has been provided and the ECe values and ratings presented in the soil description tables in the EIS are the final result of the calculations.

Upon review of this soil data for the Eutrophic Black Dermosol in the Bylong Soil Landscape, as raised by DPI Agriculture, the results show it had an ECe of 3.3 dS/m at 45-55 cm (30-60 cm horizon) then an ECe of 5.5 dS/m at 85-95 cm (60-100 cm horizon). Whilst soil unit BO3-P1 was located in the study area, this soil type is located outside of the Project disturbance footprint.

4.4.1.2 Soil Parameters

Issue

The soil test results in Appendix C of the Soil, Land Capability and Strategic Agricultural Land Assessment (Appendix V). Soil parameters could not be matched to soil test results for soil type numbers BH1-P1, BH1-P2, BH2-P2, B04, B05, B09, G02, G03, G04-P1, G05-P1, G06-P1, G11, G14-P1, G16, O2 and O2-P1. Of these, B9 and G02 are listed as BSAL. It should be noted that while there is no B9 and G02 in the project boundary, there is a total of 109.6ha (19.9ha of B9 and 89.7ha of G02) of BSAL in the study area. This should be noted if subsequent modifications to the project boundary are requested.

Response

Table 9 addresses the specific soil sample sites raised by DPI – Agriculture in their submission. It should be noted that as per the Interim Protocol, if a soil fails BSAL criteria 1, 2, 3, 4, 5, 6, 8 or 9, then lab testing is not required for criteria 7, 10, 11 and 12.

Table 9
Response to DPI Agriculture Soil Unit Queries

Soil Unit	Report Site #	Response
BH1-P1,	139	No lab testing was conducted. Ruled out of BSAL based on Slope >10%.
BH1-P2,	31 (GSSE 2012)	The lab data for site 31 is shown in the Soil Test Report from the Soil Conservation Service dated 12 October 2012 and is listed as Sample ID Bylong 83 on page 5 of 11 and page 10 of 11.
BH2-P2	28	No lab testing was conducted. Ruled out of BSAL based on Slope >10%.
B04	251	No lab testing was conducted. This site was considered Non-BSAL in the EIS based on physical barrier (bedrock at 0.75 m).
B05	131	No lab testing was conducted. This site was listed as a Brown Orthic Tenosol, and ruled out of BSAL due to moderately low fertility.
B09	60	No lab testing was conducted despite it being listed as tested in Table A1 of Appendix C. The soil type and field observations meant this soil was classed as BSAL.
G02	26 (GSSE 2012)	The lab data for site 26 is shown in the Soil Test Report from the Soil Conservation Service dated 12 October 2012 and is listed as Sample ID Bylong 77 on page 4 of 11 and page 9 of 11. This site was classed as BSAL.
G03	93	No lab testing was conducted. Ruled out of BSAL based on Slope >10%.
G04-P1	82	No lab testing was conducted. Ruled out of BSAL based on Slope >10%.
GO6-P1	238	No lab testing was conducted. This site was considered Non-BSAL based on physical barrier (bedrock at 0.50 m)
G11	208	No lab testing was conducted. This site was listed as a Stratic Rudosol, and ruled out of BSAL due to moderately low fertility.
G14-P1	100	No lab testing was conducted. This site was considered Non-BSAL based on physical Barrier (bedrock at 0.50 m)

Soil Unit	Report Site #	Response
G16	252	No lab testing was conducted. This site was listed as a Stratic Rudosol, and ruled out of BSAL due to moderately low fertility.
O2	173	No lab testing was conducted. This site was listed as a Clastic Rudosol, and ruled out of BSAL due to low fertility.
O2-P1	231	No lab testing was conducted. Ruled out of BSAL based on Slope >10%.

4.4.1.3 Soil References

Issue

Many soil test results have been included which are not referenced in the rest of Appendix V. These clearly form part of the soil survey but cannot be clearly associated with any soil type. These include:

- GSSE 2012 sample ID numbers 73, 45, 48, 70, 57, 36, 35, 37, 23, 24, 59, 58, 64, 74, 75, 65, 13, 10, 7 and 34.
- February sample ID numbers 1 and 6.
- Bylong Sample ID numbers 8.x, 77.x, 83.x and 80.x
- May 2013 sample ID numbers 117, 202, 77, 76, 79, 83, 236, 234, 225, 303, 311, 215, 297, 293, 156, 5, 37, 50, 284, 290, 253, 274, 266, 264, 259, 64 and 73.

Response

Upon further review and following consultation with DPI Agriculture, KEPCO commissioned SLR to undertake additional soil investigation work and data analysis to thoroughly address the issues raised in DPI Agriculture's submission. As a result of this additional work, supplementary data has been prepared addressing this issue in detail. The data is attached in **Appendix I**.

In summary, the 2016 supplementary soils work consisted of the following:

- Review of the 54 sites used as representatives for soil types within the EIS;
- Review and inclusion of 122 soil profile sites from 2011, 2012 and 2013 survey programs, in the revised 2016 BSAL assessment; and
- Additional laboratory testing of 191 archived samples from 47 sites within the proposed disturbance areas.

This supplementary work was undertaken to further increase the density of sites used for a more detailed assessment of BSAL within the project area, with a strong focus of improving the intensity of BSAL mapping within the Project Disturbance Footprint (see **Appendix I**).

The results of this supplementary soils work has resulted in the identification of an overall net increase of 154 ha of BSAL located within the grazing land capabilities of the proposed disturbance footprint, as illustrated in **Figure 9**.

This means that within the 2,874.7 ha of proposed disturbance footprint, a total of 594.8 ha of BSAL (20.69%) has been identified throughout the EIS process and the additional supplementary soils work undertaken in 2016. It is worth noting that 50.3% of the revised mapping within the direct disturbance areas is either LSC Class 5 or Class 6. A summary of the findings are outlined in **Table 10**.

The BSAL assessment results are also presented in **Appendix I**, which includes site figure numbers and associated laboratory reference numbers to allow correlation with raw laboratory data. The results of the BSAL assessment on the additional 47 sites tested in 2016 are also presented in **Appendix I**.

Table 10
LSC Class BSAL Within Disturbance Footprint

LSC Class of BSAL areas in Disturbance Footprint	Indirect and Temporary (ha)	Direct and Temporary (ha)	Direct and Permanent (ha)	Totals (ha)
Class 3	171.75	35.72	118.68	326.15
Class 4	0	4.99	50.81	55.80
Class 5	0	57.28	132.7	189.98
Class 6	0	5.56	17.33	22.89
Totals	171.75	103.55	319.52	594.82

4.4.1.4 Representative Site for Soil Type

Issue

DPI Agriculture state in their submission that *“the proponent has also only used a single site as a “representative” site for each soil type. Since soil types which are inherently fertile enough to be BSAL encompass up to 443ha, a single soil sample is insufficient to accept or reject an area of this size.”*

Response

This generally occurred as a result of the timing of field survey work. In November 2012, the ‘draft Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land’ (1st Draft Interim Protocol) was released with reference to specific assessment process and associated criteria. A second draft of the protocol entitled ‘Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land – V7’ (2nd Draft Interim Protocol) was released in February 2013. On 12 April 2013, the current version of this document titled ‘Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land’ (final Interim Protocol) was released by the NSW Government.

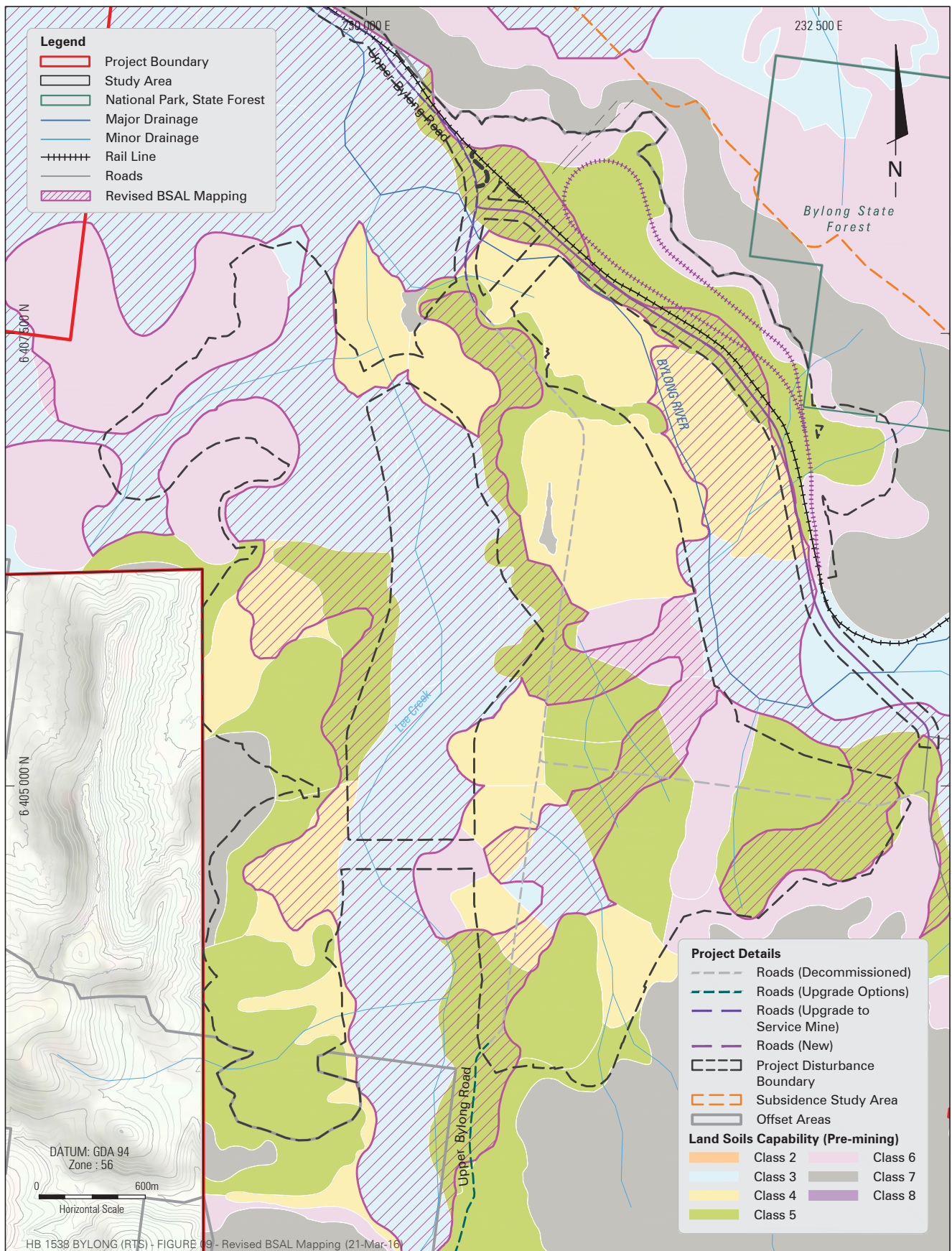
Several changes to the process/criteria to verify BSAL were made during these revisions. It should be noted that extensive fieldwork has been conducted across the Study Area over an approximate one and a half year period, commencing in November 2011 and finishing in April 2013, which was largely prior to the finalisation of the current version of the document.

The changes to the verification criteria towards the back end of the fieldwork program, culminating in the final version of the Interim Protocol being released within days of completing the fieldwork program, meant the requirement for representative sites changed significantly. That is, the 1st and 2nd draft Interim Protocol documents required two detailed sites and one analysed (laboratory analysed) site for each soil type, with the final Interim Protocol requiring each soil type to have three detailed sites (defined as laboratory tested sites in final Interim Protocol). Clearly, the fieldwork program which had largely been completed in accordance with the plan based on the 1st and 2nd draft Interim Protocol documents did not allow for the additional laboratory samples required under the final Interim Protocol.

The survey effort and scale was discussed and agreed with the then Department of Primary Industries-Office of Agriculture and Food Security (DPI-OAS&FS) (now DPI Agriculture) and OEH prior to the fieldwork commencing. The fieldwork proceeded on the basis that an agreement was in place with these regulators as part of the verification.

The supplementary work undertaken in 2016 which analysed a further 191 archived samples from 47 sites in a laboratory testing program, addresses the issue of 'representative' sites by increasing the number of analysed sites per soil type to improve the density of representative sites across the Study Area.

A detailed table containing the results of the BSAL results, including corresponding laboratory reference numbers and BSAL limiting factors is provided in **Appendix I** to facilitate DPI Agriculture assessment of the BSAL report. As a consequence of all of this additional work, the BSAL mapping has been revised within the Project Boundary as shown in **Figure 9**.



BYLONG COAL PROJECT

4.4.2 BSAL Impacts

4.4.2.1 BSAL within Subsidence Study Area

Issue

The project will have impacts to land identified as BSAL from both the open cut and underground mining operations as well as from the proposed biodiversity offset plan.

- *The proponent has committed to reinstating 227ha of BSAL which is 10 per cent more than the 206.3ha contained within the “direct and permanent” area affected.*
- *The proponent has committed to maintaining agriculture on 109.44 ha of BSAL within the biodiversity offset areas.*
- *The proponent will not mitigate the 171.8ha of BSAL within the subsidence study area. This will be utilised as biodiversity offsets and will be unavailable for agricultural production.*

Response

Whilst any surface cracking and other potential issues within the BSAL areas will be monitored and remediated throughout the mining process, the verified BSAL located within the predicted subsidence study area will be used as part of the Project’s Biodiversity Offset Strategy and will therefore be unavailable for agricultural production into the future.

4.4.2.2 Repair of BSAL Impacts

Issue

The proponent has committed to repairing 62.7ha of BSAL within the “direct and temporary” area affected (after infrastructure and haul roads are decommissioned) although page 66 App W appears to refute this.

Response

The Table 19 on page 66 of Appendix W of the EIS only accounts for the 227 ha of Class 3 LSC / BSAL land to be re-instated within the project disturbance footprint, for the purposes of calculating soil volume requirements from the soil stripped within that same footprint. The stripping and rehabilitation of infrastructure areas assumes the soil stripped from these areas will be stockpiled adjacent the infrastructure and upon decommissioning, this same soil will be replaced in its original location. This also assumes previous verified BSAL will be returned to BSAL post disturbance in these areas.

4.4.2.3 BSAL Loss to Mining

Issue

A considerable area of BSAL has been identified which will be fully encompassed by the open cut related mining activities and is unlikely to be available to agricultural production. The proponent has not identified where such areas will be closed off to the mining activities, therefore no estimate of how much BSAL will be taken out of production can be made.

Response

All land available for agricultural production, which is not within the Project Disturbance Footprint, will continue to be utilised for agricultural production through either KEPCO's farm manager or a leasing arrangement. It is not proposed that this land is restricted from agricultural activities during mining operations.

4.4.2.4 Verification of Soil Figures

Issue

It was not possible to verify any of the soil figures in the BSAL verification due to the way the soil data were presented.

Response

Upon further review and following consultation with DPI Agriculture KEPCO commissioned SLR to undertake an additional round of soil analysis to thoroughly address and respond to the issues raised in DPI Agriculture's submission. The results of this additional soil work have been summarised in the above in responses and is detailed in **Appendix I**.

4.4.2.5 Adjoining BSAL

Issue

The proponent has not commented on the effects of the project on adjoining BSAL as raised by the Gateway Panel.

Response

As detailed in the EIS, all land and soil disturbance to occur as a result of mining has been captured within the Project disturbance footprint and therefore by definition the soils outside of the Project disturbance footprint will not be physically impacted by the Project. It is noted that since the Gateway Application process, the Project Disturbance Boundary was modified and included an additional standoff from the proposed disturbance. This buffer was included within the EIS in response to the Gateway Panel's recommendations.

4.4.2.6 Loss of Farming Land

Issue

DPI Agriculture raised concerns that farming land will be lost to biodiversity offset areas.

Response

KEPCO has developed a proposed Biodiversity Offset Strategy with the aim of appropriately compensating the unavoidable predicted impacts of the Project on biodiversity values within the region. According to the government requirements, KEPCO aims for the proposed Biodiversity Offset Strategy to maintain and improve biodiversity values within the region.

The main focus of the Biodiversity Offset Strategy was around the conservation of State and Federal listed White Box, Yellow Box, Blakely's Red Gum Woodland and Derived Native Grassland (Box Gum Woodland). This community typically occurs on the better quality soils which have historically been exploited for agricultural activities which has resulted in widespread clearing of this community across eastern areas of Australia, the primary reason for the State and Federal listing of this community.

The land that is proposed to be included in the Biodiversity Offset Strategy has been selected based on the presence of threatened ecological communities and woodlands (such as Box Gum Woodlands and Derived Native Grasslands) that provide habitat to threatened species. Land containing these communities also contains areas which have historically been utilised for extensive agricultural activities such as cultivation.

Amended BSAL mapping within Study Area has reduced the overall area of BSAL within the offset areas 1, 2 and 5 by approximately 54 ha. Whilst areas of BSAL within an offset area will result in these areas not being utilised by agriculture in the future, the soil resources will continue to remain.

Those areas of land within the Biodiversity Offset Strategy which have previously been cultivated provide limited ecological conservation value and as such will continue to be utilised for agriculture. Approximately 109 ha of BSAL within the Biodiversity Offset Strategy which has historically been utilised for cultivation will continue to be utilised for agriculture. A further 245 ha of BSAL is located within the Biodiversity Offset Strategy and comprises vegetation conforming to Box Gum Woodland and Derived Native Grassland. This BSAL will be utilised as part of the Biodiversity Offset Strategy for conservation purposes. Actively regenerating and preserving these areas relevant to native woodland and grassland is considered a priority land use for preservation of native biodiversity within the region. The Biodiversity Offset Strategy will not significantly reduce the agricultural productivity of BSAL, but rather modify the potential land use within some areas of native vegetation.

KEPCO has discussed this strategy with DP&E and received support for the previously cleared/cultivated land to be maintained for agriculture whilst areas containing native vegetation attributes will be conserved as part of the BOS.

4.4.3 Critical Industry Cluster Impacts

4.4.3.1 Equine CIC

Issue

Equine CIC has been mapped in the Bylong Valley region and covers both the open cut mining and biodiversity offset areas. Of the 699.9ha within the project boundary, and 584 ha within the offset areas, a total of 515ha will be permanently lost to agriculture. The potential add-on impacts of the project on the Equine CIC remain unquantified. The Proponent has not provided sufficient information to allow the assessment of the impacts from change in land use on the Equine CIC as a whole.

Response

As noted in the AIS and the EIS, there are currently no operating thoroughbred horse studs within the Bylong Valley and subsequently the Project Area. In August 2012, KEPCO purchased Bylong Park which was the only operating thoroughbred stud in the Bylong Valley, which is not mapped as Equine Critical Industry Cluster (CIC) within Government mapping. The owner of Bylong Park has since also sold their property in the Hawkesbury Valley which was also used as part of their thoroughbred operation and purchased a property in the Hunter Valley at Martindale near Denman, Benchmark Park. From there, they have continued to operate the Bylong Park Stud. Benchmark Park is also within the Upper Hunter Region Equine CIC.

Bylong Park Stud has continued to perform strongly since relocating both arms of its thoroughbred business to Martindale within the Hunter Valley from its previous dual locations of the Bylong Valley and Hawkesbury Valley.

Bylong Park Stud's relocation from the Hawkesbury Valley and Bylong Valley to Martindale in the Hunter Valley (also within the mapped Equine CIC) has not diminished the value or standing of the Hunter Valley Equine CIC.

The Upper Hunter Equine CIC also includes areas within the mapped CIC that produces fodder for use by the equine industry. As part of the AIS, landholders within the Study Area were interviewed by Scott Barnett of Scott Barnett & Associates. The interviews were held in June 2014. At these interviews information was gathered on enterprises carried out and production levels obtained on land within the Study Area.

From these interviews it was determined that 1,628 tonnes per annum (p/a) of lucerne hay was sold from production within the Study Area as well as 420 p/a tonnes of cereal hay. Of the 1,628 tonnes of lucerne hay sold it was estimated based on Land Manager's interviews that:

- 431 tonnes p/a was sold for equine breeding purposes;
- 367 tonnes p/a was sold to Sydney hay traders for use in the Sydney horse racing (thoroughbred and standard bred), pony club and hack market; and
- 830 tonnes p/a sold to dairy and beef producers.

Based on full feeding a dry mare for 365 days of 4 kg of Dry Mass (kgDM) of concentrate (pellets/grain) and 4 kgDM Lucerne hay a dry mare would consume 1.6 tonnes per year (assumes wastage absorbed into daily feeding levels). At 1.6 tonnes per dry mare the lucerne hay sold from the Study Area per year is enough for approximately 270 dry mares.

DPI Agriculture stated that based on the Bureau of Statistics (ABS, 2006) there were 10,179 stud (thoroughbred) horses in the Upper Hunter. As such the lucerne hay sales from within the Study Area could feed approximately 2.7% of the upper Hunter thoroughbred horse population (this assumes all is sold within the Equine CIC).

This is not a significant quantum relative to the total annual hay production from the Upper Hunter, of 57,851 tonnes, which represents only 3% of the NSW total annual yield (DPI, 2013).

As such the Project will not impact on the Upper Hunter Equine CIC.

KEPCO is committed to a rehabilitation strategy that returns land to LSC Classes within the same pre-mining range (i.e. Class 3 through to Class 7, inclusive). The dominant post-mining LSC Classes are 3 and 5, which would be suitable for equine related land uses post-mining.

4.4.3.2 Losses of Equine CIC

Issue

All references to CIC are based on the SRLUP maps (January 2014).

	Total CIC Impact (ha)	Impacted by project	Mitigation Proposed	Project Total Loss
<i>Within Project boundary</i>	<i>1283.9ha</i>	<i>699.9ha</i>	<i>The reinstatement of the post-mining Land & Soil Capability (LSC) see AIS table 42) will not prevent CIC utilisation of this land within the project boundary</i>	<i>515ha</i>
<i>Within offsite offset areas</i>		<i>584ha</i>	<i>Of the 584ha identified, 69ha is located within the identified “cultivated land” that will remain available for agricultural activities; therefore 515ha of equine CIC will be lost.</i>	
<i>Note: CIC impact area data sourced from AID p 81</i>				

The EIS (App W, p37) notes that the main post-mining LSC classes are 3 and 5, which have been identified as suitable for equine land use and should not limit the use of this land for Equine CIC related activities.

The permanent losses of equine CIC land is the result of a change in land use due to biodiversity offsets.

Response

As detailed in **Section 4.4.3.1**, the permanent removal of Equine CIC land due to the biodiversity offsets will not impact on the Upper Hunter Equine CIC.

4.4.3.3 Losses of Scenic and Landscape Values

Issue

The Mining and Petroleum Gateway Panel (M&P GP) report concluded that the "loss of scenic and landscape values will have a significant impact on the Equine CIC" (M&P GP Report Section 5.2.5 'The loss of scenic and landscape values', p31). The Proponent has not provided sufficient information to allow the assessment of the impacts from change in land use on the Equine CIC as a whole.

Further the Mining and Petroleum Gateway panel report concluded that the “loss of scenic and landscape values will have a significant impact on the Equine CIC” (M&P GP Report Section 5.2.5 ‘The loss of scenic and landscape values’, p31).

Response

As noted in Section 2.4.2 of the EIS, approximately 1,933 ha of mapped Equine CIC is located within the Project Boundary, with a further 467 ha mapped immediately adjacent to the Project Boundary on land owned by KEPCO. This area of approximately 2,400 ha represents approximately 0.94% of all land mapped as Equine CIC within the Upper Hunter region.

The VIA prepared by JVP (2015) (Appendix Y of the EIS) identified the areas of land mapped as Equine CIC that would experience visual effects in relation to the Project. A large proportion (approximately 80%) of the Equine CIC in the local area is located within or immediately adjacent to the Project Disturbance Footprint. Section 5.2.2 of the VIA (Appendix Y of the EIS) assessed these areas as being highly impacted by visual effects due to open cut mining or the development of the OEAs for at least the first ten years of the Project, until rehabilitation is established.

The mapped Equine CIC in the Upper Hunter region extends well beyond the Project Boundary and beyond the visual effects of the Project as assessed in the EIS. The majority of mapped Equine CIC lands within the Lee Creek and upper reaches of the Bylong River catchment (owned by KEPCO) are not currently utilised for equine related land use. This would remain the case during the Project’s operational period. As such, the visual impact to operational Equine CIC land was assessed to be low, when considering the entirety of the mapped area and current agricultural land use.

The exception is Tinka Tong, a private freehold property with residence and equine facilities on Upper Bylong Road; this is the closest privately owned Equine CIC land to the Project. The VIA identifies that existing woodland vegetation screens views to the Project from both the residence and equine facilities. *“While this vegetation is intact, visibility and visual sensitivity are reduced. Without vegetation screening, as after a bushfire event or drought induced canopy loss, this property would have high visual sensitivity to the Project.”*

We refer to general statements from the VIA that the *“...visual impact of the Project is generally low from key viewing locations. Impacts are confined to the local setting of Lee Creek and Upper Bylong Valley. The major experience of the Bylong Valley is west of the major operational areas of the Project. It is separated visually from the Project by existing topography and vegetation.”*

Visual avoidance and mitigation works for the Project were also designed to remove direct views to mining activity from those locations or to minimise the potential for indirect visual impacts to land surrounding the Project Boundary. In terms of the visual effect of the change of land use on the whole of the mapped Equine CIC in the region, the direct or indirect visual effects of the Project as assessed in the VIA are not considered to result in a significant long term visual impact.

The impact of direct views to the open cut mining areas and OEAs proposed for the Project from mapped Equine CIC lands would be reduced as progressive rehabilitation is undertaken. Generally, these visual impacts would be limited to a period of up to 10 years after which rehabilitation areas would be established, reducing visual impacts over time.

The more general concerns noted in the submission regarding impacts to the scenic and landscape values are related to “dynamic effects” on an inferred sense of place and the theoretical general land use of the region by the equine industry. The potential for these impacts was acknowledged and reflected in the definition of visual sensitivity within the Primary Visual Catchment assessed in the VIA, with any location associated with mapped Equine CIC land given a higher visual sensitivity, even for those areas not currently utilised for equine related land uses.

The “dynamic effect” of the Project for the equine industry in the wider Equine CIC would be based on sequential views experienced over time. This includes the current views when travelling along roads in the vicinity of the Project, as well as a general knowledge based on all sources of information, which would create perceptions of an area.

In this context, staff and management at the equine related operations in the region and local residents are likely to have a greater source of knowledge of the Project by being aware of the development application process. Generally, a lesser level of knowledge is likely to be held by visitors to the equine related operations from outside of the region. However, they may have knowledge of mining operations within the area through trips past existing mines and infrastructure elsewhere in the Hunter Valley, outside of the Bylong Valley.

The Project is generally shielded from views from the vehicles travelling along the Bylong Valley Way in the vicinity of the mapped Equine CIC. In this context, there is unlikely to be a loss of landscape or scenic values to the Equine CIC areas as a whole as a result of the Project. The visual impact on visitors’ “dynamic” or “image” perception will be limited due to screening of direct views to Project operations from public roads (Bylong Valley Way) and the short, infrequent nature of visual effects on visitor experience.

4.4.4 Water Impacts

Issue

The AIS states “no loss to the current utilised agricultural water available under KEPCO water allocation entitlements is predicted as a result of mining activities” (AIS p95). The impact of KEPCO’s allocation on agricultural water use in the area both currently and into the future has not been addressed.

KEPCO holds existing water license allocations of 2535 units (currently equals 2535ML/year when Available Water Determinations (AWD’s) are at 100%). This water is available for use by KEPCO as it sees fit however, the AIS does not identify if or how much of this water will be available for agricultural use on KEPCO owned land.

The impact of KEPCO's purchasing of its 2535 units of water on the broader agricultural region has not been identified. The Report Card for the Bylong River Water Source indicates that the area has a total groundwater entitlement of 5843 ML/ year all of which was used for irrigation purposes. KEPCO's ownership of 2535 units represents 43.4% of the licensed water availability in this area. This project represents a significant change in how water is used in the area where previously 100% of the allocation was used for irrigation, to only 56.6% remaining available for irrigation.

The impact of KEPCO's allocation on agricultural water use in the area both currently and into the future has not been addressed.

Response

As stated in the AIS (page 58) if all of KEPCO's allocation is removed from agricultural use in a 100% AWD year 443 ha of land would be removed from irrigated agriculture and used for dryland agriculture. The gross value of irrigated crops loss would be \$1.395 Million (\$4,550/ML) and a net value of production of \$0.370 Million (\$146/ML) (see Table 28 in the AIS). This would be offset by the value of dryland agricultural production from the same 443 ha resulting in a net loss of:

- Gross value of agricultural production of \$1.052 Million (\$415/ML removed from agriculture), and
- Net value of agricultural production of (\$0.256 Million) (\$101/ML removed from agriculture).

However as discussed in the AIS (see Table 38 of the AIS) the Project's water requirements to be taken from the borefield drawing from the Bylong River alluvium plus predicted average alluvial groundwater seepage is:

- Project Years 3 – 6 (open cut only): 990 ML/annum which represents 16.9% of the available water source leaving 4,853 ML per annum available for agricultural use;
- Project Years 7 – 10 (combined mining operations): 500 ML/annum which represents 8.6% of the available water source leaving 5,343 ML per annum available for agricultural use; and
- Project Years 11 – 25 (underground only): 0 ML/annum which represents 0% of the available water source leaving 5,843 ML per annum available for agricultural use.

Assuming all water in the system not used for mining is available to agriculture the gross value of agricultural production lost due to the use of potential irrigation water for the Project is \$2.471 Million over the life of the Project and the net value is \$1.203 Million, all occurring within PY 3 to PY 10.

Based on current (and previous) management of KEPCO owned land, approximately 750 ML is used annually for agriculture. Under the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Source 2009* (Hunter Unregulated WSP) for the Bylong River Water Source, the water licenced to KEPCO which is not used for mining or agricultural use is available to trade with other licenced groundwater users of the Bylong River Water Source.

4.4.5 Biodiversity Offsets Impacts

Issue

It is DPI Agriculture's position that lands set aside for biodiversity offsets should avoid BSAL. It is noted that the proponent has tried to minimise BSAL impact from biodiversity offsets however, there is still a net loss of 376.81ha of BSAL to biodiversity offsets. Further consideration should be given to revising the biodiversity offsets to reduce the impact on BSAL.

Further, it is recommended that the proponent commits to ensuring the continued utilisation of the 282ha of identified "cultivated" land identified in the AIS, either by the proponent as part of their farming operations, or included in neighbouring agricultural production systems. Ensuring the land remains in production will reduce barriers to production following the completion of mining.

Response

Refer to previous response provided in **Section 4.4.2**.

Amended BSAL mapping within the Study Area has reduced the overall area of BSAL within the offset areas 1, 2 and 5 by approximately 54 ha. Whilst areas of BSAL within an offset area will result in these areas not being utilised by agriculture in the future, the soil resources will continue to remain.

Additionally, due to the biodiversity values of this land (hence included in offset strategy) would mean that the use of this land for extensive agriculture would be limited under provisions of *Native Vegetation Act 2003* and EPBC Act.

KEPCO has discussed this strategy with DP&E and received support for the previously cleared/cultivated land to be maintained for agriculture whilst areas containing native vegetation attributes will be conserved as part of the BOS.

A number of the vegetation communities impacted by the Project, including Box Gum Woodland and Derived Native Grassland occurs within fertile landscapes that are also agricultural lands. This creates an issue for determining offsets for these vegetation communities and associated habitat because to create such offsets additional areas of agricultural land, including BSAL is required.

Avoiding locating offset sites on BSAL has been considered; however, as there are limited opportunities for conservation of large patches of similar vegetation communities and associated habitat (including remnant Box Gum Woodland on fertile soils) elsewhere in the locality, options to conserve these communities within modified landscapes already owned by KEPCO, and subject to permanent biodiversity conservation and management, are viable options.

One of the vegetation communities impacted by the Project, Box Gum Woodland and Derived Native Grassland, is threatened because extensive areas of grassy woodland have historically been cleared and modified, largely as a result of agricultural practices. This is due to their higher soil fertility and typically flat or gently undulating land form, which is suitable for cropping and grazing. In order to recover grassy woodland communities that occur as isolated patches amidst an extensively cleared agricultural setting, and increase the ecological integrity and biodiversity of the locality and region it is essential to recover some agricultural land.

The offset sites proposed for the Project have been mapped as comprising 347.4 ha of BSAL, meaning the land potentially has inherent high agricultural qualities, which may include certain land and soil capability standards and/or reliable water access (Department of Planning and Infrastructure, 2012). The inclusion of this area of BSAL within the offset sites is not considered a significant loss of agricultural productivity in a regional context.

All native vegetation within the offset sites will be managed for biodiversity.

The remaining portions of the offset sites will be managed for agriculture (cultivated lands) or retained as cleared (dams, roads etc.). A total of 283 ha of cultivated lands will be retained within the offset sites, which includes:

- Offset Area 1: 75 ha;
- Offset Area 2: 106 ha;
- Offset Area 4: 69 ha;
- Offset Area 5: 13 ha; and
- Yarran View Offset Area: 22 ha.

The utilisation of the cultivated lands within the offset sites will take into consideration the requirement for managing adjoining native vegetation for biodiversity.

4.4.6 BSAL Rehabilitation

4.4.6.1 Biodiversity Offsets

Issue

The proponent is proposing to undertake the reinstatement of 227ha of BSAL to offset the 206.3ha lost in the disturbance footprint. There will be no reinstatement to offset the loss of 171.8ha in the subsidence study areas nor the 205ha in the other biodiversity offset areas.

The evidence provided within the documents is insufficient to demonstrate that the BSAL can be reinstated or that the proponent is capable of successful reinstatement of BSAL.

Response

The phrase 'Biophysical Strategic Agricultural Land' was coined in March 2012 with the release of the initial *draft Strategic Regional Land Use Plan* (NSW Government, 2012). The aim of categorising parcels of land as BSAL is to identify the land with "a rare combination of natural resources highly suitable for agriculture" (NSW Government, 2013). The interim protocol for site verification and mapping of BSAL (2013) has created a systematic process of identifying the important criteria is met for a soil profile to be classified as BSAL. Therefore in reality, for a soil profile to be classed as BSAL requires each criteria to be met within the thresholds and definitions. This standardised system can be applied to any soil profile including rehabilitated mined land. Further, all criteria, except Inherent General Fertility, can be assessed to verify the land as BSAL.

Given the short term (approximately 3 years) experience with the Interim Protocol being available, there are no mines or proposed mines in NSW, that have been required to re-instate soil profiles to a BSAL standard. As such there are no examples of rehabilitation on mined land specifically aimed at re-instating BSAL. However, as explained within Section 3.4 of Appendix W in the EIS, there are numerous examples of mine rehabilitation aimed at returning mined land to a productive agricultural use post-mining.

These examples are outlined to provide a basis for the rehabilitation principles and methods, which have been proposed and outlined in Sections 8 to 12 of Appendix W of the EIS. Traditionally mines have been required to rehabilitate mined land to a standard with potential for light to medium grazing, if required to use the rehabilitated land for agricultural purposes at all. Often the aim for rehabilitation has been limited to providing a stable, non-polluting landform. However, as the industry has progressed over the last 15 years, other aims have been pursued such as biodiversity outcomes, targeted species and communities, higher quality grazing land and more recently cropping land.

There is a vast knowledge base in mine rehabilitation which has been drawn upon to structure the Project's Rehabilitation Strategy including Soil Scientists, Agronomists, Erosion and Sediment Control Experts, Mine Planners and Environmental Consultants. Furthermore, the strategy is based on early trials to ensure the rehabilitation program is on track to meet the closure criteria, with a Trigger Action Response Plan (TARP) approach to identify and manage potential short falls in the rehabilitation. The rehabilitation strategy has already received valuable feedback from DPI Agriculture which will be consulted when initiating the rehabilitation trials.

4.4.6.2 BSAL Reinstatement Post-Mining

Issue

The proponent has committed to reinstating 62.7ha of BSAL within the haul roads and infrastructure areas at the end of the project, however this appears to contradict their statement on page 66 of Appendix W where the proponent states that “Of the 919.5ha to be directly and permanently disturbed, land associated with the Internal Roads and Rail Loop will not be returned to a pre-mining land use and will remain as non-rehabilitated infrastructure”. The proponent is only offering to offset the BSAL lost within their defined disturbance area.

Response

Table 19 on page 66 of Appendix W of the EIS only accounts for the 227 ha of Class 3 LSC /BSAL land to be re-instated within the project disturbance footprint, for the purposes of calculating soil volume requirements from the soil stripped within that same footprint. The stripping and rehabilitation of infrastructure areas assumes the soil stripped from these areas will be stockpiled adjacent the infrastructure and upon decommissioning, this same soil will be replaced in its original location. This also assumes previous verified BSAL will be returned to BSAL post disturbance in these areas.

4.4.6.3 Anthroposols

Issue

In the Interim protocol for site verification and mapping of BSAL, Anthroposols (man-made soils) have not been considered in the soil fertility rankings, and therefore cannot be returned to BSAL, so BSAL cannot be reinstated. However, DPI is willing to consider that if reinstated land can be brought back up to fertility and productivity standards in both dryland and irrigated scenarios, with all of the soil constraints contained within the Interim protocol eliminated, then this could suffice.

Response

DPI Agriculture’s acknowledgement of the lack of consideration of Anthroposols within the Interim Protocol, and therefore no ability to technically verify any post-mining soil profiles as BSAL is noted. This issue has been raised on several occasions by SLR representatives in mining and soil science forums in the presence of OEH and DPI Agriculture representatives. It is anticipated that this issue will be addressed within the next version of the Interim Protocol. However, as stated by DPI Agriculture in their submission, there is a willingness to consider other measurement means of verifying post-mining soil profiles as BSAL or Non-BSAL.

Further to DPI Agriculture’s suggestions of fertility and productivity standards, KEPSCO propose a recording of original soil type stripped and used in the rehabilitation of BSAL to demonstrate the original inherent fertility ranking of the proposed BSAL material used on rehabilitated mining landforms.

Along with fertility measurements such as cation exchange capacity (CEC), this would provide further evidence as to BSAL verification in the absence of an Anthroposol soil fertility ranking. All soil samples from analysed sites were tested for CEC with the results presented in Appendix C of Appendix V of the EIS.

4.4.7 Rehabilitation Strategy

4.4.7.1 Rehabilitation Trials

Issue

The proponent consult with DPI Agriculture to develop an appropriate trial design and detailed monitoring program for the reinstatement of BSAL/ LSC class 3 lands. The outcomes of the trial and the rehabilitation activities (both positive and negative outcomes) should be made publically available in a timely manner.

It is also recommended that rehabilitation trials of the areas classified as "Secondary Domain A – Grazing Land" (App W, p.97) be considered. These should include pasture establishment and agricultural production aspects and could investigate the very important aspect of legume establishment in pastures.

The project proposes that rehabilitation activities will commence early in the mine's life, with grazing land rehabilitation within the first 3 years and BSAL reinstatement commencing between years 3-5. Therefore, the outcomes of any trials and the rehabilitation activities (both positive and negative outcomes) should be made publically available in a timely manner. This will allow a sharing of the very limited knowledge on BSAL rehabilitation that can be utilised by other projects and ideally lead to better rehabilitation outcomes across the state.

Response

Noted. KEPCO will continue to liaise with DPI Agriculture with regard to the trial designs and monitoring methods to ensure the rehabilitation to agricultural land use is assessed in a robust and meaningful manner.

BSAL rehabilitation updates will be included in the Annual Review each year which is publically available.

4.4.7.2 Rehabilitation Monitoring Methodology

Issue

All soil chemistry analysis (App W, table 24) needs to include Colwell Phosphorus, Phosphorus Buffering Index (PBI) and all exchangeable cations.

- Floristic Survey (App W, p94) (assuming this was to be applied to pasture and grazing rehabilitation areas); vegetative composition must be on a dry matter basis (Primefact323 Pasture assessment & livestock production, NSW DPI 2006) and vegetative groundcover targets should be 70% or greater (Agfact P2.1.14, Maintaining groundcover to reduce erosion and sustain production, January 2005).

Response

Noted.

4.4.7.3 Grazing Land

Issue

The proposed monitoring program (App W) is not considered to be adequate for monitoring agricultural production. The proposed frequency of pasture monitoring to be carried out every 6 months for the first 3 years and annually afterwards (AppW,p95) is inappropriate, especially if the proponent is attempting to prove ecosystem land use sustainability (as defined by DRE, ESG3: Mining Operations Plan (MOP) Guidelines, September 2013).

Response

Agricultural production techniques, pasture species and technologies are continually evolving. This is furthered evidence by the rapid expansion of precision agricultural techniques/technologies including remote sensing and monitoring technologies. As such, it is difficult to be prescriptive of future management plans and monitoring programs.

Notwithstanding the above, it is accepted that six monthly, then annual monitoring of pasture data is inadequate for monitoring of pasture production. Pasture growth rates and pasture composition should be monitored as part of a normal pasture management regime employed by management. The KEPCO Farm Management Plan will include estimates of pasture coverage and grazing records which will allow for pasture growth rates and production (pasture availability DM/ha) and pasture consumption to be calculated and recorded. This will be used in connection with livestock weight monitoring to help with animal performance monitoring (standard agricultural practice). Results shall be compared with production records from nominated reference sites during mining and during rehabilitation.

Frequency and timing of monitoring will be determined by the agronomy of pasture species (mixes) used and their productive cycle (e.g. summer or winter growing species), seasonal conditions and grazing management techniques best suited to various pasture species. It is not possible to be definitive at this point in time.

DPI Agriculture will be consulted during the preparation of the monitoring program for the chosen pasture mixes.

Monitoring programs and results shall be constantly evaluated against:

- Appropriateness of techniques;
- Comparative performance of rehabilitation sites and reference sites;
- New techniques of monitoring; and
- Improved agronomic and grazing management knowledge, techniques and technologies.

Issue

Nominated pasture composition of perennial grass: annual legume (80:20) should be done on a dry matter basis (Primefact 323), and legumes should be annual or perennial.

Response

Noted. Both perennial and annual legume species will be considered as appropriate.

Issue

Using dry matter yields as the only measure to compare pasture production to the nominated reference site is not appropriate for monitoring and/or comparing grazing systems. Livestock grazing influences both pasture composition and production, so it is recommended that pasture and livestock production monitoring be included into the monitoring program to ensure the pastures can sustain grazing activities, not just produce vegetation. Reference sites will also need to be managed in the same way that rehabilitated sites are to ensure fair comparisons of pasture and livestock performance.

Response

The purpose of the monitoring to is ascertain if the land has been rehabilitated well enough to be at least equivalent to the selected reference sites comprising land of similar soil and agricultural characteristics as the pre-mined land.

As such the monitoring program will include a range of soil, pasture and livestock parameters.

Issue

Whilst it is acknowledged that Landscape Function Analysis (LFA) is used in the mining rehabilitation industry, we do question the relevance of using LFA after pastures/ crops have been established. It may be quite relevant to use LFA for the first 0-5 years or up until a good vegetation cover has been establish however, after that time more relevant monitoring practices should be adopted such as those outlined in Lodge, G. (1998) Themes and experimental protocols for sustainable grazing systems, Occasional Paper No 13/98. Land and Water Resources Research and Development Corporation.

Response

As stated above, pasture production (DM yield, pasture composition and livestock performance) will be monitored as part of the monitoring program. The methodology will be informed by the technology and knowledge at the time, and be regularly reviewed and adjusted. Such methodology will be guided by Lodge, G (1998) and other work that may be published in the intervening time.

4.4.7.4 Cropping Land

Issue

The proposed monitoring regime is not appropriate for monitoring cropping activities. Crops comparisons should be made only with reference sites of a similar crop age, plant density and soil fertility.

Crop health and pest management should be included into the monitoring program.

The crops should be monitored through all stages of crop development, not just twice a year (for years 0-3) and annually thereafter as suggested by the proponent.

Response

Crops (monitor and reference sites) will be monitored through their stages of development (as per best agricultural practice). Where possible comparisons shall be made with crops of similar age, plant density and soil fertility. This will be determined by careful selection of reference sites.

As far as possible, crop rotations on various comparative paddocks (sites) shall be kept the same. Comparisons shall be made at and reported against the same stage of crop growth (implying sowing dates shall be as close as possible and management operations shall be similar) with reference to the Zadoks Growth Scale (Zadoks JC, Chang TT, Konzak CF, 1974).

Management records of all inputs and operations and trigger points shall be kept as per current KEPCO owned agricultural land management practices including pest, disease and weed burdens.

Frequency and timing of monitoring will be determined by the agronomy of cropping species used and their productive cycle (e.g. summer or winter growing species) and seasonal conditions. It is not possible to be definitive at this point in time.

Monitoring programs and results shall be constantly evaluated against:

- Appropriateness of techniques;
- Comparative performance of rehabilitation sites and reference sites;
- New techniques of monitoring; and
- Improved agronomic and grazing management knowledge, techniques and technologies.

4.4.7.5 Trigger Action Response Plans

Issue

- Soil pH unit methodology has not been identified. It is assumed that the figures provided in tables are pH(water) since the values for class 3 LSC are consistent with BSAL pH values in water. Soil pH information should be provided in calcium chloride (CaCl₂).

- The identified sodicity targets for exchangeable sodium percentage (ESP) of <15 for LSC Classes 3 & 5 and <8 for LSC Class 4 is considered to be too high. Soils with an ESP of >6 are generally regarded as sodic (agriculture.vic.gov.au/agriculture/farm_management/soil-and-water/soils/soil-physical-properties) and when wet, can become dispersive and/or prone to slaking. This can lead to soil surface crusting (which prevents seed germination) and/or soil erosion (an issue for topsoil and subsoils).

Response

Noted. TARPs will be prepared as part of the Rehabilitation Management Plan as required.

4.4.8 Socio-economic Aspects

4.4.8.1 Agricultural Support Services

Issue

The proponent acknowledges that there is approximately 2,400ha of mapped Equine Critical Industry Cluster (CIC) land located within the Agricultural Assessment Areas representing 0.94% of the mapped area (Section 3.5, p33). The mapped land is towards the western geographic edge of the Equine CIC. There are currently no thoroughbred enterprises in the area however the Proponent has attempted to estimate the value of the Equine CIC area if it was used for lucerne hay and thoroughbred broodmare production, and have estimated the annual gross value lost would be \$7,860,620 (Table 27, p58). However, the potential add-on impacts on the Equine CIC as a whole remains unquantified.

Response

As identified in the AIS (Appendix X of the EIS), while there is land within the Project Disturbance Boundary and in the proposed biodiversity offset areas that has been mapped as Equine CIC, none of this land is currently used for that purpose. Further, as explained in Section 2.2.4 of the EIS, the mapped Equine CIC within the Project Disturbance Boundary and biodiversity offset areas is on the south-western most extent of the mapped Equine CIC within the Upper Hunter Region. The Upper Hunter SRLUP identifies that the relevant thoroughbred horse breeding industry is focussed around Scone, which is one of the major horse breeding areas in the world with over 70 studs in this specific concentrated area. The Project is more than 1.5 hours' drive from the equine centre of Scone and is not located within the direct concentration.

Nevertheless, Section 5.5.2 of the Economic Impact Assessment (Appendix AE of the EIS) specifically assesses the direct opportunity cost and potential direct and indirect regional economic impacts of utilising Equine CIC land for the Project.

There is substantial land in the region mapped as Equine CIC that is not used for this purpose. This indicates that the mapping is conservative in relation to its apparent demand for this land use. Hence the impacts to this land on the most south-western extremity of this mapped Equine CIC by the Project mining and biodiversity offsets purposes is unlikely to have any add-on impacts on the Equine CIC as a whole.

4.4.8.2 Processing and Value Adding Industries

Issue

The Proponent has not provided sufficient information to allow the assessment of the impacts from change in land use on the Equine CIC as a whole which is a value adding industry.

Response

This is addressed in **Sections 4.4.3** and above.

4.4.8.3 Tourism Infrastructure

Issue

The proposed Project will include a Workforce Accommodation Facility, which will have capacity of 650 beds in years 1-2 which will then be reduced to 350 beds for years 3-6. The provision of the facility during the construction phase will reduce pressure on tourism accommodation facilities in adjacent towns such as Mudgee, Gulgong or Denman. The development of this accommodation facility is likely to reduce the likelihood of adverse impacts on tourist accommodation availability.

Response

Noted.

Hansen Bailey conducted a survey of accommodation providers of the Local Area in December 2015 (see **Section 4.2.1**). The survey has informed an assessment of housing and accommodation supply during Construction Phase 1. The outcomes of this assessment are documented in **Appendix E**. The inclusion of a WAF in the Project is a risk management strategy to ensure that Construction Phase 1 does not adversely impact the supply of accommodation for key tourist events in the region. Potential impacts to tourism under a no WAF scenario are described in the revised SIA Report (**Appendix C**).

4.4.8.4 Agricultural Lands

Issue

The Proponent states that it will retain services of a professional farm manager to “ensure the continued productivity of agricultural land” under its control in the Bylong Valley (Section 9.3, p.94). The Proponent has also committed to developing a Farm Management Plan which includes sustainable farming practices including reduced till farming and rotational grazing techniques (Section 9.3.2, p94). However, the Proponent makes no reference to which specific sustainable farming and rotational grazing practices would be applied.

Information provided by the Proponent is not sufficient for an assessment of the intended sustainable farming/rotational grazing practices and their prospective profitability to be made.

Response

Details on appropriate sustainable farming and rotational grazing practices will be included in the Farm Management Plan (developed in consultation with a regional agronomist), as discussed in the AIS (Appendix X of the EIS). These will be identified in accordance with relevant policies, guidelines and best management practices for the appropriate Land Capability and Agricultural Suitability Class, such as those published by the DPI Agricultural.

4.4.8.5 Agricultural Enterprises

Issue

The Proponent indicates that the post-mining land use for the open-cut areas will include 227ha of cropping and 497ha of grazing (Table 43, p76). No evidence is provided of the Proponent's prior experience and success in rehabilitating such areas to productive levels. The Proponent indicates that 161.8ha of "Non-rehabilitated Infrastructure" will remain including the rail loop which covers 88.3ha (Table 35, p66). It is not clear how this area would be managed after mine closure, by whom and what the impacts of its management would be on adjacent agricultural enterprises.

Information provided by the Proponent is not sufficient for an assessment to be made.

Response

The decommissioning and rehabilitation of the rail loop is discussed in **Section 4.7.2**. Other infrastructure to remain post closure includes infrastructure, such as water dams, that are considered to be of beneficial use for post-mine landowners and therefore will be left in place in accordance with the relevant stakeholders or landowner agreements.

4.4.8.6 Agricultural Infrastructure – Closure of Upper Bylong Road

Issue

- i) *The project proposes the closure of Upper Bylong Rd to the south of the Project Disturbance Boundary (PDB). This closure will increase travel time for residents and also impacts property management regimes. This is an issue for concern for the community (Section 6, Table 33).*

The Proponent indicates that it is working with the Mid-Western Regional Council and residents to resolve this issue which includes consideration of compensation options.

Before project approval is granted, negotiations with residents affected by the proposed road closures should be completed to ensure that property access is maintained and adequate roads are provided for servicing these properties.

Response

Section 4.2.9.6 describes the proposed North Link Road as KEPCO's preferred option to provide an alternate access for landholders located to the south of the Project in light of the closure of a section of Upper Bylong Road. Approval for the construction of the conceptual North Link Road is now being sought as part of the Project.

4.4.8.7 Agricultural Infrastructure – Increased Traffic on Bylong Valley Way

Issue

ii) *The project has the potential to increase traffic on the Bylong Valley Way which links Bylong to the Golden Highway and Muswellbrook Shire. Maintenance of this road is shared between Mid-Western Regional Council and Muswellbrook Shire Councils. The Proponent states that a Voluntary Planning Agreement (VPA) being negotiated with Midwestern Regional Council for road maintenance of the Bylong Valley Way (EIS Traffic and Transport Impact Assessment, Section 6.4, p66). However, the identified traffic impacts will not stop at the shire boundary and hence impacts on road users will be continued and sustained along the section of Bylong Valley Way which is maintained by Muswellbrook Shire Council.*

Muswellbrook Shire Council should be included as a signatory to the proposed VPA to ensure Bylong Valley Way is maintained to a standard so that agricultural and equine industries users are not adversely impacted.

Response

MSC has been consulted with regard to the Project. It is noted that a late submission has been provided by MSC on 15 March 2016 following the public exhibition of EIS. A response to this submission will be prepared and submitted at a later date. The response will address the issue of road maintenance raised by DPI Agriculture in their submission.

The Project will generate its peak traffic during construction in 2017 (PY 2). The section of Bylong Valley Way between the Golden Highway and Wollar Road will be one of the travel routes to and from the Project site. The vast majority of light vehicles traffic is anticipated to travel to and from Mudgee to the Project site with the upgrade of Wollar Road proposed for completion in 2017. It is anticipated that larger heavy vehicles will travel to / from the Project via the Golden Highway, Ulan Road and Wollar Road instead of Golden Highway and Bylong Valley Way given it is a B-Double approved route.

Standard light and heavy vehicle traffic are expected on this section of Bylong Valley Way but as this will not be the primary travel route, a lower traffic volume is expected based on Project traffic vehicle distribution as discussed in Section 5.8 of the Revised TTIA (**Appendix D**). Bylong Valley Way between the Golden Highway and Wollar Road is expected to carry up to 20 additional vehicles in the AM and PM peak hours during construction in 2017 (PY 2).

4.4.8.8 Impacts of Physical Movement of Water away from Agriculture

Issue

The proposed Project will result in a change in water usage and pattern of use in the Bylong Valley, as described earlier in section 4 of this attachment, and in advice from DPI Water in Attachment A.

The socio-economic impacts of this have not been fully assessed.

Response

It is noted that as illustrated within Figure 10-26 of the GIA (Appendix M of the EIS), the modelling completed for the EIS considered the ongoing use of Water Access Licences (WALs) for agricultural activities in association with extraction required for the Project. As such, it is highlighted that the water allocations to be utilised for the Project are not presently utilised to the full extent for agricultural activities.

Section 4.4.4 in relation to the economic cost of transferring water use from agriculture to mining. The Economic Impact Assessment (Appendix AE of the EIS) includes the opportunity cost of WALs required by the Project. Section 5.5.2 of the Economic Impact Assessment explicitly examines the direct and indirect regional economic impact of the reallocation of water required for the Project away from agriculture. This is a small fraction of the direct and indirect regional economic impacts of the Project.

4.4.9 Summary of Assessment

Issue

Further clarification by the Proponent is also warranted in regard to issues relating to impacts on the Equine CIC as a whole entity, proposed sustainable grazing practices, final management of the non-rehabilitated infrastructure and quantification of potential impacts from the project water use on agricultural water users.

Response

This is discussed in the **Section 4.4.3**.

4.4.10 Soil Reinstatement Volume Calculations

Issue

Due to the quality of the soil information supplied, it has not been possible to check the volumes which would be available for soil reinstatement. The proponent also states that a total of 7.42 million cubic metres (MCM) will be available and of this, 5.51 MCM is available from land to be directly and permanently impacted upon. They do not state where the other 1.91 MCM will come from. Moreover, they have stated that the total volume is enough for reinstating the 757.7 ha of land affected by the direct and permanent impacts.

There is an assumption that the other soil may come from the remaining 161.8 ha of permanently disturbed land associated with internal roads and the rail loop which will not be returned to a pre-mining land use and will remain as non-rehabilitated infrastructure. However, this is not clear in the documentation.

The proponent states that there is enough material for reinstatement of all soils and that “a Soil Resource Management Plan will be developed and documented in the approved MOP.”

Recommendation:

That the project’s Mining Operations Plan (MOP) be assessed by DPI to determine the availability of soil volumes available for rehabilitation before the project activities commence.

Response

Appendix V to the EIS outlines the methodology for calculating available soil resources and total volumes available.

Section 8.4 of Appendix W, and Section 8.4 of Appendix V in the EIS outline the soil volume requirements to achieve the proposed post-mining LSC classes and BSAL areas, as well as the soil balance indicating adequate soil resources to achieve the targeted LSC outcomes.

This confirms that the available soil resources on the site are in excess of what is required to achieve the rehabilitation outcomes as proposed by the Project.

4.5 NSW DEPARTMENT OF PRIMARY INDUSTRIES – LAND – RA5

Issue

DPI – Lands has reviewed the ‘Environmental Impact Statement for the Bylong Coal Project’ September 2015 and notes the following.

- An access easement is required prior to any Crown Road closures that provide access to and through Lot 4 DP755438, Lot 7300 DP1137901, Lot 89 DP 755438, Lot 95 DP 45337 (Attachment B).*
- Any proposed Crown road closures (Attachment B) by KEPCO Bylong Australia Pty Limited (KEPCO) be progressed following the implementation of an access easement.*
- The purchase of Lot 4 DP755438 and Lot 98 DP 704724 is progressed by KEPCO as these Crown Reserves will be impacted by open cut and overburden emplacements resulting in a modified landform.*
- If purchase is not achievable prior to the commencement of any surface disturbance, a landowner access agreement is to be negotiated with DPI–Lands for Lots 4 DP755438 and Lot 98 DP 704724.*

Response

KEPCO has lodged a number of applications with DPI Lands for the closure of unused (paper) crown roads within the areas to be occupied by the Project. KEPCO will continue to consult with DPI Lands in relation to the process of purchasing crown reserves, providing alternative access easements, landowner access agreements and other related matters, where required.

4.6 NSW DEPARTMENT OF PRIMARY INDUSTRIES – FISHERIES – RA6

Issue

DPI Fisheries advise nil issues in relation to direct impacts on Aquatic habitats. However the potential for any water loss from the alluvial system and subsequent potential impacts on the downstream receiving waters should be considered in assessing the impacts of this proposal.

Response

Noted. The potential impacts of any water loss and on downstream receiving waters has been assessed and considered in the GIA (Appendix M of the EIS) and the Surface Water Impact Assessment (SWIA) (Appendix L of the EIS).

4.7 NSW DEPARTMENT OF INDUSTRY – RESOURCES AND ENERGY – RA7

4.7.1 Mining Title

Issue

The Division notes the proponent's intention to convert part of Authorisations 287 and 342 to a mining lease. This will require the submission of a mining lease application to the Division. As part of this application the proponent will need to provide proof of native title extinguishment or go through the right to negotiate process.

Response

Mining Lease Applications were lodged with DRE in July 2015 for the Project. These applications included the appropriate supporting information as noted within DRE's submission.

4.7.2 Rehabilitation

Issue

It is noted in sections 8.2.3 and 8.2.4 (Domains 4 and 5) of the EIS that the Rail Loop and all internal roads will be retained at mine closure. The Division's default position on infrastructure is total removal and rehabilitation. KEPCO should present a case for retaining infrastructure that may have a positive outcome in the final landform, but until that time it is the Division's position that the Rail Loop and all internal roads should be removed and the land rehabilitated.

Until the case is made for the retention of internal roads and the Rail Loop, the Division does not support the retention of this infrastructure upon mine closure.

Response

It has been determined, that following mine closure, all rail loop infrastructure will be removed and the site rehabilitated to present as a natural environment. It is not the intention to reshape the site back to pre-development landform levels and grades but to ensure the site is stable, free draining and revegetated. **Figure 10, Figure 11 and Figure 12** illustrate the revised conceptual final landform, rehabilitation of the rail loop area and the relevant cross sections through this proposed rehabilitation area.

Rehabilitation works could be expected to take 6 months and revegetation approximately 18 months. Environmental impacts will be controlled using appropriate measures. Potential impacts are likely to include; erosion and sedimentation, noise, dust and storm water quality.

It is envisaged that the follows works will be required to rehabilitate the site:

Rail Infrastructure and Furniture: The following items associated with the mine rail loop will be decommissioned and removed from site.

- Rail track, sleepers and fastenings;
- Rail ballast;
- Rail signalling equipment, signage and controls;
- Drainage pits, pipes, box culverts, headwalls and reno mattresses;
- Above and below ground services including optical fibre, telecommunications, water and electricity; and
- Structures including buildings and gantries.

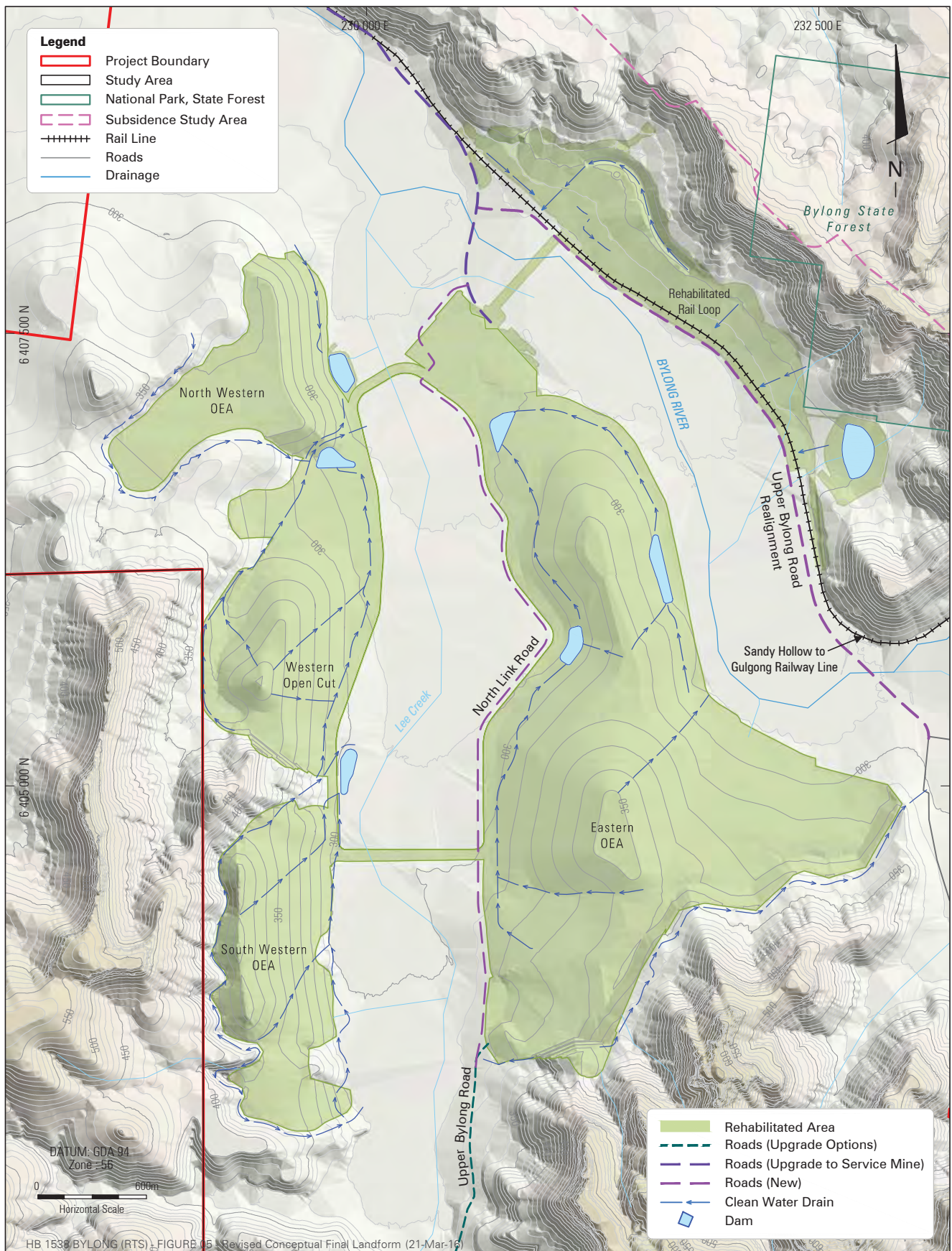
All infrastructures relating to the existing Sandy Hollow to Gulgong Railway line will be retained.

Track Formation, Access Roads and Hardstand Areas: All roads and track formation surfaces will be broken up, scarified and covered with fill and topsoil. The areas will be seeded and revegetated with appropriate native grasses. Any sealed wearing course (Eg Asphalt) will be broken up and removed from site prior to scarifying. All road furniture including signage, safety barriers and drainage infrastructure will be removed from site.

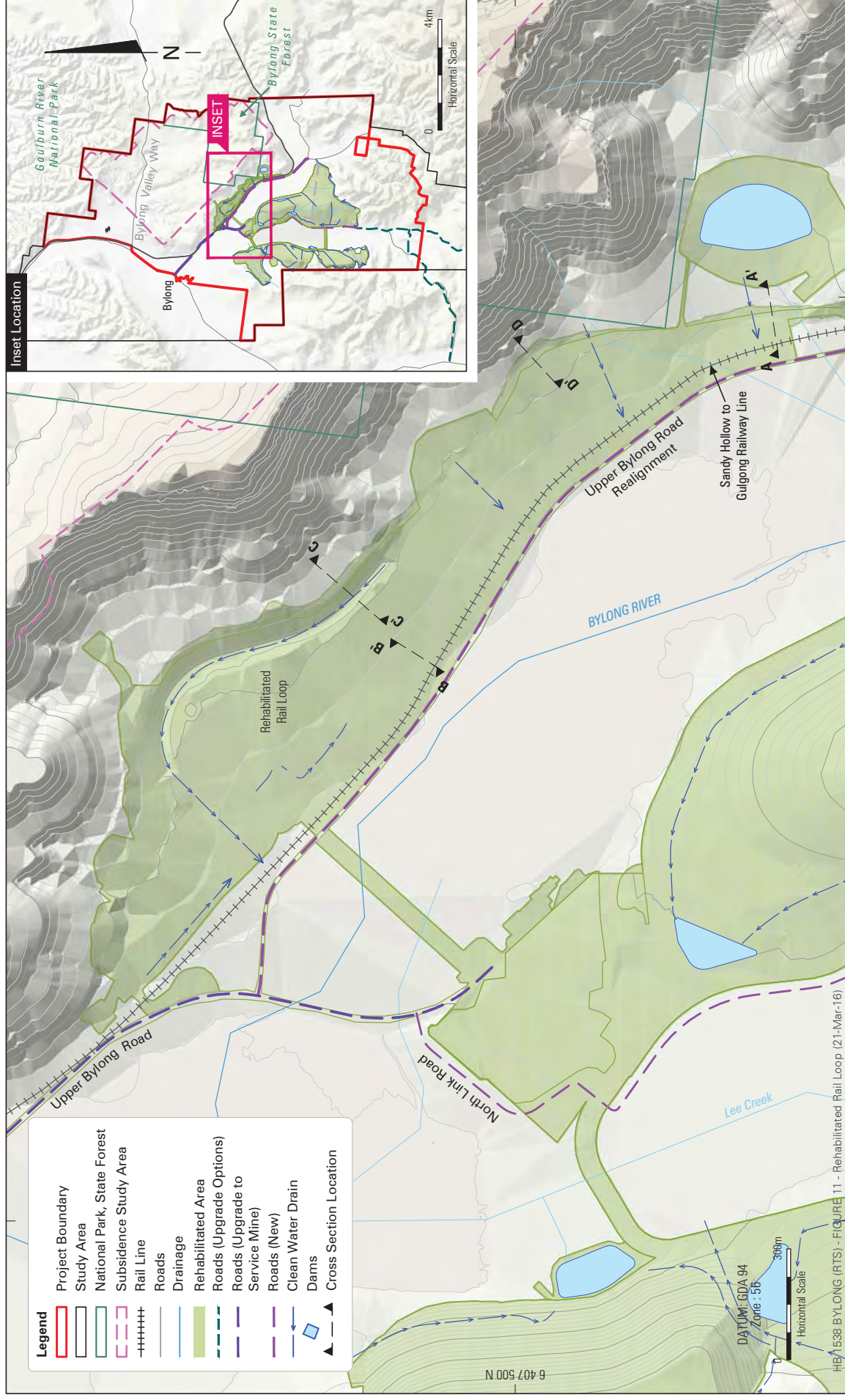
Fill and topsoil will be sourced from stockpile sites generated and maintained during mine development and operation works. Haul routes are expected to be less than 5 km and will include public and internal mine roads. Haulage will be undertaken using road registered trucks.

Embankments and Cuttings: The earthworks required for construction of the rail balloon loop includes reshaping and reinforcing the existing land to achieve design slopes. The following rehabilitation measures will be employed to achieve long term stable earth slopes:

- **Earth slopes at or flatter than 1(V):3(H)** – Retain landform. Seed and promote native vegetation growth as required;



BYLONG COAL PROJECT

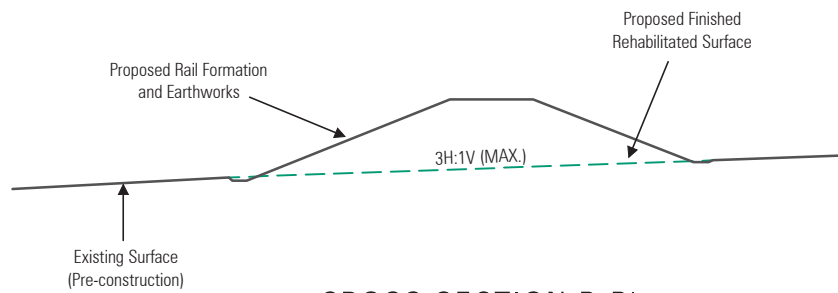


BYLONG COAL PROJECT

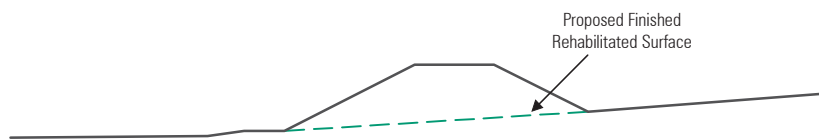
Revised Conceptual Final Landform - Rehabilitated Rail Loop

FIGURE 11

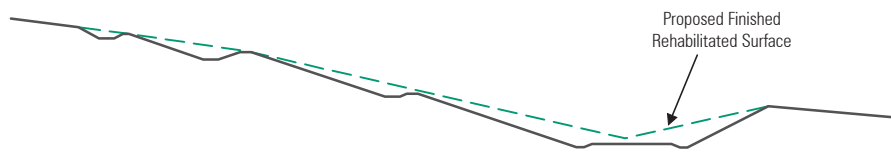
CROSS SECTION A-A'



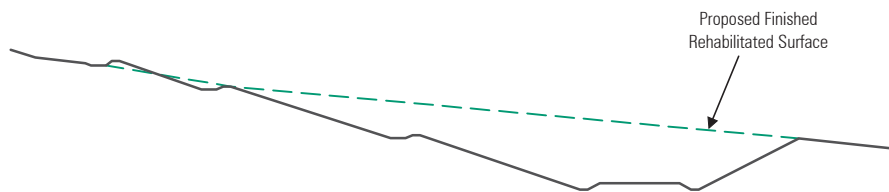
CROSS SECTION B-B'



CROSS SECTION C-C'



CROSS SECTION D-D'



HB 1538 BYLONG (RTS) - FIGURE 12 - Rehabilitated Rail Loop - Cross Sections (13-Mar-16)

BYLONG COAL PROJECT

Revised Rehabilitated Rail Loop
- Cross Sections

FIGURE 12

- **Unreinforced Earth slopes steeper than 1(V):3(H)** - Batter slopes will be flattened to 1:3 either by re-shaping insitu material or importing fill from mine waste dumps. Once regraded the areas will be topsoiled, seeded and revegetated with native grasses;
- **Reinforced Earth slopes steeper than 1(V):3(H)** - Geogrids, solid nails and geotextiles will be removed. Slopes will be topsoiled and revegetated as above; and
- **Drainage (including Catch, Bench and Cess Drains)** - Reno mattresses, geotextile and synthetic matting will be removed. Drains will be filled using either insitu surrounding material or importing fill from mine waste dumps. Filled drains will be capped with topsoil and revegetated. All areas will be graded to allow overland flow of surface water to drainage crossing points of the existing main rail line. All hollows, depressions and embankments that prevent surface flow to these points will be filled or regraded. Surface grading shall be shaped to promote sheet flow runoff. Where flows are concentrated appropriate erosion control measure such as rock rip rap shall be provided.

4.8 NSW ENVIRONMENT PROTECTION AUTHORITY – RA8

4.8.1 Environment Protection Licence

Issue

Given the proposed scale of the project, if approval is obtained under the provisions of the Environmental Planning and Assessment Act 1979, the proponent will be required to make a separate application to the EPA for an Environment Protection Licence (EPL) pursuant to the Protection of the Environment Operations Act 1997 (POEO Act) to operate.

Response

Noted. An Environment Protection Licence (EPL) will be sought under the POEO Act, as required.

4.8.2 Background Air Quality Data

Issue

EPA concluded the following: “While the EPA considers that the available data is limited and does not include the full range of weather conditions, the comparison to data listed above [reference to data presented in the EPA submission from Mount Penny and the OEH network] shows that it is likely to represent usual conditions. It should be noted though that the period 2011 to 2014 does not include either very dry years or very wet years. As such, any interpretation of the cumulative assessment should therefore consider that the background value is usual rather than conservative”

Response

Noted.

4.8.3 Air Quality Impact Assessment

Issue

EPA concluded *"The AQIA provides that annual criteria is predicted to be met at all non-mine receptors though the Project may result in additional exceedance days at non-mine receptors"*.

Response

Noted.

4.8.4 Nitrogen Dioxide

Issue

EPA concluded *"Assessment shows that predicted concentrations of NO₂ are less than the criteria for this pollutant"*.

Response

Noted.

4.8.5 Diesel Particle Emissions

Issue

Emissions of particulate matter from diesel engines have not been adequately quantified or assessed. This is a potentially significant source requiring management options differing from those used to suppress dust on roads.

The EPA recommends that DPE require these diesel emissions be estimated separately. This requirement is expected to change total emissions and therefore analysis will be needed to identify consequential changes to the assessed impact on the air environment. The EPA also recommends consideration of the approaches to minimising emissions from diesel plant and equipment is also requested.

In considering additional control measures for diesel particulate matter, the proponent should consider their obligations under s128 of the Protection of the Environment (Operations) Act.

Response

The US EPA AP-42 emission factors used in the particulate (Total Suspended Particulate (TSP), PM₁₀ and PM_{2.5}) emissions inventories include particulate matter emissions from both the mechanical processes (i.e. crustal material) and the diesel exhaust (combustion). These emission factors do not distinguish between these two sources, since the sampling method used to derive the original emission factors captured both mechanical and combustion particulate matter sources.

The following text from Version 2.3 of the National Pollutant Inventory (NPI) Emission Estimation Technique Manual for Mining supports this (NPI, 2001):

"It should be noted that the emission factors for mining activities in Tables 1 and 2 have been derived from measurements that cover all PM₁₀ emissions associated with a unit operation, including exhaust emissions. To add the exhaust PM₁₀ emissions to the fugitive emissions would involve some measure of double counting for those activities."

Discussions with Chatten Cowherd in the US, who was directly involved with the original work to determine these AP-42 emission factors several decades ago, support the NPI comments that vehicle exhaust emissions are captured to a large extent in these emission factors. While exhaust emissions from some equipment might have had sufficient buoyancy allowing a portion of those to rise above the downwind sampling tower under light wind conditions, Chatten Cowherd indicated that testing under such conditions was avoided.

It is further noted that the historical nature of the particulate matter emission factors referenced in the assessment means that the combustion component of the particulate matter emission would be reflective of both engines and fuels from several decades ago. Given the significant improvements in both of these aspects over this time period, the combustion particulate matter component within the aggregated emission factors may be regarded as highly conservative.

As the calculations in **Table 11**, **Table 12** and **Table 13** demonstrate, if the exhaust and road dust emissions are separated out, and the 85% control is applied to the road dust component only, there is an estimated increase in total PM₁₀ emissions of less than 3% compared with those assessed in the air quality assessment completed for the EIS (Pacific Environment, 2015). PEL's concludes that on this basis, there would be no change to the outcomes of the assessment.

The Air Quality and Greenhouse Gas Impact Assessment (AQGHGIA) considered the types of diesel equipment to be used, and showed there will no air quality impacts at the private residences. Nevertheless, KEPCO remains cognisant of its obligations under Section 128 of the *Protection of the Environment Operations Act 1997* and will ensure that its equipment remains maintained and operated in a proper and efficient condition.

Table 11
Diesel Exhaust Emission Calculations

Parameter	Value	Source
PM ₁₀ emission factor (kg/kL)	2.84	EPA 2008 GMR inventory (NSW EPA, 2012)
Fuel consumption (L/h)	150	Kecojevic & Komljenovic (2010) ^(b)
Speed (km/h)	50	Typical speed
Fuel consumption (kL/km)	0.003	Calculated
PM ₁₀ exhaust emissions ^(a) (kg/km)	0.009	Calculated

^(a) $PM_{10} \text{ exhaust emissions [kg/km]} = 150 \text{ [L/h]} * 1/50 \text{ [km/h]} * 1/1000 \text{ (L/kL)} * 2.84 \text{ [kg/kL]}$

^(b) Caterpillar truck 1800kW gross power, 30-40% load factor

Table 12
Hauling Emission Calculations

Activity	PM ₁₀ emissions [kg/y]	Control [%]	Nominal intensity [t/y]	Emission factor [kg/t]	Truck size [t]	Nominal return distance [km]	PM ₁₀ emissions [kg/t]
Assuming 85% control applies to all hauling emissions							
Hauling	7,410	85	10,000,000	0.00494	249	1	1.230
Total 85% control all emissions ^(a)	7,410						
Assuming no control on exhaust emissions and 85% control on surface emissions							
Hauling (exhaust)	342	0	10,000,000	0.00003	249	1	0.009
Hauling (surface)	7,358	85	10,000,000	0.00491	249	1	1.221
Total ^(b)	7,700						
% Increase	3.9%						

NB Numbers may not be exact due to rounding

^(a) $PM_{10} \text{ emissions (assuming 85% control on all) [kg/y]} = 0.00494 \text{ [kg/t]} * 10,000,000 \text{ [t/y]} * 0.15 \text{ [i.e. 85% control]}$

^(b) $PM_{10} \text{ emissions (assuming 85% control on surface only) [kg/y]} = (0.00491 \text{ [kg/t]} * 10,000,000 \text{ [t/y]} * 0.15 \text{ [i.e. 85% control]}) + (0.00003 \text{ [kg/t]} * 10,000,000 \text{ [t/y]})$

Table 13
Total Emissions Compared

Activity	Year 3		Year 5		Year 9	
	Per EIS	Inc. increase for diesel exhaust	Per EIS	Inc. increase for diesel exhaust	Per EIS	Inc. increase for diesel exhaust
Topsoil only (no haul)	3,831	3,831	733	733	-	-
Blast/drill	4,298	4,298	11,758	11,758	23,275	23,275
OB (exc. haul)	32,507	32,507	47,215	47,215	46,297	46,297
CL (exc. haul)	58,839	58,839	99,287	99,287	99,522	99,522
Haul	289,181	300,532	554,663	576,435	608,008	631,874
WE	79,535	79,535	183,174	183,174	168,601	168,601
Grading roads	3,716	3,716	11,148	11,148	3,716	3,716
TOTAL (kg/y)	471,907	483,258	907,978	929,749	949,420	973,285
% increase	-	2.41	-	2.40	-	2.51

4.8.6 Spontaneous Combustion

Issue

Section 11 of the AQIA provides that a spontaneous combustion assessment of core samples has been conducted which "concluded the risk of spontaneous combustion can be reduced to a level defined as 'low as reasonably possible' by implementing appropriate controls". The AQIA also provides some 4 measures which aim to minimise the oxygen exposure to potentially susceptible material.

Section 4.6 of the Geochemical Impact Assessment for Coal and Mining Waste Materials (GIA) provides that 13 drill core holes and 3 drill holes at the Project were subjected to a range of spontaneous combustion tests. Results indicate that coal materials from both the Ulan and Coggan coal seams have a medium to high intrinsic spontaneous combustion reactivity and propensity rating. The GIA further provides "whilst the propensity of most coal and coal rejects from the Project can be managed, it is recommended that further testing of a wider range of samples be completed during the operational phase of the Project, to confirm these findings".

Given that spontaneous combustion is an issue at Wilpinjong Coal Mine where the lower sections of the Ulan seam are currently being mined and as the EPA considers that the most appropriate method for controlling spontaneous combustion, is to prevent it occurring in the first instance, the EPA recommends that a detailed assessment regarding spontaneous combustion and management is requested by DPE.

Response

Section 4.6 (Appendix AB of the EIS) (RGS, 2015) describes the results of spontaneous combustion tests on coal materials and concludes that whilst some coal and coal reject materials may have a medium to high intrinsic spontaneous combustion reactivity and propensity rating, they gradually lose heat and do not reach thermal runaway in any practical timeframe.

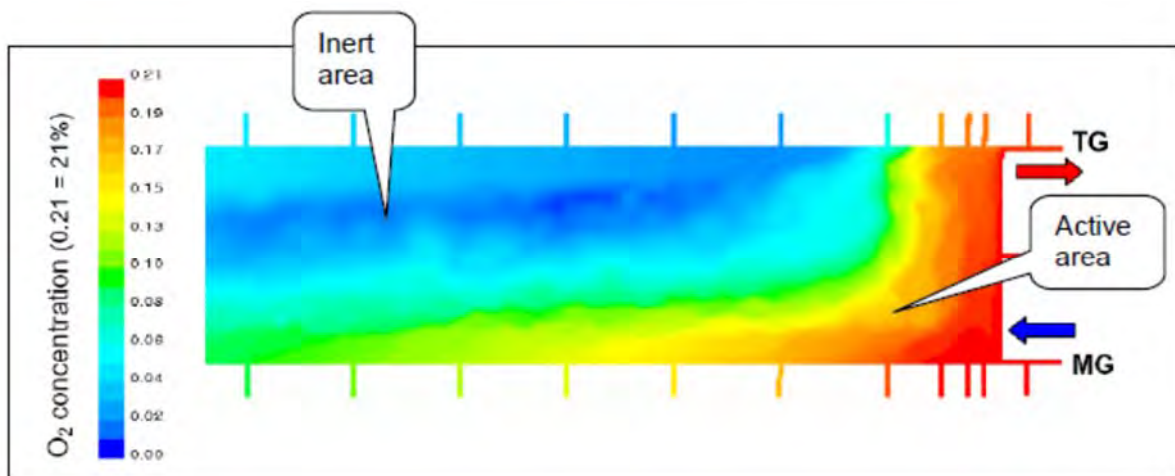
In line with standard mining industry practice, the risk of self-heating in coal and coal reject materials in the coal mining industry will be managed through the development and implementation of a Spontaneous Combustion Monitoring and Management Plan (SCMMP). This will include further testing of a wider range of sample materials during the operational phase of the project.

The Feasibility Study for the Project (Parsons Brinckerhoff, 2014) suggested that remnant coal left in the underground goaf could present a risk of spontaneous combustion, even though the coal and coal reject materials did not reach thermal runaway in the test work. As described in Section 4.6 (Appendix AB of the EIS) this potential issue will be managed by sealing of goaf areas, adopting a mine wide inertisation capability (e.g. inert gas), allocating sufficient resources, development of spontaneous combustion mitigation procedures as part of the SCMMP, collection of review of additional data and monitoring any potential for surface cracking so that the ventilation system controls oxygen ingress to the system in any areas where surface cracking occurs. Whilst there is potential for connective cracking to occur between the mined coal seam and the surface in areas where the depth of cover is shallow, this should be limited to the mining area located under lower lying topography. MSEC has predicted that the total area of surface cracking will represent less than 1 % of the Subsidence Study Area (Appendix H of the EIS).

It should be noted that for an underground coal mining situation as proposed for the Project, the atmosphere in coal mine panels, once sealed, will become oxygen deficient because remnant coal adsorbs oxygen (Yuan and Smith, 2009). **Figure 13** illustrates the simulated oxygen deficient atmosphere in a mined out area at a typical longwall underground coal mine (NSW DII, 2011). As the active longwall panel retreats, oxidation takes place in the area behind the face until the goaf atmosphere becomes inert by containment, seam gases and goaf consolidation. In the oxidation area CO and CO₂ are produced, a process that can be accelerated by introduction of inert gas into the goaf.

For a longwall panel, the goaf tends to become deficient in oxygen over a period of time, only a short distance behind the active face. Once sealed, the goaf would continue to consume oxygen and therefore regardless of the presence of water/flooding underground, the atmosphere is likely to be very low in oxygen (essentially inert) in sealed areas.

Figure 13
3D Computational Fluid Dynamic Model of Goaf Atmosphere



Note: TG= Tailgate; MG = Maingate. Reproduced from NSW DII (2011)

4.8.7 Noise Modelling

4.8.7.1 Noise Predictions

Issue

Noise predictions should have been provided including a modifying factor adjustment for low frequency noise, in accordance with the New South Wales Industrial Noise Policy (EPA 2000).

- The noise and blasting impact assessment stated that adverse impacts from low frequency noise were considered only when the predicted L_{ceq} minus L_{Aeq} noise level was greater than 15 dB and the L_{ceq} noise level exceeded 60 dB. The approach used did not comply with the New South Wales Industrial Noise Policy (EPA 2000) (INP).
- The assessment did not predict any L_{ceq} noise levels above 60 dB and therefore a modifying factor adjustment for low frequency noise was not applied to any of the predicted noise levels.
- The environmental impact statement indicated that a modifying factor adjustment for low frequency noise was included in the sound power levels of modelled equipment, but the noise and blasting impact assessment did not appear to use this approach.
- The EPA considers that noise predictions should have included a modifying adjustment for low frequency noise in accordance with the INP and accordingly the predicted noise levels require alteration.

Response

Section 4.1.3 of the NBIA (Appendix Q of the EIS) provides an outline of the assessment methodology applied for the low frequency noise impacts of the Project. As explained within the NBIA, the INP guidance states that modifying factor adjustments is applicable where there is a difference of 15 dB or more between the C-weighting and A-weighting noise levels.

The NBIA explains that research and literature reviews conducted over recent years has demonstrated that the characterisation / assessment of low frequency noise using the INP method is not necessarily appropriate in all circumstances. This is due to the greater atmospheric absorption of the high frequency noise component over distance, so that operations that would not trigger a low frequency modification factor at nearby receivers would do so at receivers further afield. In light of this known issue with the INP methodology, low frequency noise assessment was subject to discussions with EPA during a meeting on 28 April 2015 where the application of contemporary assessment methods was discussed.

The NBIA explains the research by Broner in '*A Simple Outdoor Criterion for Assessment of Low Frequency Noise Emission*' to determine a more appropriate approach to characterising low frequency noise. Broner introduces an absolute value for C-weighting spectra.

The application of both the INP method and the Broner method of assessment has been presented (and subsequently accepted) in a number of recently approved mining development noise impact assessments located in the Hunter Valley.

The results of both A and C weighted noise levels were presented in Appendix D of the NBIA. The results presented indicate that no properties will experience noise levels in excess of 60 dB(C) with consideration to the Broner method. As explained in Section 5.6 of the NBIA, the direct application of the INP stated C-A difference method in isolation would result in penalties being applied to all receivers due to attenuation of the higher frequency noise component over distance. The NBIA also refers to the Broner method and confirms that since no properties will experience noise levels in excess of 60 dB(C), the low frequency noise impacts are acceptable and there is no need to apply the penalty suggested in the INP.

Since the finalisation of the Bylong EIS, the INP approach to the assessment of low frequency noise has been modified in the NSW Government's draft Industrial Noise Guideline (Draft ING) (EPA, 2015). The Draft ING methodology includes further investigation into the received low frequency spectrum to determine whether or not a low frequency noise penalty should apply.

Based on the Draft ING methodology, the low frequency penalties would be applied where the C-A level exceeds 15 dB and the Z-weighted noise levels exceed the thresholds in Section C2 of the Draft ING (EPA, 2015).

For completeness, further assessment has been completed in consideration of the Draft ING (EPA, 2015), within Section 6 of the *Bylong Coal Project Noise Addendum* (presented in **Appendix F**).

The results indicate that low frequency modifying factors would not be applicable to any private receiver in the vicinity of the Project, with the exception of receiver 69 which has already been identified as being significantly affected and requires acquisition. For all other receivers, where the difference between C and A weighted noise levels exceeds 15 dB, the Z-weighted levels do not exceed the thresholds when comparing to the modelled results at 125Hz and 63 Hz octave bands.

It is agreed that the modifying factor for low frequency is applied to the measured or modelled noise level at the receiver before comparison with the project noise trigger levels, not at the source as was stated in the EIS.

4.8.7.2 Operational Noise

Issue

Operational noise is predicted to exceed the project specific noise level at 20 sensitive receivers, which will need to be considered by Department of Planning and Environment under the Voluntary Land Acquisition and Mitigation Policy (NSW Government 2014)

- *When the EPA applies the required low frequency modifying factor adjustment to the model predictions, in accordance with the INP, this results in 20 residential sensitive receivers where predicted noise levels are above the project specific noise level. The Voluntary Land Acquisition and Mitigation Policy (NSW Government 2014) will therefore apply as follows:*
 - o *six residences where noise will be up to 2 dBA above the project specific noise level;*
 - o *seven residences where noise will be between 3 to 5 dBA above the project specific noise level;*
 - o *and seven residences where noise will be more than 5 dBA above the project specific noise level.*
- *Noise limits are not proposed by the EPA for receivers 56, 60, 65A, 63, 68, 69 or 151 as they are predicted to receive operational noise from the Project which is more than 5 dBA above the project specific noise level. In accordance with the Voluntary Land Acquisition and Mitigation Policy those receivers are likely to receive acquisition rights, should approval be granted for the Project.*
- *The $L_{Aeq(15min)}$ and $L_{Aeq(15min)}$ predictions provided in the assessment were used to develop the proposed limits included in the recommended conditions of consent below and it should be noted that these limits include a low frequency modifying factor adjustment when the mine noise $L_{Aeq(15min)}$ is 15 dB or more above the mine noise $L_{Aeq(15min)}$.*

Due large the number of residential receivers affected by operational noise from the project above the project specific noise level, the EPA recommends that DPE include in any conditions of approval, if issued, requiring the Project sound power levels to be audited at defined intervals over time with the aim to determine any increases in noise levels during those periods.

Response

The EPA's conclusions for the application of the VLAM Policy to the Project is on the basis that a low frequency noise penalty has been applied. Based on the previous response, the application of the INP low frequency assessment method would result in penalties being applied to all receivers due primarily to atmospheric absorption of high frequency noise with distance. However, Section 5.6 of the NBIA provided a contemporary assessment approach (discussed with EPA during meeting on 28 April) which found that low frequency noise penalties were not applicable. Additional assessment of low frequency noise has also been completed within the *Bylong Coal Project Noise Addendum* based on the Draft ING (EPA, 2015). This assessment concludes that low frequency noise penalties are not applicable to noise modelling predictions.

Accordingly, the summary of impacts according to the VLAM Policy as presented within Section 7.9.4 of the EIS remains appropriate.

Section 7.9.4 of the EIS describes KEPCO's proposed noise management measures for the Project, including the development of a Noise Management Plan and monitoring program. Sound power level testing is part of the noise management measures proposed to ensure mobile plant continues to operate at modelled sound power levels.

4.8.7.3 Model Results for Properties 163, 262 and 263

Issue

No model results were provided for properties 163, 262 and 263, but they are not likely to be sensitive receivers.

- *On 14 October 2015, a landowner advised the EPA at a public meeting that the Project's noise model did not include their properties. That landowner owns part of properties identified in the noise and blasting impact assessment as 161, 162, 163, 262 and 263.*
- *The noise and blasting impact assessment included results for residences on properties 161 and 162.*
- *Results were not provided for properties 163, 262 or 263.*
- *Satellite imagery accessed by the EPA in Google Maps (accessed 2 November 2015) could not identified any buildings on properties 163, 262 or 263. The EPA considers it is unlikely to contain residential sensitive receivers.*

DPE may require modelling of noise impacts on properties 163, 262 and 263 though the EPA does not usually require modelling of noise contributions for vacant land.

Response

Noted.

Impacts on privately owned vacant land, including these identified land parcels, have been assessed in Section 5.5 of the NBIA. (Appendix Q of the EIS).

4.8.8 Sleep Disturbance

Issue

The noise and blasting impact assessment predicted that receiver 69 was the only location where the sleep disturbance screening criteria would be exceeded. Receiver 69 is also expected to be affected by operational noise more than 5 dBA above the project specific noise level, so is likely to receive acquisition rights in accordance with the Voluntary Land Acquisition and Mitigation Policy if the Project gains consent.

Response

Noted. Impacts on privately owned residences, including Receiver 69, have been assessed in Section 5.5 of the NBIA. (Appendix Q of the EIS).

4.8.9 Rail Noise

Issue

The project's rail transport will increase the number of residences where rail noise levels are above criteria

- The noise and blasting assessment indicated that the project would result in a less than 2 dBA increase in Leq(day or night) rail noise, but that total rail noise levels would be greater than the criteria in the Rail Infrastructure Noise Guideline (EPA 2013) at more residences.*
- While the project related increase in rail noise is likely to be imperceptible, the Project will increase the number of residences where rail noise levels are above criteria by three in Denman and one in Muswellbrook.*

Best practise rolling stock should be required for the project's rail transport

- The EPA recommends DPE consider requiring the proponent to use only best practise rolling stock for rail transport resulting from the proposal (including only locomotives which have obtained EPA approval to operate on the NSW rail network under Condition L2 of EPL No. 3142, 12208 or 13421, or in accordance with the former Noise Control Act 1975).*

Response

Section 7.9.4 of the EIS describes mitigation and management of rail noise. ARTC manages the rail network, with their noise emissions regulated under their EPL 3142. An EPL requires ARTC to monitor locomotive noise levels, audit noise performance (under a Pollution Reduction Program) and implement all reasonable and feasible measures to reduce rail noise impacts.

KEPCO will continue to consult with ARTC in regard to the proposed rail movements for the Project and the implementation of leading practice noise control measures.

4.8.10 Blasting and Vibration

Issue

The noise and blasting assessment did not assess construction vibration against Assessing Vibration: a technical guideline (DEC 2006), but provided peak particle velocity predictions up to 50 metres and proposed safe working distances based on structural damage.

The EPA assesses vibration against amenity limits, not building damage criteria.

Construction vibration can be managed in a construction noise and vibration management plan

Based on the information provided in the noise and blasting impact assessment, the "preferred" daytime vibration peak particle velocity level from Assessing Vibration: a technical guideline (DEC 2006) can be met at 134 metres, and the "maximum" level can be met at 79 metres.

Reasonable mitigation measures for construction vibration were proposed in the assessment including increasing separation distances when feasible and reasonable, substituting lower vibration methods, a construction noise and vibration management plan and vibration monitoring.

Distances between construction activities and residences are sufficiently large that, with the inclusion of the proposed mitigation measures, there should be no amenity impacts from the project's construction vibration.

Response

Noted.

4.8.11 Site Water Balance

Issue

It appears from the SWIA (section 5.3.2) that the simulation methodologies conducted for the site water balance are wide ranging and "cover the full range of climatic conditions represented in historical rainfall records." The EPA considers that the site water balance for worst case dry and wet years should have been provided.

While it is noted that no spills from mine dams are predicted during median inflows, the EPA recommends that DPE request further information regarding wet year scenario's to confirm that the Project will in fact be a "nil discharge" premises during predicted wet years.

This is particularly important given that any potential discharge from the mine water dams may have elevated electrical conductivity (EC) levels and other contaminants; and require treatment to reduce those levels prior to discharge. Further, given the potential space limitations due to the topography surrounding the CHPP and the Open Cut MIA due to potential flooding, any required increase in mine dam capacity to ensure that the Project is "nil discharge" during wet years may require a revision of the proposed layouts for these infrastructure areas.

Response

4.8.11.1 Overview

The proposed surface water management system and the water balance modelling methodology and inputs described in detail in Section 5 of the SWIA, are consistent with current industry best practice.

The water balance model incorporates the proposed changes in the mine plan over the life of the Project and has been simulated under 102 different climatic sequences, taken from the historical record of climate data for the Project site. Each 23 year climate sequence, referred to as a 'realisation' represents 23 consecutive years of historical rainfall data. Hence, the climate data used in the water balance simulation considers every historical 23 year rainfall period from 1889 to 2013. The use of sequential multi-year periods, rather than individual wet or dry years, is adopted because the critical scenario for having too much or too little water on site may occur due to a run of wet or dry years.

There is a small chance (of the order of 1%) that the Project may experience climatic conditions outside the range of the historical climate record. The simulation of the site water balance is based on a set of fixed operational rules to demonstrate the capability of the system to meet the adopted system objectives.

In reality, adaptive management of the water management system will be implemented so that operational rules can be varied according to prevailing conditions. This adaptive management approach will also benefit from the verification of rainfall-runoff model parameters using recorded data from the operational site to more accurately simulate the performance of the site water balance.

4.8.11.2 Sensitivity to Reduced Groundwater Inflows

As shown in Figure 5.4 of the SWIA, the predicted groundwater inflows to the underground mine (from Year 9 onwards) are predicted to be greater than 1,000 ML/year. A further sensitivity run of the water balance model was undertaken to assess the impacts on the site water requirements, assuming that the actual groundwater inflows to the underground mine were half of the predicted inflows. The adopted groundwater inflow to the underground for the sensitivity run was 563 ML, compared to 1,125 ML adopted in the SWIA.

Figure 14 shows the simulated annual bore water requirements from the 102 realisations simulated with the OPSIM model, adopting the reduced groundwater inflow to the underground. The result from each realisation is plotted as a single line. The overlapping lines illustrate the variability in results due to changes in rainfall over each realisation, which cover all historical climate sequences, including dry and wet years, from 1889. The results from all realisations were then analysed to determine the likelihood (assuming all realisations are equally likely) of requiring different volumes of water from the borefield.

Table 14 shows the bore water requirements for different periods of operation. **Figure 15** shows the total annual modelled demand for water from the borefield over the Project period, presented as percentiles of results from the different realisations.

Figure 15 also shows results for one of the 102 modelled realisations, representing the last realisation from year 1991 to year 2013. This period includes a low rainfall drought period referred to in some of the submissions. The water requirements from the borefield during this realisation are within the range of water requirements for the statistically summarised realisations.

The sensitivity modelling shows that the reduced groundwater inflows to the underground do not increase the peak annual borefield water requirement for the Project, which peak below 1,200 ML/year in the early years of the Project. The reduced groundwater inflows increase the borefield water requirements during the later years of the Project, when less groundwater (under the adopted sensitivity scenario) is entering the mine water management system.

Table 14
Summary of Borefield Water Requirements – Reduced Groundwater Inflows

Operational Period	1% Chance of Requiring	10% Chance of Requiring	50% Chance of Requiring
Open cut only operations (PY 3 to PY 6)	985 to 1,170 ML/a	940 to 1,140 ML/a	560 to 990 ML/a
Combined mining operations (PY 7 to PY 10)	970 to 1,005 ML/a	805 to 895 ML/a	340 to 500 ML/a
Underground only operations (PY 11 to PY 25)	720 to 805 ML/a	660 to 680 ML/a	390 to 490 ML/a

Figure 14
Annual Borefield Water Requirements for 102 Climate Realisations

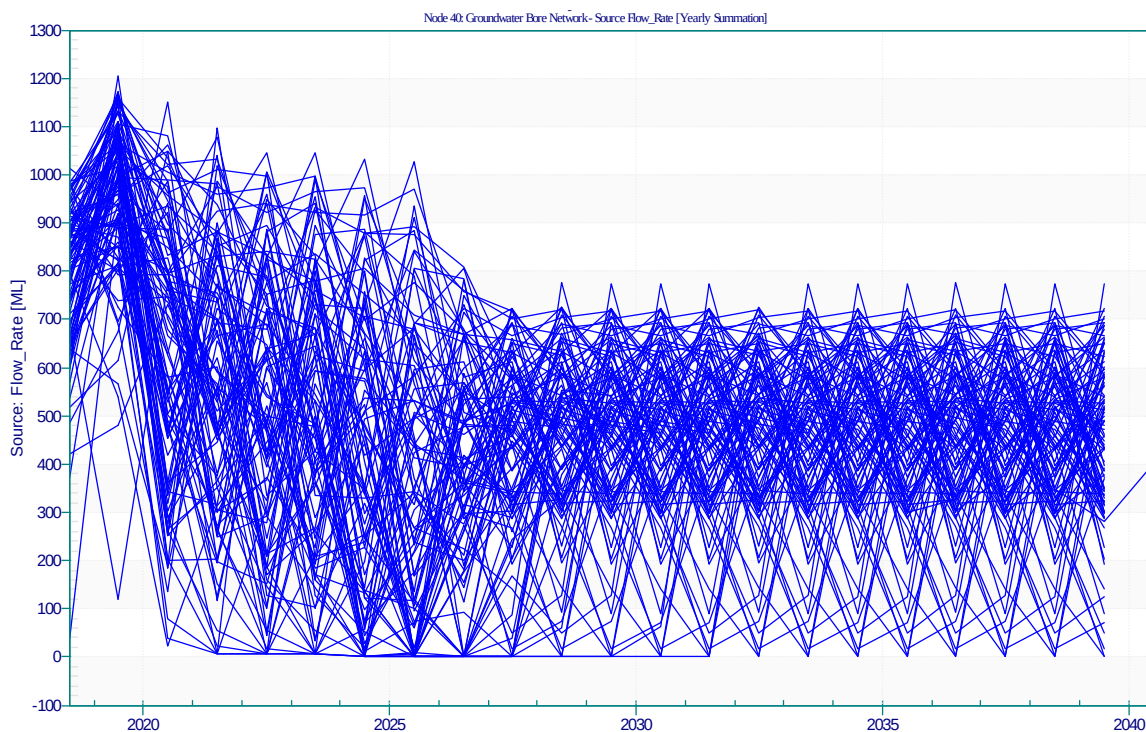
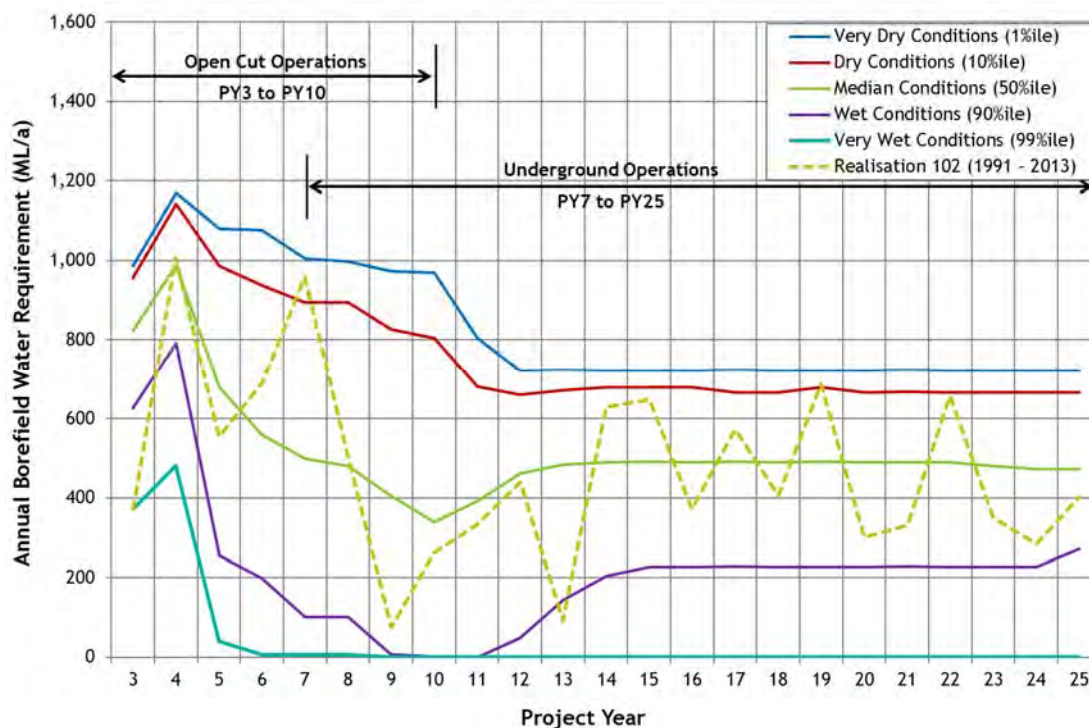


Figure 15
Annual Borefield Water Requirements – Reduced Groundwater Inflows



4.8.11.3 Mining Pit Inundation Characteristics

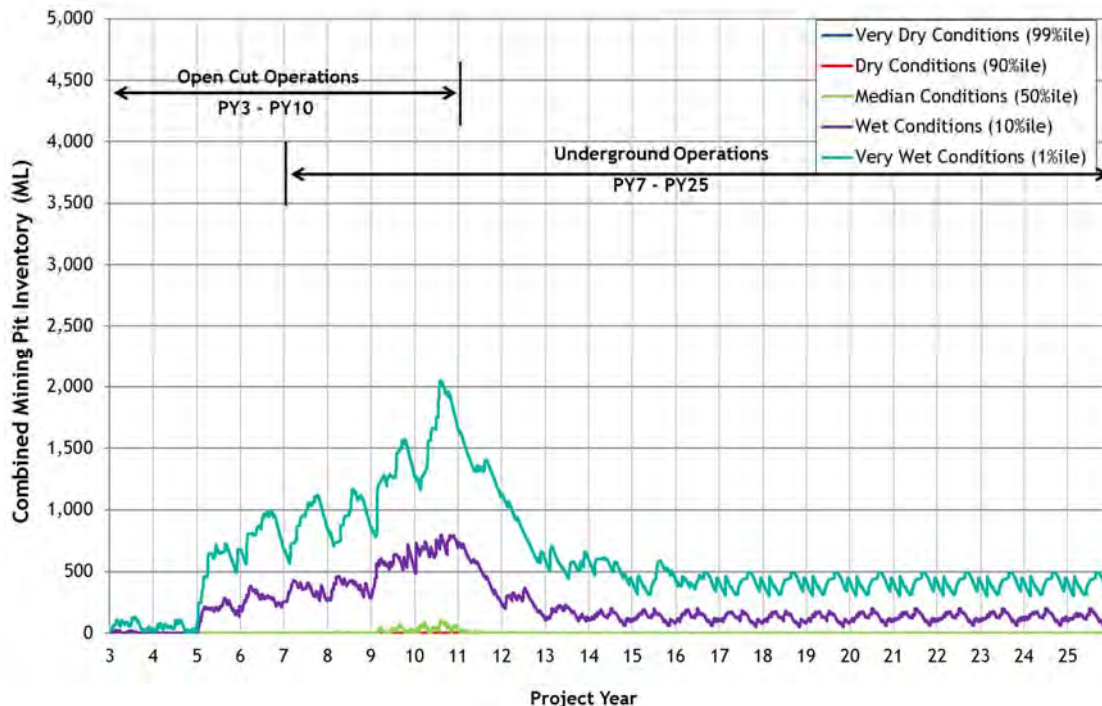
A reduction in groundwater inflows to the underground reduces the amount of water that needs to be managed within the mine water management system.

Figure 16 shows the percentile plots of stored inventory in the combined pits over the Project life for the sensitivity case with a 50% reduction in groundwater inflows to the underground. The model results show that during open cut and underground mining operations, the accumulation of water within the open cut mining areas is less than the base case presented in the SWIA (refer to Figure 6.2 of SWIA). At the end of mine life, there may be water contained within the Eastern Void for the wet and very wet conditions. The proposed management strategy for contained water at the end of mine life is to return this water to the underground mine workings.

The results indicate the following:

- During open cut only operations (PY 3 to PY 6), there is a:
 - o 1% chance of storing up to 1,000 ML in the open cut mining areas;
 - o 10% chance of storing up to 380 ML in the open cut mining areas; and
 - o 50% chance that the mining area will not be required to store significant volumes of water.
- During open cut only operations (PY 7 to PY 25), there is a:
 - o 1% chance of storing up to 2,050 ML in the open cut mining areas;
 - o 10% chance of storing up to 800 ML in the open cut mining areas; and
 - o 50% chance of storing up to 100 ML in the open cut mining areas.
- At the completion of mining, there is a:
 - o 1% chance of storing up to 420 ML in the Eastern Void;
 - o 10% chance of storing up to 100 ML in the Eastern Void; and
 - o 50% chance that the Eastern Void will not store significant volumes of water.

Figure 16
Combined Open Cut Mining Area Stored Inventory



4.8.12 Sediment Dam Sizing

Issue

Section 7.4.1, pg 186 of the EIS and section 5.9.1 of the SWIA provides that sediment dams are proposed to be sized as "Type F" sediment basins with a settling zone volume based on the 90th percentile 5-day duration rainfall. In relation to discharges from sediment dams, EPA takes a conservative approach and requires sediment basins have a settling zone volume based on the 95th percentile 5-day rainfall duration. The EPA requests DPE require the proponent to take a conservative approach to the sizing of its sediment basins and adopt sediment basins have a settling zone volume based on the 95th percentile 5-day rainfall duration.

Response

The adopted methodology for sizing of sediment dams detailed in the SWIA (Appendix L of the EIS) is consistent with current design guidelines (*Managing Urban Stormwater, Soil and Construction, Volume 2E Mines and Quarries* (DECC, 2008)). The guideline specifies a settling zone volume based on 90th percentile 5 day rainfall for standard receiving environments and 95th percentile for a 'sensitive' receiving environment. A 'sensitive' receiving environment is one that has a high conservation value, or supports human uses of water that are particularly sensitive to degraded water quality.

The adoption of 90th percentile rainfall for sizing of sediment basins has been accepted for other recently approved open cut coal projects across NSW (for example, Maules Creek Coal Mine (refer EPL 20221) and the Watermark Coal Project).

The submission does not provide any justification for the adoption of the higher design standard or Government policy, other than to be conservative.

The submission does not suggest that the receiving environment has a high conservation value, or that it supports human uses of water that are particularly sensitive to degraded water quality. Hence, the 90th percentile standard is considered appropriate.

Adopting the 95th percentile rainfall would increase the size of the sediment dams by more than 50%, for no significant environmental benefit.

4.8.13 Discharge Monitoring

Issue

During any potential discharges from sediment dams, it should be noted the EPA will require compliance with pH, oil and grease and turbidity limits in addition to Total Suspended Solids (TSS). Any monitoring program developed for the Project should include pH, oil and grease and turbidity for discharges from sediment dams.

Response

Surface water quality monitoring for the Project will include pH, oil and grease and turbidity for discharges from sediment dams and other contaminants as required by the EPA under the EPL. Details of the proposed monitoring program will be included in the site WMP.

4.8.14 Sediment Dam Overflows

4.8.14.1 Wet-Weather Overflows

Issue

Page 190 of the EIS provides that "available geochemical information indicates that the runoff draining to most of the sediment dams should have salinity consistent with receiving waterways". While it is noted that the majority of salt load included in the salt balance is due to groundwater inflows, the predicted salt load from surface water discharging into the Bylong River includes discharges from sediment dams. The EPA requests the DPE request additional information regarding the likely EC level for discharges from the proposed 6 sediment dams.

The assessment should consider potential impacts in the context of seasonal and climatic variability and uncertainty associated with predictions. The impact assessment should explicitly consider the value, condition and objectives for downstream environments (e.g. Goulburn River National Park).

Response

Surface water runoff from disturbed, active and rehabilitated areas will be directed to sediment dams for the treatment of sediment prior to either being diverted to the mine water management system for reuse or if water quality permits being released to the local catchment. Sediment dams will be managed in accordance with an EPL which will be sought from EPA for the Project under the *Protection of the Environment Operations Act 1997* (POEO Act).

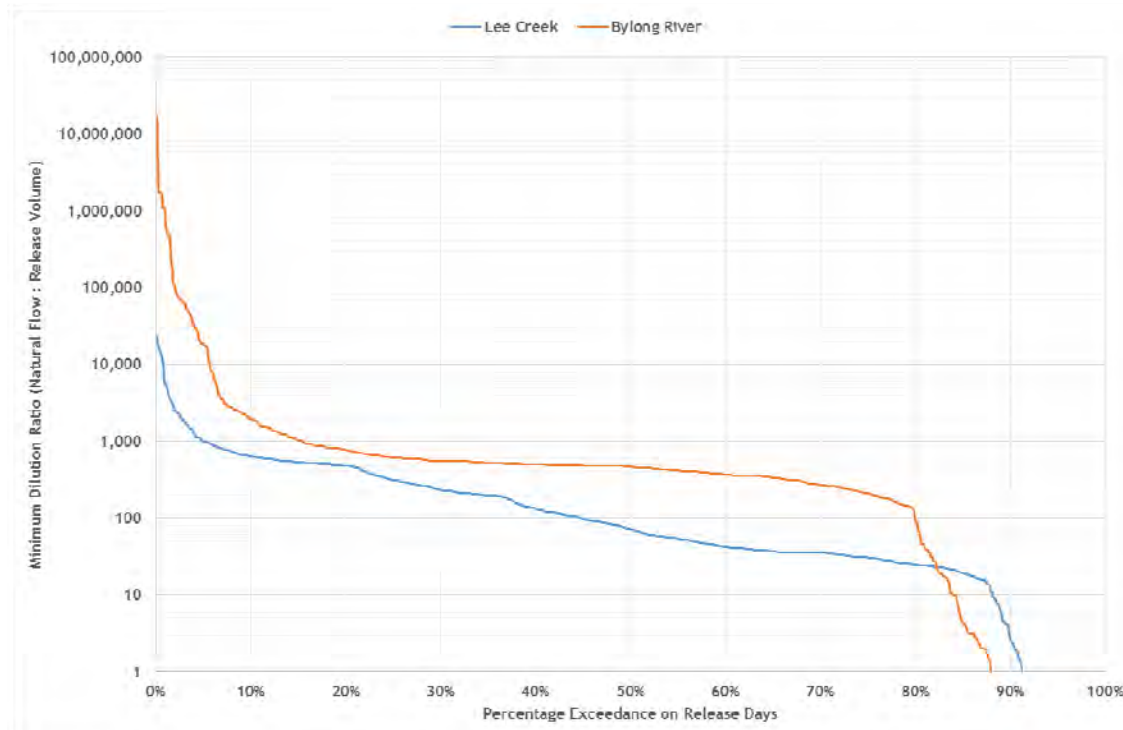
The operating rules for the sediment dams have been discussed in detail in the SWIA. Sediment dams will overflow when rainfall exceeds the design criteria. Water may also be released from sediment dams, if it meets water quality criteria and water is not required for use in the water management system.

The impacts of sediment dam overflows on downstream salt loads is provided in Section 6.4 of the SWIA. Modelled downstream salt loads will be reduced by the Project due to the capture and reuse of water from sediment dams.

Any overflows from sediment dams are likely to have minimal impact on pollutant concentrations in receiving waters due to dilution. The quality of inflows to sediment dams is likely to improve during large runoff events that exceed the design standard and result in a sediment dam overflowing. In addition, any overflows from a sediment dam will be diluted in the receiving waterway.

A further assessment of the likely dilution factor during overflows from sediment dams was undertaken using the OPSIM water balance model. **Figure 17** shows a ranked plot of the minimum modelled daily dilution ratio on overflow days (from 102 modelled climate sequences). For the Bylong River, 80% of the release days exceeded a minimum dilution ratio of 100 (i.e. receiving water flow volume is 100 times greater than the overflow volume). For Lee Creek, 80% of the release days exceeded a minimum dilution ratio of 25. Based on these dilution factors, the impacts of sediment dam overflows on receiving water quality are likely to be undetectable.

Figure 17
Ranked Plot of Minimum Dilution Ratio on Overflow Days



4.8.14.2 Releases

In circumstances where the site has a high stored water inventory and sediment dams are also close to full, water may be released from sediment dams to receiving waterways, providing that water quality is acceptable and in accordance with the EPL.

Table 15 shows water quality data for Bylong River (SW1, SW2, SW4, SW6, and SW8) and Lee Creek (SW7 and SW9). Baseline surface water quality monitoring was undertaken from February 2012 to August 2014. This monitoring regime was recommenced in December 2014 (as outlined in Section 7.4.1 of the EIS) and continues to be undertaken on a monthly basis.

Note that the number of samples for the upper reaches are limited by the relatively low frequency of flow in these reaches. Based on the available baseline water quality data, the recommended water quality objectives for releases from sediment dams, and the rationale for selecting each objective, are as follows:

- pH: 6.5 – 8.5 (ANZECC = 6.5 – 8.0 for upland rivers)

Adopted range represents the range of measured baseline pH.

- EC: 900 $\mu\text{S}/\text{cm}$ (ANZECC = 350 $\mu\text{S}/\text{cm}$)

Table 15
Summary of Baseline Water Quality Data – pH, EC and Turbidity

Parameter	Statistic	SW1 Bylong River	SW2 Bylong River	SW4 Bylong River	SW6 Bylong River	SW8 Bylong River	SW7 Lee Creek	SW9 Lee Creek
pH	Min	6.7	7	6.9	7.1	6.9	6.6	7.3
	20%ile	7.08	7.18	8	8.1	7.64	6.9	7.42
	Median	7.3	7.8	8	8.3	7.9	7.4	7.5
	80%ile	7.54	8.1	8	8.34	8.08	7.8	7.62
	Max	7.7	8.5	8.3	8.5	8.2	7.8	7.8
	No. Samples	10	9	53	19	12	6	4
Electrical Conductivity ($\mu\text{S/cm}$)	Min	120	260	380	480	250	180	320
	20%ile	176	300	1,800	1,660	596	230	326
	Median	230	670	1,900	2,100	755	270	330
	80%ile	274	884	2,100	2,140	864	320	346
	Max	290	920	2,300	2,300	950	360	370
	No. Samples	10	9	53	19	12	6	4
Turbidity (NTU)	Min	0.6	1.4	0.6	0.9	0.5	1.4	1.5
	20%ile	2.68	2.14	3	4.1	2.1	1.8	3
	Median	3.7	3.5	5	14	2.55	2.8	4.35
	80%ile	8.48	10.4	10	18	4.76	5.1	13.22
	Max	26	12	260	20	8	36	26
	No. Samples	10	9	53	19	12	6	4

Baseline monitoring data shows EC often exceeds 350 $\mu\text{S/cm}$ and exceeds 2,000 $\mu\text{S/cm}$ downstream of the Growee River confluence. As noted in Section 3.7.2 of the SWIA, the median baseline EC for the Goulburn River downstream of the Bylong River confluence is approximately 1,000 $\mu\text{S/cm}$.

- Turbidity: 25 NTU (ANZECC = 25 NTU for upland rivers)

Adopt ANZECC limit which is close to the maximum for baseline conditions at most monitoring sites.

- Oil and grease: 10 mg/L

Commonly adopted value for EPL conditions.

The first three of the above water quality parameters (reflecting the potential effects of acidity, salinity and sediment) provide a key indication of water quality that can be rapidly assessed through field measurement and are typically adopted for licensing of water releases from sediment dams in New South Wales. Ongoing monitoring prior to and during a release event will be undertaken to ensure that any releases from sediment dams which are not the result of rainfalls exceeding the design standard comply with the adopted water quality objectives.

Releases of water that meet the above water quality objectives will have no measurable adverse environmental impact on receiving waters, including Lee Creek, the Bylong River and the Goulburn River because these objectives are within the range of existing baseline water quality. Note that there are no specific water quality objectives for the Goulburn River National Park.

4.8.14.3 Effects of Seasonality and Climatic Variability

The streamflow response of the Bylong River and its tributaries is driven by rainfall events, which can occur at any time of year. Whilst average rainfalls are somewhat higher in the warmer months, Bylong River flows are relatively infrequent and cannot be categorised seasonally.

Climatic variability is incorporated in the analysis of the mine water management system by considering all historical climate sequences in the area of interest. Given the relatively short life of the Project (23 years), any longer term shifts in climate are unlikely to have a significant effect on the performance of the mine water management system. The inter-annual climatic variability, which has been incorporated in the analysis, would be significantly larger than any expected longer-term changes in climate.

4.8.15 Clean Water Diversions

Issue

It is noted that a key objective of the water management system will be to maximise the diversion of clean water flows around the mining operations. From a site inspection of the Project area previously undertaken by the EPA, the extent of the slope the hill to the northeast of the CHPP was noted. All figures in the EIS which illustrate the CHPP and underground MIA do not include an indication of any proposed clean water diversions for these areas of the Project. The EPA requests additional information regarding surface water potential flows into the CHHP and underground MIA and how any potential flow will be managed.

Response

The objective of the Project water management system is to divert, direct and contain runoff which has come in contact with coal to prevent discharge to the environment and provide water for operations. Runoff from the coal stockpiles, conveyors or from the area occupied by the CHPP will be contained for treatment and reuse within the wider mine water management system.

In the early stages of the mine planning process, a number of scenarios were considered in managing the diversion of clean water around the Rail loop, CHPP and Underground MIA. Whilst not conceptually illustrated within the EIS, KEPSCO remains committed to ensure that clean water runoff above these areas is diverted around this infrastructure via an appropriately designed diversion drain on the top side of the proposed rail loop. The positioning of this diversion drainage will be developed within the Project Disturbance Boundary and confirmed during the detailed design of this infrastructure prior to the commencement of construction.

4.8.16 Wastewater

Issue

Section 3.7.6 of the EIS provides that the design capacities of the three sewage treatment facilities are 33, 33 and 60 kl/day which are located at the open cut and underground MIA's and at the WAF. The effluent generated from the underground MIA is proposed to be pumped into the mine water management system (Section 3.6.3 of the EIS). Section 3.7.6 of the EIS provides that the effluent will be suitable for irrigation. This appears contradictory and the EIS does not indicate where the irrigation areas are located. The EPA requests DPE require additional information regarding effluent management confirming how it will be managed.

Response

As outlined in Section 3.7.6 of the EIS, the effluent from the sewage treatment facilities will be of a suitable standard to be used as irrigation water in accordance with the *Environmental Guideline for the Use of Effluent by Irrigation* (DEC, 2003) or removed from the site for appropriate disposal by a licensed waste contractor.

Conceptual designs developed during the mine planning process indicate that for the both the underground and open cut MIAs, sewerage will be treated on site and stored for removal by a licenced contractor or irrigated to land as treated effluent, however there is the potential if this water is of suitable quality to be reused within the mine water management system.

Conceptual designs for the proposed WAF layout shows the location of a sewerage treatment plant, a treated effluent dam and irrigation area located north of the WAF.

During detailed design, KEPCO will consult with and provide any required information to EPA in relation to whether any effluent irrigation areas are proposed for the Project.

4.8.17 Waste

Issue

Section 6.1 of the GIA provides the following:

- *Some of the coal reject material generated from processing coal from the Ulan and Coggan seams is likely to be PAF. This material will need to be well managed at the project to reduce the risk of AMD, NMD and saline drainage; and*
- *Some of the floor material from the Coggan seam is likely to be PAF and therefore there is some potential for parts of the final pit floor at the proposed open cut operation to be a source of AMD.*

Section 7.4.3 pg 190 of the EIS provides there is a 50% chance of storing up to 1,330 ML in the Eastern open cut mining area. Section 7.20.4 provides that "provisions for the treatment of potential acid water in underground workings or in the open cut workings e.g. mobile lime dosing plant or broadcast application of agricultural lime".

The EPA has not been able to identify whether the Eastern open cut mining area proposed to be used for storage is likely to contain PAF within its floor and therefore requests clarification as to the predicted location of the PAF material in the open cut areas. The EPA is also concerned about how potentially contaminated in-pit water will be managed given that the GIA indicates that the management of such water will be determined as part of a management plan.

The EPA requests the DPE require clarification as to how this issue will be managed in a practical manner to prevent any potential impacts to groundwater, including the potential impact of returning water from the East pit void underground.

Response

Some of the coal seam floor material derived from the Coggan seam has been identified as Potentially Acid Forming (PAF) and some has been identified as Non-Acid Forming (NAF). If any potential for acid generation is identified at the Coggan seam floor at the open cut pits, agricultural lime application and/or a mobile lime dosing plant will be used to treat the PAF material and in-pit water. The in-pit water will be managed in accordance with the WMP for the Project. There is also the potential to excavate any PAF floor materials from the Coggan seam floor and encapsulate these within NAF overburden, along with coal reject materials.

The Geochemical Impact Assessment (see Appendix AB of the EIS) provided detailed geochemical information on representative samples of coal and mining waste materials that will be generated by the Project as well as appropriate mitigation and management measures. A Mining Waste Management Plan and specific procedures will be developed for the Project to reflect and assist with the implementation of the management and mitigation measures described above.

The occurrence of some PAF coal seam floor (and coal reject) materials at the Project is similar to many coal mining operations in Australia including Moolarben Coal Mine located approximately 55 km north-west of the Project (EGi, 2006) and Bengalla Coal mine in the Upper Hunter Valley. At these mines, PAF coal (and coal reject) materials are managed without significant water quality issues involving acidity, metals/metalloids and/or salinity or significant adverse effects on the open cut operations.

4.9 FORESTRY CORPORATION OF NSW – RA9

4.9.1 Access to Bylong State Forest

Issue

The project will likely raise public awareness of Bylong State Forest. It is expected that significant community attention will be drawn to the limited opportunities for public access to the forest.

FCNSW requires unfettered access to Bylong State Forest for forest management purposes (fire suppression etc.).

Response

There are no known formed public access tracks or roads which provide road access into the Bylong State Forest. KEPCO has recently sought to close a number of unused paper Crown Roads on its landholding, one of which provides a link to the Bylong State Forest and if proposed to be developed would likely be restricted by natural terrain on its alignment. Access to the Bylong State Forest is understood to typically have been via the "Bylong Station" property, which is now owned by KEPCO.

KEPCO is committed to maintaining access to the Bylong State Forest through the "Bylong Station" property. Further, KEPCO is willing to work with the FCNSW in the process of establishing an approved "*right of way*" to the forest if this is required. Whilst the proposed Mining Lease for the Project's underground workings below the Bylong State Forest is not anticipated to apply to the surface, KEPCO is mindful of the safety requirements that will need to be observed during active mining operations to ensure the safety of persons entering the area is not at risk due to predicted subsidence impacts.

As outlined in the EIS, KEPCO will develop an Extraction Plan, in consultation with relevant regulators and infrastructure owners, prior to the commencement of longwall mining activities. The Extraction Plan will include a monitoring program to measure subsidence effects and identify environmental consequences, as well as any public safety concerns.

As part of the Extraction Plan, Property Subsidence Management Plans (PSMPs) will be prepared for each property that will be potentially impacted by subsidence. This includes the Bylong State Forest, which will be prepared in consultation with FCNSW.

KEPCO will seek the relevant Occupation Agreement from FCNSW, which may include a number of requirements, including conditions of access, remediation and rehabilitation requirements which will be addressed within the PSMP.

4.9.2 FCNSW Infrastructure

Issue

FCNSW acknowledges that Bylong State Forest will be subject to subsidence impacts from underground longwall operations. FCNSW expects that the proponents will repair or replace all FCNSW infrastructure affected by the subsidence (roads, fences etc.);

Response

All FCNSW owned infrastructure that will be subject to subsidence impacts will be identified in the PSMP, and subsequently repaired or replaced, as required. Any remediation would be undertaken subject to a risk assessment on the safety of persons affecting such repairs.

4.9.3 Subsidence Impacts

Issue

FCNSW is concerned that the influence of subsidence will immediately decrease forest stand value and reduce future site productivity as a result of:

- a. damage to snigging tracks and haul roads;*
- b. surface and subsurface water ponding;*
- c. subsurface cracking and soil moisture decline;*
- d. tree fall and/or damage from cliff collapse;*
- e. stem malformation; and*
- f. root shear.*

Response

KEPCO acknowledges FCNSW concerns in relation to the items presented above. As discussed in **Section 4.9.1**, subsidence impacts from the Project will be identified and managed in accordance with the PSMP and the relevant occupation agreement.

PSMPs will include information regarding the predicted subsidence impacts, a risk assessment, monitoring and inspection program and will also identify measures for mitigation or remediating any impacts. As discussed in Section 7.1.3 of the EIS, generally, subsidence impacts can be remedied, if necessary, by re-levelling or re-grading the land or by infilling of fractures or cracks with a suitable material. As such, impacts will not be permanent and can be either remediated as soon as practicable, if required, or can naturally repair over time. PSMPs will also consider any 4WD tracks within the property boundaries. As concluded in the Subsidence Ground Movement Predictions and Impact Assessment (Appendix H of the EIS), with the implementation of management strategies, it would be expected that 4WD tracks could be maintained in safe and serviceable conditions during and after the extraction of the proposed longwall panels.

KEPCO will implement a monitoring program as part of the PSMP to evaluate the impacts of subsidence on aspects that have the potential to affect future harvesting operations or forest productivity issues.

4.9.4 Subsidence Repairs

Issue

The proponent is to repair new sources of erosion caused by subsidence.

Response

Noted. Repairs to areas of erosion resulting from underground mining subsidence will be undertaken, as required. Remediation of these areas will be undertaken subject to a risk assessment on the safety to persons affecting such repairs.

4.9.5 Safety Concerns

Issue

Surface cracks posing safety concerns for forest users are to be repaired by the proponent.

Response

Noted. Repairs to areas impacted by underground mining subsidence will be undertaken, as required, and as discussed in **Section 4.9.1** above. Remediation of these areas will be undertaken subject to a risk assessment on the safety to persons affecting such repairs.

4.9.6 Commercial Impact

Issue

FCNSW expects access restrictions will apply to the State forest during and immediately following mining, due to the risks caused by subsidence. Any delay in access will commercially impact FCNSW.

Project Approval conditioning of similar resource projects on State forests have used Forestry Offset mechanisms to limit the commercial impacts to FCNSW. FCNSW encourages such strategies negotiated between FCNSW and the proponent.

Response

As discussed in **Section 4.9.1**, access can be managed such that delays to the business are minimal. KEPCO will engage with FCNSW during the preparation of the Extraction Plan to ensure that there is a clear understanding of the expected subsidence impacts and how they will be managed for safety and ultimate rehabilitation.

It is noted that active subsidence effects to be experienced on the surface will occur progressively in line with the progress of longwall panel extraction. The active subsidence zone will therefore be able to be closely monitored and managed on the surface in accordance with the relevant Extraction Plan.

4.9.7 Property Subsidence Management Plan

Issue

FCNSW expects that the proponent would address many of the listed concerns through the proponent's proposed Property Subsidence Management Plan.

Compensable rights are to be prescribed through the Landholder Access Arrangement (Mining Act 1992).

Response

Noted and as discussed in **Section 4.9.1**. Many of the items identified within this submission can be dealt with in the process of preparing the Occupation Agreement. Further consultation during the preparation of the Extraction Plans will be undertaken with FCNSW to develop appropriate mitigation and management strategies for predicted subsidence impacts.

4.10 HERITAGE COUNCIL OF NSW – RA10

4.10.1 Built Heritage

Issue

Of the identified sites, Bylong Upper Public School, Cheese Factory Remains, Our Lady of the Sacred Heart Catholic Church, Upper Bylong Post Office and Bylong Upper Hall are proposed to be demolished or relocated as part of the proposal. Whilst relocation is preferred to their full demolition, it should be noted that the proposed mine will substantially alter the historic landscape of Bylong, and will have an irreversible impact on the heritage value of these significant historic places. To partially mitigate these impacts, the proponent should demonstrate appropriate management of the surviving heritage sites located in the vicinity of the mine, and provide for their statutory protection. It is therefore recommended that the following sites should be considered for inclusion as heritage items in the relevant Local Environmental Plan/s (LEP) prior to the commencement of works.

1. *The Proponent should apply to Council to have the Heritage Schedule of the Mid-Western Local Environmental Plan amended to include the sites listed below prior to the commencement of works;*
 - *Homestation, Bylong Valley Way*
 - *Bylong Station Farm Complex, North Bylong*
 - *Sunnyside Homestead, Bylong Valley Way*
 - *Bylong St Stephens Anglican Church and Cemetery, Bylong Valley Way*
 - *Harley Hill Farm Complex, Upper Bylong Road*
 - *Bylong Trig Station, Upper Bylong Road*
 - *Swiss Cottage, Wooleys Road*
 - *Bridgelo Provisional School, Wollar Road*
 - *Bylong Hall, Bylong Valley Way*
 - *Tarwyn Park Farm Complex, Upper Bylong Road*
 - *Cottage Chimney Remains, Upper Bylong Road*
 - *Bylong Landscape Conservation Area*

Response

There is no statutory requirement for KEPCO to submit an application to MWRC to have these items listed on the Heritage Schedule of the *Mid-Western Regional Local Environmental Plan 2012* (LEP).

However, should MWRC wish to have these items listed on its LEP, KEPCO is happy to assist in providing any additional information required to that provided in the HHIA.

4.10.2 Vibration Monitoring

Issue

The proposed vibration monitoring prior to and throughout the life of the project is appropriate and should occur as proposed. It is also recommended that Conservation Management Plans, including Conservation and Cyclical Maintenance Schedules, are prepared and implemented for these sites by the proponent in consultation with the property owners and relevant local councils. Costs associated with preparing these documents should be funded by the proponent.

Response

Noted. The Conservation Management Plans to be prepared for sites on key properties on KEPCO owned land will detail the proposed maintenance schedules. KEPCO has commenced dilapidation assessments to inform the maintenance schedules.

4.10.3 Interpretation Plan

Issue

Given the impacts the project will have to the wider Bylong area an Interpretation Plan should be prepared for the broader Bylong Precinct as part of the EIS. The Interpretation Plan should be prepared by an Interpretation Specialist and implemented as part of the works.

Response

The HHIA (Appendix T of the EIS) has provided the appropriate background information and identified historic heritage items to be impacted by the Project as is required for assessment purposes. This information could be utilised in any development of such an Interpretation Plan requested.

As part of the Historic Heritage Management Plan (HHMP) to be prepared as a post approval, KEPCO will engage a suitably qualified person to complete an Interpretation Plan for the broader Bylong Precinct.

4.10.4 Historical Archaeological Sites and Impacts

Issue

The Historic Heritage Impact Assessment (HHIA) prepared by AECOM in 2015 has identified a total of six historical archaeological items/sites with potential within the study area. These include two historic churches and cemeteries. A further isolated burial, the Renfrew Park Isolated Burial, Upper Bylong, is identified by Higginbotham Archaeological Assessment 2015, but not discussed in the HHIA, 2015.

The project will cause direct harm to three (3) archaeological sites within the study area including:

- *Cheese Factory Remains;*
- *Renfrew Park Remains 1 and 2; and*
- *Our Lady of the Sacred Heart Catholic Church, Upper Bylong.*

The Cheese Factory Remains were assessed as retaining local heritage significance. The HHIA proposes the Cheese Factory Remains will be mitigated through a program of archaeological excavation and recording prior to impact. Heritage Division supports this recommendation where impact cannot be avoided.

Response

Noted.

4.10.5 Renfrew Park Remains 1 and 2

Issue

Renfrew Park Remains 1 and 2 will be impacted but no mitigation is proposed. It is noted that the HHIA did not include further historical investigation and assessment following the identification from oral sources that a historical dwelling was located in the area. Heritage Division does not believe that this level of assessment is suitable to adequately assess the significance of this site. It is therefore recommended that a detailed historical archaeological assessment be prepared by a suitably qualified historical archaeologist and based on the results of that assessment, if locally significant relics are likely to be present, the loss of the site of Renfrew Park Remains 1 and 2 should be mitigated through archaeological excavation and recording prior to harm occurring. Conditions to guide archaeological excavation (if required) are included below.

Response

A Historic Heritage Management Plan (HHMP) will be prepared for the Project in consultation with relevant regulators including Heritage Council. As referred to in Section 10.7 of the HHIA, a historical archaeological assessment will be undertaken for Renfrew Park Remains 1 and 2 to determine if locally significant relics are present. Further, Table 11 of the HHIA proposes the preparation of documentation including photographic record prior to impacts to this site.

If it is assessed that locally significant relics are present, these items will be subject to a relevant level of archaeological excavation and recording, prior to impact occurring. The historical archaeological assessment will be undertaken in accordance with relevant Heritage Council guidelines for archival and photographic recording.

4.10.6 Burials

Issue

Our Lady of the Sacred Heart Catholic Church, Upper Bylong is assessed as retaining local heritage significance. It contains a church and cemetery containing four marked graves with grave monuments; one reported unmarked grave and a further two potential unmarked graves indicated by ground penetrating radar. A further five areas of disturbance which may or may not be graves were also identified via a ground penetrating radar investigation in 2015 guided by historical archaeologist Dr Edward Higginbotham. The relocation of the church building is being investigated with the Rylstone Historical Society, however the final location has not been confirmed in the Higginbotham Assessment, 2015: p93. The location for reburial of known and potential burials from this site is also not yet confirmed. These points require clarification prior to approval of this project.

Response

The exhumations and reburials are discussed in **Section 4.18.5**.

The arrangements for the potential relocation of the church building and other buildings will be determined in consultation with the various stakeholders, including MWRC. Arrangements for relocation of the remains of those buried within the Catholic Cemetery as well as the repair/restoration and relocation of the grave markers is being determined in close consultation with the descendants. There has been and will continue to be consultation with the Catholic and Anglican Dioceses, the NSW Health and MWRC. There will be consultation with other interested parties as necessary.

4.11 NSW OFFICE OF ENVIRONMENT AND HERITAGE – RA11

BIODIVERSITY

4.11.1 Vegetation Mapping

Issue

Native vegetation within the Project Disturbance Boundary has not been correctly mapped where a delineation between woody vegetation types and Derived Native Grassland (DNG) is required.

Recommendations

- 1.1 KEPCO rectify the mapping of vegetation communities within the Project Disturbance Boundary.*
- 1.2 KEPCO then recalculate the quantum of ecosystem and species credits required to be offset.*
- 1.3 KEPCO do the same to the offset areas and recalculate the quantum of ecosystem and species credits available from the BOS.*

Response

The methodology used for the delineation of vegetation communities within the Study Area is described within Section 2.3.3.i of the EIS Ecological Impact Assessment, which involved the extrapolation of data points to polygons using the Voronoi areas algorithm in Manifold GIS, which was then manually edited. The FBA does not include a methodology for the delineation of native vegetation communities, however it does provide a definition of 'patch size' similar to that referred to in the submission. The following definition of patch size is contained within the FBA:

"an area of native vegetation that:

- a) occurs on the development site or offset site, and*
- b) is in moderate to good condition, and*
- c) includes native vegetation that has a gap of less than 100 m from the next area of moderate to good condition native vegetation (or ≤ 30 m for non-woody ecosystems).*

Patch size may extend onto adjoining land that is not part of the development site."

Patch size within the FBA is used to determine landscape attributes, predicted ecosystem credit species and impacts on species movement along corridors. The use of this definition to define the extent of a native vegetation community is not considered to be appropriate given the following:

- The patch size definition is not restricted to one native vegetation community as it includes all native vegetation communities that are in moderate to good condition and within the defined distance;
- Native vegetation communities can exist in low condition, which is not included in the patch size definition;
- Defined gaps (up to 100 m for woody vegetation and ≤ 30 m for non-woody vegetation) can comprise cleared land, such as roads and buildings, which should not be included within the extent of a native vegetation community; and
- Native vegetation communities occur in numerous structural forms which require a certain level of projective foliage that may not be met which included gaps of up to 100 m (e.g. a section of 100 m of derived grassland between two patches of closed forest would not fit the criteria for being defined as a closed forest).

Where there is a relatively consistent pattern of widely scattered woodland trees in a relatively natural setting, it is easy to map such areas as woodland, even when the gap is large.

In a situation where the area has been heavily modified and where irregular, scattered patches of trees (e.g. one, two or three trees) within exotic grassland or modified grassland, the choice becomes much more subjective. This is particularly because evidence from the existing areas of good quality woodland in the Study Area and locality shows that the tree spacing is much less 100 m.

A method for refining the mapping of grassy woodland within the Project Disturbance Boundary and Offset Areas was discussed with DP&E, OEH and DoE during a meeting on 3 February 2016. The following thresholds for mapping of woodland patches have been utilised:

- A woodland patch is a continuous area containing the ecological community (other communities, such as those dominated by other canopy species are excluded);
- The woodland patch must contain at least five connected trees; and
- Connected trees include trees within 75 m of another tree.

The extent of each vegetation community in the refined mapping within the Project Disturbance Boundary is provided in **Table 16** and shown on Figure 3.5 in the Biodiversity Assessment Report (**Appendix J**). The refined mapping of the Project Disturbance Boundary and Offset Areas has been incorporated into the BAR and BOS, respectively.

Table 16
Vegetation Communities Within the Project Disturbance Boundary

Vegetation Community	EIS Mapping (ha)	Updated Mapping (ha)	Change (ha)
4: Blakely's Red Gum / Apple Riparian Forest	5	6	0.57
6: Yellow Box Woodland	8	8	0.06
7a: White Box Woodland (Grassy)	54	57	2.74
7b: White Box Woodland (Shrubby)	71	71	0.00
9: Slaty Box Woodland	11	13	1.86
10: Coastal Grey Box Woodland	31	29.03	-1.52
11: Fuzzy Box Woodland	5	5	-0.28
13: Shrubby Regrowth	40	40	0.00
18: Cypress Pine Forest	4	4	0.00
DNG – 3: River Oak / Redgum Riparian Woodland Derived Native Grassland	11	11	-0.53
DNG – 4: Blakely's Redgum / Apple Riparian Forest Derived Native Grassland			
DNG – 6: Yellow Box Woodland Derived Native Grassland	14	14	0.10
DNG – 7: White Box Woodland Derived Native Grassland	174	171	-2.48
DNG – 9: Slaty Box Woodland Derived Native Grassland	31	29	-1.95
DNG – 10: Coastal Grey Box Woodland Derived Native Grassland	241	243	1.98
DNG – 11: Fuzzy Box Woodland Derived Native Grassland	53	53	-0.07
CC: Cultivated Lands	386	386	-0.53
Other (cleared, planted vegetation)	21	21	0.06
TOTAL	1,160	1,160	0

4.11.2 Regent Honeyeater Habitat

Issue

OEH acknowledged the inclusion of a number of locally-defined vegetation communities as habitat for the Regent Honeyeater. Included in this list is White Box Woodland (Shrubby), which is associated with the Plant Community Type (PCT) HU824. OEH queried whether two other locally-defined vegetation communities that are associated with HU824, namely Shrubby Regrowth and Cypress Pine Forest, should also be included in the calculated area of habitat for the Regent Honeyeater. The following recommendations were made to assist in the resolution of this matter:

Recommendations

- 2.1 KEPCO recalculate the number of Regent Honeyeater species credits required, and those available in the offset areas, by including all woody vegetation assigned to the BVT HU824.
- 2.2 KEPCO has information to support a position that these two communities do not conform to Regent Honeyeater habitat then this information should be provided in the EIS. It is also possible that only part of the 44 ha should be considered habitat.

Response

The Regent Honeyeater is classified as a species credit species in the Threatened Species Profile Database for the Hunter Central Rivers major catchment. Species credit species identified within the OEH Threatened Species Profile Database are those that cannot reliably be predicted to occur based on PCT, distribution and habitat criteria. As such, the occurrence of a particular PCT linked to the Regent Honeyeater does not necessarily imply that habitat is present within the PCT.

Habitat that has been mapped for the Regent Honeyeater within the EIS Ecological Impact Assessment and BAR (see **Appendix J**) includes all woody vegetation communities that are dominated by the feed tree species listed in the OEH (2014b) and DoE (2014) profiles for the species and the recovery plan (Menkhorst *et al.*, 1999).

One of the locally-defined vegetation communities mapped as habitat for the Regent Honeyeater is White Box Woodland (Shrubby), which is considered to align with the PCT of HU824. Two other locally-defined vegetation communities, namely Shrubby Regrowth and Cypress Pine Forest, are also considered to align with this PCT. However, feed trees for the Regent Honeyeater do not dominate or co-dominate these two communities.

Within the Project Disturbance Boundary, Shrubby Regrowth supports dense stands of shrubs, such as *Cassinia quinquefaria*, *Acacia ixiophylla* (Sticky Leaved Wattle) and *Bursaria spinosa* (Blackthorn) (see **Plate 1**) and Cypress Pine Forest is dominated by *Callitris endlicheri* (Black Cypress Pine) (see **Plate 2**).

**Plate 1
Shrubby Regrowth Within the Project Disturbance Boundary**



**Plate 2
Cypress Pine Forest Within the Project Disturbance Boundary**



Although *Eucalyptus albens* (White Box) is known to occur within these communities, it occurs occasionally as an emergent tree, rather than a dominant or co-dominant species.

As Shrubby Regrowth and Cypress Pine Forest are not dominated by feed trees for the Regent Honeyeater, these vegetation communities have been excluded from the mapping of habitat for the Regent Honeyeater within the Project Disturbance Boundary.

4.11.3 Biodiversity Offset Strategy

Issue

OEH remains concerned that OA5 is not an appropriate offset property as it will be subject to damage from the surface cracking and subsidence effects of this project proposal. Furthermore, Section 11(1) of the Threatened Species Conservation (Biodiversity Banking) Regulation 2008 (BioBanking Regulation) indicates that the land in OA5 is not suitable to be designated as a BioBank site.

Recommendation

- 3.1 That KEPCO and DPE continue to liaise with OEH to resolve a suitable BOS for residual impacts from the proposal.*
- 3.2 DP&E, OEH and KEPCO continue to liaise to resolve the issue of the appropriate mechanism(s) to permanently secure offset areas.*

Response

Offset Area 5 was selected for inclusion within the offset package for the Project for a number of strategic values including:

- Proximity to the Project Disturbance Boundary;
- Presence of like-for-like vegetation communities to those impacted, including Box Gum Woodland and Derived Native Grassland;
- Presence of known habitat for threatened flora and fauna species; and
- Potential to improve biodiversity values through appropriate management actions.

Approximately 70% of Offset Area 5 occurs within the Subsidence Study Area and may be subject to subsidence-related impacts, such as surface cracking, cliff fall and hydrological changes. To account for these potential impacts, the assessment of the offset value presented within the EIS Ecological Impact Assessment and EIS Biodiversity Offsets Strategy included the application of a 10% reduction in the total land area of the portion of Offset Area 5 occurring within the Subsidence Study Area. This reduction in value was calculated based on a conservative estimate of subsidence-related impacts.

Throughout the consultations with DP&E, they have also sought for the Project to quantify the potential underground mining impacts utilising a modified FBA methodology approach. A revised assessment of the subsidence-related impacts predicted for the Project has been undertaken using a modified FBA methodology (see **Appendix J**). The revised assessment indicates that the reduction presented within the EIS Ecological Impact Assessment and EIS Biodiversity Offsets Strategy is conservative. The revised assessment indicates a 1.1% reduction in area resulting from surface cracking, cliff fall and hydrological changes.

As there will be some level of uncertainty regarding subsidence-related impacts, as is the case with all underground mining projects, it is proposed to maintain the application of a 10% reduction in the total land area of the portion of Offset Area 5 occurring within the Subsidence Study Area.

KEPCO has undertaken further consultation with OEH and DP&E regarding the inclusion of Offset Area 5 within the offset strategy for the Project. Due to the potential for subsidence-related impacts to approximately 70% of Offset Area 5, it has been suggested that during the transitional period for the NSW Offsets Policy and associated FBA, the land within Offset Area 5 could be managed under a conservation agreement (or similar mechanism) during the life of the Project. Following completion of the Project, it has been suggested that Offset Area 5 will be secured through a BioBanking Agreement (or other appropriate mechanism at the time). Further consultation with OEH and DP&E will be undertaken to determine the details of the conservation agreement.

KEPCO will manage the biodiversity values within Offset Area 5 during the life of the mine. This includes management of the land prior to the commencement of the underground component of the Project. Therefore, the biodiversity values of the land will be improved prior to any potential subsidence-related impacts affecting the land.

4.11.4 Offset Area Management

Issue

Table 40 of the EIS lists the vegetation communities found within the offset areas and the amounts in each. At the bottom of this table there are three totals "Total Native Vegetation", "Total Non-native Vegetation and Cleared" and "Total Area". It is OEH's understanding that the intention of the BOS is to manage all the "Total Native Vegetation" as the offset and manage all the "Total Non-native Vegetation and Cleared" for agriculture. Thus there would be 3,791 ha of offset and 292 ha of agricultural land or retained as cleared (dams, roads etc) within these properties. OEH seeks confirmation that this is the case.

Recommendation

- 4.1** *KEPCO confirm that all native vegetation on the six offset properties will be managed for biodiversity conservation within the BOS.*

Response

All native vegetation within the offset sites will be managed for biodiversity. The remaining portions of the offset sites will be managed for agriculture (cultivated lands) or retained as cleared (dams, roads etc.).

A revised assessment of the offset sites has been undertaken to further assess the Project in accordance with the NSW Offsets Policy (see **Appendix J**). This assessment indicates that a total of approximately 3,789 ha (3,683 ha when discount applied to Offset Area 5) of native vegetation will be managed within the offset sites, which includes:

- Offset Area 1: 687 ha;
- Offset Area 2: 420 ha;
- Offset Area 3: 455 ha;
- Offset Area 4: 311 ha;
- Offset Area 5: 1,497 ha (1,391 ha when discount applied); and
- Yarran View Offset Area: 418 ha.

These areas of native vegetation have been utilised to determine the number of ecosystem credits generated by each of the offset sites.

4.11.5 Cliffs

Issue

Figure 39 of the EIS depicts the location of nine prominent cliffs and a number of smaller cliffs within and adjacent to the subsidence area. The EIS identified three cliffs (C1, C3 and C4) as being of particular importance and the design of the underground extraction area has been modified to minimise impacts to these cliffs. Details of these three cliffs were included in the EIS, however, equivalent details of those cliffs which were likely to be directly affected by subsidence were not included in the same way. OEH requested from the Proponent further information on the remaining prominent cliffs and received this information on 29 October 2015. OEH notes that this information may have been informative to other parties who have made submissions to the EIS.

From this additional information it is apparent that four of the prominent cliffs (C5, C6, C8 and C9) will experience significant subsidence movement (between 2.2 and 2.9 metres maximum predicted total Page 6 subsidence). The remainder are predicted to incur small subsidence effects. Two of these cliffs (C5 and C6) have lengths and maximum heights of 273 m and 40 m and 148 m and 34 m respectively. The EIS uses the effects on cliffs of underground extraction at the Ulan Mine to estimate that rock falls will occur along 20% of the cliff length with visible subsidence movement occurring in 50-70% of sandstone formations greater than 3 m high.

However, as acknowledged in the EIS, the measured subsidence for Ulan Mine is less than that of Bylong (generally around 1.0 to 1.2 m (Appendix H, Figure 3.6)) and the two cliffs in question are in the upper size range, and may exceed, the heights of those at Ulan. Consequently it is likely that these, and other cliffs within the subsidence area will incur greater effects from subsidence than those at Ulan, as acknowledged in the EIS. Also, the estimates of damage above are averages. Presumably the likely damage at the sites experiencing large subsidence effects will be greater than the average. However the EIS has not attempted to estimate the effects on the cliffs and instead states that "the likelihood of cliff instability is difficult to predict".

Inspection of Figure 39 of the EIS indicates that the cliff designated C5 is above the end point of Longwall 106. This cliff is the longest and highest of those likely to be significantly impacted by subsidence. It would be possible to avoid this cliff entirely by shortening the longwall by approximately 120 m or 6% of its length. OEH recommends that this avoidance mechanism be adopted.

Recommendation

- 5.1 KEPCO provide more information on the likely impacts and environmental consequences of subsidence on individual cliffs within the subsidence area.
- 5.2 KEPCO agrees to shorten Longwall 106 so that cliff C5 is not impacted by subsidence.
- 5.4 KEPCO clarifies the expected effects, if any, of far-field movements on the cliffs it has excluded from the subsidence study area i.e. cliffs C1-C4.

Response

A summary of additional information on each of the cliffs within the Subsidence Study Area is provided in **Table 17**. The table provides the following information:

- Cliff ID and Other ID: Identification numbers of each cliff within the Subsidence Study Area;
- Cliff Length: The measured length in metres of the top of the cliff as defined in the EIS. Cliff lengths were determined from an analysis of LIDAR data;
- Maximum Cliff Height: the maximum measured cliff height in metres. This provides a conservative approach as the maximum height is often only represented over a short length of the cliff. The cliff heights were determined from the analysis of LIDAR data and site visits;
- Location: a description of the location of each of the cliffs;
- Photo reference: a reference to photographs that were obtained for each of the cliffs within the Subsidence Study Area;

Table 17
Summary of Cliff Assessments

Cliff ID	Cliff Length (m)	Max. Cliff Height (m)	Location	Photo Reference	Maximum Predicted Total Subsidence (mm)	Maximum Predicted Total Tilt (mm/m)	Maximum Predicted Total Hogging Curvature (km-1)	Maximum Predicted Total Sagging Curvature (km-1)	Arch. sites (within 20m)	Visual Significance	Likelihood of Cliff Falls
24163	28	11	Outside Longwall panels. 35 m from LW201	Photo 1	< 20	< 0.5	0.01	< 0.01	No	Low	Unlikely
24278 C4	161	30	Outside Longwall panels. 140 m to 180 m from LW104 and LW105	Photo 2	< 20	< 0.5	0.03	< 0.01	No	High	Rare
24279 C1	348	50	Outside Longwall panels. 160 m to 270 m from LW104 and LW105	Photo 3 and Photo 4	< 20	< 0.5	< 0.01	< 0.01	No	High	Rare
24287 C9	114	12	Above LW105	Photo 5	2800	20	2.00	1.50	No	Moderate	Likely
24288	98	16	Above LW105	Photo 6	700	20	0.50	0.40	No	Low	Likely
24290	23	12	Above LW105	Photo 7	400	15	0.30	0.20	No	Low	Likely
24291	32	15	Above LW105	Photo 8	300	10	0.30	0.10	No	Low	Likely
24293	28	15	Above LW105	Photo 9	200	6	0.20	0.10	No	Low	Likely
24294	37	17	Above LW105	Photo 10	1900	30	1.50	0.90	No	Low	Likely

Cliff ID	Cliff Length (m)	Max. Cliff Height (m)	Location	Photo Reference	Maximum Predicted Total Subsidence (mm)	Maximum Predicted Total Tilt (mm/m)	Maximum Predicted Total Hogging Curvature (km-1)	Maximum Predicted Total Sagging Curvature (km-1)	Arch. sites (within 20m)	Visual Significance	Likelihood of Cliff Falls
24295	43	15	Above LW105	Photo 11	250	6	0.20	0.10	No	Low	Possible
24297	112	18	Outside Longwall panels. 10 m from LW105	Photo 12	200	3	0.10	0.10	No	Low	Possible
24304	55	19	Above LW104	Photo 13	1700	30	1.00	0.80	No	Low	Likely
24311 C5	273	40	Above LW106	Photo 14	2200	35	1.50	1.00	No	Moderate	Likely
24312	145	20	Above the end of LW106	Photo 15	1900	35	1.00	0.90	No	Low	Likely
24314	26	16	Outside Longwall panels. 55 m from LW107	Photo 16	50	1	0.04	0.03	No	Low	Unlikely
24315	98	19	Outside Longwall panels. 60 m from LW106	Photo 17	50	1	0.03	0.02	No	Low	Unlikely
24324 C2 and C3	642	45	Outside Longwall panels, 170 m to 280 m from LW105 to LW107	Photo 18 and Photo 19	< 20	< 0.5	< 0.01	< 0.01	No	High	Rare
24326	33	19	Above LW107	Photo 20	300	3	0.20	0.10	No	Low	Possible
24329	27	14	Above LW107	Photo 21	350	5	0.20	0.20	No	Low	Possible

Cliff ID	Cliff Length (m)	Max. Cliff Height (m)	Location	Photo Reference	Maximum Predicted Total Subsidence (mm)	Maximum Predicted Total Tilt (mm/m)	Maximum Predicted Total Hogging Curvature (km-1)	Maximum Predicted Total Sagging Curvature (km-1)	Arch. sites (within 20m)	Visual Significance	Likelihood of Cliff Falls
24330	83	15	Outside Longwall panels. 135 m from LW107, 110 m LW108	Photo 22	50	1	0.10	0.02	No	Low	Unlikely
24331	53	16	Outside Longwall panels. 110 m from LW108	Photo 23	50	2	0.10	0.10	No	Low	Unlikely
24332	35	12	Outside Longwall panels. 75 m from LW108	Photo 24	100	3	0.10	0.10	No	Low	Unlikely
24340 C7	54	11	Outside Longwall panels. 40 m from LW108	Photo 25	50	2	0.10	0.02	No	Low	Unlikely
24408	39	11	Above pillar (LW106 and 107)	Photo 26	800	8	0.50	0.40	No	Low	Likely
24411	50	12	Above LW107	No Photo	2800	25	2.00	1.50	No	Low	Likely
24412	38	12	Above LW107	Photo 27	1200	25	0.80	0.60	No	Low	Likely
24414	143	16	Above LW107	Photo 28	2900	30	2.00	1.50	No	Low	Likely
24422 C6	148	34	Above LW107	Photo 29	2900	30	2.00	1.50	No	Low	Likely
24425	31	15	Above LW107	Photo 30	1500	25	1.00	0.70	Yes (CUL007)	Low	Likely

Cliff ID	Cliff Length (m)	Max. Cliff Height (m)	Location	Photo Reference	Maximum Predicted Total Subsidence (mm)	Maximum Predicted Total Tilt (mm/m)	Maximum Predicted Total Hogging Curvature (km-1)	Maximum Predicted Total Sagging Curvature (km-1)	Arch. sites (within 20m)	Visual Significance	Likelihood of Cliff Falls
24434	26	12	Above LW106	Photo 31	2200	30	1.50	1.00	Yes (CUL016 & OQ01)	Low	Likely
24437	58	12	Above LW106	Photo 32	2900	25	2.00	1.50	No	Low	Likely
24457	26	11	Above LW105	Photo 33	2100	30	1.50	1.00	No	Low	Likely
24464	36	13	Above LW109	Photo 34	3300	30	2.00	1.50	No	Moderate	Likely
24465 C8	63	14	Above LW109	Photo 35	2600	40	1.50	1.50	No	Moderate	Likely
24469	24	11	Above LW109	Photo 36	2500	40	1.50	1.00	No	Low	Likely
24471	35	12	Above LW109	Photo 36	1200	30	0.80	0.60	No	Low	Likely
24514	28	19	Outside Longwall panels. 70 m from LW105	Photo 37	< 20	< 0.5	0.03	< 0.01	No	Low	Unlikely
24515	33	11	Above the corner of LW105	Photo 38	50	1	0.04	0.03	No	Low	Unlikely
24516	57	22	Outside Longwall panels. 100 m from LW106	Photo 39	< 20	1	0.10	< 0.01	No	Low	Unlikely
24518	57	24	Outside Longwall panels. 80 m from LW106	Photo 40	50	1	0.10	0.02	No	Low	Unlikely

Cliff ID	Cliff Length (m)	Max. Cliff Height (m)	Location	Photo Reference	Maximum Predicted Total Subsidence (mm)	Maximum Predicted Total Tilt (mm/m)	Maximum Predicted Total Hogging Curvature (km-1)	Maximum Predicted Total Sagging Curvature (km-1)	Arch. sites (within 20m)	Visual Significance	Likelihood of Cliff Falls
24519	35	18	Outside Longwall panels. 90 m from LW106	Photo 41	25	1	0.10	0.02	No	Low	Unlikely
24520	63	19	Outside Longwall panels. 90 m from LW106	Photo 42	< 20	1	0.10	< 0.01	No	Low	Unlikely
24546	106	20	Outside Longwall panels. 105 m from LW105	Photo 43	< 20	< 0.5	0.10	< 0.01	No	Low	Unlikely
24548	80	20	Outside Longwall panels. 60 m from LW105	Photo 44	25	1	0.10	< 0.01	No	Low	Unlikely

- Maximum Predicted Total Subsidence, Tilt, Hogging Curvature and Sagging Curvature: Predicted subsidence parameters for each of the cliff locations. The predicted subsidence parameters are the maximum values within 20 m of the perimeter of the cliffs;
- Archaeological site: Identifies cliffs with archaeological sites located within 20 m of a cliff as identified within the Aboriginal Archaeology and Cultural Heritage Impact Assessment (AACHIA) (RPS, 2015);
- Visual significance: Subjective assessment (Low, Moderate and High) by MSEC for each cliff based on visibility from outside the Subsidence Study Area. The subjective assessment incorporates the visual impact assessments made for selected cliffs by JVP (2015); and
- Likelihood of cliff falls: A ranking of the likelihood of rock falls (Rare, Unlikely, Possible and Likely) at each cliff based on the location of the cliff and the predicted subsidence parameters.

It is noted that the majority of the cliffs are located within the same cliff forming stratigraphic units as identified by SCT (2015). Seven cliffs (24163, 24434, 24457, 24464, 24465, 24469, and 24471) are located in a lower stratigraphic sequence and may be less susceptible to mining impacts, as noted in SCT (2015).

In addition to the above information, public safety should also be addressed. The majority of land within the Subsidence Study Area consists of the Bylong State Forest or is owned by KEPCO. Privately owned lots are located in the north-east (Receiver No.'s 53 to 55) and south-east (Receiver No.'s 138 to 141) of the Subsidence Study Area. The Wollemi National Park and Goulburn River National Park are located to the east of the Subsidence Study Area. There are no known public access tracks or roads which would provide road access into the Bylong State Forest. Access has primarily been via a private farm track located on the Bylong Station property which is currently owned by KEPCO. Public access to the cliffs is therefore restricted by KEPCO owned land and the natural terrain. Whilst KEPCO will not deny public access through their property to the State Forest, an appropriate access process will be implemented. The risk to public safety is therefore considered to be low. There are access permissions associated with hunting and licensed apiaries. Management plans which will be developed for the Project, including access to the Bylong State Forest and cliffs will need to include access restrictions and erection of warning signs and notification to those with access permissions. This measure is noted in Section 5.4.6 of Appendix H of the EIS.

OEH has recommended shortening longwall panel 106 to ensure that Cliff C5 (Cliff 24311) is protected. It is noted that shortening this longwall panel would also provide protection of Cliff 24312.

KEPCO is committed to minimising impacts on Cliff 5 as a result of its longwall mining operations. The extent of the mine plan modifications which may be required to avoid adverse impacts upon Cliff 5 will be determined through the monitoring information and subsidence knowledge gained through the mining of the initial five longwall panels for the Project. The mine plan modifications will be communicated within the Cliff Subsidence Management Plan as detailed below.

Cliffs C1 (24279), C2 (24324), C3 (24324) and C4 (24278) are located outside the Subsidence Study Area, which represents a 26.5° angle of draw, or 0.5 times the depth of cover from the longwall panels. The larger and more prominent cliffs, C1 (24279), C2 (24324), C3 (24324) are located greater than 0.7 times the depth of cover from the longwall panels. Section 5.4.3 of Appendix H of the EIS notes: *"The cliffs could also experience low level far-field horizontal movements of up to around 150 mm to 200 mm. These movements are expected to be bodily movements towards the extracted longwalls and are not expected to be associated with any significant strains. It is unlikely, therefore, that Cliffs 24278, 24279 and 24324 would be adversely impacted by the far-field horizontal movements, even if these predictions were exceeded by a factor of 2 times."* Expected effects of far-field movements on the Cliffs C1 (24279), C2 (24324), C3 (24324) and C4 (24278) can be summarised as follows:

- Potential for horizontal movements of 150 mm to 200 mm;
- Low levels of strain, likely to be below typical survey tolerance; and
- Potential for minor isolated cracks due to low level differential movement.

Whilst it has been noted that the prediction of impacts to cliffs is difficult, the layout and sequence of extraction of the proposed longwall panels at the Project is well suited to an adaptive management approach.

Regardless of the above assessment, mechanisms will be put in place to adapt the mine plan as required based on actual monitoring data obtained during mining. The proposed mine layout shows that longwall panels will extract coal from north to south, such that longwall panels will be sequentially approaching the Cliffs C1 (24279), C2 (24324), C3 (24324) and C4 (24278) that the Project has proposed to protect.

The Cliff Subsidence Management Plan will include measures to monitor ground movements and the condition of the cliffs as each longwall panel is extracted. This monitoring data will be reviewed for each longwall panel to determine the effectiveness of the mine layout to provide protection to the significant cliffs, as desired. This information will allow the Project to make decisions on whether to increase the setback of future longwall panels from the particular cliffs, or, if very little effect is observed, possibly allow future longwall panels to approach closer to the cliffs than conservatively planned. This adaptive management technique can be undertaken due to the orientation of the proposed Underground Extraction Area.

The economic considerations of shortening the length of the longwall panel have been assessed. Modification of the mine plan to step back from cliff lines would result in the sterilisation of some coal resources and hence a reduction in both royalties and company tax benefits to Australia and NSW. Bringing forward longwall panel change-out costs would further decrease profitability and hence company tax benefits accruing to Australia and NSW.

Whether this results in an increase or decrease in the net social benefits of the Project depends on the economic value that the community place on the increased protection of potential cliff line habitat.

4.11.6 Bat Monitoring

Issue

*OEH expects that the impact of subsidence on cliff line habitat within the proposed area potentially involves impacts on cave habitats, and therefore potential impact on cave-dependent species, including threatened micro-bat species. Two cave-dependent threatened bats have been recorded in the study area, Large-eared Pied Bat (*Chalinolobus dwyeri*) and Eastern Bentwing Bat (*Miniopterus schreibersii oceanensis*) and another two are listed in the EIS as having potential to occur. The EIS cannot conclusively exclude the potential for breeding and/or roosting of these species in the cliff lines of the proposed subsidence area, and assumes their potential presence by including the known species in the BOS. The EIS states that additional impacts are likely to occur as a result of subsidence which may injure roosting bats, modify cave structures and impact on maternity roosting habitat, if present.*

OEH recommends that a bat monitoring program be conducted around the prominent cliffs with particular emphasis given to determination of the presence of roosting or maternity sites. Given that subsidence of the cliffs is not expected to occur until year 7 at the earliest it should be possible to establish a good baseline level of bat activity and determine potential roost sites.

Recommendation

5.3 *KEPCO conduct insectivorous bat monitoring at prominent cliffs within and adjacent to the subsidence area to establish a baseline level of activity and search for potential roost sites.*

Response

A Biodiversity Management Plan will be developed for the Project to provide a comprehensive framework for the implementation of the proposed biodiversity impact mitigation. As outlined within Section 4.4 of the EIS Ecological Impact Assessment, the BMP will include ongoing monitoring or impacts on flora and fauna, including within the Subsidence Study Area.

KEPCO will include provisions within the BMP to undertaken monitoring of cave-dwelling microbats within the Subsidence Study Area. Where access is possible, this will include monitoring of prominent cliffs identified within the EIS as being subject to significant subsidence movement (i.e. C5, C6, C8 and C9).

Monitoring will be undertaken prior to commencement of the underground component of the Project to collect baseline information on the microbats utilising the Subsidence Study Area. Ongoing monitoring will be undertaken to determine if there are any observable impacts on the species known to occur. This will include assessment of changes in the occurrence of the Large-eared Pied Bat (*Chalinolobus dwyeri*) and Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*), both of which are known to occur within the Subsidence Study Area.

4.11.7 Groundwater and Surface Water Monitoring

Issue

OEH stated that no definitive evidence is provided for the level of reliance on groundwater for the GDEs identified within the EIS. OEH also noted concern regarding the potential impacts to GDEs resulting from changes to groundwater and surface water. The submission also noted that whilst the EIS discussed management of the effects of mine subsidence on Dry Creek, no detail was provided. In order to allow monitoring of GDEs and management of streams, the submission made the following recommendations:

“6.1. That DP&E ensure that the Water Management Plan include measures to monitor the drawdown of groundwater near the GDEs and the condition of the GDEs themselves and include triggers and management actions when remedial actions will be carried out.

6.2. That DP&E ensure that the effects of subsidence on streams are remediated appropriately within the mining extraction plans.”

Response

Considerable circumstantial evidence exists to indicate that the GDEs present in the study area are not heavily reliant upon groundwater. This evidence is provided within the Ecological Impact Assessment (Appendix J of the EIS) and GIA (Appendix M of the EIS).

Notwithstanding this evidence, KEPCO agrees that the WMP and associated monitoring programs will include measures to monitor the drawdown of groundwater near the identified GDEs and the condition of GDEs prior to and during the Project. TARPs and management actions will be included within the WMP to specify if and when remedial actions need to be carried out consistent with any conditions of development consent.

Any significant effects of subsidence on streams will be remediated appropriately consistent with any conditions of development consent.

Candidate GDEs identified in the study area on Figure 3.6 of the Ecological Impact Assessment (Appendix J of the EIS) are likely to be partially and seasonally dependent on groundwater, as explained below.

GDEs can rely on groundwater for the maintenance of some or all of their species composition and ecological functions and this dependence varies amongst GDEs, ranging from partial and infrequent dependence (i.e. seasonal or episodic) to total (entire / obligate, continual dependence) (Serov *et al.*, 2012). The degree of dependence on groundwater of the potential GDEs within the Study Area has not been empirically measured. However, the assessment of GDEs takes into account the depth to groundwater, the types of vegetation communities present and the plant species composition of those communities.

Due to the lack of obvious GDEs (such as wetlands and hanging swamps), vegetation occurring where depth to groundwater is 20 m or less is considered to only opportunistically access groundwater. Opportunistic dependency occurs when ecosystems use groundwater as required, for example when surface water / soil moisture is unavailable, such as at the end of a dry period (Serov *et al.*, 2012). This assumption is supported by the observation that many of the tree species recorded from the Study Area that are considered to be potentially utilising groundwater (i.e. in areas where the depth to groundwater is within the reach of their roots) also grow in areas where groundwater is not available. That is, such species grow where groundwater is significantly deeper than 20 m. Such species include for example dominant trees such as White Box, Yellow Box, Grey Box and Blakely's Red Gum. These trees grow in areas where groundwater is significantly deeper than 20 m and also in areas where groundwater is less than 20 m depth. The health and general form of these trees is not significantly different between "deep" and "shallow" groundwater areas.

Some trees, including River Red Gum and River Oak, appear to occur exclusively in area where depth to groundwater is <20 m. These species have the potential to be opportunistically using groundwater. However, where these species occur, other sources of water are also available and these include surface water flows and soil moisture – sources of water that are likely to provide a high proportion of the trees water.

Two vegetation communities, River Oak / Redgum Riparian Woodland and Blakely's Redgum / Apple Riparian Forest were identified within the Ecological Impact Assessment (Appendix J of the EIS) as being GDEs due to the likelihood of access to alluvial groundwater. The Project is predicted to result in alterations to the groundwater regime from groundwater extraction and depressurisation. These alterations are predicted to potentially impact the Blakely's Redgum / Apple Riparian Forest community.

KEPCO will include provisions within the relevant management plans to assess the level of impact to the Blakely's Redgum / Apple Riparian Forest. Monitoring of GDEs will be undertaken to confirm the level of dependency of an ecosystem on groundwater and how the ecosystem responds to changes in the groundwater system (Richardson *et al.*, 2011) in accordance with any conditions of development consent.

In general terms, a number of indicators can be assessed within GDEs including hydrology and hydrogeology, water quality, vegetation, fauna and climate (Richardson *et al.*, 2011). GDE condition monitoring for the Project will focus on vegetation characteristics. Methods that may be implemented to assess GDE condition include:

- Aerial photograph interpretation and vegetation community ground-truthing;
- Establishment of permanent plots for monitoring GDEs, including:
 - o Vegetation structure and composition (including tree health and population condition);
 - o Water table assessment (depth, physio chemistry); and
- GDE monitoring plan.

The purpose of the GDE monitoring program will be to detect changes to the vegetation characteristics of GDEs resulting from changes to groundwater levels.

As explained in Section 7.1.3 of the EIS, stream bed surface cracking that occurs as a result of the mining will be remediated by infilling and regrading (as appropriate) as soon as practical after being identified.

The Extraction Plans to be developed for the longwall panel operations will identify the process to survey surface conditions prior to mining and for the monitoring to take place following mining to identify any impacts upon the environment. The Extraction Plans will also identify the process to be undertaken to remediate any surface cracking along the alignment of Dry Creek and associated tributaries.

4.11.8 Proximity of Subsidence Area to Goulburn River National Park

Issue

The north-eastern edge of the underground mining area approaches the boundary of the Goulburn River National Park. Figure 39 of the EIS indicates that the Subsidence Study Area does not encroach the Park but that it abuts the Park boundary. OEH seeks a commitment from the Proponent that there will be no, or negligible, effects on the National Park from underground mining.

In addition the EIS discusses the possibility of far-field horizontal movements which could occur for up to three kilometres, therefore within Goulburn River and Wollemi National Parks. The EIS states that “far-field horizontal movements on natural and built features are not expected to be significant” and that “they only have the potential to affect large structures that are susceptible to small differential movements”. Large structures may include the cliffs on the south-western edge of the subsidence area. It is not clear from the information provided whether there are any structures with the National Parks which may also be potentially impacted by far-field movements.

Recommendations

- 7.1 *KEPCO provides a commitment that there will be no, or negligible, effects on the National Park from underground mining.*
- 7.2 *KEPCO clarifies whether there are any natural features in the adjoining Goulburn River and Wollemi National Parks which could be affected by far-field horizontal movements.*
- 7.3 *Given the uncertainty of subsidence predictions and impacts KEPCO should outline contingency management measures if the effects of subsidence on the adjoining National Parks should be greater than anticipated.*

Response

The Subsidence Impact Assessment (Appendix H of the EIS) comprehensively considered the potential impacts and environmental consequences for surface features in the vicinity of the underground operations. The Goulburn River and Wollemi National Parks both lie outside the Subsidence Study Area and as such are not predicted to be subject to any subsidence impacts, including impacts from far-field horizontal movements.

As part of the Subsidence Impact Assessment, a Sensitivity Analysis was undertaken to determine the potential consequences in the event that actual subsidence exceeds the predictions. It was concluded that doubling the predicted subsidence effects does not result in any adverse or unmanageable impacts.

Further, SCT Operations Pty Ltd (SCT) was engaged to complete an independent peer review of the Subsidence Impact Assessment. The peer review concluded that the report provided an adequate discussion on effects, impacts, increased impacts and mitigation measures as required.

In addition, the comments discussed in **Section 4.11.5** regarding far field movements would also apply to the National Park areas except that, being further away from the proposed longwall panels, the potential for differential movement and possible cracking is lower.

One of the contingency measures that could be adopted, should impacts on National Parks be greater than predicted would be the adaptive management strategy noted previously. This adaptive management strategy would enable future longwall panels to be offset further away from the boundary of the Wollemi and Goulburn River National Parks, if impacts are observed when extracting earlier longwall panels.

4.11.9 Proximity of Offset Areas to National Parks

Issue

In general the management of offset properties is likely to be compatible with the management of adjoining national parks. The National Parks and Wildlife Service (NPWS) requires vehicle access to adjoining areas of Goulburn River and Wollemi National Parks for wildfire suppression, fuel reduction and other management activities.

The construction and operation of mining infrastructure and management of offset areas have some potential to restrict access, particularly from the upper Bylong valley. The Proponent and the NPWS will need to liaise regarding access to the parks particularly if the Proponent considers the closing of any access tracks.

Recommendations

- 8.1 KEPCO and NPWS discuss and formalise access arrangement for NPWS into the national parks from the Bylong and Upper Bylong sides.*
- 8.2 KEPCO and NPWS liaise to ensure that management of adjoining offset areas and national parks is compatible.*

Response

As part of the development of the BOMP for the Project, KEPCO will liaise with NPWS in relation to agreeing on access arrangements and management of areas adjacent National Parks.

Access arrangements will be formalised with NPWS, as required, to ensure access is maintained to the Goulburn and Wollemi National Parks.

KEPCO will continue to liaise with NPWS and discuss offsetting arrangements to ensure the management of offset areas is compatible with the adjoining National Parks.

4.11.10 Road Widening Impacts on Riparian Vegetation of the Bylong River

Issue

In the northern part of the Upper Bylong Road there is a short section where the Bylong River approaches the hillside to the north-east. This narrow section currently includes the Upper Bylong Road and the Sandy Hollow – Gulgong railway. The EIS requires the upgrade of the Upper Bylong Road to a total road formation of 10 m. OEH is unable to determine from the information in the EIS whether this will encroach on the riparian vegetation along the Bylong River.

The Bylong River is regarded in the EIS as a fourth order stream. Section 9.2.3 of the FBA requires consideration of any effect reducing the width of the riparian buffer on fourth, or higher, order streams. If the widening of the road will encroach further on the riparian buffer along the Bylong River then it will require consideration on this landscape feature which may have an effect on the landscape score in the BioBanking Credit Calculator (BBCC).

The Proponent should demonstrate that the widening of the Upper Bylong Road will not encroach further on the riparian buffer or must include consideration of the effect on this landscape feature in the BBCC.

Recommendations

- 9.1 KEPCO to provide details the effects of the widening of the Upper Bylong Road on the riparian vegetation of the Bylong River.*

9.2 *KEPCO should detail any effects on the riparian buffer along the Bylong River and include consideration of this within the BBCC.*

Response

The calculation of the landscape value scores within the BAR and BOS have been updated to reflect the stream ordering used within the EIS SWIA (WRM Water & Environment, 2015). The BAR and BOS are presented in **Appendix J** and **Appendix K**, respectively.

The Project Disturbance Boundary does encroach within the 20 m riparian buffer associated with the Bylong River, which is categorised as a fourth order stream. Further details regarding the impact to Bylong River and its associated riparian corridor are provided in the BAR, as this landscape feature is considered to be a matter for further consideration. Despite the fact that the Project satisfies the “*matters requiring further consideration threshold*”, the consent authority may allow the Project to proceed having regard to, amongst other things, the social and / or economic benefits of the Project and if the impacts can be appropriately ameliorated with other conservation measures.

The riparian buffer being impacted by the Project is the result of an upgrade to Upper Bylong Road. It is proposed that Upper Bylong Valley Road will be widened from Bylong Valley Way to the mine sites to accommodate a two lane two-way road with 3.5 m wide travel lanes and 1.5 shoulders with a total road formation of 10 m ((Parsons Brinckerhoff, 2015). This will largely occur within the existing road corridor. The final design of the road upgrade will endeavour to achieve further avoidance of sensitive biodiversity. General construction, operation and water management mitigation measures will be dealt with in a specific Environmental Management Plan to be developed for this construction activity.

4.11.11 Indirect Impacts

Issue

OEH is concerned about the effects of the mining and infrastructure areas on the flora and fauna of the neighbouring native vegetation areas. OEH notes that section 7.2.5 of the EIS indicates that the effects of dust, noise and lighting will be mitigated within the provisions of a Biodiversity Management Plan (BMP). Other indirect impacts are also potentially damaging, for example pest and weed invasion and inappropriate fire regimes. OEH requests that DP&E ensure measures to minimise the effects of all indirect impacts are incorporated into the BMP.

Recommendation

10.1 *DP&E ensure measures to minimise the effects of all indirect impacts are incorporated into the BMP.*

Response

A Biodiversity Management Plan (BMP) will be developed for the Project to provide a comprehensive framework for the implementation of the proposed biodiversity impact mitigation. As outlined within Section 4.4 of the EIS Ecological Impact Assessment, the BMP will include (at least):

- Control and ongoing management of environmental and noxious weeds;
- Control and ongoing management of feral animals;

A suite of other measures, including those that relate to indirect impacts, will be implemented for the Project which will help to minimise indirect impacts to the biodiversity values of the Study Area and surrounds. The BMP will be prepared in accordance with relevant conditions of development consents in consultation with relevant regulators.

4.11.12 Potential New Flora Species

Issue

The EIS lists three species found within the study area which may represent new taxonomic entities, Hibbertia sp. aff. acicularis, Sannantha sp. aff. cunninghamii and Grevillea sp. aff. patulifolia/sericea. Only very general information regarding their location is given in Appendix J. OEHL requires the locality information of these taxa to ensure they will not be affected by the proposed development.

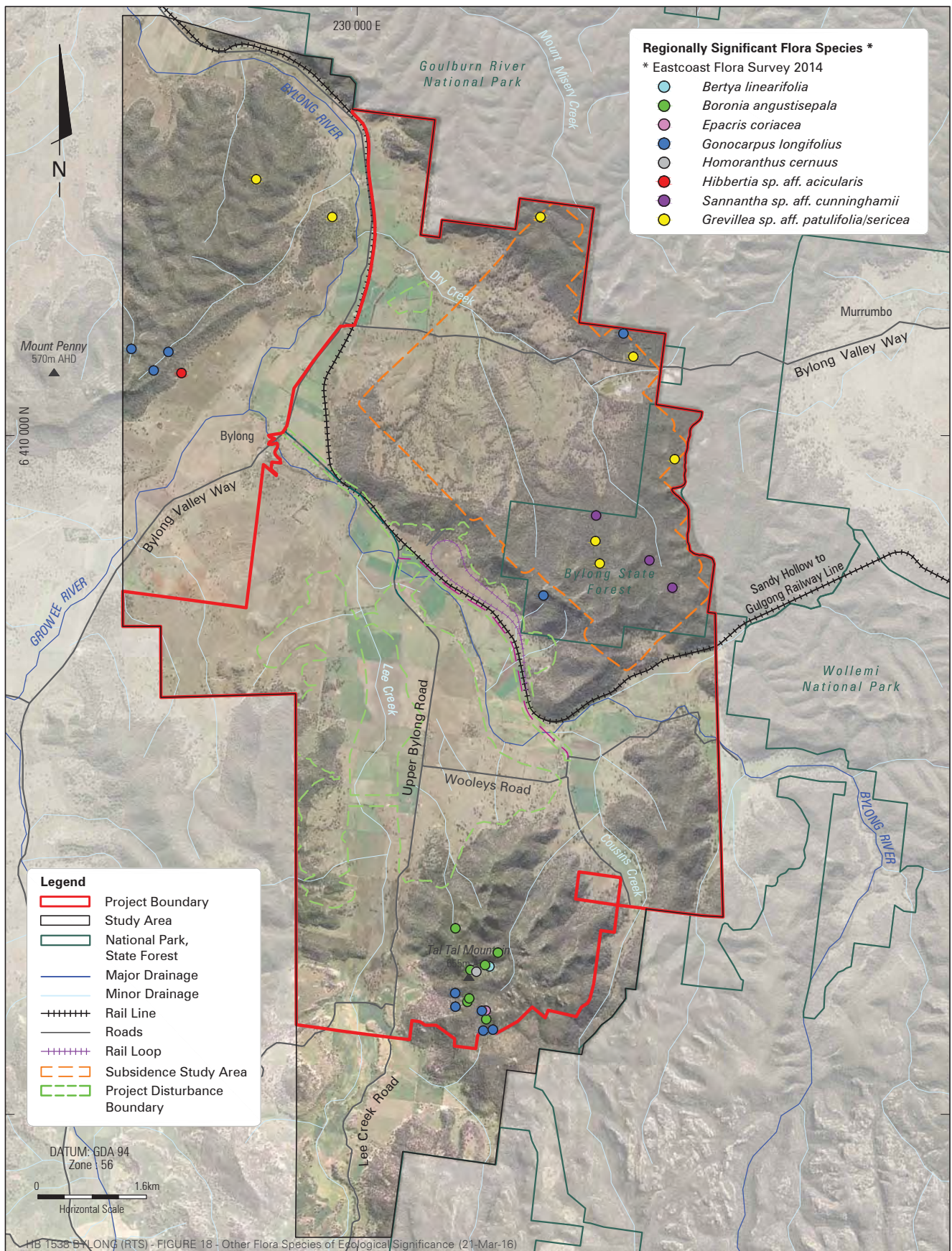
Recommendation

11.1 KEPCO supplies OEHL with location details of the three potentially new flora taxa.

Response

The locations of the three potential new species are shown in Figure 3.9 of the EIS Ecological Impact Assessment, and reproduced in **Figure 18**. **Table 18** lists the vegetation communities in which the species were recorded in. None of the recorded individuals of the potential new species occur within the Project Disturbance Boundary and will not be directly impacted by the Project. Of the 12 individuals of the potential new species, nine occur within the Subsidence Study Area, which may be subject to subsidence-related impacts, this includes six individuals of *Grevillea sp. aff. patulifolia/sericea* and three individuals of *Sannantha sp. aff. cunninghamii*.

Given that the individuals are located in areas where depth to groundwater is at least 50 m and are not within the identified GDEs and are located away from cliff lines, the subsidence-related impact potentially relevant to these individuals is surface cracking. The EIS Subsidence Impact Assessment has estimated surface cracking will cover less than 1% of the Subsidence Study Area (MSEC, 2015).



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Other Flora Species of
Ecological Significance

FIGURE 18

Table 18
Location of Potential New Flora Species

Vegetation Community	<i>Grevillea</i> sp. aff. <i>patulifolia/sericea</i>	<i>Hibbertia</i> sp. aff. <i>acicularis</i>	<i>Sannantha</i> sp. aff. <i>cunninghamii</i>
5: Blakely's Red Gum / Paperbark Forest			3
8b: Blakely's Red Gum Woodland (Shrubby)	1		
9: Slaty Box Woodland	1		
15: Caley's Ironbark Forest	2		
16: Blue-leaf Ironbark / Cypress Forest*	3		
17: Red Ironbark / Cypress Forest	1		
DNG – 7: White Box Woodland Derived Native Grassland		1	
TOTAL	8	1	3

**Includes areas of Caley's Ironbark Forest (Unit 15)*

The potential surface cracking within the vegetation communities in which these species occur are expected to be localised and overall are not considered to cause a substantial change in potential habitat. The potential subsidence-related impacts within the Subsidence Study Area are not expected to significantly impact the three potential new species.

4.11.13 Apparent Mistakes in the EIS

Issue

Table 12 indicates that an Environment Protection Licence and a Radiation Management Licence will be required from OEH. The correct authority in these cases is the Environment Protection Authority.

Figure 62 Post-mining Land Use has mapped the following areas as cleared grasslands which should have been mapped as heavy timber:

- *a large area centred on Tal Tal Mountain,*
- *western half of Offset Area 1, and*
- *a small area just to the north of the project boundary.*

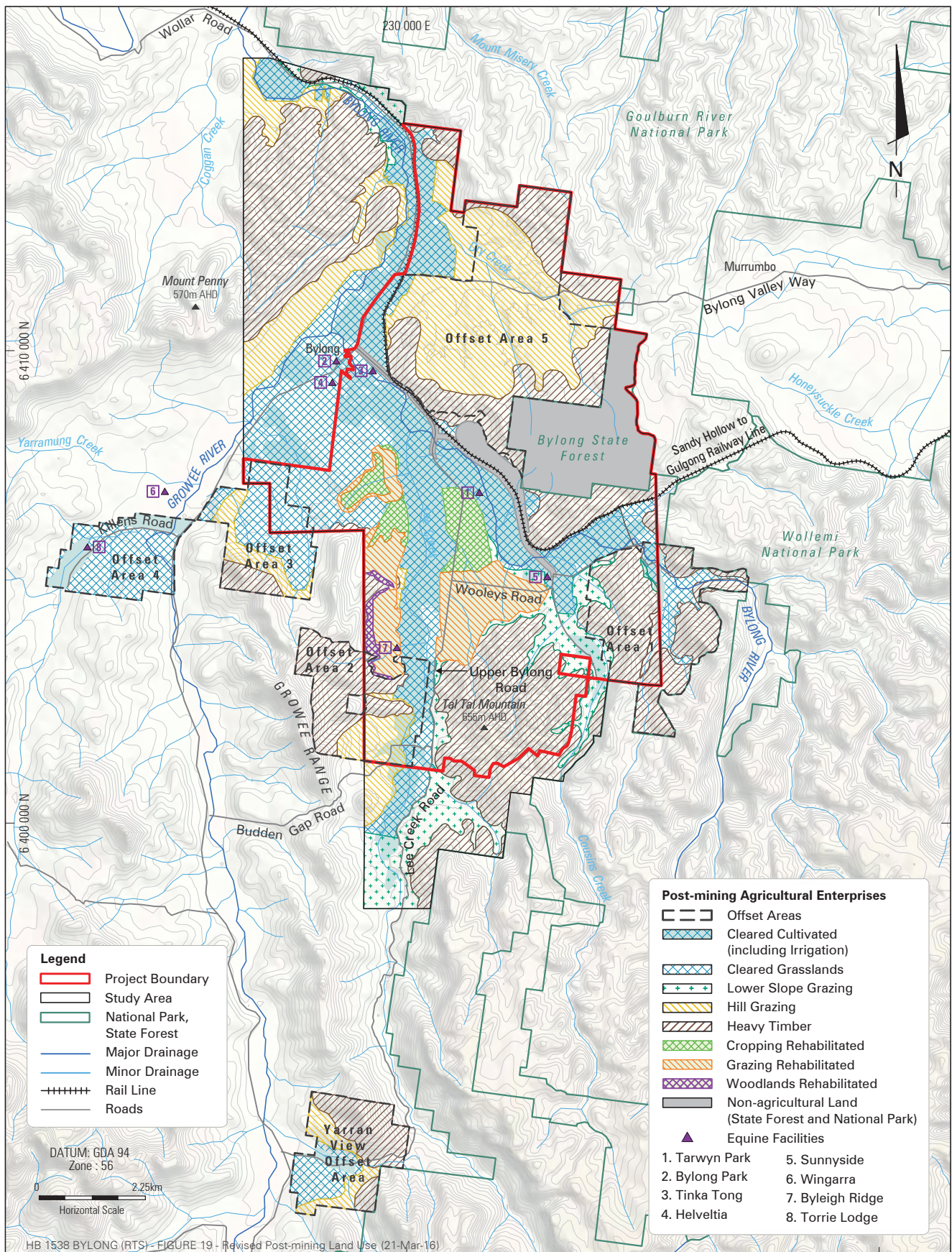
Recommendation

KEPCO notes these mistakes and corrects them in later correspondence.

Response

Noted.

KEPCO will apply to the EPA at the appropriate time to obtain an EPL and Radiation Management Licence. A copy of the Post-Mining Land Use Figure (Figure 62 of the EIS) has been revised and is included in this RTS as **Figure 19**.



HB 1538 BYLONG (RTS) - FIGURE 19 - Revised Post-mining Land Use (21-Mar-16)

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4.11.14 Impacts to Aboriginal Sites from Subsidence

Issue

The RPS assessment of areas to be affected by underground mining identified 51 Aboriginal sites. The majority of these sites are low scatters of stone artefacts and isolated finds located in the Bylong State Forest where timber harvesting has had an effect on site integrity. OEH points out that as in all forest environments ground surface visibility is not optimal for sighting stone artefacts and other archaeological surface features, consequently surveys in forests are restricted to vehicle tracks and local surface erosion. Therefore it is a reasonable assumption that the RPS results of low site density may be a conservative estimate.

In considering the potential of harm to Aboriginal sites in the forest areas OEH accepts the specialists subsidence report conclusion that impacts to artefact scatter sites and isolated finds in the subsidence areas will be minimal from underground mining (MSEC:2015:70).

Response

KEPCO acknowledges that the number of surface artefacts identified in the underground mining area is a conservative estimate, as other than on tracks, vegetation cover obscured much of the ground surface. This has been correctly reported as per the relevant OEH guideline (i.e. *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW*) in Appendix 2 of the AACHIA (Appendix S of the EIS).

KEPCO acknowledges OEH's acceptance of the specialist's subsidence report's conclusions that impacts to artefact scatters and isolated find sites will be minimal from underground mining.

4.11.15 Ochre Site OQ0001

Issue

Site OQ0001 is described by RPS as an ochre site located in rugged terrain of the State Forest in the vicinity of the proposed underground mining. OEH understanding of the RPS site description is that it comprises a layer of varied coloured mineral deposits and that there is evidence of extraction warranting RPS to categorise it as an archaeological site. RPS has also remarked on the significance of the colours based on gender interpretation. The site has been reported as high in significance.

OEH assumes that the RPS interpretation of OQ0001 is accurate. RPS provide limited information about the site and the source of information regarding the gender use of ochre colours is not cited.

RPS has selected the site for research and detailed recording but there are reported concerns that it may be affected by subsidence (MSEC 2015).

Recommendation

OEH supports RPS management proposals for site OQ0001. However, due to the reported significance of the site, OEH recommends prior to approval of the project, a rock art specialist with expertise in the management of ochre sites is involved in recording and be available to contribute to the management and mitigation of the site.

Response

Information on the gender use of the ochre colours was provided in confidence by a representative of a Registered Aboriginal Party (RAP) who did not wish to be specifically cited for this information.

As a consequence of OEH's EIS submission, Hansen Bailey arranged RPS to engage Ben Gunn as the rock art specialist to evaluate the reported ochre quarry site. Ben Gunn has over 30 years' experience in Australian rock art analysis, including experience with ochre quarries. He has over 30 publications in refereed journals throughout Australia.

Ben Gunn undertook an inspection of the site (OQ001) on 20 January 2016 with RPS Senior Cultural Heritage Consultant Laraine Nelson and WorleyParsons Community Liaison Officer Cassie Jones. An updated recording and specialist evaluation of the site was undertaken.

The specialist evaluation concluded that although there were several exposures of pigment quality ochre, *"no evidence of Aboriginal quarrying or other signs of use was detected and, consequently, it cannot be regarded as an archaeological site."* Accordingly, the site is now referred to as an ochre site rather than an ochre quarry as reported within the AACHIA.

The results of this specialist evaluation will be discussed with the RAPs as part of the Aboriginal Archaeology and Cultural Heritage Management Plan (AACHMP) and additional information added to the Aboriginal Heritage Information Management System (AHIMS) site card as required.

In order to contextualise the chemical signature from the site a sample of red ochre is to be analysed and compared with ochre noted in the Bylong Valley Way road cutting outcrop, as it appears there are numerous sources of ochre in the region which may be geologically comparable and thus part of a larger ochre body running through the sandstone.

A copy of the Assessment of the Reported Ochre Quarry is presented in **Appendix L**.

4.11.16 Axe Grinding Groove Sites

Issue

RPS has recorded several axe grinding groove sites in good preservation. RPS has reported concerns regarding one of the axe grinding groove sites, GG004, which has been assessed by the subsidence specialist as likely to be impacted from underground mining but may equally be affected by putting in place physical measures to lessen harm from subsidence (MSEC 2015). RPS has identified the site of high significance and recommended detailed recording.

Recommendation

- 3.1 *OEH supports the RPS recommendation for detailed recording of GG004 if it is not possible to modify the mine plan to avoid impact.*

Response

Noted.

4.11.17 Impacts to Aboriginal Sites in the Disturbance Footprint

Issue

RPS reports that 95 Aboriginal sites will be affected by the mine proposal within the disturbance boundary. The majority of these comprise stone artefacts.

The RPS assessment report contains no interpretive lithic analysis of any of the artefacts discovered during the field survey. Coarse descriptions about the artefacts present only limited descriptions of the sites generally. The authors have ranked the significance of the artefact scatter sites based primarily on presence of multiple raw materials, artefact estimates and land use disturbance history. There is no organised data in the report that provides context to understanding the RPS summary descriptions. RPS has recommended salvage of all artefacts but do not refer to an analysis of the artefacts.

The RPS report shows that stone artefact sites are more frequent and more representative of the evidence of Aboriginal occupation across the variety of landforms within the mine lease. The interpretation of Aboriginal heritage across the mine lease will therefore hinge significantly on identifying what patterns of stone tool manufacture, use and discard can be drawn from analysing the artefacts to support identifying the mode of Aboriginal occupation especially when differences in land use that may be drawn from interpreting the relationships of Aboriginal sites among the varied landforms that intersect the mine easement. The RPS statements of significance have been reached by examining the heritage values on a site by site basis.

OEH recognises that the disturbance history recorded at each site has altered the appearance of each site but information from studying the stone artefacts remains available for developing insights into Aboriginal occupation of the Bylong Valley. The distribution of a large number of artefact scatters across the various landforms (RPS 2015:40-52) presents an interesting investigation result which needs to be explored further.

Recommendation

- 4.1 *Develop a lithic analysis program as part of the artefact salvage exercise for artefacts. The analysis must be adequate in producing interpretative insights into Aboriginal land use.*

Response

A lithic analysis program will be developed based on the significance for a sample of sites as part of the proposed salvage program to take place prior to the initial construction activities.

The recording will include documentation of, where relevant, the raw materials, artefact type, extent of reduction (artefact dimensions, weight and cortex), identification of reduction sequences, tool manufacture, use, discard and identification for specialised activities (backed artefact manufacture, or hatchet production for instance). The analysis will include the extraction of relevant information for characterising the nature of the assemblage in terms of artefact and raw material richness and diversity, patterns of reduction, artefact typologies (and chronology if discernible), these components of the analysis will then be used to analyse if there is spatial patterning across the landscape and particularly whether assemblages on the footslopes differ from those in the alluvial valleys and interpret whether this can be attributable to patterns of Aboriginal occupation in the landscape or whether it is influenced by more recent land-use history.

4.11.18 Cumulative Impact Assessment

Issue

OEH understanding of the RPS assessment of cumulative harm to Aboriginal sites is that it is based on a method designed from the RPS site distribution model and a prediction of site frequency across a regional parameter selected by RPS.

RPS concludes that the proposed harm to 144 sites within the mine easement is less than 1% cumulative impact based on a single record of an Aboriginal Heritage Impact Permit and that regionally the proposed cumulative harm is estimated to be less than 7%.

OEH recognise the effort by RPS in attempting to assess the cumulative harm to Aboriginal sites within the mine easement especially in lieu of no guiding material. However OEH views the results of the RPS exercise with caution because the main components of the RPS model are built on subjective interpretations and this potentially weakens the logic inferred from the RPS exercise. For example the RPS method is built on models it produced for predicting sites and interpreting site and landform relationships without discussion on the robustness of those predictions or interrogating the data. The RPS model is also silent on the cumulative impacts on Aboriginal heritage from pastoral and agriculture land use, nearby major mining precincts, nearby commercial forestry land use and major utilities and infrastructure.

Response

The cumulative impact assessment model examines the relative proportion of sites identified in alluvial valleys compared with ridgelines. The data collected from the Project identified that 81% of sites were identified in the alluvial valleys and 19% were identified on the ridgelines. This is based on systematic survey of these landforms as part of the field components of the assessment. In the cumulative impact assessment study area, the other most relevant systematic survey was undertaken at the former Mt Penny Project.

Aboriginal sites on alluvial valleys comprise 79% of sites with 21% of sites occurring on ridgelines. Thus, the predictions of archaeological sites, based on the similar systematic surveys in the cumulative impact assessment study area, are very similar ± 2 percent. On the basis of available information, the proportion of sites in alluvial valleys compared with ridgelines is consistent.

The AHIMS contains information and records about Aboriginal objects that have been reported to the Secretary of the Department of Premier and Cabinet. The AHIMS information includes Aboriginal site status valid or not valid; whereby valid sites are sites which are considered to be extant; whereby sites which are not valid, have been salvaged or destroyed under an Aboriginal Heritage Impact Permit (AHIP) or equivalent consent mechanism.

The AHIMS search result does not contain information on impact from pastoral, agricultural or forestry unless a specific consent or AHIP has been applied for previously, it also does not contain information impact from mining, major utilities or infrastructure where impact occurred prior to the introduction of the NSW *National Parks and Wildlife Act* in 1974, or where impact could be undertaken without consent. On the basis of information available from AHIMS search results, there is no quantitative mechanism for understanding impact on Aboriginal heritage from pastoral, agricultural or forestry activities, or other activities if they occurred prior 1974. Thus only a qualitative approach to cumulative impact from these activities can be undertaken and effects of this are discussed below.

The alluvial valleys in the CIA study area have been extensively cropped or subject to pastoral activities. The level to which this has impacted sites will vary across the cumulative impact assessment study area, but, experience from the Bylong survey is that the subsurface soils across the majority of the alluvial valley have been disturbed. Areas of potential archaeological deposit (PADs) therefore were only identified in the lower slopes adjacent to the alluvial flats (as these areas had not been subject to intensive agriculture).

Impact to the alluvial flats has resulted in the displacement, but, not removal of artefacts and thus some information could be gained from the detailed analysis of surface artefact assemblages (these would not be able to be placed easily into a chronology of occupation). Artefacts in the alluvial valleys have already been displaced from previous activities; it is proposed that the surface artefacts are collected and analysed prior to the commencement of open cut mining and emplacement of infrastructure associated with the Project. Thus the Project will only incrementally increase the cumulative impact to these sites, as they have already been displaced by previous land use activities.

4.11.19 Regional Archaeological Context

Issue

The regional archaeological context is introduced on pages 29 and 30 and involves the results of the RPS AHIMS search of previously recorded sites (118). RPS has also undertaken a summary of previous archaeological investigations for the region which have been used to summarise archaeological context for the region. OEH identifies limitations for example, RPS has made no reference to archaeological data of investigations available from the nearby Ulan, Wilpinjong and Moolarben coal precinct which has over the years exposed a rich data base of archaeological information.

The RPS summary of the adjacent Mt Penny Coal project has been limited due to reasons of access. RPS was able to access a summary of key results of the Mt Penny project which include the identification of 24 archaeological sites of high significance among a population of 215 sites recorded for the project. The RPS discussion on the relevance of the 24 sites to the Bylong Coal project is constrained by limited access to all assessment information from the Mt Penny project and differences in landform interpretation.

Response

RPS was only able to get information on some of the Mt Penny sites, but key sites and findings were included in the analysis. There are currently no OEH guidelines on the extent of land which needs to be considered for cumulative impact assessment, thus the AACHIA methodology selected the size of the cumulative impact assessment Study Area to be 25 times the size of the impact area, that included 75,000 hectares of land surrounding the Project. Thus this cumulative impact assessment Study Area included the Mt Penny and Kerrabee Dam project areas. Ulan, Wilpinjong and Moolarben fall outside the cumulative impact assessment Study Area (they are over 30 km from the Project) and thus were not included for the cumulative impact assessment analysis.

For reference, summaries for the Ulan, Wilpinjong and Moolarben localities have been included below.

Ulan

Ulan Coal Mine is located approximately 45 km northwest of the Project and is adjacent to the Goulburn River. The Ulan Project Area is approximately 5,400 hectares in size and identified 709 Aboriginal heritage sites (Southeast Archaeology 2009). Site types included 558 surface artefact sites, nine grinding grooves, 128 rockshelters (with artefacts, art or grinding grooves), five scarred trees, five stone arrangements, two ochre quarries, a waterhole/well and a grinding groove site with artefacts.

The study concluded that occupation of the study area was generally of a low intensity (Southeast Archaeology 2009:142, 147). This was inferred to be partly related to the study area being comprised of higher order watercourses.

The study area comprises elevated ridges with outcropping sandstone which contain rockshelters, whereby the lower slopes and flats generally contain the surface artefact sites. This pattern was also identified as part of the surveys undertaken for the Project. Surface artefact sites at Ulan represented approximately 78.8% of the assemblage. For the Project, the figure was higher at 89.45%.

Ulan had a greater diversity of Aboriginal site types including rockshelters with art and stone arrangements and had higher proportions of other site types other than surface artefacts 21.2%, as compared with 10.55%. This suggests that there was a greater diversity of activities being undertaken at Ulan than at Bylong and this may reflect more frequent occupation, or specialised occupation for ceremonies or seasonal gatherings. Approximately half of the sites recorded were identified to be subject to surface or underground impacts (Southeast Archaeology 2009:197).

Wilpinjong

The Wilpinjong Coal Mine is located approximately 30 km northwest of the Project. The Wilpinjong Coal Mine is approximately 3,700 hectares in size and encompasses flats and lower slopes adjacent to Wilpinjong Creek, but, extends into ridgeline areas to the south. The survey identified 293 Aboriginal sites including 133 open artefact sites, 124 rockshelters with PADs and 12 rockshelters with other site features such as art, artefacts, ochre or waterhole/well, eighteen possible scarred trees and 2 scarred trees and four waterholes/wells. Compared with the Project (and also Ulan and Moolarben), Wilpinjong had a much lower proportion of surface artefacts, approximately 45%, compared with 78-91% from the other projects within the region. This is primarily a result of the high numbers of rockshelters identified at Wilpinjong.

There are some inaccuracies in the data for the rockshelters as discussed by Southeast Archaeology (2015:71-73) and it could be that rockshelters are over represented as a result. On the basis of surface artefacts and rockshelters with artefacts, art, ochre or waterhole/wells, the site patterning is similar to the other projects with the majority of surface artefacts being identified on the flats and lower slopes and the rockshelters indicating occupation of the ridgelines. Approximately half of the sites recorded were identified to be subject to surface or underground impacts (Southeast Archaeology 2015:126).

Moolarben

Moolarben Coal Mine is located directly south of Ulan Coal Mine and is approximately 40 km north-west of the Project. Moolarben, Murrangamba and Wilpinjong Creeks traverse the study area and sandstone ridges reach elevations of 620 m. The Moolarben project area is approximately 11,000 ha in size.

Similar to the Project, it comprises elevated ridgelines with outcropping sandstone as well as flats and lower slopes along the valley floors. Currently there has been 603 Aboriginal sites identified including 258 artefact scatters, 276 isolated finds, 52 rockshelter sites, 9 PADs, 5 grinding groove sites, 2 scarred trees and an ochre site.

Approximately 89% of sites comprised surface artefacts which is very similar to the proportion identified as part of the Project (89.45%). The majority of artefacts were identified on alluvial flats and adjacent to drainage channels, whereas rockshelters were predominately confined to the ridgelines (Niche Environment and Heritage. 2015: 35-36). This site distribution patterning is similar the Project results.

Approximately 106 sites at the Moolarben Coal Complex have already been salvaged. Over half of the remaining sites were identified to be subject to direct or indirect impacts (MCO 2015).

4.11.20 Landform Analysis

Issue

Overall, RPS has produced an adequate presentation of the landform variation and distribution across the mine easement and this has been useful for measuring the frequency and distribution of Aboriginal sites for each landform type. The identification of landform categories has proven to be successful in aiding the RPS sample survey of the mine easement. The RPS landform descriptions and photographic record show the physical setting of the study area and how this has influenced the RPS site survey method and landform site analysis. OEH notes:

- *The study area is flanked by rugged terrain (landform units 2&3) (OEH appreciates the difficulty this has presented for the field survey teams),*
- *Aboriginal sites are distributed across all landform types (bar one),*
- *The landform descriptions although generally course in description provide a suitable unit of analysis to be later used when detailed analysis of sites are likely to take place post approval.*

OEH considers that an estimated percentage of land use disturbance per landform type would have assisted in understanding the extent of disturbance across the easement.

Response

Table 19 provides a summary of the land disturbances per landform unit for the Project. **Table 19** has been ordered according to landform representation across the Study Area (Figure 9 of the AACHIA). Disturbance in landform units 2, 4, 5 and 6 was mainly due to vegetation clearance for unsealed vehicle tracks and there was some vegetation still extant in these landform units.

Landform units 7, 8, 9 and 11 have been heavily cleared and used for pasture or cropping, with landform units 7 and 8 particularly disturbed from cropping practices. Landform unit 3 contained disturbance associated with the existing quarry and associated vehicle tracks. Due to their inaccessibility to vehicles, as well as steepness landform units 3 and 10 were undisturbed.

Table 19
Land Disturbances Per Landform Unit

Landform Number	Landform ID #	Hectares	Number of Sites	Percentage of Sites	Disturbance Percent	Sites Per 100 Hectares
5	Steep Rolling Hills	587	25	10.46%	10%	4.3
9	Footslopes	477	56	23.43%	70%	11.7
7	Alluvial Plain	422	33	13.81%	90%	7.8
2	Mid to Upper Jointed Sandstone	348	19	7.95%	5%	5.5
3	Stepped Creeks and Terraces	324	53	22.18%	70%	16.4
4	Interlocking Spurs and Creeklines	321	28	11.72%	20%	8.7
11	Flats and slopes adjacent to major channel.	189	18	7.53%	90%	9.5
8	Volcanic Capped Hills	165	2	0.84%	80%	1.2
10	Incised V-Shaped Creeklines and Slopes	128	0	0	0%	0.00
6	Cobbled Creeks and Flat Terraces	47	4	1.67%	10%	3.1
1	Cliffines	34	1	0.42%	0%	2.1

4.11.21 Landform and Site Analysis

Issue

The landform and site analysis section of the report (RPS 2015:57) divides landforms (11) into two general environments, the Dry Creek Catchment (affected by subsidence) and the Bylong River Valley (project disturbance boundary) and used each to identify patterns of Aboriginal sites distribution. Elsewhere in the report (pp83 – 84) landforms are divided across the alluvial valley and ridgelines. This is confusing for the reader but it is assumed that the category alluvial valley is the same as that described as the Bylong River Valley and likewise the ridgelines are representative of the Dry Creek Catchment.

The decision to rationalise the total number of landforms from 11 to 2 broad types (alluvial and ridgelines) for analysis purposes is a reasonable approach for highlighting the highest density of sites (Bylong Valley) and because of the complexity and variation of landform diversity. However this approach can over-simplify results and as a consequence the interpretation of Aboriginal sites can be equally over-simplified in regards to developing significance statements. The landform site analysis is yet to provide an insight of Aboriginal land-use across the areas affected by the mine easement other than common generalisations about Aboriginal site distribution patterns.

OEH is of the view that additional archaeological site research including stone artefact analysis will substantially improve knowledge of Aboriginal occupation by overlaying the results of artefacts analysis with each landform category. This will also better inform Aboriginal people when they are forming a cultural view point on the archaeological findings overall.

Recommendation

8.1 Incorporate artefact analysis with spatial landform data to support analyses in recommendation 16.1

Response

The purpose of using 11 landform units for the description of the Project survey was to identify localised patterning of site distribution. These landform units can only be identified by an on-ground survey of the area and are not able to be derived from topographic maps. By contrast, the cumulative impact assessment had to use available data from topographic maps in order to characterise relative proportions of landforms. As detailed landform mapping was not available (and survey of the cumulative impact assessment study area not feasible), it was necessary to consolidate landforms units into more simplified units.

For the interpretation of the Project study area, the detailed artefact analysis will be undertaken prior to impacts. A framework of the methodology for this analysis has been outlined in the response to issue 4 (see **Section 4.11.17**).

4.11.22 Aboriginal Consultation

Issue

OEH has examined the consultation section of the RPS report that details the engagement and consultation with the Registered Aboriginal Parties (RAPs). OEH has also examined the detailed responses by the RAPs which appear in Appendix 1. The consultation is consistent with the procedures set out in the OEH consultation guidelines (2010) which is listed in the SEARs as the means for identifying Aboriginal people affected by the mine proposal and the method of engagement.

OEH has noted a consistent theme of issues raised by the RAPs in their written responses about inadequate survey coverage. This issue relates to the sampling strategy used by RPS and which likely includes factors of landform diversity, size of area and whether the sample coverage has been sufficient for adequately investigating ACH. OEH has not sighted an adequate written response to the RAPs concerns and believe that a response is warranted.

Recommendation

9.1 Prepare adequate response to the RAPs regarding issues on survey coverage and include OEH in that response.

Response

The survey coverage issue which was initially raised in response to the Draft Survey Methodology was adequately addressed by revising the survey methodology prior to the field work commencing. RPS acknowledges the ordering of documents in Appendix 1 of the AACHIA may have made this unclear, whereby the revised methodology was placed before RAP responses.

There were no objections received in relation to survey coverage between April 17, 2014 and January 2015, despite undertaking the survey, workshops and meetings. In January 2015, ten responses to the draft report were received, of which two directly referred to the inadequacy of survey coverage and two responses indirectly referred to this as an issue. The majority of RAPs were satisfied with the level of survey coverage once the survey methodology was revised prior to the survey.

The Project Area has also been extensively surveyed as part of preliminary investigations. Between 2011 and 2015, RPS archaeologists have undertaken over 30 due diligence inspections in the area, as well as works relating to the cliff lines. This equates to over 50 days of fieldwork. This combined with the fieldwork undertaken for the AACHIA equates to more than 75 days of survey coverage for the Project.

4.11.23 Identification and Assessment of Cultural Significance

Issue

OEH is not satisfied with the cultural significance sections of the report for the following reasons:

- The method used by RPS to seek information of cultural places offers little in way of understanding how places of Aboriginal importance (cultural significance) were identified.*
- The application of OEH guidelines (2011) has not been executed well with respect to the identification and assessment of cultural significance (OEH 2011:7).*
- A significant number of sites (29) described as cultural features are listed as likely to be impacted by subsidence. The sites comprise mostly of exposed sandstone bedrock with varying degrees of weathering and which are prone to cracking from underground mining (MSEC 2014, STC 2014). RPS has documented that there is a disparity of views among the RAPS on the cultural significance of the features and this is confirmed by the written responses from RAPs (Appendix 1).*
- OEH believes that the problems associated with how the cultural values assessment was conducted will present challenges on determining the appropriate mitigation needed for safeguarding the sites given the ambiguity surrounding the claims of cultural importance.*

- *OEH also note that the RPS report recommends further recording of the features during the post approval management plan process but RPS does not provide what information will be recorded and how it will be recorded and used for what purpose, given the first two points above and notably OEH (2011:7).*

Recommendation

10.1 Engage suitably qualified expertise to progress the identification of Aboriginal cultural values for those areas affected by the proposed mine but which draws in the regional context of documented cultural values.

Response

Under the OEH guidelines (2011:7), cultural values may include the following:

- Known places of social, spiritual, cultural value, including natural resources of significance;
- Known historic places;
- Known Aboriginal objects and/or declared Aboriginal places; and
- Potential places/areas of social, spiritual, cultural value, including natural resources, historic or archaeological significance.

The 29 cultural features identified were not known places and were not raised prior to their identification in the field surveys. They should be regarded as potential places/areas of social, spiritual, cultural value, including natural resources, historic or archaeological significance. As part of the AACHMP, the values attached to these cultural features will be further documented in relation to the regional context of documented cultural values.

4.11.24 Management Options

Issue

OEH notes the proposal to test excavate 9 small sandstone bedrock shelters with varying degrees of cavernous weathering as a way of mitigating potential impacts from subsidence. Based on the information made available to OEH the shelters show nil to scant evidence of Aboriginal objects and shelter floor deposits do not exceed 30cms. It is therefore likely that exposing datable features is expected to be low. The survey assessment has documented that an inspection of each shelter for cache burials, art and other items of cultural importance has been completed but with nil result. The reason for further detailed excavation lacks a clear rationale. OEH makes the assumption that RPS archaeological field judgements are appropriate for the proposed test excavations of the rock shelters. OEH makes comments based on the information contained within the assessment report.

OEH raises this matter because the OEH review of the ACH assessment has not identified a clear rationale for excavating select areas of the valley floor where the bulk of the sites to be impacted by the mine will occur. Despite the RPS results recording surface erosion at each of the surface valley sites there maybe merit in test excavating a selection to determine if surface observation are confirmed or, if a greater number of artefacts are revealed. Either result would assist in reaching an interpretation of the intensity of Aboriginal land use. OEH supports the proposal to test excavate the two foot hill sites.

Recommendation

11.1 Develop a test excavation program for suitable localities on the valley floor incorporating an analysis of results with 16.1 and 20.1.

Response

RS007 was the largest rockshelter identified in the Project Study Area, although its internal PAD was only up to 30 cm in depth, as estimated by a flag probe test. This should be regarded as a minimum indication of deposit as the results may have been skewed by previous rockfall. There is also a flat habitable area immediately outside the rockshelter which may have also been used for occupation. There is potential for datable deposit inside the rockshelter. As this is the only example of a large rockshelter with habitable floor inside and outside the shelter, it has been selected for further investigation.

RS013 is the only rockshelter site in the Project Study Area identified with artefacts on the floor surface and should be subject to surface collection and limited subsurface testing to recover any additional artefacts. However, the deposit is not intended to be dated. As it is the only shelter with this attribute, it has been selected for further investigation.

In light of OEHs comments, RPS considers that the remaining 7 rockshelters are unlikely to provide datable material and thus will not include them in the excavation methodology.

A test excavation methodology will be developed for suitable locations on the valley floor as part of the AACHMP in consultation with the RAPs. Thus only a framework for this methodology has been provided and is outlined below.

The test excavation will be undertaken as a phased methodology in accordance with the Project disturbance timeline. The areas for test excavation have been outlined in Figure 8 of the AACHIA. The investigation methodology will include the selection of 1 m x 1 m test pits to be excavated by hand to identify subsurface soil characteristics as well as the presence or absence of artefacts. The 1 m x 1 m test pits will be dug in arbitrary spits of 0.1 m unless clear strata are observed, in which case they will be excavated by stratigraphic unit; these spits and units will be removed until clay is encountered, or pits terminated if there archaeological sterile deposit is encountered, or if it is unsafe to excavate further. All material from the test pits will be hand sieved in order to identify the presence of any artefacts. If artefact concentrations are identified, then further test pits will be undertaken.

Artefact concentrations are defined for the purposes of this framework as complete flakes or complete cores over 2 cm in length in frequencies of >20 per 0.1 m² (i.e. over 20 artefacts in one 10 cm spit in a 1 m x1 m test pit). Special features may include hearths, heat treatment pits, or other features as determined by the archaeologist will also trigger further archaeological testing of the area.

Artefact concentrations will be examined by excavating adjacent pits in order to follow the artefact concentration; although in some instances outlier pits offset by several metres may also be used to examine the artefact concentration. Special features will be examined using pit configurations suited to the type of feature uncovered.

Excavated pits will be documented through photography, field notes, section drawings and plans. Artefacts will be bagged and labelled for later analysis and recording within the laboratory. Artefact recording will be undertaken using the same methodology as the salvage of the surface sites in order to ensure comparability between these two data sets and to enhance the interpretative value of the surface and subsurface assemblages. Analysis of artefacts will be undertaken with reference to the analysis of results with 16.1 and 20.1.

4.11.25 Aboriginal Cultural Heritage Offsets

Issue

The RPS report discusses cultural offsets which has been raised in consultation with the RAPs (RPS 2015: 99-100). OEH view is that the proposals are not offsets they are actions commonly used to mitigate harm in major projects.

Mitigation refers to the sequence of steps required to avoid or mitigate harm to sites and objects at threat from the mine proposal. The RPS recommendations to manage Aboriginal heritage at the Bylong Coal project are mitigation and includes the salvage of all archaeological material in addition to RPS recommendation for further detailed recording and investigation. The Aboriginal cultural offsets proposed in the RPS report (2015:99) continue within the same mitigation hierarchy where by the proposed actions concern the management of salvaged artefacts and further information gathering for example, oral history. These are not offsets but actions to mitigate harm.

The idea of Aboriginal offsets is slowly taking root across major coal producers but the concept of offsets for ACH has had no exposure to the same rigour and set of principles that underpin biodiversity offsets. In lieu of no formal policy in this area, but supportive of RPS effort, OEH recommend that ACH offsets be a consideration for further discussion for the Bylong Coal project despite the late timing of raising this topic.

Offsets for ACH must follow some of the guiding principles for biodiversity such as like-for-like exchanges, assessed against the full range of values possessed by Aboriginal Cultural Heritage, and which must aim at net gain or net improvement in these full range of values.

Aboriginal Cultural Heritage offsets for the Bylong project should follow a landscape theme building on the RPS survey results where a range of evidence based values can be captured and re-produced into a landscape outcome. This is also in sync with comments from the RAPs on ACH assessment and their preference to view significance assessments based on landscape interpretation and not rely solely on a site by site basis (RPS has documented the RAP refusal to consider significance for sites singularly).

Permanent protection of Aboriginal sites is under-represented among the valleys of the central west of NSW. OEH advises that ACH investigations across areas selected as biodiversity offsets may later be suitable for Aboriginal Place nomination. Such an outcome would also provide for additional Aboriginal community expectations of keeping places, cultural camps and educational opportunities.

Response

It is acknowledged that the section entitled “Aboriginal Cultural Heritage Offsets” in the RPS report should be changed to “Mitigation of Impact to Aboriginal Cultural Heritage Sites and Features”.

Ongoing discussions with Aboriginal stakeholders regarding commitments from the proponent in relation to the implementation of relevant social, economic and/or conservation gains to offset the loss of cultural heritage will be undertaken as part of the AACHMP process.

4.11.26 Significance Assessments (Archaeological)

Issue

RPS has concluded that 90% of the archaeological sites in the survey area have been assessed as low in significance on a regional level. RPS has measured each site discovered during the field survey on the educational potential, research potential, representativeness and rarity.

OEH accepts that many of the sites recorded within the Bylong Coal project easement represent common examples of site types that are situated in varying levels of ground disturbance. The lack of site content analysis undertaken during the ACH assessment and the limited response to the Mt Penny project ACH assessment which identified 24 highly significant archaeological sites in a neighbouring valley, has presented challenges for OEH to provide concise advice on the merits of RPS significance assessment. In addition to the mixed responses from the RAPs of the assessment, RPS conclusions on site significance are less than robust.

Response

RPS identified 25 Aboriginal sites as having high local significance and of these, seven, were assessed to have high local and regional significance. Incorporating the results of the recent investigation of the ochre source, this number reduces to 24 for local significance and six for regional significance.

This assessment of significance was based on the OEH 2011 Significance Assessment Methodology as outlined in Section 7 of the AACHIA (Appendix S of the EIS). Sites of high significance at the former Mt Penny Project included the following site types: modified trees, grinding grooves and PADs. These site types at Bylong were also identified as having high significance. Other sites at the former Mt Penny Project which were of high significance included those with evidence for hearths. No sites identified during the surveys for the Project contained hearths and therefore this site type is not comparable between the two projects.

The former Mt Penny Project contained 15 sites with over 100 artefacts (ARAS 2012: 129) and thus a detailed site content analysis was undertaken. These sites had adequate sample size in order to carry out this type of analysis. By contrast, the Project only identified six artefact scatters with over 20 artefacts and thus the sample of artefacts available for analysis was constrained. Due to the smaller size of artefact scatters at the Project compared with the former Mt Penny Project, detailed site content analysis was not deemed warranted.

4.11.27 RPS Mitigation Measures

Issue

The RPS recommendations for mitigating harm to Aboriginal sites are supported for inclusion in an Aboriginal Cultural Heritage Management Plan (ACHMP). However, the ACHMP should also include an adequate research program that addresses the issues raised in this submission.

Response

An AACHMP will be prepared for the Project. It will include methodologies for the recording and analysis of artefacts as outlined in **Section 4.11.17** as well as a methodology for test excavation as outlined in **Section 4.11.24**. The AACHMP will be prepared in consultation with the RAPs.

4.12 TRANSPORT FOR NSW – RA12

4.12.1 Number of Movements to the Site

Issue

The Traffic and Transport Assessment (Traffic Report) provides the number of vehicle movements generated by development in the Traffic Report. TfNSW requests that the applicant also includes tonnages transported by road in the Traffic Report. Tonnages should be broken down into mining input types, including dangerous goods.

Response

Section 5 of the revised TTIA (**Appendix D**) provides further details on the tonnages of material transported to and from the Project. In summary, a breakdown of mining input, vehicle type and vehicle tonnages includes:

- Concrete and other building materials, single rigid vehicle, medium rigid vehicle or heavy rigid vehicle, truck tonnage 10 tonne;
- Pipe, structural and other building materials, semi-trailer, truck tonnage 9 tonne;
- Bulk materials, fuel, CPP consumables, B-Double, truck tonnage 26 tonne;
- WAF housing, equipment and furniture, heavy rigid vehicle, truck tonnage 10-12 tonne;
- WAF operation, linen, food, service, waster, maintenance, heavy rigid vehicle, truck tonnage 10-12 tonne; and
- Oversize and over mass vehicles greater than 42.5 tonnes.

4.12.2 Heavy Vehicle Types

Issue

The Traffic Report provides the number of heavy vehicle movements generated by development in the Traffic Report. TfNSW requests that the applicant also includes the details of heavy vehicle type in the Traffic Report.

Response

The following heavy vehicle types are proposed for the Project:

- Concrete and other building materials, single rigid vehicle, medium rigid vehicle or heavy rigid vehicle, truck tonnage 10 tonne;
- Pipe, structural and other building materials, semi-trailer, truck tonnage 9 tonne;
- Bulk materials, fuel, CPP consumables, B-Double, truck tonnage 26 tonne;
- WAF housing, equipment and furniture, heavy rigid vehicle, truck tonnage 10-12 tonne;
- WAF operation, linen, food, service, waster, maintenance, heavy rigid vehicle, truck tonnage 10-12 tonne; and
- Oversize and over mass vehicles greater than 42.5 tonnes.

Refer to Section 5 of the revised TTIA (**Appendix D**) for further detail.

4.12.3 Dangerous Goods Routes

Issue

No information is provided in the Traffic Report in relation to the details of the dangerous goods routes to the site. TfNSW requests that the applicant assesses access routes to the site based on the relevant Regulations to confirm that these routes are suitable for carrying dangerous goods.

Response

Transport of dangerous goods to the Project site is to adhere to the *NSW Dangerous Goods (Road and Rail Transport) Act 2008* and *NSW Dangerous Goods (Road and Rail Transport) Regulation 2014*.

Consultation with MWRC, MSC, the RMS and relevant agencies would be undertaken in determining the preferred route for the transport of dangerous goods.

It is proposed that the following State and Main roads will be utilised for transport of dangerous goods to the Project site:

- Golden Highway;
- Castlereagh Highway;
- Ulan Road;
- Wollar Road; and
- Bylong Valley Way.

4.12.4 Service and Delivery Vehicle Route

Issue

It is not clear from the Traffic Report that direct routes from the Golden Highway have been considered for the traffic assessment. Section 4.7 of the Traffic Report states the following:

"Service and delivery vehicle trips were distributed according to the most accessible routes and direction from which the vehicles will likely to travel, i.e. service and delivery vehicles are most likely to travel from Sydney, Newcastle and Muswellbrook (either on Golden Highway and Ulan Road and Wollar Road or along Wollar Road to the north-west)."

It is noted that Ulan-Wollar Road which is an approved B-Double route and this route provides a more direct route compared to Ulan Road and Wollar Road. TfNSW requests that the applicant assesses the following:

- *Feasibility of using Ulan-Wollar Road as a heavy vehicle route for the proposed development.*
- *Improvements needed on Ulan-Wollar Road for heavy vehicle movements.*

Response

The revised TTIA (**Appendix D**) has been revised to include an assessment to the regional study area and includes construction, service and delivery trips to and from the Golden Highway, including the intersections of the Golden Highway with Bylong Valley Way and Ulan Road.

The majority of service and delivery vehicles are expected to travel from the Hunter region via the Golden Highway and utilise either Ulan Road or Wollar Road or in some instances the Bylong Valley Way to access the Project site and WAF. Project traffic generation is discussed in Section 5 of the revised TTIA (**Appendix D**).

The volume of Project related traffic anticipated to and from the Golden Highway and Ulan Road intersection via Ulan Road and Ulan-Wollar Road to the Project site is minimal (less than 5% of Project traffic in the AM and PM peak with up to 5 vehicle movements in both directions) in the context of other Project related traffic and the preference for the Project is to utilise Wollar Road from Ulan Road instead. Wollar Road is an approved B-Double route.

Ulan-Wollar Road is currently utilised by both Wilpinjong and Moolarben mines. Sections of this road remain unsealed and include several level railway crossings. This route is not the preferred route to the Project and is not a State or Main road.

Ulan-Wollar Road east of the Wilpinjong mine would need to be sealed should it be the preferred route for Project related traffic.

4.12.5 Number of Train Movements During Operation

Issue

The calculation of the number of train movements (up to 2.1 trains per day at peak operation) are based on the ARTC's aspirational train standard which is 96 wagon (9,200t payload and overall length of 1,610 m) trains are used. Section 2.10.2 of the Traffic Report states the following:

"ARTC's 2014-2023 Hunter Valley Corridor Capacity Strategy acknowledges that the aspirational 1,610m train is not required for current contracted volumes and will require extension of two existing passing loops on the Sandy Hollow to Gulgong Railway line. It is unlikely that this train length will be instituted within the Project development period and accordingly, the design of the Bylong Coal project balloon loop is based on ARTC's published guideline length of 1,543m, with sufficient in length to hold an empty train prior to the loader, and a full train after the loader, off the main line."

It is noted that the current maximum train used on the Ulan line is 91 x 120t wagons with a payload of 8,800t and overall length of 1,543m. TfNSW requests that the applicant estimates the number of train movements based on the current maximum train used on the Ulan line.

Response

Based on these revised figures, the assessed rail movements from Table 8-3 of the NBIA remain consistent, and the resulting impacts on rail noise levels on the Bylong-Mangoola and Bengalla-Muswellbrook sections (Tables 8-4 and 8-5) remain unchanged.

KEPCO has been in ongoing consultation with ARTC throughout the planning and design stage of the Project in light of rail access being an integral component of the Project. KEPCO has provided various modelling to ARTC in their consideration of how the Project's demand is able to be satisfied on the existing Sandy Hollow to Gulgong Railway line.

ARTC has completed a separate analysis using an assumed 8,428 net tonne train, with a current 88 wagon train at 98% loading, which is the smallest of the units servicing the Sandy Hollow to Gulgong Railway Line and would have the greatest impact on the lines capacity. ARTCs analysis equates to 1.1 round trips per day, or 2.2 trains per day. **Appendix B** provides a copy of a letter from ARTC dated 27 January 2016 confirming the results of this modelling.

4.13 ROADS AND MARITIME SERVICES – RA13

4.13.1 Request for Additional Information

Issue

The information submitted in support of the proposed mine is inadequate for Roads and Maritime to assess the road safety and traffic amenity impacts of the proposal. To enable Roads and Maritime to complete an assessment of the proposal, the following additional information is required:

- *Further analysis of the impacts of mine commuter traffic, in particular, on Wollar (MR208) and Ulan (MR214) Roads. The long commuter distance required between Mudgee and the Bylong Coal Project site cannot be relied upon to guarantee Bylong Coal traffic will not coincide with traffic generated by three other coal mines on Ulan and Wollar Roads. These three mines have scheduled shift changeovers to not coincide with the other mines' shift changeovers and to avoid local school bus pickup/drop off activities. In this regard, the applicant should consult with the three mines to understand their peak traffic generating operations and to quantify the cumulative impacts once construction and operation of the Bylong Coal Project commences.*
- *Details of how the applicant intends to ensure construction staff use the provided shuttle bus between the accommodation facility and the mine site.*
- *Details of how commuter traffic will be minimised and the interaction of commuter traffic with other road users (e.g. school bus route pick up/drop off activities) will be eliminated or reduced.*
- *The traffic analysis needs to extend to the intersections of Bylong Valley Way and the Golden Highway (HW27) and Bylong Valley Way and the Castlereagh Highway (HW18). In particular, Bylong Valley Way is a regional classified road which carries regional traffic.*

Based upon experiences with coal mines in the Mudgee and Gunnedah-Narrabri coal fields, it can be assumed that many employees and service contractors will have bases/links to the Hunter area and in this regard, the project will significantly increase traffic volumes and change the types of traffic using this road. The project is likely to also change travel patterns on this road (e.g. driving outside of daylight hours). The traffic analysis needs to address these issues and potential road safety risks for the full length of Bylong Valley Way and discuss measures to mitigate these risks.

- Additional traffic data in relation to the accommodation facility. Projected traffic data provided for the accommodation facility appears low and does not consider service traffic generation volumes such as cleaning, food, linen and maintenance services.*
- Clarification of the types and volumes of heavy vehicles and the routes used by these vehicles transporting to and from the mine site. Where appropriate, details of the transport routes required for these vehicles should extend to the Golden and Castlereagh Highways.*
- An agreement between Mid Western Regional Council and the applicant needs to be in place for the monitoring, maintenance and continued access for all road users on Bylong Valley Way in the event of subsidence or damage to the roadway caused by mining activities.*

Response

The TTIA (Appendix Z of the EIS) provided an assessment of the impacts of the Project on the intersections and roads in the immediate vicinity of the Project Boundary. A qualitative assessment was completed on the regional road network to satisfy the impacts further afield from the Project. The assessment area did not go as far as the State road network which includes the Golden Highway and the Castlereagh Highway which are relatively distant being approximately 60 km and 80 km from the Project itself.

A revised TTIA has been completed which includes further consideration of the potential impacts of the Project on the regional study area, including the impacts on Wollar Road and Ulan Road. The revised TTIA includes a consideration of the potential cumulative impacts of the Project with the three other mines within the MWRC LGA. Further detail is supplied in Sections 4 and 5 of the revised TTIA (**Appendix D**).

Parking facilities within the Open Cut and Underground MIAs has been designed to the capacity required for the local workforce. The limited capacity for parking will deter light vehicle use by employees residing within the WAF to travel to and from the WAF to the mine. Staff residing within the WAF will be required to travel to and from the mine via the shuttle bus provided. This will be reflected in site rules and induction procedures.

Commuter traffic will be minimised by the use of shuttle bus between the WAF and the mine sites and also by encouraging workers to carpool to and from Mudgee and surrounding locality.

The proposed staff shift start and end times of 7 am to 7 pm and 7 pm to 7 am will not coincide with school bus traffic and pick-up/drop off periods likely to occur on the road network within the regional study area between 7.30 am to 9.30 am and 2.30 pm to 5 pm.

The revised TTIA considers the intersections of the Golden Highway and Bylong Valley Way and Castlereagh Highway and Bylong Valley Way. The volume of employee traffic utilising these two intersections is dependent on whether the WAF is in operation or not, and if in operation, what its life span is. The majority of service and delivery vehicles are expected to travel from the Hunter region via Golden Highway and utilise either Ulan Road and Wollar Road or Bylong Valley Way to access the Project site and WAF. When the majority of staff are located in Mudgee and surrounds, travel during non-daylight hours would be more of an issue as to when staff return to their place of residence on weekends or non-working weeks. Potential risks along Bylong Valley Way include tight curves, narrow sections of road, culvert crossings, steep road grades in mountainous area, lack of line marking, areas of poor pavement quality and guide posting, impacts of sunlight and travel in darkness. Mitigation measures to be implemented for travel include driver training, encouraging carpooling, travel outside of school pick up and drop off periods, limiting travel in darkness if possible.

Traffic generation for the WAF have been updated to include all servicing and delivery requirements as well as construction vehicle demands for the Project. This requested detail has been included within Section 5.6 of the revised TTIA.

Transport routes to and from the Project site for both light and heavy vehicles has been revised to extend to the Golden Highway and Castlereagh Highway. The traffic distributions are shown in Figure 5.1, 5.2 and section 5.8 of the revised traffic and transport assessment.

The following heavy vehicle types are proposed for the Project:

- Concrete and other building materials, single rigid vehicle, medium rigid vehicle or heavy rigid vehicle, truck tonnage 10 tonne;
- Pipe, structural and other building materials, semi-trailer, truck tonnage 9 tonne;
- Bulk materials, fuel, CPP consumables, B-Double, truck tonnage 26 tonne;
- WAF housing, equipment and furniture, heavy rigid vehicle, truck tonnage 10-12 tonne;
- WAF operation, linen, food, service, waster, maintenance, heavy rigid vehicle, truck tonnage 10-12 tonne; and
- Oversize and over mass vehicles greater than 42.5 tonnes.

The types and volumes of heavy vehicles are included in Section 5 of the revised TTIA (**Appendix D**).

As explained in **Section 4.2.4**, KEPCO is in ongoing discussions with MWRC in relation to an agreement for the contribution to road maintenance on the road network used by the Project-related traffic.

4.14 RURAL FIRE SERVICE – RA14

4.14.1 Asset Protection Zones

Issue

Sufficient space must be provided for fire fighters and other emergency services personnel during a fire event, ensuring radiant heat levels permit operations while supporting or evacuating staff and occupants. Therefore, at the commencement of works, and in perpetuity, 100m Asset Protection Zones (APZ) shall to be provided around the following areas:

- i) All mining infrastructure and associated facilities/structures*
- ii) The accommodation facility and associated facilities/structures, and*
- iii) Open cut mining operations and entrances/exits to underground mining facilities.*

Note: All areas as indicated in Figure 18 (Conceptual Project Layout) of the EIS by Hanson Bailey dated 1 September 2015.

It is recognised vegetation removal/clearing will be required to facilitate such APZs, particularly north/north-east of the proposed mining infrastructure location. All proposed APZs may be divided into an inner protection area (IPA) (with a minimum distance of 70 metres), with an additional 30 metres maintained as an outer protection area (OPA). All APZs are to be managed as outlined within section 4.1.3 and Appendix 5 of Planning for Bush Fire Protection 2006 and the NSW Rural Fire Service's document Standards for asset protection zones.

Response

Noted. KEPCO has committed to preparing a Bushfire Management Plan and associated response system for the Project. The plan will be prepared in accordance with the relevant guidelines and standards, and in consultation with the RFS. All Project infrastructure and associated facilities that are constructed for the Project will also comply with the requirements of *Australian Standard (AS) 3959 Construction of Buildings in Bushfire Prone Areas*.

4.14.2 Property Access

Issue

To ensure safe access to and from the public road system for fire fighters providing property protection during a bush fire and for staff faced with evacuation, property access roads shall comply with section 4.1.3 (2) of Planning for Bush Fire Protection 2006.

Response

Noted. KEPCO will consult with the NRFS during the detailed design stage of the Project to ensure that the relevant requirements are met.

4.14.3 Water Provision

Issue

No evidence has been provided that indicate a reticulated water supply will be connected to the site. Therefore, at a minimum, a dedicated 20 000L water supply is to be provided for fire fighting purposes. The water source should be located within the inner protection area (IPA) and have a hardened ground surface for truck access supplied up to and within 4 metres of the water source.

Response

Noted. A series of raw water tanks with a capacity of 460,000L will be utilised to store suitable quantities of water for use in the Open Cut MIA, including emergency fire water supplies. Further, raw water tanks with a capacity of approximately 420,000 L will be sited in the north-eastern extent of the Underground MIA, to provide the capacity required for fire water storage purposes in this area (Sections 3.6.1 and 3.6.2 of the EIS).

4.14.4 Emergency and Evacuation

Issue

In recognition of the isolated location of the development, an emergency/evacuation plan is to be prepared consistent with the NSW Rural Fire Service document Guidelines for the Preparation of Emergency/Evacuation plan.

Response

Noted. This will be included as part of the Bushfire Management Plan.

4.15 INDEPENDENT EXPERT SCIENTIFIC COMMITTEE – RA15

4.15.1 Explanation – Groundwater Assessment

Although the groundwater, surface water and subsidence assessments provide estimations of most of the likely impacts to water resources, some gaps have been identified. Key gaps include: descriptions of boundary conditions for the numerical groundwater model; consideration of impacts to the Goulburn River; identification and assessment of GDEs; details of the proposed borefield; consideration of the combined impacts to surface water; and a thorough assessment of potential subsidence impacts.

4.15.1.1 Numerical Groundwater Model

Issue

2. *The numerical groundwater model is adequate to predict the range of potential impacts to groundwater resources associated with the proposed project. Recommendations made in the previous IESC advice (IESC 2013-040) in relation to the numerical groundwater model have been addressed, with the exception of testing the sensitivity of the fluxes to the Goulburn River to changes in a range of model parameter values. Undertaking the following activities would improve confidence in the model's performance:*

- a. Interrogation and sensitivity analysis of the predicted groundwater-surface water exchange fluxes associated with the Goulburn River including pre, during and post mining. This is of particular importance given the stated significant flow through the alluvium to the Goulburn River.*
- b. Further explanation and justification of all boundary conditions used in the groundwater model*

Response

When considering the impacts of the Project on the Goulburn River, it is important to note that the extent of drawdown relative to the river and the size of the catchment that feeds the Goulburn River upstream. The catchment of the Goulburn River, upstream of the Bylong River confluence extends approximately 60 km north to the Liverpool Ranges, and approximately 40 km west and covers approximately 3,340 km². The catchment to the north contains the Liverpool Range basalts that supply significant base flow to the Goulburn River, which will not be affected by the Project. The Wilpinjong, Moolarben and the Ulan mines are also present within this catchment, but at sufficient distance to preclude any cumulative impacts on groundwater. The Coggan stream gauge (No. 210006) which is located at the confluence of Coggan Creek and the Bylong River has flow records since 1912. The gauge has a recorded mean monthly flow of 6,140 ML (~200 ML/day), which indicates the Goulburn River is a significant water course.

The numerical modelling indicated that the zone of depressurisation (as indicated by the 1 m drawdown contour) did not extend to the Goulburn River, and therefore considering this and the large catchment area upstream of the Bylong River confluence, any change in flux of groundwater to the Goulburn River due to the Project will be insignificant on a catchment scale.

Section 8.2 of the GIA (Appendix M of the EIS) outlined the boundary conditions adopted within the model. The model grid was 33 km wide (E-W) and 39 km long (N-S), and aligned with the principal groundwater flow direction in the alluvial aquifer. The boundaries were 10 km to 11 km from the proposed mining areas and set as no flow boundaries. The zone of depressurisation expanded several kilometres from the mining areas, but remained relatively distant from the no flow boundaries, meaning they did not affect the predictions justifying this approach.

4.15.1.2 Assessment of GDEs

Issue

3. The groundwater impact assessment indicates riparian vegetation GDEs associated with Bylong River, Lee Creek and Dry Creek will experience groundwater drawdown as a result of the proposed project. However, GDEs have not been identified using the methodology identified in the previous IESC advice (IESC 2013-14). Consistent with that advice, GDEs should be identified using a systematic approach in which:

- a. the hydrogeological conceptualisation identifies areas of shallow groundwater (less than 20 metres below ground level) and groundwater discharge,*
- b. vegetation and wetland mapping is overlaid to identify areas of potential GDEs, and*
- c. techniques from the Australian GDE Toolbox (Richardson et al., 2011) are applied to confirm groundwater use by vegetation and groundwater discharge to surface water bodies.*

Response

Cumberland Ecology confirms that as requested by the IESC, candidate GDEs have been identified using a systematic approach in which:

- a. the hydrogeological conceptualisation identified areas of shallow groundwater (less than 20 m below ground level) and groundwater discharge, and
- b. vegetation and wetland mapping was overlaid to identify areas of potential GDEs.

The techniques from the Australian GDE Toolbox have not been applied to confirm groundwater use at this stage. This is because when vegetation community maps are overlaid on maps showing depth to groundwater (see Figure 7.3 of the GIA (Appendix M of the EIS), this analysis indicates that the GDEs present in the study area are not likely to be heavily reliant upon groundwater.

Candidate GDEs identified in the study area within the EIS are likely to be partially and seasonally dependent on groundwater. Furthermore, the EIS assessment of impacts to GDEs has adopted a precautionary approach that has assumed GDEs are present, and also that they will be substantially impacted, which is unlikely to be the case for reasons explained below. Further work is proposed to analyse the dependence of vegetation on groundwater as described below.

4.15.1.3 Location of Shallow Groundwater

The depth to groundwater is an important consideration in determining whether the vegetation within the Project Boundary is able to access groundwater. The GIA (Appendix M of the EIS) provided an estimate of the depth to the water table which was based on public domain groundwater level data and additional measurements within the Project's monitoring bores.

The water level measurements indicate that the water table occurs within 20 m of the land surface within the floodplain areas and the lower adjacent slopes. As the land elevation increases the depth to the water table also increases, meaning the water table is generally deeper than 20 m below the land within the Underground Extraction Area. The exception occurs around the lower reaches of Dry Creek, where data suggests a water table within 20 m of the land surface. **Figure 20** shows the portions of the Study Area where depth to groundwater is 20 m or less as reported in the EIS.

Since the EIS was submitted, KEPCO has continued to monitor groundwater levels within the monitoring bore network and has augmented the network with additional bores along Dry Creek. A review of recent data suggests that the water level measurements collected from the single monitoring bore installed within the Tertiary basalt were not representative and the basalt appears largely dry, or only forms an aquifer in isolated zones where the floor of the basalt is relatively low.

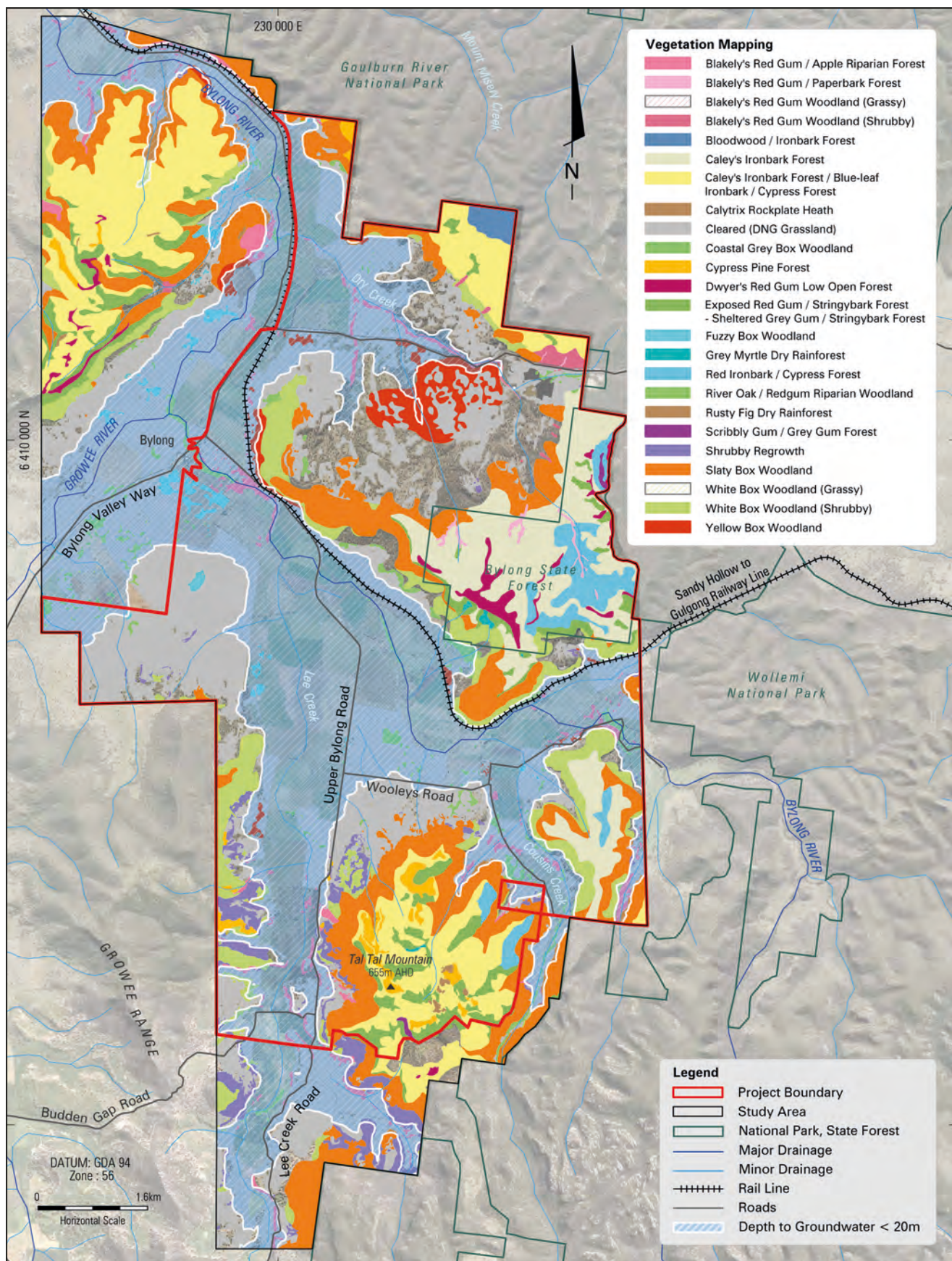
Drilling activities associated with the installation of additional monitoring bores along Dry Creek suggests that the Dry Creek alluvium is less saturated than previously assumed within the GIA (Appendix M of the EIS). It is therefore important to note that the water table depth contours utilised within the assessment of potential GDEs along Dry Creek are conservative and the actual water table is expected to be deeper than indicated within **Figure 20**.

4.15.1.4 Vegetation within Areas of Shallow Groundwater

The GIA (Appendix M of the EIS) provided an estimate of the depth to the water table, which was used to determine where there was potential for vegetation to depend on groundwater. **Figure 20** shows the vegetation communities within the Study Area in relation to the 20 m depth to water contour.

Areas within the Study Area that comprise grassland are not considered to be dependent on groundwater because roots of grasses and other herbaceous plants are shallow and are unlikely to reach the groundwater. Accordingly, it is predominantly woody vegetation (especially trees) that has potential to comprise a GDE.

Due to the lack of obvious GDEs identified within the Underground Extraction Area (such as wetlands and hanging swamps), vegetation occurring where depth to groundwater is 20 m or less is considered to only opportunistically access groundwater. Opportunistic dependency occurs when ecosystems use groundwater as required, for example when surface water / soil moisture is unavailable, such as at the end of a dry period (Serov *et al.*, 2012). This is indicated by the observation by Cumberland Ecology that many of the tree species recorded from the Study Area that are considered to be potentially utilising groundwater (i.e. in areas where the depth to groundwater is within the reach of their roots) also grow in areas where groundwater is not available. That is such species grow where groundwater is significantly deeper than 20 m. Such species include for example dominant trees such as White Box, Yellow Box, Grey Box and Blakely's Red Gum.



BYLONG COAL PROJECT
Vegetation Communities and
Groundwater Depth (<20 m)
within the Study Area

FIGURE 20

These trees grow in areas where groundwater is significantly deeper than 20 m and also in areas where groundwater is less than 20 m in depth. The health and general form of these trees is not significantly different between “deep” and “shallow” groundwater areas. Some trees, including River Red Gum and River Oak, appear to occur exclusively in areas where depth to groundwater is <20 m.

As noted within Section 3.5.3 of the Ecological Impact Assessment (Appendix J of the EIS), the identification of GDEs within the Study Area has been determined on the basis of the presence of species such as *Eucalyptus camaldulensis* (River Red Gum) and *Casuarina cunninghamiana* (River Oak), as well as other riparian vegetation communities. These tree species have potential to be opportunistically using groundwater. However, where these species occur, other sources of water are also likely to be available such as surface water flows and soil moisture – sources of water that are likely to provide a high proportion of the trees water.

The tree species and communities within floodplain and creek line areas are considered likely to have some root access to groundwater. Vegetation communities assessed as GDEs within the Study Area include River Oak / Redgum Riparian Woodland (Unit 3) and Blakely's Red Gum / Apple Riparian Forest (Unit 4).

As noted above, recent drilling activities associated with the installation of monitoring bores along Dry Creek has indicated that the water table is likely to be deeper than shown in **Figure 20**. Therefore the inclusion of a portion of the Blakely's Red Gum / Apple Riparian Forest (Unit 4) occurring along Dry Creek as a GDE is considered as conservative. However for the purposes of conservatively assessing impacts to GDEs, the entirety of this community has been included.

4.15.1.5 Confirmation of Groundwater Usage

GDEs can rely on groundwater for the maintenance of some or all of their species composition and ecological functions and this dependence can be variable, ranging from partial and infrequent dependence (i.e. seasonal or episodic) to total (entire / obligate, continual dependence) (Serov *et al.*, 2012). The degree of dependence on groundwater of the potential GDEs within the Study Area has not been empirically measured. Further work as outlined within **Section 4.11.7** will be undertaken within the identified GDEs within the Study Area to determine the level of dependence.

4.15.2 Impacts of Groundwater Drawdown on GDEs

Issue

4. The ecological impacts of the predicted groundwater drawdown have not been adequately assessed. In particular the assessment needs to consider how groundwater drawdown, including associated changes to the groundwater gaining/losing nature of watercourses, may affect recruitment and survival of groundwater-dependent riparian vegetation and the condition and permanence of groundwater-fed pools.

The alluvial drawdown predictions should be updated to include this increased borefield, with the risks to GDEs, including surface water baseflow and groundwater users reassessed.

Response

Further groundwater modelling and uncertainty analyses have been undertaken as part of this RTS (see **Appendix H**) to provide further certainty that the borefield will be capable of supplying the required water for the Project. Alluvial drawdown predictions from the uncertainty analyses have been undertaken to provide an indication of the probable impacts under various climatic conditions with varying hydraulic properties within the alluvium. Figure 42 to Figure 44 of **Appendix H** shows the maximum drawdown predicted by the model within layer 2 (alluvium) for the Project for various uncertainty model runs. Figure 43 of **Appendix H** shows the drawdown predicted by the mean result, whilst Figure 42 and Figure 44 of **Appendix H** show the upper and lower boundaries of probable impacts. The assessment of impacts presented below is based on the mean predictions which are thought to provide the most reasonable scenarios for the Project and are comparable with the predictions presented within the EIS. However based on the extreme uncertainty predictions in **Appendix H**, it is acknowledged that there are additional areas that may be impacted by the Project.

With the exception of an area along Dry Creek, the majority of drawdown impacts relate to the proposed borefield (see Figure 37 of **Appendix H**), rather than the open cut component of the Project. Alluvial groundwater resources may be extracted from the borefield when recharge rates are low and water demand from mining are high. It is important to note that the extent of drawdowns as shown in Figures 42 to 44 of **Appendix H** will not all occur at one time and the figure represents the maximum drawdown at any given location. There are predicted to be episodes of maximum drawdown during the use of the borefield. Areas along Bylong River and Lee Creek may be impacted within the first seven years of the Project associated with the predicted demands on the borefield as part of the open cut mining operations. The drawdown impacts predicted to occur along a portion of Dry Creek are predicted to occur as the underground mining progresses in a north-westerly direction.

Cumberland Ecology has confirmed that the risk of impacts as a result of drawdown to vegetation communities assessed as GDEs is not considered to be high as these communities are considered to only opportunistically access groundwater. The vegetation communities occurring within the Study Area would likely derive water from multiple sources such as rainfall, surface water and soil moisture, with some vegetation communities also accessing groundwater where it occurs closer to the surface. The Project is predicted to temporarily deplete shallow groundwater in some areas. The mean drawdown for the Project is predicted to be in the order of 2-10 m.

Attempts to predict the impact of changes in the availability (quantity) and quality of groundwater on native trees are problematic, due to the complex nature of the factors that potentially influence dependence on groundwater at any one site (Reid *et al.*, 1997).

Reliance of eucalypts on groundwater varies between species, and with factors such as local geology, soil type, groundwater salinity, seasons and major climatic events or trends (Reid *et al.*, 1997). Potential changes to GDEs as a result of drawdown could include:

- Altered species composition with an increase in drought tolerant species and decrease in less drought tolerant species;
- Change in community structure;
- Reduced growth in canopy and mid-storey species; and
- Tree death.

Both GDEs identified within the Study Area are known to occur within the predicted area of drawdown. However, on the valley floor where these communities are located, groundwater levels respond rapidly to rainfall indicating recharge readily infiltrates the upper sequence of the aquifer, with the other primary recharge source being infiltration of surface water through the beds of rivers and creeks (AGE, 2015).

The majority of the area of predicted drawdown occurs outside of the mapped areas of GDEs. The predicted drawdown is not considered likely to result in the loss of the GDEs in question because they are considered likely to be able to be supplied by other sources of water, however there may be changes such as decline in canopy health and modifications to understorey species composition at some locations of the GDEs. This will be monitored and managed according to the WMP and, if necessary, actions will be taken to address any detected significant declines in GDE condition in accordance with any conditions of development consent.

4.15.3 Alluvial Drawdown Predictions

Issue

5. Water requirements for mine operations are proposed to be met through groundwater inflows to mining areas and a borefield in the Bylong River alluvium. Numerical groundwater model predictions suggest that if dry conditions occurred in years 3 to 10 of the proposed project, the borefield (15 bores) would yield insufficient water and a further 25 to 31 bores would be necessary. The number and distribution of these bores will affect groundwater drawdown predictions. The alluvial drawdown predictions should be updated to include this increased borefield, with the risks to GDEs, including surface water baseflow and groundwater users re-assessed.

Response

Appendix H provides a supplementary groundwater report which further investigates the sustainability of the borefield for the Project. The IESC along with other stakeholders requested additional information on the ability of the 'make up water' borefield to supply the mining operations if there is a short fall of surface water, particularly during a drought period.

Ultimately, the ability of a borefield to supply supplementary water depends on climatic conditions at the times which control diffuse and stream bed recharge, as well as the hydraulic properties of the alluvial aquifer.

Whilst the hydraulic properties are not definitively known, the available testing data does provide a range of hydraulic properties within which the alluvium within the Project Boundary will ultimately hold. Similarly, the future climate cannot be predicted with confidence. However historical climate records indicate how rainfall may vary during times of drought, and the rainfall conditions when droughts break.

To quantify the uncertainty in the predicted borefield yield, a linear uncertainty analysis was undertaken. The process implemented involved assessing the statistical uncertainty around model predictions, and projecting these linearly to estimate the likely range in borefield yield due to uncertainty in model parameters.

The supplementary modelling considered a revised borefield layout, spacing the bores 700 m apart with a total of 16 bores. This differed slightly from the EIS that presented a total of 15 bores, located with proximity to the source of the water demand being the coal handling and preparation plant. **Appendix H** provides maps showing the range in drawdown within the alluvium predicted from the linear uncertainty analysis. The analysis confirms the drawdown within similar areas to those presented within the GIA. As discussed above, monitoring and management measures for the GDEs will be outlined within the WMP prepared for the Project.

4.15.4 Surface Water Assessment

Issue

6. The results from the proponent's surface water modelling studies should be used to assess the integrated impact on surface water resources as a result of the proposed project (i.e. the combined impact of the loss of catchment area, altered surface water-groundwater interactions, loss of baseflow and subsidence-related surface cracking, streambed cracking and ponding). A subsequent assessment of the potential for impacts to water-related assets should be undertaken.

Response

An assessment of cumulative impacts on surface water resources is provided in Section 10.3 of the SWIA.

The maximum mine captured catchment area is 15.7 km², which is 0.5% of the Goulburn River catchment downstream of the confluence with Bylong River (3,340 km²). The loss of surface runoff resulting from a reduction in catchment area of 0.5% would be undetectable.

With respect to water quality, the results of water balance modelling show that no releases will occur from mine water dams containing water affected by contact with coal. Some overflows from sediment dams may occur during events that exceed the relevant design standard, which will ensure that water quality impacts to receiving waters are minimal. Further discussion on potential overflows and releases from sediment dams are provided in **Section 4.8.14**.

4.15.5 Flooding

Issue

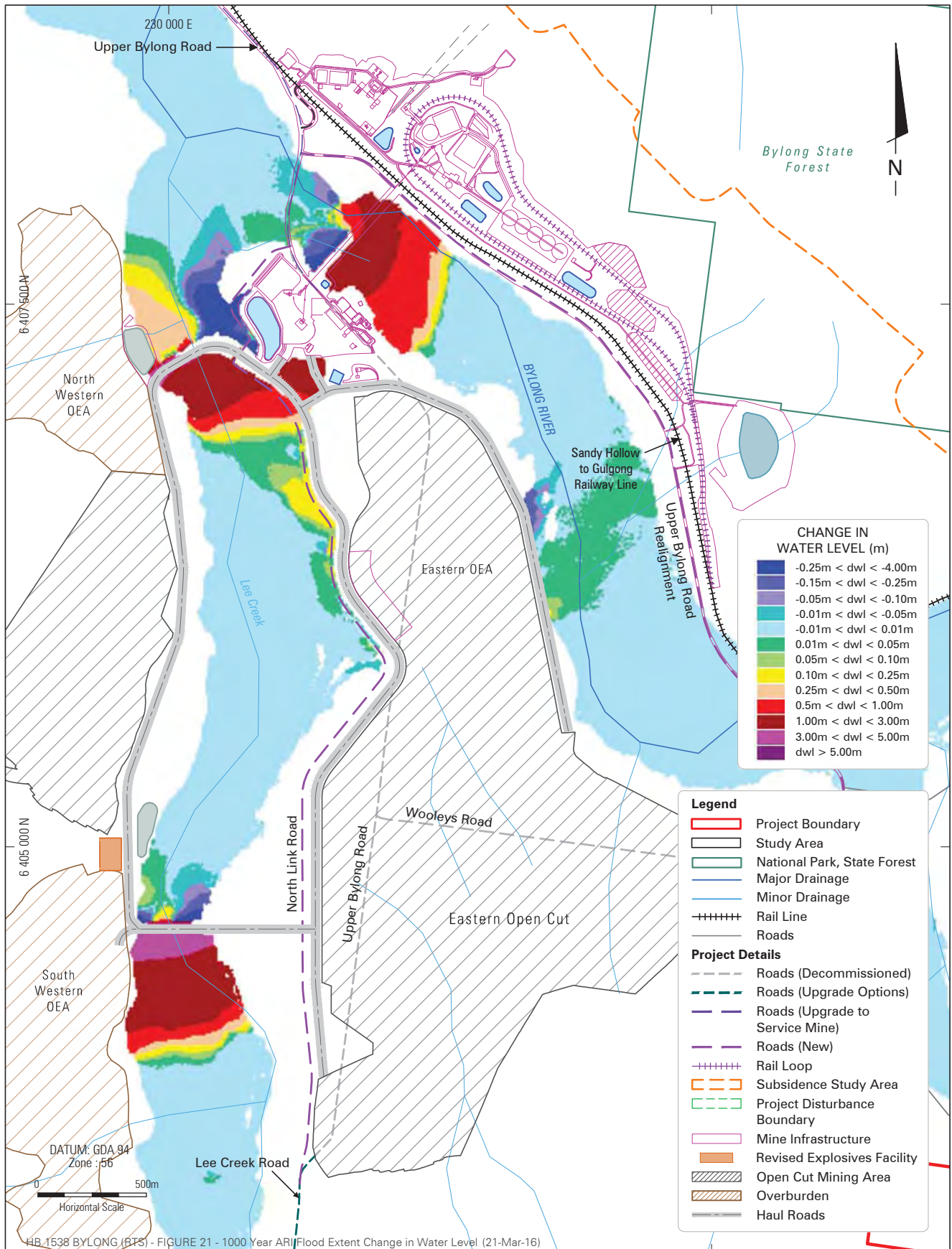
7. The 1000 year average recurrence interval design event should be modelled to inform the assessment the flooding risk to mine infrastructure and potential mobilisation of contaminants from coal stockpiles and reject emplacement areas. Further recommendations regarding the assessment of potential impacts to surface water quality are discussed in response to Question 2.

Response

4.15.5.1 Overview

The hydrological and hydraulic models of the Bylong River presented in the SWIA were used to assess the flood risks and impacts of the Project for the 1,000 year Average Recurrence Interval (ARI) design event. The revised haul roads and proposed North Link Road were included in the hydraulic model for the Developed Conditions. The updated model configuration was run for a range of design flood events, as well as the 1,000 year ARI event.

Figure 21 shows the revised 1,000 Year ARI Change in Water Level in the Bylong River Catchment.



BYLONG COAL PROJECT
1,000 Year ARI Flood Event
Change in Water Level in the
Bylong River Catchment
FIGURE 21

4.15.5.2 Design Flood Discharges

The design discharges estimated by the RAFTS model described in Section 7 in the SWIA were adopted for the TUFLOW model. **Table 20** shows the adopted 2, 50, 100 and 1,000 year ARI design flood discharges.

Table 20
Adopted Design Discharges (m³/s)

Location	2 year ARI	50 year ARI	100 year ARI	1,000 year ARI
U2 (Local Inflow)	3.6	19.8	24.5	31.0
UB3 (Bylong River)	38.5	224.4	286.5	504.6
U1 (Local Inflow)	5.6	29.5	36.2	46.0
C1 (Cousins Creek)	8.4	48.3	61.5	94.7
L4 (Lee Creek)	41.8	202.1	250.0	360.9
G11 (Growee River)	127.1	668.6	837.5	1,406.8
S1 (Dry Creek)	4.7	26.0	32.2	42.5
Critical Storm Duration	48 Hrs	12 Hrs	12 Hrs	24 Hrs

TUFLOW Model Configuration – Existing Conditions

The Existing Conditions TUFLOW model configuration was unchanged from that used within the SWIA.

TUFLOW Model Configuration – Developed Conditions

The Developed Model configuration was modified to include the updated haul road designs and the proposed North Link Road. Figure A.1 of **Appendix M** shows the configuration of the developed TUFLOW model.

4.15.5.3 Analysis of Impacts

The results of the updated TUFLOW hydraulic model for the 1,000 year ARI event are presented in **Appendix M**.

The impacts of the Project on flood levels and velocities along the Bylong River floodplain for the 2, 50 and 100 year ARI design events are similar to those described in Section 7 of the SWIA.

The model results show that the proposed North Link Road has a 2 year ARI flood immunity. The proposed North Link Road and Upper Bylong Road will be closed during events greater than 2 year ARI where flood waters will cover these roads.

During a 100 year ARI flood event, the proposed North Link Road is inundated to a peak flood depth of approximately 1.5 m at the road centre near the north-eastern tunnel under the haul road. High flood velocity and flood hazard are expected in the north-eastern tunnel.

Further detailed modelling at this location will be undertaken during the detail design stage and scour protection will be implemented into the design as required to ensure structural stability and assess vehicle safety issues.

Based on the culvert configuration adopted in the SWIA, the north-western corner of the proposed haul road is overtopped to about 0.5 m at the road centre during a 100 year ARI flood event. The inundation on the haul road is less than 100 m in length. Other sections of the proposed haul road have a 100 year ARI flood immunity and flows would be directed via culverts installed below the road alignment.

The proposed haul road crossings of Lee Creek will be fully overtopped for the 1,000 year ARI flood event (refer to **Appendix M**). The 1,000 year ARI peak flood level upstream of the overland conveyor (OLC) embankment is 275.34 mAHD, about 0.67 m higher than the 100 year ARI peak flood level.

The risk of mobilisation of contaminants from reject emplacement areas during extreme flood events is low. Rejects will be capped with overburden and topsoil. The emplacement areas are located on the floodplain fringe where flood velocities are lower. Some scour of the toe of emplacement areas is possible in a couple of places, however it is unlikely that this would result in mobilisation of large volumes of any underlying reject material.

It is possible that an extreme flood event (such as 1,000 year ARI) could overtop the haul road and reach the southern edge of the Open Cut MIA. The potential for and consequences of inundation of the Open Cut MIA will depend upon the adopted final finished ground levels across the MIA, particularly along the southern edge. The volume of floodwater passing through the MIA, if this occurred, would represent a very small fraction of the total flood hydrograph volume.

4.15.6 Subsidence Assessment

Issue

8. The subsidence modelling provides a conservative assessment of the potential extent and severity of subsidence effects likely to be caused by the proposed project (i.e. the model is likely to overestimate the impacts of subsidence).

9. The potential impacts of severe subsidence have been identified (e.g. connective cracking to the surface, root shear and reduction in length of water residence time in perched aquifers) but the implications of these impacts and associated mitigation and management measures have not been adequately assessed. Further consideration of potential impacts to GDEs, aquifer storage and critically endangered ecological communities within the subsidence area is needed. This assessment should inform estimates of the value and future persistence of the proposed offset site located above the proposed longwall mining area.

Response

Detailed further consideration of potential impacts to GDEs, aquifer storage and critically endangered ecological communities within the subsidence area has been undertaken. A quantitative assessment of the potential impacts of subsidence on the vegetation and habitats, including GDEs, within the Subsidence Study Area is provided in **Appendix J**.

This quantitative assessment of potential impacts to GDEs indicates that the underground component of the Project is predicted to have a negligible ecological impact within the Subsidence Study Area. Monitoring is proposed to assess the response of GDEs to changes in the groundwater system.

The reduced value (i.e. 10% reduction) of biodiversity attributes for the portion of Offset Area 5 overlying the Subsidence Study Area was calculated based on a conservative estimate of subsidence-related impacts. A revised assessment of the subsidence-related impacts predicted for the Project has been undertaken (see **Appendix J**). The assessment indicates that the reduction presented within the Ecological Impact Assessment (Appendix J of the EIS) and the Biodiversity Offsets Strategy (Appendix K of the EIS) is conservative. The revised assessment indicates a 1.1% reduction in area resulting from surface cracking, cliff fall and hydrological changes (including reduction in extent of GDEs). As there will be some level of uncertainty regarding subsidence-related impacts, which is the case with all underground mining projects, it is proposed to maintain a conservative application of a 10% reduction in the total biodiversity value of the portion of Offset Area 5 occurring within the Subsidence Study Area.

Box Gum Woodland and Derived Native Grassland, which is listed as an Ecological Endangered Community (EEC) under the TSC Act and Critically Endangered Ecological Community (CEEC) under the EPBC Act occurs within the Study Area. Only the woodland (i.e. treed) component of this vegetation community is considered to be a potential GDE. Some occurrences of this community grow where depth to groundwater is 20 m or less. However, extensive areas occur where groundwater is not available, as it is up to 50 m below the ground surface (see **Figure 20**).

Cumberland Ecology advises that Box Gum Woodland condition within the Study Area, including the health and form of trees, appears to be unrelated to the depth of groundwater. As such, Box Gum Woodland has not been assessed as a GDE. Despite this, the Project includes the provision of extensive areas of this vegetation community within offset area to be secured and managed for biodiversity values.

4.15.7 Consideration of Potential Discharges

Issue

10. While a variety of studies, including water and salt balances and geochemical analyses, have been undertaken to assess the likelihood and potential impact of discharges, the full range of potential impacts of these discharges have not been considered.

The assessment should consider potential impacts in the context of seasonal and climatic variability and uncertainty associated with predictions. The impact assessment should explicitly consider the value, condition and objectives for downstream environments (e.g. Goulburn River National Park).

Explanation

11. Increased concentrations of salts and other contaminants may enter the alluvial and surface water systems via the following pathways:

- a. discharges from the water management system and*
 - b. surface runoff and seepage from overburden emplacement areas and backfilled pits.*
- Discharges from the water management system*

Response

See responses provided in **Section 4.8.11** and **Section 4.8.14** for these issues.

4.15.8 Discharges from the Water Management System

Issue

12. The proposed project's water balance modelling predicts:

- a. controlled discharges from the water management system to surface waters are not needed,*
- b. uncontrolled releases from sediment dams will occur, and*
- c. no uncontrolled spills of mine-affected water will occur.*

13. While the water balance model does not model controlled discharges from sediment dams, this is a proposed mechanism for dewatering following rainfall events (page 194 of EIS). The assessment should consider potential impacts to water quality and quantity associated with these releases, and derive local water quality objectives to permit releases for turbidity, salinity and other contaminants.

14. To provide greater assurance that the proposed project's water management system will adequately minimise impacts to downstream water quality and quantity, sensitivity and uncertainty analysis, including consideration of future climate variability, should be undertaken on the water balance model. Once operations commence and additional data are collected, the water balance model should be revised and rerun and action taken, as required, to ensure the water management system's performance measures can be satisfied.

Response

See responses provided in **Section 4.8.11** and **Section 4.8.14** for these issues.

4.15.9 Surface Runoff and Seepage from the OEAs and Backfilled Pits

Issue

15. The proposed topography of the backfilled pits along with the predicted rise in the groundwater level at equilibrium may result in areas of groundwater seepage at the surface. Seepages to the surface may transport contaminants and contribute to reductions in surface water quality in the long term. This potential discharge pathway has not been assessed.

Response

The Geochemical Impact Assessment (see Appendix AB of the EIS) (RGS, 2015) provides detailed geochemical information on the salinity potentially released by representative samples of coal and mining waste materials under ideal oxidising conditions over a period of six months with no materials management or mitigation measures in place. The RGS report identifies that the salinity of surface runoff and seepage from overburden materials (overburden, interburden and uneconomic coal seams from open cut mining) is likely to be relatively low. The salinity of runoff and seepage from coal and coal reject materials (from both open pit and underground mining) is also likely to be low, but may increase over time if PAF materials are exposed to oxidising conditions (mainly through increased sulphate concentration caused by sulphide oxidation). Hence, the reason why both PAF and NAF coal reject materials will be preferentially placed deep in the open pit, dozed, traffic compacted, and encapsulated with NAF overburden after addition of agricultural limestone as required.

Over the past few years, RGS has utilised cumulative salinity values from Kinetic Leach Column (KLC) tests on representative samples of overburden materials (completed under ideal oxidizing conditions) to extrapolate likely long term salinity values for pore water chemistry at coal mining projects in NSW and other parts of Australia. These values are then used by others as source terms to evaluate potential impacts to the receiving environment from salinity. The KLC salinity results have been compared against predictions made for several coal mining operations in the Upper Hunter Valley of NSW (Mackie, 2009). In summary, Mackie reviewed the mineralogy and chemical processes occurring within the saturated zone of an OEA in some detail and projected long term pore water salinity levels out to 100 years.

The KLC data in Section 4.5 of the RGS report indicate that the salinity of pore water in saturated overburden materials at Bylong is likely to be in the range 1,500 to 3,000 $\mu\text{S}/\text{cm}$. These values are towards the lower end of the range predicted for overburden by Mackie, although it is noted that Mackie predicted 100 years would be required to reach these values in saturated zones. The KLC results also suggest that salinity values from well managed coal reject materials are likely to be in the range 5,000 to 8,000 $\mu\text{S}/\text{cm}$, although it should be noted that coal rejects make up only about 11% of the total mine waste volume at the Project. Using a mass balance approach and assuming a reasonable level of leachate mixing, it is expected that long term pore water salinity values derived from co-disposed overburden and well managed/encapsulated coal rejects at Bylong will be in the range 1,800 to 3,500 $\mu\text{S}/\text{cm}$.

These values were used within the GIA (Appendix M of the EIS) to predict potential impacts on groundwater and surface water quality post-mining. The KLC tests were performed on sample materials with a relatively large surface area under fully oxidised free-draining conditions, and represent an assumed “worst case” scenario best representing materials stored at or near the surface of (or in preferential flow paths within) a coal stockpile, OEA and/or a coal reject cell.

An evaluation of the potential risk to the receiving environment was completed for salinity as this can be a potential issue for some coal mines. Other issues were not evaluated to the same extent as they did not merit such an evaluation based on the level of risk and adopted management measures. For example, the potential use and environmental value of groundwater and surface water is dependent upon the water quality, with the overriding constituent controlling use being the salinity.

4.15.10 Contaminant Transport Pathways

Issue

16. The assessment documentation acknowledges the potential for seepage through backfilled pits to have some impact on the salinity of water in the alluvial aquifers adjacent to open cut mining areas, and to the surface waters of the Bylong River and Lee Creek. The assessment:

- a. considers impacts on an average annual basis only,*
- b. assumes no parallel reduction in surface water quality, and*
- c. does not consider other contaminant transport pathways, such as the potential for seepage from overburden emplacements, via the weathered colluvium, to alluvial aquifers.*

Response

As explained in Section 10.11.3 of the GIA (Appendix M of the EIS), the potential for seepage to ‘breakout’ of the backfilled open cut post-mining will depend on the seepage rates through the capping material post-mining and the ability of any seepage to leave the mined area through the former pit walls into adjacent geological units.

The groundwater modelling presented within the GIA predicted the potential for a 2 m rise in groundwater levels (compared to pre-mining conditions) within and adjacent to the footprint of the open cut mine when equilibrium conditions are reached.

The WMP will outline further hydrological analysis of the mine spoils during mining to ensure that there are no outbreaks of saline or contaminated groundwater around the edge of the backfilled mining area. This will include monitoring of infiltration through the spoils and permeability of adjacent geological strata, to assess the ability of water to move in and out of the backfilled pit.

Ongoing updates to the groundwater model every five years during mining will allow the groundwater model to be refined and more accurately determine appropriate closure designs that will minimise the potential for outbreak of water from the backfilled mining area.

4.15.11 Impact of Contaminants on GDEs and Aquatic Biota

Issue

17. The assessment documentation states that if saline leachate enters the alluvial groundwater it is likely to be heavily diluted and that contaminants would be removed by natural filtration processes (EIS, Appendix J, p. 6.66). Limited evidence is presented to support these claims, whilst no data is presented to show that the predicted concentrations of contaminants are within safe limits for GDEs or aquatic biota.

Response

Significant increases in the salinity of groundwater can have impacts on GDEs. Potential salinity loads as a result of the Project have been assessed by AGE (2015) and WRM (2015). The AGE (2015) assessment has indicated that salinity in the alluvium may rise by 12%. This assumes that the groundwater salinity increases on average from 699 mg/L to 783 mg/L and therefore potentially in the surface water baseflow when no rainfall runoff occurs.

WRM (2015) concluded the total salt load (surface runoff plus baseflow) could increase from 4,297 to 4,339 tonnes per year, which represents an increase of about 1%. A 1% change in salinity is considered to be well within the range for natural variation, based on the data that has been collected within the system to date given the wide fluctuations in salinity that naturally occur in the streams in the Study Area. In addition, the estimated change does not change the beneficial use of the groundwater and connected surface water, as it remains fresh.

The AGE (2015) results indicate that the Project will not cause a significant impact to groundwater resources when compared to existing background salinity loads. Accordingly, it is not expected that the Project will elevate salinity levels of groundwater significantly relative to current levels, and vegetation potentially dependent on groundwater is not expected to be affected.

This analysis of macro-invertebrates within the Study Area indicated that the waterways within the Study Area have been significantly altered or affected by surrounding land practices and do not support a diverse assemblage of aquatic macro-invertebrate fauna. The assemblage is relatively low diversity and comprised of taxa that are tolerant of disturbed/poor aquatic conditions. Alterations to water quality as a result of the Project is not considered to be high and is considered unlikely to significantly impact macro-invertebrates. Despite this, aquatic biota including macro-invertebrate will be monitored as part of the WMP.

4.15.12 Further Improvements

4.15.12.1 Impacts to Biota from Surface and Groundwater

Issue

18. The assessment would benefit from consideration of the proposed project's potential combined impact to surface water quality and alluvial groundwater quality and the associated impacts to biota. All components of this assessment should consider how changing conditions (as a result of seasonal or future climatic change) may affect predicted impacts. For example during periods of low surface flows where watercourses retract to groundwater-fed pools that are subject to evaporation, impacts are likely to be more severe. Uncertainty associated with the leaching potential and contaminant load from infill materials should also be considered.

Response

Existing process within the Study Area have an impact on the water resources within the Study Area. The water resources and associated habitats currently contend with the natural variations to water levels and water quality resulting from existing climatic conditions as well as modifications resulting from existing land uses. The Project will also result in a modification to surface water and groundwater conditions (both quality and quantity).

Details on changes to water quality are provided within the GIA (Appendix M of the EIS) and the SWIA (Appendix L of the EIS). Modelling of groundwater and surface water undertaken for the Project takes into account climate variability and current conditions in conjunction with changes resulting from the Project. The Project is predicted to result in the modification of baseflow in Lee Creek and the Bylong River as well as drawdown within the valley floor. Such modifications, in conjunction with natural climatic variations can have an impact on GDEs and aquatic habitat within the Study Area.

Monitoring is proposed to assess the response of GDEs to changes in the groundwater system as well as monitoring of aquatic habitats. A TARP will be developed as part of the Extraction Plan to ensure that if significant detrimental impacts occur, appropriate remedial responses will be implemented.

GDEs

Limited areas of GDEs have been identified within the Study Area. Changes to salinity within groundwater and surface water has the potential to impact vegetation within the Study Area. Potentially contaminated water stored on site, or that that comes into contact with areas disturbed by mining operations, has the potential to contain elevated levels of salt. WRM (2015) completed a water balance to confirm the ability of the water management system to handle historic climatic conditions. The water balance assessment confirmed that there was no discharges from the mine water management system during the 99th percentile wet year. WRM (2015) also considered the impacts of leaching post-mining completed by AGE (2015) and concluded the total salt load (surface runoff plus baseflow) could increase from 4,297 to 4,339 tonnes per year, which represents an increase of about 1%.

A 1% change in salinity is considered to be well within the range for natural variation, based on the data that has been collected within the system to date.

In addition, the estimated change does not change the beneficial use of the groundwater and connected surface water, as it remains fresh. As the water will remain fresh and the salinity levels will remain within existing fluctuations within the system, the predicted salinity changes are not expected to impact vegetation within the Study Area. Additionally, as noted within the assessment of GDEs, the vegetation communities occurring within the Study Area would likely derive water from multiple sources including rainfall, surface water and soil water, with some vegetation communities also accessing groundwater where it occurs closer to the surface.

Aquatic Biota

Limited areas of aquatic habitats occur within the Study Area and are currently impacted by existing land uses. Aquatic biota is likely to predominantly occur in areas where water persists for longer durations within the system, such as pools. In addition to impacts results from the Project, the aquatic habitats within these pools may be further impacted during natural climatic variation when there are low surface water flows. Although the aquatic biota within these pools currently contend with such climatic variation, the Project could contribute to additional impacts through increases in salinity.

The potential for the salinity in the pools to increase by more than 1% is essentially impossible to quantify and measure with any confidence. For example assuming a pool has a salinity of 1,500 mg/L, a 1% increase in the total salt load, as predicted above, represents a marginal change to 1,515 mg/L. The salinity within the pools depends on climatic conditions and salinity increases during periods of dry weather due to evaporation and decreases when rainfall runoff promotes flow within the river. Results from surface water gauges in the Project area show that water quality backs up this assumption, and fluctuates by up to 1,000 $\mu\text{S}/\text{cm}$ (or ~100%) throughout the year.

4.15.12.2 Concentration of Contaminants in Leachate

Issue

19. In relation to the geochemical impact assessment, the concentrations of contaminants in the leachate (e.g. metals) should be compared to guidelines for aquatic ecosystem protection. For example, if a metal exceeds the guideline (allowing for dilution and attenuation in the environment), then implementation of the tiered approach in the National Water Quality Management Strategy (refer to the decision tree at Figure 3.4.2 of ANZECC and ARMCANZ, 2000) may be useful to assess impacts on biota from the leachate mixture.

Response

Direct comparison of the concentration of parameters in the leachate from static and kinetic geochemical tests on sample materials with (ANZECC & ARMCANZ, 2000) guidelines for aquatic ecosystem protection and/or livestock drinking water for (e.g. metals) can be misleading.

The ANZECC & ARMCANZ livestock drinking water guidelines presented in the RGS report (RGS, 2015) were provided for broad context only and were not intended to be interpreted as arbitrary 'maximum' permissible levels or 'trigger' values associated with site water storage or discharge.

For static geochemical leach tests, sample pulps ground to passing 75 µm are used and provide a very high surface area to solution ratio, which encourages mineral reaction and dissolution of the solid phase. As such, the results of screening tests on water extract solutions are assumed to represent an assumed 'worst case' scenario for initial leachate from sample materials. For KLC tests, the samples are coarser but the ratio of sample to water is approximately 2:1 (w/v) (i.e. concentrated), whereas the ratio of sample to water generally used in tests where results can (arbitrarily) be compared against guideline concentrations to provide relevant context is more dilute at 1:5 (w/v). Whilst arbitrary comparisons against guideline concentrations can be useful in some situations, and help to provide relevant context, such comparisons cannot be directly extrapolated to the field situation at the Project.

In the field, mining waste materials are stored under significantly different conditions to those used in standard static and kinetic geochemical laboratory tests. For example, only a small component of the mining waste may actually interact with incident rainfall and contact water due to variable moisture flow conditions and the development of preferential flow paths. In fact that is one of the main objectives of the adopted management and mitigation measures for co-disposal (i.e. to encapsulate/isolate alkaline amended PAF/NAF coal reject materials within NAF overburden). The chemical and physical nature of the in situ mining waste materials will also be different with different redox and particle size distribution conditions occurring within storage areas. Dilution effects from rainfall, groundwater flows and natural attenuation are also likely to occur in the field and further reduce the concentrations of any soluble metals in surface runoff and seepage.

The completion of scale up kinetic tests at the project, when bulk mining waste materials become available during the operational phase, and monitoring of full scale mining waste storage areas will provide data that can be used to complete a more valid comparison with relevant water quality guideline criteria and facilitate further assessment of any potential impacts on downstream biota during the operational phase of the Project.

4.15.12.3 Water Quality Objectives

Issue

20. Local water quality objectives should be derived from the over two year's of baseline data collected at the proposed project's site. Potential impacts in the immediate vicinity and downstream environments (e.g. within the Goulburn River National Park) should be considered.

Response

As explained in Section 7.4.1 of the EIS, KEPCO has established an extensive surface water monitoring program for the purposes of developing a baseline for the Project assessment. The Surface Water Impact Assessment utilised data which was available at the time from February 2012 to August 2014 (i.e. more than 2 years of data) for the purposes of developing baseline water quality conditions. The surface water monitoring program for the Project has continued and is developing a longer term database for the purposes of baseline. An updated baseline will be presented within the WMP for the Project.

The potential impacts of the Project to the downstream environment is discussed in **Section 4.8.14**.

4.15.13 Strategies to Avoid, Mitigate or Reduce Impacts

Issue

21. Many of the potential impacts to water resources, for example impacts associated with groundwater drawdown and subsidence, cannot be avoided or reduced without changes to the proposed operations and/or mine layout. Many of the mitigation or remediation measures proposed are to be detailed and implemented through a variety of plans that are not part of the assessment documentation. The consideration of strategies to avoid, mitigate or reduce impacts is limited due to the:

- a. insufficient identification of potential impacts (as noted in Paragraphs 16.c and 25),*
- b. discounting of potential impacts without supporting evidence (as noted in Paragraph 17),*
- c. unproven nature of proposed mitigation measures (as described in Paragraph 23), and*
- d. lack of a quantitative risk assessment (as noted in Paragraph 24).*

Response

In relation to the four issues above:

- a) The EIS has appropriately identified all significant potential impacts of the Project and responded to the IESC's detailed comments about inadequate surveys in **Section 4.15.10** and **Section 4.15.14**;
- b) **Section 4.15.11** addresses the concerns over potential contaminants on GDEs;
- c) **Section 4.15.13.2** provides further information in relation to the effectiveness of remediation resulting from subsidence related cracking; and
- d) **Section 4.15.13.3** provides information on the quantitative risk assessment completed for the Project in order to avoid, manage and mitigate potential environmental impacts.

As such, KEPCO considers that the Project clearly demonstrates its avoidance, mitigation and impact reduction strategies on water.

4.15.13.1 Subsidence

Issue

22. There is a risk that the predicted subsidence impacts may not be fully remediated with the proposed measures given the magnitude of predicted impacts (as noted in Paragraph 9). It is also possible that fracturing could lead to changes that cannot be remediated (e.g. ongoing drainage of perched alluvial groundwater reducing groundwater availability for dependent vegetation and root shear). These impacts may reduce the viability of GDEs and/or critically endangered ecological communities.

Response

Subsurface fracturing is expected to result in potential permanent alteration of the fracture network and associated permeability characteristics of the overburden above the extracted longwall panels for the Project. The EIS GIA concluded that the groundwater systems overlying the underground extraction area would be depressurised during the mine life, but slowly recover post-mining. Post-mining the increase in the permeability of the fractured strata means there is potential long term groundwater levels will equilibrate at lower levels than prior to mining (refer to Figure 10.27 of the EIS GIA). Recent review of the groundwater level records suggests the Tertiary basalt does not support an extensive perched aquifer, or there is only groundwater occurring within low points within the basalt footprint. It is important to note whilst there is potential for the proposed mining to reduce groundwater levels in strata overlying the underground extraction area, the presence of groundwater dependent vegetation has not been confirmed, however if present it may be impacted.

Impacts to the ground surface can be managed through the implementation of suitable management plans. Remediation of the subsurface fractures can be undertaken to a limited extent, such as for the re-establishment of pools or flow in streams. However large scale remediation of subsurface fracturing is not considered to be a viable option.

4.15.13.2 Subsidence Remediation Measures

Issue

23. To improve confidence that the proposed remediation measures may be effective, further evidence, including case studies of the successful application of the proposed measures in a similar context, should be provided. While this was raised by the IESC in its previous advice (IESC 2013-040), evidence has not been provided.

Response

Mine Subsidence Engineering Consultants (MSEC) have been providing consulting services in the field of mine subsidence for approximately 20 years and have completed over 700 studies into the impacts of mine subsidence on natural features and surface improvements.

Blakefield South Mine provides online documentation outlining proposed management strategies for impacts to surface features for the extraction of BSLW1 to BSLW5 (Surface and Public Safety Subsidence Management Plan) and the actions undertaken during mining are provided in the Annual Environmental Reports.

Other reports that provide case studies of remediation measures include:

- Georges River Report. Assessment of Georges River Remediation. West Cliff Longwalls 5A1-4, 13 November 2006; and
- Damage Criteria and Practical Solutions for Protecting River Channels. Ken Mills, SCT Operations Pty Ltd, ACARP Project C12016, 25 May, 2009.

4.15.13.3 Risk Assessment

Issue

24. Consistent with the previous IESC advice (IESC 2013-040), the risk assessment should quantitatively assess the likelihood and consequence of identified impacts and justify the residual risk following application of proposed mitigation measures.

Response

As explained in Section 3.17 of the EIS, numerous mine plan alternatives were considered against the various environmental, social and economic constraints. This included the consideration of the key impacts resulting from subsidence related impacts. As noted in Section 3.3.2 of the EIS, the underground mine plan presented within the EIS represents only part of the coal resource which is suitable for underground mining potential within the two Authorisations held by KEPCO. Further to this, the Project mine plan and associated layout has been specifically designed to avoid and/minimise the potential impact to sensitive surface features.

The Project Environmental Risk Assessment is presented as Appendix G of the EIS. The risk assessment was conducted in accordance with the KEPCO Risk Assessment and Probability Matrix. The risk assessment considers the following subsidence impacts:

- Disturbance of the natural environment;
- Disturbance of the built environment; and
- Unplanned movement of land surface resulting in environmental effects.

A preliminary risk assessment was conducted as part of the Background Document (Hansen Bailey, 2014) for the Project, assuming no controls were in place. Proposed control and avoidance measures (for example stepping the longwall panel away from cliffs C1, C2 and C3) were implemented to the Project mine plan prior to a revised risk assessment being undertaken for the Project. For all subsidence related impacts, the consequence was determined to be “moderate”, the likelihood “possible” leaving a residual risk criteria of “moderate”.

Residual risks identified within the Subsidence Impact Assessment (Appendix H of the EIS) will be appropriately managed through the development and implementation of an Extraction Plan and accompanying management plans for each of the longwall panels to be extracted.

4.15.14 Aquatic Assessment

Issue

25. The single, spatially-limited aquatic ecology survey is insufficient to identify values that may be impacted by the project, and hence inform mitigation measures. If additional water-related assets are identified as a result of further surveys (as recommended in Paragraphs 3 and 40), predicted impacts should be reassessed in light of the additional data collected, and appropriate avoidance and mitigation strategies proposed.

Aquatic surveys should include fish, as suggested in IESC 2013-040. While the IESC accepts the use of the AusRivAs method to assess the macroinvertebrate community composition, the data set is currently too limited to draw conclusions regarding the condition of aquatic habitat. To maximise the effectiveness of the AusRivAs method, sampling in two seasons (i.e. spring and autumn) is recommended to enable use of the more powerful combined season AusRivAs models against which to test the results (Coysh et al., 2000). If the techniques employed to date (i.e. AusRivAs and SIGNAL) are adopted for ongoing aquatic surveys, the inclusion of additional monitoring sites downstream of the project area is recommended.

Response

No further aquatic surveys are required to predict the impacts of the Project upon aquatic biota due to the limited extent and condition of habitats in the Study Area. However, as part of the WMP, aquatic biota will be regularly monitored, including the monitoring of sites downstream of the Project Disturbance Area. Although significant detrimental impacts are considered unlikely to aquatic biota, a TARP will be developed to ensure that if significant detrimental impacts occur, appropriate remedial responses will be implemented.

No major aquatic ecosystems occur within the Study Area, which comprises ephemeral waterways. These streams are often dry or almost dry. Due to the limitations of applying the methodology of *The Australia Wide Assessment of River Health: NSW AusRivAS Sampling and Processing Manual* (Turak and Waddell, 2001) within ephemeral waterways, the survey was designed to focus on locations where water was known to be relatively permanent within the Study Area. As noted within Section 2.5 of the EIS Ecological Impact Assessment, the aquatic assessment provide baseline habitat data for the development of future monitoring programs for the Project.

The data collected from the autumn 2014 survey indicates that the aquatic habitat along the waterways within the Study Area is highly degraded and unsuitable to support significant macro-invertebrate or fish populations because:

- The aquatic habitat is naturally shallow, ephemeral and limited in extent in the Study Area;

- The aquatic habitat is highly simplified due to the historical vegetation clearance and the uniform nature of the substrate; few macro-invertebrates can colonise and survive on bare substrates, even if water quality is suitable (Chessman, 2003) and the lack of vegetation and uniformity of the substrate provides poor conditions for fish spawning;
- There is a high potential for erosion due to the substrate type, which has likely been exacerbated by sedimentation and disturbance to banks by livestock; and
- There are significant barriers to fish movement due to the ephemeral nature of the waterways (i.e. any fish present are restricted to the relatively permanent pools of water for most of the year).

As noted within Section 7.2.6.iii of the Ecological Impact Assessment, regular monitoring will occur within local waterways through the collection of water quality samples and through macroinvertebrate sampling. Regular monitoring points will be established, and the results of surveys compared using Australian Rivers Assessment System (AusRIVAS), to detect any changes to water quality over time.

As noted within Section 2.5.3 of the EIS Ecological Impact Assessment, the aquatic survey did not include vertebrate sampling (e.g. fish) as no permanent flowing waterways occur within the Study Area. Although no formal surveys were carried out, Eastern Gambusia (*Gambusia holbrooki*) were observed at a number of locations and Carp (*Cyprinus carpio*) were also observed within Bylong River. The presence of these exotic fish is consistent with macroinvertebrate and other data that indicates low aquatic habitat quality and a low likelihood that native fish make significant use of the streams of the Study Area.

4.15.15 Further Strategies

Issue

There are a number of further strategies available that could be employed by the proponent. Additional strategies are recommended to:

- a. manage waste materials to reduce the long-term risk of contamination of water resources,*
- b. manage water on site to reduce the need for external release, and*
- c. reduce subsidence impacts due to the difficulty in remediating severe subsidence impacts noted in Paragraphs 8 and 22 and 23.*

27. Additional monitoring is recommended in Question 5 to inform the assessment of potential impacts and therefore selection of appropriate strategies for the site.

Response

Section 7.20.4 of the EIS commits to the development of a Mine Waste Management Plan for the Project to minimise the potential risk of the coal reject materials to result in contamination of water resources in the long term.

The Mine Waste Management Plan and strategies within will be reviewed and updated with any new information which is identified during the initial years of mining operations.

Section 7.4 of the EIS provides a summary of the SWIA (Appendix L of the EIS) and the proposed water management system. The water balance modelling (as explained in Section 7.4.3 of the EIS) indicates that no overflows from the mine water management system based on the model assumptions and configuration.

Remediation of subsidence related surface cracking is addressed in **Section 4.15.6**, **Section 4.15.13.1** and **Section 4.15.13.2**.

The above measures are therefore appropriate for the management of the potential risks of the Project and no further management strategies are required.

4.15.15.1 Waste Material Management

Issue

28. Adoption of the full suite of recommendations relating to the management of potentially acid-forming materials proposed within the Geochemical Impact Assessment (EIS, Appendix AB) would further reduce the likelihood of and uncertainty associated with predicted impacts to water resources.

29. Given the final landform of the backfilled open cut pits is proposed to extend above the surrounding and existing landform, placement of potentially acid-forming materials should take into account the risk of erosion and exposure of waste materials, and prediction of equilibrium groundwater levels within the backfilled pits, as well as the uncertainty associated with groundwater modelling predictions.

Response

The Geochemical Impact Assessment (see Appendix AB of the EIS) provides detailed geochemical information on representative samples of coal and mining waste materials that will be generated at the Project as well as the “appropriate mitigation and management measures”. The report identifies that the majority of these materials are likely to have a high factor of safety with respect to potential acid generation. Whilst some of the coal reject materials are PAF, coal rejects make up only 11 % of the total mining waste materials and will be managed at the Project. Some of the coal seam floor and coal reject materials derived from the Coggan Seam have been identified as PAF and some have been identified as NAF.

The identified PAF/NAF coal reject materials and other mainly NAF coal reject materials from the Ulan seam will be well mixed and preferentially placed as backfill deep in the open pits, below the level of the predicted post-mining groundwater recovery level, and encapsulated with at least 5m of NAF overburden, prior to rehabilitation. The emplaced coal reject materials will be paddock dumped, dozed, traffic compacted and agricultural lime dosed as required.

In early mine life when no storage capacity is available at the open pits, coal reject materials will be encapsulated in cells at the OEAs using the same operational management controls described above. If any acid generation is identified at the Coggan Seam floor in the underground working or at the open cut pits, agricultural lime application and/or a mobile lime dosing plant will be used to treat the water. In the underground mine, the risk of any acid generation is further reduced by the use of 'stonedust' in roadways and other underground workings. 'Stonedust' is primarily used as an inert agent for the prevention and propagation of a coal dust explosion. The use of 'stonedust' is a NSW legislative requirement for underground coal mines.

This 'stonedust' is commonly used in Australian underground mines and is a natural, fine calcium carbonate product manufactured from high purity limestone. At the Project, this product will add alkalinity to underground workings, which will buffer the small amount of acidity that could potentially be generated from transient oxidation of any remnant coal materials. The occurrence of some PAF coal and coal reject materials at the Project is similar to many coal mining operations in Australia including Moolarben Coal Mine located approximately 55 km north-west of the Project (EGi, 2006), where PAF coal reject materials are managed without any significant adverse effect on the open cut and longwall panel operations.

Similarly, the coal reject management strategy proposed to be used at the Project has been used at other mining operations in NSW over many years handling mining waste materials with similar geochemical characteristics to the Project (including Bengalla and Boggabri Coal Mines) and there have been no significant water quality issues involving acidity, metals/metalloids and/or salinity. A Mining Waste Management Plan and specific procedures will be developed for the Project to reflect and assist in the implementation of the management and mitigation measures described above.

4.15.15.2 Water Management

Issue

30. Management triggers and associated responses for key storages within the water management system (e.g. sediment dams) should be developed and described in the Water Management Plan. Management responses could include increasing the pumping capacity to divert water to the mine water management system (instead of being released from site), resizing/introducing additional temporary sediment dams, use of flocculating agents or other treatment as necessary.

Response

Noted. The WMP for the Project will include processes to ensure that sediment dams and other water management structures are appropriately managed to minimise or avoid impacts to the neighbouring environment.

4.15.15.3 Subsidence

Issue

31. Subsidence impacts can be reduced through a number of engineering techniques including reducing the widths of longwall panels, increasing tailgate/chain pillar widths or a combination of both and reducing the height of coal extracted (Commonwealth of Australia, 2015). These techniques could be applied to longwalls underlying sensitive surface features or to longwalls that have a large width to depth of cover ratio.

Response

As explained in Section 3.17 of the EIS, the Project mine plan has been the result of numerous iterations and consideration of potential environmental, social and economic considerations. As a result, significant portions of the known coal resource have been removed from the Project mine plan.

The underground mine plan orientations and reduced longwall panel widths were considered during the mine planning process, however the Project mine plan was considered to be the preferred alternative as a result of maximising the extraction of the coal resource whilst achieving minimal additional environmental impacts within the Subsidence Study Area.

Section 7.1 of the EIS provides a description of the subsidence impacts associated with the Project which informed other environmental assessments. Based on the impact assessments completed for the EIS, predicted impacts are anticipated to be manageable.

4.15.16 Additional Monitoring and Management

Issue

32. Expansions to surface water and groundwater monitoring networks to minimise the risks of the project to water-related assets are suggested below. Where additional sites have been identified, monitoring should begin immediately to establish baseline conditions. Surface water and groundwater monitoring presented as part of the Water Management Plan should be consistent with the National Water Quality Management Strategy (ANZECC and ARMCANZ, 2000), which should include determination of appropriate local water quality objectives and guideline values.

33. Appropriate management and mitigation measures should be defined as part of the Water Management Plan in the event that guideline values are exceeded. Management triggers and subsequent responses should be defined before mining commences and should utilise the proponent's existing water monitoring dataset.

Response

Detailed responses to these matters are presented in **Section 4.15.19** and **Section 4.15.20** below.

4.15.17 Groundwater and Final Landform

Issue

34. The groundwater monitoring network can be improved by the inclusion of additional sites in the Lee Creek alluvium to identify potential impacts of leachate from the adjacent overburden emplacement areas. Groundwater monitoring points should also be established in the backfilled pits to monitor water quality as the groundwater level re-equilibrates, and provide an early indication of potential water quality impacts to alluvium groundwater and associated surface waters.

Response

KEPCO recognises the benefit in the additional monitoring sites recommended by the IESC and will commit to installing these bores as required. The methodology for installing the bores will be outlined in more detail within the WMP. The WMP will also consider the requirements of the National Water Quality Management Strategy when developing water level monitoring, triggers and management options.

4.15.18 Water Management Plan

Issue

35. The Water Management Plan should describe how the groundwater monitoring programme will provide assurance that observed groundwater drawdown is consistent with predictions, and in cases where groundwater drawdown exceeds predictions, describe how potential impacts will be mitigated. The Water Management Plan should also describe the management of long term impacts to water resources once mining is complete, including measures to assess the effectiveness of remediation.

Response

Noted. A WMP will be prepared for the Project in accordance with conditions of development consent.

4.15.19 Groundwater Quality

Issue

36. Groundwater quality is proposed to be sampled quarterly or annually. Monthly sampling would increase the likelihood of more rapid detection of exceedences of guideline values and therefore potential contamination. More frequent monitoring would also better reveal patterns associated with seasonal climatic variations

Response

Noted. A WMP will be prepared for the Project in accordance with conditions of development consent which will stipulate frequency of monitoring in consultation with relevant regulators.

4.15.20 Surface Water

4.15.20.1 Surface Water Monitoring Program

Issue

37. To enable more timely detection of surface water impacts and isolation of sources of contamination to inform management measures, the surface water monitoring programme should incorporate:

- a. Additional monitoring stations located closer to the downstream confluence of Bylong River and Dry Creek, and adjacent to open cut pits along Lee Creek.*
- b. Event-based water quality monitoring downstream, especially downstream of the proposed overburden emplacement areas and continuous monitoring of electrical conductivity to detect pulses of salts arising from altered groundwater inputs or potentially contaminated run off.*
- c. Additional monitoring sites on the Goulburn River upstream and downstream of the confluence of the Bylong River to provide further certainty that impacts to downstream water quality will be detected.*

Response

The IESC has suggested water quality monitoring on the Goulburn River upstream and downstream of the Bylong River confluence. Water quality monitoring of the Goulburn River is already undertaken by DPI Water immediately downstream of the Bylong River confluence at Coggan (Station No. 210006). Monitoring water quality upstream of the Bylong River confluence may provide some indication of the impact of water from the Bylong River in affecting Goulburn River water quality. However, this will not provide information on the impacts of the Project, which occupies a very small fraction of the Bylong River catchment. To detect impacts of the Project requires monitoring upstream and downstream of the Project.

There are many other human activities and natural processes in the Bylong River catchment which may impact water quality, independent of the Project. For example, monitoring data collected to date indicates that high salt concentrations occur downstream of the Project site, potentially from the Growee River catchment. These elevated salt concentrations may impact the Goulburn River, but are not related to the Project.

Further details of the proposed surface water monitoring program will be determined during development of the site WMP. The monitoring program will consider event based monitoring, the National Water Quality Management Strategy (ANZECC and ARMCANZ, 2000) and will include determination of appropriate local water quality objectives and guideline values.

4.15.20.2 Water Quality Objectives

Issue

38. Appropriate local water quality objectives and guideline values should also be determined, particularly for intermittent streams. Further collection of surface water quality data at high and low flows to support characterisation of baseline water quality in Dry Creek and Lee Creek is needed.

Response

Some additional water quality samples have been collected since the completion of the SWIA. However, the number of additional samples is limited due to relatively dry conditions. Further monitoring will continue to be undertaken until development of the Project. All collected baseline data will be used to characterise baseline water quality which will be documented in the WMP for the Project.

Table 21 shows statistics for water quality samples collected at SW4 (Bylong River), the only monitoring location where additional samples (15) have been taken since completion of the SWIA. A key observation from the water quality results is that salinity (EC) is quite high (median 1,900 $\mu\text{S}/\text{cm}$).

Results for iron, manganese and zinc are summarised as follows:

- The 80th percentile result for iron (0.14 mg/L) is below the ANZECC trigger value for irrigation (0.2 mg/L);
- The 80th percentile result for manganese (0.42 mg/L) exceeds the trigger levels for irrigation (0.2 mg/L) and recreation (0.1 mg/L) but is lower than the trigger level for ecosystem protection (1.9 mg/L); and
- The 80th percentile result for zinc (0.012 mg/L) is above the trigger level for ecosystem protection (0.008 mg/L).

These monitoring results show that natural background levels of some pollutants in the receiving waters for the Project are elevated above the ANZECC guidelines. Trigger investigation levels for water quality will be determined during development of the WMP, which will use the baseline data collected prior to commencement of the Project.

The results of the water balance modelling have shown that operation of the site water management system in accordance with the proposed system operational rules will contain mine water on the site under all historical climate conditions. Hence, mine water will not impact downstream surface water quality. As discussed in **Section 4.8.14**, any water discharging from sediment dams would occur due to rainfall that exceeds the design standards (and hence would be significantly diluted) or released if water quality is consistent with baseline conditions.

Table 21
Surface Water Quality Monitoring at SW4 (Feb 2012 – Dec 2015)

	pH	Electrical Conductivity (µS/cm)	Turbidity (NTU)	Hydroxide (OH ⁻)	Carbonate (CO ₃ ²⁻)	Bicarbonate (HCO ₃ ⁻)	Total Alkalinity	Chloride (Cl)
Min	6.9	380	0.6	1	1	5	110	47
20%ile	7.6	1,800	2.7	5	5	340	340	290
Median	7.8	1,900	4.8	5	5	360	360	320
80%ile	8.1	2,100	10.1	5	5	390	390	340
Max	8.3	2,300	260	5	320	420	420	380
No. Samples	53	53	53	53	53	53	53	53
	Ammonia (NH ₃) as N	NO _x (NO ₂ ⁻ + NO ₃ ⁻)	Sulphate (SO ₄ ²⁻)	Calcium	Potassium	Sodium	Magnesium	Total Phosphorus
Min	0.005	0.005	19	19	5.3	33	15	0.05
20%ile	0.005	0.005	220	100	6.4	170	83	0.05
Median	0.011	0.010	250	120	7.4	210	96	0.06
80%ile	0.028	0.040	296	130	8.2	230	100	0.10
Max	0.180	18	330	160	14	250	120	6.3
No. Samples	53	53	53	53	53	53	53	53
	Metals - Dissolved (mg/L)							
	Aluminium	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper
Min	0.0005	0.001	0.030	0.0001	0.0001	0.001	0.001	0.001
20%ile	0.0010	0.001	0.080	0.0001	0.0001	0.001	0.001	0.001
Median	0.0030	0.001	0.088	0.0001	0.0001	0.001	0.001	0.001
80%ile	0.0080	0.001	0.096	0.0001	0.0001	0.001	0.001	0.002
Max	0.0190	0.002	0.14	0.0005	0.0004	0.001	0.002	0.029
No. Samples	53	53	53	53	53	53	53	53
	Metals - Dissolved (mg/L)							
	Iron (Fe ²⁺)	Lead	Manganese	Mercury	Nickel	Selenium	Vanadium	Zinc
Min	0.01	0.001	0.010	0.00005	0.001	0.001	0.001	0.001
20%ile	0.02	0.001	0.114	0.00005	0.001	0.001	0.001	0.002
Median	0.06	0.001	0.240	0.00005	0.002	0.001	0.001	0.006
80%ile	0.14	0.001	0.418	0.00005	0.002	0.001	0.001	0.012
Max	0.30	0.003	1.4	0.00062	0.007	0.003	0.002	0.094
No. Samples	53	53	53	53	53	53	53	53

Note: Results expressed in mg/L unless otherwise stated.

4.15.20.3 GDE Monitoring

Issue

40. The proponent's proposed monitoring of riparian vegetation GDEs should commence immediately to establish baseline conditions. This programme should be expanded to include additional GDEs identified (refer to Paragraph 3) and stygofauna, and include sites predicted to be impacted by groundwater drawdown, as well as reference sites.

a. Condition monitoring of vegetation GDEs should assess tree health and population condition (e.g. recruitment success and seed set).

b. For surface water GDEs (e.g. groundwater-fed pools) condition monitoring should measure consistency of water supply and water quality and aquatic ecology survey sites (part of the proposed ecological monitoring programme) should coincide with these areas.

c. The GDE represented by stygofauna in the alluvium of Lee Creek and Bylong River should also be monitored to detect responses to altered groundwater flows and water quality. Experiential evidence shows that stygofauna can be stranded by declines in the groundwater table (Stumpp and Hose, 2013).

Consideration should be given to the coordinated sampling (where possible) of the same set of monitoring sites for water quality and aquatic ecology to improve the information base with which to interpret any observed changes in condition of surface-water GDEs.

Response

KEPCO has completed further drilling along the Dry Creek alluvium in the vicinity of the identified GDEs. KEPCO will include provisions within the WMP to assess the level of impacts to GDEs within the Study Area. Monitoring of GDEs will be undertaken to assess the level of dependency of an ecosystem on groundwater and how the ecosystem responds to changes in the groundwater system (Richardson *et al.*, 2011). The monitoring methods utilised will aim to assess the response of GDEs to changes in the groundwater system.

In general terms, a number of indicators can be assessed within GDEs including hydrology and hydrogeology, water quality, vegetation, fauna and climate (Richardson *et al.*, 2011). It is recommended that GDE condition monitoring for the Project focuses on vegetation characteristics. Methods that are proposed to be utilised to assess GDE condition are outlined in **Section 4.11.7**.

Following commissioning of the Dry Creek boreholes, the existing ground and surface water monitoring program will be expanded to include coordinated sampling of the Dry Creek bores. The purpose of the GDE monitoring program will be to detect changes to the vegetation characteristics of GDEs resulting from changes to groundwater levels. A TARP will be developed to ensure that if significant detrimental impacts occur, appropriate remedial responses will be implemented.

As stated in Section 7.19.4 of the EIS “the Project is predicted to result in only very limited impacts to the stygofauna community present in the local alluvium.” For this reason, no additional monitoring or management of stygofauna is required.

4.15.20.4 Subsidence Extraction Plans

Issue

Subsidence

42. To inform ongoing management of subsidence impacts, subsidence predictions and the effectiveness of proposed remediation measures should be reviewed and updated as new information is available. Extraction plans will describe how subsidence impacts will be managed. These plans could be prepared for sections of the underground operations to enable new information to be adopted and management activities modified as mining progresses.

Response

Noted. Extraction Plans will be prepared in accordance with any conditions of development consent.

4.16 DP&E PEER REVIEW OF AGE GROUNDWATER MODELLING

DP&E commissioned Dr Frans Kalf to independently review the EIS GIA. The scope of the review was in summary to review and comment on the suitability of the:

- Assumptions for impact assessment and modelling;
- Methodology for modelling and consultation;
- Suitability of the proposed mitigation/management and/or protection measures; and
- Recommended conditions of approval (where appropriate).

DP&E also requested Dr Kalf comment on the significance of the predicted impacts, key environmental risks and issues for consideration during the merit review/assessment process.

Dr Kalf concluded that ‘*overall the modelling setup was conducted within the procedures accepted in modelling practice,*’ and ‘*the modelling assumptions employed were based predominately on standard procedures.*’ Dr Kalf also supported the methodology proposed for water level monitoring, seepage monitoring, routine model reviews and mitigation measures. Dr Kalf did query and request further comment on the:

- Methodology for modelling of the water within the unsaturated zone;
- Methodology for assessing salt migration from the backfilled open cut pits; and
- Selected monitoring and mitigation measures.

Sections below respond to the issues raised by Dr Kalf.

4.16.1 Numerical Modelling of Unsaturated Zone

Issue

Dr Kalf reviewed the methods used to simulate the unsaturated zone and requested additional information as follows:

- 1. Indicate whether the “base case” was conducted with a VG value of 0.02 m^{-1} or not for determining the current regional drawdown predictions;*
- 2. Indicate in what way the pressure sections shown in Figure F26, F27 (Appendix F page 33) were “similar” to the “base case”. That is, what variable saturation parameters (VG etc.) were used presumably for these sections that are different to the base case; and*
- 3. It is assumed that the MODFLOW-USG saturated code for unconfined conditions (not variably saturated USG-Beta) was used in the sensitivity analysis. It should be clearly stated and shown how the drawdowns determined by the saturated USG code compare with the adopted current drawdown predictions for the open cut mining areas and longwall mining.*

Response

The following responses are provided to the above queries:

1. Table 8.1 of the GIA (Appendix M of the EIS) presents the unsaturated zone parameters adopted with the model. Table 8.1 highlights that the base case MODFLOW SURFACT model used an air entry (alpha) value of 0.02 m^{-1} for the van Genuchten options for the unsaturated zone.
2. Figure F26 and Figure F27 within Appendix F of the GIA (Appendix M of the EIS) were generated using data from the MODFLOW USG version of the model which used the Upstream Weighting Package. Therefore, these figures did not directly simulate flow within the unsaturated zone, in contrast to the base case model which utilised MODFLOW SURFACT.
3. The USG-Beta version was used for the sensitivity analyses to simulate groundwater flow as outlined within Appendix F of the GIA. USG-Beta has an option to use the Richard's equations for saturated/unsaturated flow. However, the Richard's equation option was not utilised for the sensitivity modelling. The Upstream Weighting Package was adopted due to the similarity with the pseudo soil function of MODFLOW. Figure 26 of **Appendix H** compares the maximum drawdown predicted by MODFLOW SURFACT with MODFLOW USG in the Coggan coal seam. It indicates that both model platforms predict a similar zone of drawdown. However, the MODFLOW USG version is slightly less extensive where the coal seam is relatively shallow and the hydraulic conductivity higher.

4.16.2 Salt Migration

Issue

DP&E's third party reviewer commented that a more rigorous method to assess the potential for changes in salinity would be to utilise a contaminant transport model coupled with the numerical groundwater flow model developed for the EIS.

Response

As discussed in **Appendix H**, it is agreed that a contaminant transport model can better represent the formation of any plumes emanating from the buried rejects materials. However, it is considered that contaminant transport modelling is not warranted at this stage of the Project. This is because despite its simplicity, the more simplistic (yet conservative) salt balance suggested a low risk to receiving water quality post-mining. If contaminant transport modelling was completed now, it would be subject to a range of assumptions for inputs, and most likely not yield results that assist the decision making process. More complex approaches to modelling the salt movement in the groundwater systems would be more valuable once data is collected on leachate from the rejects materials during the mining operations. This monitoring would allow the inputs to any contaminant transport model to be better constrained, reducing the uncertainty in the model predictions.

The WMP for the Project will describe measures for the monitoring of waters that come in contact with the rejects materials during the life of the Project and outline a post closure monitoring program. It will also include a program to validate the water balance, salt balance, surface water model and groundwater model for the development every five years and compare against monitoring results with modelled predictions. At this time, the most appropriate modelling method will be considered based on the expanding datasets. If monitoring data indicates substantial differences (previously unrecognised information) to those interpreted, these data will be incorporated into the model and revised predictions made and reported. Refer to **Appendix H** for further detail.

4.16.3 Monitoring Measures

Issue

The Groundwater Impact Assessment suggested using the 5th percentile water level measurement as a trigger to investigate water level declines. DP&E's third party reviewer suggested an alternative trigger methodology for water level declines that compares between the water level record in the bore and the rainfall mass curve over the same time period to identify climatic and pumping influences on water levels. It was also suggested metering of groundwater pumping in the vicinity of the proposed mine would also allow any pumping component of drawdown to be accounted for in such an analysis. Stream flow records were also recommended.

Response

The approach recommended by DP&E's third party reviewer has merit and will be adopted as a methodology for assessing the impacts of mining upon groundwater levels.

It is also agreed that metering of bore water usage is critical and all KEPCO bores will have flow meters and water level loggers installed. Water levels and flow velocity will also continue to be monitored in the key streams within the Project Boundary. The WMP will outline these monitoring measures in more detail.

4.17 DP&E PEER REVIEW OF ECONOMIC ASSESSMENT

Issue

DP&E commissioned the CIE to complete a peer review of the Economic Impact Assessment (Appendix AB of the EIS) for the Project.

The CIE review generally found the Economic Impact Assessment to be methodologically appropriate and analytically sound. Key findings of the CIE review are that:

- The BCA identifies and values the major costs and benefits of the Project and uses methodologies for their valuation that are reasonably sound;
- While there are uncertainties regarding the future production profile from the mine, it is expected that there will be a sustained demand for the product over the timeframe of the Project;
- While there are significant uncertainties regarding future prices, the implied coal price for export thermal coal used in the BCA is reasonable;
- The estimation of royalties from the Project is reasonable;
- Residual air quality impacts below government policy thresholds that were not valued in the BCA are immaterial to the analysis i.e. \$0.3 Million in present value terms;
- To the extent that biodiversity impacts are mitigated by the purchasing of land for offsets there are no unmitigated biodiversity impacts that need to be considered in the BCA;
- There is difficulty in placing dollar values on Aboriginal cultural heritage impacts and therefore the approach adopted by Gillespie Economics of leaving these unquantified for consideration by decision-makers against the quantified net benefits of the Project is appropriate;
- The order of magnitude of residual historic heritage impacts is around \$1 Million present value;
- The methodology for valuation of visual amenity impacts appears to be reasonable and that to the extent there are some minor residual visual amenity impacts, this would not have a material impact on the results;
- The BCA uses an appropriate discount rate;
- The time frame used in the BCA is appropriate;
- The sensitivity testing in the BCA covers an appropriate range of variables;

- At a minimum, it is reasonable to expect net benefits to NSW of above \$177 Million. In addition to this, there are public benefits associated with income tax payments to the Australian Government (some of which is distributed to NSW) and broader employment benefits to the community;
- The input-output methodology used for assessing regional economic impacts is reasonable; and
- The estimate of the regional economic impacts of the Project gives a reasonable estimate of the upper bound of regional effects.

CIE has offered some alternative views to some of the assumptions employed and approaches taken. Although they note that these alternative views in relation to some assumptions and approaches would not have a material impact on the BCAs finding, that the Project will continue to have net social benefits to Australia and NSW.

Response

Appendix N provides a detailed response to comments from the CIE review to clarify some of the interpretations and provide additional justification for the approaches taken in the Economic Impact Assessment.

4.18 NSW HEALTH – RA18

4.18.1 Receiving Waters

Issue

Product stockpile dam, receives runoff from product stockpile area, this is transferred back to Coal handling and preparation plant supply dam and any overflows enter the Bylong River. What is the anticipated quality of the water and will there be any notifications when these events occur?

Sediment dams 1, 2, 4, 5 & 6, dewatered to open cut mine dam following rainfall events with overflows going into Lee Creek and Bylong River. Once again what impact will this have on the creek?

Bylong River receives storage overflows from underground mine dam, underground raw coal contact dam, products stockpile, fill point dam and sediment dam 8. Again there is no reference to the anticipated quality.

Response

These matters are discussed in **Sections 4.8.14** and **4.15.16**.

The results of the water balance modelling have shown that operation of the site water management system in accordance with the proposed system operational rules will contain mine water on the site under all historical climate conditions. Hence, mine water will not impact downstream surface water quality.

As discussed in **Section 4.8.12**, any water discharging from sediment dams would occur due to rainfall that exceeds the design standards (and hence would be significantly diluted) or released if water quality is consistent with baseline conditions.

4.18.2 Air Quality

Issue

Will there be any warnings for the community should air quality fall outside the anticipated quality?

Response

The AQGHGIA (Appendix O of the EIS) concluded that the Project is not predicted to contribute to any exceedances of the relevant air quality criteria at any private residences (either due to the Project alone, or cumulatively). Notwithstanding this, real time air quality monitoring will be undertaken, which will allow Mine Operators to proactively manage any short term impacts by altering activities or increasing controls to prevent or minimise dust impacts at nearby private residences, to the greatest practical extent.

4.18.3 Groundwater Impact

Issue

Appendix M Ground Water Impact statement presents plenty of data and modelling and in sect 13.9, page 159 Management and mitigation strategies are discussed. I would like to see triggers for these actions described.

Response

A WMP will be developed, which will include a monitoring program to ensure predicted impacts to water resources are appropriately monitored, validated, recorded and licensed throughout the life of the Project. Trigger levels will be established within the monitoring program to identify trends departing from historical or predicted values.

4.18.4 Mine Closure

Issue

What is going to happen to the sediment ponds on closure of mine?

Response

A Rehabilitation Strategy and Biophysical Strategic Agricultural Land Reinstatement Strategy have been developed for the Project (Appendix W of the EIS). In accordance with this Strategy, mine infrastructure will be decommissioned and the area rehabilitated following mine closure. However, any infrastructure that is considered to be of beneficial use post-mining will be maintained, such as sediment ponds, which could be utilised as farm dams.

4.18.5 Exhumations

Issue

Details of consultation with NSW Health regarding exhumations

Response

There has been extensive research and consultation undertaken regarding the proposed relocation of graves from the Catholic cemetery at Upper Bylong. Engagement will continue throughout the assessment process and beyond. The research and consultation has primarily focussed on identifying relatives and descendants of those buried in the cemetery, and has included engaging with:

- Persons already known to KEPCO and WorleyParsons;
- Persons identified by research during the preparation of the historical biographies;
- Persons who have come forward as a result of public notices, media and publicity; and
- Persons located through registries, telephone directories and other publicly available documents.

The purpose of consultation with relatives and descendants has been threefold:

- To provide information regarding the Project;
- To provide information regarding the proposed exhumation and relocation of the burials in the cemetery of the former Our Lady of the Sacred Heart church at Upper Bylong; and
- To ascertain the wishes of relatives and descendants regarding the location of reburial for their ancestors.

Public notices were placed in National, state and local papers in March and April 2015, in order to:

- Identify additional relatives and descendants; and
- Elucidate further information on unidentified burials.

The wording of the public notice is provided below:

**Upper Bylong Roman Catholic Cemetery, Upper Bylong Road, Upper Bylong,
NSW.**

Proposed exhumation and relocation.

The present owners of the former Church and Cemetery of Our Lady of the Sacred Heart at Upper Bylong intend to exhume and relocate all the burials from this cemetery. Exhumations will be completed with due care and reverence and will be reburied at Bylong or at another location to be specified.

Known burials include:

John Gerald BURKE, d 1932;
Gerald William CAMPBELL d. 1931;
Hugh Francis COBREY, d. 1929;
Susan Helena Cecelia COBREY, d. 1945;
Ethel Kate READFORD, d. 1937.

Anyone with knowledge of any unmarked burials is encouraged to come forward. Relatives and descendants are invited to contact the present owners to register their interest in the exhumation and relocation of burials.

For further information please contact
Dr. Edward Higginbotham
Edward Higginbotham & Associates Pty Ltd.
PO Box 97, HABERFIELD, NSW 2045.
Phone: 02 9716-5154.
Email: drtedh@bigpond.com

Table 22 provides a schedule of publications and dates for the public notice.

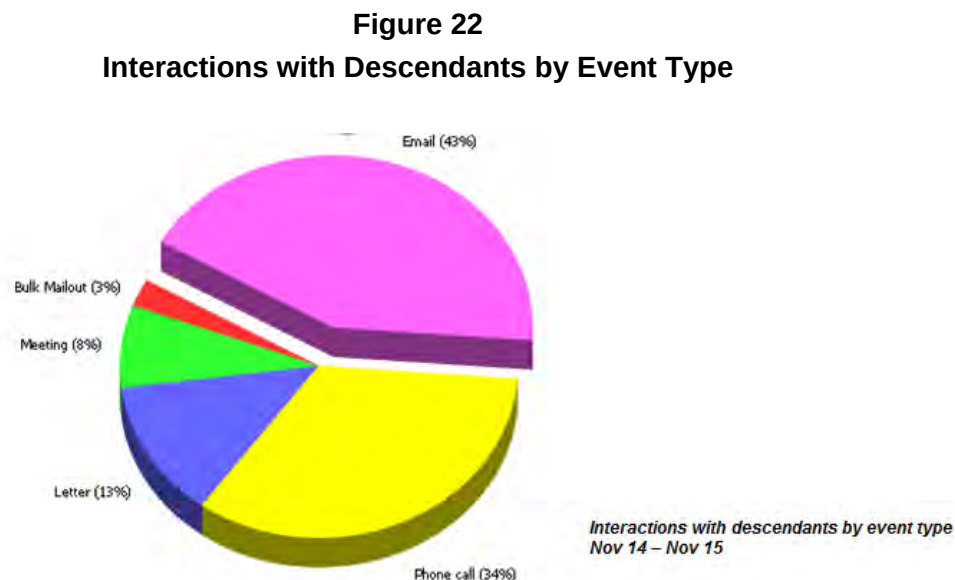
Table 22
Exhumation Public Notice Summary

Newspaper	Publication Days	Dates of Publication
The Australian	Wednesday and Friday	18 & 20 February 2015
The SMH	Wednesday and Saturday	18 & 21 March 2015
Mudgee Guardian	Fridays	20 & 27 March 2015
Mudgee Weekly	Wednesday	25 March 2015
Muswellbrook Chronicle	Fridays	20 & 27 March 2015
Hunter Valley News	Wednesdays	18 & 25 March 2015
Western Advocate - Bathurst region	Saturdays	14 & 21 March 2015
Western Times - Bathurst region	Thursdays	19 & 26 March 2015

A number of relatives came forward as a result of the public notice. The public notices elucidated no further information with regard to unmarked burials.

KEPCO is committed to full and inclusive engagement with all relevant stakeholders, and in particular with known descendants and relatives of those buried in the Upper Bylong Catholic Church cemetery. KEPCO has made concerted efforts to engage with descendants via email, phone, face-to-face meetings and letters. KEPCO has also sent descendants Project newsletters and information updates to keep them abreast of Project progress.

There has been a total of 77 interactions with 15 descendants over a 12 month period. KEPCO has corresponded with and offered face-to-face meetings with all identified descendants as shown in **Figure 22**.



Consultation is continuing with appropriate stakeholders regarding the exhumation and relocation process. Such stakeholders include relatives and descendants, community members, the Catholic and Anglican Diocese and relevant consent/ approving authorities, in particular NSW Health and MWRC.

The appropriate statutory permits and approvals for the exhumations, and depending on the management practices of the place of reinterment re-erection of the grave markers, will be obtained. Accordingly, applications will be submitted for the exhumations in accordance with Clause 69 of the *Public Health (Disposal of Bodies) Regulation 2012*. Consultation with NSW Health will be undertaken during this process.

5 STAKEHOLDER ISSUES

*This section responds to the submissions received from the SIGs, organisations and the public. A response to each of the issues identified by the above submissions is summarised below. A submission reference number is listed for each issue to identify which stakeholders have raised the specific issue. Please refer to **Appendix A** to identify each specific stakeholder reference number.*

*It is noted a total of 318 public submissions are referenced in **Appendix A** and throughout this section as the matrix and responses were complete, prior to receiving the advice from DP&E that numerous duplicate submissions are included in this number.*

5.1 GENERAL

5.1.1 Public Interest

Submission Reference: SIG3, SIG8

Issue

A number of stakeholders made the generalised comment that the Project is not justifiable and is not in the public interest.

It was also stated that it is not in the interest of the people of NSW or the current workforce in the NSW coal industry to expand existing thermal coal supply to provide security for the Korean energy market.

Further, that it cannot be justified as an economic benefit because it will compete negatively with other sources of thermal coal produced in NSW.

Response

Whilst many SIGs state the imminent demise of energy generation from thermal coal, and thus the coal industry generally, this claim is not supported by fact. As outlined in the Section 9.2 of the EIS, the International Energy Agency expects the world's energy consumption will grow 37% by 2040. Local and international predictions are that the need for coal as a source of energy for electricity production will continue to increase for some years to come as energy demand grows, despite an expectation of an increase in energy generated by alternate sources and the ultimate transition from carbon based energy to alternative fuel sources. Thermal coal with high energy capacity and low emission properties remains a highly sought after energy source in Asian countries.

The Project represents a reasonable and appropriate business decision to meet part of the forecast demand for thermal coal whilst returning substantial benefit directly to the local community, the state of NSW, and the nation.

The development of some of the coal resources within the Project Boundary will deliver considerable economic and social benefits to the various levels of the Australian economy.

With relatively stable agricultural production and diminishing manufacturing in Australia, the socio-economic benefits that flow from mining (including coal mining) are increasingly important to the Australian economy and the maintenance of Australia's standard of living.

As outlined in the Project Justification in Section 9 of the EIS, the environmental assessment undertaken has determined the Project's residual social and environmental impacts with a high degree of scientific certainty and has balanced these impacts against its benefits.

It has been concluded in the EIS, that the Project will serve the essential purpose of providing thermal coal for current and future generations and will generate significant economic benefits in the process. The Project's social and environmental impacts have been minimised as far as practicable by implementing reasonable and feasible management and mitigation measures.

The Project will provide net production benefits to Australia of approximately \$596 Million (approximately \$315 Million to NSW) and will:

- Maximise the recovery of a thermal coal resource, within the environmental constraints identified, for which there is an increasing global demand;
- Create approximately 830 direct and indirect jobs on a regional basis (MWRC LGA);
- Create approximately 1,496 direct and indirect jobs in NSW;
- Continue and extend financial support to the region, NSW and Australia with taxation and royalty benefits of approximately \$592 Million over the life of the Project; and
- Achieve the most efficient economic use of the land in question.

The socio-economic benefits of the Project will far outweigh the social and environmental impacts, and hence the Project should be considered to be in the Public Interest.

The above was confirmed in correspondence received from the DRE dated 6 November 2015, which concluded that *"the Division supports the Bylong Coal Project (the Project) as a responsible utilisation of the State's coal resources that will generate employment opportunities and bring economic benefits to the local region and the State as a whole."*

DRE also recognised the value in producing export quality coal stating *"Export income is vital for the health of both the NSW and Australian economy. Export income contributes to the Nation's balance of trade which provides positive benefits to both NSW and Australia's credit rating."*

The oversupply of coal is discussed further in **Section 5.26.2**.

5.1.2 Generally Opposed

Submission Reference: SIG3, SIG27, P276

Issue

A number of stakeholders made the general comment that the assessment of impacts and proposed mitigation measures for the Project are inadequate, that the project will have significant cumulative environmental and social impacts that have not been adequately predicted, mitigated or regulated, and as such the Project should not be approved.

Response

The EIS is a robust scientific document that has been prepared by highly credentialed experts within their fields of expertise. The sum total of the years of experience of the engineers and scientists that have contributed to the preparation of the EIS is in excess of 500 years. Many of these experts have provided evidence to court proceedings and all are willing to sign the Expert Witness Code of the Land and Environment Court of NSW. Further, peer reviews of the technical assessments were also undertaken by pre-eminent independent specialists, to quantify the potential environmental impacts resulting from the Project with certainty.

As detailed in the EIS, each environmental impact assessment has been undertaken strictly in accordance with the relevant government approved methodologies, policies and guidelines available at the time of its preparation.

The Project is designed to minimise environmental and social impacts and enable co-existence with adjacent agricultural land users. Further, all reasonable and feasible management and mitigation measures have been identified to minimise or avoid the social and environmental impacts and enhance social benefits of the Project as far as practicable.

5.1.3 SEAR's Not Met

Submission Reference: SIG3, SIG8, SIG9, O6, O8, P229

Issue

The general comment was made that the EIS did not meet the SEARs.

Response

Revised SEARs for the Project were issued 11 November 2014.

Prior to the submission of the EIS in support of the current DA, extensive consultations occurred with the relevant government departments to confirm their SEAR's and how best to address these in the EIS. The EIS and all relevant studies were then prepared in accordance with the SEAR's and any additional direction given. Table 15 in Section 5.4.1 of the EIS provides a list of the SEARs and references the section in the EIS which corresponds to each requirement.

Following the initial submission of the EIS, it was reviewed by DP&E (particularly against Table 15). Correspondence was received from DP&E on the 3 August 2015, confirming the EIS was adequate, and as such it was appropriate to be placed on public exhibition following the documents finalisation.

5.1.4 Independent Expert Scientific Committee

Submission Reference: O7, P43

Issue

A number of submissions made reference that the Project should be considered and reported to by the Independent Expert Scientific Committee.

Response

To ensure a rigorous assessment on water resources, the Project has been referred to the IESC during the Gateway Process (by the Gateway Panel) in early 2014) and recently to provide comment on the EIS (jointly requested advice by DoE and DP&E).

The IESC were requested to review the Project on 15 January 2014 under the Gateway Process due to its location on identified BSAL and potential impact upon water resources. The IESC completed a review of the Gateway Application and supporting documentation and provided advice to the Gateway Panel in relation to the groundwater and surface water impact assessment on 14 March 2014. Recommendations from the IESC were incorporated into the EIS as discussed in Section 5.4 of the EIS.

A further review and assessment was undertaken of the EIS by the IESC. Additional issues raised by the IESC have been addressed in **Section 4.15**.

5.1.5 Environmental Harm

Submission Reference: O7, SIG26

Issue

Some submissions were concerned with adverse environmental impacts (e.g. impacts to creeks and woodland bird species) and the associated liability or legacy that remains. Submissions were concerned that the proponent was a foreign-owned company which may not meet its environmental obligations leaving any liabilities for future generations to address.

Response

The Project is designed to avoid or minimise environmental and social impacts as far as practicable by implementing all reasonable and feasible management and mitigation measures. To this end, detailed technical studies were undertaken to assess and determine with certainty potential environmental impacts, followed by the development of robust management and mitigation measures.

KEPCO is committed to implementing the operational controls and management measures in Section 7 of the EIS and/or relevant regulatory policies and procedures for all activities associated with the Project.

Further, an Environmental Management Strategy (EMS) will be developed in consultation with the relevant regulators and to the satisfaction of DP&E, in addition to a series of Environmental Management Plans. These plans will outline the proposed management and mitigation measures that will be implemented to manage the potential environmental and social impacts of the Project. Monitoring programs will also be designed and implemented to facilitate the early detection of any unplanned impacts and ensure appropriate corrective action is undertaken. In addition, monitoring programs will facilitate tracking the success of implementation of management measures.

Should the Project be approved, KEPCO will be issued with a Development Consent with conditions attached and any other associated licences and permits that are required. All of these must be complied with under Australian legislation, regardless of KEPCO being a foreign owned company.

KEPCO Korea's commitment to best practice environmental management is demonstrated by its EMS being certified to ISO 14001. KEPCO is dedicated to continuing this commitment to the Bylong Coal Project.

5.1.6 Misinformation

Submission Reference: SIG27, P177, P228

Issue

There was comment regarding over KEPCO previously using photos in a report (not related to the EIS and not prepared by the author of the EIS) which were alleged as misleading as they were not of the actual property being relevant to the report in question. This led to some submissions seeking assurance that the information in the EIS is factual.

Response

This is discussed to an extent in **Section 5.1.2** above. Further, the EIS has been certified and signed by a Director of Hansen Bailey stating that to the best of his knowledge, all information contained within the EIS is neither false nor misleading.

5.2 REGULATORY AND PLANNING CONTEXT

5.2.1 Peer Review Process

Submission Reference: SIG1

Issue

A submission raised concerns with the proponent commissioning and undertaking its own peer-reviews of technical studies.

Response

A peer review of a particular technical assessment is undertaken by pre-eminent specialists of their field who are impartial to the Project and the Proponents. Many of these technical specialists have provided evidence to court proceedings and all are willing to sign the *Expert Witness Code* of the Land and Environment Court of NSW.

Further, the DP&E has commissioned its own independent peer reviews of key technical studies: the CIE was commissioned to conduct a peer review of the Economic Assessments for the Project and Dr Franz Kalf and Associates was also engaged to review the Groundwater Impact Assessment for the Project. These consultants are considered independent of the Project and highly experienced experts within their field.

5.2.2 Land Use Incompatibility

Submission Reference: SIG1, SIG10, SIG16, P217

Issue

There were a few submissions regarding the principal environmental planning aspects of the Project relevant to competition for land use with regard to mining, communities and villages and agricultural land uses. Submissions stated that 'no go' areas be created for mining.

Response

In September 2012, the NSW Government published the *Strategic Regional Land Use Policy* (SRLUP) which proposed an additional assessment process, known as the Gateway Process, for mining and petroleum development located on SAL. On 4 October 2013, Part 4AA of the Mining SEPP commenced and the Gateway Process described in the SRLUP was implemented.

The SRLUP sets out a range of initiatives to balance growth in the mining and coal seam gas industries with the need to protect important agricultural land and water resources, as well as the Equine and Viticulture CICs. The SRLUP seeks to achieve a sustainable co-existence of both resource and agricultural industries.

In accordance with the above, KEPCO lodged an application for a Gateway Certificate on 10 January 2014. This application assessed the potential impacts of the Project on BSAL and mapped Equine CIC within the Project Boundary in accordance with the 'Strategic Regional Land Use Policy – Guidelines for Gateway Applicants' (NSW Government, 2013).

The Gateway Panel issued a Conditional Gateway Certificate for the Project on 15 April 2014 which facilitates the lodgement of the current development application under Division 4.1 of Part 4 of the EP&A Act.

The Project has been designed to ensure co-existence with existing communities, agricultural enterprises and other land uses. As outlined in the EIS, the environmental and social impacts of the Project will be minimised as far as practicable by implementing reasonable and feasible management and mitigation measures.

To this end, a number of mine planning scenarios were considered as described in Section 3.17 of the EIS, with a number of material concessions made to avoid or minimise potential environmental and social impacts. This was recognised by the DRE with its submission stating *"large areas of low strip ratio open cut resources have been excluded from mine planning predominantly to avoid areas defined as Biophysical Strategic Agricultural Land (BSAL). Other constraints to open cut mine design include the Bylong Village, infrastructure and rivers, creeks and associated alluvials."*

Further, OEH also stated: *"OEH recognises KEPCO has significantly altered the proposed mine plan to avoid or mitigate impacts on Biophysical Strategic Agricultural Land, alluvial land, Critical Industry Cluster areas and the environment"*.

5.2.3 Modifications to Project

Submission Reference: SIG8

Issue

A submission raised concerns over the lack of security for the community or environment under the Planning system that allows Projects to be continually modified over time.

Response

As outlined in the Section 3.17 of the EIS, extensive mine planning and assessment has been undertaken to identify an approvable and workable Mine Plan for the Project. This has involved an extensive exploration program followed by a Concept Study, Pre-Feasibility Study, Option Study and Feasibility Study.

The primary objective of the mine planning studies was to develop an approvable mine plan which maximises coal recovery whilst minimising the potential for adverse environmental and social impacts. The various alternatives have also been considered and modified where possible, in light of changing stakeholder expectations as experienced by other recent Projects within the NSW planning approvals system.

Mine planning studies included the consideration of numerous mine plans, operational methods and infrastructure designs and alternatives. The preferred mine plan for the Project has been subject to extensive environmental impact assessments to identify and manage potential residual environmental issues.

All projects approved under the NSW planning approvals system have a legal right to apply to modify the project description under Section 96 of the EP&A Act. Any such application would be assessed in accordance with the laws and government policies of the time.

5.2.4 Regional Water Study

Submission Reference: SIG8

Issue

A submission stated that an independent, cumulative regional water study for the Upper Goulburn River had not been undertaken.

Response

An assessment of the potential impacts on regional water bodies was undertaken as part of the Surface Water Impact Assessment (Appendix L of the EIS). This considered the potential impacts on regional water availability, impacts from surface water runoff on receiving waters, loss of catchment areas and potential impacts on flood events. Further, cumulative impacts were also assessed at a local and regional level with consideration of nearby mines currently approved or under assessment, including Ulan, Moolarben and Wilpinjong coal mines.

The assessment concluded:

- The Project does not propose to discharge mine water to the receiving watercourses and hence will not contribute to any localised or regional impacts;
- The Project will result in a small loss of catchment to the receiving waters, which represents less than 1.3% of the catchment area of the Bylong River to the downstream boundary of the Project, or 0.3% of the Goulburn River catchment downstream of the Bylong River confluence; and
- By complying with licence restrictions on water consumption, the Project will not create unexpected cumulative impacts on water availability.

5.3 STAKEHOLDER CONSULTATION

5.3.1 Scope of Consultation

Submission Reference: SIG2, SIG3, SIG8, SIG16, SIG27, O5, O6, O8, P17, P107, P129, P136, P147

Issue

Some stakeholders were dissatisfied with the public consultation process, indicating they had not been directly consulted, the stakeholder engagement program was limited, there was no broader stakeholder consultation on the EIS and that the engagement program provided information not engagement.

Response

Despite its best efforts to conduct the thorough consultation program that it has undertaken for the Project to date, KEPCO appreciates that not all stakeholders may have been engaged to their satisfaction during the preparation of the EIS. KEPCO has taken on board the comments received from these stakeholders regarding their perceived lack of consultation and has deepened its focus for consultation going forward.

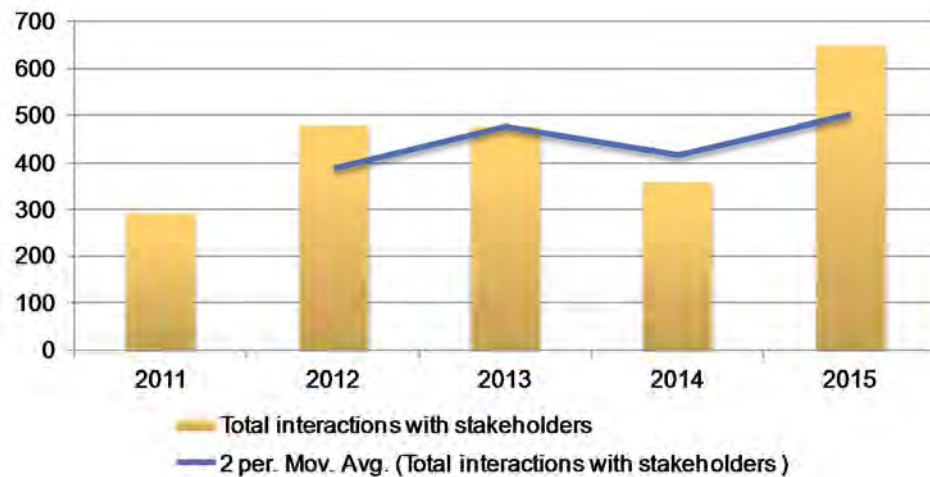
The stakeholder consultation program implemented for the preparation of the EIS is described in Section 5 of the EIS. This EIS section demonstrates a comprehensive scope of stakeholder engagement over the Project during the preparation of the EIS. In addition to the stakeholder consultation undertaken for the EIS, targeted consultation was also undertaken to inform the Social Impact (Appendix AC of the EIS), Historic Heritage Impact Assessments (Appendix T of the EIS) and various other studies.

Further information in relation to the scope of the consultation conducted for the Project and the EIS is provided in the following sections.

A robust stakeholder consultation program has been implemented by the Project team since KEPCO acquired the Authorisations in 2010. The Project team completes regular issues analysis and reporting (weekly, monthly and annually) to monitor and evaluate engagement activities to ensure engagement activities are affective and key objectives are achieved. KEPCO's consultation activities focus on stakeholders who are directly impacted by the Project's current and proposed operations. Tailored EIS consultation extended to other interested and affected parties.

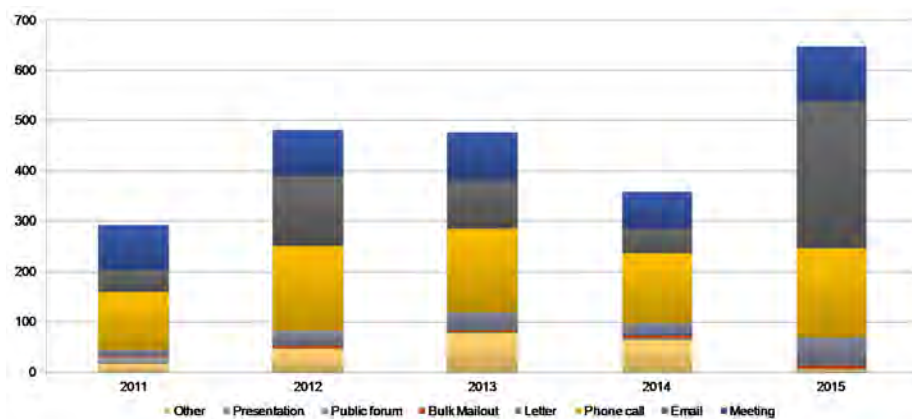
During each year, KEPCO averages 450 direct engagements with stakeholders (**Figure 23**).

Figure 23
Total Interactions with Stakeholders



KEPCO's preferred method of engagement is face-to-face and tailored meetings (**Figure 24**).

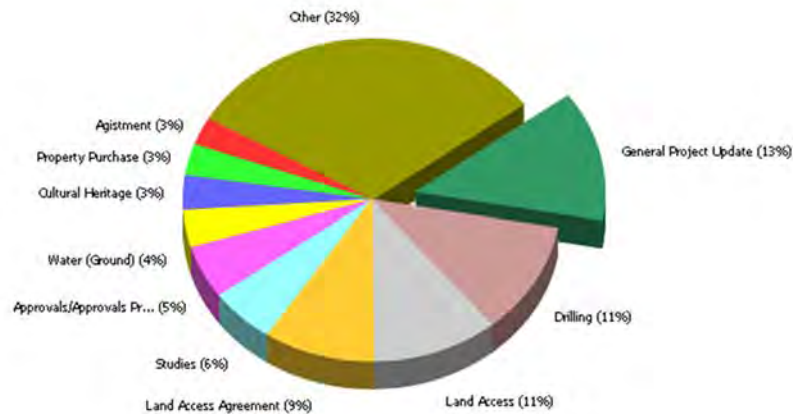
Figure 24
Method of Engagement



Direct consultations with landholders and near neighbours within the Bylong Valley have been ongoing since 2011. KEPCO regularly engages regarding a variety of issues of importance to the local community, including Project updates, land access, environmental studies, exploration activities, agricultural land management, EIS, water management, amenity and road access.

The top ten issues raised between 2010 and 2015 by stakeholders from the local community during consultations are illustrated in **Figure 25**.

Figure 25
Stakeholder Interests and Issues



Tailored EIS consultation was undertaken throughout the preparation of the EIS, during EIS public exhibition and during the preparation of this RTS. Key activities undertaken are listed below.

- Exploration Information Day held in October 2011 – 26 members of the community attended including children from the Bylong Upper Public School;
- Community information sessions were held during December 2013, February 2014 and November 2014 – approximately 52 members of community attended the information sessions to discuss issues in relation to the Project;
- Community information sessions were held in Bylong, Kandos and Mudgee during the public exhibition of the Project's EIS in September and October 2015;
- Sessions were initiated by KEPCO to provide community with opportunities to gain additional information on the Project and provide feedback;
- A series of Project briefings and presentations were provided to landholders and relevant regulators throughout preparation of the EIS;
- KEPCO prepared 13 fact sheets to summarise key EIS findings.
- Individual EIS briefings and water information sessions were provided to landholders in September and October 2015 to provide more detail on the EIS groundwater impact assessments;
- Between November 2015 and March 2016 tailored meetings have been held with individuals and organisations that made submissions on the EIS to seek further feedback and clarification on their issues;
- KEPCO has ongoing engagement with the identified descendants of the persons buried at the Catholic cemetery at Upper Bylong;
- KEPCO provided staffed information stalls at local community events, including the Rylstone-Kandos Show and Mudgee Show to answer questions and obtain feedback from local communities; and

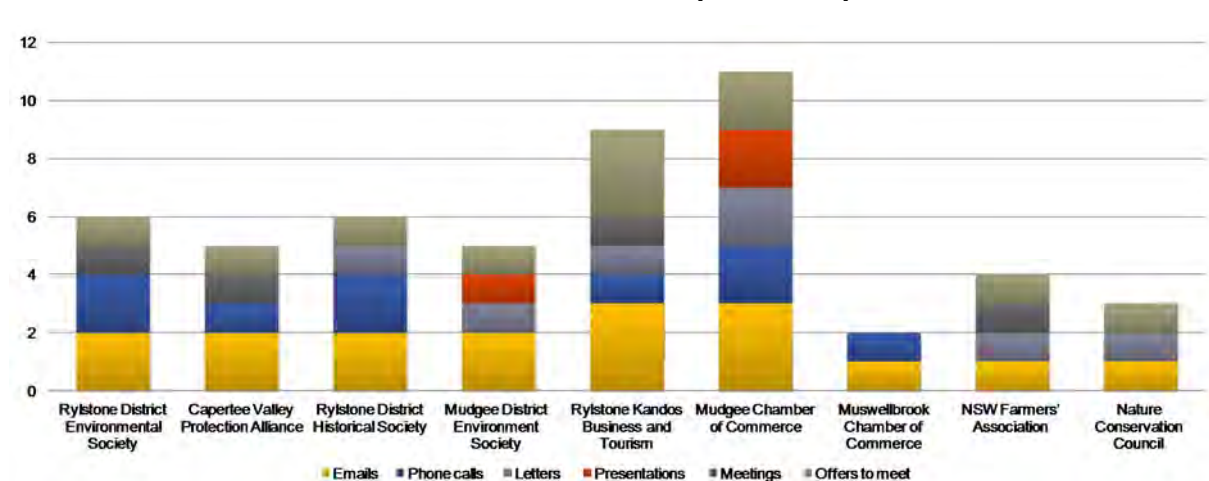
- KEPCO has distributed more than 20 Project newsletters and Information Briefs to the local community and stakeholders.

In addition to the activities described above, KEPCO has engaged with SIGs to:

- Provide updates on the Project and the EIS; and
- Gain feedback on environmental management, local content and Indigenous participation planning, cultural and historic heritage.

KEPCO has engaged or offered to meet SIGs including (but not limited to) those outlined in **Figure 26**.

Figure 26
Interactions with SIGs (2011-2015)



KEPCO has made a concerted effort to engage with the BVPA. KEPCO has had a total of 38 interactions³, including face-to-face meetings, emails and phone calls as well as newsletter and Project updates.

KEPCO has engaged or made offers to meet local service providers including (but not limited to):

- Rylstone District Care and Transport;
- Rural Fire Service (Bylong);
- NSW Health;
- NSW Ambulance Service;
- Mudgee District Hospital;

³ The BVPA requested that all correspondence be sent to the BVPAs secretary's nominated email address. General communications sent to this address, at times, served as communications to both the individual as a private landholder and as the secretary of the BVPA.

- Volunteer Rescue Association (Rylstone);
- Rylstone-Kandos and Mudgee Rotary Clubs;
- Bylong Hall Committee;
- Mudgee Men's Shed;
- Rylstone Men's Shed;
- Mudgee Pre-school;
- Rylstone-Kandos Pre-school;
- MWRC Family Daycare;
- Rylstone Public School;
- Kandos Public School;
- Kandos High School;
- Mudgee Public School;
- Mudgee High School;
- Cudgegong Valley Public School; and
- St Mathew's Catholic School.

KEPCO has engaged with infrastructure providers and neighbouring industry and mines in relation to the Project, EIS, infrastructure requirements and local road and rail capacity and has provided regular updates on Project progress. The Community Liaison Officers for the Project have been engaging with local training and employment providers (including Indigenous services) to understand the capacity and skills of individuals and businesses in the region. The Community Liaison Officers have also been engaging local community groups and service providers regarding the Project, community needs assessment and community funding opportunities. Additionally, KEPCO and the project team have been engaging local industry groups, chambers of commerce, historical societies, and business and tourism organisations to provide Project information and discuss the Project's employment and supply chain opportunities.

These activities are described in Section 5 of the EIS.

5.4 SUBSIDENCE

5.4.1 General Subsidence of Cliffs

Submission Reference: SIG1, SIG11, SIG14, P132

Issue

A number of stakeholders stated it was unacceptable that the cliffs will be subsided from underground mining, with concern over the loss or damage to scenic values and impacts to native flora and fauna habitat.

A submission requested the underground mine be shortened to avoid the cliff lines, thereby applying the precautionary principal.

Response

As discussed in Section 7.1.4 of the EIS, the mine planning design process considered the potential subsidence impacts on natural features, including the cliff lines. Subsequently substantial areas of viable underground coal resources were not included in the Project to limit the potential adverse impact of the proposed mine on cliff lines. Additionally, the Project mine plan has adopted setback distances from the three most prominent cliffs that are visible from the valley areas, to minimise the potential for adverse impacts to these features.

Approximately 20% of the length of cliff lines within the underground extraction area are predicted to be subject to rock falls. Any minor impacts to rock structures will discolour and meld with the natural weathering process over time.

It is expected that two cliffs, which have a greater height and continuous length are at risk of greater visible mining subsidence movements and rock falls. These will be screened from reasonable, every-day public vantage points by the ridge to the south-west of the Subsidence Study Area.

Some smaller cliff impact locations may be visible from isolated locations outside the Subsidence Study Area but will generally be at distances greater than 1.5 km and therefore impacts will not be discernible to the naked eye.

SCT was engaged to complete an independent peer review of the Subsidence Impact Assessment.

The peer review concluded that the report provided an adequate discussion on effects, impacts, increased impacts and mitigation measures as detailed in the scope.

Further, the peer review concluded that the section of the report relating to cliff formations, steep slopes and cliff related archaeological heritage sites, is considered to be a comprehensive assessment of the likely impacts on cliffs and steep slopes. The findings are consistent with the peer reviewer's experience of observing and monitoring mining impacts on cliff formations in the Western Coalfield of NSW.

A further assessment on subsidence impacts on cliffs has been undertaken to obtain additional information, prepare site specific predictions of subsidence movements for each of the cliffs, and further assess impacts to the cliffs from underground mining. This is discussed in **Section 4.11.5**.

With the additional setbacks and management and mitigation measures described in this RTS, KEPCO believes that a reasonable balance has been met between the sterilisation of this valuable non-renewable coal resource and the protection of the rock formations within the Study Area.

5.4.2 Damage to Cliff Areas

Submission Reference: SIG14

Issue

The project envisages longwall mining under almost the whole area of the Bylong State Forest, with 30 cliffs directly underlying the proposed longwall panels. Damage to cliff areas in the form of rock falls and 'visible mining subsidence movements' will occur, but the degree of damage is uncertain. We note that the EIS indicates that "the likelihood of cliff instability is difficult to predict"

Response

The Project's subsidence study area is proposed under less than 80% of the Bylong State Forest. MSEC has identified the presence of more than 730 cliffs within the wider Study Area, most of which occur within the south-eastern portion of the Study Area adjoining the Wollemi National Park. MSEC identified only 41 of these occur within the Subsidence Study Area and 30 of these directly overlie the proposed underground extraction area for the Project.

MSEC provided an estimate of the extent of cliff impact based on observed impacts to cliffs at the Ulan Mine in Appendix H of the EIS. It is noted within the MSEC report that the observed impacts experienced at Ulan Mine could be exceeded at the Project.

Further, the percentage of the length of each cliff likely to experience rock falls is expected to vary considerably as discussed in the following extract from Appendix H of the EIS:

"The experience from Ulan Mine provides a reasonable indication of the level of impacts that may occur at the cliffs that are located directly above the proposed longwall panels (and chain pillars) at Bylong. It is expected therefore, that the percentage of cliffs above the longwalls that are likely to experience rock falls is of the order of 20% of the length of the cliffs, and visible mining subsidence movements are expected to occur in approximately 50% to 70% of the cliffs. The actual percentage of cliffs affected may be greater than 20% given the greater magnitude of subsidence predicted at Bylong. The percentage of the length of each cliffs likely to experience rock falls is likely to vary considerably due to the variable geological factors noted above. It is however expected that cliffs that have greater height and continuous length, are considered to be more susceptible to impacts."

As can be seen in Fig. 5.5, two cliffs located above the longwalls have heights between 30 metres and 40 metres and one of these has a length between 250 metres and 300 metres. These two cliffs are therefore considered to be at greater risk of rock falls resulting from extraction of the longwalls."

As stated in **Section 5.4.1** above, with the additional setbacks and management and mitigation measures described in this RTS, KEPCO believes that a reasonable balance has been met between the sterilisation of this valuable non-renewable coal resource and the protection of the rock formations within the wider Study Area.

5.4.3 Protection of Cliffs 1,3 and 7

Submission Reference: SIG27

Issue

No calculations are given of likely strains that would be generated by the rapid topographic changes associated with cliff lines and which would impact cliff stability, calculations of the kind that are currently required of, and produced by, Clarence, Springvale and Airly collieries that mine near sensitive cliff lines. We are not persuaded by the information given in the EIS that Cliffs 1, 3 and 7 are protected.

Response

The submission refers to protection of Cliffs 1, 3 and 7, however it is possible the cliff numbers have been incorrectly referenced in the submission based on the following extract from the EIS:

- *"Cliffs C1 (24279), C2 and C3 (24324), nearest Upper Bylong Valley road and in line of sight have been assessed as "to be substantially protected: from mine induced subsidence because of the mine design;*
- *Cliff C4 (24278) is also generally protected from subsidence however is in closer proximity to the Subsidence Study Area than C1 to C3;*
- *Cliffs C5, C6 and C9 have the highest potential for subsidence; and*
- *Cliffs C7 and C8 have potential for disturbances and perceptible impacts."*

It is expected that the submissions intent is to refer to cliffs C1, C2 and C3, as in the above extract from the EIS.

A review of the database of observed strains demonstrates that ground strain development above solid unmined coal resulting from the extraction of longwall panels reduces with increasing distance from the extracted longwall panels. At distances of half of the depth of cover or greater from an extracted longwall panel (as is the case for Cliffs C1 to C3 at 160 m to 320 m), the expected ground strains are very small and less than the typical accuracy of survey methods. Cliffs, C1 to C3 are located greater than 0.7 times the depth of cover from the longwall panels.

Based on the above information, and anecdotal evidence, a numerical prediction of strain for the cliffs outside of the underground extraction area was not considered beneficial when assessing the potential for impacts to the cliffs. The impact assessments conducted for the cliffs in the vicinity of the underground extraction area were also supported in the peer review conducted by SCT (Appendix I of the EIS).

5.4.4 Cultural Heritage Impacts

Submission Reference: SIG11

Issue

Significant indigenous cultural heritage features will be unacceptably impacted by this mine. The ochre quarry, the grinding grooves and the significant sandstone formations are located in the area that will experience significant subsidence, putting them at high risk of damage.

Response

Section 4.11.15 discusses the additional work completed in relation to the assessment of the ochre site. As explained in Section 9.1.4 of the Subsidence Ground Movement Predictions and Impact Assessment (SGMPIA), included in Appendix H of the EIS, the potential impacts at the ochre site based on the proposed longwall panel layout are as follows:

“The rock ledge at the location of the ochre quarry [since identified as an ochre site] can potentially be affected by rock falls, which are discussed below in Section 9.1.5 and in Section 5.4. It is also possible for slippage to occur along the bedding plane at the location of the ochre quarry, which may result in some material at the surface of the seam to spall and increased seepage to occur.”

Three of the four identified grinding groove sites are located outside the Subsidence Study Area and are not expected to be impacted due to the extraction of the proposed longwall panels. The fourth grinding groove site is located above a proposed longwall panel and could experience impacts, if surface cracking develops and intersects with the grinding groove site.

There are three sandstone formations within the Subsidence Study Area. The sandstone formations could experience impacts by rockfalls or by cracking resulting from the extraction of the proposed longwall panel.

Further to the above, additional assessment has been undertaken in relation to the ochre site as discussed in **Section 4.11.15**. This specialist evaluation concluded that although there were several exposures of pigment quality ochre, *“no evidence of Aboriginal quarrying or other signs of use was detected and, consequently, it cannot be regarded as an archaeological site.”* It is noted that this finding does not detract from the site having cultural heritage values to some in the Aboriginal community.

As per Commitment 38 of the Management and Monitoring Summary (Section 8) of the EIS, an AACHMP will be developed in consultation with RAPs, OEH and DP&E to manage the impacts of the Project on cultural heritage features, including those discussed above.

5.4.5 Steep Slopes

Submission Reference: SIG27

Issue

Page 23 - In respect to steep slopes [gradient steeper than 1(h) :3(v)] the EIS states that: There is a potential for tension cracking to occur at upper or side slopes and for compressive ridges to form on the lower slopes. It then says that these consequences can be remediated by infilling cracks or re-grading the surface. Our experience at Mount Sugarloaf, above West Wallsend Colliery, in 2013, is that such remediation is not feasible or meaningful (see Figures 4.5A and 4.5B).

Response

The submission cites the experience at Mount Sugarloaf, above the West Wallsend Colliery, in reference to remediation being not feasible or meaningful. The experience at Mount Sugarloaf, above the West Wallsend Colliery is considered to represent a unique rather than typical scenario in terms of impact and remediation potential.

Typically, remediation of cracks will be assessed through the implementation of a suitably prepared management plan. Surface cracking will be assessed in consultation with relevant stakeholders and the consequences and risks associated with remediating or not remediating the cracks will be considered prior to any work being undertaken.

5.4.6 Surface Cracking

5.4.6.1 Cracked Zone

Submission Reference: P231

Issue

It must be inferred that the so-called cracked zone reaches the surface where the depth of cover is shallower such as in Dry Creek and its tributaries.

Response

Appendix H, SGMPA, from the EIS notes the following in Section 5.2.3:

The extraction of supercritical longwalls is expected to result in fracturing from the seam up to the surface. This does not however imply direct hydraulic connection between the surface and the seam. At the magnitudes of the predicted subsidence, the overburden is expected to have undergone large blocky movements, resulting in a network of fractures which is likely to increase the hydraulic conductivity between the surface and the seam at the areas of shallowest cover, with reducing potential for connectivity as depth of cover increases.

It is possible therefore, that some of the surface water flows in the ephemeral streams at shallow depths of cover may be lost into the mine workings during high rainfall events. It may be necessary, in some locations, to remediate and reinstate the drainage line beds with highly cohesive soils, or to locally grout the bedrock along the streams, especially where the depths of cover are the shallowest.

Experience from mining in the Hunter, Newcastle and Western Coalfields indicates that impacts on ephemeral streams are low where the depths of cover are greater than the order of 200 metres, which is the case over approximately half of the proposed mining area.

Further discussion on the potential impacts from hydraulic connectivity between the surface and seam are provided in the Surface Water Impact Assessment report by WRM (2015) and the Groundwater Impact Assessment report by AGE (2015). SCT (2014) provided the relevant inputs for the Groundwater Impact Assessment in relation to the changes to the hydraulic conductivity between the surface and the longwall mining areas.

5.4.6.2 Aquifer Integrity

Submission Reference: P132

Issue

The generation of subsidence and cracking will also impact aquifer integrity and groundwater flow. Cracking from subsidence causes drainage of shallow, perched basalt aquifers and enhanced drainage from surface water systems into the alluvium. This effect could have serious consequences for the vegetation in the area of the State Forest. The extent of cracking has not and cannot be modelled therefore this impact is largely unknown and could be much worse than portrayed in the EIS.

Also in relation to cracking the EIS reports that cracking could extend to the surface alignment of Dry Creek, which would further reduce potential flows in this creek. The rate of inflow to groundwater via cracks is estimated to be 0.15 ML/day (this is 0.1% of runoff). The EIS concludes that this reduction in flow is negligible, however this system does not receive much inflow and any loss of flow could have adverse impacts on the vegetation.

Response

Section 5.2.3 of the SGMPA, included in Appendix H of the EIS, notes the following:

“The extraction of supercritical longwalls is expected to result in fracturing from the seam up to the surface. This does not however imply direct hydraulic connection between the surface and the seam. At the magnitudes of the predicted subsidence, the overburden is expected to have undergone large blocky movements, resulting in a network of fractures which is likely to increase the hydraulic conductivity between the surface and the seam at the areas of shallowest cover, with reducing potential for connectivity as depth of cover increases.

It is possible therefore, that some of the surface water flows in the ephemeral streams at shallow depths of cover may be lost into the mine workings during high rainfall events. It may be necessary, in some locations, to remediate and reinstate the drainage line beds with highly cohesive soils, or to locally grout the bedrock along the streams, especially where the depths of cover are the shallowest.

Experience from mining in the Hunter, Newcastle and Western Coalfields indicates that impacts on ephemeral streams are low where the depths of cover are greater than the order of 200 metres, which is the case over approximately half of the proposed mining area.

Further discussion on the potential impacts from hydraulic connectivity between the surface and seam are provided in the Surface Water Impact Assessment report by WRM (2015) and the Groundwater Impact Assessment report by AGE (2015). SCT (2014) provided the relevant inputs for the Groundwater Impact Assessment in relation to the changes to the hydraulic conductivity between the surface and the longwall mining areas."

5.4.6.3 Damage to Private Land

Submission Reference: SIG27

Issue

Likewise it is noted on page 137 of the EIS, that subsidence will cause permanent surface cracking - with cracks typically between 25mm and 50mm wide but sometimes up to 100mm wide. These cracks are expected to extend for horizontal distances of several hundred metres and to depths of 20 to 30m. Our experience with proposed underground mining in the vicinity of Kestrel Colliery in Queensland and above the Appin Colliery and Tahmoor collieries in southern NSW is that such cracking would be unacceptable to private land owners as it substantially damages their land.

Response

Section 4.5 of the SGMPIA (Appendix H of the EIS) notes the following:

Management strategies and remediation measures can be developed for the surface cracking and deformations, which could include the following:

- Visual monitoring of the surface in the active subsidence zone, to identify the larger surface cracking and deformations would could affect safety, access, or increase erosion;*
- Establish methods for surface remediation, which could include infilling of surface cracks with soil or other suitable materials, or by locally regrading and compacting the surface. In some cases, erosion protection measures may be needed, such as the planting of vegetation in order to stabilise the steeper slopes in the longer term; and*

- *Develop Property Subsidence Management Plans (PSMPs) incorporating the agreed methods to manage surface cracking and deformations.*

5.4.6.4 Streambed Cracking

Submission Reference: SIG27

Issue

Based on experience with cracking of stream and river beds in the Bargo River, Woronora Rivulet and Cataract River it is very highly likely that the predicted, very high, tensile strains of 34mm/m will cause substantial cracking of the streambed, and substantial loss of water during flow periods. As the EIS notes, the predicted strains are about 70 times higher than strains known to have caused river bed cracking in the Southern Coalfields.

Response

The predicted subsidence parameters and impact assessments for the streams within the Subsidence Study Area are outlined in Section 5.2 of the EIS and Appendix H of the EIS. Section 7.4.3 of the EIS states the potential loss of surface water to groundwater (estimated to be less than 0.1% of runoff) via cracking is considered to be negligible (not substantial as stated in the submission).

The submission correctly notes that predicted subsidence parameters and assessed impacts are substantially greater for the Project than for the streams noted in the submission. The Bargo River, Waratah Rivulet and Cataract River are located in the Southern Coalfield which has a greater depth of cover than the Project.

Strategies for the management of surface cracking and subsequent impacts in Dry Creek are outlined in **Sections 4.3.11, 4.15.6 and 4.15.13.2.**

5.4.7 Cultural Features

5.4.7.1 Aboriginal Heritage

Submission Reference: P132

Issue

"The cliff lines and adjacent areas contain a large number of significant Aboriginal sites. In particular the consultants engaged to assess Aboriginal heritage sites identified an ochre quarry of regional significance and grinding stones. These sites are at considerable risk from damage and/or destruction from subsidence. The consultants recommended that these risks be managed by engineering controls to reduce the risk of subsidence. Although engineering methods would reduce the risk it would be much better to avoid this risk altogether by keeping the underground mine at a suitable distance away from the cliff lines."

Response

Section 9.1.8 of the SGMPIA (Appendix H, EIS) notes:

It is recommended that management plans be developed to manage potential impacts on archaeological sites during the mining of the proposed longwalls. The management plan would include monitoring of subsidence movements across the panels, restricted access during active mining, safe visual inspections of archaeological sites and consultation with the community before, during and after mining. The potential for impacts to selected sites, such as those of high significance, can be reduced by adopting preventive measures or by avoidance of mining beneath the features. As discussed above, however, preventive measures may result in significant disturbance to the surface surrounding the features.

In addition, Commitment 38 of the Management and Monitoring Summary (Section 8) of the EIS states:

“Specific mitigation and management measures will be developed to minimise any impacts on the ochre quarry. These management and mitigation measures will include reasonable and feasible actions to reduce the potential for rockfalls or cracking of this site.”

Prior to the commencement of any works or actions that have the potential to impact the ochre site, an archival recording and site specific management plan will be prepared.

Three of the four identified grinding groove sites are located outside the Subsidence Study Area and are not expected to be impacted due to the extraction of the proposed longwall panels. Consultation will continue to occur with the RAPs to develop the management measures and the AACHMP for the Project.

5.4.8 Tarwyn Park

Submission Reference: SIG27

Issue

The EIS also shows that both will be impacted by mine subsidence movements; Iron tank to a greater extent than Tarwyn Park as only the northern part of the latter would be impacted.

Response

The properties referred to in the submission as Iron Tank and Tarwyn Park are both KEPCO owned properties as shown in Figure 39 of the EIS. Tarwyn Park is located wholly outside the Subsidence Study Area and is unlikely to experience mine subsidence impacts.

An area of land at the northern side of the Iron Tank property is located above the proposed Longwall panels 108 and 109 and will experience mine subsidence impacts which are outlined in Appendix H of the EIS (and illustrated on Figure 40 of the EIS). The potential subsidence related impacts on this property will be managed according to the PSMPs to be prepared for the particular longwall panels.

5.4.9 Predicted Subsidence

Submission Reference: SIG27

Issue

It must be understood that the predicted subsidence movements (settlements, strains and tilts) are very large in relation to those generated by most longwall mines in NSW. The maximum subsidence induced settlements at some other current mines are listed below:

- *Clarence Colliery <50mm (partial extraction mining)*
- *Springvale Colliery ~ 1m to 1.8m*
- *Tahmoor Colliery ~1m*
- *Bellambi (SW of Cataract Reservoir) ~0.15m to 0.3m*
- *Metropolitan ~0.9m*
- *Appin Area 7 ~0.8m*

Response

In addition to the above maximum subsidence induced settlements, the following mines have experienced magnitudes of maximum observed subsidence movements, similar to those predicted for the Project:

- *Glencore Coal - Bulga Underground Operations ~3 m;*
- *Centennial Coal - Newstan ~3 m;*
- *Peabody Energy - North Wambo Underground ~3.5 m; and*
- *Lake Coal - Mannering Mine (formerly Wyee State Coal Mine) ~ 2.5 m.*

It is also stated in Section 3.8 of Appendix H of the EIS:

"It is therefore considered that a more conservative approach to predictions is warranted for the Bylong Coal Project. It is proposed to use the IPM prediction curves as shown in Fig. 3.5, which predict maximum incremental subsidence of up to 65% of the extracted seam thickness. This could be revised after the commencement of mining if it could be verified from initial monitoring data that maximum subsidence as a proportion of seam thickness was less than 65%."

5.4.10 Subsidence of Bylong Valley Way

Submission Reference: SIG27

Issue

SIG27 stated:

We consider that the EIS grossly understates the impact on Bylong Valley Way. We cite the work reported by Kay et al (2011)⁷ in respect to mine subsidence impacts on the Hume Highway near Picton, NSW. Dr Philip Pells was a member of the Technical Committee that developed the management measures and it is a matter of fact that the then RTA, now RMS, concluded that ground movements that could create steps in the road pavement of greater than about 20mm created dangerous road user conditions that would not be countenanced; and that such movements could occur at compressive ground strains of about 5mm/m. This is 5 times lower than the predicted ground strains for Bylong Valley Way. On this basis, and on the basis of experience of deformations along Appin Road above Westcliff Colliery, we consider that the expected subsidence movements beneath Bylong Valley Way cannot be countenanced, and that at the very least the mine plan should be changed to safeguard the public using this infrastructure.

Response

Mine subsidence impacts on Bylong Valley Way will be effectively managed by KEPCO to ensure that this road remains safe and serviceable during and after the extraction of the proposed longwall panels.

The Hume Highway and Appin Road case studies referenced by Dr Pells are two examples of successful methods of managing potential mine subsidence impacts on road pavements, of which MSEC, who prepared the subsidence impact assessment for the Project (MSEC, 2015), was also a member of the Technical Committee.

The concerns expressed about the potential for dangerous road user conditions to develop along Bylong Valley Way, which include cracking, heaving and stepping of the road surfaces are not disputed. However, it is important to note that KEPCO has committed to the potential impacts being effectively managed to mitigate adverse road user conditions.

This management regime proposed is discussed in the report by MSEC (2015), which was included in Appendix H of the EIS. The Charlton Road case study which was referenced by MSEC within Appendix H of the EIS to describe the proposed management regime to be undertaken for the Project is further referenced within this response.

There are substantial differences between the Hume Highway (a highway of National significance) and Appin Road (a road of State significance) sites and the Bylong Valley Way (a regional road) site which allow the potential mine subsidence impacts of the Project to be effectively managed, despite the predicted road deformations being substantially greater than those experienced on the Hume Highway and Appin Road case studies. These differences relate to traffic volumes, pavement type and duration of active subsidence experienced along the road during the mining of each longwall panel.

The Bylong Valley Way is a two lane sealed asphalt road that connects the townships of Bylong and Sandy Hollow. The road has a posted speed limit of 100 km/h generally, with reduced speed limits at level crossings and outside and within the township of Bylong. A photograph of Bylong Valley Way above the proposed longwall panels is shown in **Plate 3**.

Plate 3
Bylong Valley Way



Annual Average Daily Traffic on Bylong Valley Way based on October 2011 traffic counts was 418 vehicles, of which 13% were heavy vehicles, between Bylong and Sandy Hollow (PB, 2015).

Predictions of subsidence, tilt, curvature and strain were provided in the Subsidence Impact Assessment report by MSEC (2015). A graph showing predicted subsidence, tilt and curvature along Bylong Valley Way is provided in **Figure 27**. The maximum predicted conventional strains for Bylong Valley Way, based on applying a factor of 10 to the maximum predicted conventional curvatures, are 30 mm/m tensile and 25 mm/m compressive.

Based on the predicted subsidence movements and from experience of mining in similar situations elsewhere in NSW, MSEC (2015) provided the following impact assessment for the extraction of the proposed longwall panels at Bylong:

- The proposed extraction of longwall panels are expected to result in cracking, heaving and stepping of the road surfaces, particularly at the western end, where depths of cover are shallowest. MSEC (2015) then discussed methods of managing these impacts, which are discussed later in this response; and
- It is possible that increased levels of ponding could occur along parts of the Bylong Valley Way in terrain with shallow grades and that the proposed extraction may result in a redirection of the natural flow path through the road alignment at culverts.

A similar surface water assessment was provided in the report by WRM (2015), which highlighted that potential flow redirection could occur as a result of the extraction of Longwall panel 206.

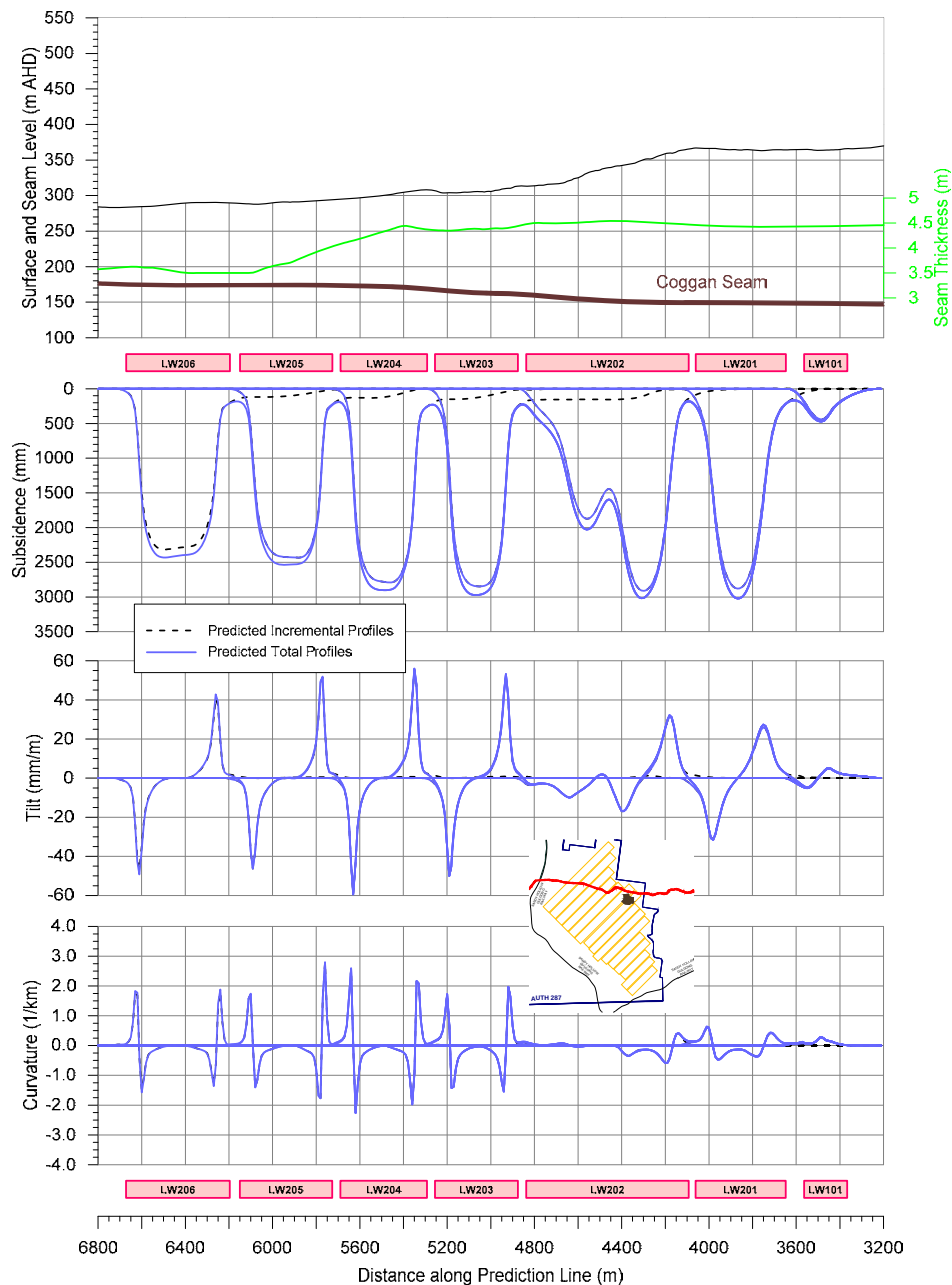
It is further advised that, based on the current mine plan, the Bylong Valley Way will experience seven separate active subsidence events. One event from each longwall panel. Most of the events will be separated in time by a period of many months, proportionate to the time it takes for the longwall mining to pass beneath the road and continue to its finishing end of the current panel, before it then returns in the next longwall panel to pass underneath the road.

The duration of each subsidence event during the extraction of each longwall panel will vary depending on the rate of longwall extraction, the depth of cover from the coal seam to the surface, and the orientation of Bylong Valley Way relative to the longwall panel. Based on the proposed mine layout relative to the Bylong Valley Way, the duration of each active subsidence event will vary between longwall panels.

Some sections of Bylong Valley Way, such as those above Longwall panels 101 and 203, are located near the start position of a longwall panel or are oriented square to the longwall panel. In these cases the duration of active subsidence will depend on the time it takes for the longwall panel to extract approximately 400 m. Based on experiences of modern longwall extraction at depths of cover between 100 and 200 m, this will typically occur over a period of 4 weeks.

In other cases, such as Longwall panels 202, 205 and 206, where Bylong Valley Way changes direction above the proposed longwall panels, the duration of active subsidence will depend on the time it takes for the longwall panel to extract approximately 700 to 800 m, or 8 weeks based on modern extraction rates.

Figure 27
Predicted Conventional Subsidence, Tilt and Curvature along Bylong Valley Way,
Reproduced from Fig. C.04 of MSEC (2015)



Compared to very busy roads such as the Hume Highway and Appin Road, both of which experienced active subsidence over a period of months per longwall panel, the relative short duration of each active subsidence event, coupled with a comparably low traffic volume on Bylong Valley Way, allows more intensive subsidence management measures to be undertaken without affecting the functionality of the road. A case study is presented on the following pages to demonstrate how this has been successfully achieved at other comparable sites.

Bylong Valley Way passes above proposed Longwall panel 101 and Longwall panels 201 to 206. The depth of cover to the Coggan Seam varies from approximately 100 m to over 200 m. The Charlton Road case study referred to within MSEC (2015) and the EIS is relevant to the Project due to the similarities in depths of cover, differential subsidence movements, traffic volumes and type of pavement. The experiences along Charlton Road are not unique in NSW. However, this case study has been well documented and published.

Charlton Road is a two lane sealed asphalt road that connects the township of Broke to the Golden Highway and the Putty Road with a posted speed limit of 100 km/h. Average daily two way traffic volumes, based on traffic counts in 2011 were 794 vehicles per weekday (5 Day Average) and 654 vehicles per day (7 Day Average) (ARC and Transport and Urban Planning, 2012). The traffic volumes on Charlton Road are, therefore a similar order of magnitude to those observed on Bylong Valley Way. The pavement types are also similar, consisting of a gravel road base with an asphaltic concrete seal. By contrast, the Hume Highway and Appin Road are stiffer pavements, which have been designed to accommodate much larger traffic volumes.

Beltana No. 1 Mine extracted 10 longwall panels in the Whybrow Seam directly beneath Charlton Road between 2002 and 2008. Beltana Longwalls 1 to 10 had void widths of 275 m and a solid chain pillar width of 25 m and were extracted in the Whybrow Seam at depths of cover ranging between 80 m and 115 m, i.e. width-to-depth ratios between 2.4 and 3.4.

A comparison between predicted and observed subsidence, tilt and strain along Charlton Road above Longwalls 1 to 8 is shown in **Figure 28**. A comparison between predicted and observed subsidence, tilt and strain along a survey line that was parallel and adjacent to Charlton Road above Longwalls 9 and 10 is shown in **Figure 29**.

Whilst the predicted maximum vertical subsidence for Bylong Valley Way are greater than those predicted along Charlton Road, the predicted maximum tilts and curvatures are of similar orders of magnitude. This is because the depths of cover beneath Charlton Road were generally shallower than those for the Project.

Figure 28
Predicted and Observed Subsidence, Tilt and Strain along Charlton Road Due to the Mining of Longwalls 1 to 8 at Beltana No. 1 Mine, Reproduced from Fig. MSEC354-04 (Umwelt, 2008)

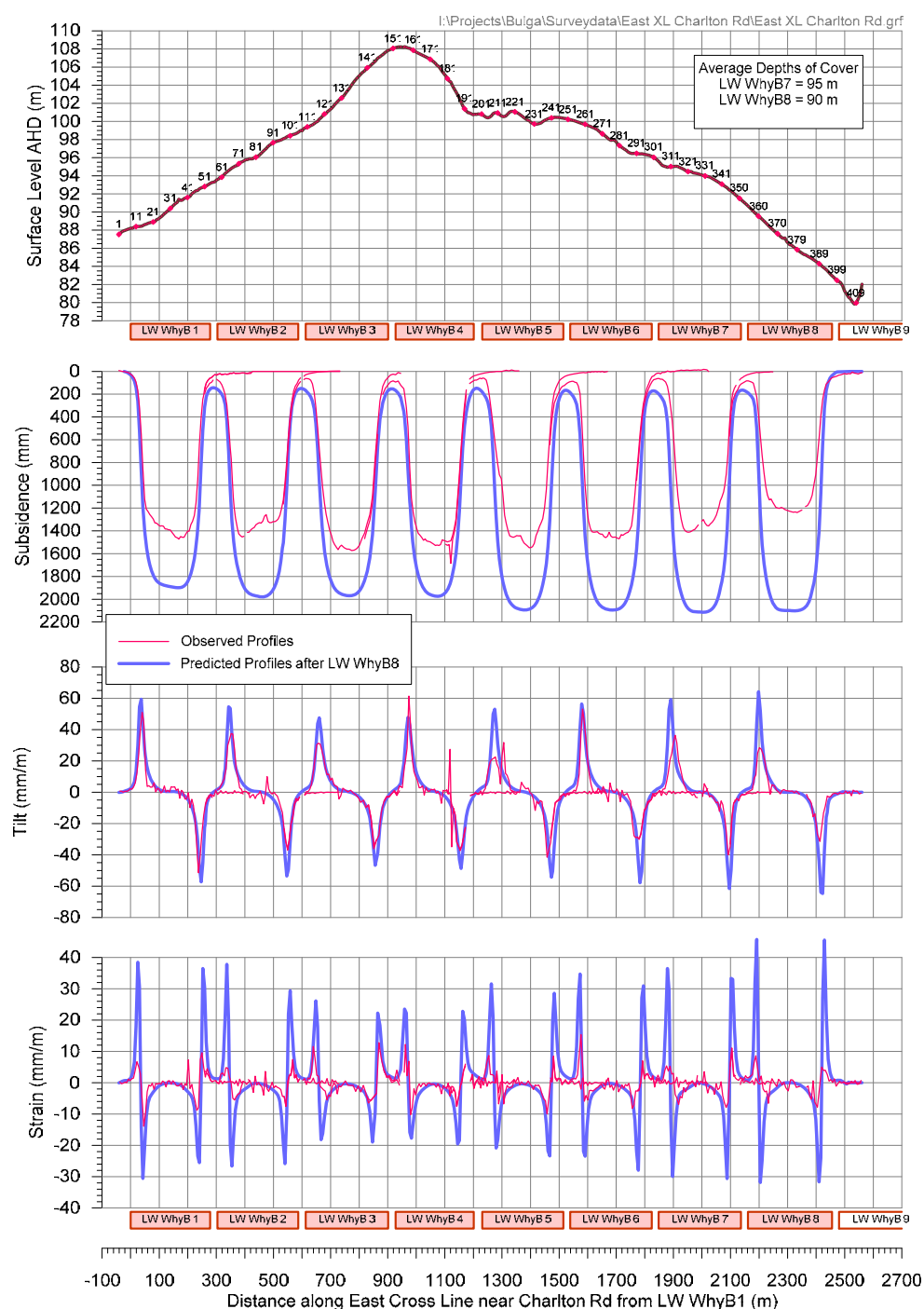
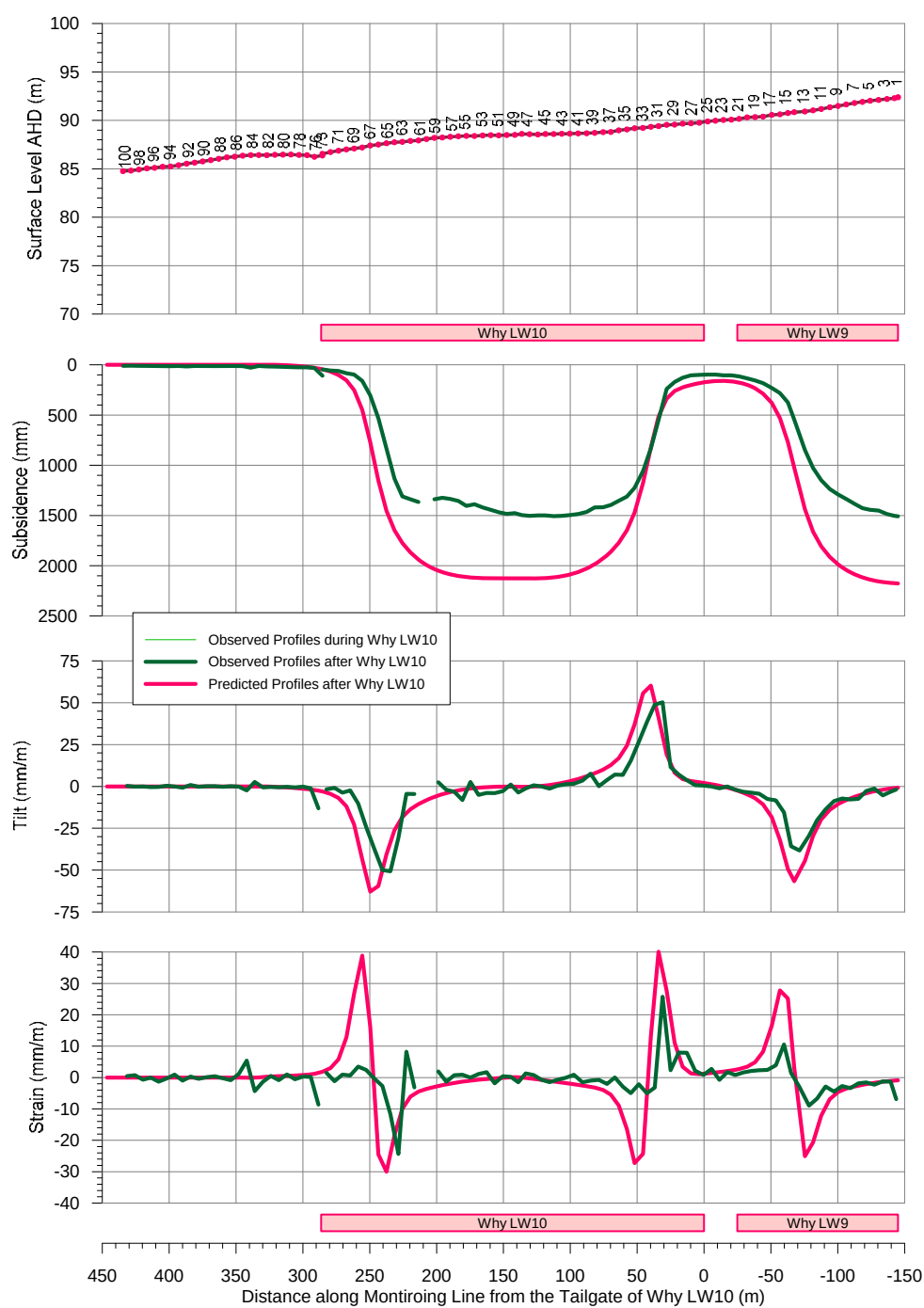


Figure 29
Predicted and Observed Subsidence, Tilt and Strain Along Line 10-XLCR, Adjacent to
Charlton Road Due to the Mining of Longwalls 9 and 10 at Beltana No. 1 Mine,
Reproduced from Fig. A.03 (Umwelt, 2009)



As the depths of cover and predicted differential subsidence movements at Charlton Road are similar to those predicted to occur along Bylong Valley Way, the impacts observed along Charlton Road should, therefore, provide a reasonable guide to the potential impacts along Bylong Valley Way. The successful methods of subsidence management that were employed along Charlton Road can also be applied to Bylong Valley Way and these are described below.

Charlton Road was successfully directly mined beneath by Longwalls 1 to 10 without incident or community complaint (Umwelt, 2009). O'Brien (2004) summarised the subsidence management measures that were undertaken prior to, during and after the mining of each longwall panel beneath Charlton Road. Following the completion of a risk assessment, a number of management plans were developed in consultation with Singleton Council and the Mine Subsidence Board, to safely manage the mining of longwall panels beneath Charlton Road, including:

- Public Road Management Plan;
- Public Road Safety and Environmental Plan; and
- Charlton Road Monitoring Action Plan.

The management actions included:

- Pre-mining inspections of the road;
- Review of subsidence movements prior to longwall panels influencing the road to compare the accuracy of the subsidence predictions;
- Notifications to the public and emergency services of the timing and location of the mining of each longwall panel beneath the road;
- 24 hour monitoring of the road during critical periods of active subsidence, with repair crews on hand to maintain the integrity of the road;
- Temporary repairs of surface cracks as required; and
- A post-mining inspection by Singleton Council and the Mine Subsidence Board to review the results of the temporary repair work and determine the extent of permanent repairs required.

The Charlton Road Monitoring and Action Plan was reviewed and updated for each longwall panel to refine the management strategies with monitoring experience.

The crack widths observed along Charlton Road, due to the extraction of Beltana Longwalls 1 to 10, typically varied between 50 mm and 100 mm, with a maximum observed crack width around 380 mm. The heave and step heights observed along the road were typically in the order of 25 mm. Examples of the impacts observed along Charlton Road at Beltana are provided in **Plate 4**.

Plate 4
Impacts Observed Along Charlton Road at the Beltana No. 1 Underground Mine



Longwall 10 mined directly beneath Charlton Road at a depth of cover of approximately 80 m. This is approximately 20 to 30 m less than the shallowest depth of cover that is proposed to be mined directly beneath Bylong Valley Way for Longwall panel 206 for the Project.

Umwelt (2009) reported that a roll developed on an oblique angle across Charlton Road during the mining of Longwall 10, which caused a localised change in elevation of approximately 600 mm, as shown in **Plate 5**. Traffic was slowed to 20 km/h and fill was placed over the roll and compacted to improve the traffic-ability of the road. The roll occurred over a period of approximately 12 hours and was progressively repaired over that period. A crack of 60 to 80 mm in width was also repaired, as shown in **Plate 6**. More permanent temporary repairs were undertaken over the following days and the road was ultimately sealed with bitumen, as shown in **Plate 7**.

Plate 5
Roll on Charlton Road Over Longwall 10 at the Beltana No. 1 Underground Mine Being Progressively Repaired (Umwelt, 2009)



Plate 6
Crack of 60-80 mm Width Across Charlton Road Over Longwall 10 at the Beltana No. 1 Underground Mine Being Repaired (Umwelt, 2009)



Plate 7
More Permanent Repairs of Roll on Charlton Road Over Longwall 10 at the Beltana No. 1 Underground Mine were Sealed with Bitumen (Umwelt, 2009)



The experiences along Charlton Road demonstrate that mine subsidence impacts due to the extraction of longwall panels at shallow depths of cover down to 80 m can be effectively managed.

Based on the information provided above, it is considered that with the implementation of an effective subsidence management strategy, mine subsidence impacts on Bylong Valley Way can be effectively managed by the Project to ensure that the road remains safe and serviceable during and after the mining of the proposed longwall panels.

As recommended by MSEC (2015), the Project will develop and implement a subsidence management strategy prior to the influence of the proposed longwall panels on Bylong Valley Way. The planned management measures will be described in a PSMP, which will be developed by the Project in consultation with the MWRC and the Mine Subsidence Board.

The PSMP will likely include the following actions, drawing from the successful experiences on Charlton Road:

- Inspections of the existing condition of Bylong Valley Way prior to mining;
- Review of observed subsidence movements prior to the influence of the proposed longwall panels on Bylong Valley Way to compare the accuracy of the subsidence predictions;

- Consideration of potential surface water impacts on Bylong Valley Way prior to the influence of the proposed longwall panels and implementation of drainage control measures, if required;
- Notifications to the public and emergency services of the timing and location of the mining of each longwall panel beneath the road;
- 24 hour monitoring of the road during critical periods of active subsidence, with repair crews on hand to maintain the integrity of the road;
- Temporary repairs of surface cracks and other deformations, as required; and
- A post-mining inspection by MWRC and the Mine Subsidence Board to review the results of the temporary repair work and determine the extent of permanent repairs required.

5.4.11 Subsidence of Bylong State Forest

Submission Reference: SIG11

Issue

One submission raised concerns over the accessibility of the Bylong State Forest during subsidence, indicating that access is required by the Public to access biodiversity and Aboriginal Cultural heritage values.

Response

This is discussed in **Section 4.9.1**.

Other than unformed Crown roads, there are no known public access tracks or roads which would provide road access into the Bylong State Forest in the vicinity of the Project. Public access is therefore restricted by the natural terrain and hence the risk to public safety is considered to be low, as outlined in the SGMPA included in Appendix H of the EIS. Notwithstanding this, measures will be implemented to ensure the Bylong State Forest is accessible to the public and that any public safety risks are appropriately managed to enable safe access to these areas. This will include appropriate notifications and consultation with the community, erecting warning signs during active subsidence, and undertaking repairs where required and as soon as practicable.

DRE considers there are no feasibility issues with the proposed mine layout rising from subsidence related health and safety risks. Any such risks should be manageable during the Extraction Plan stage of the development and will be regulated by DRE, post planning approval, under the relevant *Work Health and Safety (Mines and Petroleum Sites) Act 2013* and associated regulations.

5.4.12 Subsidence Adjacent to National Park

Submission Reference: SIG8

Issue

A submission is concerned that the design of the longwall panels leaves no room for error with subsidence predictions up to the boundary of Goulburn River National Park.

Response

This is discussed in **Section 4.11.9**. The proposed longwall mining areas have been developed based on conservative subsidence impact predictions to ensure that impacts on sensitive features such as the Wollemi and Goulburn River National Parks are appropriately managed. As mining progresses and monitoring data is gathered, this will enable the validation and refinement of the subsidence model.

5.5 ECOLOGY

5.5.1 Flora and Fauna Survey Methodology

5.5.1.1 Consultation of Previous Studies

Submission Reference: SIG26

Issue

One submission raised concerns regarding the consideration of existing literature from the Study Area to determine the suite of species known and those likely to occur. Specifically the submission notes the following:

There is no mention of the threatened species that have been recorded during the extensive Bylong Coal 'Exploration Program' EIA and pre-clearing surveys that have taken place over the years at Bylong Coal Mine.

Response

A suite of literature was reviewed during the preparation of the EIS Ecological Impact Assessment as outlined within Section 2.1 of the report. Records of threatened fauna species detected during pre-clearing surveys undertaken within the Study Area are required to be submitted to OEH as part of licensing requirements to undertake studies of fauna species.

Such records appear in the OEH Atlas of NSW Wildlife database, which was consulted on numerous occasions during the preparation of the EIS Ecological Impact Assessment. As such, it is anticipated that any threatened fauna species detected during pre-clearing surveys of the Study Area have been considered within the assessments.

Additionally, seasonal surveys of the Study Area were undertaken to provide an understanding of the threatened fauna species known and those with the potential to occur.

5.5.1.2 Consultation of Databases

Submission Reference: SIG26

Issue

One submission raised concern regarding the consideration of an additional database to determine the suite of species known and likely to occur within the Study Area. Specifically the submission notes the following:

“SIG26 are concerned that the BirdLife Australia Atlas was not consulted during the EIA process. The BirdLife Australia Atlas contains many important bird records from within and around the Bylong Coal Project area. These records include multiple threatened species, which have not as yet been incorporated into the NSW Wildlife Atlas.”

Response

Two government databases, the OEH Atlas of NSW Wildlife and the DoE Protected Matters Search Tool were consulted during the preparation of the EIS Ecological Impact Assessment.

The Atlas of NSW Wildlife comprises government-held flora and fauna records and is supported by OEH, National Parks and Wildlife, the Royal Botanic Gardens and Domain Trust, the NSW Department of Primary Industries, Forests NSW and the Australian Museum.

The DoE Protected Matters Search Tool generates a list of potentially occurring Matters of National Environmental Significance (MNES) that is determined through information from a range of sources, including government, research and community organisations.

Consultation of these two databases, in addition to the collection of survey data over multiple seasons provides an understanding of the threatened fauna species known and those with the potential to occur.

5.5.1.3 Assessment of Species Known to Occur

Submission Reference: SIG9

Issue

One submission notes that the determination of potentially occurring species has typically been incorrect; however it does not explicitly explain in what manner it is considered to be incorrect. The submission further notes that ongoing surveys of an existing mine has shown that additional threatened species have been identified over the course of a 20 year period.

Response

Cumberland Ecology notes that threatened flora and fauna species have been adequately targeted to enable a comprehensive assessment of ecological matters. A range of threatened species are known to occur within the locality and there is suitable habitat present within the Study Area for a number of these species. It is possible that some threatened species were undetected even though surveys were conducted during suitable survey periods.

For this reason a precautionary approach was used in the preparation of the EIS Ecological Impact Assessment to assume the presence of species (particularly threatened species) where the presence of suitable habitat was recorded with no observations of the species during the surveys.

5.5.1.4 Red-crowned Toadlet Survey Effort

Submission Reference: SIG3, SIG27

Issue

*Two submissions noted the potential for the Red-crowned Toadlet (*Pseudophryne australis*) to occur within the Project Area. Both submissions noted that the record of the species should have been considered within the assessment and surveys subsequently undertaken.*

Response

A single record of the Red-crowned Toadlet (*Pseudophryne australis*) within the locality was identified during interrogation of the OEH Atlas of NSW Wildlife database search undertaken. This species was assessed within Appendix F of the EIS Ecological Impact Assessment as 'unlikely to occur' and therefore no targeted surveys for this species were undertaken.

Within the revised assessment of the Project Disturbance Boundary using the FBA (see **Section 4.11**), the Red-crowned Toadlet is not predicted to be a candidate species requiring further assessment. As such, under the FBA, Cumberland Ecology notes that this species is not required to be surveyed.

5.5.1.5 General Threatened Bird Survey Effort

Submission Reference: SIG26

Issue

One submission raised concerns about the level of survey effort for woodland birds undertaken within the Study Area. Specifically the submission notes the following:

"The state and federal guidelines for threatened bird survey are already quite minimal. To not adhere to these guidelines for a large project like this is inexcusable. Inadequacy of survey effort reduces our confidence in the level of rigour of the surveys undertaken for the Bylong Coal Project.

Further targeted survey of all threatened woodland birds during the breeding season and non-breeding (foraging) seasons should be carried-out across the Project Application Areas, ideally using both observational survey methods and passive acoustic devices (e.g. SongMeters). This will assist in establishing where birds are present and possibly breeding across the Project Application Area."

Response

A substantial amount of survey effort has been undertaken within the Study Area as outlined within Chapter 2 of the EIS Ecological Impact Assessment. Bird surveys were undertaken at 84 sites within various seasons over 20 days in the period between November 2012 and May 2014, with further bird surveys having been undertaken within offset areas that are located in close proximity to the Study Area.

Within the Study Area, 130 bird species have been recorded during surveys for the Project, including 14 threatened species. An additional three threatened bird species have been recorded during previous surveys and a further 13 threatened bird species have been assessed as potentially occurring despite not being recorded during current and previous surveys.

The targeted threatened species surveys generally utilised survey techniques outlined within the OEH guidelines and DoE, however in some instances the recommended effort for each technique was not utilised. An explanation of these variations is provided in Section 2.4.15 of the EIS Ecological Assessment. As noted within Section 2.4.15.i, the OEH guidelines for threatened species surveys (DEC (NSW), 2004) state that *"where limitations cannot be overcome, an assessment of the likelihood of threatened animals utilising the habitat must be made in order to comply with legislation...If it is not possible to sample for threatened species (e.g. bats, frogs) previously recorded in the general area during appropriate seasons and weather conditions, it must be assumed that these species occur in the study site if suitable habitat exists"*. A precautionary approach was used in the preparation of this report to assume the presence of threatened species where the presence of suitable habitat was recorded.

The results of these surveys, in conjunction with consideration of records in the locality and habitat features, provide sufficient knowledge of the bird species utilising the Study Area.

Since the submission of the EIS, the Project has subsequently been further assessed using the FBA (**Appendix J**), which prescribes survey requirements for threatened species and the associated survey periods. Survey requirements are different for species classified as ecosystem credit species and those classified as species credit species within the OEH Threatened Species Profile Database.

All of the threatened bird species assessed within the EIS Ecological Impact Assessment as known or potentially occurring within the Study Area, with the exception of the Regent Honeyeater, are ecosystem credit species.

Section 6.2.1.2 of the FBA notes that *“a threatened species survey is not required to assess threatened species that require ecosystem credits as they are predicted to occur based on the presence of habitat surrogates”*. As such, further surveys for ecosystem credit species are not required.

Given that the Regent Honeyeater, a species credit species, has been recorded within the Study Area, it has been assumed to occur within the Project Disturbance Boundary. As such, no further surveys are required to be undertaken in accordance with Section 6.6.1.3.b of the FBA.

5.5.1.6 Swift Parrot Survey Effort

Submission Reference: SIG26

Issue

One submission raised concerns about the level of survey effort for the Swift Parrot (Lathamus discolor) undertaken within the Study Area. Specifically the submission notes the following:

“BirdLife Australia is concerned with the inadequacy of addressing the likelihood of the Endangered Swift Parrot (Lathamus discolor) occurring within the Project site, through both inadequate target survey and habitat assessment. A paragraph in section 2.4.15 of the EIA states “Available information suggests that the area surrounding the Study Area is not a major foraging area for this species (Swift Parrot) and it is considered that the survey effort for the species is sufficient.”

The submission also requests additional information regarding the surveys that were undertaken, including timing and methods of survey.

Response

As noted within Section 2.4.7 of the EIS Ecological Impact Assessment, targeted bird surveys were undertaken at census points which included recording all bird species observed and heard calling during a 30 minute period. All surveys were undertaken by suitably qualified ecologists with experience identifying the Swift Parrot.

Of the 84 sites surveyed within the Study Area, a total of 44 were surveyed within woody habitats between March and July (see **Table 23**), which is the recommended survey period for Swift Parrot within the Commonwealth *Survey guidelines for Australia’s threatened birds* (DEWHA, 2010). Bird census survey dates within this period include 21-23/05/2013, 18-19/03/2014, 2/04/2014, 7-9/04/2014 and 5-9/05/2014. A number of the communities surveyed contain the favoured feed trees for the Swift Parrot, including *Eucalyptus albens* (White Box), *Eucalyptus melliodora* (Yellow Box) and *Eucalyptus moluccana* (Grey Box).

Despite not having recorded the Swift Parrot within the Study Area during surveys, the EIS Ecological Impact Assessment assessed the species as potentially occurring. As such, the impacts to this species were been considered within the EIS Ecological Impact Assessment.

Table 23
Bird Census Surveys, March and July in Woody Habitats Within the Study Area

Vegetation Community	Project Disturbance Boundary	Outside Project Disturbance Boundary	Total
River Oak / Redgum Riparian Woodland		2	2
Blakely's Red Gum / Apple Riparian Forest	1	2	3
Yellow Box Woodland	2		2
White Box Woodland (Grassy)	4	2	6
White Box Woodland (Shrubby)	4	2	6
Slaty Box Woodland	1	6	7
Coastal Grey Box Woodland	4		4
Fuzzy Box Woodland	3	1	4
Shrubby Regrowth	5		5
Caley's Ironbark Forest		3	3
Cypress Pine Forest	1		1
Exposed Grey Gum / Stringybark Forest & Sheltered Grey Gum / Stringybark Forest		1	1
TOTAL	25	19	44

Within the revised assessment of the Project Disturbance Boundary using the FBA, no further survey effort is required for the Swift Parrot as it is an ecosystem credit species.

5.5.2 Flora and Fauna Impact Assessment

5.5.2.1 High Biodiversity Values Within the Study Area

Submission Reference: SIG2, SIG3, SIG6, SIG7, SIG8, SIG9, SIG11, SIG12, SIG13, SIG17, SIG18, SIG20, SIG22, SIG25, O3, P6, P7, P10, P11, P12, P13, P21, P22, P23, P24, P30, P31, P32, P33, P35, P37, P38, P40, P43, P44, P45, P48_2, P53, P57, P58, P62, P66, P70, P75, P80, P82, P83, P84, P85, P87, P88, P91, P97, P99, P100, P104, P108, P110, P114, P117, P119, P120, P124, P131, P132, P133, P135, P142, P149, P153, P156, P163, P173, P177, P178, P186, P190, P192, P195, P199, P203, P204_2, P205, P211, P212, P222, P224, P229, P233, P234, P235, P236, P237, P238, P239, P40, P241, P242, P243, P244, P245, P246, P247, P248, P249, P250, P251, P252, P253, P254, P255, P256, P257, P258, P259, P260, P261, P262, P263, P264, P265, P266, P267, P268, P269, P270, P271, P272, P273, P274, P275, P276, P277, P278, P279, P280, P281, P282, P283, P284, P285, P286, P287, P288, P289, P290, P291, P292, P293, P294, P295, P296, P297, P298, P299, P300, P301, P302, P303, P304, P305, P306, P307, P308, P309, P310_1, P310_2, P311, P312, P313, P313_2, P314, P315

Issue

Numerous submissions noted the high biodiversity values within the Study Area, including those that may be impacted by the Project. It is noted that a number of these submissions were received as form submissions.

There were repeated submissions stating:

"The mine disturbance area has very high biodiversity values that will not be mitigated through the proposed offset arrangements. Nationally endangered species recorded in the area include the Brush-tailed Rock Wallaby, New Holland Mouse, Regent Honeyeater and Spotted-tailed Quoll. Three entirely new plant species were recorded. A significant area of critically endangered Grassy Box Gum Woodland will be destroyed along with habitat for 17 threatened birds and 7 threatened plants."

Response

A detailed assessment of the biodiversity values present within the Study Area is provided in the EIS Ecological Impact Assessment. It includes assessment of species known to occur within the Study Area as well as those considered to have the potential to occur. It is acknowledged that there are high biodiversity values within the Study Area and locality, which is likely the result of proximity to Wollemi National Park and Goulburn River National Park.

The Project has been designed to minimise impacts on biodiversity (such as position of the Project Disturbance Boundary predominantly within cleared areas and avoidance of several significant cliff lines).

Following consultation with OEH and DP&E, further assessment of the Project has been undertaken to align the Project's ecological assessment with the requirements of the NSW Offsets Policy and associated FBA.

The BAR prepared for the Project is provided in **Appendix J** and quantifies the impacts to native vegetation and threatened species. The impacts to the biodiversity values within the Project Disturbance Boundary are proposed to be offset in accordance with the BOS prepared for the Project (see **Appendix K**).

5.5.2.2 Use of Framework For Biodiversity Assessment

Submission Reference: SIG27

Issue

The ecological assessment for the project was undertaken prior to the adoption of the Framework for Biodiversity Assessment, though it was submitted after the adoption of this framework and therefore should have informed the ecological assessment in the form a Biodiversity Assessment Report (BAR). Of relevance are the factors with which a determination as a matter for "further consideration".

Response

The EIS Ecological Impact Assessment prepared for the Project documented the findings of ecological investigations undertaken across the Study Area and assessed the impacts of the Project on the biodiversity values present. An indicative credit requirement for both the impact and proposed offset sites was calculated using the FBA and presented within the EIS Biodiversity Offsets Strategy and EIS Ecological Impact Assessment. An assessment of the Project's offset strategy against the principles within the NSW Offsets Policy was also presented within the EIS Ecological Impact Assessment and EIS Biodiversity Offsets Strategy.

Following consultation with DP&E and OEH, it was recommended that the assessment of direct impacts of the Project associated with vegetation clearing be further assessed in accordance with the NSW Offsets Policy. OEH has confirmed that the Project will be treated as a 'transitional project' under the NSW Offsets Policy and is therefore afforded a level of flexibility in meeting the requirements in this new policy.

A BAR has been prepared for the Project (see **Appendix J**) and provides detail on the quantification of impacts as well as matters identified for further consideration by the consent authority. Matters for further consideration identified within the BAR include:

- Impacts to Bylong River, a fourth order stream;
- Impacts to Box Gum Woodland and Derived Native Grassland; and
- Impacts to the Regent Honeyeater.

In accordance with the FBA, the assessment of impacts presented within the BAR deals only with direct impacts associated with vegetation clearing.

Despite the fact that the Project satisfies the "*matters requiring further consideration threshold*", the consent authority may allow the Project to proceed having regard to, amongst other things, the social and / or economic benefits of the Project and if the impacts can be appropriately ameliorated with other conservation measures.

5.5.2.3 Assessment of Additional EPBC Act Listed Communities and Species

Submission Reference: SIG26

Issue

*One submission raised concerns regarding new listings and up-listing of communities and species under the EPBC Act. Specifically, the submission refers to listings associated with Slaty Box Woodland and the Painted Honeyeater (*Grantiella picta*) and how the EIS Ecological Assessment fails to consider the status of these species. The submission requests the preparation of a revised Referral to address the new/up-listings.*

Response

Slaty Box Woodland mapped within the Study Area has been identified within the EIS Ecological Impact Assessment as a Vulnerable Ecological Community (VEC) as listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act). Section 6.3.1 of the EIS Ecological Impact Assessment includes a detailed assessment of impacts to this VEC.

The Painted Honeyeater (*Grantiella picta*) is assessed within the EIS Ecological Impact Assessment as a Vulnerable species under the TSC Act. Although not recorded within the Study Area, this species has been assessed as potentially occurring. Section 6.6.1.i.d of the EIS Ecological Impact Assessment includes a detailed assessment of impacts to the Painted Honeyeater.

Since the commencement of the Project, a number of listings for threatened species, populations and communities listed under the EPBC Act have changed (either new listings or up-listings), some of which are relevant to the Project. As noted within Section 1.4.1 of the EIS Ecological Impact Assessment, the discussion and assessment of threatened species, populations and communities listed under the EPBC Act relates to the listings as they were at the time of the Project being deemed a Controlled Action on 12 March 2014. This is in accordance with Section 158A of the EPBC Act as the Project is not affected by listing events made after the determination of the Project as a Controlled Action.

5.5.2.4 Impacts of Vegetation Removal

Submission Reference: P156

Issue

One submission discussed the potential impacts resulting from the removal of vegetation.

Response

The impacts of vegetation removal have been assessed in accordance with the FBA (see **Appendix J**). This assessment includes the quantification of impacts based on the existing condition of the vegetation and landscape values and takes into account the impact to threatened flora and fauna species.

5.5.2.5 Extent of Impact to Box Gum Woodland and Derived Native Grassland

Submission Reference: SIG11

Issue

Table 42 does not appear to include the area of EPBC Box Gum woodland to be undermined in its summary of the area of this community in the disturbance boundary. According to Table 39 and Appendix J, there are 672ha of this community that will be undermined.

Response

Table 42 of the EIS summarises the extent of impact within the Project Disturbance Boundary and the associated ecosystem credits required. The calculation of credits was undertaken using FBA, which requires the quantification of the direct impact of vegetation clearing.

The impacts to Box Gum Woodland and Derived Native Grassland within the Subsidence Study Area is assessed separately to the impacts within the Project Disturbance Boundary, hence why this value was not included within Table 42 of the EIS.

5.5.2.6 Impacts to Fuzzy Box Woodland

Submission Reference: SIG11

Issue

One submission raised concern regarding the impacts to Fuzzy Box Woodland. The submission notes that the main body of the EIS Ecological Impact Assessment failed to note that Fuzzy Box Woodland is likely to be an endangered community in its own right as discussed within Appendix B of the EIS Ecological Impact Assessment.

Response

Section 3.4.2 of the EIS Ecological Impact Assessment states the following:

It is more feasible that the Western Hunter Flats Fuzzy Box Woodland identified by OEH (2012)), and Fuzzy Box Woodland within the Study Area, forms a highly endangered community in its own right, and should not be subsumed into a wide ranging TEC covering three States.

As noted within this section, the Fuzzy Box Woodland occurring within the Study Area does not conform to any listed currently TECs. However, the regional significance of this community has been noted.

5.5.2.7 Impacts to Threatened Flora Assessed as Planted

Submission Reference: SIG26

Issue

The presence of Brigalow (Acacia harpophylla) and Weeping Myall (A.pendula) within the Project Area has been understated. The consultants, Cumberland Ecology and East Coast Flora have assumed that the populations of Brigalow and Weeping Myall present in the Bylong Project Area are 'planted', however this assumption lacks supporting evidence.

The Precautionary Principal should apply and these populations of Brigalow and Weeping Myall should be treated as natural and therefore potential for significant impact must be assessed under the TSC Act and EPBC Act. The Brigalow population qualifies as the Brigalow (Acacia harpophylla dominant and co-dominant) Endangered Ecological Community (EEC) listed under the EPBC Act.

Response

Section 4.2.3 of Appendix B to the EIS Ecological Impact Assessment discusses the occurrence of *Acacia harpophylla* (Brigalow) within the Study Area. The occurrence of the species is postulated to be planted due to the habitat described in literature regarding the species not matching well to the habitat in which the species was found. Despite this, the species was assessed in the EIS Ecological Impact Assessment as having regional significance.

Stands of *Acacia harpophylla* (Brigalow) within NSW have the potential to conform to TECs listed under the TSC Act and/or EPBC Act. In NSW, the TSC Act listed Brigalow community (*Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions*) occurs on the North West Slopes and Plains and Darling River Plains (OEH, 2014a) and the EPBC Act listed Brigalow community (*Brigalow (Acacia harpophylla dominant and co-dominant)*) extends from the Queensland border south to northern NSW near Narrabri and Bourke (DoE, 2016a).

As such, the individuals of *Acacia harpophylla* (Brigalow) occurring within the Study Area are outside the range of the TSC Act and EPBC Act listed Brigalow communities and do not conform to these TECs.

Section 4.2.2 of Appendix B to the EIS Ecological Impact Assessment discusses the occurrence of *Acacia pendula* (Weeping Myall) within the Study Area. This species was recorded at two locations within the Study Area. A single individual garden specimen was recorded adjacent to a Project site office. A further three individuals were identified on elevated land in grazing paddocks.

Recent literature describes the habitat for *Acacia pendula* (Weeping Myall) as heavy loams of floodplains, floodplains on fertile alluvial clay, grey clay soils on flats and shallow depressions, depositional landforms on heavy textured clay subsoil and major river floodplains and particularly on heavy clay soils (Bell and Driscoll, 2014). The habitats in which the individuals within the Study Area were recorded do not match these habitat descriptions, or the known habitat of this species within the Hunter Valley, which is described as heavy clay soils on depositional landforms (OEH, 2015a). Additionally, a recent article concluded that based on evidence of historical writings, database records, herbarium records and habitat characteristics, that it is unlikely that *Acacia pendula* (Weeping Myall) ever occurred naturally within the Hunter Valley region (Bell and Driscoll, 2014).

5.5.2.8 Impacts to the Wollemi Pine

Submission Reference: P48_2, P145, P197, P216

Issue

A few submissions raised concern regarding the lack of assessment of the potential impact to the Wollemi Pine, in particular the impacts resulting from water use and dust.

Response

The location of the Wollemi Pine is not publicly available so its proximity to the Study Area is unknown. However it is known to occur within Wollemi National Park and is restricted to specialised habitats in rainforest communities in deep sandstone gorges (DoE, 2016b).

Species associated within the rainforest and surrounding ridges include *Ceratopetalum apetalum*, *Doryphora sassafras*, *Acmena smithii*, *Backhousea myrtifolia*, *Quintinia sieberi*, *Angophora floribunda*, *Dicksonia antarctica*, *Cyathea australis*, *Eupomatia laurina*, *Lepidosperma urophorum*, *Sticherus flabellatus*, *Todea barbara*, *Cissus hypoglauca*, *Clematis aristata*, *Pandorea pandorana* and *Parsonsia straminea*.

The Wollemi Pine was considered within the EIS Ecological Impact Assessment as interrogation of the DoE Protected Matters Search Tool determined that the species or its habitat was likely to occur within the locality of the Study Area.

This species was assessed within Appendix F of the EIS Ecological Impact Assessment as 'unlikely to occur' due to the lack of suitable habitat and therefore was not assessed further.

The potential impacts of dust are considered within Section 6.2.6.ii of the EIS Ecological Impact Assessment. A suite of mitigation measures are proposed to be implemented including dust minimisation. As noted within Section 6.8.7 of the EIS Ecological Impact Assessment, indirect impacts such as increased dust levels are not considered to significantly impact adjoining National Parks.

The Project is located downstream of Wollemi National Park. As such, any water use associated with the Project is not considered to impact the habitat within Wollemi National Park.

5.5.2.9 Loss of Hollow-bearing Trees

Submission Reference: SIG26

Issue

The loss of tree hollows is a listed 'Key Threatening Process' under the TSC Act and is likely to impact on a large number of threatened birds including the Brown Treecreeper, Turquoise Parrot, Barking Owl (Ninox connivens), Powerful Owl (Ninox strenua), Glossy Black Cockatoo (Calyptorhynchus lathami) and Gang Gang Cockatoo (Callocephalon fimbriatum). BirdLife maintain that the direct removal of any tree hollows should be avoided, and if unavoidable should be offset with significantly more artificial hollows (at least 5 artificial hollows to each natural hollow removed).

Response

Section 4.1.1.iii of the EIS Ecological Impact Assessment identified the presence of hollow-bearing trees and stags within the Study Area and provided the number and sizes of hollows within 34 sampled plots within the Project Disturbance Boundary. The importance of hollow-bearing trees and stags to hollow-dependent fauna is also noted within this section.

Given the location of coal resources within the Study Area, it is not possible to completely avoid impacts to hollow-bearing trees and stags whilst allowing the Project to be feasible.

The impacts within the Project Disturbance Boundary have been further assessed using the FBA. Hollow-bearing trees are considered within the calculation of the credit requirement within the Project Disturbance Boundary and the credits generated within the offsets.

An abundance of hollow-bearing trees exist within the six proposed offset areas. In addition to the conservation of the existing hollow-bearing trees within the offset areas, the regeneration of grassland to woodland over time within will also result in additional hollow-bearing trees. The standard management actions required within the offset areas include the retention of native vegetation; however they do not include the provision of artificial hollows. As such, it is not considered necessary to provide artificial hollows.

5.5.2.10 Loss of Fallen Logs

Submission Reference: SIG26

Issue

*The loss of coarse woody debris, 'standing and felled timber' is a listed 'Key Threatening Process' under the TSC Act and likely to impact on a large number of threatened birds including the Brown Treecreeper, Hooded Robin, Grey-crowned Babbler, Speckled Warbler, Diamond Firetail, Scarlet Robin (*Petroica boodang*) and Flame Robin (*Petroica phoenica*). BirdLife maintain that the direct removal of any woody debris and standing timber should be avoided, and if unavoidable should be offset with more woody debris than was removed.*

Response

Section 4.1.1.ii identified the presence of terrestrial habitat features, such as fallen logs, within the Study Area. This section also noted the use of such habitat features by woodland birds. Given the location of coal resources within the Study Area, it is not possible to completely avoid impacts to woody debris whilst allowing the Project to be feasible.

The impacts within the Project Disturbance Boundary have been further assessed using the FBA. Fallen logs are considered within the calculation of the credit requirement within the Project Disturbance Boundary and the credits generated within the offsets. An abundance of fallen logs exist within the six proposed offset areas. The standard management actions required within the offset areas include the retention of dead timber; however they do not include the relocation of such habitat features to the offset areas. As such, it is not considered to be a requirement to relocate dead timber to the offset areas.

Some of the woody debris removed within the Project Disturbance Boundary will be relocated and used in whole or in part in rehabilitation areas. Details regarding the quantities of woody debris within the rehabilitation areas will be contained within the Biodiversity Management Plan (BMP).

5.5.2.11 Regent Honeyeater

Submission Reference: SIG2, SIG14, SIG26

Issue

A number of submissions raised concerns about the impacts to the Regent Honeyeater and the provision of offsets to mitigate this impact.

Response

The impacts to the Regent Honeyeater were identified as significant within the EIS Ecological Impact Assessment and a substantial offset package has been developed for the Project which seeks to provide sufficient compensation for the loss of habitat for the Regent Honeyeater.

A revised assessment of the Project has been undertaken in accordance with the FBA (see **Appendix J**). Within this assessment, the Regent Honeyeater has been identified as a species requiring further consideration by the consent authority. Additional information has been provided in the BAR to enable the consent authority to determine whether the offset strategy proposed is sufficient, or whether additional offsets are required, either in the form of additional credits or supplementary measures.

Despite the fact that the Project satisfies the “*matters requiring further consideration threshold*”, the consent authority may allow the Project to proceed having regard to, amongst other things, the social and / or economic benefits of the Project and if the impacts can be appropriately ameliorated with other conservation measures.

5.5.2.12 Swift Parrot

Submission Reference: SIG26

Issue

We believe that insufficient survey efforts have been conducted in the Bylong region for Swift Parrot and many other woodland birds to date, largely owing to lack of public access over large areas of the region including the proposed Bylong Coal Project Area. Our knowledge of in-situ habitat suggests the area should be recognised as important Swift Parrot foraging habitat.

Response

Although not recorded during surveys (see **Section 5.5.1.6** for survey effort), the Swift Parrot is assessed as a potentially occurring species. Section 4.3.3.i.b of the EIS Ecological Impact Assessment discusses the potential occurrence of the Swift Parrot within the Study Area, which notes that the occurrence of the species will be influenced by the presence of winter-flowering eucalypts.

Of the feed tree species identified within the DoE Species Profile and Threats Database (DoE, 2015), the OEH Threatened Species Profile Search Database (OEH, 2014c), the OEH BioNet Threatened Species Profile Database (OEH, 2015b) and the *National Recovery Plan for the Swift Parrot Lathamus discolor* (Saunders and Tzaros, 2011), *Eucalyptus albens* (White Box), *Eucalyptus blakelyi* (Blakely's Red Gum), *Eucalyptus melliodora* (Yellow Box) and *Eucalyptus camaldulensis* (River Red Gum) occur within the Study Area. *Eucalyptus albens* (White Box) is the most prevalent of the winter-flowering feed tree species within the Study Area and Project Disturbance Boundary.

Key winter foraging habitat types and characteristics for the Swift Parrot in natural resource management areas have been identified within the *National Recovery Plan for the Swift Parrot Lathamus discolor* (Saunders and Tzaros, 2011). The Study Area occurs within the then defined Hunter-Central Rivers natural resource management region, which lists *Eucalyptus robusta* (Swamp Mahogany), *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus pilularis* (Blackbutt) as the key foraging habitat types in the region. None of these species have been recorded within the Study Area. *Eucalyptus albens* (White Box) and *Eucalyptus melliodora* (Yellow Box) are listed as key foraging habitat types in the Central West region, which occurs to the west of the Study Area.

The EIS Ecological Impact Assessment has assessed the Swift Parrot as a potentially occurring species impacted by the Project. Within the revised assessment of the Project Disturbance Boundary using the FBA, the Swift Parrot is assessed as an ecosystem credit species, which is only predicted for one of the PCTs identified within the Project Disturbance Area (HU869). Sufficient credits for HU869 have been provided in the offset strategy, although the species is not assessed as the driver for the calculation of these credits.

5.5.2.13 Hooded Robin

Submission Reference: SIG26

Issue

The Hooded Robin is approaching extinction in the Hunter Valley and the Bylong Coal Mine is likely to severely impact one of the last populations of this species in the Hunter Valley. This has not been addressed adequately.

Response

Section 4.3.1.vii of the EIS Ecological Impact Assessment discusses the occurrence of the Hooded Robin within the Study Area and notes that the occurrence of the species will favour ecotonal habitat where fallen logs are present and in proximity to water. Within the Sydney Basin Bioregion, in which the Study Area is located, the Hooded Robin is restricted to the Hunter, Capertee and Burragorang Valleys where it is closely associated with the drier woodland habitats (DEC, 2006). It remains quite common in the Capertee Valley, but appears to have suffered marked declines in the Hunter Valley (DEC, 2006).

It is however known from nearby reserves, including Wollemi National Park and Goulburn River National Park as well as Munghorn Gap Nature Reserve. The species has also been recorded within Offset Area 5 and the Yarran View Offset Area.

Section 6.6.1.ii.d of the Ecological Impact Assessment assesses the potential impacts to the Hooded Robin and an Assessment of Significance is provided in Appendix H. Given that the species is mobile and likely to utilise numerous habitat resources within the locality, the species is considered to remain viable within the locality.

The revised assessment of the Project Disturbance Boundary, which is in accordance with the FBA, the Hooded Robin is assessed as an ecosystem credit species, which is only predicted for two of the PCTs identified within the Project Disturbance Area (HU824 and HU869). Sufficient ecosystem credits for HU824 and HU869 have been provided in the offset strategy, although the species is not assessed as the driver for the calculation of these credits.

5.5.2.14 Impacts to Woodland Birds

Submission Reference: SIG26

Issue

Birdlife Australia is aware of state-significant populations of breeding Turquoise Parrot and Hooded Robin as well as healthy populations of Grey-crowned Babbler, Speckled Warbler, and Brown Treecreeper in areas of woodland that will be permanently removed as a result of the Bylong Coal Project. BirdLife Australia believe the mine will have significant impact on these species and would like to see a Species Impact Statement (SIS) produced to follow due procedure. Significant impact is highly likely due to the already low amount of lowland woodland remaining in the Bylong region at present.

Response

No populations of Turquoise Parrot, Hooded Robin, Grey-crowned Babbler, Speckled Warbler and Brown Treecreeper have been listed as endangered under the TSC Act. The significance of impacts to these species has been assessed within Appendix H of the EIS Ecological Impact Assessment. Given that these species are highly mobile and are likely to utilise numerous habitat resources within the locality, the species are considered to remain viable within the locality and their ranges.

Within the revised assessment of the Project Disturbance Boundary using the FBA, the Turquoise Parrot, Hooded Robin, Grey-crowned Babbler, Speckled Warbler and Brown Treecreeper are all assessed as an ecosystem credit species. They are known to occur across a range of PCTs assessed as impacted by the Project. None of these species are the drivers for the calculation of these credits.

The Turquoise Parrot is predicted for all PCTs assessed as impacted by the Project and the remaining species are predicted for HU827 and/or HU869. With the exception of HU547, sufficient ecosystem credits have been provided for all PCTs in which these species occur. Additional credits are provided for all other PCTs.

The Project is seeking SSD Development Consent under Division 4.1 of Part 4 of the EP&A Act. Under Section 78A(8A) of the EP&A Act, a SSD Development Application must be accompanied by an EIS. Clause 2(f) of Schedule 1 of the EP&A Regulation does not require the preparation of a Species Impact Statement for SSD. As such, there is no requirement to prepare a Species Impact Statement for the Project. However, an assessment of significance has been completed for this species and is included in Appendix J of the EIS.

5.5.2.15 Assessment of Significance for Blossom-dependent Birds

Submission Reference: SIG26

Issue

The section 5a assessment for 'blossom-dependent birds' is unacceptable. It is not appropriate to assess Regent Honey Eater (NSW: critically endangered, Cth: critically endangered) alongside Black-chinned honeyeater (NSW: vulnerable, Cth: not listed), little lorikeet (NSW: vulnerable, Cth: not listed), painted honeyeater (NSW: vulnerable, Cth: not listed) and swift parrot (NSW: endangered, Cth: endangered) in one large grouping such as this when the potential impacts are so large. To further consider the impact upon all of these as not significant is completely incorrect, particularly for Regent Honeyeater, as mentioned above. This is an area where this proposal may be subject to future legal challenge due to the inadequacy of the assessment. Added to this, the main body of the report indicates that the Regent Honeyeater would be significantly impacted by the project, though this is not reflected in the assessment of significance which appears to conclude no significant impact upon any of these species.

Response

A BAR has been prepared for the Project (see **Appendix J**) which quantifies the impacts to native vegetation and threatened species, including the Regent Honeyeater. An Assessment of Significance in accordance with Section 5A of the EP&A Act is not a requirement of the NSW Offsets Policy. In recognition of the listing of the Regent Honeyeater as critically endangered, the species is assessed as a matter for further consideration. Despite the fact that the Project satisfies the “*matters requiring further consideration threshold*”, the consent authority may allow the Project to proceed having regard to, amongst other things, the social and / or economic benefits of the Project and if the impacts can be appropriately ameliorated with other conservation measures. As such, additional information is presented within the BAR in relation to this species to enable the consent authority to determine whether it is appropriate for the impact to occur.

5.5.2.16 Impacts to Migratory Species

Submission Reference: SIG14

Issue

The EIS does not provide adequate consideration of the impacts of the proposal on EPBC Act listed migratory bird species.

Response

A Referral was submitted to DoE in February 2014 and the Project was deemed a Controlled Action for two items of national environmental significance:

- listed threatened species and communities (Section 18 and 18A); and
- a water resource, in relation to coal seam gas development and large coal mining development (Section 24D and 24E) under the EPBC Act on 12 March 2014.

Migratory species (Section 20 and 20A) were not assessed by DoE as being controlling provisions for the Project. Despite this, the EIS Ecological Impact Assessment considered both direct and indirect impacts to known and potentially occurring migratory species.

Two migratory species, the Rainbow Bee-eater (*Merops ornatus*) and White-throated Needletail (*Hirundapus caudacutus*) have been recorded within the Study Area. A further six species were assessed as potentially occurring. Section 6.6.1.v of the EIS Ecological Impact Assessment outlines the potential impacts of the Project on habitat for migratory species. Additionally, Section I.4.1.iii provides an assessment of the significance of impacts to migratory species according to the MNES Significant Impact Guidelines 1.1 (DoE, 2013). This included the consideration of the loss of foraging habitat for these species. The Project has been assessed as not significantly impacting the known and potentially occurring migratory species.

5.5.2.17 Impacts to the Spotted-tailed Quoll

Submission Reference: SIG14

Issue

The spotted-tailed quoll is listed as vulnerable under NSW legislation and endangered under the EPBC Act. The quoll has been recorded in the study area. Approximately 229 ha of suitable foraging habitat will be removed by the project¹¹. The quoll is especially sensitive to habitat change, as it is dependent on forests for its prey and shelter. The species disappears if 50% of the forest canopy is removed¹². NCC believes that the removal of 229 ha of habitat as proposed may have a significant negative impact on the quoll population remaining in the Bylong Valley.

Response

The Spotted-tailed Quoll has been recorded from a wide range of habitat types including rainforest, wet and dry sclerophyll forest, coastal heathland, scrub and dunes, woodland, heathy woodland, swamp forest, mangroves, on beaches and sometimes in grassland or pastoral areas adjacent to forested areas (Long and Nelson, 2010). Suitable habitat for the Spotted-tailed Quoll within the Study Area was identified within the EIS Ecological Impact Assessment as woody vegetation where there are few predators.

The 229 ha of habitat for this species identified within the Project Disturbance Boundary is not considered important for the long term survival of the species within the locality. The presence of predators such as foxes (*Vulpes vulpes*) and wild dogs (*Canis lupus*) in conjunction with a previously disturbed landscape indicates that the quality of the habitat to be removed has previously been reduced.

Extensive areas of connected habitat will remain within the Study Area and in adjoining conservation reserves. This species is considered likely to utilise habitat resources throughout the locality. Additionally, a substantial offset package has been proposed that includes consideration of potential habitat for the Spotted-tailed Quoll within the Bylong Valley.

5.5.2.18 Brush-tailed Rock-wallaby Impact

Submission Reference: SIG14, SIG27

Issue

Two submissions raised concern regarding the lack of information regarding the extent of habitat for the Brush-tailed Rock-wallaby. Both submissions noted that there may be a significant impact to this species as a result of the Project.

Response

This species has not been recorded within the Project Disturbance Boundary, however it has been assumed to occur due to a recent nearby record. This species was recorded at one location within the Study Area to the south of the Project Disturbance Boundary within Slaty Box Woodland and in close proximity to cliff line habitat. It is therefore assumed that the Brush-tailed Rock-wallaby both forages and breeds within the Study Area. Habitat for this species occurs within shrubby woodland, shrubland and forest within proximity to cliff lines which is a habitat constraint for this species. This species is likely to occur in areas that have little disturbance and fewer predators.

A revised assessment of the Project has been undertaken using the FBA. The initial process to identify habitat impacted within the Project Disturbance Boundary included riparian woodland/forest, grassy woodland, shrubby woodland, shrubland and forest located within 500 m of identified cliff lines (extent of foraging habitat beyond breeding habitat identified within the OEH Threatened Species Profile Database).

This was then refined to only include areas in close proximity to the known record at Tal Tal Mountain, whereby the source population would be expected to occur. A total of 26.45 ha of habitat for the Brush-tailed Rock-wallaby has been identified within the Project Disturbance Boundary, which equates to 688 species credits. The extent of habitat assessed differs from the extent reported in the EIS Ecological Impact Assessment following review of the Threatened Species Profile Database and extent of cliff lines mapped.

Despite the presence of suitable habitat features within the Subsidence Study Area, due to lack of records within close proximity that could provide a source population for this area, as well as the presence of foxes and wild dogs, the habitat within this area is not considered to support a population of the Brush-tailed Rock-wallaby.

Based on the extent of habitat loss within the Project Disturbance Boundary, the Project is not considered to result in a significant impact to the Brush-tailed Rock-wallaby. The offset strategy proposed for the Project includes the provision of two offset sites which contain suitable habitat and could support the local population of the species.

5.5.2.19 Cave-dwelling Bats

Submission Reference: SIG27

Issue

One submission raised concern regarding the assessment of roosting or breeding habitat for the two cave-dependent microbats known to occur within the Study Area.

Response

The Large-eared Pied Bat has been recorded at multiple locations either within or in close proximity to the Project Disturbance Boundary. It is expected that this species would roost within the cliff line habitat which occurs in the Study Area and forage within adjoining woody vegetation, including that within the Project Disturbance Boundary. It is unknown if any maternity roosts occur within the Study Area. Lactating females have been recorded in Ulan, to the west of the Study Area. No breeding habitat has been recorded within the Study Area, however there is potential for this species to breed within the cliff line habitats which occur within this area.

The Eastern Bentwing-bat has been recorded at multiple locations either within or in close proximity to the Project Disturbance Boundary. Records within the Project Disturbance Boundary occur within habitats located adjacent to cliff lines. Records outside of the project Disturbance Boundary occur both within cliff line habitat and habitats adjacent to cliff lines. It is expected that this species would roost within the cliff line habitat within the Study Area and forage within adjoining woody vegetation, including within the Project Disturbance Boundary. It is unknown if any maternity roosts occur within the Study Area. Surveys of the north-western portion of Wollemi National Park indicated that breeding occurs in the region, however this is likely to occur in the Baerami Valley oil shale mines (DEC, 2006).

No breeding habitat has been recorded within the Study Area, however there is potential for this species to breed within the cliff line habitats.

It is assumed that the Large-eared Pied Bat and Eastern Bentwing-bat breed within cliff line habitat in the Study Area within cliff line habitat and habitat adjacent to these areas is a component of this breeding habitat.

A revised assessment of the Project has been undertaken using the FBA, which included determining the extent of breeding habitat impacted by the Project within the Project Disturbance Boundary. The extent of impact assessed included woody vegetation within 500 m of identified cliff lines (assumed extent of foraging habitat required adjacent to breeding habitat). Identified cliffs include those within the Study Area as documented within MSEC (2015) and those outside of the Study Area as shown on the 1: 250, 000 topographic map.

No areas of identified cliff lines occur within the Project Disturbance Boundary; however important foraging habitat adjacent to cliff lines has been identified. A total of 56 ha of potential breeding habitat for the Large-eared Pied Bat and Eastern Bentwing-bat has been identified within the Project Disturbance Boundary, which equates to 728 species credits each. The extent of habitat assessed differs from the extent report in the Ecological Impact Assessment following review of the Threatened Species Profile Database and extent of cliff lines mapped.

The design of the underground component of the Project has sought to minimise impacts to cliff lines. Key avoidance measures relevant to the Large-eared Pied Bat and Eastern Bentwing-bat include:

- Refinement of the underground mine plan to ensure the Main Headings will be positioned under most significant and visible cliff lines overlying the underground extraction area and longwall panels adjusted to ensure any significant subsidence related impacts are avoided at these locations; and
- Positioning of the longwall panel layouts to ensure that the Subsidence Study Area did not encompass subsidence impacts on the most significant and visible cliff lines which have been identified within the vicinity of the mining areas.

As noted in Section 6.2.1.iii of the EIS Ecological Impact Assessment, MSEC (2015) identified 43 cliffs within the Subsidence Study Area of which 22 are located above the proposed longwall mining extent. Based on previous quantification of impacts at Ulan Mine, it is expected that the percentage of cliffs above the longwall panels that are likely to experience rock falls is of the order of 20% of the length of the cliffs, and visible mining subsidence movements is expected to occur in approximately 50% to 70% of the cliffs (MSEC, 2015). If it is assumed that 20% of the cliff lines, including a 20 m buffer either side of the cliff is lost, the total area of cliff habitat impacted within the Subsidence Study Area is 3.25 ha. This represents an impact of 1.3% of the total cliff lines and associated buffer within the Study Area.

Based on the extent of habitat loss within the Project Disturbance Boundary and the minimal impacts within the Subsidence Study Area, the Project is not considered to result in a significant impact to the Large-eared Pied Bat and Eastern Bentwing-bat. The offset strategy proposed for the Project includes the provision of offset sites which contain suitable habitat for the local populations of these species.

5.5.2.20 Lack of Consideration of Impact on Wollemi National Park

Submission Reference: SIG27

Issue

Lack of consideration for impacts on the adjacent Wollemi National Park

Response

OEH has prepared guidelines for development occurring adjacent to OEH estate to assist in the assessment of impacts to this land. As the Project is located adjacent to Wollemi National Park and Goulburn River National Park, the EIS Ecological Impact Assessment provided an assessment in accordance with these guidelines within Section 6.8.

5.5.2.21 Connectivity

Submission Reference: SIG8, SIG26

Issue

Two submissions noted the importance of remnants to provide habitat connectivity. It was also noted that the modification to connectivity within the Study Area has the potential to significantly impact woodland birds.

Response

Impacts to wildlife corridors within the Study Area were assessed within Section 6.2.5 of the EIS Ecological Impact Assessment. The assessment noted that on a local scale, the Project will reduce the extent of some wildlife corridors within the Study Area, which will affect a range of fauna groups, particularly woodland birds and small mammals.

The reinstatement and/or improvement of existing wildlife corridors has been an important consideration in the selection of offset sites for the Project. Conservation of existing habitat and revegetation is proposed to address the loss of connectivity resulting from the removal of 232 ha of woody vegetation within the Project Disturbance Boundary. The offset sites will be capable of providing for the movement of species across the landscape and will improve the current connectivity values of the lands in several important ways:

- Vegetation will be planted to connect existing patches of remnant vegetation that are currently isolated;
- Planting will increase the size of the existing remnant patches, which will decrease the distance between patches and provide better connectivity; and

- Planting will increase the size and number of patches in the existing landscape to provide better stepping stone corridors.

The Onsite Offset Areas will contribute to the corridor between Wollemi National Park, Tal Tal Mountain and Mount Penny as shown in Figure 45 of the EIS.

5.5.2.22 Great Eastern Ranges Initiative

Submission Reference: SIG3, SIG9, SIG26

Issue

Three submissions note the occurrence of the Project within the corridor delineated by the Great Eastern Ranges Initiative and the potential for impacts to this corridor.

Response

Section 4.2.1 of the EIS Ecological Impact Assessment identifies that the Study Area falls within the corridor delineated by the Great Eastern Ranges Initiative. Whilst it has no legal requirements, the initiative is a national effort which aims to maintain and improve connectivity of the mountainous ecosystems of eastern Australia (OEH, 2011). The Great Eastern Ranges Initiative is not identified by OEH as being a State or regional biodiversity link required to be considered under the FBA.

Section 6.2.5 of the EIS Ecological Impact Assessment outlines the impacts to this corridor. Given that the corridor is already interspersed with cleared land, the removal of 232 ha of woody vegetation predominantly at the edge of trees habitat the Project is not considered to severe the corridor. Additionally, extensive areas of land within the offsets sites will regenerate to woodland over time, thus providing additional connectivity.

5.5.2.23 Impact to Mudgee-Wollar Important Bird Area

Submission Reference: SIG26

Issue

*The Bylong Valley has been designated by BirdLife International as part of the Mudgee-Wollar Important Bird and Biodiversity Area (IBA no. 24449 <http://www.birddata.com.au/iba.vm>). The IBA was designated because it is a stronghold for the Regent Honeyeater, Diamond Firetail (*Stagonopleura guttata*) and Rockwarbler (*Origma solitaria*). All three of these species have been recorded within the proposed Bylong Coal Project Area. BirdLife Australia is concerned that there has been no consideration of this IBA in the EIA, and that therefore the impact upon this IBA have not been considered.*

Response

The Mudgee-Wollar Important Bird Area covers an area of 162,656 ha. Three bird species have been identified as globally important bird populations within this area, including the Regent Honeyeater, Diamond Firetail and Rockwarbler.

The extent of habitat removal for the Regent Honeyeater and Diamond Firetail is detailed within the EIS Ecological Impact Assessment. As the Rockwarbler is not listed as a threatened species under the TSC Act or EPBC Act, no detailed assessment has been provided for this species. The Rockwarbler is considered to be a specialist of cliff lines and associated habitats. Impacts to cliff lines are considered within Section 6.2.1.iii of the EIS Ecological Impact Assessment.

Despite the Project impacting habitat for the Regent Honeyeater, Diamond Firetail and Rockwarbler, a substantial offset strategy is proposed to compensate for the loss of habitat. The offset strategy will include the protection of woodland and enhancement of previously cleared areas, which are in line with the management considerations recommended for the Important Bird Area.

5.5.2.24 Cumulative Impact

Submission Reference: SIG8, SIG9, SIG11, SIG26, P229

Issue

A few submissions noted the cumulative impacts to biodiversity as a result of the Project in conjunction with other losses of biodiversity. The submission refers to cumulative impacts of other mines within the region, such as Mangoola, Bengalla and Warkworth.

Response

Section 6.9 of the EIS Ecological Impact Assessment provides an assessment of the cumulative impacts of the Project with other processes in the locality. Impacts to vegetation and fauna species in the locality have already occurred through vegetation clearing for agriculture and logging, and through ongoing agricultural practices.

No existing or proposed mines occur within the locality of the Study Area, however they are known within the wider region. As noted within the EIS Ecological Impact Assessment, these occur as both open cut and underground mines, and are predicted to generate similar impacts to the Project. Mangoola, Bengalla and Warkworth are located approximately 55 km, 65 km and 85 km from the Project, respectively. The long term impacts associated with the Project as well as other proximate mines will be offset by rehabilitation and appropriate offset strategies. This will result in a net increase in conserved vegetation and habitat in the longer term.

Whilst it is acknowledged that the Project will contribute to the cumulative loss of habitat from mining projects within the wider region, KEPCO has sought to implement avoidance, mitigation and offset measures in accordance with State and Commonwealth Guidelines.

5.5.3 Subsidence-Related impacts

5.5.3.1 Impact to Bird Species

Submission Reference: SIG26

Issue

Impacts of subsidence on vegetation and bird habitat (e.g. through dieback caused by the shearing of tree roots, or alteration of tree root access to ground water) is overlooked in this report and not addressed adequately enough to provide any satisfaction that impacts will not be significant.

*Subsidence will cause the collapse of pagoda formations, cliff lines, overhangs and other outcropping sandstone formations. This may cause direct impact to roosting Masked Owl (*Tyto novaehollandiae*) listed as Vulnerable under the TSC Act, and breeding habitat of the rare Rockwarbler (*Origma solitaria*) which is the only species of bird that is endemic to NSW.*

Response

Additional information has been provided on the likely impacts and environmental consequences of subsidence on individual cliffs within the subsidence area. This is discussed in **Section 4.11.5**.

This assessment indicates that a small portion of the Subsidence Study Area may be impacted by the subsidence-related impacts of surface cracking, cliff fall and hydrological changes.

Some additional impacts, such as root shearing may occur outside the area of these predicted impacts; however they are expected to be localised. The indirect impacts are not considered to be significant for the bird species that may utilise the habitat within the Subsidence Study Area.

5.5.3.2 Impact to Rocky Habitats

Submission Reference: SIG27

Issue

One submission raised concerns regarding the impacts to rocky habitats identified within the Subsidence Study Area. In particular the submission notes that alteration of rocky habitat is not a normal geological process and may impact specific habitat variables, such as temperature, heat and light regimes, which may make some areas unsuitable for species dependent on those rocky habitats.

Response

The impacts to cliff lines and associated habitats as a result of subsidence are addressed within Section 6.2.1 of the EIS Ecological Assessment. Information from a strategic review of the southern coalfields by the then Department of Planning (DoP) was presented which noted that the existence of cliffs with a rocky talus slope below is a demonstration that these are dynamic environments, where rock falls are not uncommon over significant periods of time (DoP, 2008). The assessment did however note that vegetation, habitat and species may be lost as a result of cliff fall.

The EIS Subsidence Impact Assessment states: *"the percentage of cliffs above the longwalls that are likely to experience rock falls is of the order of 20% of the length of the cliffs"*.

Within the information for the subsidence-related impacts on cliff lines (see **Section 4.11.5**), a 20 m buffer has been applied to the extent of the cliff lines identified in the EIS. The total cliff habitat, including the buffer, within the Subsidence Study Area is 16.23 ha.

Therefore an impact to 20% of this cliff line habitat is approximately 3.25 ha. This represents a potential impact of 1.3% of the total cliff lines and associated buffer within the Study Area.

The potential loss of these habitat features are not considered to be significant for the species that may utilise the habitat within the Subsidence Study Area. The EIS Ecological Impact Assessment also notes the following:

"A strategic review of the southern coalfields found that there is little to no evidence that vegetation or fauna habitats have been significantly altered as a result of cliff falls associated with subsidence (DoP, 2008). Similar conclusions have been made on underground mining projects in the wider locality of the Project (see Ecovision (2008), Umwelt (2009) and Umwelt (2011))."

5.5.3.3 Inconsistency in Extent of Predicted Impacts

Submission Reference: SIG27

Issue

There seems to be some inconsistency between what the subsidence study and what Cumberland Ecology states are the expected impacts of subsidence on terrestrial habitat in the subsidence area. MSEC (2015) identified 45 cliff locations in the study area, of which 22 lie above or bordering the subsidence area. However, in the Offset Strategy document, it is stated that surface cracking will only affect 1% of the subsidence area.

Response

The extent of predicted surface cracking is documented in both the EIS Ecological Impact Assessment and EIS Biodiversity Offsets Report as 1% of the total area of the Subsidence Study Area. The extent of predicted surface cracking documented within these reports relate to the surface expression of ground movements, rather than the loss of habitat within the 43 cliffs identified within the Subsidence Study Area (MESC, 2015).

In addition to surface cracking, the EIS Ecological Impact Assessment also identified the potential for cliff fall within the Subsidence Study Area. The EIS Subsidence Impact Assessment states: *"the percentage of cliffs above the longwalls that are likely to experience rock falls is of the order of 20% of the length of the cliffs"*. Within the information for the subsidence-related impacts on cliff lines, a 20 m buffer has been applied to the extent of the cliff lines identified in the EIS (see **Section 4.11.5**). The total cliff habitat, including the buffer, within the Subsidence Study Area is 16.23 ha. Therefore an impact to 20% of this cliff line habitat is approximately 3.25 ha. This represents a potential impact of 1.3% of the total cliff lines and associated buffer within the Study Area.

5.5.3.4 Extent of Impact

Submission Reference: SIG27

Issue

Potential damage to approximately half the cliff-line area could have a significant impact on any species dependent on this type of habitat. However, these impacts are not adequately considered in the significance of impact assessments as the extent of rocky habitat within the indirect disturbance area is not indicated in the Ecological Assessment nor what proportion this represents of the total extent of this type of habitat in the study area. It is stated that the impact on habitat in the direct disturbance area is 125 ha, though in the Offset Strategy document, this is given as <1 ha. What do these figures represent?

Response

The area of impact within the Project Disturbance Boundary is documented as 125 ha for the Brush-tailed Rock-wallaby and represents a general assessment of the vegetation types that could be utilised by this species.

The area of <1 ha documented within the EIS Biodiversity Offsets Strategy represents the extent of these same vegetation types that are located within 200 m of cliff lines where a potential source population is known to occur in connected habitats within and immediately adjacent to the Study Area. The extent of habitat within the Project Disturbance Boundary for the Brush-tailed Rock-wallaby has been revised within the BAR (see **Appendix J**).

Despite the presence of suitable habitat features within the Subsidence Study Area, due to lack of records within close proximity that could provide a source population for this area, as well as the presence of foxes and wild dogs, the habitat within this area is not considered to support a population of the Brush-tailed Rock-wallaby.

The EIS Subsidence Impact Assessment states: *"the percentage of cliffs above the longwalls that are likely to experience rock falls is of the order of 20% of the length of the cliffs"*. Within the information for the subsidence-related impacts on cliff lines (see **Section 4.11.5**), a 20 m buffer has been applied to the extent of the cliff lines identified in the EIS. The total cliff habitat, including the buffer, within the Subsidence Study Area is 16.23 ha. Therefore an impact to 20% of this cliff line habitat is approximately 3.25 ha.

This represents a potential impact of 1.3% of the total cliff lines and associated buffer within the Study Area. The Study Area is shown on Figure 59 in the EIS.

5.5.3.5 Significance of Impact

Submission Reference: SIG27

Issue

One submission noted that the assessments of significance prepared to address Section 5A of the EP&A Act do not appear to take into account the potential subsidence-related impacts of the Project. Additionally, the submission noted that the local populations of species, which are required to be considered within the assessments of significance, is defined by the Study Area.

Response

Section H.1 of the EIS Ecological Impact Assessment notes the following:

"Both direct and indirect impacts are taken into account within these assessments. Direct impacts have been quantified within the assessments and are represented by the Project Disturbance Boundary. Whilst it is acknowledged that indirect impacts can potentially be significant for a variety of species, such impacts cannot be mapped or accurately calculated in advance. However, subsidence impacts can be and the impacts have been predicted and mapped as occurring within an area defined as the Subsidence Study Area. An important consideration in these assessments is that the direct and indirect impacts are not proposed to take place at one time; rather they will take place progressively."

Subsidence related impacts were considered within the assessments of significance presented within the EIS Ecological Impact Assessment. These assessments concluded that the potential changes to habitat resulting from subsidence are expected to be localised and overall are not considered to cause a substantial change to habitat.

An additional assessment of the subsidence-related impacts predicted for the Project has been undertaken (as described in **Section 4.3.11**). This assessment indicates that a small portion of the Subsidence Study Area may be impacted by the subsidence-related impacts of surface cracking, cliff fall and hydrological changes. Cumberland Ecology has concluded similar to the Assessments of Significance presented within the EIS Ecological Impact Assessment that the subsidence related impacts are not considered to be significant for the species that may utilise the habitat within the Subsidence Study Area.

Within the *Threatened Species Assessment Guidelines* (DECC (NSW), 2007), the local population of a species is defined as follows:

“Local population: the population that occurs in the study area. The assessment of the local population may be extended to include individuals beyond the study area if it can be clearly demonstrated that contiguous or interconnecting parts of the population continue beyond the study area, according to the following definitions.

- *The local population of a threatened plant species comprises those individuals occurring in the study area or the cluster of individuals that extend into habitat adjoining and contiguous with the study area that could reasonably be expected to be cross-pollinating with those in the study area.*
- *The local population of resident fauna species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area.*
- *The local population of migratory or nomadic fauna species comprises those individuals that are likely to occur in the study area from time to time.”*

For each species, or group of species, assessed within Appendix H of the EIS Ecological Impact Assessment, the extent of the local population is noted. For many species, the local populations are considered to extend beyond the Study Area due to contiguous habitat which is in accordance with the above information from the assessment guidelines.

5.5.4 Avoidance Measures

Submission Reference: SIG1

Issue

One submission notes that avoidance measures will not be possible despite the EIS Ecological Impact Assessment noting that the BMP to be prepared for the Project will include such measures.

Response

Section 7.1 of the EIS Ecological Impact Assessment outlines the avoidance measures undertaken to date for the Project. The Project has avoided impacts to biodiversity values through the selection of a combined open cut and underground mine, and through a process of refinement to the design, location of key mining activities and the associated infrastructure.

This section also notes that KEPCO will endeavour to achieve further avoidance of sensitive biodiversity beyond that described during the detailed design and construction phases of the Project as the mine plan and associated infrastructure is refined. Section 7.2.2 of the EIS Ecological Assessment outlines how further minimisation of vegetation and habitat loss is proposed.

5.5.5 Mitigation Measures

5.5.5.1 Pre-clearing and Clearing Surveys

Submission Reference: SIG26

Issue

One submission recommended timing and methods for pre-clearing and clearings surveys within the Project Disturbance Boundary.

Response

Pre-clearance and clearing surveys are included in the mitigation measures proposed for the Project. Section 7.2.3 of the EIS Ecological Impact Assessment outlines the surveys proposed for the Project.

A detailed plan for pre-clearance and clearing surveys will be incorporated into the BMP to be prepared for the Project. The BMP will be prepared in consultation with relevant regulators.

5.5.5.2 Bushland Regeneration Plan

Submission Reference: O3

Issue

Finally, reference should be made for consideration of the main focus that for implementation of mitigation measures for risk to habitat. With a proposal to establish a threat abatement plan for the species and ecological communities at risk, could also be linked a bushland regeneration plan to establish nursery development and remnant bushland recovery for any losses that occur.

Response

The assessment of impacts of the Project has taken into account existing threat abatement plans relevant to the species and communities identified as impacted. No threat abatement plans are proposed to be prepared specifically for the Project. Management of biodiversity values within the Study Area, including mitigation measures, will be done in accordance with the Biodiversity Management Plan proposed to be prepared for the Project.

5.5.6 Auditing

Submission Reference: SIG26

Issue

SIG26 recommends that subsidence risk, offset management and rehabilitation is audited by environmental agencies that are impartial and unbiased (not employed or contracted by KEPCO). Any potential impacts upon native vegetation should be adequately documented, released to the public and addressed by KEPCO.

Response

KEPCO will comply with any requirement for auditing of the Project as stipulated in any conditions of development consent issued.

5.5.7 Groundwater Dependant Ecosystems

5.5.7.1 Misidentification of GDEs within the Study Area

Submission Reference: SIG27

Issue

One submission notes that the EIS EIA misinterprets and misidentifies what GDEs are and how they appear in the field. Specifically, the submission notes the following:

The consultant first states that, "Eastcoast Flora Survey observed no obvious evidence of GDEs apart from one 'soak' at Tal Tal Mountain..." However GDEs do not necessarily require standing water to substantiate their identity, particularly sub-surface GDEs. Yet the assessment goes on to say that "temporary pools are present within the network of drainage lines in the Study Area with some aquatic vegetation present in pools where water persist for longer durations." (p.4.1). Importantly, the location of these water bodies, like the dams, are not indicated in the assessment, nor is their presence thought to be indicative of groundwater influences.

Response

Section 3.5.3 of the Ecological Impact Assessment in the EIS provides an assessment of the occurrence of GDEs within the Study Area as described in **Section 4.15.1**. The submission misquotes the information presented within this section, which includes the following incorrect text:

"Despite the Atlas of GDEs mapping of potential groundwater interaction within the Study Area, Eastcoast Flora Survey observed no obvious evidence of GDEs. There have been no hanging swamps identified with perched water tables present on the sandstone hills, as are present in south-western Wollemi National Park and Blue Mountains National Park. Evidence of ground seepage was observed at one location within the Study Area, in the vicinity of Tal Tal Mountain, in a sandstone gully with a considerable amount of sandstone outcropping. The vegetation present in the gully does not support different vegetation than surrounding areas and the baseflow observed is consistent with ground seepage in areas with extensive sandstone outcropping."

Section 3.5.3 of the EIS Ecological Impact Assessment provides no correlation between the occurrence of GDEs and the presence of standing water. Additionally, the area of ground seepage identified by Eastcoast Flora Survey was not reported as comprising standing water.

The vegetation communities identified as GDEs within the Study Area have been assessed as GDEs as they are considered likely to have some root access to groundwater, rather than occurring in areas of standing water.

5.5.7.2 Atlas of GDEs Mapping

Submission Reference: SIG27

Issue

One submission stated that the mapping of GDEs within the Subsidence Study Area differs to that mapping available within the Commonwealth's Atlas of GDEs and that no GDEs have been identified within the Subsidence Study Area.

Response

Section 3.5.2 of the EIS Ecological Impact Assessment presents the results of interrogation of the Commonwealth's Atlas of GDEs and a map of the surface expression of groundwater is provided in Figure 3.5. The EIS Ecological Impact Assessment notes that the estimates of potential groundwater interaction contained within the Atlas of GDEs are only estimates of potential interaction, and are not supported by quantitative measurements.

Of particular note is that both the Atlas of GDEs mapping show large areas of vegetation associated with Bylong State Forest and Tal Tal Mountain as having a moderate potential for subsurface groundwater interaction, when groundwater modelling indicates that the depth to groundwater in these areas exceeds 50 m, thereby placing it out of the likely reach of the roots of the canopy tree species. Accordingly, the mapping is not considered to accurately represent the conditions on the ground.

A separate and more comprehensive assessment of GDEs has been undertaken within the Study Area (see Section 3.5.3 of the EIS Ecological Impact Assessment), which considered on ground conditions and groundwater modelling presented within the EIS Groundwater Assessment.

Figure 3.6 of the EIS Ecological Impact Assessment shows that one GDE, namely Blakely's Red Gum / Apple Riparian Forest, occurs within the Subsidence Study Area. Further assessment of the impact to this GDE within the Subsidence Study Area is discussed in **Section 4.15.1.2**.

5.5.7.3 Vegetation Mapped as GDEs

Submission Reference: SIG27

Issue

One submission noted that two additional vegetation communities should be included as GDEs assessed by the Project.

Response

An assessment of potential GDEs is discussed in **Section 4.15.1.2**. This assessment determined that two vegetation communities mapped as occurring within the Study Area are likely to be moderately dependent on groundwater. Both these communities predominantly occur within areas where depth to groundwater is 20 m or less.

Grey Myrtle Dry Rainforest (Unit 2) and Blakely's Red Gum/Paperbark Forest (Unit 5) occur in areas where depth to groundwater is 50 m or greater. Grey Myrtle Dry Rainforest (Unit 2) occurs in sheltered gullies and Blakely's Red Gum/Paperbark Forest (Unit 5) occurs in minor drainage lines. As these communities occur within areas that the canopy species are unlikely to access groundwater, the species composition is likely a result of other factors. For Grey Myrtle Dry Rainforest (Unit 2), it occurs at sheltered locations which give rise to shade-tolerant species. For Blakely's Red Gum/Paperbark Forest (Unit 5), the species composition may be the result of increased retention of water in the soil along minor drainage lines. Therefore, these two communities have not been assessed as GDEs.

5.5.7.4 Impact of Drawdown on GDEs

Submission Reference: SIG3, SIG11, SIG27

Issue

A few submissions noted that no assessment of the impacts of drawdown on GDEs has been undertaken.

Response

See response in **Section 4.15**.

5.5.7.5 Impact of Subsidence on GDEs

Submission Reference: SIG3, SIG11, SIG27

Issue

A few submissions noted that no assessment of the impacts of subsidence on GDEs has been undertaken.

Response

See response in **Section 4.15.6**.

5.5.7.6 Drawdown within Offset Areas

Submission Reference: SIG11

Issue

One submission notes that the predicted extent of alluvial drawdown extends into Offset Area 2 and Offset Area 3.

Response

Alluvial drawdown predictions from the uncertainty analyses have been undertaken to provide an indication of the probable impacts under various climatic conditions with varying hydraulic properties within the alluvium. Figure 42 to Figure 44 of **Appendix H** shows the maximum drawdown predicted by the model within layer 2 (alluvium) for the Project for various uncertainty model runs.

The mean predicted extent of drawdown occurs at the edge of Offset Area 1 and Offset Area 2. No area of Offset Area 3 occurs within the mean predicted extent of drawdown. The impacts of drawdown on GDE vegetation is addressed within **Section 4.15.2**.

5.5.7.7 Protection of GDEs

Submission Reference: P132

Issue

It is predicated that there will be a decline in water table at the River Oak and Blakely's Red Gum vegetation communities along the Bylong River, and at the River Oak Redgum Riparian and Blakely's Red Gum/Apple Riparian Forests along Bylong River and Lee Creek. Although these communities are not listed as 'high priority ecosystems' they are likely to have some reliance on groundwater and provide important ecosystem functions and while the level of groundwater dependence has not been determined we would argue that the precautionary principle should be applied and further efforts made to protect these trees. Tree preservation is critical for basic ecosystem functioning and trees play a vital function in soil and bank stabilization. It should also be noted that recent research has shown that riparian trees are groundwater dependent and can be affected by mining to an extent not previously appreciated, (pfautsch, 2015).

Response

Given that the watercourses within the Study Area are typically ephemeral, it is likely that communities considered as GDEs have a moderate but not a complete dependence, on groundwater. On the valley floor, where these communities are located, groundwater levels respond rapidly to rainfall indicating recharge readily infiltrates the upper sequence of the aquifer, with the other primary recharge source being infiltration of surface water through the beds of rivers and creeks (AGE, 2015). The predicted area of drawdown predominantly occurs outside of the mapped areas of GDEs in cultivated land and grassland.

Monitoring is proposed to assess the response of GDEs to changes in the groundwater system.

5.5.7.8 Assessment of Dams

Submission Reference: SIG27

Issue

There are 11 dams occurring in the study area according to the Subsidence Assessment. They are described as being of poor quality for wildlife to others supporting native vegetation. Their location and an accurate habitat assessment of each one has not been undertaken. Dams containing native vegetation could provide habitat and drinking sources for a wide range of locally occurring fauna.

Response

Section 4.1.1.i of the EIS Ecological Impact Assessment addressed the potential habitat for fauna within the agricultural dams within the Study Area, which noted the following:

“Agricultural dams are also present within the Study Area on the valley floor. Many of the dams observed feature little aquatic and semi-aquatic vegetation and are surrounded by cleared land. The agricultural dams within the Study Area do not generally support aquatic vegetation. However, these dams do provide some limited habitat for wetland dependent species, including birds and amphibians. Additionally, the water contained within dams provides a drinking source for terrestrial mammals, microbats, birds and reptiles, including native and non-native species.”

A substantial number of dams will remain within the Study Area and wider locality, including within the proposed offset areas, which will provide habitat and drinking sources for a suite of fauna species.

5.6 BIODIVERSITY OFFSET STRATEGY

5.6.1 Biodiversity Impacts and Adequacy of Offset Strategy

Submission Reference: SIG1, SIG2, SIG3, SIG6, SIG9, SIG11, SIG12, SIG13, SIG18, SIG19, SIG20, SIG22, SIG25, SIG26, O3, P6, P7, P10, P11, P12, P13, P21, P22, P23, P24, P30, P31, P32, P33, P35, P37, P38, P40, P43, P44, P45, P53, P57, P58, P62, P66, P70, P75, P80, P82, P83, P84, P85, P87, P88, P91, P97, P99, P100, P104, P108, P110, P114, P117, P119, P120, P124, P131, P132, P133, P135, P142, P149, P153, P163, P173, P177, P178, P186, P190, P192, P195, P199, P203, P204_2, P205, P211, P212, P222, P224, P229, P233, P234, P235, P236, P237, P238, P239, P40, P241, P242, P243, P244, P245, P246, P247, P248, P249, P250, P251, P252, P253, P254, P255, P256, P257, P258, P259, P260, P261, P262, P263, P264, P265, P266, P267, P268, P269, P270, P271, P272, P273, P274, P275, P276, P277, P278, P279, P280, P281, P282, P283, P284, P285, P286, P287, P288, P289, P290, P291, P292, P293, P294, P295, P296, P297, P298, P299, P300, P301, P302, P303, P304, P305, P306, P307, P308, P309, P310_1, P310_2, P311, P312, P313, P313_2, P314, P315

Issue

Some submissions raised a general objection to the use of offsets. It is noted that a number of these submissions were received as form submissions. Specifically, the submissions noted the following:

“Offsetting is government-sanctioned destruction and is, in any case, woefully inadequate.

It is impossible to “offset” “mitigate” critically endangered vegetation and the many threatened species which rely on it as habitat or relocate special soils which occur in limited area. The protection of the state’s biodiversity and the State government’s responsibilities under Commonwealth threatened species legislation must be taken seriously by the State government on behalf of all the people of NSW.”

“SIG26 maintains that offsets are rarely an appropriate response to destruction of threatened species habitat.”

Repeated general submissions were received from stakeholders concerned over the impact on biodiversity and questioning the adequacy and suitability of the Mitigation and Offset arrangements.

There were repeated submissions stating:

“The mine disturbance area has very high biodiversity values that will not be mitigated through the proposed offset arrangements. Nationally endangered species recorded in the area include the Brush-tailed Rock Wallaby, New Holland Mouse, Regent Honeyeater and Spotted-tailed Quoll. Three entirely new plant species were recorded. A significant area of critically endangered Grassy Box Gum Woodland will be destroyed along with habitat for 17 threatened birds and 7 threatened plants.”

Response

Offsetting is part of the impact assessment and mitigation process approved by the State and Commonwealth Governments. The hierarchy of measures includes avoidance, mitigation and offsetting, which has been followed by the Project. Offsetting is only approved by the State and Commonwealth Governments after avoidance and mitigation measures have been considered and implemented. In some cases not all developments that follow the hierarchy are approved as offsetting is not deemed to be adequate.

Offsetting can and does result in increases in the total areas of native vegetation and habitats that are been conserved. For ecological communities such as Box Gum Woodland and Derived Native Grassland, offsetting is suitable because the major areas where the community remains are farmlands that are not conserved. Offsetting offers the opportunity to salvage otherwise unconserved Box Gum Woodland and Derived Native Grassland, to restore it, and expand it as habitats for threatened species.

KEPCO has sought to provide sufficient information to the State and Commonwealth Governments to allow adequate assessment of the Project in accordance with relevant offset policies and guidelines. The determination of the Project by the State and Commonwealth Governments will take into account the consistency of the Project with such policies and guidelines.

5.6.2 Mechanism for Offsetting

Submission Reference: SIG27, P132

Issue

Despite identifying five offset areas which are owned partially by KEPCO (except that lying within Bylong State Forest) the Offset Strategy does not identify any mechanism by which offsets could be secured. Five possibilities are suggested, a BioBanking Agreement, a Conservation Agreement under the NPW Act, Conservation Covenants under Section 88 of the Conveyancing Act, and a proposed re-zoning. This is despite the fact that under the current Offset Policy for Major Projects, an in perpetuity BioBanking Agreement or a transfer to NPW estate, should be mandatory for any offset strategy in NSW. Surprisingly the latter is not discussed in the Offset Strategy.

The EIS proposes 6 Biodiversity Offsets (EIS 2015, page 148). However, there is no certainty that these offsets will be retained as offsets for the life of the project or at project completion. As outlined in the KEPCO EIS the current biodiversity offsets could be used for other purposes and are not enduring.

Response

The Project will be treated as a 'transitional project' under the NSW Offsets Policy and is therefore afforded a level of flexibility in meeting the requirements in this policy. KEPCO has undertaken further consultation with OEH and DP&E regarding the mechanism to secure the offset sites for the Project. It is proposed that Offset Area 1-4 and the Yarran View Offset Area will be secured through BioBanking Agreements. KEPCO has undertaken further consultation with OEH and DP&E regarding the inclusion of Offset Area 5 within the offset strategy for the Project. Due to the potential for subsidence-related impacts to approximately 70% of Offset Area 5, it has been suggested that during the transitional period for the NSW Offsets Policy and associated FBA, the land within Offset Area 5 could be managed under a conservation agreement (or similar mechanism) during the life of the Project. Following completion of the Project, it has been suggested that Offset Area 5 will be secured through a BioBanking Agreement (or other appropriate mechanism at the time). Further consultation with OEH and DP&E will be undertaken to determine the details of the conservation agreement.

Following discussions regarding potential offset sites for the Project, OEH provided written advice on 5 September 2014 to summarise the consultation undertaken with the Mudgee Area of the National Parks and Wildlife Service to determine whether any of the potential offset sites were suitable for addition to the National Park Estate.

OEH advised that the northern block of Offset Area 5 that adjoins Goulburn River National Park will be the only area suitable for inclusion in the National Parks Estate. No map was provided to indicate the location of this area and no details were provided regarding the reasons for its suitability for inclusion. The Project does not propose to include any of the offset sites within the National Parks Estate. Offset sites proposed for the Project will be secured and managed through alternative mechanisms.

5.6.3 Location of Offset Sites in Proximity to the Project Disturbance Boundary

Submission Reference: SIG1

Issue

In relation to offsetting, four of the six areas are entirely or partly within the Project Boundary and impacted by the mining operations including depressurisation.

Response

The offset sites were selected for inclusion within the offsets package based on a number of strategic values, including:

- Proximity to the Project Disturbance Boundary;
- Presence of like-for-like vegetation communities to those impacted, including Box Gum Woodland and Derived Native Grassland;
- Presence of known habitat for threatened flora and fauna species; and
- Potential to improve biodiversity values through appropriate management actions.

All are located outside the Project Disturbance Boundary; however some may be subject to indirect impacts, including depressurisation as described in **Section 4.11.3**.

5.6.4 Location of Offset Area 5 within the Subsidence Study Area

Submission Reference: SIG1, SIG3, SIG9, SIG11, SIG13, SIG27, P132

Issue

A number of submissions raised concerns regarding the inclusion of Offset Area 5 within the offsets package for the Project. This is due to a portion of the offset occurring within the Subsidence Study Area, which may potentially be impacted by subsidence-related impacts such as surface cracking, cliff fall and hydrological changes.

Response

This is discussed in **Section 4.11.3**.

5.6.5 Location of Offset Area 5 within a State Forest

Submission Reference: SIG9, SIG13, SIG27

Issue

A few submissions noted concern regarding the location of Offset Area 5 within a State Forest. Specifically the submissions note the following:

The largest offset, Area 5, is in an operating State Forest overlying the underground mine subsidence area.

The proposed Area 5 offset is highly unacceptable because the majority of the area, i.e. 1,064 ha, is impacted by mine subsidence and is a State Forest.

The offset lies on a public forest used for exploitation of resources – creating an offset over a state forest is a new precedent and raises questions of appropriate tenures and whether this is consistent with Offsetting rules in NSW.

Response

No portion of Offset Area 5 is located within State Forest. All of the lands within the offset sites are privately owned by KEPCO.

5.6.6 Application of Discount to Offset Area 5

Submission Reference: SIG3, SIG8, SIG13

Issue

A few submissions queried whether the 10% discount to the portion of Offset Area 5 occurring within the Subsidence Study Area had been applied, particularly in relation to ecosystem and species credits.

Response

Table E.1 of the EIS Biodiversity Offset Strategy details the extent of vegetation within Offset Area 5, including the portions outside and within the Subsidence Study Area.

Offset Area 5 is 1,512 ha in size of which 1,497 ha comprises native vegetation communities. Of the area comprising native vegetation communities, 435 ha occurs outside the Subsidence Study Area and 1,062 ha occurs within the Subsidence Study Area. When a 10% discount is applied to the portion occurring within the Subsidence Study Area (thus reducing 1,062 ha to 956 ha), the total area of native vegetation assessed as occurring within Offset Area 5 is 1,391 ha.

Both Table 5.5 and Table 5.7 of the EIS Biodiversity Offset Strategy demonstrate that the total value of Offset Area 5 (including the 10% discount) has been assessed as 1,391 ha when considering offset ratios and ecosystem credits, respectively.

The same discounting of total land area was also applied to species credits calculated for Offset Area 5, namely the Regent Honeyeater, Eastern Bentwing-bat and Large-eared Pied Bat. For example, the total area of habitat for the Regent Honeyeater within Offset Area 5 is approximately 838 ha (equivalent to 5,947 species credits); however when the 10% discount is applied to the portion occurring within the Subsidence Study Area the total assessed value is approximately 773 ha (equivalent to 5,486 species credits).

Following amendments of the vegetation mapping within the offset sites in consultation with OEH, the total area of native vegetation communities within Offset Area 5 has remained unchanged.

Table 24 provides the current areas of vegetation within Offset Area 5 and the revised calculation based on a 10% reduction in value for the portion within the Subsidence Study Area. These amended values have been applied to both ecosystem credits and species credits.

Table 24
Discounted Value of Offset Area 5

Vegetation Community	Area Outside Subsidence Study Area (ha) [A]	Area Within Subsidence Study Area (ha) [B]	Total Area of Offset Area 5 (ha) [A+B]	Total Value of Offset Area 5 with Discount (ha) [A+(B*0.9)]
4: Blakely's Red Gum / Apple Riparian Forest	2	12	13	12
5: Blakely's Red Gum / Paperbark Forest		1	1	1
6: Yellow Box Woodland	20	97	117	107
7a: White Box Woodland (Grassy)	53	361	414	378
7b: White Box Woodland (Shrubby)	66	18	84	82
8b: Blakely's Red Gum Woodland (Shrubby)		3	3	3
9: Slaty Box Woodland	110	99	209	199
10: Coastal Grey Box Woodland	7	0	7	7
13: Shrubby Regrowth		1	1	1
14: Dwyer's Red Gum Low Open Forest	1		1	1
15: Caley's Ironbark Forest	6	51	57	52
15&16: Caley's Ironbark Forest & Blue-leaf Ironbark / Cypress Forest	26	76	103	95
18: Bloodwood / Ironbark Forest	13	17	29	28
21: Exposed Grey Gum / Stringybark Forest	6	5	11	11
22: Sheltered Grey Gum / Stringybark Forest				

Vegetation Community	Area Outside Subsidence Study Area (ha) [A]	Area Within Subsidence Study Area (ha) [B]	Total Area of Offset Area 5 (ha) [A+B]	Total Value of Offset Area 5 with Discount (ha) [A+(B*0.9)]
DNG – 3: River Oak / Redgum Riparian Woodland Derived Native Grassland	0	1	2	2
DNG – 4: Blakely's Redgum / Apple Riparian Forest Derived Native Grassland				
DNG – 6: Yellow Box Woodland Derived Native Grassland	14	4	18	18
Cleared (DNG_Yellow Box Woodland)	33	76	109	101
Cleared (DNG_White Box Woodland)	48	124	171	159
DNG – 7: White Box Woodland Derived Native Grassland	73	229	302	279
DNG – 8: Blakely's Red Gum Woodland Derived Native Grassland	0	<1	<1	<1
DNG – 9: Slaty Box Woodland Derived Native Grassland	8	13	22	20
DNG – 10: Coastal Grey Box Woodland Derived Native Grassland	12		12	12
TOTAL	435	1,062	1,497	1,391

5.6.7 Inclusion of Offset Areas within the National Parks Estate

Submission Reference: SIG1, P132

Issue

KEPCO claim that OEH have written to them confirming that, “the northern block of Offset Area 5 will potentially be suitable for inclusion within the National Park Estate” (Main Report 166). If this is the case, then it should not be mined, and the proponent should immediately give it to the National Parks and Wildlife Service for inclusion in the Park.

There is an opportunity to make Yarran View Offset and Offset Area 1 enduring because they share boundaries with the Wollemi National Park, and could be incorporated into the park.

Response

Following discussions regarding potential offset sites for the Project, OEH provided written advice on 5 September 2014 to summarise the results of their consultation undertaken with the Mudgee Area of the National Parks and Wildlife Service to determine whether any of the potential offset sites were suitable for addition to the National Park Estate.

OEH advised that the northern block of Offset Area 5 that adjoins Goulburn River National Park will be the only area potentially suitable for inclusion in the National Parks Estate. No map was provided to indicate the location of this area and no details were provided regarding the reasons for its suitability for inclusion.

KEPCO does not propose to have to include any its offset sites within the National Parks Estate. Offsets proposed for the Project will be secured and managed through alternative mechanisms as described in **Section 5.6.2**.

5.6.8 Area of Box Gum Woodland and Derived Native Grassland within the Offsets

Submission Reference: SIG11

Issue

One submission queried the use of extensive areas of derived native grassland within the offset sites. Specifically the submission noted the following:

“According to Table 40, it appears that 617ha of the 715ha critically endangered box woodland that is present in the five offset areas is derived native grassland. Though this is important remnant vegetation, it does not support the habitat features of mature woodland.

Offset Area 4 supports only 33ha of woodland, less than 10% of its area, being mostly derived native grassland. Native grasslands are of course important to preserve and can provide regeneration opportunities, but this cannot replace mature woodlands with extensive hollow bearing trees for many decades.”

Response

Table 40 of the EIS shows the total extent of vegetation and cleared areas within the offset sites (excluding reduction of area for the portion of Offset Area 5 occurring within the Subsidence Study Area). The offset sites comprise 1,587 ha of Box Gum Woodland and Derived Native Grassland, including 715 ha of woodland form and 872 ha of grassland form. When taking into account the discount to Offset Area 5, this is reduced to a total of 1,509 ha of Box Gum Woodland and Derived Native Grassland, including 669 ha of woodland form and 840 ha of grassland form. Thus the extent of the woodland form of the community is much greater than reported in the submission.

Despite woodland comprising a small proportion of Offset Area 4, the land has been selected for inclusion within the offset strategy due to a number of strategic values. In addition to the presence of both woodland and grassland forms of Box Gum Woodland and Derived Native Grassland (both of which are impacted by the Project), this includes the potential for portions of the land to be improved to provide additional connectivity across previously cleared land.

The current and future value of the offset site is taken into account by using the BioBanking Assessment Methodology (BBAM) in accordance with the rules of the FBA. BBAM takes into account the current condition of the vegetation and habitat in conjunction with potential for increases in those values through required management actions.

5.6.9 Area of Grey Box Woodland and Fuzzy Box Woodland within the Offset Sites

Submission Reference: SIG11

Issue

One submission raised concern regarding the provision of offsets for Grey Box Woodland and Fuzzy Box Woodland. Specifically the submission notes the following:

“...And yet, because this community is not listed under the State or Commonwealth Acts, and because the current practice of assessing, mitigating and offsetting biodiversity impacts concentrates almost exclusively on listed species and communities, five hectares of this community will be cleared, with no proposal to avoid the impact, mitigate or offset it.”

“Thirty-one hectares of Coastal Grey Box woodland is proposed to be cleared. But the offset sites proposed for this project do not support significant areas of these woodlands. Offset Area 5 (which will be undermined) supports 7ha of Coastal Grey Box woodland and there are 8ha in the other areas combined. Offset area 3 supports less than 1ha of Fuzzy Box woodland.”

Response

Cumberland Ecology advises that Grey Box Woodland has been assessed as being associated with the PCT of HU690. A number of locally-defined vegetation communities occurring within the offset sites are also associated with HU690. As outlined within the BOS (see **Appendix K**), the proposed offsets provide an excess of HU690 credits. These credits are provided in the form of Grey Box Woodland and White Box Woodland (Grassy) and their associated derived native grasslands.

Fuzzy Box Woodland has been assessed as being associated with the PCT of HU547. Within the BOS prepared for the Project (see **Appendix K**), it is proposed to utilise an excess of HU690 credits to address the shortfall of 143 HU547 credits. Although this variation is not in line with the rules of the FBA, as the Project will be treated as a ‘transitional project’ a level of flexibility to the variation to offset rules is being sought.

The alternative PCT (HU690) is the same formation (Grassy Woodlands) and same class (Western Slopes Grassy Woodland) as the required PCT (HU547). Despite the alternative PCT (HU690) having a slightly lower (by 5%) percent cleared value in the major catchment than the required PCT (HU547), it is associated with Box Gum Woodland and Derived Native Grassland, which is a TSC Act listed EEC and an EPBC Act listed CEEC.

Some of the alternative PCTs allowed under the rules of the FBA is also associated with Box Gum Woodland and Derived Native Grassland. Additionally, as outlined within Section 3.4.2 of the EIS Ecological Impact Assessment, the community is related to the Western Hunter Flats Fuzzy Box Woodland community mapped by OEH within the north-western portion of Wollemi National Park, which is considered to have affinities with the Box Gum Woodland and Derived Native Grassland EEC/CEEC.

As such, the use of HU690 is considered an appropriate alternative of provision of land-based offsets to address the shortfall of credits for HU547.

5.6.10 Portions of Land Contributing to Offset Sites

Submission Reference: P132

Issue

It is not clear from the EIS what area of land at Yarran View will actually be used to contribute to biodiversity offsets because an unspecified area will be used for continued agricultural use.

Response

All native vegetation within the offset sites will be managed for biodiversity. The remaining portions of Yarran View will be managed for agriculture (cultivated lands) or retained as cleared (dams, roads etc.) i.e. 22 ha.

The utilisation of the cultivated lands at Yarran View will take into consideration the requirement for managing adjoining native vegetation for biodiversity.

5.6.11 Additionality of Offset Sites

Submission Reference: SIG14, P43

Issue

Two submissions note concern regarding the additionality of the offset sites given the existing land uses. Specifically the submissions note the following:

"We are concerned that limited application of the 'principle of additionality' is being used to justify offset areas that would otherwise remain intact."

"The biodiversity offset strategy outlined in the EIS will deliver no net benefits for fauna or flora protection because the areas set aside to be protected are extremely unlikely to be ever subject to development anyway."

Response

This is discussed in **Section 4.2.17**.

The NSW Offsets Policy requires offsets to be additional to other legal requirements. The EPBC Offsets Policy requires offsets to be additional to what is already required, determined by law or planning regulations, or agreed to under other schemes or programs. As noted within Section 8.3.2 and Section 8.3.3 of the EIS Ecological Impact Assessment and Section 5.5.2 and Section 5.5.3 of the EIS Biodiversity Offsets Strategy, the offsets sites are proposed exclusively for the Project are not already funded or being managed for biodiversity value. The management actions proposed within the offset sites are in addition to other legal requirements for conservation of the land.

5.6.12 Shortfall of Grassland within Offset Sites

Submission Reference: SIG3, SIG13

Issue

Two submissions noted that there is a shortfall in the provision of the grassland component of Box Gum Woodland and Derived Native Grassland.

Response

A revised assessment of the Project has been undertaken in accordance with the NSW Offsets Policy and associated FBA and BBAM. The policy requires offsets to be like-for-like in terms of the PCTs that are being impacted. Both woodland and grassland forms of Box Gum Woodland and Derived Native Grassland comprise the same PCT, therefore there is no requirement to differentiate between the woodland and grassland components when determining adequacy of the offset strategy.

BBAM takes into account the current condition of the vegetation and habitat in conjunction with potential for increases in those values through required management actions.

The BOS demonstrates that the Project will provide sufficient credits for the PCTs assigned to Box Gum Woodland and Derived Native Grassland.

5.6.13 Supplementary Measures

Submission Reference: SIG27

Issue

No supplementary measures have been proposed as it is that the direct offsetting is sufficient to retire all credits generated by the project.

Response

The BAR prepared for the Project is provided in **Appendix J** and quantifies the impacts to native vegetation and threatened species. The impacts to the biodiversity values within the Project Disturbance Boundary are proposed to be offset in accordance with the BOS prepared for the Project (see **Appendix K**). No supplementary measures are currently proposed for the Project.

5.6.14 Adequacy of Offset Strategy

Submission Reference: SIG1, SIG3, SIG6, SIG8, SIG9, SIG11, SIG12, SIG13, SIG14, SIG17, SIG25, SIG27

Issue

Numerous submissions raised concern regarding the adequacy of the offset strategy in mitigating the impacts of the Project. Some submissions suggested the BOS is not consistent with offset policies and the SEARs.

Response

A revised assessment of the Project has been undertaken in accordance with the NSW Offsets Policy and associated FBA. See response in **Section 4.11** and **Appendix J**.

The results of the revised assessment indicate that the proposed biodiversity offsets for the Project will generate a surplus of ecosystem credits for all except one of the PCTs impacted within the Project Disturbance Boundary. A shortfall of 143 credits exists for HU547, which is proposed to be offset with additional HU690 credits. The biodiversity offsets will also generate a surplus of species credits for all except one of the species credit species impacted within the Project Disturbance Boundary. A shortfall of 81 credits exists for the Regent Honeyeater, of which an outcome is proposed to be negotiated with OEH. The offset sites also generate ecosystem credits and species credits for a number of PCTs and species not assessed as impacted within the Project Disturbance Boundary.

5.6.15 Biophysical Strategic Agricultural Land within Offset Sites

Submission Reference: SIG16

Issue

It is clear that the project represents an unacceptable and large impact on the state's BSAL asset base as a result of direct impact of the mining project. In addition, the proponent proposes to tie up large areas of BSAL via their offsets strategy with 486.25Ha of verified BSAL to be managed in the future to primarily deliver biodiversity conservation outcomes. It is acknowledged that 109.44Ha of that BSAL is currently cultivated. The proponent has stated that these lands will continue to be managed as agricultural activity; however the main objective and requirement of an offset is to deliver biodiversity outcomes.

It is disingenuous to state that some BSAL areas will be used agricultural when it is well know that this cannot be primary purpose of that offset land. NSW Farmers would prefer that productive agricultural land, including BSAL, not be locked up as an offset for mining and energy companies.

Response

See response in **Section 4.4.5**.

KEPCO has developed a proposed Biodiversity Offset Strategy with the aim of appropriately compensating the unavoidable predicted impacts of the Project on biodiversity values within the region. According to the government requirements, KEPCO aims for the proposed BOS to maintain and improve biodiversity values within the region.

The main focus of the BOS was around the conservation of State and Federal listed White Box, Yellow Box, Blakely's Red Gum Woodland and Derived Native Grassland (Box Gum Woodland). This community typically occurs on the better quality soils which have historically been exploited for agricultural activities which has resulted in widespread clearing of this community across eastern areas of Australia, the primary reason for the State and Federal listing of this community.

The land that is proposed to be included in the BOS has been selected based on the presence of threatened ecological communities and woodlands (such as Box Gum Woodlands and Derived Native Grasslands) that provide habitat to threatened species. Land containing these communities also contains areas which have historically been utilised for extensive agricultural activities such as cultivation.

As explained in Section 7.16.5 of the EIS, approximately 486 ha of BSAL is located within the BOS. Those areas of land within the BOS which have previously been cultivated provide limited ecological conservation value and as such will continue to be utilised for agriculture. Approximately 109 ha of BSAL within the BOS which has historically been utilised for cultivation will continue to be utilised for agriculture. A further 245 ha of BSAL is located within the BOS and comprises vegetation conforming to Box Gum Woodland and Derived Native Grassland.

This BSAL will be utilised as part of the BOS for conservation purposes. Actively regenerating and preserving these areas relevant to native woodland and grassland is considered a priority land use for preservation of native biodiversity within the region. The BOS will not significantly reduce the agricultural productivity of BSAL, but rather modify the potential land use within some areas of native vegetation.

KEPCO has discussed this strategy with DP&E and received support for the previously cleared/cultivated land to be maintained for agriculture whilst areas containing native vegetation attributes being conserved as part of the BOS.

5.7 SURFACE WATER

5.7.1 Water Modelling

5.7.1.1 Water Balance

Issue

SIG 8 submission identified:

"A number of conflicting and confusing statements in regard to water management and mine rehabilitation that need to be addressed. The proposal is assessed to have no voids in the final landform. The proposal is assessed to have no requirement to discharge mine water throughout the life of the mine under all historical climatic scenarios modelled. However, under extreme weather events, it is predicted that up to 3,560 ML may have to be stored in the open cut pits with a proposal to pump the water back down the underground mine on its completion.

This is a high risk and untested proposal. It conflicts with the orderly backfilling of the open cut and could interfere with mining operations. It is highly likely under these circumstances that mine water will need to be discharged into surrounding water sources, as is the case with the Ulan, Moolarben and Wilpinjong mines.

SIG8 considers that the discussion in regard to the water balance for the proposal has too many unresolved issues, conflicts and contradictions. There is likely to be a much greater cumulative impact on water sources and the landscape than predicted."

Response

This is discussed in **Section 4.8.11**.

5.7.1.2 Historic Data

Issue

Submissions: SIG14

SIG14 has questioned whether water modelling has considered historical data whereby water extraction in the Bylong Valley has not been allowed over the last 10 years due to drought conditions. They have requested that the water assessments be independently checked by the NSW Office of Water.

Response

This is discussed in **Section 4.8.11**.

5.7.2 Loss of Flow in Dry Creek

Issue

Submission reference: SIG1, P132

Several submissions were received from stakeholders regarding the potential loss of flow in Dry Creek.

Response

A calculation of likely total loss of flow from Dry Creek is provided in Section 9.5.2 of the SWIA. Dry Creek has no flow for most of the time. Hence, there is no loss of flow during dry periods. Loss of flow cannot be estimated by multiplying the maximum daily flow loss by the duration of the Project because there is no flow and hence no loss of flow for the vast majority of that time.

5.7.3 Harvestable rights

Issue

Submission reference: SIG11

A submission was received from SIG11 with concerns over the harvestable rights for the Project.

Response

The adopted method of calculating harvestable rights is described in Section 9.2.2 of the SWIA. As discussed in Section 9.2.3 of the SWIA, water captured in the site water management structures, with the exception of rainfall runoff from undisturbed natural catchments, is not subject to licensing requirements. Most of the runoff inputs noted in the site water balance drain to dams solely for the capture, containment and recirculation drainage and/or effluent (e.g. mine affected water) consistent with best management practice to prevent the contamination of a water source. Such dams are “excluded works” which are not subject to licensing requirements under the WM Act.

The proposed Raw Water Dam has a capacity (300 ML), greater than the estimated total runoff volume from the undisturbed catchment draining to the dam (149 ML). Even though the dam is larger than the harvestable rights volume (266 ML), it cannot capture more than 100% of runoff. Hence, the available harvestable rights volume exceeds the runoff capture volume.

5.7.4 Property Access in Periods of High Rainfall

Submission reference: P218

Issue

This submission is concerned the proposed new route (Realignment of Upper Bylong Road) across the floodplain, if not properly constructed, will see us flooded in during periods of high rainfall. This is unacceptable and needs to be addressed.

Response

A new road referred to as the North Link Road is proposed to provide alternate access for landholders located to the south of the Project, as discussed in **Section 4.2.9.6**.

Flooding issues associated with MIA and the North Link Road is discussed in **Section 4.15.5**, with additional flood modelling provided in **Appendix M**.

The existing Upper Bylong Road currently has low flood immunity and is inundated to a depth of more than 1 m during a 2 year ARI flood event. To minimise flood impacts, the realignment of Upper Bylong Road will also be constructed to a low level of flood immunity. Alternate access during times of flooding (in an emergency) can potentially be provided via an escort through the mine site to Upper Bylong Road, North Link Road or Lee Creek Road. However, these roads are also subject to flooding constraints during relatively small events which may restrict access to Bylong Valley Way during flood events.

5.7.5 Upper Bylong Road and the Floodplain

Issue

Submission reference: P218

P218 raised concern over the potential interference of the realignment of the Upper Bylong road with the functioning of the Tarwyn Park/Iron Tank floodplain

Response

The Project will impact flood flows along the Bylong River for a short distance upstream of the proposed conveyor crossing. There will be no change in flood behaviour or flood levels on adjoining upstream properties.

5.7.6 Impact on the Goulburn River and the Hunter River

Submission reference: SIG9

Issue

SIG9 submission questioned the impacts on the Goulburn River and the Hunter River, commenting that the Impacts on water quality and the Hunter River Salinity Trading Scheme have not been considered.

Response

The mean annual flow volume in the Goulburn River at Coggan (Station No. 210006) is 67,182 ML/yr. The predicted peak losses of 295 ML/yr represents 0.4% of the mean annual flow volume at the Goulburn River, which is insignificant.

The mean annual flow volume in the Hunter River at Denman (Station No. 210055) is 251,113 ML/yr. The predicted peak losses of 295 ML/yr represents 0.1% of the mean annual flow volume at the Hunter River, which is insignificant.

The impacts of the Project on water quality are addressed in Section 9.3 and 10.3.2 of the SWIA. The proposed Mine Water management system has been developed to minimise or mitigate the impact of the Project on the downstream water quality. The water management system includes a system to collect and reuse water that may contain high TDS (salt) concentrations or other contaminants. The Project is not proposing to discharge any contaminated water off site to receiving watercourses.

Further, the Hunter River Salinity Trading Scheme does not apply to the upper Goulburn River where the Project is located. Impacts of any discharges from existing operations in the upper Goulburn River catchment are regulated through Environmental Protection Licences for each operation.

5.7.7 Cumulative Impacts

Submission reference: SIG8, SIG11

Issue

A number of submissions were received regarding potential cumulative impacts of the Project on surface water resources.

Response

An assessment of cumulative impacts on surface water resources is provided in Section 10.3 of the SWIA.

The maximum mine captured catchment area is 15.7 km², which is 0.5% of the Goulburn River catchment downstream of the confluence with Bylong River (3,340 km²). The loss of surface runoff resulting from a reduction in catchment area of 0.5% will be undetectable.

With respect to water quality, the results of water balance modelling show that no releases will occur from mine water dams containing water affected by contact with coal. Some overflows from sediment dams may occur during events that exceed the relevant design standard, which will ensure that water quality impacts to receiving waters are minimal. Further discussion on potential overflows and releases from sediment dams are provided in **Section 4.8.12** of the RTS. The impacts on the HRST scheme is discussed in **Section 5.7.6** above. The Regional Water study is also discussed in **Section 5.2.4**.

5.7.8 Water Quality

Submission Reference: O3, P118, P132

Issue

A number of submissions raised concerns relating to background water quality and the potential impacts of the Project on water quality.

Submissions suggested that additional background data was required to characterise background water quality and that iron, manganese and zinc were above ANZECC trigger values.

Further, collection of surface water quality data at high and low flows to support characterisation of baseline water quality in Dry Creek and Lee Creek is needed.

A submission commented: "It should be noted that the assumption about the 'insignificant' extent of increased salinity is based on modelling conducted by the consultants engaged for the EIS. However, it is well documented that saline loads in water sources adjacent to other mines have exceeded the model predictions, (Colagiuri 2012)."

Response

It is understood that the reference to a study by Colagiuri (2012) in one of the submissions (P132) relates to the following report:

Colagiuri R, Cochrane J, Girgis S. *Health and Social Harms of Coal Mining in Local Communities: Spotlight on the Hunter Region*. Beyond Zero Emissions, Melbourne, October 2012.

(Available at: http://media.bze.org.au/coal_health_Report_FINAL.pdf)

The above report is a review of general health information and statistics from various countries around the world. The report does not analyse any water quality data or compare it to model predictions. The report does not once mention salt or salinity and hence does not support the claims made in the submission.

Additional sampling is discussed in **Section 4.8.13**.

5.7.9 Water Monitoring

Submission Reference: P51

Issue

P51 has requested water monitoring be undertaken, if approved, to monitor the greater impacts on water sources located further east of the project.

Response

A Water Management Plan will be prepared in consultation with the relevant agencies prior to the commencement of operations, which will include the Water Monitoring Program. The Program will be expanded to include samples from key storages within the water management system, such as sediment dams and the primary mine water storages, as well as monitoring of upstream and downstream water quality to assist in demonstrating that the site water management system is effective in meeting its objective of minimal impact on receiving water quality and also to allow for early detection of any impacts such that appropriate corrective actions can be taken.

The Water Management Plan and the locations for additional monitoring sites (if required) will be developed in consultation with DPI Water.

5.7.10 Water Recycling Strategies

Submission Reference: O7

Issue

O7 requested water recycling strategies be devised to reduce the impact of the proposed operations on the quantity and quality of water resources in the Bylong Valley.

Response

As outlined in Section 7.4.1 of the EIS, the Water Management System has been designed to maximise and prioritise the reuse of mine water over extracting water from external fresh water sources. This includes:

- Sediment dams to collect and treat runoff from the OEAs;
- Dirty water drains to divert sediment-laden runoff from the OEAs to sediment dams; and
- A mine-affected water system to store water pumped out of the open cut and underground mining areas and to collect runoff from the CHPP and coal stockpile areas.

5.7.11 Mitigation Measures

Submission Reference: O7

Issue

A submission commented that the EIS did not include steps that would be taken to mitigate any loss of water entitlements or adverse impacts to water quality for neighbouring landholders, in the event that this occurred, including immediate, short-term and long-term rectification and remediation strategies, economic and non-economic compensation and future guarantees.

This was further asserted to "uncontrolled offsite spills from mine water storages or controlled discharges throughout the life of the project" and that "only a small proportion of existing catchments will be taken throughout the life of the open cut mining operations".

O7 requested that the Project not be further considered unless and until, expert peer reviewed evidence is provided in support of the proposal for the mitigation measures. Further, that audited costings and projected financing of each proposal be provided, as well as expert peer reviewed evidence as to the enforceability of each proposal submitted in response to this submission.

Response

This is discussed in **Section 4.3.1** and further in **Appendix H**.

5.8 WATER LICENCES

5.8.1 Over Allocation of Water Licences

Submission Reference: SIG1, SIG2, SIG3, SIG8, SIG9, SIG11, SIG12, SIG13, SIG14, SIG20, SIG22, SIG25, O6, O7, P6, P7, P10, P11, P12, P21, P31, P33, P35, P37, P40, P43, P44, P45, P48_2, P53, P55, P57, P62, P67_1, P70, P75, P84, P87, P88, P89, P91, P97, P104, P108, P117, P119, P120, P124, P128, P131, P132, P133, P135, P142, P145, P149, P151, P153, P159, P166, P171, P173, P177, P178, P184, P186, P190, P192, P200, P203, P204_2, P205, P211, P212, P217, P224, P227, P71_2, P230, P232, P233, P234, P235, P236, P237, P238, P239, P240, P241, P242, P243, P244, P245, P246, P247, P248, P249, P250, P251, P252, P253, P254, P255, P256, P257, P258, P259, P260, P261, P262, P263, P264, P267_2, P265, P266, P267, P268, P269, P270, P271, P272, P273, P274, P275, P276, P277, P278, P279, P280, P281, P282, P283, P284, P285, P286, P287, P288, P289, P290, P291, P292, P293, P294, P295, P296, P297, P298, P299, P300, P301, P302, P304, P305, P306, P307, P308, P309, P310_1, P311, P113_2, P312, P313, P314, P315, P310_2, P316, P317, P318

Issue

There are a number of submissions that believe there is a significant over allocation of water licenses in the system. Further that this would severely restrict water availability for the agricultural industry in the Bylong Valley and for the environment. There was particular concern when drought conditions prevail. It is noted that a number of these submissions were received as form submissions.

Response

The *Aquifer Interference Policy* (AIP) requires proponents to hold water licences to account for all water taken from groundwater and surface water sources as a result of the Project.

As outlined in Section 7.4.3 of the EIS, under median climatic conditions, the water balance modelling has indicated that the Project will require up to 1,000 ML/Year of fresh water from the borefield water supply to supplement water demands for the CHPP and mining activities during the year of highest water demands (nominally PY 3).

KEPCO has secured 2,535 units of water allocation from the Bylong River Water Source under the Hunter Unregulated WSP. These existing WALs will more than satisfy this extreme worst case requirement for external water supplies for all years of operation, even in the driest climatic sequence experienced over the past 125 years.

Hence, KEPCO holds entitlements to account for its groundwater take (both direct and indirect) from the Bylong River Water Source even if the available water determination (AWD) reduces to less than 80%.

KEPCO has lodged an appropriate water licence application under the Water Act for its predicted water takes from the Permian units (groundwater) due to the underground and open cut operations. Groundwater in the Permian units is not considered a usable water source for the agricultural industry generally due to its poor water quality.

By complying with licence restrictions on water consumption, the Project will not create unexpected impacts on water availability to other users as the licences will be regulated under appropriate water sharing plans.

5.8.2 Water Licences

Submission Reference: SIG11

Issue

SIG11 had a number of queries regarding water licences and associated calculations.

Clarification is sought on whether a surface water licence is required, in the Bylong Water Source, to account for the reduction in baseflow anticipated to be caused by the Mine.

SIG11 stated:

"The model shows water demand peaking in Year 9, at 2,049ML. This is 35% of the total water entitlement for the Bylong Water Source. The model run presented is for median inflows, and in that scenario, the proponent will need to use groundwater from the borefield in all phases, with demand exceeding available water in three of the five years presented in the EIS. KEPCO claims that its existing Water Access Licences (WALs) will provide it with 2,535ML per annum of water, and that therefore their demands will be met, but do not discuss the possibility that water allocations will be reduced, and mining production therefore ceased if and when local water is not available. The company states that it holds entitlements sufficient to take groundwater even if the available water determination reduces to less than 80% (Main Report 212). The Gateway Panel specifically requested the proponent provide a strategy for complying with the implication of reduced available water determinations and the cease to pump rule (due in 2019). KEPCO claims to have done this in section 12.1 of Appendix M but this is not evident. DPI Water recommended contingency options be identified "given sufficient access to alluvial groundwater may not be available to meet the indicated mine water requirements." Again KEPCO claims to have provided this information in section 10.10 of Appendix M, but again, this is not evident. We have grave concerns that the water demand of this project is not sustainable in the Bylong Valley and that the borefield pumping of the alluvial aquifer will severely impact other water users."

“KEPCO claims to hold WALs with an allocation of 2,535ML and that more are likely to be secured. It is not clear how Table 13 of the Main Report has calculated the total volume required from the Bylong Water Source, since the total average predicted take (491ML) and the total maximum annual take (1,149ML) are not the sum of the volumes listed above them. The sum of the maximum predicted annual take from each of the listed parts of the Bylong Water Source appears to be 1,846ML.”

“In addition to using the Bylong Water Source in the Hunter Unregulated and Alluvial Water Sharing Plan, the company will need a licence for up to 2,093ML per annum of water from the Permian aquifer, which is part of the Northern Fractured and Porous Rock Groundwater Sources for which a Water Sharing Plan is currently in development (Main Report 205). We are disappointed that a draft of this plan has not yet been made available for public exhibition and that an embargo has not been declared for the source while the plan is in development to stop further licences from being issued in what is already, we understand, a fully or over-allocated water source. We seek assurance from DPI Water that KEPCO will not be issued with licences under the Water Act 1912 for this water source and that the company will be instructed to wait until the Water Sharing Plan for Northern Fractured and Porous Rock Groundwater Sources is finalised before seeking licences for it.”

“Finally, KEPCO are claiming a total of 355MLpa under their harvestable right, based on a total landholding of 5,425ha. They subtract the average capacity of their existing 63 dams from this, to claim a harvestable right of 266MLpa (Main Report 185). In Table 45, the raw water dam is listed as having a capacity of 300ML, which will be fed by rainfall run off. This exceeds the 266ML harvestable right being claimed, and in the model run for the water balance, rainfall run off inputs in years 5, 7, 9 and 11 are 737ML, 961ML, 563ML and 729ML. But elsewhere KEPCO claims that the maximum runoff capture is 149ML (Main Report 193). This needs clarification.”

“We have not been able to find a map in the EIS that accurately depicts this impact. We were provided with a map by Bylong landholders that showed the contour lines of draw down in the alluvium, which is what we’re basing these comments on. It is shocking and unacceptable that this map was not included in the EIS, though admittedly, EIS’s are so labyrinthine it is possible that it is buried somewhere we could not find it. For example, “The proponent has purchased a large landholding surrounding the Project and this means there are no private bores predicted to be impacted by mining.” (Appendix M 152). There are myriad similar claims made.”

Response

Water licensing is discussed in **Section 4.3.7** and further in **Section 5.8.2**. Loss of baseflow is discussed in **Section 5.9.11**. The water supply from the borefield is discussed in **Section 5.9.13**.

5.8.3 Mine Dewatering

Submission Reference: O6, O8

Issue

A number of submissions are concerned about the likelihood of a 2 metre drawdown in the regulated Bylong Water Source and KEPCO's intention to seek a licence under the Water Act 1912 for underground mine dewatering. Submission O8 is opposed to the quantum of the proposed extraction and the risk to surface aquifers inherent in doing so.

Response

This is discussed in **Section 4.3**.

5.9 GROUNDWATER

5.9.1 Impacts Groundwater Prior to Mining

5.9.1.1 Impacts of Exploration Activities Groundwater Levels

Submission Reference: P15_3

Issue

One landholder noted a 6 feet reduction in groundwater level within their well, used for domestic purposes and raised the potential for exploration drilling to have caused the decline in water levels within the well.

Response

Prior to all exploration activities, the potential environmental effects are reviewed and submitted to the NSW Government for approval.

Permanent declines in groundwater levels due to exploration is not considered a significant risk as only very limited volumes of water are removed from the groundwater systems during the drilling process.

Appendix H provides a detailed review of the available groundwater monitoring data collected by KEPCO since 2011. This review concluded that there has been a gradual decline in groundwater levels within the Bylong River valley of typically between 1.5 m and 3.0 m due to below average rainfall from 2012 onwards.

A decline of 6 feet is equivalent to 1.8 m and therefore within the range of natural decline that has been observed elsewhere throughout the Bylong River valley. Increased abstraction for agricultural purposes due to the dry conditions may also have contributed to the observed decline. Accordingly, it is unlikely that the decline at the landholder bore is attributable to exploration activities.

5.9.1.2 Impacts of Baseline Conditions on Predictions

Submission Reference: P132

Issue

One submission considered the alluvial groundwater systems within the region have been declining over the last 25 years and this decline, which was not represented within the groundwater model would result in the drawdown extending further than predicted by the numerical model developed for the EIS.

Response

The EIS Groundwater Impact Assessment considered historical measurements of groundwater levels which are available within the public domain (Refer Section 7.3 and Figure 7-7 of Appendix M of the EIS). The NSW Government database has water level measurements for a network of monitoring bores dating back to 1980, with more frequent measurements from the late 1990s to the late 2000s.

The Groundwater Impact Assessment completed for the Gateway Certificate Application in 2013 commented that the “...groundwater levels are relatively stable, with only a handful of bores following the CRD curve (e.g. GW027030 and GW047611). However, the monitoring frequency has not been sufficient to detect subtle water level fluctuations due to recharge events. Several alluvial bores have recorded falling groundwater levels of up to 7 m between the period 1999 and 2006 (e.g. GW053322, GW053266, and GW027030). The falling trends are likely to be associated with groundwater pumping or below average rainfall over this period.”

The groundwater modelling calibrated groundwater levels to all available measurements, but particularly the most recent groundwater level measurements collected by KEPCO between 2011 and 2015. Any historical declines in groundwater levels were therefore accounted for within the model, which did not report water levels rising back to higher levels.

5.9.1.3 Characterisation of Groundwater Regime

Submission Reference: P223

Issue

A single submission contended that the stratigraphic profile and 'interburden geology' above the longwall panels had not been characterised or adequately assessed, particularly the Triassic sandstones and Tertiary basalt hydrogeological units and groundwater inflow to the alluvial system, and contributions to stream baseflows in the valley floor.

Response

During the baseline monitoring period, KEPCO has installed a monitoring bore and VWP network across the Project Boundary which includes monitoring of the upper sandstones and Tertiary basalt.

It is correct however that the investigative work has focused on the stratigraphic units that are to be directly impacted by mining including the coal seams and the alluvial aquifers. The numerical model represents the shallow Triassic sandstones and Tertiary basalt hydrogeological units, and therefore represents the process of recharge and groundwater flowing from these units to the alluvial groundwater systems.

Additional work which has recently been completed provides additional information on further monitoring which will be installed to supplement the water monitoring network, including the overlying Tertiary and Triassic stratum. These details will be explained within the Water Management Plan for the Project.

5.9.2 Impacts upon Tarwyn Park Groundwater

Submission Reference: P67_1, P99, P153, SIG3

Issue

Several submissions indicated concern that declining groundwater levels at the Tarwyn Park property would impact the agricultural productivity of this property.

Response

Whilst the Tarwyn Park property has been acquired by KEPCO, it is proposed to continue to be utilised for agricultural purposes. To this end, KEPCO has appointed a qualified Farm Manager and sustainable agricultural practices are being put developed in consultation with a regional agronomist and the relevant regulatory authorities.

There is potential that pumping wells will be installed on the Tarwyn Park property to supply any shortfall of water to the Project. This will reduce the groundwater water levels at the property, whilst the abstraction is occurring. Abstraction will however remain within the limits set by the water licenses and annual announced allocations.

5.9.3 Impacts upon Murrumbo Station Groundwater

Submission Reference: O5

Issue

A submission indicated concern that the Project may impact upon the supply of water from agricultural bores located on Murrumbo Station property to the east of the Project. The submission also commented that the census of private bores had not included Murrumbo Station, and that the owners had not been consulted during the approvals process.

Response

KEPCO has had a number of consultations with the owners and managers of the Murrumbo Station property throughout the preparation of the EIS. Since the receipt of this submission, members of the Project team have met with personnel representing the Murrumbo Station property on two occasions specifically in relation to the findings within the EIS.

In light of comments from Murrumbo Station personnel, KEPCO's groundwater monitoring consultants visited the Murrumbo Station property on 11 January 2016 and collected baseline information for two groundwater bores currently in use on the property. This included water level measurements, water quality, indicative bore flows (artesian conditions) and usage.

Representatives of the Project team then met with the owners of Murrumbo Station on 16 February 2016 to further discuss the results of the Groundwater Impact Assessment, present the information gathered during the baseline monitoring and to further discuss and explain the potential for impacts to Murrumbo Station. It was explained that the zone of depressurisation (predicted by the modelling) did not extend to the Murrumbo Station bores for all scenarios modelled (including the uncertainty analyses completed).

However, given the relative proximity of this property to the Project, KEPCO has committed to including the Murrumbo Station bores within the baseline monitoring program going forward. The baseline monitoring at two bores will include recording of water levels with data loggers and water quality on a routine basis. Additionally a flow meter will be installed at one of these bores. This addition to the groundwater monitoring regime will be outlined within the Water Management Plan to be developed for the Project.

5.9.4 Impacts upon Locaway Pty Ltd Groundwater

Submission Reference: O6

Issue

A submission outlined the agricultural activities which are undertaken by Locaway Pty Ltd on the Cherrydale Park property and indicated concern regarding access to groundwater may potentially be affected by the proposed mining operations.

It also suggested that the EIS had not demonstrated that mining could continue to operate in periods of low water availability, and that granting of new water licenses under the Water Act 1912 would be the only way to secure sufficient water for the Project.

Response

The Groundwater Impact Assessment (Appendix M of the EIS) estimated the extent of drawdown surrounding the mining areas using a numerical model. The Groundwater Impact Assessment also described the sensitivity modelling undertaken to assess the effects of changes in the model parameters.

None of the modelling scenarios undertaken for the Groundwater Impact Assessment indicated drawdown (as indicated by the 1 m drawdown contour) extending to the registered bores located on the Cherrydale Park property.

The query regarding the ability of the Project borefield to yield sufficient water to supplement water supplies for the mine water management system during dry periods and the impact of this abstraction to neighbouring landholders is a common concern within the submissions received on the EIS.

Section 4.3.5 and Appendix H presents additional modelling analysis undertaken to further investigate the ability of the alluvial aquifer to sustainably abstract groundwater for 'make up water' for the Project.

The uncertainty analysis approach was utilised to estimate the probability of the borefield being able to supply the 'make up water' demand under the extreme 99th percentile dry scenarios. The analysis indicated the yield from the borefield will depend on climate conditions during mining operations and the hydraulic properties of the aquifer and that the average yield from the borefield is generally similar to the makeup water demands, except for periods towards the end of an enduring drought. During these periods, the probability that the borefield can supply the predicted 99th percentile 'make up' water demands reduces, as water levels within the aquifer fall. During these conditions, there may be a need to expand the borefield outside the Project Boundary or source makeup water from an alternative source.

KEPCO will prepare and implement a WMP for the Project. The WMP will detail a program to monitor water yields and availability from the borefield, particularly if there are extended periods of drought. The WMP will detail trigger levels to monitor against and if reached, the Project will implement a contingency plan to ensure the supply of water to the Project. The contingency plan may include the expansion of the borefield (subject to approval), temporarily reducing KEPCO's agricultural activities (and temporarily transferring associated water entitlements to the Project) and in a worst case scenario, progressively adjusting mining-related activities (such as coal processing) to match the available water supplies.

5.9.5 Impacts upon Budden Property Groundwater

Submission Reference: O7

Issue

A submission indicated concern about uncertainties associated with groundwater modelling, the potential for impacts beyond that predicted within the EIS and measures to 'make good' any unforeseen impacts upon the supply of groundwater from bores located on Budden Property.

Response

The Budden Property is located within the Growee River catchment, west of the Growee Range. Representatives of the Project team met with landholders located within this catchment, including the owners of the Budden Property on 28 October 2015 to discuss the Project impacts, particularly the predicted impacts on the groundwater regime. During this meeting, it was acknowledged that whilst the property is not located within the catchment where mining is proposed, the owners were concerned about impacts travelling downstream through the Bylong River alluvial groundwater system and then back upstream through the Growee River alluvium.

The presence of the Growee Range between the Project and the Budden property has a significant influence on the impacts predicted by the numerical model for the Project. Historical weathering of the coal seam in the vicinity of the alignment of the Bylong River and the Growee River has removed sections the primary coal seams proposed for mining. This indicates that there is no direct connectivity for water to travel through the coal seam between the proposed mining areas and the properties west of the Growee Range.

The drawdown within the Permian and Triassic units therefore did not extend to these areas to the west. The Groundwater Impact Assessment (Appendix M of the EIS) also did not predict the zone of drawdown within the alluvium to extend from the Project and move significantly up through the Growee River alluvium. Hence the predicted impacts do not extend to the Budden Property for all scenarios modelled.

It is important to note that since the proposed mining operations are not located within this catchment, the Growee River alluvium will continue to receive groundwater recharge from rainfall, river bed leakage, upstream flow through the alluvium and flow from the underlying bedrock. This is the overall reason for significant impacts not being predicted for the Budden Property and other properties within this part of the catchment.

Despite the modelling outcomes, and given the proximity to the Project, KEPCO has committed to installing groundwater loggers within the bores located on the Budden Property to gather baseline monitoring data. The additional monitoring on the Budden Property will be outlined within the Water Management Plan to be developed for the Project.

5.9.6 Buffer Zone Between Open Cut Mining and Alluvial Systems

Submission Reference: P67_1, P99

Issue

One submission commented that blasting to develop the open cut mine may fracture the buffer zone proposed to remain between the open cut pit and the alluvial aquifer.

A second submission recommended a buffer zone of 50 meters wide either side of the bank of water courses should be maintained for water and ecological purposes.

Response

The mine has been designed to remain at least 150 m from the edge of the alluvial aquifer and 200 m from the high bank of water courses to comply with the AIP. The buffer zone will therefore be well in excess of the 50 m recommended within the submission. The buffer zone provided by the NSW Government guidelines will be more than substantial to manage the potential fracturing of adjacent rock as a result of blasting activities.

5.9.7 Interception of Groundwater Recharge

Submission Reference: SIG1, SIG2, SIG3, SIG6, SIG8, SIG9, SIG11, SIG12, SIG13, SIG18, SIG20, SIG22, P6, P7, P10, P11, P12, P13, P21, P22, P23, P24, P30, P31, P32, P33, P35, P37, P38, P40, P43, P44, P45, P53, P57, P58, P62, P66, P70, P75, P80, P81, P82, P83, P84, P85, P87, P88, P91, P96, P97, P100, P104, P108, P110, P114, P117, P119, P120, P124, P131, P132, P133, P135, P142, P149, P151, P153, P163, P173, P177, P178, P186, P190, P192, P195, P196, P199, P203, P204_2, P205, P211, P212, P216, P224, P230, P233, P234, P235, P236, P237, P238, P239, P240, P241, P242, P243, P244, P245, P246, P247, P248, P249, P250, P251, P252, P253, P254, P255, P256, P257, P258, P259, P260, P261, P262, P263, P264, P265, P266, P267, P268, P269, P270, P271, P272, P273, P274, P275, P276, P277, P278, P279, P280, P281, P282, P283, P284, P285, P286, P287, P288, P289, P290, P291, P292, P293, P294, P295, P296, P297, P298, P299, P300, P301, P302, P303, P304, P305, P306, P307, P308, P309, P310_1, P310_2, P311, P312, P313, P313_2, P314, P315

Issue

A number of submissions commented that the mine will use up to 75% of annual rainfall recharge and that will be lost to farmers and others users in the Bylong River Catchment. It is noted that a number of these submissions were received as form submissions.

Response

Section 10.5 of the Groundwater Impact Assessment (Appendix M of the EIS) estimated the impact of groundwater takes for the Project on groundwater levels surrounding the mining areas. The modelling indicated the potential to impact on a single property ('Tinka Tong'), as it is situated in close proximity to the proposed borefield and mining areas for the Project. Other properties were identified to be too far upstream, downstream or separate part of the catchment for mining activities to significantly impact these properties. The additional modelling recently undertaken and described within **Appendix H** has reconfirmed this outcome.

5.9.8 Conceptual Model of Groundwater Regime

Submission Reference: P132

Issue

A single submission commented that the Lee Creek and Growee River aquifers are interconnected, but this was not sufficiently represented within the numerical model.

Response

The numerical model within the Groundwater Impact Assessment (Appendix M of the EIS) included two layers that represented the alluvial sediments deposited within the flood plain areas, including Lee Creek and Growee River. These sediments were represented as interconnected at the confluences of the Lee Creek/Bylong River and then Bylong River/Growee River. Section 8.2 of the Groundwater Impact Assessment (Appendix M of the EIS) outlines the setup of the numerical model.

5.9.9 Numerical Modelling Assumptions

Submission Reference: SIG27

Issue

A submission suggested the ratio of hydraulic conductivity to specific storage values, referred to as the diffusivity was inappropriate for some of the model layers. They considered diffusivity values should be 2 to 3 orders of magnitude higher in selected layers within the model in order to be consistent with known bulk modulus values of the geology.

Response

To further investigate this comment, the specific storage for each layer in the model was plotted against Young's Modulus, which was estimated from the Bulk Modulus and Poisson's Ratio. **Appendix H** demonstrated the relationship between specific storage and Young's Modulus from the numerical model, and values for alluvium, interburden or coal identified in the literature. It shows not all values are outside the ranges suggested by literature, however Coggan coal seam was slightly above the upper extreme and the colluvium lower than the literature range.

The EIS recognised the uncertainty in geological properties and assessed the sensitivity of the model predictions to changes in the hydraulic conductivity and specific storage values. The specific storage of the alluvium, weathered material and tertiary basalt was adjusted by ± 5 times, with the all other layers changed by ± 1 order of magnitude over the base case. Whilst an order of magnitude reduction in the Coggan coal seam specific storage was assessed during the EIS, the results were influenced by reductions applied to other layers at the same time.

Appendix H presents further sensitivity analysis to determine the influence of reducing the specific storage in the Coggan coal seam, and increasing the specific storage in the colluvium.

The results show a drawdown that is within the range presented by the sensitivity analyses, and indicates the EIS considered the range of impacts from parameter variability.

5.9.10 Uncertainty in Numerical Modelling Predictions

Submission Reference: P81, P132, P223, P231, P318

Issue

Several submissions expressed concern that the predicted impacts from numerical models were uncertain and not sufficient to determine the true impacts of the Project on groundwater systems.

Response

It is recognised that hydrogeology, is a relatively uncertain science, and that when assessing the impacts of mining, it is important to acknowledge and quantify this uncertainty as much as possible for the decision making process.

There are two processes the Groundwater Impact Assessment (Appendix M of the EIS) used to manage uncertainty. Firstly, when there was the need to adopt modelling parameters, which were not fully quantified, the approach was to ensure the parameter utilised was conservative in that it would result in a greater impact, not a lesser impact. Secondly, a detailed sensitivity analysis was undertaken to examine how the predictions from the numerical models changes as the input assumptions to the models are varied. As described within Appendix F of the Groundwater Impact Assessment (Appendix M of the EIS), the uncertainty in the model predictions was assessed using a traditional sensitivity analysis where model inputs were changed individually to assess the impact upon the predictions. A more complex Monte Carlo style uncertainty analysis was also undertaken where numerous model inputs were changed at the same time.

Further uncertainty analysis has been completed within **Appendix H** to assess the sustainable yield from the alluvial borefield. It is considered the range of potential outcomes have been sufficiently quantified within the Groundwater Impact Assessment. Further the various management and mitigation measures committed to by KEPCO address the inherent uncertainty in numerical modelling predictions.

Field investigations and associated data can assist in reducing the uncertainty in predictions from numerical models. At the time of writing, KEPCO were preparing to mobilise a drilling crew to install four test pumping bores within the Bylong River alluvium, in an effort to gain further data of the hydraulic properties of the alluvium and further reduce the modelling uncertainty.

5.9.11 Loss of Baseflow

Submission references SIG11, SIG 27

Issue

Some of the stakeholder submissions raised concerns about the nature of the connectivity between the surface water features in the Project Boundary and the water table. These concerns were primarily focussed on the potential for increased groundwater abstraction to lead to a declining water table that could affect flows in the creeks and rivers. Comments on the methodology for accounting for baseflow loss with water licenses were also provided.

Response

Section 4.2.3 of **Appendix H** outlines the observed connectivity of groundwater with surface water. The assessment concludes that during extended periods of below average rainfall, the streams form a chain of ponds along the drainage alignment. These chain of ponds are thought to form windows to the water table, however there is no continuous connected baseflow at the surface. The analysis indicated that during these dry periods, groundwater does continue to flow underground through the alluvium along the alignment of the water courses.

Section 5.9.10 above describes adjustments made to the model to represent the periods where the alluvial water table falls below the bed of the streams and the additional modelling completed to assess the impacts of the Project under this scenario.

As discussed in Section 10.8 of the Groundwater Impact Assessment (Appendix M of the EIS), the numerical model pumping from the borefield induced steep hydraulic gradients between the wells and the Bylong River. This effect resulted in water from the Bylong River and Lee Creek feeding into the bore field through the alluvium in the model. This water cannot be accounted for from both the alluvial aquifer and the Bylong River or Lee Creek as this would be 'double accounting' of water abstraction from the Bylong River Water Source, as noted in the EIS.

Additional modelling which has been undertaken and described in **Appendix H** considered the impact of an even more extreme 'make up' water demand from the borefield, than that presented within the EIS. This additional modelling has also considered in further detail the effects of natural variability in recharge and the hydraulic properties of the alluvium. These additional modelling scenarios did not represent any leakage from the Bylong River into the alluvial aquifer, and therefore there is no potential for double accounting under these scenarios.

5.9.12 Cease to Pump Limits

Submission References SIG11 and SIG18

Issue

One submission states the Gateway Panel specifically requested the proponent provide a strategy for complying with the implication of reduced available water determinations and the cease to pump rule (due in 2019). The submission states that KEPCO has failed to provide this information.

Another stakeholder commented that the proposed activities, particularly the borefield may influence both the triggers established at the DPI Water reference sites that are installed as part of developing 'cease to pump' triggers

Response

As discussed in Section 7 of **Appendix H**, the Hunter Unregulated WSP, Bylong River Water Source commenced on 1 August 2009. It requires a groundwater trigger for the 'cease to pump' rule to be determined by year ten for the Bylong River Water Source, which commences on 1 August 2018. Subject to Development Consent being granted, the Project is expected to commence open cut mining in Year 3, which will not be before 1 August 2018. Therefore, the Project will not influence the development of the cease to pump rule trigger.

5.9.13 Security of 'Make up Water' Supply from Borefield

Submission Reference: P43, P67_1, P77, P96, P99, P132, SIG8

Issue

Several submissions expressed concern that the reliance on the borefield for 'makeup water' could be unsustainable during droughts, and there appeared to be no contingency if the borefield failed to supply the required volumes to operate the mine. One submission also commented that the predictions of the borefield sustainability should have been independently reviewed.

Response

The SWIA for the Project (Appendix L of the EIS) took a conservative approach to assessing the water demands for the Project by modelling the wide range of climatic conditions over the last 125 years of record. The water balance modelling considered the 99th percentile demand from the borefield during extreme dry climatic conditions. This analysis indicated that under these conditions, there was a potential deficit in water supplies for mining that will be required to be abstracted via a borefield within the alluvial aquifer.

During the preparation of this RTS, WRM has completed even more extreme analysis assuming the groundwater inflows to the underground mine as predicted within the Groundwater Impact Assessment are reduced by half. This is a highly unlikely outcome, when for example Ulan Mine operating in a similar geological setting has an excess of groundwater sourced from the underground mine. The groundwater modelling for the Project also indicated there will be a reliable seepage of groundwater into the underground workings.

Appendix H presents additional analysis undertaken to further investigate the ability of the alluvial aquifer to sustainably abstract groundwater for 'make up water' for the Project. An uncertainty analysis approach was utilised to estimate the probability of the borefield being able to supply the 'make up water' demand under the extreme 99th percentile dry scenarios. The analysis indicated the yield from the borefield will depend on climate conditions during mining operations and the hydraulic properties of the aquifer which were varied with the expected ranges as part of the uncertainty analysis.

The analysis indicated the average yield from the borefield is generally similar to the makeup water demands, except for periods towards the end of an enduring drought. During these periods, the probability that the borefield can supply the predicted 99th percentile 'make up' water demands reduces, as water levels within the aquifer fall.

During these extreme drought conditions, there may be a need to implement contingency plans to ensure the supply of water for the Project, such as expand the borefield outside the Project Boundary. KEPCO will prepare and implement a WMP for the Project. The WMP will detail a program to monitor water yields and availability from the borefield, particularly if there are extended periods of drought. The WMP will detail trigger levels to monitor against and if reached, the Project will implement a contingency plan to ensure the supply of water to the Project. The contingency plan may include the expansion of the borefield (subject to approval), temporarily reducing KEPCO's agricultural activities (and temporarily transferring associated water entitlements to the Project) and in a worst case scenario, progressively adjusting mining-related activities (such as coal processing) to match the available water supplies. Again, it should be highlighted that this outcome is based on the extremes in both the groundwater and surface water models.

As discussed in Appendix F Section 1.1.3 of the GIA (Appendix M of the EIS), low recharge rates to groundwater systems are not necessarily correlated with lesser runoff to surface water storages. A review of rainfall records highlighted that the fact that the groundwater recharge rate is not directly correlated to the monthly rainfall total, but is influenced by the antecedent moisture in the soil profile and the intensity/frequency of rainfall events. For example three days of 20 mm rainfall per day will generate more recharge than one day of 60 mm because more deep drainage can occur as sufficient time elapses to allow the soil profile to 'wet up'. However, the 60 mm rainfall event will allow more runoff to fill mine water storages than the three days of 20 mm. The intensity and frequency of rainfall events will influence the sites water storage and volume of required make-up water, rather than simply the monthly total rainfall.

The EIS investigated historical climatic data which showed that some periods where rainfall was trending below average had low demands for make-up water, because the rainfall events were of sufficient intensity and duration to generate runoff to the mine water circuit and reduce demand. This indicates that whilst periods of drought will certainly reduce the Project's ability to harvest water, peak demands in make-up water are not necessarily associated with periods of low groundwater recharge.

However planning for the possibility that the make-up water cannot be pumped from the borefield is necessary and will be documented within the Water Management Plan.

5.9.14 Availability of Water Entitlements

Submission Reference: SIG1, SIG2, SIG6, SIG8, SIG9, SIG11, SIG12, SIG13, SIG18, SIG20, SIG22, P6, P7, P10, P11, P12, P13, P21, P22, P23, P24, P30, P31, P32, P33, P35, P37, P38, P40, P43, P44, P45, P53, P57, P58, P62, P66, P70, P75, P80, P81, P82, P83, P84, P85, P87, P88, P91, P96, P97, P100, P104, P108, P110, P114, P117, P119, P120, P124, P131, P132, P133, P135, P142, P149, P151, P153, P163, P173, P177, P178, P186, P190, P192, P195, P196, P199, P203, P204_2, P205, P211, P212, P216, P224, P230, P233, P234, P235, P236, P237, P238, P239, P240, P241, P242, P243, P244, P245, P246, P247, P248, P249, P250, P251, P252, P253, P254, P255, P256, P257, P258, P259, P260, P261, P262, P263, P264, P265, P266, P267, P268, P269, P270, P271, P272, P273, P274, P275, P276, P277, P278, P279, P280, P281, P282, P283, P284, P285, P286, P287, P288, P289, P290, P291, P292, P293, P294, P295, P296, P297, P298, P299, P300, P301, P302, P303, P304, P305, P306, P307, P308, P309, P310_1, P310_2, P311, P312, P313, P313_2, P314, P315

Issue

Numerous submissions considered the entitlements to extract water from the Bylong alluvial aquifer to be over allocated and exceed the sustainable yield of the aquifer system. It is noted that a number of these submissions were received as form submissions.

In addition, a number of submissions raised the potential for the entitlements to be reduced to account for the potential future reduction in recharge due to climate change.

The following statement was repeated in a number of submissions:

"Impacts on groundwater and surface water will be significant. The highly connected alluvial aquifer system within the stressed Bylong River catchment will have predicted peak losses of up to 295 million litres per year (ML/yr.). Loss of base flows to the Bylong River is predicted to be 918 ML/yr. The mine proposes to use up to 1,942 ML/yr. which is over 75% of the annual rainfall recharge. The river system is over allocated and local farmers will lose important water supply".

Response

KEPCO has purchased various landholdings within the Bylong River valley that have contained associated water licenses. The most recent allocation announcements for the Hunter catchment have allowed license holders to extract 100% of their license entitlement. KEPCO will operate within the constraints of their license entitlements and any annual reductions in allocations, including any future changes to account for climate change.

KEPCO will prepare and implement a WMP for the Project. The WMP will detail a program to monitor water yields and availability from the borefield, particularly if there are extended periods of drought. The WMP will detail trigger levels to monitor against and if reached, the Project will implement a contingency plan to ensure the supply of water to the Project. The contingency plan may include the expansion of the borefield (subject to approval), temporarily reducing KEPCO's agricultural activities (and temporarily transferring associated water entitlements to the Project) and in a worst case scenario, progressively adjusting mining-related activities (such as coal processing) to match the available water supplies.

5.9.15 Security of Water Supply for Agriculture

Submission Reference: SIG1, SIG2, SIG6, SIG9, SIG12, SIG13, SIG18, SIG20, SIG22, P6, P7, P10, P11, P12, P13, P21, P22, P23, P24, P30, P31, P32, P33, P35, P37, P38, P40, P44, P45, P51, P53, P57, P58, P62, P66, P67_1, P70, P75, P77, P80, P82, P83, P84, P85, P87, P88, P91, P96, P97, P99, P100, P104, P108, P110, P114, P117, P119, P120, P124, P131, P132, P133, P135, P142, P149, P153, P163, P173, P177, P178, P186, P190, P192, P195, P199, P201, P203, P205, P211, P212, P223, P224, P226, P230, P233, P234, P235, P236, P237, P238, P239, P40, P241, P242, P243, P244, P245, P246, P247, P248, P249, P250, P251, P252, P253, P254, P255, P256, P257, P258, P259, P260, P261, P262, P263, P264, P265, P266, P267, P268, P269, P270, P271, P272, P273, P274, P275, P276, P277, P278, P279, P280, P281, P282, P283, P284, P285, P286, P287, P288, P289, P290, P291, P292, P293, P294, P295, P296, P297, P298, P299, P300, P301, P302, P303, P304, P305, P306, P307, P308, P309, P310_1, P310_2, P311, P312, P313, P313_2, P314, P315

Issue

Multiple submissions expressed concerns that agricultural production within the Bylong Valley will be impacted by reduced availability of groundwater. It is noted that a number of these submissions were received as form submissions.

Another submission raised concerns about the downstream water supply impacts to a property located near Denman, approximately 13 km downstream of the Project Boundary.

Response

Section 10.6 of the GIA (Appendix M of the EIS) considered the impact of the Project on water levels at neighbouring non-mine owned private bores.

Additional modelling (described in **Appendix H**) which has been undertaken in response to various submissions indicated that there is potential for the Project to impact on the water supply bores at the Tinka Tong property. This property is located within close proximity to the proposed 'make up water;' borefield.

The impacts of the Project on groundwater levels reduce with distance from the mining area, and no other bores are considered likely to be impacted by thresholds specified with the AIP. It is important for concerned landholders to recognise that whilst the mine will intercept and utilise groundwater within the mining area, outside this area, the process of rainfall recharge and stream recharge to the aquifers will be unaffected by the mining activities and therefore the ability to be replenished will not be removed by the proposed mining activities.

The catchment area that contributes to flow increases with distance downstream from the Project, whilst the proportion of the catchment influenced by the Project reduces. This is why the most significant impacts occur in relatively close proximity to the Project, and the impacts reduce with distance further downstream within the catchment. When considering the impacts of the Project on the Goulburn River baseflow, it is important to note that the extent of drawdown relative to the river and the size of the catchment that feeds the Goulburn River upstream.

The catchment of the Goulburn River, upstream of the Bylong River confluence extends approximately 60 km north to the Liverpool Ranges, and approximately 40 km west and covers approximately 3,340 km². The catchment to the north contains the Liverpool Range basalts that are expected to supply significant baseflow to the Goulburn River which will not be affected by the Project. As explained in Section 7.6.3 of the EIS, the Wilpinjong, Moolarben and the Ulan mines are also located within this catchment, but at sufficient distance to preclude any cumulative impacts on groundwater. The Coggan stream gauge (No. 210006) which is located at the confluence of Coggan Creek and the Bylong River has flow records since 1912. The gauge has a recorded mean monthly flow of 6,140 ML (~200 ML/day), which indicates the Goulburn River is a significant water course, and it is important for downstream users to consider this scale.

5.9.16 Security of Water Supply for the Environment

Submission Reference: O3, P132, P223, P230

Issue

A submission indicated concern for native vegetation that depends on groundwater will be impacted by the Project.

Response

Section 12.2.3 of the GIA considers the impact of the Project to water availability to the environment. The Ecology Impact Assessment (Appendix J of the EIS) identified the presence of vegetation potentially depending on shallow groundwater tables.

Groundwater modelling for the Project indicated that drawdown at these potential GDEs will generally be less than 2 m with greater drawdown predicted to areas adjacent to the Eastern Open Cut and in the lower reaches of Dry Creek adjacent to the underground mining area.

The impacts on GDEs are further discussed in **Section 4.15.2**.

5.9.17 Impacts of Groundwater Abstraction on Aquifer Properties

Submission Reference: P43

Issue

One submission considered that the potential of groundwater abstraction from the alluvium to reduce the porosity and permeability of the alluvial sediments, and consequential impacts for long term flow and storage of groundwater should have been assessed.

Response

In theory, abstraction of groundwater from soft compressible sediments could result in consolidation reducing the permeability and porosity of the sediments. Within the Bylong River catchment, there is a long history of abstraction of groundwater from the alluvial aquifers and this issue has not emerged as significant by landholders abstracting water.

KEPCO will not abstract more water than the current volumes allocated by licensing. This abstraction is approved by the NSW Government which has not identified this issue when allocating water licenses.

5.9.18 Hydraulic Conductivity of Fractured Zone

Submission Reference: P231

Issue

One submission considered the hydraulic conductivity used to represent the fractured zone within the numerical model was too low compared to values published by Tammetta (2015).

Response

There have been a number of efforts by hydrogeologists to determine the impact of underground mine subsidence on the hydraulic conductivity of overlying strata, and the height of the fracturing. Ultimately as noted previously, hydrogeology is a relatively uncertain science, and that when assessing the impacts of mining it is important to acknowledge and quantify this uncertainty as much as possible for the decision making process.

Whilst the exact hydraulic conductivity of the strata overlying the fractured zone is not known with certainty, despite efforts of various investigators, the values adopted within the numerical model do result in the complete drainage of the strata overlying the active longwall mining area due to the values assumed to represent the fractured zone. Figure 10.15 of the Groundwater Impact Assessment (Appendix M of the EIS) shows the maximum drawdown exceeds 100 m within the underground extraction area.

Figure 10.18 of the Groundwater Impact Assessment (Appendix M of the EIS) shows the groundwater being completely drawn down in the active Underground Extraction Area. The Groundwater Impact Assessment (Appendix M of the EIS) recognised the uncertainty in the hydraulic properties of the fractured zone and assessed the sensitivity of the impacts to these parameters by running the model with an order of magnitude increase and decrease in the adopted values.

Appendix F of the Groundwater Impact Assessment that described the sensitivity analysis undertaken concluded that *“reducing the vertical hydraulic conductivity of the fractured zone reduced predicted seepage rates to approximately 50% of the base case model. Interestingly, mining seepage recorded at the last time step of each period using a higher vertical conductivity in the fracture zone was similar to the base case. The weighted average of inflow from all time steps would show greater disparity.”* Figure F25 of Appendix F of the Groundwater Impact Assessment illustrated that the sensitivity analysis also has very limited impact upon the extent of the zone of drawdown predicted by the model.

5.9.19 Monitoring Program

Submission Reference: P43, P51

Issue

One submission queries, if approved will there be any monitoring of the aquifers in the Bylong River and Lee Creek valleys.

Response

As explained in Section 2.8 of the EIS, an environmental monitoring program has been implemented in preparation for the Project, including an extensive groundwater monitoring network. This network has enabled collection of data from the hydrological regime prior to mining that will serve as an important baseline, allowing the effects of climate cycles and mining to the hydrological regime to be differentiated.

Section 13 of the Groundwater Impact Assessment (Appendix M of the EIS) further described the proposed groundwater monitoring program during and post-mining.

Appendix H also discusses further refinements to the groundwater monitoring network. The groundwater monitoring network will be outlined within the Water Management Plan to be developed for the Project. In summary, the groundwater monitoring network will be expanded during mining operations to ensure that sufficient information is available to identify the predicted impacts of mining.

5.9.20 Impacts on Groundwater Systems Post-Mining

5.9.20.1 Impacts of Final Landform

Submission Reference: P43, P67_1, P132, P223

Issue

Several submissions expressed concern about the final landform and the potential for salinity impacts. One submission expressed concern that the landform remaining at the completion of open cut mining would form an evaporative lake that would become saline over time and permanently drawdown groundwater levels around it, and that the impacts of this process had not been sufficiently quantified. Other submissions were concerned about the leaching of salts to the environment through movement of groundwater.

Response

As explained in Section 3.3.1 of the EIS, the open cut mine plan has been specifically designed to ensure that the final landform will not contain a void post-mining. Section 10.11 of the Groundwater Impact Assessment (Appendix M of the EIS) discusses the potential impacts of the final landform on the groundwater regime after mining is complete. It is proposed that the open cut mining areas will be backfilled above the water table, ensuring a water table lake will not form within the mining areas. This will prevent the accumulation of salts as there will be no surface water body in existence following mine rehabilitation. Backfilling of the mining areas will allow groundwater recharge to enter the former mining area from the surface. As the pit will be excavated below the water table, groundwater will move very slowly through the mining area when groundwater levels return to a new equilibrium post-mining. Section 10.11.13 of the Groundwater Impact Assessment (Appendix M of the EIS13) identified the potential for a slow leaching of salt from the reject materials from the backfilled mining area into the alluvial groundwater system, and Bylong River. The Groundwater Impact Assessment concluded *"...the water from the backfilled pits is a small portion of the water within the alluvium, and that flow through the alluvium is significantly greater than in the weathered Permian. The diluting effect when the leachate from the overburden and reject materials enters the alluvium is expected to be significant and it is therefore improbable that environmental values, the river condition or beneficial use of the water in the alluvium or the pools would change due to the Project."*

Despite the above conclusions, the Water Management Plan developed for the Project will outline measures to monitor water quality within and around the open cut mining areas during and post-mining.

5.9.20.2 Mine Water Disposal

Submission Reference: P43, P77, P118

Issue

Several submissions commented that the volume of water proposed to be pumped from the open cut mine at closure into the underground mine was not reported within the EIS, and sustainable reinjection rates were not investigated with field work. It was also noted there was no approval for the reinjection of water into the underground mine at closure, and it has the potential to degrade groundwater and connected environmental systems.

Response

Pumping of water stored within the open cut mine to the waste workings of the underground mine at closure will be necessary to enable the rejects material to be capped and the landform rehabilitated. Section 10.2.10 of the Groundwater Impact Assessment (Appendix M of the EIS) discusses the reinjection of excess water back into the underground mine at closure.

The assessment noted that the volume of water to be reinjected was approximately 2,500 ML, which is conservatively based on the very wet condition scenario (i.e. there is a 1% chance of up to 2,500 ML of surplus water to remain within the Eastern Open Cut at the end of the Project life (PY 25)) within the Surface Water Impact Assessment. It is probable that the surplus water within the Eastern Open Cut at the end of the mine life will be far less than this.

Simple calculations of the potential storage volume which would be present within the mined longwall panels demonstrated that this water would be capable of being disposed underground. The volume of water storage within the underground mine was estimated by calculating (area x coal height x volume remaining after goafing). It is estimated that the volume water storage is some 31,000 ML, ($17,182,877\text{m}^2 \times 5\text{ m} \times 36\% \times 0.001$) within the underground mine. Therefore, there is more than sufficient volume for reinjection of the excess water underground.

The submission also expressed concern about the quality of this water and potential impacts on surrounding groundwater systems. Whilst the groundwater system is recovering about the depressurised underground mining area groundwater flow will be into the underground mine workings until equilibrium conditions are reached. There is then potential for the stored water to move back into the groundwater systems, preferentially through the more permeable pathways which will be the coal seams and the strata fractured by subsidence. The impact of this movement of water will depend on the initial quality, mixing with surrounding groundwater that floods the underground mine during the recovery period, groundwater fluxes and any discharge zones.

The water stored within the open cut mining areas will likely be a mixture of surface water collected at the site and groundwater pumped from the underground mining areas. This means it is expected that this water will have a similar or better quality to insitu groundwater from the Permian strata ranging from fresh to brackish, with an EC from 930 $\mu\text{S}/\text{cm}$ to 3,900 $\mu\text{S}/\text{cm}$ (Section 7.5 that the Groundwater Impact Assessment). This being the case, the impact of reinjecting this remaining water will be expected to be inconsequential to the quality of surrounding groundwater.

5.10 AIR QUALITY

5.10.1 Impacts on Locaway Pty Ltd

Submission Reference: O6

The submission submitted by Nexus Law Group, on behalf of Locaway Pty Ltd (Locaway), contains several issues related to air quality. Locaway is the registered proprietor of the single enterprise known as Cherrydale Park, a commercial agricultural operation. Per Paragraph 4 of the submission, it is understood that the sensitive receptors that constitute the Locaway property are identified as residential dwellings 56, 57A, 57B and 57C in the EIS. It is these sensitive receptors that the responses refer to. Each of the relevant aspects raised are provided below (in italics) with the response following.

Issue

Although the EIS does not make any statement in relation to the position of Locaway or the Property, it is considered that the glaring omissions in the EIS concerning the Property are based upon the mistaken assumption by KEPCO in preparing the EIS that Locaway is a mine related company.

Response

Table 3.1 of the AQGHGIA (Appendix O of the EIS) (Pacific Environment, 2015) identified sensitive receptors 56, 57A, 57B and 57C as private residential receptors (not mine related) and were assessed accordingly.

Issue

The air quality assessment appears to be significantly underestimating the likely air quality impacts of the Project. For instance, according to Figure 54 it appears that any air quality impacts from the western out of pit emplacements are almost fully contained to the project disturbance boundary.

Response

Figure 54 of the EIS does not show the full extent to which dispersion of the dust is predicted to occur. Figure 54 of the EIS presents the maximum extent relevant to the criterion for each, that is:

- Maximum 24-hour average PM₁₀ concentrations due to the Project only = 50 µm /m³;
- Cumulative annual average PM₁₀ = 30 µm /m³;
- Cumulative annual average TSP = 90 µm /m³; and
- Cumulative annual average dust deposition = 4 g/m²/month (annual average).

The contour plots that show the full extent to which dispersion of the dust is predicted to occur are presented in the AQGHGIA (Appendix O of the EIS) summarised in **Table 25**.

The predicted contribution at the Locaway sensitive receptors are presented in the AQGHGIA in Table 8.1 (Year 3), Table 8.2 (Year 5) and Table 8.3 (Year 9).

For ease of reference, the relevant predictions from each of these tables are represented in **Table 26**. The results show that all the sensitive receptors at Locaway are predicted to meet all the relevant assessment criterion.

Table 25
Reference of contour plots in AQGHGIA

Parameter	Averaging Period	Contribution	Year 3	Year 5	Year 9
PM ₁₀	Maximum 24-hour average	Project only	Figure 8.1	Figure 8.11	Figure 8.21
PM _{2.5}			Figure 8.2	Figure 8.12	Figure 8.22
PM ₁₀	Annual average	Project only	Figure 8.7 – left	Figure 8.17 – left	Figure 8.27 – left
		Cumulative	Figure 8.7 – right	Figure 8.17 – right	Figure 8.27 – right
PM _{2.5}		Project only	Figure 8.8 – left	Figure 8.18 – left	Figure 8.28 – left
		Cumulative	Figure 8.8 – right	Figure 8.18 – right	Figure 8.28 – right
TSP		Project only	Figure 8.9 – left	Figure 8.19 – left	Figure 8.29 – left
		Cumulative	Figure 8.9 – right	Figure 8.19 – right	Figure 8.29 – right
Dust deposition		Project only	Figure 8.10 – left	Figure 8.20 – left	Figure 8.30 – left
		Cumulative	Figure 8.10 – right	Figure 8.20 – right	Figure 8.30 – right

Table 26
Predicted Incremental and Cumulative Concentrations at Locaway

ID	PM ₁₀				PM _{2.5}				TSP		Dust Deposition	
	24 hour		Annual		24 hour		Annual		Annual		Annual	
	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative	Increment	Cumulative
Units	µg/m ³										g/m ² /month	
Impact Assessment criteria	N/A	50	N/A	30	N/A	25	N/A	8	N/A	90	2	4
Acquisition / Mitigation criteria	50	N/A	N/A	30	N/A	N/A	N/A	N/A	N/A	90	2	4
Private Receptors												
Year 3 (per Table 8.1 of the AQGHGIA)												
56	12.4	34	1.9	12	1.7	24.2	0.3	5	5.4	37	0.09	0.89
57A	8.1	34	1.1	11	1.2	24.2	0.2	5	3.0	35	0.06	0.86
57B	8.1	34	1.0	11	1.2	24.2	0.2	5	2.9	35	0.06	0.86
57C	8.4	34	1.1	11	1.2	24.2	0.2	5	3.0	35	0.06	0.86
Year 5 (per Table 8.2 of the AQGHGIA)												
56	10.1	34	2.5	13	1.6	24	0.4	5	6.9	39	0.11	0.91
57A	12.4	34	1.9	12	2.0	24	0.3	5	5.1	37	0.10	0.90
57B	11.7	34	1.9	12	1.9	24	0.3	5	4.9	37	0.09	0.89
57C	12.2	34	1.9	12	1.9	24	0.3	5	5.1	37	0.10	0.90
Year 9 (per Table 8.3 of the AQGHGIA)												
56	7.8	34	1.7	12	1.1	24	0.2	5	4.7	37	0.08	0.88
57A	9.5	34	1.5	12	1.4	24	0.2	5	4.1	36	0.08	0.88
57B	9.5	34	1.5	12	1.4	24	0.2	5	4.0	36	0.08	0.88
57C	9.6	34	1.5	12	1.4	24	0.2	5	4.1	36	0.08	0.88

Issue

DPE should have significant concerns in relation to the acceptability of the air quality model due the availability of meteorological data representative of the Bylong Valley, its inability to include areas to the west and documented issues with the reliability for lengthy periods of the Bylong TEOM.

Response

NSW EPA completed a detailed review of the AQGHGIA, and concluded *“The assessment is broadly consistent with the EPA’s ‘Approved Methods for Modelling and Assessment of Air Pollutant in NSW’”*

The NSW EPA raised no issues with respect to the meteorological data.

With respect to the ambient air quality monitoring data, NSW EPA compared the available data from the Project site with other data from nearby sources including Mt Penny, Merriwa, Oakdale, Bargo and Bathurst. NSW EPA and concluded *“While the EPA considers that the available data is limited and does not include the full range of weather conditions, the comparison to the data listed above shows that it is likely to represent usual conditions”*.

Issue

The EIS contains very little information on the parameters of the model which would allow for a full examination of whether the model is an accurate representation of the Bylong Valley.

Response

As noted above, NSW EPA completed a detailed review of the AQGHGIA, and concluded *“The assessment is broadly consistent with the EPA’s ‘Approved Methods for Modelling and Assessment of Air Pollutant in NSW’”*

The AQGHGIA (Appendix O of the EIS) contains all the information required to determine the parameters used in the assessment. A summary of the relevant sections is provided below:

- Table 1-1 summarises which section of the AQGHGIA responds to each of the Agency’s requirements, as detailed in the SEARs;
- Section 3 discusses the local setting and sensitive receptors assessed;
- Section 4 details the air quality criteria against which the Project has been assessed;
- Section 5.2 details the meteorological data used;
- Section 5.3.4 detail the assumptions used for existing air quality;
- Section 6 contains all the details regarding the set-up of the dispersion model
 - o Supporting information specific switches/values applied in the models used are provided in Appendix A;
- Section 7 details the following:
 - o The assumptions applied regarding dust control (Table 7.1);

- o The location of sources as used in the modelling (Figure 7.1 to Figure 7.3);
- o A summary of the emissions from mining activities for each year assessed (Table 7.2 to Table 7.6); and
- Detailed emission inventories showing each of the equations and assumptions used are provided in Appendix B of the AQGHGIA.

The AQGHGIA was also peer reviewed by Jacobs (refer Appendix P of the EIS) which concluded the following, *"In my opinion, the air quality assessment (based on dispersion modelling) has been undertaken in a manner which is consistent with the requirements of the EPA (DEC 2005) for these types of projects. The methodology used in this assessment has been appropriate and applied in a conservative manner, in order to determine the potential air quality impacts. The conclusions of the assessment are supported by the model predictions."*

Issue

Neither is there an assessment of whether more than 25% of the contiguous area of the Property will exceed the relevant air quality criteria. That should be undertaken.

Response

None of the Locaway residences were predicted to exceed the relevant assessment criteria. Additionally, the air quality impacts illustrated within Figure 54 of the EIS do not extend over any portion of the Locaway property. Therefore, the predicted impacts do not exceed the relevant criteria over more than 25% of the property.

Issue

There is no doubt that the Property will experience air quality impacts from the Project particularly in relation to PM_{2.5} impacts. This impact is not sufficiently or properly dealt with in the EIS. KEPCO should address this aspect before any further steps in the assessment process are undertaken.

Response

As detailed in the above responses, the AQGHGIA was completed in accordance with the Approved Methods, including the assessment of PM_{2.5}. As presented in **Table 26**, the Locaway sensitive receptors are predicted to meet all the relevant assessment criterion.

5.10.2 Rail Activity and Air Quality in Wollar Village

Submission Reference: SIG24, P100, P187, P201

Issue

Several submissions raised comments around an increase in the number of rail movements due to the Project on the Wollar rail loop and the impact on the air quality in Wollar Village.

Response

The Project will not result in any additional trains on the Sandy Hollow to Gulgong Railway Line to the west of the Bylong Rail Loop and hence there will be no changes to air quality in the vicinity of the Wollar Village due to the Project.

5.10.3 Dust Emissions

Issue

Submission Reference: P15_2, P81, P99, P118, P226, P201, SIG27

A number of submissions raised concerns related to dust emissions from the Project and its impact on both air quality at private residences in the vicinity of the Project, and also further afield.

Response

A detailed AQGHGIA was completed for the Project and was included as Appendix O of the EIS (Pacific Environment, 2015).

Air quality dispersion modelling for the Project was conducted in accordance with the procedures outlined in the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (Approved Methods) (NSW EPA, 2005). The Approved Methods outlines the air quality impact assessment criteria for air quality and provides guidance on dispersion modelling that is required to estimate likely air pollutant concentrations.

In this regard, it is noted that the EPA submission on the Project states “*The EPA has reviewed the air quality impact assessment (AQIA)..... The assessment is broadly consistent with the EPA’s ‘Approved Methods for the Modelling and Assessment of Air Pollutants in NSW’.....*”

The AQGHGIA presents a comparison of the estimated (modelled) results with the air quality impact assessment criteria to assess the potential impacts of the Project at all sensitive receivers in the area (defined as places where people normally reside or work). The contour plots presented in the AQGHGIA show the predicted ground level air quality concentrations across an area of approximately 25 km by 30 km. It is important to note that the air quality dispersion modelling does not include wet deposition (pollutant removal by rainfall) and as such the predicted ground level concentrations due to the Project are considered to be conservative.

The predicted ground level air quality concentrations due to the Project and cumulatively (Project contribution plus existing concentrations) were assessed by comparison against the relevant air quality impact assessment criteria (see **Table 27**).

The impact assessment criteria provide benchmarks, which are intended to protect the community against the adverse effects of air particulates. These criteria reflect current Australian and NSW standards for the protection of health and against nuisance effects.

The predicted ground level dust concentrations and deposition levels of the Project were assessed by comparison against the relevant current EPA impact assessment criteria and DP&E mitigation and acquisition criteria.

It is noted that EPA currently does not have an impact assessment criteria for annual average or 24-hour average PM_{2.5}. To date, assessments of PM_{2.5} for coal mines have been compared against the NEPM Advisory Reporting Standard (ARS)

Table 27 and **Table 28** lists the NSW EPA impact assessment criteria and the NEPM ARS, while **Table 29** lists the DP&E acquisition criteria.

The modelling results show that no private residence identified in the 25 km x 30 km modelling domain was predicted to experience ground level concentrations of PM₁₀, PM_{2.5}, TSP and dust deposition above the relevant impact assessment criteria, due to the Project alone or cumulatively. It is considered unlikely that there will be any measurable change to air quality at locations outside the modelling domain (for example, Capertee Valley) due to the Project.

Table 27
NSW EPA Air Quality Impact Assessment Criteria

Pollutant	Criterion	Averaging Period	Application
TSP	90 µg/m ³	Annual	Cumulative
PM ₁₀	50 µg/m ³	24-hour	Cumulative
	30 µg/m ³	Annual	Cumulative
Deposited Dust	2 g/m ² /month	Annual	Incremental
	4 g/m ² /month	Annual	Cumulative

Table 28
National Environment Protection Measure Advisory Reporting Standard²

Pollutant	Advisory Reporting Standard	Averaging Period	Application
PM _{2.5}	25 µg/m ³	24-hour	Cumulative
	8 µg/m ³	Annual	Cumulative

Table 29
NSW DP&E Air Quality Acquisition Criteria

Pollutant	Advisory Reporting Standard	Averaging Period	Application(a)
TSP	90 µg/m ³	Annual	Cumulative
PM ₁₀	50 µg/m ³	24-hour	Incremental(b)
	30 µg/m ³	Annual	Cumulative
Deposited Dust	2 g/m ² /month	Annual	Incremental(b)
	4 g/m ² /month	Annual	Cumulative

Notes:

Voluntary acquisition rights apply where the Project contributes to exceedances of the acquisition criteria at any residence or workplace on privately-owned land, or, on more than 25% of any privately-owned land, and a dwelling could be built on that land under exiting planning controls. Up to five allowable exceedances of the criterion over the life of the development.

5.10.4 Dust Impacts to Heritage Structures

Submission Reference: SIG27

Issue

Low end annoyance of coal dust in relation to discolouration on windows and the more damaging long term effects of coal dust being ingrained on buildings, including light sandstone structures such as Tarwyn Park Homestead and its stables. The dust contains sulphur compounds, which can corrode structures and combine with rain.

Response

A detailed AQGHGIA was completed for the Project and was included as Appendix O of the EIS (Pacific Environment, 2015). Air quality dispersion modelling for the Project was conducted in accordance with the procedures outlined in the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (Approved Methods) (NSW EPA, 2005). In order to assess the potential for nuisance dust, one of the assessment criteria is the predicted levels of deposited dust which are set to protect against nuisance impacts, such as the discolouration of windows, and deposition on surfaces.

Deposited dust results from the larger particles, which typically do not tend to remain suspended in the atmosphere for long periods of time and will fall out relatively close to source.

As detailed in Section 5.3.2 of the AQGHGIA, existing dust deposition levels are approximately 1 g/m²/month. The maximum predicted increase at a private receptor is 0.27 g/m²/month (Year 3, Residence 69 – see Table 8.1 of the AQGHGIA). As such the maximum predicted cumulative dust deposition levels are less than 1.5 g/m²/month, compared with the assessment criterion of 4 g/m²/month.

Whilst the coal removed will contain sulphur compounds, they are bound within the coal and only released to the atmosphere during combustion. Therefore there is limited potential for corrosive impacts.

5.10.5 Health Impacts Due to Dust

Submission Reference: SIG27, P91, P96, P99, P113_1, P118, P132, P222

Issue

Several submissions were concerned about potential health impacts from exposure to air pollution.

Response

It is important to note that the population of a rural area (even without active coal mining in the vicinity) is exposed on a daily basis to multiple sources of PM. These include: vehicles, farm equipment, agricultural activities, wood burning fires etc.

The health of employees at coal mining operations is covered by Workplace Health and Safety Regulations, and is not required to be assessed during the EIS process.

The AQGHGIA completed for the Project predicted concentrations of all PM fractions: TSP, PM₁₀ and PM_{2.5}. The predicted incremental (Project-only) and cumulative annual average concentrations at the private residences for all PM fractions are below the relevant air quality impact assessment criteria which are designed for the protection of health and against nuisance effects.

When considering 24-hour average PM₁₀ concentrations, a cumulative assessment incorporating existing background levels indicates that the Project is unlikely to result in any additional exceedances of the relevant air quality impact assessment criteria and standards at the majority of sensitive receivers.

KEPCO will review and augment the existing air quality monitoring network, where required to monitor the compliance of the Project's operations against the relevant NSW Government air quality criteria at representative private receivers.

It is important to note the health based air quality criteria set by NSW EPA are based on studies undertaken in urban areas with large populations, where there is higher exposure to air pollutants from combustion sources (that is, emissions from traffic fumes and industrial sources).

The majority of emissions from open cut mining are coarser than PM_{2.5}. As the finer PM_{2.5} particles are of the greatest concern owing to their impact on health, and there are multiple sources of PM_{2.5}, including mining, wood smoke from solid fuel heaters and other forms of combustion (e.g. road and rail transport, coal-fired power generation and coal-seam spontaneous combustion), NSW Health and EPA commissioned a research study to better understand the composition and source of fine particles in the Upper Hunter (CSIRO, 2013). The Upper Hunter Fine Particle Characterisation Study focused on the Muswellbrook and Singleton Upper Hunter Air Quality Monitoring Network (UHAQMN) sites, as these are major population centres where elevated PM_{2.5} concentrations have been measured.

Sampling was undertaken at the Upper Hunter Air Quality Monitoring Network sites in Singleton and Muswellbrook between January 2012 and December 2012. Samples were collected for 24 hours every third day and analysed for organic carbon, elemental carbon, soluble ions, anhydrous sugars, elemental composition, black carbon and gravimetric mass.

The chemical composition of all the samples from each site was analysed using an internationally recognised technique called positive matrix factorisation (PMF). PMF is widely applied internationally for identifying sources contributing to ambient pollution. In the first step, the PMF statistical technique is applied to identify correlations between the concentrations of individual chemical species, grouping correlated species into 'factors'. Factors have distinct chemical patterns or fingerprints. In this study, eight factors were identified, with this number of factors found to provide the best explanation of the measured data.

Further analysis was then undertaken to identify the most likely source of emissions identified in each factor and the contribution that each source makes to the total PM_{2.5} concentrations. A summary of the results are presented in **Table 30**.

Even though both Singleton and Muswellbrook have a significant amount of open cut mining nearby, the data show that fugitive coal dust is the fifth highest contributor to PM_{2.5} emissions. In Singleton, secondary sulphate (from sources such as power stations) is the main contributor (20%), and in Muswellbrook, domestic wood heaters are the most significant source (30%).

Residents of the Hunter Valley reside in an area that has a number of large open cut coal mines (as opposed to Bylong which currently has no open cut mines). In response to concerns that the population are at a greater risk of diseases and causes of death associated with the exposure to air pollutants, NSW Health completed an analysis of respiratory and cardiovascular diseases and cancer health data for the Hunter New England Health Area Service in 2010 (NSW Health, 2010).

The statistically-based study covered a wide range of diseases, but focused on diseases and causes of death that are known to be associated with exposure to air pollutants. The study covered areas where the population would clearly be exposed to emissions from mining (e.g. Singleton and Muswellbrook and surrounding areas) and areas too distant from mining to experience significant exposure from mining emissions (e.g. Tamworth, Armidale, etc.).

Table 30
Contribution by Source Type to PM_{2.5} Mass in Singleton and Muswellbrook

Factor	Potential Source	Singleton	Muswellbrook
Secondary sulfate	Local and regional sources of SO ₂ such as power stations	20 ± 2%	17 ± 2%
Industry aged sea salt	Sea salt, local and regional sources of SO ₂ such as power stations	18 ± 3%	13 ± 3%
Vehicle/industry	Vehicle/industry	17 ± 2%	8 ± 1%
Wood smoke	Domestic wood heaters	14 ± 2%	30 ± 3%
Soil	Soil, fugitive coal dust	12 ± 2%	11 ± 1%
Biomass smoke	Wildfires, hazard reduction burns	8 ± 2%	12 ± 2%
Sea salt	Sea salt	8 ± 1%	3 ± 1%
Secondary nitrate	Motor vehicle NO ₂ , power station NO ₂	3 ± 2%	6 ± 1%

The study was based on a geographical analysis and did not make direct use of air quality data. At the time the review was completed, no suitable ambient air quality data existed in the Hunter Valley.

The study provided insights into the incidence of various categories of disease and the use of health services. The factors affecting the measures of health that are examined in the study are complex and it is difficult to provide a brief summary of these findings, but some observations are pertinent, as described below.

For example, asthma is of concern to the community. The rates of asthma separation at Muswellbrook hospital from 2004 to 2009 (which would be expected to be affected by mining emissions) were higher than the NSW average, but were lower than Liverpool Plains (which would not be expected to be significantly affected by mining emissions at the time the study was completed).

Singleton (which also would be expected to be affected by mining emissions) experiences asthma separation rates lower than Muswellbrook and lower than the NSW average. Therefore, the data suggests that there are other health and lifestyle factors involved. Although asthma rates on the Liverpool Plains may be higher than in Muswellbrook, as the Liverpool Plains was not dominated by mining at the time of the study, the data suggests that there are other health and lifestyle factors at play and asthma separation levels will not necessarily increase due to mining activities.

These findings undermine a hypothesis that mining is leading to increased rates of asthma. It would of course still be appropriate to investigate whether mining emissions contribute to increased rates of asthma, but the data suggest that other factors appear to be more important, which illustrates the complexity of the issue.

From the information presented in the 2010 NSW Health report, it is reasonable to conclude that significant differences in the statistical measures of health are observed in the different areas studied. However, it is also reasonable to conclude that the data does not point to areas where mining takes place as having significantly different health outcomes compared with those where mining does not occur.

The data appears to suggest that other factors that influence health (possibly lifestyle and population make up) and non-lifestyle factors (for example the way the different communities use the available health services) are more important than the presence or absence of open cut mines in determining the health statistics.

The report does not conclude that adverse health effects are directly attributable to air pollutants generated from coal mining or coal-fired power generation. There is no current evidence to suggest there is a link.

Since the NSW Health review was completed, NSW EPA has established the UHAQMN. The monitoring data from this network is demonstrating that in general, air quality criteria are met in the populated areas.

5.10.6 Rainwater Tanks

Submission Reference: P113_1

Issue

One submission (P113_1) included a journal article that stated:

"Pumped and tanked water on properties around the open cut coalmines has been contaminated with high levels of lead, arsenic, mercury, nickel and zinc. The water cannot be used for drinking, bathing or for livestock plants or on pastures. Remaining residents drink only bottled water"

Response

As noted in **Section 5.10.3**, the predicted air quality concentrations due to the Project and cumulatively are below the relevant impact assessment criteria which are designed for the protection of health and against nuisance effects.

A risk assessment completed in 2009 by the University of Queensland measured lead levels at residences in proximity to coal mine operations in Camberwell and Muswellbrook, with reference sites distant from mining activity (Noller, 2009).

To determine if there is a potential for the coal mining dust to generate high lead levels in tank water, samples of water directly from rainwater tanks (no samples were taken from taps inside houses) and sludge samples from the bottom sediment layer of the tanks were taken and analysed for lead content.

Samples of house dust from floor wipes, window sill and trough wipes were also collected and analysed for lead content and ambient air samples of TSP were analysed for lead content, together with sampling and analysis of fines from overburden, coal and topsoil.

The TSP results of ambient air showed no detectable lead, and as such it would be unlikely to exceed the NEPM ambient air quality criteria.

The results of the samples taken from houses can be summarised as follows:

- Floor wipes were all below the relevant criteria;
- Window sills were all below the relevant criteria;
- Window troughs exceeded the relevant criteria at two houses, indicating some localised source of lead and lack of cleaning of window tracks. All other houses were below the relevant criteria; and
- Lead concentrations in dust from carpet in Camberwell are higher than found in the soil but do not exceed the relevant criteria.

The dust found on window sills was the least available (in terms of potential for human inhalation/ingestion) of the samples collected and will be controlled by regular cleaning.

Importantly, the floors and window sills which are more commonly accessed by children were found to be low in lead concentration and indicate no association with an external dust source, such as soil or coal. The carpet dust average lead concentration was lower than reported for floor dust from other sites remote from mining areas, including Newcastle, but complied with the relevant criteria (Noller, 2009).

The tank water showed no exceedance of the *Australian Drinking Water Guideline* (ADWG) (NHMRC, 2011) for lead in any of the water samples. There was no significant difference in drinking water lead levels between houses with tanks close to coal mining operations and that obtained from background sites, including Newcastle town water.

Noller (2009) also noted that the mean concentration of lead in sludge is similar to the mean of selected tanks sludge (184 mg/kg) found in Brisbane and associated with urban sources.

Whilst the sludge in tanks contained lead, it is not being transferred to water. The high pH of the tank water (pH > 7.0) ensures that lead is not present in solution from any sludge. Some tanks contained more sludge than others, however it was noted that these tanks may not have been cleaned for some time, and at some sites no cleaning had ever been undertaken. NSW Health's *Private Water Supply Guidelines* (NSW Health, 2015) recommends that sludge is cleaned from tanks annually.

It is unlikely that the dust from coal mines was the cause of high lead levels found in some sludge samples as average levels of lead measured by Noller (2009) in overburden (13 mg/kg), coal (15 mg/kg) and topsoil samples (16 mg/kg) were within the range for lead in Australian coal (2 to 14 mg/kg) and have significantly lower percentage lead levels than found in the sludge. It is more likely that sites with higher concentration of lead in the sludge could be due to historical lead paint, roof materials, lead based solder, etc.

Further Rainwater Tank Study

Other research conducted in Queensland (in close proximity to the Dalrymple Bay Coal Terminal) investigated the potential health risks of coal dust deposited on rooftops entering rainwater tank systems used for potable supply (Lucas et. al., 2009).

Leaching tests were conducted on numerous coal types to identify the potential for trace element release into rainwater stored in the tanks. In addition, rainwater samples were collected from both the rainwater tanks and taps of three homes within the dust deposition zone of the Dalrymple Bay area.

The leaching tests indicated that negligible amounts of trace elements in coal dust were released in the rainwater, and all trace elements were below the ADWG. The ADWG provide the threshold levels considered safe for human consumption.

The analysis of the water in rainwater tanks from homes tested also showed that no trace element exceeded the ADWG.

The research concluded:

“...tank and tap samples were all below ADWG and indicated a minimal likelihood of coal dust being an issue with respect to human health”

Management Measures

Regardless of the research showing that coal mining operations are unlikely to contribute metal contamination to tanked rainwater, health and aesthetic hazards for rainwater collected in tanks can be minimised by sensible preventative management procedures, as detailed in the document prepared by the Environmental Health Committee (enHealth) of the Australian Health Protection Committee, *Guidance on use of rainwater tanks*, (enHealth, 2010).

An example of some of the sources of the potential health and aesthetic hazards and preventative measures identified by enHealth are presented in **Table 31**.

Table 31
Sources of Potential Health and Aesthetic Hazards and Preventative Measures

Health Hazard	Cause	Preventative Measure	Monitoring	Corrective Action
Lead contamination	Lead based paints and primers on roofs	Do not collect rainwater from roofs painted with products containing high lead concentrations (e.g. pre-1970s paint. When painting roof, check suitability with paint retailer.		
	Uncoated lead flashing on roofs.	Paint existing material or use pre-coated products.	Inspect roof and gutters every six months.	Use coated lead flashing or alternative materials on new roofs. Paint existing uncoated flashing.
	Increased corrosion of metals due to low pH from long periods of contact between rainwater and leaves.	Keep gutters clean. Install leaf protection devices on gutters.	Inspect roof and gutters every six months.	Clean gutters. If large amounts of leaves are detected on regular inspections Clean more often.
Faecal contamination from birds and small animals	Overhanging branches on roof.	Prune tree branches. Install first flush device.	Check tree growth every six months. Check device after rainfall.	Prune branches. Empty contents of device after rainfall.
Coloured water	Accumulated damp leaves in gutter.	Keep gutters clean. Install leaf protection devices on gutters.	Inspect roof and gutters every six months.	Clean gutters. If large amounts of leaves are detected on regular inspections Clean more often.

Source: Adapted from Table 2 and Table 3, enHealth, 2010

NSW Health (2015) also provides a number of recommendations for households to avoid or minimise water quality problems within rainwater tanks.

As noted by NSW Health, it is good practice for any rain water system in any location to install a simple first flush system to prevent particulate matter (or any other undesirable materials) that have collected on the roof being washed into the rain water tank.

Given that the AQGHGIA predicted air quality concentrations due to the Project at the sensitive receivers are below the relevant air quality impact assessment criteria designed for the protection of health and against nuisance effects, no further mitigation measures are necessary.

5.11 CLIMATE CHANGE AND GREENHOUSE GAS EMISSIONS

5.11.1 Greenhouse Gas Emissions

Submission Reference: SIG4, SIG6, SIG14, SIG15, SIG25, SIG26, P1, P5, P9, P12, P27, P43, P46, P62, P66, P74, P102, P105, P112, P124, P127, P129, P132, P142, P157, P160, P164, P172, P173, P183, P194, P202, P208, P220, P222, P229, P231

Issue

A number of submissions referenced the significance of greenhouse gas emissions due to the Project and the contribution to global emissions and climate change. It is noted that a number of these submissions were received as form submissions.

Response

As detailed in Section 12 of the AQGHGIA (Pacific Environment, 2015), the GHG assessment was completed in accordance with the methodologies established by the relevant policies and guidelines, and used the most recent National Greenhouse Accounts Factors available at the time of the assessment as published by the DoE *National Greenhouse Accounts Factors 2014* (DoE, 2014).

This document defines three “scopes” (or emission categories), consistent with those defined by the World Resources Institute/World Business Council for Sustainable Development Greenhouse Gas Protocol (WRI/WBCSD, 2004). These are detailed below:

- Scope 1 covers direct emissions from sources within the Project Boundary such as fuel combustion and manufacturing processes. For the Project, this includes emissions from:
 - o Fuel consumption (diesel) during mining operations and construction.
 - o Release of fugitive methane (CH₄) during and post-mining.
- Scope 2 covers indirect emissions from the consumption of purchased electricity, steam or heat produced by another organisation. For the Project, this includes emissions from:
 - o Electrical energy used in coal processing.

- Scope 3 includes all other indirect emissions that are a consequence of the organisation's activities but are not from sources owned or controlled by the organisation, for example, production of diesel fuel or off-site transport of the product. For the Project, this includes emissions from:
 - o Consumption of purchased electrical energy (indirect emissions from the extraction, production and transport of fuel burned at generation and the indirect emissions attributable to the electricity lost in delivery in the transmission and distribution network);
 - o Consumption of fossil fuels (indirect emissions from the extraction, production and transport), which includes:
 - Diesel usage off site;
 - Fuel usage in rail transport of product coal; and
 - Burning of product coal.

As defined above, Scope 3 emissions “are a consequence of the organisation's activities but are not from sources owned or controlled by the organisations”.

The product coal from the Project will be exported overseas, and as such, carbon dioxide equivalent (CO₂-e) emissions from the burning of this coal will not be included in the calculation of CO₂-e emissions from NSW.

Whilst it is accepted that no matter where the coal is burnt the CO₂-e emissions will add to the global carbon dioxide (CO₂) load, only the Scope 1 and Scope 2 CO₂-e emissions from the Project will be included in NSW CO₂-e emission inventory. The Scope 3 CO₂-e emissions that occur within NSW (e.g. rail transport) will be accounted for in the NSW totals as emissions released by the company that operates the railway.

The total CO₂-e emissions for the State of NSW in 2012/13 (the latest year of validated data) were 141.8 Mt CO₂-e (Adapt NSW, 2016). The average annual emissions estimated for the lifetime of the proposed Project (Scopes 1 and 2) are 0.14 Mt CO₂-e / annum. This equals to approximately 0.09% of the total emissions for NSW in 2012/13.

Globally, in excess of 35.7 Gigatonnes per annum (Gtpa) of CO₂-e are currently estimated to be emitted to the atmosphere (PBL Netherlands Environmental Assessment Agency, 2015). Average annual emissions over the lifetime of the proposed Project from the mining and burning of coal (including Scope 1, Scope 2 and Scope 3 emissions from the mining, transportation of the coal to the Port of Newcastle, and usage of the coal) are estimated to be 0.02% of the current global annual anthropogenic CO₂-e emissions.

The Project will develop an Energy and Greenhouse Gas Management Plan which will describe a number of reasonable and feasible measures to be implemented to minimise GHG emissions from the Project.

5.11.2 Renewable Energy Sources

Submission Reference: SIG4, P36, P39, P61, P62, P68, P69, P72, P79, P84, P99, P112, P123, P127, P144, P150, P157, P176, P185, P202, P204_2, P220, P229, P231, P294,

Issue

Submissions were raised by stakeholders calling for non-carbon energy sources such as renewable instead of coal production.

Response

The United Nations sponsored IEA (IEA, 2015) expects the world's energy consumption will grow 37% by 2040. Local and international predictions are that the need for coal as a source of energy for electricity production will continue to increase for some years as energy demand grows, despite an expectation of an increase in energy generated by alternate sources and the ultimate transition from carbon based energy to alternative fuel sources.

While steps are being taken across the world to reduce the reliance on the use of fossil fuels for electricity production, the forecasts are that increasing energy production from alternate energy sources (i.e. wind and solar) and energy saving actions will not match the anticipated increased demand for electricity. This is particularly the case from the developing countries of south-east Asia, Africa and South America. The result will be an increase in demand for energy coal over (at least) the next 20 years.

As the largest electricity generator in South Korea, KEPCO Korea is at the forefront of developing alternate non carbon energy sources for the people of South Korea. However, it is accepted that an alternative to coal will not be developed sufficiently to replace carbon based energy entirely for some time (International Energy Agency, 2014). The demand for electricity is predicted to continue to increase with growing populations and the standards of living that are being demanded in the developing world. KEPCO Korea itself is forecasting an approximate 27% increase in direct coal imports from approximately 80 Mtpa (in 2014) to approximately 110 Mtpa by 2020.

Australia has an estimated 76 gigaton of proven black coal reserves, which equates to the fourth largest reserve and approximately 9% of the world's proven coal resources (Geoscience Australia and BREE, 2014).

Coal is Australia's second-largest export earner after iron ore and is the largest export industry in both Queensland and NSW. Over the last five years, coal has accounted on average for more than 15% of Australia's exports.

The coal mining industry is a major provider of revenue for governments. Coal is mined in all six states, however Queensland (52%) and NSW (46%) together account for almost 98% of Australia's black coal production.

Coal mining is the largest contributing industry to the economy of NSW. In 2012-13, NSW received \$1.3 Billion in mining royalties, the vast majority of which was derived from coal mining. Approximately 84% of the total value of mineral production in NSW is derived from thermal and coking coal, the total value of which was \$17.8 Billion in 2012-13 during which NSW produced a record 260 Mt of raw coal, yielding 196 Mt of saleable coal (NSW Minerals Council, 2015).

The Project will generate an estimated \$290 Million in royalties (NPV) for the NSW Government throughout the life of the Project. These royalties are used by the State government to fund infrastructure projects and community services across NSW. A proportion of these funds is expended locally each year in the regions where the coal is produced by way of the NSW Governments Royalties for Regions funding initiative.

The existence of the coal resource in the Bylong Authorisations has been known for a considerable period of time. The ability for this resource to be mined in an economic and environmentally acceptable manner has been the subject of extensive investigations and planning.

KEPCO is committed to the significant investment required to develop this valuable NSW Government owned coal resource. The coal resource within the Authorisations has a significant material value to the Local, State and Australian communities, which will be foregone without its recovery.

To this end the Project will:

- Assist Australia to continue to meet the international demand for thermal coal for at least the next 25 years, during which time it is expected that there will continue to be a strong world demand for coal for the purposes of electricity generation;
- Support Australia in maintaining its reputation as a consistent and reliable supplier of thermal coal to its existing and expanding markets; and
- Contribute materially to sustaining the Australian economy and maintaining the economic stability of NSW, the MWRC LGA and the broader region.

5.11.3 Economic Assessment

Submission Reference: SIG15, P43 and P153

Issue

P43 submitted that the Economic Impact Assessment should include the burning of coal in the quantification of greenhouse gas emissions.

Response

The product coal from the Project will be exported overseas, and as such, carbon dioxide equivalent (CO₂-e) emissions from the burning of this coal will not be included in the calculation of CO₂-e emissions from NSW.

Whilst it is accepted that no matter where the coal is burnt the CO₂-e emissions will add to the global carbon dioxide (CO₂) load, only the Scope 1 and Scope 2 CO₂-e emissions from the Project will be and are required to be included in NSW CO₂-e emission inventory, and hence considered in the economic assessment.

5.12 NOISE

5.12.1 Noise Assessment

Submission Reference: SIG2, SIG11, SIG20, SIG27, O1, O5, O6, P15_1, P15_2, P48_2, P81, P118, P132, P166, P177, P196, P201, P218, P318, , P221, P222

Issue

Several submissions questioned the noise impacts of the Project.

Response

The NBIA (Appendix Q of the EIS) has been completed in general accordance with the relevant Government guidelines and policies to assess the potential impacts of the proposed development. Noise management and mitigation measures have been applied to the Project and further, measures to manage and monitor ongoing noise impacts have been proposed in Section 7.9.4 of the EIS and Section 11 of the NBIA.

The NSW INP recommends amenity criteria for recreation areas of 50 dB(A). The predicted noise levels will comply with these criteria at locations accessible by tourists passing through the Bylong Valley.

The impacts of the Project to sustainable tourism have been assessed in the SIA of the EIS.

5.12.1.1 Background Noise Levels

Submission Reference: SIG27

Issue

One submission related to the assessment methodology adopted in terms of background noise levels in rural areas. SIG 27 states:

“...due to the very low background noise level in the Bylong area (<19 dBA), the impact of noise from the proposal is likely to be significant. This arises because the INP methodology allows measured background noise levels below 30 dBA to be considered as 30 dBA for the purpose of assessment.

In this case, that leads to a prediction of project noise levels of 15-20 dB above the background noise level, instead of the normally accepted 5 dB emergence. This is a serious shortcoming of the INP which only affect rural communities.

In accordance with the Industrial Noise Policy (INP), where the RBL is measured to be 30 dBA, the RBL is increased to be 30 dBA. The effect of this artificial increase in the RBL is that it will increase the audibility of the expected mine noise and most likely the annoyance for residents.

This effect should be taken into account when assessing the extent of 'non-compliance' of the proposal. All predicted exceedances above the Project Specific Noise Level (PSNL) should be considered significant.

A 1-2 dB exceedance above the PSNL is normally 5-6 dB above the background noise level. In this case, 1-2 dB above the PSNL will often be 16-18 dB above the measured background noise level and will be clearly audible, and most likely annoying. In my opinion, this level of noise would be considered offensive as defined by the POEO Act 1997.

That is, "it would interfere unreasonable with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted".

Response

As stated in the submission reference SIG20, the NBIA (Appendix Q of the EIS) has been completed in general accordance with the relevant Government guidelines and policies. Noise assessments are required to be completed in accordance with the INP (EPA, 2000) and its associated application notes, which define the minimum assessable background noise level for the definition of criteria as 30 dB(A).

5.12.1.2 Noise Modelling for Murrumbo Station

Issue

A submission was associated with specific noise impact predictions and impacts on Murrumbo Station.

O5 states concerns regarding:

"the potential for operational noise impacts on the property. We note there is some uncertainty about the impacts on our property as specific predictions are not included in the noise assessment and the noise contours are truncated in the east in the vicinity of the Sandy Hollow Railway."

Response

Murrumbo Station is located to the east of the Project and outside of the modelling domain. The noise levels at inhabited locations within this property would be below 35 dB(A), according to worst case noise contours (Appendix E of the NBIA), as stated in Section 5.4.4 of the NBIA (Appendix Q of the EIS).

5.12.1.3 Construction and Operations Noise

Issue

P201 states:

"The EIS proposes that there will be 54 pieces of heavy equipment being operated at the open-cut mine during continuous operations. No doubt there will be different, and a larger number of pieces of large equipment during the construction phase. The nature of the construction works, and the open-cut mining operations which involves earth moving, and then coal extraction and processing, being carried out will, even if the mitigation measures are all taken and are successful, nevertheless produce dust and noise".

Response

The residences associated with this submission are located at least 2 km from the Project boundary. Results from the NBIA (Appendix Q of the EIS) indicate that noise levels at the properties related to this submission (Receiver IDs 165, 168, 348, 350) are predicted to be less than 20 dB(A) for the majority of meteorological conditions for Mining Year 3 and the underground only operations, and less than 25 dB(A) for Mining Year 5 and 9. These levels are below the project PSNL.

5.12.1.4 Noise Modelling for Receiver 65

Submission Reference: P15_1

Issue

Another submission questioned the noise modelling and impact on their specific property.

Submission P15_1 states:

"We are receiver 65 within the exploration licence and right on the project boundary, in the village of Bylong. All of our neighbours are classed as significantly impacted and therefore either at property mitigation or acquisition (receivers 60, 63, 69). We are classed as moderately impacted, therefore only receive voluntary at property mitigation rights. What could possibly be the difference between our neighbours and ourselves re possible acquisition? We will be living 2-2.5 kms from the major infrastructure and open cuts pits if this project goes ahead and are told by KEPCO that there will be no impacts!

We believe a mine that will operate 24/7 will have major impacts on our health, well being and amenity. Mine construction, road construction, increased traffic movements, heavy plant and equipment movement, new rail loop, coal handling preparation plant, blasting, open cut MIA and reverse noise beeping. Plus any operating noise that we have not considered.

How can KEPCO's modelling for noise be taken seriously, when they can hand pick who will be affected and who will not."

"I will be affected by noise, dust, increased traffic, new rail loop, blasting ... The modelling done by this company puts my residence (I am receiver 65) at moderately impacted and therefore maybe I am due some mitigation, yet all my neighbours in the village of Bylong are severely impacted therefore acquisition could be their scenario. How does that work? Nowhere in the EIS can I find any information on buffer zones. Why is that? How can this company suggest to me after me having lived here for 17 years that their modelling for all the above impacts will have little or no affect on me or my business".

Response

As explained in Section 4 of the NBIA, operational noise impacts for the Project have been assessed in accordance with current noise policies applicable for NSW, including the INP (EPA, 2000) and the DP&E VLAM Policy (DP&E, 2014). The requirement for at property mitigation is implemented in order to mitigate the residual impacts of the Project when design and operational measures cannot achieve the noise levels required to minimise residual noise impacts as a result of development.

Noise level impacts are enforced by the determination of project specific criteria in accordance with the INP (EPA, 2000). If noise levels following the implementation of noise mitigation measures result in residual impact, then voluntary mitigation and acquisition rights are triggered in accordance with DP&E VLAM Policy (DP&E, 2014). The level of residual impact is assessed in terms of exceedance above the criteria as presented in Table 1 of the VLAM Policy.

With reference to the figures in Appendix E of the NBIA (Appendix Q of the EIS), receiver 65A is located slightly further setback from the Project's noise generating activities when compared with receivers 60, 63 and 69. The predicted noise levels at these locations were under worst case meteorological conditions, which has triggered the voluntary acquisition criteria in accordance with the DP&E VLAM Policy (DP&E, 2014) at these three closer receivers in the NBIA.

With reference to the Noise Assessment Addendum (Pacific Environment, 2016), the changes in haul road crossing design have generally increased noise levels by up to 0.1 dB at some locations under worst case conditions. Predicted noise levels at receiver 65A remain within the moderately impacted category.

5.12.1.5 Noise Impacts on Locaway Property

Submission Reference: O6

Issue

A submission was received regarding noise impacts on the Locaway property.

O6 stated:

“Examples in relation to omissions concerning Locaway include:

- failure to present noise impact results in the Main Text of the EIS as it relates to the Property where there are exceedances of the Project Specific Noise Levels (PSNL);*
- Failure to include any discussion on whether the various buildings at Receiver 57 are affected above the PSNL despite the PSNL noise contour passing immediately through the receivers.”*

Submission O6 continues:

“The assessment of the noise impacts is misleading and fails to provide a proper representation of the noise impacts on the Property.

According to Figure 55 of the Main Text of the EIS, part of the Property is within the 35 dB(A) worst case predicted noise contour and therefore exceeds the identified Project Specific Noise Levels (PSNL). Receiver 56 is clearly within the contour. However, the contour passes through Receivers 57A, 57B and 57C. It is therefore difficult to discern from the Main Text of the EIS whether the buildings on Lot 1 DP 421103 (that is Receivers 57A, 57B and 57C) are within the 35 dB(A) contour or not. There is no discussion about the issue.”

Table 59 titled ‘Predicted Noise Levels in Exceedance of PSNL at Private Receivers’ provides no assistance. Indeed, according to this table, there is an exceedance of the PSNL at Receiver 56 during the evening/night in PY3 and PY5 and at 57A and 57B in PY5 evening /night. No other exceedances are identified.

However, the Noise and Blasting Impact Assessment prepared by Pacific Environment Limited (NBIA) at page 43 states “Land affected by operational noise was assessed using the contours predicted for mitigated noise levels presented in Appendix E.” According to Appendix E the receivers identified as 57A, 57B and 57C are clearly within the 35 - 40 dB(A) Noise Level Contour under Scenario: 2018 Time Period Evening/Night Conditions: Adverse and Scenario: 2020 Time Period: Day Conditions: Worst-case.

That is, in PY3 and PY5 there is an exceedance of the PSNLs at these locations and it is not until a reading of Appendix E of the NBIA that this is stated. That conclusion is not reflected at all in the Main Text of the EIS or the main text of the NBIA. Indeed, it is actually omitted. In our view, the omission of this material from Table 59 of the Main Part of the EIS is misleading."

Response

The predicted noise levels for the residential buildings associated with Locaway are presented in Table 59 of the EIS. Table 59 correctly illustrates noise modelling results at receivers 56, 57A and 57C for periods where noise predictions exceed the PSNL. The footer to Table 59 of the EIS correctly indicates that the noise levels are qualified as *"negligible operational noise impacts predicted"* in accordance with the DP&E VLAM Policy (DP&E, 2014). The VLAM Policy explains that for this category of noise *"the exceedances would not be discernible by the average listener and therefore would not warrant receiver based treatment or controls"*.

Further, with reference to the results from Table 5-5 of the NBIA and Table - of the Addendum Noise Report (**Appendix F**), noise levels at receivers 56, 57A, and 57C are presented where residual noise impacts are predicted to be marginally greater than the PSNL.

Consistent with the noise contours from Appendix E of the NBIA, receivers 56, 57A and 57C are located just within the 35 dB(A) noise contour. Receiver 57B is located on the 35 dB(A) contour, consistent with the model results presented within Appendix D of the NBIA.

In accordance with the DP&E VLAM Policy (DP&E, 2014), residual noise levels predicted for receivers 56, 57A and 57C are characterised as "negligible" and do not require receiver based treatment or control.

5.12.1.6 Noise Impacts on Workplaces on Locaway Property

Submission Reference: O6

Issue

Submission O6 continues:

"It should also be noted that 2 'workplaces' exists on the Property. Firstly, to the west of Receivers 57 there are substantial workshops and to the east of the buildings is a large agricultural storage facility. None of these are identified."

Response

The assessment has been completed to assess the noise impacts at privately owned residences, in accordance with the INP (EPA, 2000) and the DP&E VLAM Policy (DP&E, 2014). The application of DP&E VLAM Policy (DP&E, 2014) only applies to residences. The relevant NSW noise criteria for industrial workplaces (under the INP) is 70 dB(A). Predicted noise levels within the identified land parcels are significantly less than this criterion.

5.12.1.7 Noise Impacts on Receiver 146

Submission Reference: P218

Issue

Submission P218 states:

“Our home falls almost precisely on the 35dB contour (the dwelling marked on the northern boundary of the land parcel identified as #146)... is the proponent really maintaining the that their modelling is so accurate as to meaningfully distinguish, in any real terms, between a point falling precisely on versus fractionally inside the 35dB contour? Surely the contours themselves are subject to some margin of error estimation. As such, it seems impossible to justify exclusion from the offer of mitigation measures in our case. We expect some consultation in this regard and mitigation measure to be available to us if needed.”

Response

Acoustic modelling is used as a tool to predict future noise impacts of a development. The output noise modelling results provide an estimate of the potential future noise impacts based on a number of assumptions included within the modelling.

When developing a noise model, approximations are made of future reasonable worst case operational scenarios of the development including noise emissions for each individual source, source locations and duration of emissions. Transmission of noise from the source to receiver is then influenced by shielding from intervening terrain, reflection, atmospheric attenuation and weather conditions. Model scenarios were developed to represent likely worse case operational conditions. Noise enhancing meteorological conditions were then applied to determine potential noise impacts.

The noise contours presented in Appendix E of the NBIA indicate that noise levels at receiver 146 are predicted to range between 21 to 35 dB(A). Reference to the predicted noise levels in Appendix D of the NBIA indicate that worse case noise levels at this receiver will be 34 dB(A) during Year 3 operations and 35 dB(A) during Year 5 and Year 9 of the Project. The majority of conditions assessed for each model year were well below 30 dB(A).

As discussed in **Sections 5.12.1.4** and **5.12.1.5**, the noise assessment has been completed in general accordance with current noise policy for NSW, including the INP (EPA, 2000) and the DP&E VLAM Policy (DP&E, 2014). The level of residual impact is assessed in terms of exceedance above the criteria as presented in Table 1 of the VLAM Policy. KEPCO has committed to ongoing monitoring and consultation with the landholder to ensure that operational noise goals are achieved.

5.12.2 Noise Monitoring

Submission Reference: P218 and P228

Issue

A few submissions queried the process and independence of noise monitoring.

Response

KEPCO has committed to various noise management measures, including the implementation of a noise monitoring plan which will be detailed within a Noise Management Plan for the Project. Proposed noise monitoring procedures are presented in Section 11.1.3 of the NBIA. The noise monitoring includes real-time continuous unattended monitoring and periodic attended noise monitoring at selected representative sites.

This monitoring will provide both real-time and continuous noise monitoring data to enable the ongoing management and improvement of noise emissions from the Project. The monitoring program will also include initial and periodic sound power level testing to confirm sound power levels of the equipment used on site.

Compliance monitoring will be carried out by independent, suitably qualified acoustic practitioners using methodologies developed in general accordance with the relevant Australian guidelines and standards.

5.12.3 Low Frequency Noise

Submission Reference: SIG 27

Issue

One submission questioned the low frequency noise methodology. The respondent (Submission Reference SIG27) states:

"The Broner method is often relied on but has not been adopted by the EPA. In the proposed amendment to the INP, currently on public exhibition, the Broner method is not included. It is not acceptable to rely on a low frequency noise criterion that essentially ignores the INP LFN correction. If the receivers where the LFN should be applied in accordance with the INP, where duly corrected, the outcome of the Report would be vastly different and many more receivers would be significantly affected."

Response

A discussion of low frequency noise is provided in the response to the EPA Submission in **Section 4.8.7**.

5.12.4 Voluntary Land Acquisition

Submission Reference: SIG27:

Issue

"For very low noise areas where the actual background noise level is very low (say 20-25 dBA), the impacts are much greater. In my opinion the Table 4-3 misrepresents the impacts of the expected mine noise on residential receivers in areas with very low background noise levels."

Response

As discussed in the response to submission P15_1, operational noise impacts for the Project have been assessed in accordance with current noise policy for NSW, including the INP (EPA, 2000) and the DP&E VLAM Policy (DP&E, 2014). Noise criteria are determined with respect to a background noise levels, and in accordance with the INP (EPA, 2000) the minimum assessable background noise level is 30 dB(A) regardless of whether the actual background is lower than this.

5.12.5 Contiguous Land Assessment of Locaway Property

Submission Reference: O6

Issue

Submission Reference O6 states:

"... we note that there has been no assessment of the percentage of contiguous land owned by Locaway which is affected above the PSNL."

Response

Section 5.5 of the NBIA (Appendix Q of the EIS) presents the required assessment of noise impacts over more than 25% of the land in accordance with the DP&E VLAM Policy (DP&E, 2014). The NBIA states that where more than 25% of adjacent continuous blocks owned by the same freehold is predicted to experience noise levels of more than the recommended maximum amenity noise levels (as defined in Table 2.1 of the INP), voluntary land acquisition rights should be applied. The assessment criteria are not the PSNL as identified by the respondent. The maximum recommended amenity noise levels for rural type receivers are:

- $L_{Aeq,period}$ 55 dB(A) during the day;
- $L_{Aeq,period}$ 50 dB(A) during the evening; and
- $L_{Aeq,period}$ 45 dB(A) at night.

Comparison of the 15 minute (intrusive) noise levels predicted in this assessment against the acquisition criteria presents a worst case approach, as it is not generally accepted that the equivalent 15 minute noise level will be sustained over an entire period.

The predicted noise levels presented in the NBIA indicate that noise levels in the vicinity of receivers 56 and 57A, 57B and 57C are nonetheless below these criteria.

5.12.6 Reasonable and Feasible Mitigation

Submission Reference: SIG27

Issue

"In Table 5-3, the proponent has rejected all bund walls considered as they are 'Not reasonable'. I do not have enough information at hand to agree or disagree with the rejection of bund walls as a mitigation measure. Due to the large volume of earth being moved to create the proposal, the creation of earth berms would appear to be a reasonable method of noise control. The Table includes a heading labelled 'No of Receivers Significantly Impacted in Year 3'. The definition of 'Significantly affected' is 5 dB above the PSNL. The table excludes receivers that are predicted to receive 1-4 dB above the PSNL. In my opinion, all receivers that are affected should be included in the table, not just those +5dB above the PSNL. In my opinion, due to the low background noise level in the area, all Affected Receivers' will be significantly affected."

Response

Section 5.4.1 of the NBIA (Appendix Q of the EIS) presents an analysis of the investigations into feasible and reasonable mitigation measures explored for the Project.

The INP states that feasibility relates to engineering considerations and what is practical to build. Reasonableness relates to the application of judgement in arriving at a decision, taking into account noise mitigation benefits and noise level reductions, the cost of mitigation versus the benefit, community views and the noise levels for affected land uses.

Measures to control the propagation path were investigated, involving a quantitative assessment of noise bund implementation; this was completed for up to 18 meteorological scenarios. The assessment identified that haul truck movements were identified as being a primary noise contributor to the northern receivers. Further, quantitative modelling identified that the implementation of noise bunds did not effectively mitigate noise emissions (predominantly during inversion conditions) and was not considered reasonable, particularly with the requirement to provide shielding along the entire length of the haul routes.

5.12.7 Cumulative Impacts

Submission Reference: SIG8, SIG11, P122, P118, P113_1

Issue

There were several submissions regarding cumulative impacts of noise on a regional scale.

Response

Cumulative noise impacts have been assessed in Section 5.8 of the NBIA (Appendix Q of the EIS) in accordance with the requirements of the INP (EPA, 2000). Cumulative impacts are not expected to occur due to the absence of existing or proposed industrial noise sources in the immediate vicinity of the Project. Background monitoring indicated that the sensitive receivers in the area are not exposed to significant industrial noise from any other sources, such as mining or industrial facilities.

The proposed mining activities are not expected to generate cumulative noise impacts with existing Bylong Quarry and other agricultural practices in the valley. The other mines within the MWRC LGA have also been assessed to be too distant to result in cumulative impacts. Bylong Quarry is located in the northeast of the Project Boundary and is distant from the proposed surface activities associated with the Project.

Furthermore, the NBIA has quantified where Project noise impacts extend beyond the Project Boundary and identified appropriate management and mitigation measures in Section 11 of the NBIA.

5.12.8 Rail Noise

Submission Reference: O1, O5, O8, SIG8, P187, P201

5.12.8.1 Train Movements

Submission Reference: O1, O5, O8

Issue

A number of submissions from key organisations (with similar interests in rail noise impacts) queried the number of train movements considered in the noise assessment.

O1 states:

“WCPL is currently preparing an Environmental Impact Statement (EIS) to seek approval ... for the Wilpinjong Extension Project... (i.e. no change to existing approved average and maximum daily rail movements to and from the Wilpinjong Coal Mine)...the [Bylong Coal] Project is estimated to require an annual average of two return train movements per day, with a peak of ten return train movements per day to transport the product coal from the site at any one time.”

“The Bylong Coal Project EIS Noise and Blasting Impact Assessment (Pacific Environment Limited, 2015) also states:

"The [Bylong Coal] Project is expected to generate on average up to 500 trains per year with a maximum of 720 trains per year. ...The report then goes on to explain this equates to a maximum of 1,440 rail movements (i.e. in both directions) in one year, based on a 8,600 tonne payload train. The above descriptions correspond to a maximum of 20 additional rail movements (in both directions) per day."

Response

As explained in Section 3.5.3 of the EIS, the Project proposes an annual average of two return train movements per day, with a peak of ten return train movements per day to transport the product coal from the site at any one time. The presumption that this corresponds to 20 rail movements per day is incorrect.

Appendix B provides a letter from ARTC confirming the ability for the existing Sandy Hollow to Gulgong Railway line to accommodate the Project's rail movements.

5.12.8.2 Rail Noise Impacts on Murrumbo Station

Submission Reference: O5

Issue

The submission received was particularly concerned with the impact of rail noise on the operation and value of the Murrumbo Station, from the Sandy Hollow Railway that passes through their property.

Response

The rail noise assessment described within Section 8 of the NBIA has been completed in accordance with the NSW Rail Noise Guideline.

The rail noise for existing contracted and approved movements is expected to exceed the criteria at distances of up to 50 m from the track. The addition of the Project related movements is not expected to cause a noticeable increase in the day or night rail noise levels and no additional receivers are expected to be affected.

The residential areas within the Murrumbo Station property have been included in this assessment and are located more than 500 m from the Sandy Hollow to Gulgong Railway line. As a result, the predicted impacts of the Project at residential areas within the property are not expected to generate significant additional noise issues.

5.12.8.3 Noise Assessment of Additional Train Movements

Submission Reference: SIG8, P201

Issue

A few submissions asserted that the noise assessment of additional train movements was poor, in regards to additional time for trains idling in rail loops, time considered for loading operations, 24-hour operations and increased noise levels at neighbouring properties.

Response

The rail noise assessment described within Section 8 of the NBIA has been completed in general accordance with the NSW Rail Noise Infrastructure Guideline. The assessment determined the overall increase in noise level due to additional rail traffic resulting from the Project. These increases are applicable to train passby events at residential properties along the Sandy Hollow to Gulgong Railway line. Section 7.9.4 of the EIS explains the requirement for control of noise emissions from rolling stock, for operation on the ARTC managed rail network to comply with EPL 3142.

As discussed in the previous response, the addition of the Project related movements is not expected to cause a noticeable increase in the day or night rail noise levels. Noise levels from rail noise are predicted to meet relevant criteria at distances exceeding 50 m from the track. The residences associated with submission P201 are located at least 3 km from the rail line and are not anticipated to experience noticeable changes to noise levels compared to existing at these distances.

5.12.9 Road Noise

Submission Reference: P226

Issue

There was concern regarding noise associated with the widening of the Upper Bylong Road and the impact it will have on the property of submission P226.

P226 states:

"The widening of Upper Bylong Road which runs adjacent to my property will increase noise ... to an unacceptable level, severely impacting both horse and cattle breeding...

KEPCO management has recognized that it will be impossible for me to live on my property once mining commences due to the impact of noise and dust. As a consequence I understand that my property is noted as an impacted holding subject to acquisition upon request."

Response

The NBIA (Appendix Q of the EIS) identified that receiver 69 will experience significant noise levels as a result of the initial open cut mining operations for the Project. Air quality impacts are predicted to remain within the relevant criteria. As a result of the predicted residual noise impacts, this receiver should be afforded at property noise mitigation and management measures, whilst also being subject to acquisition upon request, in accordance with the VLAM Policy.

KEPCO has been in ongoing discussions with this landowner with regards to the predicted noise impacts on the property including the likelihood of them being provided acquisition rights if planning approval is granted.

5.12.10 Health Impacts from Noise and Blasting

Submission Reference: P81, P99, P222, P113_1

Issue

There were a number of submissions raising concerns over health impacts from noise and blasting, in regards to increase in noise from traffic, noise pollution, blast overpressure and low rumbling sound.

Response

The NBIA has been completed in accordance with the requirements of current policy, including the INP (EPA, 2000), the ANZEC (1990) guidelines and relevant Australian standards. A key objective of the INP is to establish “*criteria that would protect the community from excessive intrusive noise and preserve amenity for specific land uses*”. The INP specifies that reactions to noise can vary and “*in extreme cases health can be affected, but generally it appears that annoyance can occur well before there is a question of health impact*” (EPA, 2000).

The noise limits enforced by the INP are lower than limits established by the world health organisation in *Guidelines for Community Noise* (WHO, 1999), which takes into consideration hearing damage, mental and physical health and wellbeing. The ANZEC (1990) blasting guidance establishes limits for blast noise (overpressure). These limits were established to manage annoyance and are significantly lower than impulsive noise levels at which hearing damage occurs. The ANZEC limits are lower than equivalent guidelines for open cut mining and quarrying in the United Kingdom and the United States of America for both overpressure and vibration.

5.12.11 Impacts on Onsite Workers

Submission Reference: P113_1

Issue

A submission was received outlining concern for the health impacts from noise and blasting on onsite workers such as the continuous high impulse noise levels created by the drilling, digging, loading, hauling and dumping of the diesel-powered machinery.

Response

Mining activities are conducted in accordance with established methodologies and standards to minimise health impacts to workers. The implementation of occupational health and safety protocols, management measures and training will minimise potential risks to onsite workers.

This includes, in the case of blasting, trial blasts to develop suitable Maximum Instantaneous Charge (MIC) and blast design to meet vibration limits, which will be outlined in the Blast Management Plan for the site. Additionally, exclusion or buffer zones are implemented prior to each mine blast to ensure that workers are not exposed to blasting impacts.

Fleet vehicles and equipment will be selected to achieve a specified sound power level specification and health and safety procedures, safety exclusion zones and appropriate PPE and training will be implemented to reduce exposure to noise.

5.12.12 Quality of Life

Submission Reference: P118

Issue

Several submissions were received with regard to impacts on quality of life from noise and blasting.

Response

As discussed in the previous response, the noise and blasting impacts of the Project have been adequately assessed in accordance with the relevant guidelines and policies. Noise assessment and impact policy in NSW has generally been devised to account for the nuisance aspect of industrial activities, particularly in rural environments such as the Project. While the Project activities will be perceptible and audible at a number of residences in the area, the implementation of the current noise policy and voluntary mitigation and acquisition measures acts to manage and minimise the residual impacts associated with operational noise.

As discussed in Section 7.9.4 of the EIS (and Section 7 of the NBIA), a noise management plan (and associated monitoring programs) will involve the continuous monitoring of noise levels generated by the operations in and around the Project. Additionally, monitoring will be conducted and assessed by an independent contractor to ensure the ongoing compliance with the relevant regulatory requirements.

In terms of explosions, blasting is to be limited to daytime hours only and will therefore not occur 24 hours a day. The impacts of blasting have been assessed in consideration of a range of applicable limits, and the results of the NBIA have indicated that no private residence will experience blasting overpressure or ground vibration levels in exceedance of the ANZEC guideline limit. These limits have been devised to “*minimise annoyance and discomfort to persons at noise sensitive sites*” (ANZEC, 1990).

As discussed in Section 7.10.4 of the EIS (and Section 11 of the NBIA), a Blast Management Plan will be developed for the Project. The Blast Management Plan will include the enforcement of blasting hours, use of trial blasts to develop site laws based on site specific monitoring data, condition surveys at sensitive receivers and heritage receivers to ensure these limits are met. Monitoring will be completed in accordance with AS 2187.2-2006 *Explosives - Storage and use - Use of explosives* and the ANZEC guidelines.

5.12.13 Amenity Impacts from Noise

Submission Reference: P132 and P201

Issue

P132 states:

"We are also concerned about the possible ... loss of amenity due to noise and traffic impacts."

P201 states:

"It is simply a quiet, peaceful valley where farms, and animal breeding operations have existed undisturbed for over a century... that atmosphere has become the home to many locals...many people come to visit for the purpose of enjoying the atmosphere of peace and tranquillity... That amenity is something which has been prized and enjoyed by the family, and employees for many decades. The peaceful valley with such amenity will be entirely destroyed by the proposed mine and its operations. ...The construction of, and the continuous operation of, the mine for 24 hours per day, seven days per week, for each week of the year for a period of 25 years... will notwithstanding any measures which can be taken, adversely impact by way of noise, traffic and equipment fumes and dust on the farm, from which impacts there can be no escape for those who live on, work on and use the farm for its amenity and enjoyment."

Response

The noise assessment has been completed in accordance with current policy, including the NSW INP (EPA, 2000) which has as specific objectives to establish "*criteria that would protect the community from excessive intrusive noise and preserve amenity for specific land uses*". While noise impacts are an inherent result of industrial development, the enforcement of industrial noise goals acts to minimise the impacts on noise amenity in the context of the environmental setting in question.

The results of the NBIA (Appendix Q of the EIS) demonstrate that operational noise levels will generally be below the amenity criteria for rural residential areas as defined in the INP (EPA, 2000) at the closest private receivers, with exception of receiver 69 which is predicted to receive significant noise impacts. The implementation of ongoing monitoring and management programs will ensure the ongoing compliance of the project and identify any sources of sustained exceedances, as discussed in **Section 5.12.2**.

5.12.14 Peer Review

Submission Reference: SIG27

Issue

SIG27 states in Appendix 4, "It is unusual that the date of the Peer Review 18 June 2015, whereas the date of the Report is 10 July 2015. It is apparent that the Final Report has not been peer reviewed."

Response

Modelling methodology and results were subject to detailed peer review prior to finalisation of the report. Earlier versions of the report were also subject to peer review. The final version of the report included some minor formatting, wording updates and refinements in readiness for public exhibition within the EIS. The overall results and conclusions presented within the final report remained consistent with that of the earlier versions of the report.

5.13 BLASTING

5.13.1 Blasting Impacts

Submission Reference: SIG11, P15_1, P15_2, P201

Issue

There were a few submissions that raised concerns regarding impacts from blasting in relation to sensitive features, particularly Tarwyn Park House and an Aboriginal rockshelter.

Response

Section 10 of the NBIA (Appendix Q of the EIS) presents the blasting predictions for heritage and infrastructure items. The results indicated that vibration and overpressure limits may be potentially exceeded at Tarwyn Park, Harley Hill Cottage and Swiss Cottage.

Blasting management and mitigation measures have been recommended to assist in the control and reduction of adverse impacts on these receivers. A Blast Management Plan will be developed to appropriately identify and manage potential impacts at specific heritage receivers. These measures included trial blasts to develop suitable Maximum Instantaneous Charge and blast design to meet vibration limits, blast monitoring and ongoing condition surveys. The undertaking of these measures will ensure that blasting occurs in a manner that mitigates potential impacts at these sensitive locations. Condition surveys proposed will provide ongoing information as to the in-situ condition of the features identified.

5.14 ABORIGINAL HERITAGE

5.14.1 Aboriginal Cultural Heritage Impacts and Adequacy of Assessment

Submissions: SIG1, SIG2, SIG3, SIG5, SIG7, SIG6, SIG9, SIG11, SIG12, SIG13, SIG14, SIG15, SIG17, SIG18, SIG19, SIG20, SIG22, SIG25, SIG27, P6, P7, P8, P10, P11, P12, P13, P21, P22, P23, P24, P25, P29, P30, P31, P32, P33, P35, P36, P37, P38, P39, P40, P44, P45, P48_2, P53, P55, P56, P57, P58, P59, P62, P66, P70, P71_1, P74, P75, P80, P82, P83, P84, P85, P86, P87, P88, P89, P91, P92, P96, P97, P98, P100, P104, P105, P108, P110, P114, P116, P117, P119, P120, P130, P131, P132, P133, P135, P141, P142, P143, P149, P153, P154, P163, P166, P173, P175, P176, P177, P178, P180, P181, P182, P186, P190, P192, P195, P196, P199, P202, P203, P204_2, P205, P211, P212, P217, P224, P310_2, P67_2, P233, P234, P235, P236, P237, P238, P239, P40, P241, P242, P243, P244, P245, P246, P247, P248, P249, P250, P251, P252, P253, P254, P255, P256, P257, P258, P259, P260, P261, P262, P263, P264, P265, P266, P267, P268, P269, P270, P271, P272, P273, P274, P275, P276, P277, P278, P279, P280, P281, P282, P283, P284, P285, P286, P287, P288, P289, P290, P291, P292, P293, P294, P295, P296, P297, P298, P299, P300, P301, P302, P303, P304, P305, P306, P307, P308, P309, P310_1, P311, P312, P313, P313_2, P314, P315

Issue

A number of stakeholders raised concerns over the unacceptable impact and loss of Aboriginal cultural heritage, including the ochre quarry and grinding grooves. Stakeholders also questioned the adequacy of the assessment.

Response

As outlined in Appendix S of the EIS a comprehensive AACHIA was undertaken to inform the EIS. As stated in the AACHIA, 216 archaeological sites have been identified within the Project Impact Boundary. Approximately 42% of the sites/features are not anticipated to be impacted at all and approximately 40% of the sites/features which are predicted to be impacted are of low regional archaeological significance. Thus approximately 83% of sites/features will either not be impacted, or are of low regional archaeological significance. The number of sites identified within the Project Impact Boundary is consistent with that identified for other mining related projects with similar study areas.

The impacts have been assessed in accordance with the OEH guidelines. An assessment has been undertaken which demonstrates that the cumulative impact of the Project is low. This is outlined in Section 8 of the AACHIA.

Mitigation and management measures have been devised for the sites/features which are proposed to be impacted either directly (from open cut mining) or indirectly (from underground mining).

For sites and features to be impacted directly by mining within the Project Disturbance Boundary, surface collection will be undertaken (including artefact scatters, isolated finds and modified trees in accordance with OEH protocols).

It is recognised that the sites and features located within the underground mining area may be indirectly impacted by subsidence. The Subsidence Ground Movement Predictions and Impact Assessment (Appendix H) predicted surface cracking with a width of 25mm to 50mm in flatter areas, and in the order of 50mm to 100mm in steeper areas, covering a conservative area of less than 1% of the Subsidence Study Area. Although the degree of disturbance varies depending on the remediation method and access constraints, the total disturbance is expected to be less than 10% of the Subsidence Study Area (even when using conservative estimates). In some areas, surface cracking may infill through natural processes, and will not require any proactive remediation. Other areas may not be practically accessible for remediation activities and may likely naturally remediate over time. Hence, it is unlikely that the scattered artefacts or isolated finds themselves will be impacted by surface cracking. Any remediation work required for subsidence will be undertaken in such a manner so as to avoid impacts to artefact sites, where possible.

Further in response to comments by OEH (addressed in **Section 4.11.15**), Site OQ001 has been re-examined by a rock art specialist with expertise in the management of ochre quarries. This investigation has identified that this site is an ochre source, however there is no definitive evidence of extraction. Based on this finding, the archaeological significance of this site will be reassessed to be “low”. The site remains of “high” significance because of its cultural values.

Four grinding groove sites were identified in the Study Area, of these, three are outside the impact area. GG04 is the only grinding groove in the Subsidence Study Area. There are options for monitoring and mitigating impact to this site as part of the Extraction Plan (or PSMP) and Environmental Management Plan (EMP) will be developed which will contain a TARP to address potential impacts to GG04. Further detail has been provided in response to the SIG 11 submission (refer **Section 5.4.4**).

The impact to the ochre source and sandstone formations has been assessed in Section 8 of the AACHIA for DP&Es consideration.

As detailed in Section 7.11.4 of the EIS, specific mitigation and management measures will be developed to minimise any impacts on the ochre site, including reasonable and feasible actions to reduce the potential for rockfalls or cracking of this site. Further, prior to the commencement of any works or actions that have the potential to impact the ochre site, an archival recording and site specific management plan will be prepared.

5.14.2 Survey Coverage

Submission Reference: SIG27

Issue

The submission questioned the survey coverage and mapping of transects.

Response

Survey coverage is documented according to OEH Guidelines in Section 6 and Appendix 2 of the AACHIA, this includes mapping of the survey units. In addition, each week the RAPs were issued with a report which showed transects covered in the previous week. This issue is further addressed under Issue 9 in response to the OEH submission.

5.14.3 Aboriginal Heritage Values on a Landscape Level

Submission Reference: SIG11

Issue

This submission commented that the Aboriginal heritage values of the Bylong Valley should be considered on a landscape level and mining will unacceptably alter the Indigenous cultural landscape.

Response

Aboriginal use of the landscape was considered in Section 6 of the AACHIA. The AACHIA showed that Aboriginal occupation in the Dry Creek catchment represented campsite occupation in open contexts, as well as rockshelters and specialised activities such as hatchet sharpening. By contrast, the AACHIA explained that the Bylong River Valley catchment was likely used for campsite occupation, as evidenced by surface artefact sites.

As per the discussion in Section 7.1 of the AACHIA, the RAPs identified the whole of the landscape to be of moderate to high significance. The archaeological significance assessment is based on the physical evidence of Aboriginal occupation and thus individual site assessment was undertaken as per the OEH criteria (2011:9-10).

It is considered important to recognise that the landscape of the site of the Project has been subject to alterations and modifications from earlier land use practices as outlined in Section 4.5 of the AACHIA. Those practices have included clearing, grazing, cropping, tracks, fencing, farm buildings, as well as construction of dams and contour banks and other human modified activities associated with the land uses over time. A rock quarry for road works and other purposes has operated in the north-eastern parts of the Survey Area to the south of Bylong Valley Way. The land use activities have disturbed much of the topsoil and subsequently displaced many of the artefacts; as such, it is considered that this landscape is already substantially altered.

The further alteration of the landscape as a result of mining has been assessed in Section 8 of the AACHIA (Appendix S of the EIS).

5.14.4 Significance of Ochre Site and Scarred Trees

Submission Reference: SIG11, SIG27

Issue

This submission stated that the significance of the ochre quarry and scarred trees is understated in the ACHIA and the Project should avoid the grinding grooves and ochre quarry.

Response

The assessments of significance were been carried out in accordance with the OEH guidelines (2011) and is documented in Section 7 of the AACHIA (Appendix S of the EIS). Their respective levels of significance are factually reported as required by the OEH criteria.

In response to OEH's submission (see **Section 4.11.15**), a rock art specialist was engaged to provide further assessment of the Ochre site (OQ001) in January 2016.

The assessment found "*The lack of any archaeological evidence for quarrying at the site would warrant its exclusion as an archaeological site (Aboriginal quarry) under the National Parks and Wildlife Act 1974... However, the location of the ochre can be recorded on AHIMS as a cultural site, this designation reflects its significance to the local Aboriginal community*". A copy of the assessment is presented in **Appendix L**.

5.14.5 Continued Access to Aboriginal Sites

Submission Reference: SIG11

Issue

SIG11 commented that the quarry and one formation is in the State Forest and is currently accessible to the Aboriginal people, and that the Mine Plan should be amended to ensure continued access to these sites for the Aboriginal community.

Response

The ochre site and some of the sandstone sites are located in the Bylong State Forest which is accessible to the public. Access can be gained from the east, as well as the west (via KEPCO land). Access by the RAPs to areas on land owned by KEPCO is able to be arranged via the KEPCO site personnel and this will continue regardless of the outcome of the mine consent, provided it is safe to access these areas.

Prior to the commencement of longwall mining, Extraction Plans (or PSMPs) and Environmental Management Plans (EMP) will be developed which will contain a TARP to be implemented in the event that impacts on sensitive landscape features or sites assessed as having conservation values are anticipated or observed.

The Extraction Plans and EMPs will detail inspection regimes, layout of monitoring points, parameters to be measured, monitoring methods and accuracy, timing and frequency of inspections.

These documents require regulatory approval prior to the commencement of longwall extraction of a particular panel. For each new longwall panel, the Extraction Plans and EMPs will be revised to incorporate actual subsidence impacts recorded from the completed longwall panels in the vicinity.

5.14.6 Differences Between HHIA and AACHIA

Submission Reference: SIG11

Issue

SIG11 raised concern with the differences between the HHIA (Appendix T of the EIS) and the AACHIA, particularly in respect to history and description of individual sites.

Response

The AACHIA was written in accordance for the relevant OEH Guidelines and other guidelines which deal with Aboriginal heritage. Different guidelines apply to European/historic heritage assessment. The methods for assessing significance also differ due to the different statutory regimes that apply their protection whereby Aboriginal heritage is protected under the NSW *National Parks and Wildlife Act 1974* and European heritage is protected under the NSW *Heritage Act 1977*.

Thus the description of Aboriginal sites compared to historic heritage sites will differ because of the different legislative and regulatory requirements. Historic records of Aboriginal occupation are not as detailed as records of European occupation and this is largely due to the differing attitudes of settlers over the last 200 years, and the availability of Aboriginal records to the general public. As such, historic records for Aboriginal occupation in the region are not as detailed, due to biases in the primary sources. As such, the archaeological record often provides a superior source of evidence than the historic record.

5.14.7 Significance Assessment

Submission Reference: SIG11

Issue

SIG11 raised that the AACHIA takes a fragmentary approach to heritage value, using lists and percentages to quantify the impact of the mine and down plays the importance of the sites.

Response

As per the discussion in Section 7.1 of the AACHIA (Appendix S of the EIS), the RAPs identified the whole of the landscape to be of moderate to high significance. The archaeological significance assessment is based on the physical evidence of Aboriginal occupation and use of the land. Individual site assessment was undertaken as per the OEH criteria (2011:9-10).

The assessment of significance has been undertaken for all of the sites and this is detailed (qualitatively) in Appendix 7 of the AACHIA (Appendix S of the EIS). The heritage value of the Aboriginal archaeological record has been identified qualitatively; however, in order to assess the extent of impact a quantitative approach is needed to identify which sites may be impacted by the Project. The value of the highly significant sites and proposed impacts are discussed in detail in Sections 7, 8 and Appendix 7 of the AACHIA.

5.14.8 Adequacy of Assessment

Submission Reference: SIG27

Issue

SIG27 raised concern that there was a disparity amount of text covering cultural significance versus archaeological significance. Submission questions compliance with OEH and Burra Charter guidelines. Submission questions that some of the detail on significance is in an appendix. Submission questions separation of cultural features from archaeological sites. Cultural value of quarry site not discussed.

Response

The perception of disparity in the amount of text covering cultural significance versus archaeological significance arises partially from the methodology described in **Section 5.14.6** for identifying significance and from the information available to the author. The methodology for identifying archaeological significance requires assessment against rigid OEH guidelines and this requires robust justification in documentation.

The cultural significance of the sites identified within the AACHIA was identified by the RAPs. As appropriate, RAPs documented the cultural significance of the sites in a holistic manner since it was indicated that they did not want to individually rank the significance of the sites or features.

Compliance with OEH and Burra Charter Guidelines is explained in Sections 7.1 and 7.2 of the AACHIA. The appendices are part of the assessable material of the AACHIA and are to be considered along with the contents of the main document. The reasons for separation of cultural features from archaeological sites are outlined in Section 5.4.2 of the AACHIA, in accordance with the governing criteria of the AHIMS database. Both the cultural features and archaeological sites have been identified by the RAPs to hold cultural value and both have been assessed in Section 7 of the AACHIA. It is acknowledged that the archaeological sites have cultural value and this is also documented in Section 7 of the AACHIA.

The Ochre site was assessed to have high cultural significance to the RAPs because it may have been used for ceremonial and spiritual purposes. The different colours of ochre were identified by RAPs as having meaning with regards to gender roles, but they did not want any further documentation on this made publically available.

In light of OEH's submission, a rock art specialist was engaged to provide further assessment of the Ochre site in January 2016. The assessment found *"The lack of any archaeological evidence for quarrying at the site would warrant its exclusion as an archaeological site (Aboriginal quarry) under the National Parks and Wildlife Act 1974... However, the location of the ochre can be recorded on AHIMS as a cultural site, this designation reflects its significance to the local Aboriginal community"*. A copy of the assessment is presented in **Appendix L**.

The scarred trees were identified as having high cultural value because of their rarity, but also because they showed evidence for the practice of bark extraction for use as shields, coolamons and similar implements.

The grinding grooves were identified as having high cultural value because of their rarity in the locality as well as showing evidence for hatchet sharpening activities as well as being in areas that appeared to have been occupied on a more regular basis (due to the length of time required for such sharpening practices).

The sandstone formations CUL004 and CUL007 were considered by some RAPs as having high cultural significance because these formations resemble anthropomorphic and zoomorphic features in the landscape which could have been used for navigation or have ceremonial meanings. Not all RAPs agreed with this interpretation.

5.14.9 Clarification on Cultural Features

Submission Reference: SIG27

Issue

SIG27 also requested clarification on cultural features identified in the ACHIA. SIG27 also questions the contents of Table 26 claiming that cultural features are not addressed.

Response

Section 5.4.2 of the AACHIA (Appendix S of the EIS) is clarifying that Aboriginal Places are areas of high significance which have been gazetted by the Minister. The cultural features do not meet the criteria for Aboriginal Places or for registration as archaeological sites in the AHIMS database.

The sentence that cultural features do *"not conform predictive models based on environmental factors such as landforms and drainage"* should be read as generally do not 'conform to archaeological models.' This is because they are cultural features rather than archaeological sites modelled in Section 5.6 of the AACHIA. Section 7.1 of the AACHIA covers the cultural values of the cultural features on the basis of the discussions held with RAPs on 3 & 4 July 2014 and any other correspondence received from the RAPs. Section 7.1 is not related to Section 5.4 of the AACHIA.

Table 26 of the AACHIA includes the cultural features identified for the Project. These features appear in rows 6 and 7 of the Table 26 of the AACHIA.

5.14.10 State Significance of Ochre Site

Submission Reference: SIG27

Issue

The submission from SIG27 questions that the ochre site is not of state significance. Submission makes an association between significance and impact for the ochre site. Submission questions the significance assessment of scarred trees given the destruction of other scarred trees across NSW. Submission suggests that controlled removal of the scarred tree is not a form of conservation.

Response

The reasoning behind the classification of the ochre site is clearly explained in Section 7.3.2 of the AACHIA. The description of significance needs to follow the criteria for the assessment of significance. The question of impact to a site does not form part of the OEH criteria for significance assessment.

The significance assessment of the scarred trees is clearly laid out in Appendix 7 of the AACHIA. Given the nature of the proposed impacts, the scarred tree will be destroyed if left in-situ. The controlled removal of the scarred tree is the only form of conservation available given the proposed impacts.

5.14.11 Credentials of Experts

Submission Reference: SIG27

Issue

This submission requested information on the credentials of the authors and the lack of ethnographic coverage of the area.

Response

Under the OEH guideline, *the Code of Practice for Archaeological Investigation of Objects in NSW* (2010), the following skills are required for professions undertaking Aboriginal heritage assessments:

- A minimum of a bachelor's degree with honours in archaeology or relevant experience in the field of Aboriginal cultural heritage management;
- The equivalent of two years full-time experience in Aboriginal archaeological investigation, including involvement in a project of similar scope; and
- A demonstrated ability to conduct a project of the scope required through inclusion as an attributed author on a report of similar scope.

The AACHIA was written by Tessa Boer-Mah, who holds a BA (Hons) in Aboriginal Archaeology and has over a decade of experience in cultural heritage management in Australia. She has undertaken and co-ordinated similar level heritage assessments for major projects which are available on the DP&E's website including Anna Bay Nature Resort, Airly Coal Mine Extension, Awaba Coal Project, Airly Coal Mine Extension and Newcastle Gas Storage Facility.

The review of ethnography is reliant on the available information. Differences noted in the level of detail in the AACHIA between the Section 5.4 and Section 5.1 reflects differences in the levels of information available to the author, rather than an omission.

5.14.12 Aboriginal Consultation

Submission Reference: SIG27

Issue

The level of Aboriginal consultation that was undertaken for the Project was questioned.

Response

Multiple opportunities were offered to the RAPs as part of the consultation process implemented for the Project. It should be noted that additional Aboriginal consultation was undertaken where requested by the RAPs and went over and above the requirements provided within the *Aboriginal Cultural Heritage Consultation Requirements* and the *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation*. Opportunities for individual interviews were offered to ensure cross cultural sensitivities could be explored on a confidential basis.

Opportunities for input were provided in chronological order:

- 18 March 2014 Initial Methodology sent out with opportunity for feedback;
- 11 April 2014 Planning Meeting to discuss Project;
- 17 April 2014 Revised methodology sent to RAPs, modified according to feedback received in writing and the planning meeting;
- 2 May 2014 Site visit to discuss the Project;
- 19 May – 27 June 2014, 5 week field survey with opportunities to discuss the Project;
- 26 June 2014 Written invitation to provide information on cultural values;
- 3 and 4 July 2014 Cultural values workshops to discuss cultural values identified during the Project;
- 19 December 2014 Draft report sent to RAPs for comment; and
- 20 January 2015 Meeting opportunity to provide comments on the draft report.

The OEH submission confirmed that *"The consultation is consistent with the procedures set out in the OEH consultation guidelines (2010) which is listed in the SEARs as the means for identifying Aboriginal people affected by the mine proposal and the method of engagement."*

5.14.13 Identification of Traditional Owners

Submission Reference: SIG27

Issue

This submission raised concern that RPS did not undertake a process to identify the traditional owners with the appropriate level of cultural knowledge for the area.

Response

In accordance with Section 4.1 of the Aboriginal Consultation Guidelines, a number of agencies were notified of the Project on 21 January 2014 (as detailed in Section 5.6.1 of the EIS). These agencies were asked to assist in identifying and notifying Aboriginal persons who may possess the cultural knowledge needed for determining the cultural significance of Aboriginal objects or places in the area associated with the Project. Requests were then mailed to all Aboriginal persons/groups that were identified inviting them to register an interest in the Project.

The OEH guidelines require the proponent to consult with any Aboriginal parties who register an interest. There is no formal process for differentiating RAPs and past experience suggests this is not culturally appropriate for these Projects.

5.15 HISTORIC HERITAGE

5.15.1 European Heritage Impacts

Submission Reference: SIG1, SIG2, SIG3, SIG6, SIG7, SIG9, SIG10, SIG11, SIG12, SIG13, SIG14, SIG15, SIG17, SIG18, SIG19, SIG20, SIG21, SIG22, O3, P6, P7, P10, P11, P12, P13, P14, P21, P22, P23, P24, P25, P30, P31, P32, P33, P35, P36, P37, P38, P40, P44, P45, P48_2, P48_3, P53, P55, P57, P58, P62, P66, P67_1, P70, P71_1, P74, P75, P80, P82, P83, P84, P85, P87, P88, P89, P91, P97, P100, P104, P108, P110, P113_1, P114, P116, P117, P119, P120, P124, P130, P131, P132, P133, P135, P141, P142, P143, P146_1, P146_2, P146_3, P148, P149, P153, P154, P162, P163, P166, P168, P172, P173, P176, P177, P178, P180, P181, P182, P186, P190, P192, P195, P199, P200, P203,, P204_1, P204_2, P205, P211, P212, P213, P215, P217, P219, P224, P228, P233, P234, P235, P236, P237, P238, P239, P40, P241, P242, P243, P244, P245, P246, P247, P248, P249, P250, P251, P252, P253, P254, P255, P256, P257, P258, P259, P260, P261, P262, P263, P264, P265, P266, P267, P268, P269, P270, P271, P272, P273, P274, P275, P276, P277, P278, P279, P280, P281, P282, P283, P284, P285, P286, P287, P288, P289, P290, P291, P292, P293, P294, P295, P296, P297, P298, P299, P300, P301, P302, P303, P304, P305, P306, P307, P308, P309, P310_1, P310_2, P311, P312, P313, P313_2, P314, P315, P67_2

Issue

A number of stakeholders raised concerns over the impact and loss of European heritage. It is noted that a number of these submissions were received as form submissions.

Repeated submissions (received as form submissions) commented:

“Important European heritage, including the Catholic Church Cemetery, Upper Bylong Public School and a number of historic homesteads and farm buildings that will be destroyed in the open cut. The social impacts on the Bylong community have already been devastating.”

Response

The HHIA (Appendix T of the EIS) notes that the Bylong Upper Public School, former Post Office, former community hall and former Catholic Church building and the Cemetery will be impacted by the Project. Mitigation measures have been proposed within the HHIA including consideration of relocation (depending on structural integrity and practical adaptive reuse) and archival recording for these items prior to disturbance. All measures are in accordance with the relevant legislative and regulatory requirements.

This is discussed further in **Section 4.2.13** and below.

5.15.2 European Heritage Impact Concerns

Submission Reference: SIG27

Issue

The following main issues were raised by the submission received from SIG27:

- 1. Proposed Interim Heritage Order for Tarwyn Park*
- 2. Multiple heritage items in Bylong should be locally listed*
- 3. The Catholic church, Bylong Upper Public School, Upper Bylong Post Office and Store and Upper Bylong Hall should be retained or relocated*
- 4. Tarwyn Park, Bylong Station and Homestation need occupation and conservation as an ongoing policy to maintain the buildings that are habitable now, through the whole mining process and many years [sic].*

Response

The listing of heritage items and the proposed Interim Heritage Order for Tarwyn Park (items 1 and 2 listed above) is discussed in **Section 4.2.13**.

The practical relocation and or adaptive reuse of the former Catholic church building, Bylong Upper Public School, former Upper Bylong Post Office and Store and former Upper Bylong Hall (item 3 above) is discussed in **Section 4.2.13**.

In relation to item 4 above, KEPCO is implementing its conservation management regime as described within the HHIA, including dilapidation studies of the key heritage items.

KEPCO will prepare a HHMP for the Project. Conservation Management Plans (CMPs) will be prepared for Tarwyn Park, Bylong Station Farm Complex and Homestation as a component of the HHMP. These CMPs which will explore potential options for occupation, adaptive re-use, maintenance and repair for these items.

5.15.3 Bylong Valley Landscape Conservation Area

Submission Reference: SIG11

Issue

SIG11 commented that “the project is proposed in an idyll rural landscape surrounded by World Heritage National Parks. The mine will demolish a 100 year old school, the former post office/general store, community hall and Catholic Church with cemetery holding the interred remains of a number of the early European settlers of the Valley.

The Bylong Valley Landscape Conservation Area was listed on the National Trust register in August 2013 for its agricultural and exceptional scenic value, for its scientific significance, as the place where natural sequence farming was invented, for its rich Aboriginal history for three Aboriginal tribes and a major trading route between the coast and the western plains.

A Deed poll applies to the Catholic Church cemetery site, which KEPCO claims will no longer apply if development consent is granted for the mine, by virtue of s28 of the EP&A Act.”

Response

The HHIA states that the Bylong Upper Public School, former Post Office, former community hall and former Catholic Church building and the Cemetery will be impacted by the Project. Mitigation measures have been proposed within the HHIA including consideration of relocation (depending on structural integrity and practical adaptive reuse) and archival recording for these items prior to disturbance. All measures are in accordance with the relevant legislative and regulatory requirements.

Section 7.13 of the EIS refers to a Deed Poll in relation to the land occupied by the former Catholic Church and Cemetery. The Deed Poll imposes a number of obligations relating to the maintenance and access to the Cemetery for representatives of the Catholic Diocese of Bathurst, direct descendants of those buried there and persons undertaking legitimate historical research.

In the event that development consent is granted to the Project, KEPCO understands that the Deed Poll will no longer apply by operation of Section 28 of the EP&A Act and clause 1.9A of the LEP.

Together, these provisions operate so as to enable KEPCO to carry out the Project despite the restrictions contained in the Deed Poll, if development consent is granted for the Project.

KEPCO has been and will continue consultation with the beneficiaries of the Deed Poll throughout the assessment of the Development Application for the Project.

The Bylong Valley Landscape Conservation Area (BVLCA) encompasses an area of approximately 486 km². The Project is situated in the approximate centre of the listing area and comprises an area of approximately 2.3% of the total listed area. Land within the BVLCA that will be impacted by the Project comprises farmland and sections of the Bylong River and Lee Creek noted for their scenic value.

Objectives of the Project Rehabilitation Strategy include returning land to its pre-mining land capability such that it is consistent with its current character. In addition, the HHIA recommends that the Strategy considers the impacted natural scenic values of the BVLCA when restoring the landscape.

5.15.4 St Stephen's Anglican Church and Cemetery

Submission Reference: SIG21, P48_3, P204_1

Issue

A number of submissions identified an incorrect statement in that the St Stephen's Anglican Church is not currently in use.

Concern was also raised that St Stephen's itself may be in jeopardy in the future as it is within Exploration Licence Areas.

Response

The point regarding use of the Church is duly noted. St Stephen's Anglican Church is identified and assessed in the HHIA as being of local significance.

A recognised heritage expert has confirmed that the error in the description regarding its use does not alter the assessment of significance as set out in the HHIA. The church is located outside the Project Disturbance Boundary and will not be directly impacted by the Project. However, visitors to the church may experience low visual impacts as a result of the Project. Visual impacts will be mitigated in accordance with the Mitigation Strategy outlined in Section 8 of the VIA (Appendix Y, EIS). KEPCO has and will continue to support the Bylong Hall Committee with funding so that it can, in turn, support the local community to assist with the ongoing maintenance of St Stephens Anglican Church.

5.15.5 Church Heritage

Submission Reference: O3

Issue

O3 stated:

“Whilst the consideration of all matters pertaining to the project is essential, the heritage with regards to churches in the township, and historical structures should not be overlooked. There was no mention of alternative churches in the main EIS document, at the very least. The measures suggested only considered recording and documenting these sites before development. The siting of the Upper Bylong Public School is of intrinsic concern for assessment.”

Response

The HHIA identified and assessed potential impacts to two churches from the Project. The Catholic Diocese of Bathurst ceased using the former Our Lady of the Sacred Heart Catholic Church and Cemetery at Upper Bylong in 2000 and in 2008 sold the site to an adjoining private landholder. The site including the former Church building and cemetery was later acquired by KEPCO. The former Catholic Church building and cemetery will be directly impacted by the Project. Mitigation measures for the former Church building include relocation (subject to structural integrity), archival recording and consideration of appropriate adaptive reuse strategies if there is enough local interest and support.

A Burial and Relocation Management Plan is being prepared which details the protocols for liaison with descendants and investigation of requirements for exhumation and relocation of the remains of those buried in the cemetery adjacent to the former Catholic Church building.

The Anglican Church will not be directly impacted however visitors will be indirectly impacted by distant views to the Project. Visual impacts on the Anglican Church, which is outside of the Project Disturbance Boundary will be mitigated in accordance with the Mitigation Strategy in Section 8 of the VIA.

The Bylong Upper Public School (which has been closed by NSW DEC) will be directly impacted by the Project and as such archival recording and consultation regarding potential relocation will be undertaken.

5.15.6 Cliff Lines

Issue

P132 stated:

"The KEPCO EIS (page 140) acknowledges that there will almost certainly be damage to the cliffs and rock falls from the cliff lines. These cliff lines are iconic and are essential to the cultural value and heritage value of the Bylong Valley. Iconic Australian landscapes cannot be replaced or rehabilitated with tree planting - they are an essential part of the national estate. The proposed destruction of a heritage landscape is a serious issue and sets a dangerous precedent for the preservation of iconic and valuable landscapes.

The dramatic cliff lines are currently visible from Bylong Valley Way and contribute markedly to the scenic value of the whole valley. The KEPCO EIS claims that the serious and irreversible damage to these cliff lines is not a problem because screening vegetation can be planted along the roadside thus making the damage hard to see by passing motorists. Using a similar argument, damage to cliff lines in the Bylong State Forest is discounted because these areas are not easily accessible to the public and therefore not easily seen. It is an egregious argument to say that features of a heritage landscape can be destroyed and then justify the destruction on the basis that the damaged cliffs can be screened from passing motorists. These cliff lines have intrinsic value not just a value for passing motorists."

Response

The HHIA acknowledges that natural landscape features which include cliff lines, form part of the Bylong Valley Cultural Landscape, imbuing it with aesthetic significance. As noted in Section 9.5.2 of the HHIA, once rehabilitation has been undertaken and the proposed mitigation measures completed, the Project will result in a moderate impact to the Bylong Valley Cultural Landscape.

In order to mitigate this impact, Section 10.6 of the HHIA has committed to completing pre-mining documentation including a photographic record and where possible, reinstatement of natural elements of the landscape post-mining.

The mine plan has been specifically designed to limit the impact on the three most prominent cliffs which are outside the subsidence study area (Section 7.1.3 of the EIS). The VIA carried out for the Project indicates that impacts to the two larger cliffs above the longwall panels (referred to as C5 and C6 in the EIS) will be screened from reasonable, every-day public vantage points by the ridge to the south-west of the Subsidence Study Area. Some smaller cliff impact locations may be visible from isolated locations outside the Subsidence Study Area but will generally be at distances greater than 1.5 km.

A discussion of the monitoring and mitigation management measures for the cliff lines in the vicinity of the Project is included in **Section 5.4.1**.

5.16 HISTORIC BURIALS

5.16.1 Exhumation of Graves

Submission Reference: SIG21, P113_1, P177, P180

Issue

There were a number of stakeholders that objected to the exhumation of graves from the cemetery adjacent to the former Catholic Church building at Upper Bylong.

A submission noted concern over the possibility of receiving one or more of the exhumed remains at St Stephen's Church for reburial.

Response

Extensive consultation has been undertaken regarding the relocation of graves as discussed in **Section 4.18.15**.

KEPCO is committed to full and inclusive engagement with all known descendants and relatives of those buried in the Upper Bylong Catholic cemetery. Concerted efforts have been made to engage with descendants via email, phone, face-to-face meetings and letters. Project newsletters and information updates have also been sent to known descendants to keep them abreast of project progress. Consultation will continue with descendants.

Commitments to mitigation and management strategies for the former Catholic Church and Cemetery are set out in the HHIA and summarised in Section 7.12 of the EIS.

A Burial and Relocation Management Plan will be prepared, which details the protocols for liaison with descendants and investigation of requirements for exhumation and relocation of the remains of those buried in the cemetery. The Burials and Relocation Management Plan will detail the following:

- Applications for Exhumation for each burial recorded in the Upper Bylong Catholic Cemetery, signed in accordance with the provisions of the *Public Health Regulation 2012*;
- Stakeholder liaison plans and procedures;
- Procedures for the exhumation, relocation and reburial;
- Location and requirements for forensic analysis and storage of skeletal material, prior to reburial;
- Procedure for accidental discovery of human remains; and
- Recommendations for selecting suitable locations for relocations and reburials.

Consultation is continuing with appropriate stakeholders regarding the exhumation and relocation process. Such stakeholders include relatives and descendants, community members, the Catholic and Anglican Diocese and relevant consent / approval authorities, in particular the NSW Health and MWRC.

The arrangements for the reburials and the relocation of grave markers will be determined in consultation with the various stakeholders including KEPCO, relatives and descendants, other community members, the Catholic and Anglican Dioceses the NSW Health and MWRC.

5.16.1.1 Exhumation of Graves

Submission Reference: P113_1

Issue

P113_1 is opposed to the removal of grandparents buried in the affected catholic cemetery in Bylong and expressed concerns over the covenant agreement in place with the Catholic Church.

Response

The ongoing consultation process with descendants and proposed management and mitigation measures are discussed in **Section 4.18.5**.

Section 7.13 of the EIS refers to a Deed Poll in relation to the land occupied by the former Catholic Church and Cemetery. The Deed Poll imposes a number of obligations relating to the maintenance and access to the Cemetery for representatives of the Catholic Diocese of Bathurst, direct descendants of those buried there and persons undertaking legitimate historical research.

However, if development consent is granted in relation to the Project, KEPCO understands that the Deed Poll shall no longer apply by operation of *Section 28 of the EP&A Act* and *Clause 1.9A of the LEP*.

Together, these provisions operate so as to enable KEPCO to carry out the Project despite the restrictions contained in the Deed Poll, if development consent is granted for the Project. KEPCO will continue to consult with the beneficiaries of the Deed Poll throughout the assessment of the Development Application for the Project.

5.16.2 Exhumation of Horses

Submission Reference: SIG10

Issue

One submission raised concern over the process for relocation of horse burials at Tarwyn Park.

Response

Further assessments undertaken by Higginbotham and Associates has indicated that two horses buried at Tarwyn Park are “relics” under the *Heritage Act, 1977* (i.e. Rain Lover and Ngawyni). The assessment identified there are remains of five racehorses known to be buried within the Tarwyn Park property – Rain Lover, Eleazar, Colourman, Ngawyni and Crazy Moon.

KEPCO is mindful of the historical and social value that these remains may hold for local residents, as well as the significance of these horses to the region’s equine history. To this end, consultation has been initiated with relevant stakeholders, including the tenants of Tarwyn Park and equine and racing industry representatives and organisations over appropriate mitigation and management strategies.

A Horse Burial Management Plan (HBMP) has been prepared, in consultation with key stakeholders, which outlines the necessary regulatory processes and appropriate management protocols and strategies for the excavation and relocation of the relics. Excavation and relocation will occur following Development Consent approval in consultation with key stakeholders.

5.17 SOIL AND LAND CAPABILITY

5.17.1 Soil Degradation

Submission Reference: SIG1

Issue

SIG1 raised concerns over the treatment and management of soil to be stripped from the mining area and the potential for loss of compositional, structural and hydrological characteristics.

SIG1 stated:

“Soils have differing compositions and structures as a result of their protracted development. Their agricultural values and hydrologic properties reflect this. It is ridiculous to contend that a soil which has been stripped, stockpiled (for how many months/years?), and then ‘emplaced’ will have retained its compositional, structural and hydrologic characteristics. The whole notion of soils being removed and replaced is part of the rehabilitation fable perpetuated by mining companies and seemingly accepted by government”.

Response

Section 17.5.3 and Appendix W of the EIS includes measures for stripping and handling of soil. A Soil Resource Management Plan will be developed, which will provide further detailed protocols for soil stripping and handling. Where possible stripped soils will be placed directly onto the area to be rehabilitated and spread immediately to avoid the requirement for stockpiling.

Where stockpiling is required, the stockpiling and stripping guidelines outlined in Appendix W will be adhered to. This will involve a range of measures to ensure the integrity of the soil is maintained, such as:

- Where topsoil must be stockpiled, efforts will be made to reduce compaction by keeping soil in as coarsely textured a condition as possible;
- Minimising vehicular traffic on soils to be stripped particularly soils sensitive to structural degradation;
- Stockpiles will be a maximum of 3 m in height and if stored for greater than 12 months will be shaped to be free draining, seeded, fertilised and treated for weeds prior to resspreading;
- Stockpiles will be monitored throughout the life of the Project. Records of observations will be retained and if required corrective action will be undertaken;
- Thorough seedbed preparation will be undertaken to ensure optimum establishment and growth of vegetation with all topsoiled areas lightly contour ripped to create a “key” between the soil and the overburden. Ripping will be undertaken on the contour, preferably when soil is moist. The resspread topsoil surface will be scarified prior to, or during seeding, to reduce runoff and increase infiltration via tilling with a fine tuned plough or disc harrow; and
- An inventory of designated areas and volumes of topsoil will be maintained to ensure adequate material is available for planned rehabilitation activities.

Examples of successful re-establishment of soil material and rehabilitation are discussed in Appendix W of the EIS.

5.17.2 Soil Survey Density within Subsidence Area

Submission Reference: SIG10 and SIG27

Issue

The submissions referenced above expressed concern that the Gateway Panel comments in regard to the risk ranking, and therefore the soil survey density, of the subsidence area was not adequately addressed in the EIS. The relevant gateway concerns are reproduced below:

The Gateway Panel does not accept the Applicant's view that subsidence impacts on verified BSAL soils are by general rule, “indirect and temporary”;

The risk rankings used to determine soil survey density are incorrect and ranked too low for accurate verification of BSAL affected by subsidence;

The potential impacts of subsidence on BSAL should have been assigned a higher risk ranking and land surveyed at a larger scale, egg 1:50,000 or larger, rather than the 1:100,000 scale used (SLR,2013a);

Response

The categorisation of the subsidence zone as 'Low' risk to soil resources, and that it would accordingly cause 'Indirect and Temporary' impacts on agricultural resources in the EIS has been challenged by several submissions.

The risk assessment provided in *Appendix V - Soil, Land Capability and Strategic Agricultural Land Assessment* (2015) categorised the impact on soil resources as follows:

- On non BSAL - B5 Low: Likely – very minor damage and minor impact to agricultural resources or industries. Can be effectively managed as part of normal operations; and
- On non Alluvial BSAL - C4 Low: Possible – Minor damage and/or short term impact to agricultural resources or industries. Can be managed as part of routine operations. Footnote 3 also states: 'BSAL on elevated land is not predicted to be impacted by subsidence'.

A reproduction of the risk ranking tables and definitions are provided in **Table 32** and **Table 33** below.

Table 32
Risk Ranking Tables

Table 6 Agricultural Impact and Risk Ranking Matrix					
Consequence \ Probability	A Almost Certain	B Likely	C Possible	D Unlikely	E Rare
1. Severe and/or permanent damage. Irreversible impacts	A1 High	B1 High	C1 High	D1 High	E1 Medium
2. Significant and/or long term damage. Long term mgt implications. Impacts difficult or impractical to reverse.	A2 High	B2 High	C2 High	D2 Medium	E2 Medium
3. Moderate damage and/or medium-term impact to agricultural resources or industries. Some ongoing mgt implications which may be expensive to implement. Minor damage or impacts over the long term.	A3 High	B3 High	C3 Medium	D3 Medium	E3 Medium
4. Minor damage and/or short-term impact to agricultural resources or industries. Can be managed as part of routine operations.	A4 Medium	B4 Medium	C4 Low	D4 Low	E4 Low
5. Very minor damage and minor impact to agricultural resources or industries. Can be effectively managed as part of normal.	A5 Low	B5 Low	C5 Low	D5 Low	E5 Low

Source: DPI-OASFS, 2013

The risk ranking associated with major Project domains on soil resources ranges from low to high (**Table 7**). **Figure 10** shows the risk rating of proposed Project domains across the Study Area.

Table 33
Project Domains for Risk Assessment

Table 7 Project Domains			
Project Domain		Risk Rating	Survey Scale
No.	Unit	Rating	-
1	Open Cut Mining Areas	A1-A3 – High	1:25,000
2	OEAs	A1-A3 – High	
4	Rail Loop	A3 – High ¹	
6	Water Storage Facilities	A3 – High ²	
3	Mine Infrastructure Area	A4 – Medium	1:50,000
5	Roads	A4 – Medium	1:50,000
7	Subsidence Study Areas - on non-SRLUP mapped BSAL	B5 - Low	1:100,000
	- on non-alluvial influenced BSAL	C4 - Low ³	
8	Stockpile Area	C4- Low	
	Nil Disturbance	Nil ⁴	1:100,000 – 1:250,000

1 Project domains will be left in place for future use

2 Area of land is small and impact on agricultural industries is minimal; however, as topsoil and subsoil will be significantly disturbed it has been assigned a high rating.

3 BSAL on elevated land is not predicted to be impacted by subsidence

4 No survey required for BSAL verification. Survey scale nominated to satisfy typical project SEARs

The result of the risk assessment dictated the intensity of soil inspection sites at a scale of 1:100,000 or within the recommended range of 1 site per 100 ha to 200 ha (with a minimum acceptable density of 1 site per 400 ha) Schoknecht *et al* in CSIRO (2008). This risk assessment and associated sampling strategy was discussed and agreed in concept with OEH and DPI-OAS&FS during a meeting on 23 January 2013 prior to the final field work being undertaken.

There are a total of 9 sites surveyed within the 1,714.3 ha subsidence disturbance footprint which equates to 1 site per 190 ha which is within the recommended range of site inspections for a 1:100,000 survey intensity scale, according to Schoknecht *et al* in CSIRO (2008). There is a total of 1,033.4 ha of land within the subsidence disturbance footprint greater than 10% slope, and an additional 160.6 ha of less than 10% slope but also less than 10h ha contiguous. Both of these categories are considered exclusion areas in the assessment of BSAL and therefore do not form part of the remaining BSAL Assessment area in which soil profile investigations are required. The remaining area with less than 10% slope in the subsidence disturbance footprint is 520.6 ha. A total of nine test cores were assessed for the soil survey within this area, which equates to a survey density of 1 site per 57 ha, which satisfies a 1:50,000 survey scale (recommended range 1 site per 25 to 50 ha with a minimum acceptable density of 1 site per 100 ha) (Schoknecht *et al* in CSIRO (2008).

Therefore the EIS survey scale satisfies the scale recommended by the Gateway Panel as well as the DPI Agriculture submission.

As noted in EIS Appendix W Rehabilitation Strategy and BSAL Reinstatement Strategy, the subsidence study area totals 1,714.3 ha and has a Rehabilitation Objective to *monitor erosion, ponding and surface cracking during operations and post closure*. Furthermore as stated in Table 5 the post-mining goal is to return the areas impacted by subsidence to their pre-mining land use and pre-mining LSC Class with pre-mining soil and landscape characteristics.

Accordingly, subsidence impacts on soil resources (including BSAL soils) have been determined to be indirect and temporary.

The submissions argue that subsidence causes impacts to the lands surface via surface cracking, topography changes and potential surface water ponding. Section 5.2.3 of Appendix H - Subsidence Ground Movement Predictions and Impact Assessment of the EIS states the areas of ponding of Dry Creek as a result of subsidence are predicted to be in the order of 50 m to 100 m long by a maximum of 1 m deep.

As described in detail in the EIS, it is acknowledged that temporary surface cracking will occur, topography will be altered due to the up to 3 m subsidence predicted, and minor changes to ponding and flood events have been predicted, however the surface soil and the soil profile will not be excavated to undertake mining operations. Section 7.1.1 of Appendix H identifies surface cracks being a hazard to cattle and people working on the site, however monitoring and remediation recommendations are also listed in order to manage the hazards of surface cracking. Any impacts that result from subsidence on areas of BSAL will be rehabilitated as detailed in **Section 4.4.6**.

Further to the above, the land within the Subsidence Study Area will be part of a designated biodiversity offset, including the land currently used for agriculture on the derived native grasslands. This proposed change in post-mining land use shifts the focus from agriculture use to biodiversity preservation and therefore the land within the subsidence study area will be unavailable for agriculture post-mining. This is described further in **Section 4.4**.

5.18 REHABILITATION

5.18.1 Rehabilitation and Restoration

Submission Reference: SIG1, SIG3, SIG14, SIG16, SIG27, P5, P6, P7, P10, P11, P21, P22, P30, P31, P32, P33, P35, P40, P44, P45, P53, P55, P57, P59, P75, P80, P82, P83, P84, P85, P87, P88, P89, P91, P97, P104, P117, P119, P120, P124, P130, P131, P133, P135, P142, P149, P159, P163, P166, P167, P173, P177, P178, P186, P192, P195, P196, P200, P201, P204_2, P205, P206, P210, P211, P212, P216, P222, P224, P227, P71_2, P232, P233, P234, P235, P236, P237, P238, P239, P40, P241, P242, P243, P244, P245, P246, P247, P248, P249, P250, P251, P252, P253, P254, P255, P256, P257, P258, P259, P260, P261, P262, P263, P264, P265, P266, P267, P268, P269, P270, P271, P272, P273, P274, P275, P276, P277, P278, P279, P280, P281, P282, P283, P284, P285, P286, P287, P288, P289, P290, P291, P292, P293, P294, P295, P296, P297, P298, P299, P300, P301, P302, P303, P304, P305, P306, P307, P308, P309, P310_1, P311, P312, P313, P313_2, P314, P315, P310_2, P318.

Issue

A number of submissions raised concerns with regard to the proposed rehabilitation and restoration of BSAL. A key area of concern was the likely success of mine rehabilitation and the ability to reinstate BSAL. It is noted that a number of these submissions were received as form submissions.

Response

A Rehabilitation Strategy and Biophysical Strategic Agricultural Land Reinstatement Strategy have been developed for the Project, as outlined in Section 7.15 of the EIS. The main aim of the Strategies is to return the land to its pre-mining land capability and land use as well as ensuring a similar quantity of land is returned to BSAL classification. During preparation of the strategies, numerous policies, studies and reports were referenced to ensure most up-to-date and successful methodologies and strategies were considered. Examples in the report include Nelson & Stewart (2007) *Alluvial Lands Reinstatement Project. Hunter Valley Operations Final Report* and Darmody, R., Dunker, R. and Barnhisel, R. (2002). *Reclamation of Prime Agricultural Lands After Coal Surface Mining: The Midwestern Experience*, Published by ASMR, Lexington KY.

The successful establishment of BSAL is dependent upon the execution of a detailed BSAL Reinstatement Plan. This Plan will be prepared in consultation with relevant government authorities and will outline specific soil handling and replacement techniques and strict rehabilitation monitoring protocols. Should the monitoring trends indicate that the BSAL establishment trajectory is unfavourable, TARPs developed for potential hazards will be implemented (see Appendix W, EIS) to rectify the situation and ensure that the proposed rehabilitation objectives are met.

KEPCO is committed to carrying out rehabilitation consistent with best practice guidelines and to applying the most current knowledge to improve the performance of rehabilitation works. Rehabilitation trials will be conducted in conjunction with relevant government and scientific organisations to support the successful reinstatement of BSAL.

It is proposed to establish a small trial area within the Class 4 and 5 rehabilitated lands to investigate the benefits of soil hydrology techniques that has been previously pioneered in the locality. This trial will be conducted in conjunction with local farming experience and expertise and may involve other organisations. KEPCO has held discussions with both organisations to discuss this trial.

It is also proposed that a trial plot for BSAL/LSC Class 3 land (cropping land) be established within or proximal to the Project Boundary to assess the acceptability of the soil profile depths proposed for LSC Class 3 land rehabilitation and to assess yields and to establish the effect of handling techniques and deep ripping.

Further, KEPCO will become a participant in the NSW Minerals Council's working group on rehabilitation. The key objectives of the working group are to:

- Decrease the time that disturbed areas are left without final or temporary cover, recognising that different mining operations are at different points in the rehabilitation process; and
- Achieve a consistent level of best practice, quality, and integrated rehabilitation across the Upper Hunter.

Further detail addressing this concern is provided in **Section 4.4**.

Further, the potential risk that this might occur is mitigated by the fact that KEPCO is required to lodge a rehabilitation security deposit (which is typically by way of a bank guarantee) to the DRE as the holder of a mining authority under the *Mining Act 1992*. This security deposit will be held by DRE to ensure that the legal obligations in relation to rehabilitation and safety of the site can be met following mine closure. If rehabilitation obligations are not met to the satisfaction of the Minister, then the security deposit would be used by DRE to meet the relevant requirements.

5.18.2 Proportion of Reinstatement of LSC Classes

Submission Reference: SIG1

Issue

SIG1 note in their submission that even if the five LSC classes are reinstated, there will be little likelihood of them being in the same proportions and/or having the same distributions as the pre-mining landscape.

Response

The reduction and gain in LSC classes between pre-mining and post-mining landforms is detailed in *Table 30 of Appendix V* of the EIS.

The criteria for establishing the different LSC classes is clearly defined in Section 4.1 of Appendix V of the EIS. It is further detailed in Section 7.2 of Appendix W of the EIS.

This shows that while there will be a reduction in LSC Class 5 and 6 in the rehabilitated landscape, there will be an increase in LSC Class 3 and 4 which is considered a preferred outcome.

5.18.3 Location of Rehabilitated BSAL

Submission Reference: SIG27

Issue

SIG27 questioned the proposed location of rehabilitated land which is aimed to fulfil BSAL criteria.

Response

The proposed locations for rehabilitating the post-mining landform and soil profile to BSAL status is detailed in Appendix A of Appendix W of the EIS. Figure 4 in Appendix A of Appendix W of the EIS also shows the recommended BSAL reinstatement areas. This proposed area is approximately 227 ha.

The post-mining location of the additional 154 ha of BSAL has been identified from the grazing land capabilities that have been identified by the supplementary soils work undertaken in 2016. This will be rehabilitated within the Eastern Open Cut area following final landform development.

5.19 MINE CLOSURE AND FINAL LANDFORM

5.19.1 Final Landuse of Open Cut Mining Area

Submission Reference: SIG1

Issue

Sig 1 stated:

"Open cuts remove the coal and stockpile the rock-waste. The rock with its stratigraphy and primary and secondary structures would have had a gradational relationship with the overlying soil-profile. The open cuts will have a negative relief and inevitably depress the local watertable. When the rock-waste is returned, the rock's stratigraphy and structure have totally lost their integrity and the hydrologic properties will therefore have changed. Likewise, the gradational relationship between the soil-profile and the bedrock will no longer exist.

The bottom line is that the open cuts will have changed from pits filled with air, to ones filled with rubble and masked by a cosmetic veneer of soil. Yes, it is likely to become useable over time, but it is extremely unlikely to behave in the manner originally understood and rationally used by the one-time owner."

Response

A Rehabilitation Strategy and Biophysical Strategic Agricultural Land Reinstatement Strategy have been developed for the Project, as outlined above and in Section 7.15 of the EIS. One of the main aims of the Strategy is to return the land to its pre-mining land capability.

The rehabilitation program for the Project involves the progressive rehabilitation of open cut mining areas and OEAs, the establishment of an integrated stable final landform, soil management and translocation, implementation of erosion and sediment controls, revegetation and relevant maintenance and monitoring to achieve a successful and self-sustaining final landscape.

There are numerous examples of mine rehabilitation where the land has been returned to its pre-mining land use such as cropping and grazing land. Section 3.4 of Appendix W of the EIS provides details for a number of such examples.

5.19.2 Retention of Mine Water Dams

Issue

Submission Reference: SIG8, P43, P67_1

There were a few submissions requesting further information regarding management of mine water post mine closure including retaining mine water dams.

Response

Disposal of any residual water contained within the open cut mining areas within the underground mining area at the completion of mining is discussed in the Groundwater Impact Assessment. No final void will remain at the completion of the Project.

The final landform includes rehabilitated OEAs and removal and rehabilitation of all infrastructure including roads and MIAs. As such, any water run-off from rehabilitated areas will be considered to be clean water and hence surface water runoff can be released from the site. Any water dams remaining would be considered to be beneficial for future use by post-mine landowners and therefore will be left in place in accordance with the relevant stakeholders or landowner agreements.

5.20 AGRICULTURE

5.20.1 Gateway Assessment

Submission Reference: SIG10, SIG16, SIG27 and P33

Issue

The submissions referenced above expressed concern that the Gateway process is flawed in that there is no power to stop a potential coal mine through this process, despite the Conditional Gateway Certificate failing 11 out of the 12 gateway criteria. Further issues were raised specifically in regard to the perceived 'failed' gateway criteria.

Response

On 15 April 2014, the Gateway Panel issued a Conditional Gateway Certificate for the Bylong Coal Project (MPGP 2014). A summary of the key recommendations of the report relating to BSAL are reproduced below:

SCHEDULE 2

Relevant criteria	Consideration	Recommendations
17H4(a)(i), (ii), (v), (vi)	The proposal to remove 194.4 ha of verified BSAL soils from within the planned open-cut mining area and the 're-creation' of this BSAL elsewhere lacks precedence and necessary detail.	With regard to the removal and recreation of verified BSAL soils: 1. Undertake a risk assessment that identifies the hazards and proposes controls with respect to the movement of BSAL soils; 2. Identify a final location for the verified BSAL soils within the Project Boundary area; 3. Detail the methods proposed for the handling, storage and treatment of the verified BSAL soils; 4. Propose alternate mitigation measures to be implemented in the event that the methodology selected results in the loss of verified BSAL soils post-implementation.

Gateway Recommendation 1

KEPCO has undertaken a risk assessment that identifies the hazards and proposed controls with respect to recreating BSAL on post-mining landforms. This is detailed in Section 12 'BSAL Reinstatement Summary' of Appendix W of the EIS.

Gateway Recommendation 2

KEPCO has identified the location suitable for the re-instatement of BSAL in Figure 9 Section 6.3 'Location of BSAL' within Appendix W of the EIS.

Gateway Recommendation 3

A description of the methods proposed for handling, storage and treatment of the verified BSAL soils are provided in Section 8 'Rehabilitation Implementation' within Appendix W of the EIS.

Gateway Recommendation 4

KEPCO has presented a TARP in Section 11 'Intervention and Adaptive Management' within Appendix W of the EIS.

Accordingly, KEPCO has taken on board the specific recommendations of the Conditional Gateway Certificate (MPGP 2014) and presented the information in the EIS as required.

Further comments in relation to the Conditional Gateway Certificate (MPGO 2014) report are provided below, and have been raised by some submissions and therefore a response to these issues is also provided below:

1. *The Gateway Panel found the Applicants methodology for verification of BSAL within the Project Boundary area is generally acceptable for a Gateway Application with the following exceptions:*

The Gateway Panel does not accept the Applicant's view that subsidence impacts on verified BSAL soils are by general rule, "indirect and temporary";

The risk rankings used to determine soil survey density are incorrect and ranked too low for accurate verification of BSAL affected by subsidence;

This issue is covered in **Section 5.17.2**.

2. *The Gateway Panel states the Applicant provides "insubstantial information of how verified BSAL within the Project Boundary but outside of the planned disturbance areas is impacted or how potential BSAL outside the Project Boundary is potentially, indirectly impacted by the Project".*

The EIS makes the assumption that the soils outside of the Project Disturbance Footprint will not be physically impacted by the Project. It is appreciated that commercial decisions about the management of adjacent land will vary depending on the proximity of mining and ownership/control of that land. However, these are commercial related management decisions and not to be included in the same category as physical impacts from mining activities. In regard to impacts, the Project assumes no direct surface soil impacts will occur to BSAL land outside the Project Disturbance Footprint. Soil and BSAL related impacts will be limited to the Project Disturbance Footprint as assessed in the EIS.

5.20.1.1 Amendment of Gateway Certificate

Submission Reference: O6

Issue

O6 asserts that the Gateway Certificate should have been amended following the changes made to the Project.

Response

The changes made to the Project were minor in nature and as such the Gateway Certificate application was not required to be amended.

5.20.1.2 Equine CIC Criteria

Submission Reference: SIG10, SIG16 and SIG27

Issue

In their submissions the SIG10, SIG16 and SIG27 raise that the Gateway Panel Assessment stated that the Project did meet the criteria of the Government verified Equine CIC. Explicitly the BVPA raised the Gateway Panel's opinion that:

- *There is 1,933 ha of verified Equine CIC land within the Project Boundary area;*
- *The Applicant has already directly impacted the Equine CIC through its acquisition of land, e.g. Bylong Park Stud, and the implemented land use change;*
- *The Project proposes a disturbance footprint of 2,667ha for open cut and underground mining;*
- *The Project proposes open cut and underground coal mining that directly impacts lands within this CIC; and*
- *The Applicant has misconstrued the Gateway process and failed to put forward a compliant or considered assessment of its potential impact on the Equine CIC.*

Response

There is approximately 1,933 ha of mapped Equine CIC within the AIS Study Area. Of this 700 ha will be disturbed by the Project or included within the Biodiversity Offset Areas. This represents 0.27% of the approximate 255,000 ha of mapped Equine CIC in the Upper Hunter. Also as detailed in the responses above there are no thoroughbred enterprises currently within the Bylong Valley let-alone the disturbance footprint or Biodiversity Offset Areas.

As stated in the EIS and sections above the Project will impact on landed mapped in 2014 as Equine CIC. However this will not result in an impact on the Equine CIC. A distinction needs to be made between the impact on mapped Equine CIC and impact on the Equine CIC. The purpose of the policy is to protect the unique Upper Hunter horse industry. As stated earlier the Project does not impact on the number of thoroughbred horses bred or raised in the Equine CIC. Similarly, the Project Boundary does not provide a significant input of fodder (lucerne hay) into the Upper Horse industry.

The purchase by the Proponent of Bylong Park, one of the previous properties associated with the Bylong Park Stud (the other being located in the Hawkesbury Valley) was completed in August 2012, well before the first draft Equine CIC maps were published let-alone the final maps in 2014. It is illogical to imply that the Proponent has gone against the Equine CIC policy by an action (buying Bylong Park in 2012) before the draft Equine CIC map was published.

Notwithstanding the above it is noted that Bylong Park Stud has moved both parts of its thoroughbred operations previously operating in the Bylong Valley and the Hawkesbury Valley, to Benchmark Park, Martindale near Denman within the mapped Equine CIC, thus this enterprise continues to thrive.

5.20.2 BSAL

5.20.2.1 Impact on BSAL

Submission Reference: SIG1, SIG2, SIG10, SIG11, SIG18, P80, P153, P200, P216 SIG2, SIG6, SIG9, SIG12, SIG13, SIG18, SIG20, SIG22, P6, P7, P10, P11, P12, P13, P21, P22, P23, P24, P30, P31, P32, P33, P35, P37, P38, P40, P44, P45, P53, P57, P58, P62, P66, P70, P75, P80, P82, P83, P84, P85, P87, P88, P91, P97, P100, P104, P108, P110, P114, P117, P119, P120, P124, P131, P133, P135, P142, P149, P153, P163, P173, P177, P178, P186, P190, P192, P195, P199, P203, P205, P211, P212, P224, P310_2, P233, P234, P235, P236, P237, P238, P239, P40, P241, P242, P243, P244, P245, P246, P247, P248, P249, P250, P251, P252, P253, P254, P255, P256, P257, P258, P259, P260, P261, P262, P263, P264, P265, P266, P267, P268, P269, P270, P271, P272, P273, P274, P275, P276, P277, P278, P279, P280, P281, P282, P283, P284, P285, P286, P287, P288, P289, P290, P291, P292, P293, P294, P295, P296, P297, P298, P299, P300, P301, P302, P303, P304, P305, P306, P307, P308, P309, P310_1, P311, P312, P313, P313_2, P314, P315

Issue

A number of stakeholders raised concerns regarding the potential for the Project to impact on BSAL, as well as in relation to the verification of BSAL in consideration of the SRLUP and the gateway criteria. It is noted that a number of these submissions were received as form submissions.

Response

It is noted that within their submission the OEH “recognises KEPCO has significantly altered the proposed mine plan to avoid or mitigate impacts on Biophysical Strategic Agricultural Land, alluvial land, Critical Industry Cluster areas and the environment”

The EIS concluded any long term impacts on BSAL will be prevented or minimised as far as practicable. To this end, all disturbed areas will be rehabilitated on completion of mining and the land returned to its pre-mining use. A Rehabilitation Strategy and Biophysical Strategic Agricultural Land Reinstatement Strategy have been developed for the Project, as outlined in Section 7.15 of the EIS.

The main aim of the Strategies is to return the land to its pre-mining land capability and land use as well as ensuring a similar quantity of land is returned to BSAL classification. Further detail regarding the proposed rehabilitation and biodiversity offsets are discussed in **Sections 5.18.1** and **5.6.1** respectively.

Concerns that were raised with regard to the verification of BSAL are discussed in **Section 4.4.1**.

The natural sequence farming processes at Tarwyn Park is discussed in **Section 5.20.10**. The impacts on the water systems are discussed in **Sections 5.7, 5.8** and **5.9**.

5.20.2.2 Groundwater Impacts on BSAL

Submission Reference: SIG8

Issue

SIG8 noted their concern with BSAL and its close association with groundwater, stating:

“The proposal is predicted to cause a groundwater drawdown of up to 10 metres. This is a major impact that cannot be easily mitigated. Aquifer systems cannot be reproduced in rehabilitated mine land. The damage will last for centuries and is essentially irreparable.”

Response

This matter is discussed in **Section 4.4**.

5.20.2.3 BSAL Impacts on Adjacent Properties

Submission Reference: O6

Issue

O6 noted that the impacts of the Project on BSAL was restricted to the Study Area and did not consider impacts to BSAL on adjacent properties such as Locaway.

Response

As detailed in the EIS, all land and soil disturbance to occur as a result of mining has been captured within the Project disturbance footprint and therefore by definition the soils outside of the Project Disturbance Boundary will not be physically impacted by the Project. It is noted that since the Gateway Application process, the Project Disturbance Boundary was modified and included an additional standoff from the proposed disturbance. This buffer was included within the EIS in response to the gateway panel's recommendations.

The Locaway property is located over 2 km from the Project Disturbance Boundary. As such no impacts are predicted to occur to the soil resources on this property.

5.20.3 Equine CIC

5.20.3.1 Historical Equine Use

Submission Reference: SIG10, SIG11, SIG16, SIG27, P91, P99

Issue

There were a number of submissions that raised concerns over the impact to equine CIC land.

A number of submissions raised concerns that the thoroughbred's breeding history within the Bylong Valley with specific reference to past thoroughbreds of note being bred and in the case of horses (Stallions) standing in the valley.

Also noted is the reference to equine related infrastructure on the Wallings's Aggregation, namely stables, stable complexes and associated facilities at Helvetia, Torrie Lodge and Sunnyside.

Response

Historic (previous, not current) land use is not a criteria of intellectual rigour to be used to determine future allocation of land resources. As stated in both the Gateway AIS, and the BVPA and the HTBA submissions the Bylong Valley has historically been used for thoroughbred breeding. Both submissions reference *Heroic*, a stallion that was Australia's leading sire in the 1930's and Rain Lover, dual Melbourne Cup winner (1968 and 1969). Both these animals were associated with Tarwyn Park. These animals were in their prime over 80 years and over 45 years ago respectively. Mr Stewart Andrews (owner operator of Tarwyn Park) was interviewed by Mr Scott Barnett of Scott Barnett & Associates on 11 June 2014 as part of the preparation of the AIS. Mr Andrews during this interview stated that in the period 2004 to 2005 Tarwyn Park "stopped being a thoroughbred operation". Further to this, an article from 28 January 2011 on the racing and Sport website (<http://www.racingsports.com.au>) quotes Mr Peter Andrews OAM, previous owner and operator of Tarwyn Park: "*The property (Tarwyn Park) is now used as a cattle raising farm operated by the Andrew's family*".

Similarly a letter from Mr David Wallings to the DP&E (formally the NSW Department of Planning and Infrastructure) dated 15 November 2013 states that horse breeding on the Wallings aggregation run by Wallings Pastoral company was a previous "subsidiary activity" to their farming and cattle enterprises but no longer part of their current land use.

The historical, not current, context of the Bylong Valley's connection to thoroughbred breeding is not a valid argument to support a current need to limit land use change from its current non-thoroughbred breeding land use.

KEPCO has purchased Bylong Park which operated as a thoroughbred stud. This sale was settled in August 2012. The owner of Bylong Park has since also sold their property in the Hawkesbury Valley which was also used as part of their thoroughbred operation and purchased a property in the Hunter Valley at Martindale near Denman, Benchmark Park.

From there they have continued to operate the Bylong Park Stud. Benchmark Park is also within the Hunter Valley Equine CIC.

The sale records of five major Yearling Sales for the Hunter Valley was carried out to determine the extent of yearlings bred in the Bylong Valley. The examination was carried by examining the online sales records of the Magic Millions (www.magicmillions.com.au) and Inglis Bloodstock (www.inglis.com.au). The sales examined were:

- Magic Millions Gold Coast Yearling Sales (January): 2010-2016;
- Magic Millions Gold Coast March Yearling Sales (March): 2010-2015;
- Inglis Sydney summer sale (January/February): 2009-2016;
- Inglis Easter Yearling Sales (Sydney): 2009-2015; and
- Inglis Scone Yearling Sale (May) 2009-2015.

As well as past sale results the online sale catalogues for:

- 2016 Magic Millions Gold Coast March Yearling Sales; and
- 2016 Inglis Easter yearling Sales.

This examination revealed that the only thoroughbred enterprise represented that was connected with the Bylong Valley was Bylong Park Stud. Details of Bylong Park Stud's sales results across these sales is Shown in **Table 34**.

Table 34
Bylong Park Stud's Sale Results
Selected^ East Coast Thoroughbred Yearling Sales 2009-2016

	2016	2015	2014	2013	2012	2011	2010	2009*
Yearlings catalogued	5^^	10	4	14	19	1	11	24
Yearlings Sold	-	8	3	10	12	1	6	14
Gross Proceeds	-	\$1,1016,500	\$240,000	\$1,089,000	\$1,312,000	\$90,000	\$35,705	\$1,241,500
Average Price Achieved**	-	\$1327,063	\$80,000	\$108,900	\$109,333	\$90,000	\$5,951	\$88,679

^ Sales are Magic Millions Gold Coast, Magic Millions Gold Coast March Yearling, Inglis Summer Yearling, Inglis Easter Yearling and Scone Yearling Sales

* No records could be found for either Magic Millions Sale in 2009

^^ 5 yearlings are catalogued for the 2016 Inglis Yearling Easter Sales

** Average price received is for Yearlings sold and excludes Yearlings Withdrawn or Passed-In

As is demonstrated in **Table 34**, Bylong Park Stud has continued to perform strongly since relocating both arms of its thoroughbred business to Martindale within the Hunter Valley from its previous dual locations of the Bylong Valley and Hawkesbury Valley.

Bylong Park Stud's relocation from The Hawkesbury Valley and Bylong Valley to Martindale in the Hunter Valley (also within the mapped Equine CIC) has not diminished the value or standing of the Hunter Valley Equine CIC.

5.20.3.2 Widden Valley

Submission Reference: SIG27

Issue

In its submission SIG27 stated:

"The Bylong Valley along with the Widden Valley form an important and integral part of the Upper Hunter's critical equine industry cluster."

Response

As discussed in the response above the Bylong Valley has a history of thoroughbred breeding but maintains no current thoroughbred industry.

The Widden Valley is located over 40 minutes drive (approximately 53 km) from Bylong Valley and has both a current and ongoing thoroughbred industry. The thoroughbred industry is the major and dominant land use within the Widden Valley. As detailed in the response above the same cannot be said of the Bylong Valley.

The Widden Valley has 2 current thoroughbred studs being:

- Widden Stud; and
- Baramul Stud.

These two studs occupy the majority of the Widden Valley. Examination of the Magic Millions website and the Inglis Bloodstock website shows that in 2016 alone these two studs accounted for 192 entries for the 2016 Magic Millions Gold Coast Yearling Sale, 2016 Inglis Summer Yearling Sale and the 2016 Inglis Easter yearling Sale.

As described in the response above, and within the EIS the Bylong Valley is not considered to form an important and integral part of the Upper Hunter's critical equine industry cluster.

5.20.3.3 Australian Stock Horses

Submission Reference: SIG27

Issue

The presence of Tinka Tong, AN ASH Stud (Tinka Tong Stud), within the study area of the AIS was raised by SIG27 to support assertion that the Project would impact the Equine CIC.

Response

Tinka Tong Stud is operated as a 56.6 ha beef and stock horse property in the Bylong Valley. The owner was interviewed on her property by Scott Barnett of SBA on 11 June 2014 as part of the information gathering for the AIS for the Project.

The owner stated they owned and ran on Tinka Tong Stud 12 Australian Stock Horses being:

- 4 yearlings;
- 8 mares; and
- 4 geldings.

An estimate of the quantity and value of annual Australian Stock Horse sales was obtained by Mr Barnett as part of the information gathering for the AIS, but cannot be divulged as Mr Barnett undertook not to divulge to any party individual production or sales data that would identify an individual business or person but only publish all data in an aggregate form.

Tinka Tong is the only horse enterprise within the AIS study area and the mapped Equine CIC subject to the Project. Tinka Tong Stud lies outside the mine disturbance area.

5.20.3.4 Fodder Production from the Equine CIC

Submission Reference: SIG10 and SIG27

Issue

In their submissions the SIG10 and SIG27 raise that the Upper Hunter Equine CIC includes areas that produces fodder for the thoroughbred breeding industry and that the Project has not considered this.

Response

As part of the AIS, landholders within the study area were interviewed by Scott Barnett of Scott Barnett & Associates. The interviews were held in June 2014. At these interviews information was gathered on enterprises carried out and production levels obtained by the land managers on land within the study area.

From these interviews it was determined that 1,628 tonnes per annum (p/a) of Lucerne hay was sold from production within the study area as well as 420 tonnes p/a of cereal hay. Of the 1,628 tonnes of Lucerne hay sold it was estimated based on Land Managers' interviews that:

- 431 tonne p/a was sold for equine breeding purposes;
- 367 tonne p/a was sold to Sydney hay traders for use in the Sydney horse racing (thoroughbred and standard bred), pony club and hack market; and
- 830 tonne p/a sold to dairy and beef producers.

Based on full feeding a dry mare for 365 days of 4 kgDM of concentrate (pellets/grain) and 4 kg DM Lucerne hay and dry mare would consume 1.6 tonnes per year (assumes wastage absorbed into daily feeding levels). At 1.6 tonnes per dry mare the Lucerne hay sold from the Study area per year is enough to feed 270 dry mares.

The NSW DPI quoting 2006 ABS statistics stated that there were 10,179 stud (thoroughbred) horses in the three LGAs of Upper Hunter (6,617), Muswellbrook (2,630) and Singleton (932) (ABS, 2006). Assuming these numbers have not significantly decreased since 2006 the 270 full feed dry mare equivalents that could be fed for 12 months from the Lucerne Hay sales from the Project study area (270) represents 2.7% of the Upper Hunter thoroughbred horse population.

The is not a significant quantum relative to the total annual hay production from the Upper Hunter, of 57,851 tonnes, which represents only 3% of the NSW total annual yield.

The above supports that the Project will not impact the Equine CIC. The CIC is defined as:

“concentrations of highly productive industries within a region that are related to each other, contribute to the identity of that region and provide significant employment opportunities.”

The Upper Hunter Equine CIC (terms of a concentration of highly productive industries) is not at risk of losing its economic value, its stature as one of three Centres of Excellence of Thoroughbred Breeding in the world or a decline in industry interdependency and employment by the approval of the Project.

5.20.3.5 Consultation

Submission Reference: SIG16

Issue

In their submission the SIG16 raised concern that consultation has not been undertaken with key stakeholders within the equine industry.

Response

As part of the research and preparation of the AIS for the Project land owner interviews were held with all landowners and managers who had land within the study area. This included an interview with the only equine activity within the study area, that being Ms Wright of Tinka Tong Australian Stock Horse stud.

Also consulted was:

- Mr Stuart Andrews, owner and operator of Tarwyn Park
- Mr Andrew Walling, owner and operator of the Wallings' Aggregation that covered the properties (amongst others) known as Sunnyside, Helveltia and Torrie Lodge.

Both Mr Andrews and Mr Walling stated that equine activities were no longer part of their agricultural operations, nor had they been for some time. This was prior to the acquisition of these properties by KEPCO.

Discussion with DPI Agriculture staff also indicated to Scott Barnett & Associates that there were no significant equine related enterprises within the Bylong Valley.

Furthermore, searches of White Pages and Yellow Pages website directories did not reveal any supporting services or equine related industries as being located in the surrounding area

All equine stakeholders and potential stakeholders within the study area were consulted during the preparation of the AIS and EIS.

5.20.4 Loss of Prime Agricultural Land

Submission Reference: SIG2, SIG6, SIG9, SIG12, SIG13, SIG16, SIG18, SIG20, SIG22, P6, P7, P10, P11, P12, P13, P21, P22, P23, P24, P30, P31, P32, P33, P35, P37, P38, P40, P44, P45, P53, P57, P58, P62, P66, P70, P75, P80, P82, P83, P84, P85, P87, P88, P91, P97, P100, P104, P108, P110, P114, P117, P119, P120, P124, P131, P133, P135, P142, P149, P151, P152, P153, P163, P173, P177, P178, P186, P190, P192, P195, P199, P203, P205, P211, P212, P224, P233, P234, P235, P236, P237, P238, P239, P240, P241, P242, P243, P244, P245, P246, P247, P248, P249, P250, P251, P252, P253, P254, P255, P256, P257, P258, P259, P260, P261, P262, P263, P264, P265, P266, P267, P268, P269, P270, P271, P272, P273, P274, P275, P276, P277, P278, P279, P280, P281, P282, P283, P284, P285, P286, P287, P288, P289, P290, P291, P292, P293, P294, P295, P296, P297, P298, P299, P300, P301, P302, P303, P304, P305, P306, P307, P308, P309, P310_1, P310_2, P311, P312, P313, P313_2, P314, P315

Issue

A number of stakeholders asserted that the predicted long-term impacts on prime agricultural land and water systems in the Bylong Valley are unacceptable and will not be mitigated through proposed offsets and rehabilitation. Further, that the Bylong Valley is very important for Australia's future food security and should not be impacted for a short term coal project.

The following statement was repeated in a number of submissions (received as form submissions):

"The predicted long-term impacts on prime agricultural land and water systems in the Bylong Valley are unacceptable and will not be mitigated through proposed offsets and rehabilitation. The renowned Tarwyn Park natural sequence farming processes will be destroyed."

It is noted that a number of these submissions were received as form submissions.

Response

The EIS concluded any long term impacts on prime agricultural land will be prevented or minimised as far as practicable. To this end, all disturbed areas will be rehabilitated on completion of mining and the land returned to its pre-mining use.

Concerns that were raised regarding the proposed rehabilitation and biodiversity offsets are discussed in **Sections 5.18.1** and **5.6.1** respectively. The natural sequence farming processes at Tarwyn Park is discussed in **Section 5.20.10.1**. The impacts on the water systems are discussed in **Sections 5.8** and **5.9**.

5.20.5 BSAL Land as Offsets

Submission Reference: SIG16

Issue

SIG16 prefers that productive agricultural land, including BSAL, is not locked up as an offset for mining and energy companies.

Response

This is addressed in **Section 5.6.15**.

5.20.6 Agricultural Impact Statement

5.20.6.1 Adequacy of the AIS

Issue

Submission Reference: SIG16

In their submission SIG16 question the basis of the methodology used in the AIS for assessing quantum and value of agricultural production. They also commented that lucerne hay was not only a cash crop but also used within the production system.

Response

The methodology used to determine the quantum and value of agricultural production from the Study Area is outlined in Sections 4.1 and 5.1 of the AIS (Appendix X) of the EIS. Explicitly the quantum and value of agricultural production relied on site visits and individual land manager interviews with licensees of KEPCO owned land and non-KEPCO owned land by Scott Barnett of Scott Barnett & Associates to ascertain current and potential agricultural production levels on Study Area land. These visits and interviews were completed on the 10 and 11 June 2014. In relation to determining the basis of quantum production the individual land manager was asked to use what was an average carrying capacity and yield over a 5 year period with a basis, if any, on the upper side of production expectations. In short, they were told not to underestimate the level of production.

During these interviews the land owner/manager was guaranteed that their individual responses would not be made available to any party other than Scott Barnett & Associates that all information would be aggregated and only presented in an aggregated format so individual owner, manager or property information and details would not be identifiable.

The land managers were told that the value of agricultural production was to be valued using NSW DPI gross margin budgets as published on the NSW DPI (agriculture) website. The land manager was asked if they thought this would realistically reflect their business and if it did not, proportional adjustments would be made. All respondents concurred with the concept of using the NSW DPI gross margin budget as the basis for calculating the value of agricultural production.

NSW DPI Agriculture did not raise concerns with this methodology and indeed has accepted this same methodology as appropriate in previous AIS for mining developments (such as the Watermark Coal Project). It is noted that NSW Farmers' Association did not raise concerns with this methodology when applied to previous coal mine developments.

With regard to Lucerne and cereal hay the quantum of production applied was based on the land managers interviews which covered production systems and outputs, including the utilisation of hay (lucerne and cereal) for sale and for utilisation within the various livestock enterprises. These are outlined in Appendices 1, 2, 3, 4 and 6 in the AIS (Appendix X of the EIS). The value add of any hay utilised on farm is recognised in the quantum of cattle turned off the study area.

5.20.6.2 Peer Review

Submission Reference: SIG16

Issue

In their submission SIG16 has raised a number of issues relating to the assumptions and methodology employed in the AIS and input that it shows a lack of understanding of animal husbandry and agronomic processes. They recommend that KEPCO fund an independent expert to conduct a peer review.

Response

The issues raised by SIG16 have been addressed in the above response and the methodology and assumptions have been justified. What is more DPI Agriculture has reviewed the AIS and have accepted the methodology or assumptions used. DPI Agriculture is considered an independent expert and have reviewed the AIS and made a submission (see **Section 4.4**).

The author of the AIS is an experienced Agricultural Scientist and consultant with over 30 years professional experience. This has included work for small scale farming operations, corporate agricultural operators and investors (Australian and overseas based), industry bodies and Federal and State Government.

5.20.6.3 Consultation

Submission Reference: SIG16

Issue

SIG16 believes the consultation process in the Agricultural Impact Statement was inadequate, in terms of not consulting with all local communities and interest groups (e.g. peak equine groups, NSW Farmers, Bylong Valley Protection Alliance), and does not reference biosecurity or bushfire risks.

Response

As part of the research and preparation of the AIS for the Project land owner interviews were held with all landowners and managers who had land within the study area. This included an interview with the only equine activity within the study area, that being Ms Robin Wright of Tinka Tong Australian Stock Horse stud.

Also consulted was:

- Former owner and operator of Tarwyn Park; and
- Former owner and operator of the Wallings' Aggregation that covered the properties (amongst others) known as Sunnyside, Helveltia and Torrie Lodge.

This was prior to the acquisition of these properties by KEPCO.

Furthermore, searches of White Pages and Yellow Pages website directories did not reveal any additional industries as being located in the surrounding area.

All stakeholders and potential stakeholders within the study area were consulted in the preparation of the AIS and EIS.

5.20.7 Economic Considerations in AIS

5.20.7.1 Cost Assumptions

Submission Reference: SIG16

Issue

In their submission SIG16 raised that the use of 2011 gross margin budgets does not give a true and accurate reflection of the present day value of agriculture arguing that the impacts have been underestimated.

Response

The gross margin budgets used as a basis to calculate the value of production were the gross margin budgets as published by the NSW DPI (Agriculture) on their website. These were dated November and December 2012. These budgets were used as at the time of researching and writing of the AIS, they provided the best unbiased estimate of production economics applicable to the Bylong Valley. This methodology has been accepted by the DPI Agriculture.

As raised by NSW Farmers', since then the beef cattle market has improved significantly. This can be seen by the change in the Eastern Young Cattle Indicator (EYCI), published weekly by Meat and Livestock Australia (MLA). This may be viewed on their website: <http://statistics.mla.com.au/Report/List>.

The EYCI is the general benchmark of Australian cattle prices. The indicator is a seven-day rolling average produced daily by MLA's National Livestock Reporting Service.

The EYCI includes vealer and yearling heifers and steers, grade score C2 or C3, 200kg+ live weight from saleyards in NSW, QLD and VIC. The results include cattle purchased for slaughter, restocking or lot feeding and are expressed in cents per kilogram carcass (dressed) weight (c/kg cwt). (<http://www.mla.com.au/Prices-and-markets/About-the-National-Livestock-Reporting-Service/Eastern-Young-Cattle-Indicator>)

To quantify the growth in the EYCI, this site was interrogated and the weighted weekly average of the EYCI was calculated for 3 periods:

- September – November 2012 (the 3 months preceding the publishing of the DPI gross margin budgets);
- February – April 2015 (the 3 months preceding the date of the AIS (Appendix X of the EIS)); and
- September – November 2015 (the 3 months preceding the receiving of submissions on the EIS made by the stakeholders).

The weighted weekly average was calculated by the algorithm:

$$\text{Sum (EYCI for week X cattle sold in week) / sum (total cattle sold over 3 month period)}$$

Table 35 summarises the growth in the EYCI over this period. It shows the absolute change and the relative change relative to the weighted EYCI for September – November 2012 Base 100).

Table 35
Change in Weighted Average EYCI

Period	Weighted average EYCI c/kgDW	Base
September – November 2012	351.80	100
February – April 2015	437.67	124
September – November 2015	573.22	163

This demonstrates the current and sustained improvement in the beef cattle market.

The impact on this improvement on the value of the agricultural production from the Study Area was examined by adjusting the sale price (revenue) and purchase price (cost) where applicable of cattle in the NSW DPI gross margins by the increase in the EYCI relative to the September – November 2012 (Base 100). Additionally, the impact of a doubling of the EYCI was examined (i.e. an 100% increase in cattle prices). These are shown in **Table 36**.

Appendix 6 of the AIS (Appendix X of the EIS) identified that the annual gross value of agricultural production from the Project Disturbance Footprint to be \$0.674 Million and the annual net value of agricultural production to be \$0.318 Million (EYCI 351.80 cents per Kg cwt). When the value of cattle is doubled (EYCI 703.60 cents per Kg cwt), the annual gross value of agricultural production increases to \$1.124 Million and the annual net value of agricultural production increases to \$0.656 Million.

Conservatively assuming that the agricultural production is lost from the Disturbance Footprint from the beginning of the Project for perpetuity, the present value of the gross value agriculture production foregone is \$16.1 Million (7% discount rate) and the present value of the net value of agricultural projection is \$9.4 Million (7% discount rate) (Gillespie Economics).

Table 36
Annual Gross Value of Agricultural Production and Annual Net Value of Agricultural Production Adjusted for Changing EYCI (Cattle Prices)

	NSW DPI GM Dec 2012 EYCI Sep – Nov 2012 weighted weekly average 100	EYCI Feb – Apr 2015 weighted weekly average 124	EYCI Sep – Nov 2015 weighted weekly average 163	EYCI Sep – Nov 2012 X2 weighted weekly average 200
	\$ Million	\$ Million	\$ Million	\$ Million
EYCI (cents/kgcwt)	351.80	437.67	573.22	703.60
Study Area				
Gross Income	5.281	6.110	7.457	8.735
Variable Income	2.824	3.021	3.341	3.645
Gross Margin	2.475	3.089	4.116	5.090
Biodiversity Offset Area Area				
Gross Income	1.433	1.749	2.263	2.750
Variable Income	0.676	0.750	0.871	0.986
Gross Margin	0.757	0.989	1.392	1.764

	NSW DPI GM Dec 2012 EYCI Sep – Nov 2012 weighted weekly average 100	EYCI Feb – Apr 2015 weighted weekly average 124	EYCI Sep – Nov 2015 weighted weekly average 163	EYCI Sep – Nov 2012 X2 weighted weekly average 200
	\$ Million	\$ Million	\$ Million	\$ Million
Disturbance Boundary	0.674	0.782	0.957	1.124
Gross Income	0.358	0.383	0.426	0.468
Variable Income	0.318	0.399	0.531	0.656
Gross Margin				
Post-Mining Area	0.660	0.721	0.821	0.915
Gross Income	0.385	0.400	0.424	0.466
Variable Income	0.275	0.322	0.398	0.470
Gross Margin				
Max Potential Study Area	7.606	8.946	11.123	13.189
Gross Income	4.127	4.504	5.118	5.690
Variable Income	3.479	4.442	6.006	7.489
Gross Margin				

Similarly the annual gross value of agricultural production lost from the Biodiversity Offset Area if a EYCI is doubled to 703.60 cents per kg cwt, increases from \$1,433 Million to \$2.750 Million, and the annual net value if agricultural production increases from \$0.757 Million to \$1.764 Million.

Conservatively assuming that the agricultural production is lost from the Biodiversity Offset Areas from the beginning of the Project for perpetuity, the present value of the gross value agriculture production foregone is \$39.3 Million (7% discount rate) and the present value of the net value of agricultural projection is \$25.2 Million (7% discount rate) (Gillespie Economics).

Increasing the value of cattle purchased and sold by 100% (EYCI assumed to go from 351.80 cents/kg cwt to 705.60 cents/kg cwt) the gross value and net value of agricultural production foregone due to the Project (disturbance footprint, biodiversity offset areas and water potentially lost) is \$4.285 Million and \$2.520 Million. If this is conservatively assumed to be lost annually from the commencement of the Project for perpetuity the net present value of the gross value of production is \$61.2 Million and the net value of production \$36.0 Million (assuming 7% discount rate) (Gillespie Economics).

Furthermore, the BCA includes foregone agricultural production as an economic cost. This cost is based on the value of the agricultural land used for the Project - land already in KEPSCO ownership and land that will be acquired.

As identified in the Economic Impact Assessment, in a properly functioning land market, the present value of the potential net financial benefits of future potential agricultural production, including on BSAL and land identified as a part of Equine CIC, is reflected in land prices.

Gillespie Economics notes that unless there is a demonstrated failure in agricultural markets to adequately reflect the scarcity of agricultural products or a failure in land markets to adequately reflect the scarcity of agricultural land, then the market price of land reflects the opportunity cost of using that land for alternative uses.

Conservatively, the BCA assumed that no agricultural production occurs on this land for the life of the Project, even though it is recognised that KEPCO has employed a Farm Manager and will continue to manage agricultural activities on land that is not required for mining, mining related purposes or as part of the BOS.

In addition, Section 5.5.2 of the Economic Impact Assessment specifically examined the magnitude of potential foregone agricultural production from the mining disturbance footprint and biodiversity offsets. This information was based on 2011 gross margin information provided by Scott Barnett and Associates. It has now been revised for 2015 beef cattle gross margin information provided by Scott Barnett and Associates (as discussed above).

The annual gross value of production and annual net value of production foregone as a result of the Project Disturbance Area and Biodiversity Offset Area (using SBA, 2015) are shown in **Table 37**.

The combined annual gross value of production from the impacted agricultural land is \$3.9 Million per annum. The combined net value of production from the impacted land is \$2.4 Million per annum.

Table 37
Quantum and Value of Agricultural Production with Project Disturbance Boundary and Biodiversity Offset Areas

Parameter	Gross Value of Production (per annum)	Net Value of Production (per annum)
Project Disturbance Boundary	\$1,124,000	\$656,000
Biodiversity Offset Areas	\$2,750,000	\$1,764,000
Total Land Impacts	\$3,874,000	\$2,420,000

For the purpose of this exercise, the estimate of agricultural production lost from agriculture due to Project water requirements is the same as assumed in the Economic Impact Assessment (i.e. \$410,562 per annum and the maximum net value lost is \$99,956 per annum) during open cut operations.

The regional economic impacts of foregone agricultural production have been estimated using IO analysis by modelling the direct and indirect effects on the regional economy of a reduction in \$3.9 Million in output from the beef/sheep/grains sector of the regional economy.

A comparison of the regional economic impacts of the Project operation and the foregone agricultural production is provided in **Table 38**. The foregone agricultural regional economic activity impacts are between 0.7% and 8.1% of the regional economic activity impacts of the Project.

Table 38
Regional Economic Impacts of the Project and Displaced Agriculture

Parameter	Project Impact	Agriculture Land and Water	
		Impact	% of Project
Annual direct output value (\$000)	468,691	3,874	0.8
Annual direct value-added (\$000)	305,426	2,123	0.7
Annual direct income (\$000)	40,600	675	1.7
Direct employment (No.)	290	24	8.1
Annual direct and indirect output (\$000)	623,682	6,234	1.0
Annual direct and indirect value-added (\$000)	377,973	3,214	0.9
Annual direct and indirect income (\$000)	72,409	1,128	1.6
Direct and indirect employment (No.)	830	33	4.0

If it were to be assumed that agricultural production from the Project Disturbance Boundary ceases at the commencement of the Project for perpetuity, the present value of the gross value of production foregone is \$14.8 Million (using a 7% discount rate) and the present value of the net value of agricultural production foregone is \$8.7 Million (using a 7% discount rate). These values are developed as a conservative worst-case scenario as the mitigation measures and proposed rehabilitation strategy ensures the present value of agricultural production will be forgone for as little time as practicable.

Conservatively assuming that agricultural production from the onsite biodiversity offset areas ceases at the commencement of the Project for perpetuity, the present value of the gross value of production foregone is \$36.3 Million (using a 7% discount rate) and the present value of the net value of agricultural production foregone is \$25.3 Million (using a 7% discount rate).

Conservatively assuming that the predicted maximum loss of water from agriculture under median conditions due to Project water requirements is removed for perpetuity, the present value of the gross value of production foregone is \$5.4 Million (using a 7% discount rate) and the present value of the net value of agricultural production foregone is \$1.3 Million.

In total, foregone gross value and net value of agricultural production from land and water resources required for the Project is estimated at a present value of \$56.5 Million and \$33.2 Million, respectively (using a 7% discount rate).

The BCA included an estimation of the present value of production costs and benefits of the Project over a 27 year evaluation period. The present value of net production benefits of the Project are estimated at \$807 Million, with in the order of \$596 Million accruing to Australia. These estimates include an allowance for the opportunity costs of the agricultural land. In contrast, the present value of foregone agriculture in perpetuity is estimated at \$33.2 Million.

The net production benefits of the Project to Australia are therefore 18 times those of displaced agriculture and the allocation of the land resource to the Project results in an improvement in economic welfare.

5.20.7.2 Livestock Premiums

Submission Reference: SIG16

Issue

SIG16 submission commented that the study did not recognise “that for this valley, many producers are receiving premiums for both livestock and horses.”

Response

As stated in the above response during the land managers' interviews the land managers were given the opportunity to indicate if they thought their livestock or produce received a premium above the market standard or were they happy to use the values as applied in the DPI Agriculture gross margin budgets. All respondents said they were happy with using the values used in the NSW DPI gross market budgets.

The impact of improved prices received for livestock have been discussed in the above response based on the improved EYCI and the doubling of the cattle prices used in the NSW DPI gross margin budgets.

5.20.7.3 Water Value

Submission Reference: SIG16

Issue

In their submission the SIG16 questioned the economic modelling used for impacts to water use commenting that the AIS used northern NSW cropping figures for summer irrigated and dryland crops and that they were not applicable to the Bylong Valley.

Response

The NSW DPI gross margin budgets for northern NSW irrigated summer cropping relate to the regions of NSW that have neither a summer nor winter rainfall dominance or the areas that have a summer rainfall dominance. The Bylong Valley falls into this former classification. As such the models used are the best source of non-bias information. DPI Agriculture accepts the methodology as appropriate.

5.20.7.4 Scale of Agricultural Impacts

Submission Reference: SIG1

Issue

A submission contended that the statement that made in the AIS that the combined gross value of production from the agricultural land and water impacted by the Project is approximately 4% of the total agricultural production of the Mid-Western Regional Local Government Area, only 0.02% of that for NSW, and only 0.005 % of that for Australia, is not justification for sacrificing production.

Response

Gillespie Economics notes that this information is not provided as justification for the Project or for impacting agricultural resources, but provides some context to the scale of potential agricultural impacts. This is deemed to be an appropriate approach in order to quantify the impacts within the AIS and EIS.

5.20.7.5 Relative Economic Benefits of Agriculture and the Project

Submission Reference: SIG1

Issue

The foregone gross value and net value of agricultural production from land and water resources required for the Project have estimated present values of \$5.4 million and 1.4 million respectively (using a 7% discount rate) – this is then compared with the present value (estimated as \$596 million) of the total net production of the Project to Australia, and obviously found to be significantly less.

However, the comparison is really between a finite resource within a declining market (even to the extent that the coal might become a stranded asset) over 25 years or perhaps much less, versus sustainable utilisation within an expanding market over an 'infinite' number of years. Put simply, investment in long-term 'food supply' carries a high level certainty.

Response

The principles of welfare economics and BCA are suitable for the comparison of alternatives that have different economic lives. Gillespie Economics notes that the comparison of the present value of the Project which has a finite life, was made to agriculture, in perpetuity.

What this shows is that the Project will provide significantly more economic benefits to the community over its defined life than agricultural use of the land in perpetuity.

Nevertheless, agricultural production from the land will not be lost in perpetuity. This is because the primary objective of the rehabilitation strategy is to rehabilitate land to its pre-mining land use capability, including an equivalent area that will be classified as BSAL and other land capable of supporting equine activities.

5.20.7.6 Economic Contribution of the Hunter Valley's Thoroughbred Breeding Industry

Submission Reference: SIG10

Issue

A submission provides an outline of the economic contribution of the Hunter Valley's Thoroughbred Breeding industry to the region, the state and nationally, which includes a reference to the "Hunter Valley's multibillion dollar thoroughbred breeding industry".

Response

The economic contribution of the Hunter Valley's Thoroughbred Breeding Industry is not relevant to a consideration of the Project since no thoroughbred horse stud operations exist in proximity to the Project or will be impacted by it.

While some land mapped as Equine CIC will be impacted by the Project, none of this land is currently used for that purpose, and other land in the vicinity of the Project mapped as Equine CIC is also not used for this purpose.

Claims of the Hunter Valley thoroughbred breeding industry being a multibillion dollar industry are spurious and stems from an analysis that erroneously included downstream activities such as all the gambling turnover on horseracing in Australia as part of the thoroughbred industry of the Hunter Valley.

5.20.7.7 Dubious Economic Benefits

Submission Reference: SIG18

Issue

When quoting economic figures, the EIS does not compare like with like: it compares the annual value of agricultural production against the total economic value of life of the mine. Given that agriculture has been producing economic benefits in Bylong Valley for nearly 200 years and, if left undisturbed by a coal mine, can continue to produce for hundreds more years, such a comparison is invalid. We reject such short-term comparisons. Food production for the centuries to come is more important than a few years of royalty income.

Response

Gillespie Economics notes that the assumptions in this submission are incorrect. Section 5.5.2 of Economic Impact Assessment (Appendix AE of the EIS) provides a comparison between displaced agricultural activity and the Project on both an annual and present value basis.

The present value comparison conservatively assumes displaced agriculture in perpetuity. However, the objective of the rehabilitation strategy is to rehabilitate land to its pre-mining land use capability and hence minimal long term impacts on agriculture are expected.

5.20.8 Agricultural Risk Assessment

Issue

SIG16 believes the risk assessment process is inadequate in regards to the Agricultural Assessment and submits that until this section of the AIS is extensively revised, the AIS should not be adopted.

Response

To assist in identifying the key potential impacts to agricultural resources and enterprises within the locality of the Project, a risk assessment was completed utilising the KEPCO risk assessment tools. This risk assessment followed the standard procedure for quantitative risk assessment and is presented in Appendix 5 of Appendix X of the EIS. Each of the potential environmental issues was ranked in accordance with the KEPCO Risk Matrix as either being of low, moderate, high or extreme risk. The risk assessment presented the relevant risk category prior to the application of mitigation and management measures and ensured that all potential risks were identified and adequately addressed within the AIS. It is noted that none of the regulators including DPI Agriculture raised any concerns with regard to the risk assessment contained in the AIS.

Management and mitigation measures for mitigating the potential risks to agriculture are discussed in Section 7.16.6 of the EIS.

The existing environmental monitoring network will be expanded within the Project Boundary and in the locality to ensure that no unforeseen environmental impacts occur that may deleteriously affect agricultural activities adjacent to the Project Boundary.

5.20.9 Bylong Station

Submission Reference: P51, P153

Issue

There were concerns expressed over the land use of Bylong Station since its purchase by KEPCO. Some indicated it is not being utilised to its maximum potential, others were concerned that it is no longer utilised for horse breeding and consequently not mapped as BSAL land.

Response

A Farm Manager has been appointed to ensure available agricultural land will continue to be used for Agricultural enterprises where practicable. A Farm Management Plan has been developed for all KEPCO owned land not required for mining purposes, as detailed in Section 7.16.7 of the EIS, which will include the Bylong Station. The Plan will ensure sustainable farming practices are implemented to ensure the long term productivity of KEPCO owned agricultural lands.

Land is mapped as BSAL based on satisfying two criteria:

1. Access to reliable water supply; and
2. Assessment of the land against BSAL Criteria.

The BSAL criteria consider soil types and does not take into account the current land use.

5.20.10 Tarwyn Park / Natural Sequence Farming

5.20.10.1 Loss of Tarwyn Park

Submission Reference: SIG2, SIG3, SIG6, SIG9, SIG10, SIG11, SIG12, SIG13, SIG18, SIG20, SIG22, SIG25, SIG27, P4, P6, P7, P10, P11, P12, P13, P21, P23, P25, P30, P31, P33, P35, P38, P40, P44, P45, P47, P53, P55, P57, P62, P75, P82, P84, P87, P88, P89, P91, P94, P97, P99, P100, P104, P114, P116, P117, P119, P120, P124, P131, P133, P135, P142, P145, P147, P149, P150, P153, P159, P163, P166, P167, P170, P173, P177, P178, P186, P190, P192, P196, P200, P203, P204_2, P205, P211, P212, P213, P216, P218, P227 P71_2, P230, P232, P233, P234, P235, P236, P237, P238, P239, P240, P241, P242, P243, P244, P245, P246, P247, P248, P249, P250, P251, P252, P253, P254, P255, P256, P257, P258, P259, P260, P261, P262, P263, P264, P265, P266, P267, P268, P269, P270, P271, P272, P273, P274, P275, P276, P277, P278, P279, P280, P281, P282, P283, P284, P285, P286, P287, P288, P289, P290, P291, P292, P293, P294, P295, P296, P297, P298, P299, P300, P301, P302, P303, P304, P305, P306, P307, P308, P309, P310_1, P311, P312, P313, P313_2, P314, P315, P310_2, P317

Issue

A number of submissions (including form letters) raised concern that the renowned Tarwyn Park natural sequence farming processes will be destroyed, as well as concern over the impact on the historic homestead and buildings. It is noted that a number of these submissions were received as form submissions.

Response

Much of Tarwyn Park will continue to be used for agriculture based on a similar enterprise mix as before. KEPCO will to continue management and monitoring of Tarwyn Park, as far as practicable, under Natural Sequence Farming techniques unless future monitoring and analysis of Natural Sequence Farming at Tarwyn Park demonstrates it is not a viable option.

Further, Tarwyn Park will be made available for external study by appropriate scientific entities with an interest in land management and natural resource management of agricultural and grazing lands such as the CSIRO, Universities and regulatory agencies.

Such access will be determined on a case by case basis and within appropriate *NSW Work Health and Safety (Mines and Petroleum Sites) Act 2013* and associated regulations, operational and commercial limitations.

The impact and management on the historic homestead and buildings is discussed in **Section 4.2.13**. Impacts on Tarwyn Park groundwater is discussed in **Section 5.9.2**.

The Project has made application(s) for Mining Lease(s) (ML) providing the holder the exclusive right to mine for minerals over a specific area of land. The boundaries of a Mining Lease will include a proposed Mining Operations Plan (MOP) specifying the Disturbance Area (DA) that is contained in the ML. In regards to Tarwyn Park approximately 434 ha will be contained within the ML and approximately 177 ha outside the ML. The ML is specific in KEPCO's responsibility in both environmental management and in regards for health and safety that would come under the *NSW Work Health and Safety (Mines and Petroleum Sites) Act 2013* and associated regulations once a MOP is granted. As such the majority of the Natural Sequence Farming (NSF) land and infrastructure will remain intact within the ML undisturbed and with restrictive public access due to the legislative requirements of the *NSW Work Health and Safety (Mines and Petroleum Sites) Act 2013* and associated regulations to unauthorised personnel.

5.20.10.2 Reinstatement Natural Sequence Farming

Submission Reference: SIG2, SIG27 and P67_1

Issue

The submissions referenced above raise concerns with regard to the ability of the proposed rehabilitation strategy to reinstate and implement Natural Sequence Farming (or soil hydrology techniques) practices on the site.

Response

Section 10 of Appendix W of the EIS outlines the rehabilitation monitoring and research trials proposed for the Project. A consultative approach will be taken in regard to research trials which will be detailed in a Rehabilitation Management Plan to be developed following approval. DPI Agriculture and other relevant regulatory agencies will be consulted on the trial designs and targeted outcomes to ensure a collaborative approach is taken.

Natural Sequence Farming, as a form of Soil Hydrology Techniques (SHT), is a land management technique initially developed within the Bylong Valley. The principles of SHT are proposed to be included in the establishment of rehabilitation trials for the Project.

The trial principles to be employed consist of similar concepts as listed for the general rehabilitation trials in Section 10 of Appendix W of the EIS. Prior to the trial designs being implemented, an extensive consultation program will be undertaken including input from regulatory agencies, university/research entities, soil scientists, agronomists, farmers and water specialists.

Whilst the monitoring program for Landscape Function Analysis is applicable to mine rehabilitation sites, it is envisaged separate parameters will be identified and applied for the establishment of the principles of SHT on the post-mining landform. This will ensure the legacy of NSF, if deemed feasible through the trials, will not only be preserved, but expanded onto a broader range of landscapes for further analysis of the principles underlying the land management techniques.

The rehabilitation trials, including those proposed for SHT will be detailed in a rehabilitation management plan to be developed following approval. This plan will coincide with the detailed BSAL reinstatement plan to be developed concurrently.

5.21 VISUAL

5.21.1.1 Destruction of Landscape

Submission Reference: P132

Issue

P132 stated that “the EIS does not take into account the landscape impacts in the whole of the Bylong Valley. The proposed mines will impact the whole valley and the outstanding heritage value of the valley will be severely diminished.”

Response

The VIA for the Project (Appendix Y of the EIS) concluded that visual impacts will be limited to areas east of the ridgeline that runs north-south between Growee River Valley (within which the Bylong Valley Way traverses) and the Lee Creek and Upper Bylong Valleys. The positioning of the open cut mining areas, the OEAs and design amendments made to them during the preparation of the Project mine plan has limited any direct sightlines to the operational areas from the Bylong Valley Way and the Bylong Village.

In addition to the screening of views provided by topographic features, there are areas of broad woodland vegetation that screen or filter the distant views towards the mine from a sensitive viewing location near intersection of Bylong Valley Way and Upper Bylong Road where the natural landform is flatter.

Figure 67 of the EIS illustrates the location of photomontage analyses conducted for the Project. Photomontage analysis within the VIA was prepared for the purpose of determining levels of visibility of mine elements and estimating the extent of potential impacts on and from respective viewing locations.

It is considered that the analysis has demonstrated that from one of the most sensitive view locations, an open vista across Tinka Tong on Upper Bylong Road, the OEA will screen most of the views of the active operational areas of the open cut mine. **Figure 30** (reproduced from Figure 6.3(e) of the VIA) illustrates the present view and the level of impacts from this highly sensitive viewing location at Project Year 9.

Figure 30
Photomontage of Upper Bylong Road – Year 9
View from Upper Bylong Road Looking South-East Towards Open Cut Mine Area



Statements from Section 7.7 of the VIA include the “...visual impact of the Project is generally low from key viewing locations. Impacts are confined to the local setting of Lee Creek and Upper Bylong Valley....The major experience of the Bylong Valley is west of the major operational areas of the Project. It is separated visually from the Project by existing topography and vegetation.”

Visibility of the Project from areas of high visual sensitivity such as the Bylong Valley Way is limited. It is noted visual impacts are generally restricted, because visual effects of Project elements will be minimised over time by progressive rehabilitation. High visual effect levels due to views to active mining areas of OEAs from sensitive viewing locations assessed in the VIA will generally have very short duration times of up to 2 - 5 years, after which time the commencement of landscape restoration and the establishment of progressive rehabilitation will reduce visual effects to low.

5.21.1.2 Rural Landscape Value

Submission Reference: SIG11, SIG20, P26, P33, P34, P38, P39, P43, P49, P54, P60, P63, P73, P79, P85, P90, P102, P118, P121, P129, P132, P134, P161, P163, P172, P180, P181, P183, P185, P188, P190, P201, P212, P217, P223, P224, P269, P272

Issue

A number of stakeholders raised concerns over the loss to scenic values with the destruction of rural landscape, heritage structures and cliff lines.

Response

Refer to **Section 5.26.4** for information regarding the economic considerations of the landscape impacts on the Bylong Valley tourism in the EIS.

The potential visual impacts on the rural landscape is discussed in the VIA in Appendix Y of the EIS and further in **Section 5.21.1.1**.

The concern over the loss or damage to scenic values from the subsidence of cliffs is discussed in **Section 5.4.1**. The loss of heritage structures is discussed in **Section 5.15.1**.

5.21.1.3 Bylong Valley Way

Submission Reference: P118

Issue

P118 commented that the Project would destroy another area of scenic beauty and would be denied to us and bring about dust, light pollution and traffic issues along the Bylong Valley Way which links with Capertee Valley Way and Tablelands Way, Tourist Drives.

Response

The Capertee Valley is located more than 40 km to the south of the Project and is separated by a number of vegetated mountain ranges. This geographical separation will limit any visual experience of the Project to journeys within the region, specifically to short stretches of Bylong Valley Way and the Upper Bylong and Lee Creek Valleys.

Following a visual assessment of all components of the Project, it was determined by JVP (2015) that visual impacts would be limited to areas east of the Growee Ranges ridgeline that runs north-south between the Growee River Valley within which the Bylong Valley Way traverses (to the west) and the Lee Creek and Upper Bylong Valley. The positioning of the open cut mining areas and OEAs for the Project has limited the vast majority of sightlines to the active operational areas from the Bylong Valley Way, which is the main route used as a tourist drive.

Bylong Valley Way has a limited section of road north of the Bylong Village in the northern view sector where visual effect is high to moderate for short periods until views to small areas of the North-Western OEA are rehabilitated.

After 2 to 3 years, the OEA will be shaped and rehabilitation commenced. The visual effects of the OEA will be reduced and visual integration with existing setting will improve. Generally, the percentage of view occupied by the Project in this instance is less than 2.5% of primary view area on Bylong Valley Way.

The lesser-used rural roads along Lee Creek and the Upper Bylong Road are predominantly local access roads to rural properties south of Bylong. Access along parts of these routes will be closed and relocated for the duration of operations. The landscape conditions and views from these roads will be modified and impacted with the addition of the OEAs. However rehabilitation strategies for the final landforms will allow these features to begin to integrate with the surrounding landscape in a relatively short period of approximately 10 years.

5.21.2 Indirect Visual Impacts

Submission Reference: SIG2, SIG11, SIG20, P81, P118, P201

Issue

The submissions referenced above raised concern with regard to the potential for indirect visual impacts such as night lighting, dust and traffic to impact the Bylong Valley and also carry to landholders living in the Capertee Valley.

Response

As outlined in Section 7.6 of the VIA, night light impacts occur as a result of direct and/or diffuse light, dependent on the viewing location.

The potential for visual impacts from direct light sources are minimised by the location of concentrated light sources at the CHPP, rail loading, and underground mine portals. Local ridgelines and vegetation around MIAs will generally screen areas to the north and north-west, and south-west from direct lighting effects at night. The Capertee Valley being located more than 40 km away and separated by vegetated ridgelines will be unlikely to experience direct light effects. This valley will be similarly screened from night light associated with operations in the open cut mining areas and on the OEAs. Indirect light effects at these distances with intervening topography will be negligible.

Diffuse or indirect night light effects depend in part on atmospheric conditions, being greatest when light can be reflected off airborne particles such as dust but generally, especially at night, moisture particles such as light fogs. A strong light source is also required. In the case of mining operations, such a source will only emanate from the concentrated source of lights required at the MIAs for the CHPP, rail loading facility and site offices. While the concentration of lights at the MIAs will generate indirect (diffuse) lighting effects these operational clusters are well shielded by either topography or planned OEAs that will limit the "spillage" from these light sources. Indirect lighting effects are unlikely to be created by the small amount of light generated by the night operations of the open cut mining fleet.

In addition to topographic features, regular mitigation treatments and light management further reduce diffuse light spillage from active areas. It is considered that visual impacts from light effects will be low to negligible.

Noise and dust effects from blasting will be infrequent and of short duration. This will minimise the potential of such events creating this indirect effect.

Other dust sources will be appropriately managed utilising standard techniques to minimise any visual effect on residents of the Bylong area. As a result, residences in the Capertee Valley 40 km away have a low likelihood of experiencing the visual effects of dust.

5.21.3 Visual Impacts on Southern Landholders

Submission Reference: P81 and P201

Issue

The submissions referenced above had a number of concerns regarding visual impacts on the properties Lee Creek and Carawatha and questioned whether visual impacts have been assessed for private landholders located to the south of the Project.

Response

There was no exclusion of private landholders in the southern view sector from the VIA.

The VIA identified that residences in the southern part of the Bylong Valley will have moderate to high sensitivity, thereby acknowledging the visual impacts on private residences as well as KEPCO owned properties in that area.

Section 7.3.3 of the VIA acknowledges that residents in the southern view sector may experience moderate to high visual impacts for up to 25 years where direct views of the Project takes up a large proportion of the view. However, local conditions (topography, vegetation and view orientation) that provide screening at specific viewing locations and at residences are likely to reduce or eliminate many of the potential impacting views.

It was noted that those properties with the greatest potential for visual impact within 2.5 km of proposed mining operations have been acquired by KEPCO. It is considered that private landholders further to the south have limited views of, or to the operations, which, when coupled with an increased view distance to any visible elements of the Project, reduces the levels of visual effect caused by the mine.

5.21.3.1 Visual Impacts on North-Western Quadrant

Submission Reference: P81 and P201

Issue

The submissions referenced above raised concern that the visual assessment does not adequately consider the impacts that the Project will have on the high value vistas and landscape views of the paddocks within the north western quadrant of the farm.

Response

The moderate to low visual impact attributed to these areas in the VIA reflects the acknowledged high visual effect levels created by mining operations before rehabilitation is achieved. However views from working rural farmlands (which have a low visual sensitivity due to the functional requirements of agricultural land) results in the reduction in the visual impact levels assessed by JVP (2015).

Loss of views to distant cliffs and forested ridges may occur from various locations of the property in question due to the establishment of the final landform of the Project. However, such losses could be lost due to numerous land use activities such as roadside or residential tree planting on neighbouring properties. What is paramount in considering changes to views from existing residences is that rehabilitated landform of the Project will emulate the form of adjoining topography and vegetated patterns and visually integrate with them in the long term.

5.21.3.2 Visual Representations for Southern Quadrant

Submission Reference: P43, P81 and P201

Issue

The submissions referenced above raised concern that the EIS does not include any visual representation of the adverse impact on vistas and views from any property or place in the southern quadrant of its visual impact analysis.

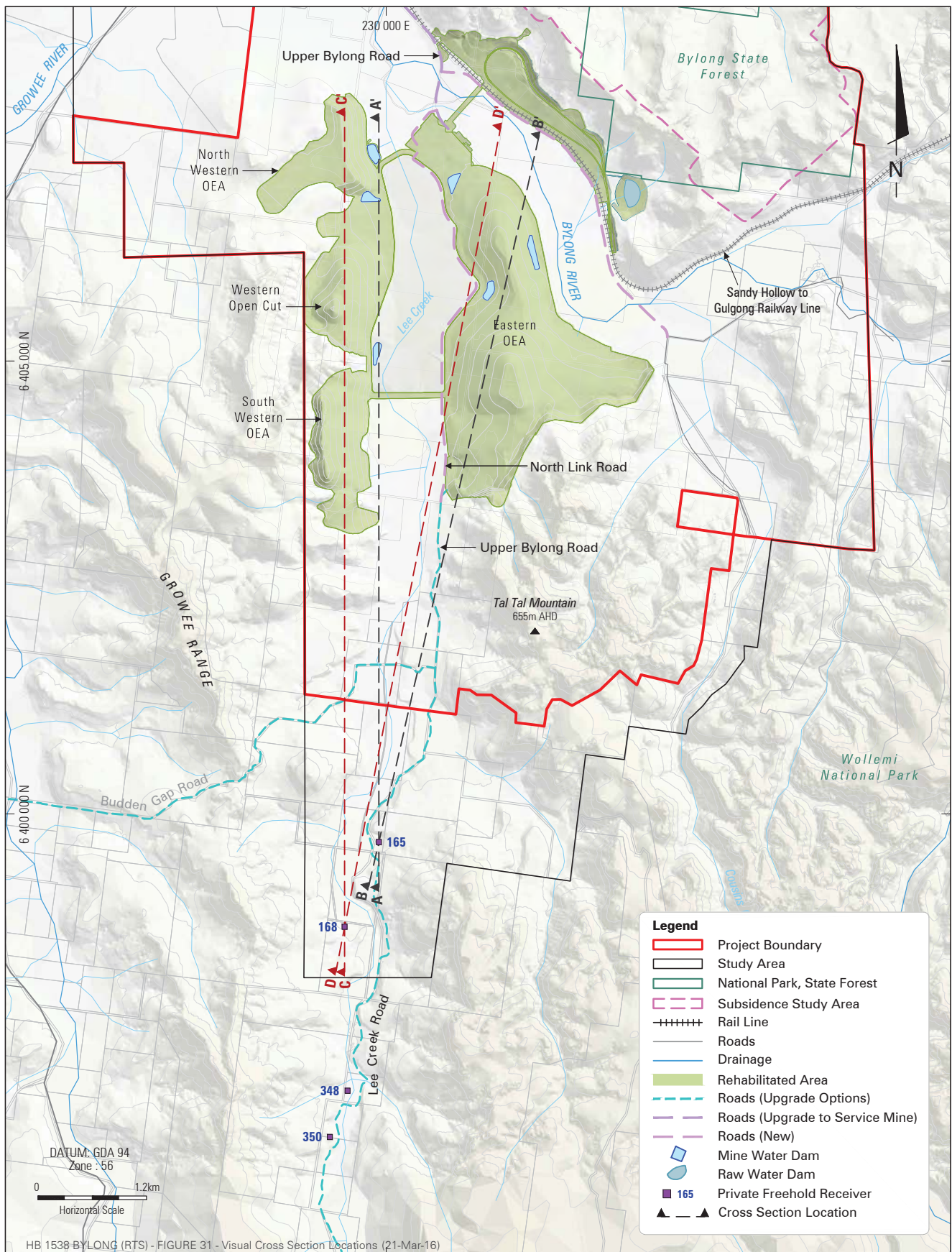
Response

The Garling / Loneragan family property (Receiver Numbers 165, 168, 348 and 350 on Figure 12a of the EIS) represents private freehold properties located south of the Project.

The residences for Receivers 165 and 168 are approximately 3.9 km and 5.1 km respectively from the southern extent of the Eastern OEA and were assessed as a moderate to high sensitivity receivers in the VIA. This is derived from the JVP visual assessment methodology Table 2.2 where any urban or rural house less than 7.5 km from nearest visible mine area has moderate to high sensitivity.

Cross sections have been developed to provide visual representation of the line of sight from the four residential receivers on the Garling / Loneragan properties (refer to **Figure 31**, **Figure 32**, **Figure 33** and **Figure 34**).

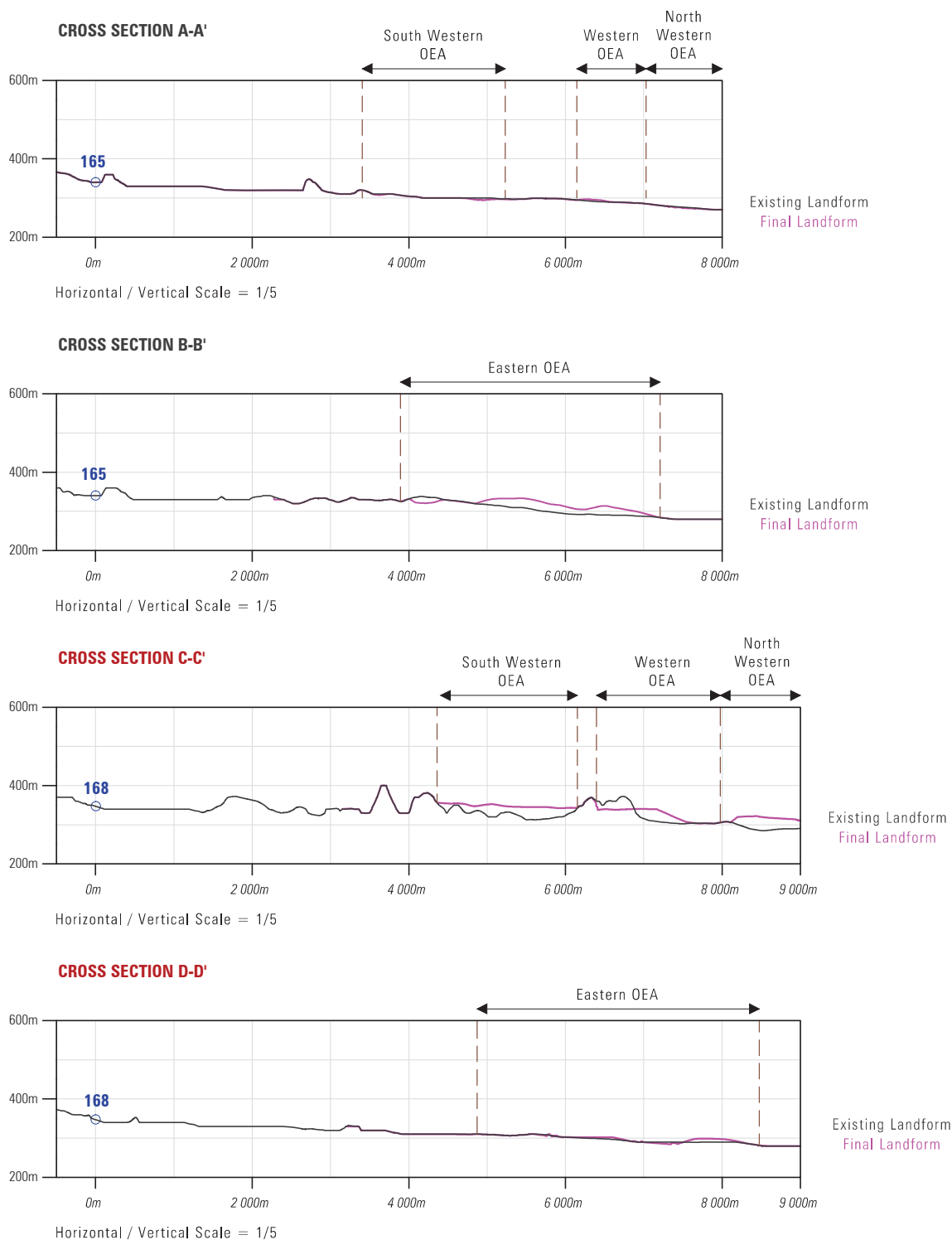
Each section line has been generated from one of the four receiver locations, with two directions of view illustrated to include both existing and final landform. This provides an indication of visibility of a Project element including OEAs, from these receiver locations.



BYLONG COAL PROJECT

Visual Cross Section Locations
from Receivers 165 and 168

FIGURE 31



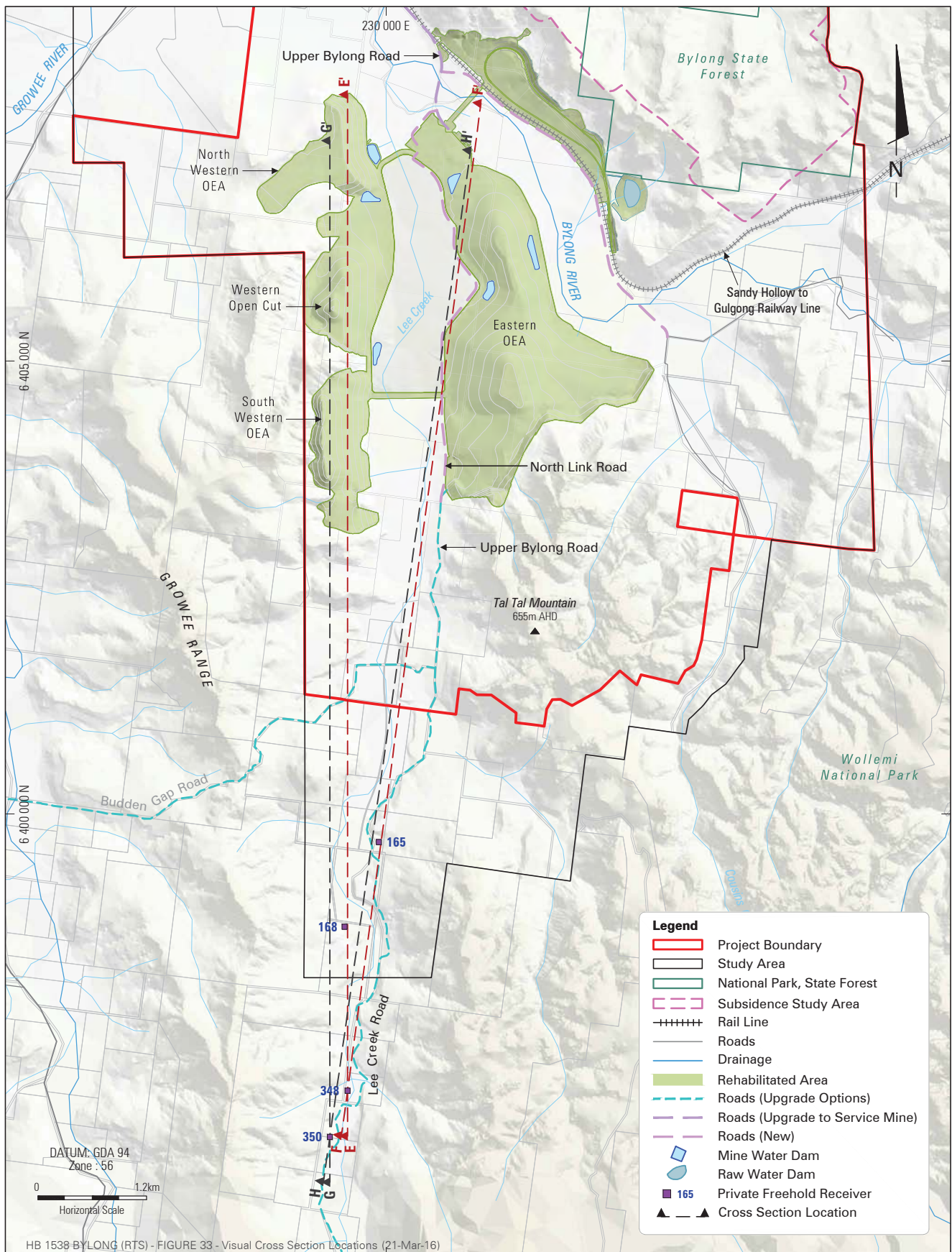
HB 1538 BYLONG (RTS) - FIGURE 32 - Visual Cross Sections (13-Mar-16)

BYLONG COAL PROJECT



Visual Cross Sections
- Receivers 165 and 168

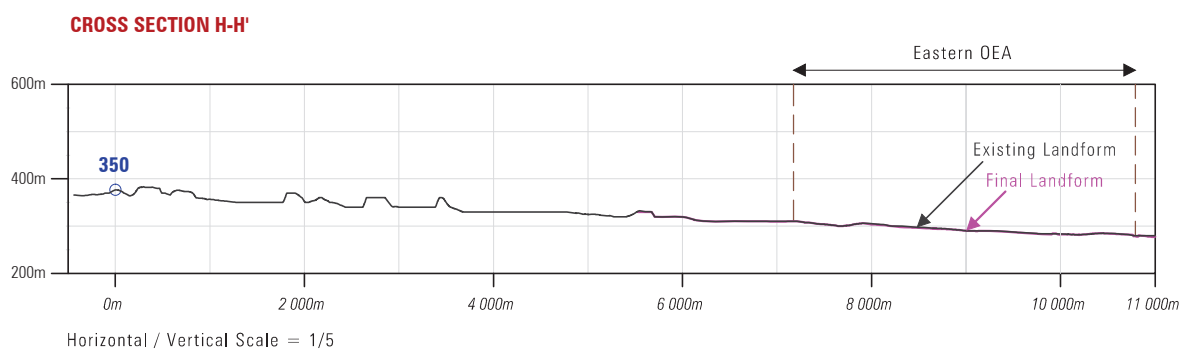
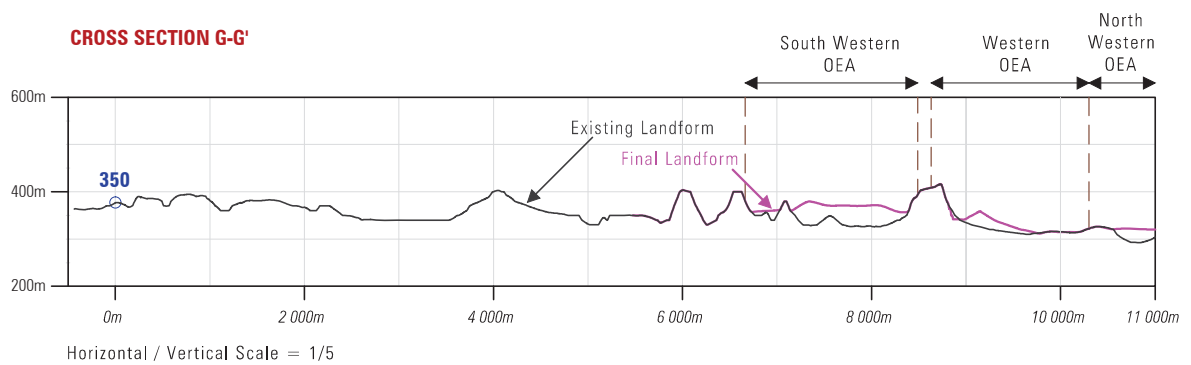
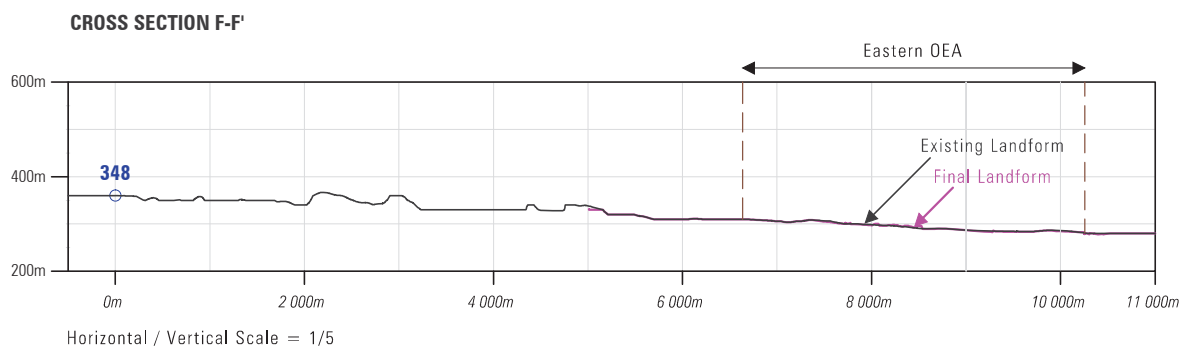
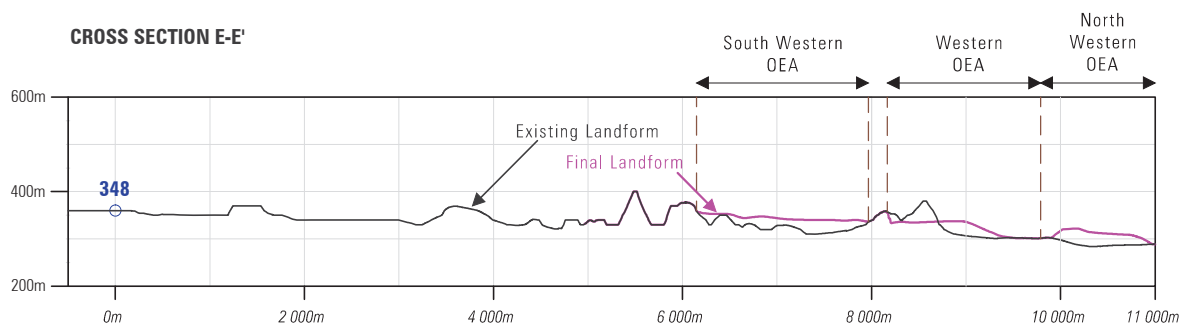
FIGURE 32



BYLONG COAL PROJECT

Visual Cross Section Locations
from Receivers 348 and 350

FIGURE 33



0 1.6km
Horizontal Scale

HB 1538 BYLONG (RTS) - FIGURE 34 - Visual Cross Sections (13-Mar-16)

BYLONG COAL PROJECT



Visual Cross Sections
- Receivers 348 and 350

FIGURE 34

The following provides evaluation of these visual representations:

Figure 31 and Figure 32: Receiver 165 Visual Cross Sections

A - A: View line to north in direction of South-Western, Western and North-Western OEAs

Two existing intervening ridgelines provide a visual barrier to landforms beyond. There is no change to visible landform and profile resulting in no visual impact from this receiver location.

B - B: View line north-east in direction of Eastern OEA.

One existing intervening ridgeline provides visual barrier to landforms beyond.

There are changes to the profile with an increase in vertical elevation of final landform at a distance of approximately 5 km from this receiver location, however this remains below the line of sight and the intervening ridgeline.

There are no views to Project hence no visual impact from this receiver location.

Figure 31 and Figure 32: Receiver 168 Visual Cross Sections

C - C: View line to north in direction of South-Western, Western and North-Western OEAs

Two existing intervening ridgelines provide visual barrier to landforms beyond. The Project is developed behind these ridgelines with the final landform elevations and profiles remaining below these screening ridgelines.

There are no views to Project hence no visual impact from this receiver location.

D - D: View line north-east in direction of Eastern OEA.

The view line is along creek valley with the western extent of a low ridgeline providing intervening foreground screening topography. Beyond this, the existing landform is altered (lower) at a distance of approximately 5 km from Receiver 168.

There are no views to Project hence no visual impact from this receiver location.

Figure 33 and Figure 34: Receiver 348 Visual Cross Sections

E - E: View line to north in direction of South-Western, Western and North-Western OEAs

Two existing low rises and one significant ridgeline provide visual barriers to the receptor of landforms beyond. The Project is developed behind the ridgeline, with final landform elevations and profiles remaining below these existing levels.

There are no views to Project hence no visual impact from this receiver location.

F - F: View line north-east in direction of Eastern OEA.

The view line is along creek valley with the western extent of a low ridgeline providing intervening foreground screening topography. Beyond this, the existing landform has minor level changes beyond a distance of 5 km from Receiver 348. The line of sight is over these changes in the Project area.

There are no views to the Project hence no visual impact from this receiver location.

Figure 33 and Figure 34: Receiver 350 Visual Cross Sections

G - G: View line to north in direction of South-Western, Western and North-Western OEAs

The nearest Project element is approximately 6.7 km from the Receiver. A series of existing intervening ridgelines provide visual barrier to landforms beyond. The Project is developed behind these ridgelines with final landform elevations and profiles remaining below these screening ridgelines.

There are no views to the Project hence no visual impact from this receiver location.

H - H: View line north-east in direction of Eastern OEA.

The nearest Project element is approximately 7.1 km from Receiver. View line is along creek valley with a localised rise to the north providing intervening foreground screening topography. Beyond this, the existing landform has minor level changes between 7.1 km and 10.8 km from Receiver 350. The line of sight is over these changes in the Project area.

There are no views to the Project, hence no visual impact from this receiver location.

Should the owner of these residences (receiver IDs 165, 168, 348 & 350) consider that during the course of mining operations that they are experiencing high visual impacts from the Project at their residences, an assessment will be made at the residence and feasible and reasonable mitigation measures will be considered for implementation.

It is acknowledged that for the initial 10 years of the Project, the visual experience will be diminished due to views of the Project during journeys to and from their property and ephemeral perceptions and knowledge of the changes to the landscape more than any actual loss of views experienced from the residences.

5.21.4 Final Landform

Submission Reference: P201

Issue

In their submission P201 stated that *"the other matter to note is that, according to the Main Report, even after rehabilitation is concluded the north-west OEA will be finished to height equivalent to RL 395m, the south-west OEA will be finished to RL 390m, and each of the east and west OEA's will be finished to RL 360m: see Figure 23 and pp 45-46 of the Main Report, see also para 7.15.4 at p 277 of the Main Report. The conceptual drawings, and the descriptions of the intended purposes to be achieved with final rehabilitation suggest a slope of around but not exceeding 10%. The natural topography of the land in these areas is RL 260m - 280m, with the majority of the slope being of less than 1%: see Figure 24 at page 47 of the Main Report."*

Response

It is acknowledged that there will be modifications to the existing landscape as a result of final OEA landforms. The increase in the final heights mentioned in the submission does not reflect the context of the proposed profiles of the rehabilitated OEAs. For example, the natural topography of the land in the areas proposed for OEAs includes more vertical variation than heights of RL 260 (not identified in cross sections on Figure 24 of EIS) – 280 m as stated in the submission. In particular, the areas proposed for the North-West, West and South-West OEAs are areas of existing elevated ridgelines and side slopes. While the OEAs will modify these existing profiles, the final landforms will be contiguous with and similar to the existing ridgeline landforms.

The Eastern OEA does create a highly modified topography in a previously gently sloping valley. However, it is considered that the southern extents of the Eastern OEA profile, become contiguous with the existing elevated topography.

5.21.5 Visual Impacts of Proposed North Link Road

Submission Reference: P201

Issue

In their submission P201 states that “since the preparation of the EIS, KEPCO has investigated a further alternative route for neighbours living within the Lee Creek valley area to the south of the Project to travel to Bylong and Bylong Valley Way. This proposed route was not included in the EIS.”

Response

The proposed North Link Road (see **Figure 7** in **Section 4.2.9.6**) is aligned to the west of the existing rural Upper Bylong Road which continues as Lee Creek Road to the south of its intersection with Buddens Gap Road. The North Link Road alignment will follow the western limit of the Eastern OEA and Open Cut MIA before joining the existing Upper Bylong Road to the north of the Open Cut MIA. This new road will be formed as a local rural road with moderate to low visual sensitivity as per the visual assessment methodology.

As the proposed road will be located in close proximity to the OEAs (less than 500 m), the visual effect for road users will be high, resulting in a moderate visual impact for this 5 km proposed section of road. The proposed route offers an improved alternative route into Bylong Village and to access the Bylong Valley Way (see **Section 4.2.9.6**).

5.22 TRAFFIC AND TRANSPORT

5.22.1 Traffic Assessment of Wollar and Mudgee Ulan Road

Submission Reference: SIG8, SIG24, P51, P100, P75_1, P187,

Issue

A number of submissions raised concern over the increase in traffic through Wollar to Mudgee via the Munghorn Gap Nature Reserve, indicating the increased traffic and road conditions had not been adequately assessed and that the road was not suitable due to road width and condition.

Response

The TTIA (Appendix Z of the EIS) undertaken for the Project completed a qualitative assessment for the traffic volumes and intersection performance of the regional road network distant from the Project. This qualitative assessment concluded that the key roads will operate with plenty of spare capacity and the key intersections will only experience small impacts during peak Project traffic periods.

In light of the submissions received, a revised TTIA (**Appendix D**) has been prepared for the Project. This revised assessment includes further consideration and modelling for the regional study area, including the potential impacts on Wollar Road and Ulan Road towards Mudgee (which includes a consideration of the Munghorn Gap Nature Reserve). This assessment considers the impacts of the Project utilising quantitative modelling and provides a similar conclusion to the EIS assessment.

The assessment indicates that the road network and intersections analysed will perform within capacity and easily accommodate increased traffic. No congestion is anticipated.

The Wollar Road is an approved B-Double road between Bylong Valley Way and Ulan road with B-Doubles restricted to an 80 km/h speed limit and travel outside of school bus operation times. Hence this road accommodates heavy vehicle use. Parsons Brinckerhoff has also reviewed and inspected the proposed route and indicated that whilst there are a few adjustments required to improve the safety of a section of the road, this regional route is acceptable for use by Project-related traffic.

As committed to within the EIS, KEPCO will commission dilapidation inspections of the regional road network to be undertaken prior to the commencement of construction. These inspections will confirm the items that need to be addressed in the construction phase as well as providing a base case condition of the road network to be utilised, prior to any impacts of the Project occurring.

5.22.2 Study on Wollar-Mudgee Road

Submission Reference: SIG24

Issue

The Wilpinjong Coal Project was originally designed and approved to use the Wollar-Mudgee Road as the mine traffic route with the main mine entrance on that road. The approval required a comprehensive traffic study to be conducted. The outcome of the study was a modification of the mine plan so that the main mine entrance was shifted to the south on the Wollar-Ulan Road and all mine traffic re-routed to use the Mudgee-Ulan Road. This was because the width of the sealed road through the Nature Reserve was inadequate for the safe passage of heavy mine traffic and the large number of daily movements.

Response

This submission refers to the outcomes of a study completed on the road conditions approximately 10 years ago. MWRC has made substantial improvements to the regional road network during this time.

Based on the site inspections completed by Parsons Brinckerhoff for the revised TTIA, the current condition of Wollar-Mudgee Road does not encompass all the constraints identified in this submission. The Wollar-Mudgee Road is an approved B-double road and provides the most direct route to Mudgee from the Project site.

5.22.3 General Traffic Impacts

Submission Reference: SIG8, SIG24, P51, P71_1, P81, P99, P118, P187, P196, P212

Issue

A number of submission indicated that the Traffic Impact Assessment is inadequate, raising concerns with a general increase in traffic, traffic congestion, coal trucks on the road, road conditions.

Response

The TTIA presented within the EIS presents a detailed assessment of the key local roads within the vicinity of the Project. The assessment concluded that the regional road network and road intersections will continue to operate with sufficient capacity including the predicted Project related traffic.

As discussed in **Section 5.22.1**, a revised TTIA has been undertaken to assess the regional study area. Whilst a road condition assessment has been undertaken for the purposes of the assessment, Parsons Brinckerhoff has visited the key regional roads within the MWRC LGA and has deemed these roads to be suitable for accommodating the road traffic associated with the Project, at the same time noting deficiencies and identifying potential improvements for safety.

Coal will be transported by rail from the site and therefore no coal trucks will be utilised on public roads for the Project.

The Project will generate Project related traffic including employee, service, construction and delivery traffic. The revised TTIA (**Appendix D**) indicates that the regional road network and intersections analysed will perform within capacity and easily accommodate increased traffic from the Project. No congestion is anticipated. KEPCO is in ongoing discussions with MRWC in relation to an agreement for the contribution to road maintenance for the road network utilised by Project related traffic.

5.22.4 Road Safety Audit and Dilapidation Inspections

Submission Reference: SIG24

Issue

The traffic report recommends that a formal road safety audit is needed (p 27) and road dilapidation inspections be conducted prior to commencement of construction. We consider this to be a critical requirement of the project assessment prior to approval.

Response

The revised TTIA has identified a number of road safety deficiencies on the regional road network as identified by Parsons Brinckerhoff during their site inspections. The site inspections also identified particular areas of the regional road network which are in a deteriorated condition and noted these as road safety deficiencies. Therefore the site inspections have identified the key safety and dilapidation issues of the regional road network for the purposes of Project assessment.

As committed to within the EIS, KEPCO will engage formal road safety audit and dilapidation inspections of the regional road network to be undertaken prior to the commencement of construction. These inspections will confirm the items that need to be addressed in the construction phase as well as providing a base case condition of the road network to be utilised, prior to any impacts of the Project occurring.

5.22.5 Increased Traffic on Wollar Road

Submission Reference: SIG24

Issue

The traffic report identifies that Mid-Western Regional Council (MWRC) has forecast that the sealing of the Wollar-Bylong Road with the Bylong Mine in operation will attract 500 – 1,000 vehicles per day. This is an increase of 250% - 600% on existing daily traffic movements on Wollar Road (p 34).

Response

As noted within MWRCs submission, this forecast was based on the Project not requiring a WAF for the peak year of construction for the Project with the majority of staff travelling to and from the Project from Mudgee and surrounds.

The revised TTIA has considered this scenario, which confirms that Wollar Road will experience an increase of approximately 478 vehicles per day during the peak year of construction (PY 2). This increase in traffic movements is predicted to be less during other periods of the Project. Under the with WAF scenario, an increase of approximately 262 vehicles daily is expected on Wollar Road (during PY 2).

5.22.6 Background Traffic Counts

Submission Reference: SIG24

Issue

The traffic report outlines that the Annual Average Daily Traffic (AADT) on the Wollar Road based on 2011 counts was 161 vehicles with 20% heavy vehicles between Bylong and Wollar and 455 vehicles with 7% heavy vehicles between Wollar and Mudgee. These figures are now four years old and do not provide an adequate background traffic count.

Response

Additional intersection and mid-block traffic counts were undertaken in December 2015 and these have been utilised for baseline data purposes within the revised TTIA. The results of the December 2015 counts indicate 104 vehicles with 17% heavy vehicles between Bylong and Wollar, and 150 vehicles with 16% heavy vehicles between Wollar and Mudgee. The traffic data indicates a significant decrease in vehicles utilising Wollar Road from 2011 to latest counts undertaken in 2015.

5.22.7 Background Traffic Counts Within Wollar Village

Submission Reference: SIG24

Issue

Contractors travelling from the Muswellbrook area to the three existing mines regularly use the Bylong Valley Way and Wollar Road, often breaking the speed limit. More recent traffic counts through the Wollar village are necessary to provide more accurate background traffic movements.

Response

Recent traffic surveys undertaken in December 2015 included the traffic generated by other adjacent mines, including those who mine employees that may travel from the east (Muswellbrook) through Wollar village.

5.22.8 Condition of Wollar-Mudgee Road

Submission Reference: SIG24

Issue

The Wollar-Mudgee Road has recently been severely impacted by several months of re-routing of all Wilpinjong Mine traffic through Wollar village caused by the closure of the Wollar-Ulan Road after a threatening highwall collapse at Moolarben Mine.

Response

This closure occurred in June 2015. As committed to within the EIS, KEPCO will commission dilapidation inspections of the regional road network to be undertaken prior to the commencement of construction. These inspections will confirm the items that need to be addressed in the construction phase as well as providing a base case condition of the road network to be utilised, prior to any impacts of the Project occurring. The Wollar Mudgee Road is a B-Double approved route and therefore accommodates heavy vehicle use.

5.22.9 Intersection of Wollar-Mudgee and Wollar-Ulan Road

Submission Reference: SIG24

Issue

The analysis of intersection impacts in the traffic report (5.2 p68) fails to acknowledge that the intersection of the Wollar-Mudgee Road and Wollar-Ulan Road is in the middle of the Wollar village.

Response

The recent intersection traffic surveys undertaken in December 2015 assessed this intersection. The intersection modelling described within the revised TTIA indicates good levels of service, with minimal vehicle delay and vehicle queuing. Therefore, whilst this intersection is located within the Wollar Village within a 50 km/h speed environment, there are no traffic related issues.

The *RMS Guide to Traffic Generating Developments* (October 2002) further describes traffic related impacts on residential streets. Table 4.6 of this document looks at environmental capacity standards on residential streets and takes into both public amenity and safety considerations. Based upon Table 4.6, a Local Street could accommodate a maximum 300 vehicles per hour in a peak hour and likewise a Collector Street could accommodate a maximum 500 vehicles per hour in a peak hour. Under cumulative traffic conditions during construction in 2017, the Projects peak traffic year, there is a maximum 203 vehicles per hour through this intersection within a peak hour which is well within RMS environmental capacity performance standards.

5.22.10 Cumulative Impact

Submission Reference: SIG24

Issue

SIG24 does not support the conclusion in the traffic report (p20) that a cumulative impact of the expansion of existing mines will not exist.

Response

The TTIA presented within the EIS presents a detailed assessment of the key local roads and intersections within the vicinity of the Project including a cumulative traffic assessment. Due to the local area study, cumulative traffic from Bylong Quarry was included but not the adjacent three mines traffic. On review of these three mine traffic assessments, no traffic was distributed to these two intersections assessed, hence no mine traffic at either Bylong Valley Way and Wollar Road or Bylong Valley Way and Upper Bylong Road intersections.

The revised TTIA (**Appendix D**) includes consideration of the regional study area which has been widened from the TTIA (Appendix Z of the EIS). The revised assessment has also included consideration of the potential cumulative traffic impacts with the adjacent three mines. When considering the contributions from the other mines with the Project-related movements, the results indicate that all roads and intersections assessed will continue to perform at good levels of service, with ample spare capacity under all scenarios assessed (including conservative worst case no WAF scenario).

5.22.11 Moolarben Stage 2 Traffic Impact Assessment

Submission Reference: SIG24

Issue

The fact that the Moolarben Stage 2 Traffic Impact Assessment did not distribute any traffic movements to Wollar Road or the Bylong Valley Way demonstrates the inadequacy of that assessment report.

Response

Noted. Recent baseline traffic surveys undertaken in December 2015 included the traffic generated by other adjacent mines. This baseline data has been utilised within the revised TTIA (**Appendix D**) to assess the potential cumulative traffic impacts of the Project on the regional road network.

5.22.12 Safety and Amenity of Wollar Village

Submission Reference: SIG24, P187

Issue

A few submissions considered the impacts of mine traffic on Wollar village, road condition and public safety have not been adequately assessed, and that the major increase in traffic movements will have a significant impact on the safety and amenity of the Wollar village.

Response

The majority of Project related traffic is proposed to travel along Wollar Road to and from Mudgee, with a minor proportion potentially utilising Ulan-Wollar Road from Wollar village. The results of the revised TTIA (**Appendix D**) indicates both the road network and intersections at these locations have ample capacity to accommodate increased road traffic generated by the Project. Road condition and public safety will be monitored during the mine construction and operation stages in close consultation with the MWRC.

The *RMS Guide to Traffic Generating Developments* (October 2002) further describes traffic related impacts on residential streets. Table 4.6 of this document looks at environmental capacity standards on residential streets and takes into both public amenity and safety considerations.

Based upon Table 4.6, a Local Street could accommodate a maximum 300 vehicles per hour in a peak hour and likewise a Collector Street could accommodate a maximum 500 vehicles per hour in a peak hour. Under cumulative traffic conditions during construction in 2017, the Projects peak traffic year, there is a maximum 203 vehicles per hour through this intersection within a peak hour which is well within RMS environmental capacity performance standards.

5.22.13 Impact on Murrumbo Property from Traffic

Submission Reference: O5

Issue

Submission O5 is concerned about impacts on the operation and value of our agricultural property associated with increased traffic on Bylong Valley Way, which is a key transport route for the property.

"The increase of traffic on this road is significant (63%) and would include mine workers that have travelled significant distances and oversize vehicles that will affect the safety of other road users."

Response

KEPCO acknowledges that the Murrumbo Station property (located to the east of the Project) contains landholdings on either side of the Bylong Valley Way and at certain times transports stock from one side of the property to the other.

Some of the Project related traffic is likely to utilise the Bylong Valley Way to the east of the Project, including the section of road in the vicinity of the Murrumbo Station property. However, it is noted that whilst some traffic will travel towards the east, the largest proportion of Project related traffic is anticipated to travel towards Mudgee and surrounds.

The percentage increase in traffic flow on Bylong Valley Way stated within this submission appears to be significant. However, this is due to the existing low traffic volumes on the Bylong Valley Way and therefore any increase (such as that proposed for the Project) would appear to be significant.

The modelling completed within the revised TTIA (**Appendix D**) has indicated that the Bylong Valley Way will continue to have ample capacity to carry the Project related traffic. Bylong Valley Way between the Golden Highway and Wollar Road is expected to carry up to 20 additional vehicles in the AM and PM peak hours during construction in 2017 (PY 2).

Despite the predicted increase in traffic flows as a result of the Project, which primarily occur during prior to and post work shifts, the Murrumbo Station property will continue to be capable of transporting its stock over the Bylong Valley Way subject to the requirements from MWRC as the local roads authority. It is likely that during periods of stock transport, the relevant road signage will be installed to ensure the maximum safety to road users, stock workers and the stock.

5.22.14 Castlereagh Highway and Associated Roads

Submission Reference: P212

Issue

Traffic dangers will now be exacerbated, with heavy traffic for construction and servicing of the mines, and transportation of materials. An infant can see how the existing Castlereagh Highway and associated roads cannot cope with the problems posed by this proposed mine.

Response

The revised TTIA (**Appendix D**) has assessed the regional road network and modelled the performance at key intersections and mid-block sections of road. The modelling and assessment has concluded that the road network and intersections assessed will continue to have ample capacity to accommodate increased Project traffic.

5.22.15 Ulan Road Strategy

Submission Reference: O1

Issue

O1 requests that the Department seeks confirmation from KEPCO that the Bylong Coal Project would financially contribute to the Ulan Road Strategy road upgrades and road maintenance program proportional to its contribution to total future traffic on the length of Ulan Road.

Response

KEPCO is in ongoing discussions with MRWC in relation to an agreement for the contribution to road maintenance for the road network utilised by Project related traffic.

5.22.16 Train Assessment

Submission Reference: O1, O8, P187, P196, SIG8, SIG24,

Issue

A number of submissions indicated that the train assessment is inadequate or poor, in regards to assessing the capacity, efficiency and safety of the rail network and the cumulative impact to existing users. Further, existing users have not been consulted.

Response

ARTC is responsible for the management of the use and scheduling of trains on the Sandy Hollow to Gulgong Railway Line. The TTIA for the Project (Appendix Z of the EIS) completed an assessment for the potential impacts of the Project to the rail network in consideration of the assessments within the ARTCs *2014-2023 Hunter Valley Corridor Capacity Strategy*. The ARTC strategy considers the current and prospective volumes on the rail network, including the current and proposed rail movements of the three mines within the MWRC LGA.

This review and assessment along with discussions with ARTC confirmed that there is sufficient capacity on the rail network to accommodate the Project with little potential to influence the use of the rail line by other users (which is strictly managed by ARTC).

Appendix B provides letter correspondence received from ARTC confirming that there is sufficient capacity on the existing network to accommodate the movements anticipated for the Project. Further the capacity assessment has been completed based on the smaller train sizes, which is considered to be conservative. KEPCO will continue to consult with ARTC in regard to the proposed rail movements for the Project.

KEPCO has recently met with Glencore representatives to discuss the various aspects of the Project and to alleviate concerns stated within their submission.

5.22.17 Train Movements

Submission Reference: SIG8

Issue

The assessment of additional train movements with a peak of up to 10 movements per day is very poor. There has been no analysis of additional time for trains idling in rail loops, particularly because of the constraints with ventilation of the Bylong tunnel, or increased noise levels at properties neighbouring the line or increased impacts on rail crossings within properties and on roads.

Response

WorleyParsons, as the Project Manager for the Project has been in ongoing consultation with ARTC in relation to accommodating Project-related traffic on the Sandy Hollow to Gulgong Railway Line. As part of this consultation, WorleyParsons has completed various rail operational assessments which has considered train idling times, tunnel ventilation times, increased noise levels and impacts to rail crossings on properties and on roads.

The operation of trains on the rail loop has been included within the noise modelling for the operational scenarios for the Project, conservatively assuming 2 trains on the rail loop. Whilst the use of the rail loop is a noise source of the operational activities, it is unlikely to be the predominant extended source from the Project.

Section 7.9.4 of the EIS describes that training of good operational practices for the use of the trains on the rail loop will be implemented to minimise potential rail noise impacts for the Project. Section 7.9.4 of the EIS also provides an outline of the various mitigation and management measures to be implemented to manage rail noise impacts.

ARTC manages the rail network, with their noise emissions regulated under their EPL 3142. An EPL requires ARTC to monitor locomotive noise levels, audit noise performance (under a Pollution Reduction Program) and implement all reasonable and feasible measures to reduce rail noise impacts.

KEPCO will continue to consult with ARTC in regard to the proposed rail movements for the Project and the implementation of leading practice noise control measures.

5.23 PROPOSED ROAD UPGRADES/ CLOSURES

5.23.1 Land Access

Submission Reference: P81, P201, P218,

Issue

There were a few submissions who were concerned with losing all weather access to their private properties with the planned closure of Upper Bylong Road and the section of Woolleys road. Some requested an upgrade to Budden Gap Rd to an all weather road capable of handling large semi trailers and cattle trucks.

Response

A new road is proposed to address concerns with property access as raised by stakeholders. The proposed North Link Road will involve the construction of a road connecting the Upper Bylong Road to the north with Lee Creek Road to the south, to provide alternate access for landowners. Whilst it was outlined within the EIS, the upgrade of Lee Creek Road was being considered, the North Link Road is believed to provide the most appropriate alternative for providing access by landholders to the south of the Project to Bylong Valley Way. This is discussed further in **Section 4.2.9.6**.

KEPCO is in discussions with the affected landholders regarding acquisition or compensation for the impacts associated with the proposed decommissioning of Upper Bylong Road.

The potential impacts of construction of the new road on the floodplain are also discussed in **Section 5.7.4**.

5.23.2 Lee Creek Road

Submission Reference: P43

Issue

Submission from P43 objects to the upgrade or closure of Lee Creek road, indicating it would diminish the road's appeal to local cyclists.

They also requested consultation on this matter with recreational users of the road.

Response

The option presented within the EIS to potentially upgrade Lee Creek Road was one of the options proposed to provide access for property owners to the south of the Project site when the Upper Bylong Road is closed to accommodate the mining areas. The second option presented within the EIS was to upgrade Budden Gap Road to the west towards Bylong Valley Way.

Since the preparation of the EIS and the concerns raised by the three local landholders, KEPCO has developed the preferred option to provide access for these landholders. KEPCO now proposes the construction of the North Link Road as the preferred alternative of providing access to landholders to the south of the Project. The North Link Road will extend from the remaining section of Upper Bylong Road to the north of the Open Cut MIA, continue down the western side of the Eastern Open Cut and link up with Lee Creek Road, immediately to the south of the Project Disturbance Boundary. The alignment of the North Link Road is shown on **Figure 7** in **Section 4.2.9.6**.

5.23.3 Wollar Road Upgrade

Submission Reference: P51

Issue

The EIS focuses entirely on traffic from Mudgee, nothing at all from the eastern region, which we feel may be not represented accurately. Bylong Valley Way, starting from the intersection at the Golden Highway at Sandy Hollow is a sealed road to Bylong, but relatively narrow and winding in parts. It is entirely feasible that traffic will increase if the proposed project is approved. The project is reliant on the upgrade of the Wollar Road by Mid Western Regional Council. As the Bylong Project is the principal beneficiary of this upgrade for their project, shouldn't they be liable for some of the funding? The project would be under severe restrictions if the upgrade does not occur in the timeframe before construction commences.

Response

During the initial mine planning stages of the Project, it was identified that whilst Muswellbrook and surrounds have an established mining-related workforce, the travel times to and from Bylong from Muswellbrook is longer than the acceptable safe commute time. Accordingly with the upgrade of Wollar Road proposed by the MWRC, Mudgee was identified as the most appropriate place of residence for the Project workforce, hence the large proportion of traffic anticipated on Wollar Road. The TTIA (Appendix Z of the EIS) identified some Project related traffic will utilise Bylong Valley Way to the east of the Project.

KEPCO has been in ongoing discussions with the MWRC in relation to their plans to upgrade Wollar Road and how this may accommodate the Project. Prior to the announcement for Resources for Regions funding for the Wollar Road upgrade, KEPCO was in discussions around the potential for its financial contributions proposed under a VPA will be included into this road upgrade. MWRC has since advised KEPCO that the VPA contributions will be better contributed to other social infrastructure improvements across the region.

KEPCO proposes the upgrade and improvements to various roads within the vicinity of the Project, including the construction of two new local roads to provide ongoing access for neighbouring landholders. These are significant contributions to the MWRC in terms of improving local road infrastructure.

KEPCO is in ongoing discussions with MRWC in relation to an agreement for the contribution to road maintenance for the road network utilised by Project related traffic.

KEPCO acknowledges the risk to the Project of the Wollar Road not being upgraded in time for the commencement of construction activities. However, it is noted that MWRC has confirmed that the upgrade works being undertaken will be strictly managed to ensure that they are completed in the required timeframe.

5.24 GEOCHEMISTRY

5.24.1 Acid Forming Soils

Submission Reference: SIG1

Issue

There were concerns over the propensity of parts of the mine to be acid forming. SIG1 questioned the measures proposed to manage and mitigate the impacts and requested further assurances.

Response

The Geochemical Impact Assessment (see Appendix AB of the EIS) provides detailed geochemical information on representative samples of coal and mining waste materials that will be generated by the Project as well as the “appropriate mitigation and management measures”. The report identifies that the majority of these materials are likely to have a high factor of safety with respect to potential acid generation. Whilst some of the coal reject materials are PAF, coal rejects make up only 11 % of the total mining waste materials and will be managed at the Project. Some of the coal seam floor and coal reject materials derived from the Coggan Seam have been identified as PAF and some have been identified as NAF. The identified PAF/NAF coal reject materials and other mainly NAF coal reject materials from the Ulan seam will be well mixed and preferentially placed as backfill deep in the open pits, below the level of the predicted post-mining groundwater recovery level, and encapsulated with at least 5m of NAF overburden, prior to rehabilitation. The emplaced coal reject materials will be paddock dumped, dozed, traffic compacted and agricultural lime dosed as required. In early mine life when no storage capacity is available at the open pits, coal reject materials will be encapsulated in cells at the OEAs using the same operational management controls described above. If any acid generation is identified at the Coggan Seam floor in the underground working or at the open cut pits, agricultural lime application and/or a mobile lime dosing plant will be used to treat the water. In the underground mine, the risk of any acid generation is further reduced by the use of ‘stonedust’ in roadways and other underground workings.

This 'stonedust' is commonly used in Australian underground mines and is a natural, fine calcium carbonate product manufactured from high purity limestone. At the Project, this product will add alkalinity to underground workings, which will buffer the small amount of acidity that could potentially be generated from transient oxidation of any remnant coal materials. The occurrence of some PAF coal and coal reject materials at the Project is similar to many coal mining operations in Australia including Moolarben Coal Mine located approximately 55 km north-west of the Project (EGi, 2006), where PAF coal reject materials are managed without any significant adverse effect on the open cut and longwall operations. Similarly, the coal reject management strategy proposed to be used at the Project has been used at other mining operations in NSW over many years handling mining waste materials with similar geochemical characteristics to Bylong (including Bengalla and Boggabri Coal Mines) and there have been no significant water quality issues involving acidity, metals/metalloids and/or salinity. A Mining Waste Management Plan and specific procedures will be developed for the Project to reflect and assist in the implementation of the management and mitigation measures described above.

5.24.2 Spontaneous Combustion

Submission Reference: SIG1

Issue

SIG 1 believes the risk of the high sulphur content in certain layers of the Mine leading to spontaneous combustion is underestimated.

Response

This is addressed in **Section 4.8.6**.

5.24.3 Salt Migration

Submission Reference: P67_1 and O3

Issue

P67_1 and O3 raised concerns over salt migration and salinity from overburden, coal measures and the final void.

P67_1 submitted:

"Salt currently contained in the overburden will be released into the environment. Salt will also enter the shallow aquifer from the Permian coal measures, from the screenings (5000-8000 ppm salt) accumulated in the final void. Salt is the greatest destroyer of agricultural land, in particular irrigation land."

O3 stated:

“With relevance to the ecology and existing agriculture, are the flow and water quality in the locality. Both surface water and groundwater were assessed, with comment included in the report. Salinity increases are a concern, whilst the run-off in the localised catchments is being discounted from the regional context, affecting the ecology. There are traces of iron, manganese and zinc that are above trigger values from ANZECC guidelines, and this may worsen following development. Importantly, the groundwater is forecast to reduce by at least 2m, a matter that is not rare in the assessment, in the area of the River Redgum habitat, and risking the ecology.”

Response

The Geochemical Impact Assessment (see Appendix AB of the EIS) (RGS, 2015) provides detailed geochemical information on the salinity and concentrations of iron, manganese and zinc potentially released by representative samples of coal and mining waste materials under ideal oxidising conditions over a period of six months with no materials management or mitigation measures in place.

The RGS report identifies that the salinity of surface runoff and seepage from overburden materials (overburden, interburden and uneconomic coal seams from open cut mining) is likely to be relatively low.

The salinity of runoff and seepage from coal and coal reject materials (from both open pit and underground mining) is also likely to be low, but may increase over time if PAF materials are exposed to oxidising conditions (mainly through increased sulfate concentration caused by sulfide oxidation). Hence, the reason why both PAF and NAF coal reject materials will be preferentially placed deep in the open pit, dozed, traffic compacted, and encapsulated with NAF overburden after addition of agricultural limestone as required.

Over the past few years, RGS has utilised cumulative salinity values from KLC tests on representative samples of overburden materials (completed under ideal oxidizing conditions) to extrapolate likely long term salinity values for pore water chemistry at coal mining projects in NSW and other parts of Australia. These values are then used by others as source terms to evaluate potential impacts to the receiving environment from salinity. The KLC salinity results have been compared against predictions made for several coal mining operations in the Upper Hunter Valley of NSW (Mackie, 2009). In summary, Mackie reviewed the mineralogy and chemical processes occurring within the saturated zone of an OEA in some detail and projected long term pore water salinity levels out to 100 years.

The KLC data in Section 4.5 of the RGS report indicate that the salinity of pore water in saturated overburden materials at Bylong is likely to be in the range 1,500 to 3,000 $\mu\text{S}/\text{cm}$. These values are towards the lower end of the range predicted for overburden by Mackie, although it is noted that Mackie predicted 100 years will be required to reach these values in saturated zones.

The KLC results also suggest that salinity values from well managed coal reject materials are likely to be in the range 5,000 to 8,000 $\mu\text{S}/\text{cm}$, although it should be noted that coal rejects make up only about 11% of the total mine waste volume at the Project.

Using a mass balance approach and assuming a reasonable level of leachate mixing, it is expected that long term pore water salinity values derived from co-disposed overburden and well managed/encapsulated coal rejects at Bylong will be in the range 1,800 to 3,500 $\mu\text{S}/\text{cm}$. These values have been used within the Groundwater Impact Assessment (Appendix M of the EIS) to predict the potential impacts on groundwater and surface water quality post-mining from the overburden and coal reject emplacement areas. The KLC tests were performed on sample materials with a relatively large surface area under fully oxidised free-draining conditions, and represent an assumed “worst case” scenario best representing materials stored at or near the surface of (or in preferential flow paths within) a coal stockpile, OEA and/or a coal reject cell.

Most trace metals/metalloids in NAF coal and mining waste materials at the Project are likely to be sparingly soluble at the predicted neutral to slightly alkaline pH of surface run-off/seepage and dissolved concentrations are expected to be low compared to the applied livestock drinking water quality guideline criteria (ANZECC & ARMCANZ, 2000). A minor exception is selenium, although the concentration of this element is not expected to be elevated above the applied guideline criteria under field conditions at the Project.

The solubility of most trace metals/metalloids is dependent upon pH, therefore if unmanaged and allowed to oxidise, some PAF coal reject materials from the Coggan seam have the potential to generate acidic leachate containing elevated concentrations of iron, manganese and zinc compared to the applied water quality guideline criteria (ANZECC & ARMCANZ, 2000). These guidelines were provided for context in the RGS report and were not intended to be interpreted as maximum permissible levels for site water storage or discharge.

In order to address this potential issue, bulk coal reject materials will be preferentially placed in cells as backfill deep in the open pits, below the level of the predicted post-mining groundwater recovery level, and encapsulated with at least 5 m of NAF overburden material, prior to rehabilitation. The emplaced coal reject materials will be a mixture of NAF and PAF materials and will be paddock dumped, dozed, traffic compacted and amended with alkaline material (agricultural limestone), prior to encapsulation. A conceptual illustration of the backfilled open pits was provided in the RGS report (Appendix AB of the EIS) at Figure 7b.

In early mine life whilst no storage capacity is available at the open pits, coal reject materials will be encapsulated in cells by at least 5 m of NAF overburden material at the OEAs with operational management methods, such as paddock dumping, dosing, traffic compaction and lime dosing used as described above. A conceptual illustration of the OEAs containing encapsulated coal reject materials was provided in the RGS report (Appendix AB of the EIS) at Figure 7a.

Under the pH neutral to slightly alkaline conditions expected at the Project, the concentrations of iron, manganese and zinc are expected to be low and within applied (ANZECC & ARMCANZ, 2000) guideline criteria.

A similar mine waste encapsulation strategy for coal reject materials has been used at other mining operations in NSW handling mining waste materials with similar geochemical characteristics to Bylong for many years (e.g. Bengalla and Boggabri Coal Mines) and this has resulted in no significant water quality issues involving acidity, metals/metalloids and/or salinity. Overall, the risk of potential impact on the quality of surface and groundwater from the Project is expected be low for coal and mining waste materials, when the recommended management measures for coal reject materials are implemented. This finding will be verified by scale-up of leaching tests for PAF/NAF materials and alkaline amendment tests as part of operational planning when bulk materials become available and through the ongoing water quality monitoring program for surface water and groundwater at the Project.

5.24.4 Geochemistry Assessment

Submission Reference: SIG27

Issue

A submission received from SIG27 raised a number of issues relating to the geochemistry assessment including potential impacts on water quality, pit discharge and geochemistry and best practice at Hume Coal Mine.

Response

Water Quality

Water quality results for static and kinetic leaching tests on representative samples of overburden materials are contained in Appendix AB of the EIS (RGS, 2015). The results demonstrate that the pore water quality in overburden materials is likely to be good (low salinity, low concentrations of metals/metalloids, and pH neutral to slightly alkaline). Some of the coal seam floor and coal reject materials derived from the Coggan Seam have been identified as PAF and some have been identified as NAF (Non-Acid Forming). The identified PAF/NAF coal reject materials and other mainly NAF coal reject materials from the Ulan seam will be well mixed and preferentially placed as backfill deep in the open pits, below the level of the predicted post-mining groundwater recovery level, and encapsulated with at least 5 m of NAF overburden, prior to rehabilitation. The emplaced coal reject materials will be paddock dumped, dozed, traffic compacted and agricultural lime dosed as required.

In early mine life when no storage capacity is available at the open pits, coal reject materials will be encapsulated in cells at the OEAs using the same operational management controls described above. If any acid generation is identified at the Coggan Seam floor in the underground working or at the open cut pits, agricultural lime application and/or a mobile lime dosing plant will be used to treat the water.

In the underground mine, the risk of any acid generation is further reduced by the use of 'stonedust' in roadways and other underground workings.

This 'stonedust' is commonly used in Australian underground mines and is a natural, fine calcium carbonate product manufactured from high purity limestone. At the Project, this product will add alkalinity to underground workings, which will buffer the small amount of acidity that could potentially be generated from transient oxidation of any remnant coal materials. The occurrence of some PAF coal and coal reject materials at the Project is similar to many coal mining operations in Australia including Moolarben Coal Mine located approximately 55 km north-west of the Project (EGi, 2006), where PAF coal reject materials are managed without any significant adverse effect on the open cut and longwall operations. Similarly, the coal reject management strategy proposed to be used at the Project has been used at other mining operations in NSW over many years handling mining waste materials with similar geochemical characteristics to the Project (including Bengalla and Boggabri Coal Mines) and there have been no significant water quality issues involving acidity, metals/metalloids and/or salinity.

Pit Discharge and Geochemistry

There is a focus on salinity in the EIS as detailed geochemical information (see Appendix AB of the EIS) demonstrates that when mine waste material is subject to material management and mitigation measures, other potential water quality issues such as fouling and metal/metalloid leaching are not significant. In particular, most metals/metalloids are sparingly soluble at the neutral to slightly alkaline pH values exhibited by the bulk of the mining waste materials.

Whilst the concentrations of iron, manganese and zinc could be elevated in leachate from any unmanaged PAF coal reject materials allowed to oxidise over time, these materials will be appropriately managed at the Project to avoid this outcome.

The KLC data in Section 4.5 of the RGS report (RGS, 2015) indicate that the salinity of pore water in saturated overburden materials at the Project is likely to be in the range 1,500 to 3,000 $\mu\text{S}/\text{cm}$ and that the salinity of pore water in well managed coal reject materials are likely to be in the range 5,000 to 8,000 $\mu\text{S}/\text{cm}$, although it should be noted that coal rejects make up only about 11 % of the total mine waste volume at the Project. Using a mass balance approach and assuming a reasonable level of leachate mixing, it is expected that long term pore water salinity values derived from co-disposed overburden and well managed/encapsulated coal rejects at the Project will be in the range 1,800 to 3,500 $\mu\text{S}/\text{cm}$. These values have been used within the Groundwater Impact Assessment (Appendix M of the EIS) to predict the potential impacts on groundwater and surface water quality post-mining from overburden and coal reject emplacement areas. The KLC tests were performed on sample materials with a relatively large surface area under fully oxidised free-draining conditions, and represent an assumed "worst case" scenario best representing materials stored at or near the surface of (or in preferential flow paths within) an OEA and/or a coal reject cell.

As described above, the relatively small amount of PAF coal reject materials from the Coggan Seam will be well managed in a similar manner to several existing coal mining operations in NSW. When the management and mitigation measures described above for the Project are implemented, the risk of any significant acid generation at the project is low. Scale up of leaching tests as part of operational planning will occur, but is reliant upon the existence of bulk materials for testing. In early mine life when no storage capacity is available at the open pits, coal reject materials will be encapsulated in cells at the OEAs using the operational management controls described above.

Best Practice

The coal reject management strategy proposed to be used at the Project has been used at other mining operations in NSW over many years handling mining waste materials with similar geochemical characteristics to the Project (including Bengalla and Boggabri Coal Mines) and there have been no significant water quality issues involving acidity, metals/metalloids and/or salinity.

Direct comparison of the Project with the Hume Coal Project is not strictly valid given that the EIS for the Hume Project has not yet been submitted for approval, a different underground mining method will be used, and the geology is different.

The Hume Coal Project is proposed as an underground operation only and has no open cut activities planned due to the depth of overburden above the coal seam (approximately 200 m) (i.e. the coal seam is too deep and therefore not economically viable for open cut mining).

5.25 SOCIAL

Submission Reference: SIG8, SIG11, SIG15, SIG18, SIG24, SIG27, O4, P4, P16, P17, P30, P51, P66, P71_1, P91, P99, P100, P113_1, P118, P132, P143, P153, P156, P187, P201, P204_1, P204_2

5.25.1 Social and Cumulative Impacts

Submission Reference: SIG8, SIG13, SIG11, SIG21, P100, P153, P187, P204_1, P204_2, P233, P234, P235, P236, P237, P238, P239, P40, P241, P242, P243, P244, P245, P246, P247, P248, P249, P250, P251, P252, P253, P254, P255, P256, P257, P258, P259, P260, P261, P262, P263, P264, P265, P266, P267, P268, P269, P270, P271, P272, P273, P274, P275, P276, P277, P278, P279, P280, P281, P282, P283, P284, P285, P286, P287, P288, P289, P290, P291, P292, P293, P294, P295, P296, P297, P298, P299, P300, P301, P302, P303, P304, P305, P306, P307, P308, P309, P310_1, P311, P312, P313, P313_2, P314, P315

Issue

Repeated form submissions made comment that the Project will have significant social impacts that are not acceptable and that these have not been clearly assessed for their cumulative impact. Such impacts includes the loss of the Upper Bylong Public School, loss of the Bylong Bushfire Brigade, increased traffic use on regional and local roads, increased train movements on the Sandy Hollow rail line, ongoing loss of rural population, loss of agricultural industry services from the Ulan/Wollar/Bylong area, increased competition for water extraction, loss of the Bylong Mouse Races.

It is noted that a number of these submissions were received as form submissions.

Response

Cumulative impacts are discussed in **Section 4.2.7** and Sections 5-9 of the SIA (Appendix AC, EIS). The impact on increased competition for water resources is discussed in **Section 5.8**. The loss of rural population is discussed in **Section 5.25.15**. The consultation processes are discussed in **Section 5.3.1**.

5.25.2 Methodology

Submission Reference: SIG2, SIG8, SIG11, SIG21, SIG27, O5, P17, P132

Issue

There were a number of submissions concerned with the methodology adopted for the SIA and compliance with the Project SEARs.

Response

There are no specific NSW Government guidelines for the preparation of SIAs in NSW. However Section 79C of the EP&A Act requires the consent authority to take into consideration the *"likely impact of the development, including social impacts in the locality"* when determining a development application made under Part 4 of the Act.

The content of the SIA has been guided by the SEARs for the Project and by the regulatory requirements for social impact assessment in other states, such as Queensland (QLD). Table A-1 of Appendix A of the SIA (Appendix AC of the EIS) lists each relevant requirement in the SEARs and where each aspect is addressed within the SIA.

The SIA is not an academic research document. It is designed to address specific approval requirements of the NSW government and reflects best practice in NSW. The scope of the SIA provides consistent, however more detailed assessment of the potential social impacts of a Project when compared with social assessments conducted for other recent mining projects in NSW. For example, the Watermark Coal Project, Drayton South Coal Project, Wilpinjong Extension Project, Cobbora Coal Project and the Warkworth Extension Project.

Finally, the SIA has also been prepared by a specialist in the SIA field. Bronwyn Pressland from Hansen Bailey has more than 20 years of experience in SIA, with the past 10 years specialising in the SIA of brownfield and greenfield mining projects in NSW, Queensland and the Northern Territory. Ms Pressland prepared the SIA for Boggabri Coal Project and the Social Impact Management Plan for the Maules Creek Project. Ms Pressland conducted an internal peer review of the SIA for the Watermark Coal Project and was also involved in the preparation of the SIA for the Drayton South Mine Extension.

Ms Pressland has lead the preparation of numerous SIAs for coal projects in the Bowen Basin in Central Queensland including the Eagle Downs Project, Grosvenor Project, Moranbah South Project, Foxleigh Plains Project and in the Gallilee Basin, Project China Stone. More recently Bronwyn has completed a SIA of the proposed Groote Eylandt Extension Project on Groot Eylandt in the Northern Territory.

Ms Pressland has also provided strategic engagement services to Anglo American in Moranbah to assist with the facilitation of consultation with residents, community groups and service providers in relation to the implementation of the Anglo American Socio-economic Assessment Tool (SEAT). Ms Pressland has also assisted Anglo American in the preparation of annual SEAT reports for their operating mines in the Bowen Basin including Moranbah North, Foxleigh and Callide Mines.

The SIA for the Project considers the interlinked aspects of economic, social and environmental change. Franks (2012) identifies a number of common changes induced by mining that can lead to social impacts. These include:

- Social and Cultural Change:
 - Population and demographics e.g. Worker camps, conflict and tensions between social groups;
 - Social infrastructure e.g. Demands on and investment in housing, skills, health and education; and
 - Community health and safety e.g. Vehicle accidents, pollution, alcohol and substance abuse.
- Economic Change:
 - Distribution of benefits e.g. Employment, flow of profits, royalties and taxes, community development and social programs.
- Socio-Environmental Change
 - Pollution and amenity e.g. air, water, noise, scenic amenity; and
 - Disturbance e.g. Disruption to economic and social activities.

The SIA considers all of these common changes and many more identified that are specific to the Project.

The SIA considers both positive and negative cumulative impacts, specifically those related to housing and accommodation, provision and access to community infrastructure and services, regional and community development benefits through mining investment, water quality and noise and vibration impacts. Further cumulative assessment has been undertaken and is described in **Section 4.2.7** and **Appendix C**, which addresses cumulative impacts associated with population change, changes in rural character and traffic and road safety.

The assessment of cumulative impacts presented within the SIA and further information provided in **Section 4.2.7** and **Appendix C** considers the principles of cumulative impact assessment described in Franks et al (2010). Evidence is presented to illustrate that population change, notably population decline across the communities of the Bylong Valley, Wollar and Ulan has triggered a series of linked and unlinked associative impacts (Franks 2010). Sections 9.3 and 11.3 of the SIA (Appendix AC of the EIS) discuss the potential cumulative impacts on community services and facilities from the growth in resident population, driven by population changes associated with the Project and other mining projects in the region e.g. Ulan Mine, Moolarben Mine and Wilpinjong Mine. The discussion of potential changes in rural character and amenity presented in Section 10.3 of the SIA (Appendix AC of the EIS) considers the impact to rural character and residential amenity arising from the interaction of different amenity impacts e.g. noise, dust, vibration and visual.

The submitters suggest the SIA lacks analysis of quantitative and qualitative data. These assertions are not valid.

The SIA uses quantitative data to assess impacts associated with demographic change, labour force, housing and accommodation and demand for community facilities and services. For example the housing and accommodation impacts presented in Section 9.3 of SIA (Appendix AC of the EIS) are quantitatively analysed with reference to land development statistics, population growth predictions and Project workforce arrangements. Findings are compared to the existing housing market and existing demands for residential land. A discussion of population change (existing and predicted) is presented in Section 6.3 of the SIA (Appendix AC of the EIS) with additional assessment of cumulative population impacts presented in **Section 4.2.7**. Both assessments draw on a combination of quantitative data (ABS Census data) and qualitative data (findings of interviews with Bylong residents) to present existing and predicted population changes in the Bylong Valley and the broader Rural Area and the potential impacts (including cumulative) of these population changes.

The assessment of potential impacts to residential amenity and rural character draws on the quantitative findings of the NBIA (Appendix Q of the EIS) and the perceived impacts identified by residents of the Bylong Valley during SIA consultation.

The SIA was prepared prior to the release of the International Association for Impact Assessment's (IAIA) document, *SIA: Guidance for assessing and managing the social impacts of projects* (Vanclay et al 2015). **Table 39** demonstrates how the scope and methodology adopted for the SIA is generally consistent with the principles defined in IAIA guidance document. This demonstrates that the SIA is generally consistent with 'best practice'.

Table 39
SIA Compliance with Guidance Documents

Principle	Demonstrated Compliance
Understand the Issues	Preparation of the SIA involved a scoping study to determine the 'social area of influence' of the project. The social area of influence is described in Section 3.2 of the SIA. The scope of the SIA was discussed and agreed with the MWRC as the affected council. The scope of the SIA was amended on a few occasions based on comments from MWRC in relation to the change in accommodation demands with the downturn experienced within the mining industry. The timing of the SIA enabled the consideration of interactions with other relevant technical studies including noise and vibration, visual, traffic and economic. A community profile of the social area of influence was prepared based on both quantitative and qualitative data. The profile included consideration of the interests, values and aspirations of the affected communities, historical processes evident in the communities of interest, a discussion of trends etc. A relevant baseline for the key social issues was collated based on qualitative and quantitative data. This information is presented in Section 2 and Sections 5-9 of the SIA.
Predict, analyse and assess the likely impact pathways	The potential social changes and impacts likely to result from the Project have been identified and described in Sections 5-9 of the SIA. Consideration has been given to how the various affected groups and communities would respond to the Project. The reaction to the Project from residents of the Bylong Valley was recorded during SIA interviews, reported within the SIA and considered in the identification and analysis of potential social impacts. A qualitative assessment of the significance of each impact has been included in the SIA in the absence of regulations around the conduct of a social risk assessment. The initial findings of the scoping study informed a Project wide assessment of Project alternatives including the no go option.
Develop and Implement Strategies	The SIA process included the identification actions to address potential negative impacts. The identification of management actions considers the mitigation hierarchy suggested in Vanclay (2015) i.e. avoid, reduce, repair, compensate in kind and compensate by other means. Management actions identified seek to deliver benefits to the broader MWRC LGA through social investment funding (Voluntary Planning Agreement), local content (Local Content Plan and Local Employment Plan), Capacity Building (employee participation in the Bylong RFS, participation on Bylong Hall Community Board), supporting community initiatives both in the Bylong Valley and the broader MWRC LGA. KEPCO has implemented feedback mechanisms to enable stakeholders to provide input to the Project and raise their concerns. A grievance mechanism has been established for the Project.
Design and implement monitoring programs	The SIA includes a commitment to the preparation of a social impact management plan following the granting of Development Consent. The SIMP will guide implementation of the management strategies and actions described in the SIA and will also detail responsibilities, timing, performance indicators and targets and a regime for monitoring potential impacts.

5.25.3 SIA Consultation

Submission Reference: SIG8, SIG27, O5, P17

Issue

A number of submissions were concerned with the scope and implementation of the SIA consultation.

Response

The methodology adopted for the consultation process is described in Section 3 of the SIA (Appendix AC of the EIS). The consultation conducted for the EIS is described in Section 5 of the EIS with further information included in **Section 5.3.1**. A detailed description of the consultation conducted to inform the SIA, including the face-to-face interviews with residents of the Bylong Valley is provided in Section 3.6.1 of the SIA (Appendix AC of the EIS).

For confidentiality reasons, the names of participants have not been disclosed. No quantitative surveys were conducted with Bylong Valley residents to inform the SIA. Rather informal qualitative face-to-face interviews were conducted with interested residents of the Bylong Valley.

The following discussion provides further information in relation to the conduct of SIA interviews with residents of the Bylong Valley.

Survey Participation

A total of 18 face-to-face interviews were conducted with existing residents of the Bylong Valley to inform the SIA for the Project. A total of 29 residents participated in the interviews. Participants represented 17 property holdings across the Bylong Valley, some of which included numerous landholdings. At the time of the survey, six interview participants were associated with landholdings recently purchased by KEPCO. Four of these participants were the original landowners and two were current tenants (**Table 40**). Of the 29 interview participants:

- Nine participants had resided in the Bylong Valley for less than 10 years;
- Five had resided in the Bylong Valley between 10 and 20 years; and
- 15 had resided in the Bylong Valley for more than 20 years, with seven of these residing longer than 30 years and three for longer than 40 years.

Table 40
Summary of Interviews with Bylong Valley Residents

Interview Attribute	Number
Interviews conducted with Bylong Valley residents	18
Number of participants in interviews	29
Number of properties represented	17 ¹
Number of properties not owned by KEPCO	16
Participants residing on land owned by KEPCO	6
Participants residing on privately held land	23

Notes:

1. Where participants owned more than one property in the Bylong Valley, each property is counted. KEPCO owned properties are all treated as one property.

Participant Identification

Residents of the Bylong Valley were invited to participate in face-to-face interviews to inform the SIA for the Project. Participation was purely voluntary and not subject to any coercion. Participants were contacted directly by the Project Community Liaison Officer.

The Community Liaison Officer informed all potential interview participants of the purpose of the interviews and arranged suitable meeting times.

Interview Implementation

Interviews with Bylong Valley residents were held during the week of Monday, 4 August 2014. Interviews were held at the KEPCO site office located on Upper Bylong Road. Interview times were scheduled in line with participant availability. Interviews were conducted by two representatives of Hansen Bailey. At no time following the commencement of each interview were KEPCO representatives, the Community Liaison Officer or any other Project team personnel in attendance. Interviews were scheduled for one hour time slots, however in a number of cases, discussions extended beyond the first hour.

Each interview participant was informed by Hansen Bailey of the purpose of the interview prior to commencement. All participants were asked to confirm they were happy for the information disclosed to be used in the preparation of the SIA for the Project and in the identification and analysis of Project related impacts. Participants were informed that:

- Involvement in the interview would remain confidential (hence the names of interview participants have not been disclosed); and
- Names would not be attributed to specific quotes in the SIA.

Transcripts were taken of all interviews.

Interview Structure

Interviews were structured to discuss a range of issues, including the following:

- Valued attributes of Bylong Valley;
- Local and regional issues of concern;
- Social capital of Bylong community;
- Changes over time in the Bylong Valley;
- Social changes in the Bylong community over time;
- Impacts of coal exploration in the Bylong Valley;
- Positive and negative Project impacts;
- Lifestyle aspirations; and
- Potential operation of a WAF in Bylong.

The majority of questions asked were open ended and designed to prompt discussion around particular themes.

The findings of the interviews as they relate to the values, aspirations and issues in the Bylong Valley are documented in Section 5 of the SIA (Appendix AC of the EIS). The Project related issues and opportunities identified by participants in the interviews are recorded in Section 5.2.2 of the SIA (Appendix AC of the EIS).

The findings of the interviews were used to inform the social baseline and impacts described in the SIA.

5.25.4 Scope of Assessment

Submission Reference: SIG17, SIG27, P113-1

Issue

These submissions were concerned with the scope of the SIA and the depth of assessment conducted. Generally, comments were raised regarding:

- *Apparent lack of social research and assessment of impacts against benchmarks, standards and best practice evidence;*
- *Social impacts only assessed as positive or negative with no temporal understanding of these impacts;*
- *No ranking and prioritisation of social impacts and no overall assessment of impacts and opportunities;*
- *No sense of stakeholder feedback;*
- *Limited assessment of temporary workers facilities;*
- *Insufficient description of the proponent;*
- *Insufficient consideration of visual impacts;*

- A 'No development' scenario is not included;
- Relevance of management strategies to address impacts; and
- No health impact assessment included.

Response

Section 5.25.2 provides a response to the queries in regards to the robust methodology applied to the SIA in absence of any NSW guidelines.

A Health Impact Assessment was not a specific requirement of the SEARs for the Project. Although it is noted that the various environmental impact assessments (e.g. Noise, Blasting, Air Quality, etc) have been completed according to the relevant Government guidelines and assessment criteria and identified those receivers to be significantly affected by the Project. These significantly affected receivers and the rights afforded to these landholders is presented within the SIA.

The "No Development" scenario is discussed in Section 3.17.1 of the EIS. Further, it is noted that existing background conditions within the vicinity of the Project Boundary have also been addressed within the baseline conditions described within each environmental assessment, including the SIA. These assessments of the baseline conditions were referred to as the "no development" conditions.

The predicted visual impacts of the Project are considered in Section 10.3.1 of the SIA (Appendix AC of the EIS) and described in detail in the VIA (Appendix Y of the EIS). Due to the location of the proposed open cut mining areas and infrastructure with surrounding topography and vegetation, the visual impacts of the Project are able to be suitably managed to ensure that impacts to the local amenity of the Bylong Valley is minimised.

There is no requirement under NSW legislation to prepare a Social Impact Management Plan for the Project. However, KEPCO has committed to the preparation of a Social Impact Management Plan for the Project and has most recently become a typical condition of consent for mining related projects with potential to contain social impacts. Management strategies presented in the SIA will be discussed in further detail in the Social Impact Management Plan which will be prepared prior to the commencement of construction (refer to Section 12.2.5 of the SIA (Appendix AC of the EIS)).

With regards to the scope of consultation both the findings of SIA consultation and the findings of the EIS consultation informed the prediction and assessment of social impacts. The scope of EIS consultation is discussed in **Section 5.3.1**. It is notable that this consultation included consultation with groups and organisations in communities throughout the MWRC LGA.

5.25.5 Cumulative Impact and Impact on Community

Submission Reference: SIG8, SIG11, SIG13, SIG18, SIG21, P71_1, P100, P153, P187, P204_1, P204_2, P233, P234, P235, P236, P237, P238, P239, P240, P241, P242, P243, P244, P245, P246, P247, P248, P249, P250, P251, P252, P253, P254, P255, P256, P257, P258, P259, P260, P261, P262, P263, P264, P265, P266, P267, P268, P269, P270, P271, P272, P273, P274, P275, P276, P277, P278, P279, P280, P281, P282, P283, P284, P285, P286, P287, P288, P289, P290, P291, P292, P293, P294, P295, P296, P297, P298, P299, P300, P301, P302, P303, P304, P305, P306, P307, P308, P309, P310_1, P311, P312, P313, P313_2, P314, P315

Issue

Repeated submissions made the comment that the Project will have significant social impacts that are not acceptable and that these have not been clearly assessed for their cumulative impact. It is noted that a number of these submissions were received as form submissions.

Submissions are concerned with the cumulative impact of mining on the Bylong Valley and Wollar communities, specifically the declining population and the resulting impact on services and facilities. Such impacts includes the loss of the Upper Bylong Public School, loss of the Bylong Bushfire Brigade, viability of St Stephens Church, increased traffic use on regional and local roads, increased train movements on the Sandy Hollow rail line, loss of agricultural industry services from the Ulan/Wollar/Bylong area, increased competition for water extraction and the loss of the Bylong Mouse Races.

Response

Cumulative impacts are discussed in Sections 5-9 of the SIA (Appendix AC, EIS). Population decline in the Bylong Valley is discussed in Section 6.2.3 of the SIA (Appendix AC of the EIS) and further detail provided in **Section 4.2.7** and **Appendix C**.

The effects of cumulative population decline across the Bylong Valley and Wollar is further discussed in **Section 4.2.7**.

The cumulative impact of mining on infrastructure and services in the rural area within which Bylong and Wollar are located, is also further discussed in **Section 4.2.7**.

In recent years, the Bylong General Store has benefited significantly from mining exploration in the Bylong Valley. Whilst the reduction in population (historical and Project induced) is likely to have impacted local spend at the Bylong General Store, the economic benefits accruing to the Bylong General Store over the course of the past three years as a result of Project exploration activities have been significant. KEPCO has an account at the Bylong General Store and actively encourages its workforce to purchase food, drinks and other relevant consumables from the Bylong General Store. Irrespective of potential Project impacts, KEPCO is committed to encouraging the retention of the Bylong General Store and recognises the importance of the service it provides to local residents, visiting tourists and to future employees.

The impact on increased competition for water resources is discussed in **Section 5.8**. The loss of rural population is discussed in **Section 5.25.15**. The consultation processes are discussed in **Section 5.3.1**.

5.25.6 Justification for Workforce Accommodation Facility

Submission Reference: SIG11, O4, P16, P51

Issue

A number of submissions questioned the justification for the WAF and raised concerns over the social impacts associated with having the WAF.

Response

Further justification for the inclusion of a WAF in the Project is presented in **Section 4.2.1**, **Section 4.2.3** and in **Appendix C**.

5.25.7 Solastalgia

Submission Reference: SIG15

Issue

This submission is concerned with the issue of Solastalgia.

“Research in the Hunter (Albrecht, et al, 2007; Connor, et al, 2004; Higginbotham, et al, 2006), and extended by others elsewhere (Cordial, et al, 2012), demonstrates that rural people who draw their identity from living in and caring for a particular place, such as the Bylong Valley, suffer a profound sense of loss when the loved and familiar place becomes an industrial landscape of resource extraction. It is experienced as an attack on one's sense of identity and security of belonging to a place.”

Response

Solastalgia is considered in the SIA consistent with the discussion presented in *Bulga Milbrodale Progress Association Inc v Minister for Planning and Infrastructure and Warkworth Mining Limited [2013] NSWLEC 48* (NSWLEC 2013).

Section 10.3.1 of the SIA (Appendix AC of the EIS) discusses the potential impacts of the Project on aspects of community liveability including:

- Changes to rural amenity and village character in the Bylong Valley;
- Community sustainability and cohesion;
- Connection to land; and
- Road safety and accessibility.

The SIA considers the impact of the Project, including the workforce on a range of natural, built, economic and cultural attributes of the Bylong Valley. It discusses the social impacts on the existing Bylong Valley community and how it will be required to cope with change with reference to a number of environmental aspects including visual, air quality and noise. The SIA draws on the experience of the existing residents of the Bylong Valley through the conduct of interviews. Additional assessment of cumulative impacts taking into consideration the impacts experienced by the nearby Wollar community have been included in **Section 4.2.7**.

The SIA considers the change in composition of the community of Bylong Valley and cumulative change in the community of the Rural Area including Wollar township (refer to **Section 4.2.7**).

In summary the SIA is considered to adequately address the potential issue of Solastalgia as described in NSW Land and Environment Court (2013).

5.25.8 Suitability of Shift Based Operations

Submission Reference: SIG11, P118

Issue

A number of submissions asserted that 24 hour operation is not appropriate in the Bylong Valley's rural environmental and social context and the company must be required by the NSW government to design its operation to suit that context by closing operations overnight and not employing a shift-base workforce.

Response

The technical studies completed in the EIS assessed the noise, air quality and visual impacts associated with working at night (i.e. 24 hour operations). Visual impacts from lighting is discussed in Section 7.6 of the VIA (Appendix Y, EIS) and further in **Section 5.21.2** of this RTS.

Amenity impacts from noise in the rural setting are discussed in **Section 5.12.13**. Air quality amenity impacts are discussed in the AQ&GG Impact Assessment (Appendix O, EIS).

KEPCO acknowledges the concerns raised in the submissions. However, it is not economically viable to operate the mine without a 24 hour per day operation. There are few, if any examples of economically viable mines of a similar size within Australia operating on restricted day light hours. The potential for the operation of the Project during daylight hours only was considered within the NBIA (Appendix O of the EIS), however this was determined to be economically unviable for the Project.

The use of a shift based workforce is essential for a 24 hour mine operation. The employee health and wellbeing impacts associated with the shift arrangements and the use of a WAF to accommodate the initial construction workforce is discussed in **Section 4.2** and in **Appendix C**.

5.25.9 Community Health and Wellbeing

Submission Reference: P4, P66, P99, SIG15, SIG17

Issue

A number of submissions raised concerns in relation to the impact of mining related activities on the health of local communities, in particular the farming sector, as a result of change in landscape.

Response

KEPCO is committed to mitigate against potential social impacts in the Bylong Valley by developing and working within the framework of a set of Government approved Management Plans, notably the Social Impact Management Plan.

Furthermore, in Australia, voluntary social groups and land care groups (e.g. Country Women's Association, Men's Shed, Beyond Blue, etc) are becoming more established to offer support for communities.

KEPCO is committed to achieving positive outcomes for the Bylong Valley community and the Sub-Regional Area by means of:

- The VPA with the MWRC to address the supply of critical social infrastructure;
- Distribution of community investment funding;
- Implementation of environmental and social management, mitigation and avoidance measures and systems, to ensure that there is no significant effect on the environment or the local community as a result of the Project;
- Employing existing residents from the Local Area;
- Attracting a resident population including families, back to the Bylong Valley and the surrounding Rural Area;
- Supporting local spend and economic growth in the Local Area;
- Supporting existing local community organisations such as the RFS and Bylong Hall Committee through financial and in-kind donations e.g. encouragement of staff to volunteer;
- Maintenance of existing rural amenity through the optimisation of the equipment fleet required for the Project, thereby resulting in a significant reduction in air quality and noise impacts for the Project on adjacent residences; and

- Ongoing consultation with stakeholders to seek the community's opinions and recommendations on the Project's operations via:
 - Regular consultation with land owners in the Bylong Valley;
 - Project updates via the Project's website; and
 - Regular Community Information Sessions.

Concerns over Solastalgia are discussed in **Section 5.25.7**.

5.25.10 Impact of WAF on Bylong Valley

Submission Reference: SIG17

Issues

This submission raised concerns over the sociological impacts of the WAF.

"I also believe that from a sociological point of view this project's workers accommodation project will create substantial problems in our local communities. Leading studies highlight the implications of creating an exclusive ghetto-like workers' camp for surrounding communities especially at the proposed large scale. My greatest concern for this part of the project is the very real possibility that this South Korean, state-owned company will fly in cheap Korean miners to establish the mine, reducing the economic and welfare benefits of this project for our local communities. In addition these flown in workers will be deprived of elemental satisfaction of certain human needs and will seek for this in the surrounding communities. This in turn can increase conflicts in the interactions with the local community members and a subsequent need for increased policing."

Response

The sociological issues of the WAF are addressed in **Section 4.2.3**.

As identified within the SIA (Appendix AC of the EIS), KEPCO is developing and updating a Local Content Plan to encourage the participation of local and under-represented groups in the Project's workforce and supply chain. The Local Content Plan will address actions that aim to secure a long term local workforce for the Project.

The Local Content Plan will provide a detailed analysis of identified existing local enterprise and the skills / education base of local residents. Wherever possible, Project supply and workforce requirements will then be 'matched' with existing capabilities in the local community. The Local Content Plan will also identify strategies to build local capacity where this is lacking, or does not meet Project needs. This may involve training, mentorship, recruitment and development programs which focus on local and regional communities as a first priority.

5.25.11 Employee Health and Wellbeing

Submission Reference: P113-1

Issues

This submission is concerned with the impact of long-distance commuting practices on the workforce.

Response

The need for a WAF for the Project is presented in **Section 4.2.1**. The impact of long-distance commuting practices on employees is discussed in **Section 4.2.3**. The impact of the Project on the health and wellbeing of the Bylong Valley community is discussed in **Section 5.25.9**.

5.25.12 Loss of Employment in Farming and Equine Industries

Submission Reference: P30, P91, P153

Issues

A number of submissions are concerned with the loss of employment and economic output in the non-mining sector as a result of the Project.

Response

The main negative impact of the Project on jobs relates to the displacement of agricultural land uses on the land to be occupied by the mining operations. This is explicitly addressed in Section 5.5.2 of the Economic Impact Assessment (Appendix AE of the EIS). While it is acknowledged that there will be some loss of jobs from displaced agriculture in the vicinity of the Project, these represent approximately 2.7% of the jobs to be generated by the Project within the same region (i.e. a loss of 23 jobs versus the creation of 830 Project related jobs).

Environmental, social and cultural costs of the Project including health costs, are discussed in Section 4.4.2 of the Economic Impact Assessment (Appendix AE of the EIS). The economic considerations for potential loss of agricultural employment is discussed further in **Section 5.26.3**.

5.25.13 Impacts to Tourism

Submission Reference: SIG20, P99, P118, P153, P156, P188

Issues

A number of submissions are concerned with the potential impact of the Project on tourism attributes of the Bylong Valley.

Response

As explained in Section 3.17 of the EIS, numerous mine plans, operational methods and infrastructure designs were considered in the development of the preferred Project. The mine planning process included a thorough consideration of the key environmental, social and economic constraints, including the potential impacts on the Bylong Valley Way tourist route.

As explained in Appendix E of the EIS, these mine planning considerations (including stand off from the Bylong Village) have involved the sterilisation of a significant amount of known coal resources within the two Authorisations held by KEPCO. So effectively, the Project has been designed to minimise adverse impacts on tourism within the Bylong Valley.

The SIA (Appendix AC of the EIS) and VIA (Appendix Y of the EIS) specifically address the potential impacts of the Project on tourism along Bylong Valley Way and the potential for the Project to reduce the attractiveness of the Village as a stopping point.

The SIA concluded that through the implementation of a range of management measures *"changes in the character and amenity of the Bylong Valley Way and Bylong Village are not predicted to adversely impact the 'experience' of travelling along the Bylong Valley Way."*

Further information in relation to the potential impact of the Project on the Bylong Valley Way is provided in **Section 5.21.1.3**.

5.25.14 Community Investment Fund

Submission Reference: P147

Issues

This submission seeks further information in relation to the Community Investment Fund implemented by KEPCO to date.

Response

KEPCO is investing beyond the requirements of the Project with the aim of making a lasting contribution to the communities in which it operates. A Community Investment Fund has been established for investment in community projects, events, sponsorships and donations. To appropriately target strategic investment over the short and long term, KEPCO is undertaking a Community Needs Assessment (CNA) which involves consultation with local service providers and government agencies.

KEPCO has supported the following local community groups through its Community Investment Fund:

- Kandos Rylstone Men's Shed;
- Rylstone Street Feast;
- Bylong Hall Committee;
- Rylstone Kandos Show;

- Mudgee Show;
- Rylstone Hospital Auxiliary;
- Mudgee Disability Support Service;
- Mudgee Men's Shed;
- Rotary Club of Mudgee Sunrise Inc;
- Cudgegong Valley Mathematics;
- Rylstone Public School;
- Kandos High School;
- Rylstone Branch Combined Pensioners & Superannuates; and
- Rylstone and District Pony Club.

Further information in relation to the priorities identified under the CNA and investment progressed through the Community Investment Fund will be made available to the public on the Projects' website and various Project community newsletters. Evaluation of the success of the Community Investment Fund is acknowledged as an integral component of the implementation process.

5.25.15 Displacement of Rural Population

Submission Reference: SIG11, SIG12, SIG21

Issue

A number of submissions were concerned with the displacement of the community and reduction of the population due to landowners being bought out by KEPCO.

Response

This is discussed in **Section 4.2.7**.

5.25.16 Rural Amenity

Submission Reference: SIG11

Issue

SIG11 asserted that the Government must require the company to ensure that there are no noise and air quality impacts beyond the project boundary, so that no further acquisition needs to take place, rural amenity is maintained and the properties already owned by KEPCO can be rented without causing serious health and amenity concerns for renters.

Response

The AQGHGIA (Appendix O, EIS) confirmed the Project is not predicted to contribute to the air exceedances of the relevant air quality criteria at any private residences (either due to the Project alone, or cumulatively). Health concerns from dust are discussed in **Section 5.10.5**.

The NBIA (Appendix Q, EIS) confirmed three receivers are predicted to be significantly impacted by noise. These receivers are entitled to voluntary at-property mitigation or acquisition rights.

A further six receivers are predicted to be moderately impacted by noise from the Project. These receivers will be entitled to voluntary at property mitigation rights. Amenity impacts from noise are discussed in **Section 5.12.13**.

KEPCO is committed to mitigating and managing potential environmental and social impacts as discussed further in **Section 5.1.5**.

5.25.17 Housing Affordability

Submission Reference: P143

Issue

There is concern that an influx of mine employees will artificially increase the rental prices of housing in the Mudgee region which will in turn make it unaffordable for the local population to continue to live there.

Response

Section 9.3.5 of the SIA (Appendix AC, EIS), discussed the impacts on housing and availability. KEPCO acknowledges the concerns in relation to the potential impact of the cumulative mining sector population growth on housing affordability and housing accessibility for lower socio-economic and vulnerable groups. In consultation with MWRC, actions to address the crisis housing deficit in the MWRC LGA will be discussed as a component of the VPA. Further engagement in relation to the provision of crisis housing will be conducted with key stakeholders such as Housing Plus, Barnardos and the MWRC as part of the preparation of a Community Needs Assessment.

A supplementary assessment has been completed of the key social impacts associated with the Project under a scenario where there is no WAF provided for the construction workforce. This is included in **Appendix C** and discussed in **Section 4.2.1**.

5.25.18 Property Impacts – Murrumbo

Submission Reference: O5

Issue

A submission expressed concern about impacts on the operation and value of their agricultural property (Murrumbo) associated with increase in rail noise, operational noise, labour supply, increased road traffic on the Bylong Valley Way and related safety concerns. Further, they also consider the consultation process undertaken by KEPCO and its representatives has been inadequate as they were not afforded the opportunity for any individual consultation on the Project.

Response

The impact of rail noise on the operation and value of the Murrumbo property is discussed in **Section 5.12.8**. The predicted impacts of the Project at residential areas on the Murrumbo property are not expected to generate significant additional noise from rail or operations.

The impact of increased traffic on the Bylong Valley Way is discussed in the TTIA in Appendix Z of the EIS. Results of the TTIA indicated that there will not be any additional adverse impacts beyond the networks capacity on the surrounding road network as a result of the increased traffic associated with the construction and operation activities. A Construction Traffic Management Plan will be prepared to ensure the traffic network can be safely and efficiently managed throughout the construction phases of the Project. Additional mitigation strategies will also be investigated to manage ongoing safety risks including fatigue and speeding. Such strategies could include the provision of a bus service between Mudgee and the Project, as well as a shuttle bus between the MIA and WAF areas.

Labour supply is discussed in **Section 4.2.3**. The SIA concluded that the Project will have minimal impact on labour supply in the MWRC LGA.

Property devaluation could be expected to occur when land is adversely impacted by mining. As a result of careful planning and design, the mine plan for the Project has been developed to ensure that the predicted impacts are largely contained within the Project Boundary and on land already owned by KEPCO. In this regard, the Project is not anticipated to impact on the value of properties in the vicinity, such as Murrumbo.

Discussions have been held with representatives of Murrumbo in regard to a number of matters raised by them.

The extensive consultation process undertaken to-date is discussed in detail in **Section 5.3.1**.

5.25.19 Property Impacts – Locaway

Submission Reference: O6

Issue

A submission stated that the EIS has given either no or very minimal consideration to the environmental, social and economic impacts of the Project on the Locaway Property, including noise impacts, water licences and availability, property's BSAL, and air quality. Further, no consultation has been undertaken in relation to impacts on the Property.

Response

The noise considerations for the Locaway Property are discussed in **Sections 5.12.1.5, 5.12.1.6, and 5.12.5**. The potential air quality impacts are discussed in **Section 5.10.1**, water licences and availability is discussed in **Section 5.8.1** and the impacts of the project on nearby BSAL are discussed in **Section 5.20.2.3**.

The Economic Impact Assessment was undertaken at an aggregate level based on biophysical assessments completed by technical specialists. To the extent that there are any direct or indirect impacts of the Project on this individual property, they are included in the consideration of the aggregate costs and benefits of the Project (including noise, dust, visual and agricultural impacts) and the regional economic impact assessment.

As outlined in the EIS, the environmental, social and economic impacts have been appropriately assessed and concluded there will be no exceedances of relevant amenity criteria at the Locaway property.

Section 5 of the EIS summarises the stakeholder engagement process undertaken for the Project during the preparation of the EIS. KEPCO has endeavoured to engage with relevant stakeholders and the community to inform stakeholders of the Project and to gain an understanding of the key concerns from the community. This is discussed further in **Section 5.3.1**.

Individual discussions have been held with key landholders predicted to receive significant amenity/access impacts that will result in mitigation or acquisition.

5.25.20 Property Impacts – Lee Creek and Carawatha

Submission Reference: P81 and P201

Issue

Two submissions expressed concern that the adverse effect on the operations of Lee Creek and Carawatha farms and upon the daily lives of the permanent staff and family who live on the farm are ignored in the EIS. Further, that no mitigation or amelioration measures have been proposed. This is in relation to water supply, noise and dust pollution, land access, all weather road access and the impact to power supply from the power substation at Bylong.

Response

The NBIA (Appendix Q, EIS) concluded that noise levels are predicted to remain below all relevant noise criteria at Lee Creek and Carawatha residences, as discussed further in **Section 5.12.1.3**. Air quality modelling in the AQGHGIA (Appendix O, EIS) and as discussed further in **Section 5.10.3** concluded no exceedances of air quality criteria is predicted, as a result of the Project alone or cumulatively, at any private residences, including Lee Creek and Carawatha.

Concerns over loss of water supply is discussed in **Section 5.8**. Land Access, including all weather access to these properties is discussed in **Sections 4.2.9** and **5.23.1**. KEPCO have revised the road strategy in response to stakeholder concerns. The conceptual North Link Road is proposed to provide alternate access to the landowners to the south of the Project.

Section 3.8 of the EIS describes various realignments of the existing power reticulation infrastructure that will be undertaken to accommodate the various components of the Project. KEPCO will engage with landowners located to the south of the Project to ensure a reliable power supply is maintained to their properties and that there are minimal interruptions to power supply during realignment works.

The EIS demonstrates that there are not predicted to be any adverse impacts anticipated as a result of the Project, on the operations, residences, staff or families that reside at Lee Creek or Carawatha. As such, no additional or specific mitigation and amelioration measures are required to those already proposed in the EIS.

5.25.21 Property Impacts – Tinka Tong

Submission Reference: P226

Issue

A submission provided highlighted the adverse impacts the Project will have on the neighbouring property Tinka Tong, such as noise, dust and water supply. If the Project is approved, then a request for acquisition should be granted, based on a fair price unaffected by mining, together with compensation for costs and the disturbance caused by the acquisition process.

Response

KEPCO has been in ongoing discussions with this landowner with regards to the predicted noise impacts on the property including the potential for acquisition rights. Any voluntary acquisition will be undertaken in accordance with relevant legislation and policies, including the DP&E VLAM Policy.

Under this policy, the acquisition price must, as a minimum, include:

- A sale price no less favourable than market value calculated in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* as if the land was unaffected by the development; and
- An amount no less favourable than an amount calculated with respect to the matters referred to in section 55 of the *Land Acquisition (Just Terms Compensation) Act 1991* other than market value.

5.26 ECONOMICS

Submission Reference: SIG1, SIG8, SIG10, SIG15, SIG16, SIG18, SIG23, O4, O6, P3, P10, P27, P30, P36, P38, P93, P130, P136, P152, P153, P157, P196, P222, P228, P231, P153, P157, P204_2, P217.

5.26.1 No Economic Benefits to the Region from the WAF

Submission Reference: O4

Issue

This submission considered that there is very little economic benefit to Mudgee and its residents.

Response

This is discussed in **Section 4.2.6**.

5.26.2 Need for the Project

Submission Reference: SIG1, SIG8, P3, P10, P27, P30, P36, P38, P93, P130, P152, P153, P157, P204_2, P217

Issue

These submissions refer to the state of the international coal export market and question the demand for the Project given current market oversupply.

A number of stakeholders commented that there is a global decline in demand for coal. Further, there is no coal resource scarcity and the viability of many coal mining operations across the state is under threat due to the oversupply of thermal coal in the export market.

Response

Need for the Project

The market for coal is currently subject to oversupply and hence depressed prices. However, the IEA (IEA, 2015) predicts price recovery under the current policy and new policy scenarios and coal continuing to be a major part of the international energy mix at 2040. The IEA predicts annual growth in its New Policies Scenario of 0.4% per annum and annual growth in the Current Policy Scenario of 1.6% per annum.

South Korea has limited coal resources of its own with this being low-quality anthracite used in home heating and small boilers. Bituminous coal supplies (steam coal for power plants and industrial boilers and metallurgical coal for steelmaking) need to be imported, mainly from Australia and Indonesia. Coal consumption in South Korea increased by 59% between 2005 and 2014, driven primarily by growing demand from the electric power sector and the forced shutdowns of some nuclear plants in late 2012 because of safety issues. KEPCO Korea is forecasting its demand for thermal coal to rise significantly in the future.

KEPCO forecasts demand for thermal coal to rise to approximately 110 Mtpa by 2020, representing a 27% increase from 2014.

KEPCO is seeking to develop the energy resources located within the Project site so as to reduce KEPCO Korea's exposure to global supply and demand fluctuations and to assist in ensuring energy security for South Korea as a whole.

Coal Resource Scarcity

Gillespie Economics notes that proven recoverable coal resources are those that are currently technologically or economically feasible to extract. However, only a subset of these are currently supplying the market. Mining of proven recoverable coal resources requires labour and capital resources to be expended to bring the coal to the market. Australian coal is economical, plentiful and is generally of high quality. It is also close to South East Asian countries, including South Korea, where it has been noted by the IEA (2015) that the forecast demand for coal is expected to grow most strongly. It is for these reasons that there is a strong demand for Australian coal.

Crowding out of other NSW Mine Employment

KEPCO is seeking to develop the energy resources located within the Project site so as to reduce KEPCO Korea's exposure to resource scarcity issues and assist in ensuring energy security for South Korea as a whole. KEPCO forecasts an approximate 27% increase in direct coal imports from approximately 80 Mtpa (in 2014) to approximately 110 Mtpa by 2020 (Hansen Bailey, 2015).

There is not expected to be any crowding out of other coal operations in NSW.

5.26.3 Costs to the Community

Submission Reference: SIG15, P153, P136, and P228

Issue

This submission questions the costs and benefits of the Project to the community, in particular the costs to existing agricultural, private properties, environmental, social, and health costs.

Response

Social, Environmental and Health Costs

The potential environmental, social and economic risks/impacts of the Project to the community including impacts on existing agricultural, social and environmental resources are assessed in the EIS and considered in the Economic Impact Assessment (Appendix AE of the EIS). Specifically the environmental, social and cultural costs of the Project including health costs, are discussed in Section 4.4.2 of the Economic Impact Assessment.

Regulatory controls for coal mines are aimed at minimising, offsetting and compensating the community for potential environmental, social and cultural impacts. Having regard to this, the Economics Impact Assessment, independent expert peer review by BDA Group and peer review recently completed for DP&E by CIE all find that relative to the "no-go alternative" the benefits of the Project to NSW, outweigh the costs.

Loss of Jobs

The main negative impact of the Project on jobs relates to the displacement of agricultural land uses on the land to be occupied by the mining operations. This is explicitly addressed in Section 5.5.2 of the Economic Impact Assessment (Appendix AE of the EIS). While it is acknowledged that there will be some loss of jobs from displaced agriculture in the vicinity of the Project, these represent approximately 2.7% of the jobs to be generated by the Project.

5.26.4 Impact on Tourism in the Bylong Valley

Submission Reference: P153

Issue

This submission identifies the Bylong Valley as one of Australia's top ten scenic drives. Concern was raised that the EIS does not even mention the negative impact of the mine on tourism, actual and potential, of the Bylong Valley.

Response

The response provided in **Section 5.25.13** addresses this issue.

The Economic Impact Assessment relies on the input from other technical specialists to identify the physical impacts of the Project. The Assessment identified there are no economic impacts associated with the tourism value of Bylong Valley Way by the Project.

5.26.5 Price Forecasts of Coal Make Delivery of Economic Benefits Unlikely

Submission Reference: P157

Issue

A submission stated that “the 25 year price outlook for thermal coal makes the delivery of the overall net economic benefits to NSW and the capacity of the company to earn a profit, as well as provide all the resources to protect the environment, manage the inevitable environmental breaches and deliver ultimate rehabilitation is at best, a small chance. Far more likely is economic collapse and environmental vandalism.”

Response

The IEA forecasts a rebound in thermal coal prices. Over the life of the Project, forecast coal prices are expected to result in a financially viable Project with resultant economic benefits for Australia and NSW. Accordingly, there will be sufficient resources for proposed environmental mitigation measures and mine site rehabilitation. Coal price projections are discussed in **Section 5.26.9**.

Most potential environmental impacts such as greenhouse gas generation, noise, dust, water use, etc. occur while the mine is operating. If for some reason a mine ceases to operate or does not commence operation, then these potential impacts do not occur.

The exception is where a mine commences operation and then prematurely ceases whereby some rehabilitation liability may exist. In this respect, it should be noted that KEPCO is willing to invest \$1.3 Billion in the Project. It is highly unlikely that a \$1.3 Billion investment will take place and then operations prematurely cease.

However, the risk that this might occur is mitigated by the fact that KEPCO is required to lodge a rehabilitation security deposit as the holder of a mining authority under the *Mining Act 1992*. This security deposit is held by DRE to ensure that the legal obligations in relation to rehabilitation and safety of the site can be met following mine closure. If rehabilitation obligations are not met to the satisfaction of the Minister, then the security deposit would be used by DRE to meet the relevant requirements.

With respect to biodiversity offsets, KEPCO will also be required to enter into an appropriate biodiversity offset agreement (or relevant mechanism) that includes the payment of a conservation bond which reflects the full cost of implementing the offset strategy.

5.26.6 Competition for Water

Submission Reference: P196

Issue

A submission stated "Coal mining uses vast quantities of water. Coal mining water is sourced from bore fields, rivers and dams in direct competition with a sustainable but vulnerable agriculture sector and towns and communities around it. The economic benefits are negligible as they are only temporary, whereas farming and tourism are ongoing and the benefits are directly felt by those communities."

Response

The main impact of the Project on water relates to pumping from a borefield to supplement supply to the water management system and water take from the alluvial groundwater systems due to mining.

Section 7.4.3 of the EIS predicts no licensed bores on privately owned land to be significantly impacted by the Project's groundwater impacts. Therefore, the predicted depressurisation and drawdown in groundwater within the coal seams and within the alluvium as a result of the Project are contained to KEPCO owned land and will have no consequences for neighbouring private groundwater users. The two government monitoring bores which are located within the alluvium adjacent to the proposed open cut mining areas are not predicted to be significantly impacted by the Project's groundwater impacts.

As identified in the Economic Impact Assessment (Appendix AE of the EIS), in NSW, the government has established a market framework to facilitate the allocation of water resources between competing uses.

Water access and use is only permissible with possession of a WAL (except in the case of exemptions such as harvestable rights, native title rights and some stock and domestic rights) as outlined in Section 4.3.4 of the EIS.

Water Sharing Plans that are prepared under the WM Act set the rules by which water is shared between all users, including the environment, in each water management area in NSW. These plans also set rules for water trading, that is, the buying and selling of water licences and also annual water allocations.

Consistent with this framework, KEPCO has secured sufficient units of water allocation from the Bylong River Water Source under the Hunter Unregulated WSP to account for the Project's predicted water take and water uses from the Bylong River Water Source. The opportunity cost of holding these entitlements has been included in the BCA.

The Economic Impact Assessment demonstrates that the incremental net economic benefits of the Project to Australia and NSW are anything but negligible. They are significant at \$314 Million, present value, of net social benefits to NSW.

This includes an allowance for foregone agriculture during the operation of the mine and the opportunity cost of water used in the Project. As identified above, no significant impacts are expected to water for tourism as a result of the Project.

5.26.7 Benefits Overstated

Submission Reference: SIG1, SIG18, P30, P153, P157, P196, P222, P231

Issue

A number of submissions questioned the economic benefits of the Project, indicating they were overstated, negligible and short-term or temporary, such as jobs and royalties. Further, that mines the mines enjoy many free subsidies.

Response

The Economic Impact Assessment (Appendix AE of the EIS) has been peer reviewed by BDA Group and CIE. Neither suggested there was any overstatement of benefits. The CIE Peer Review commissioned by DP&E specifically concludes that the estimate of royalties presented by Gillespie Economics appears reasonable. In addition, DRE in its submission, dated 6 November 2015, has estimated a present value of royalties from the Project of \$266 Million.

No information is provided in the submission with regard to the subsidies that are considered to be provided to the mining industry. However, the Productivity Commission's (2015, p.114), clearly states that *"the estimated effective rate of assistance from tariff and budgetary assistance for Mining is negligible."*

5.26.8 Economic Justification

Submission Reference: SIG18

Issue

A submission was concerned with the loss of jobs, stating that jobs are touted as a reason for this project to go ahead. However, there is no tally given of jobs lost due to agricultural land being taken out of action, nor the jobs lost in relation to the loss of the local school. These are all long-term (decades and decades) jobs as opposed to short-term construction jobs and slightly longer-term, but equally impermanent mining jobs. Viewed over a longer time frame, the economic benefit is not so great. Furthermore, the full economic costs of the social dislocation, loss of biodiversity and cultural heritage, both European and Indigenous, have not been accounted for.

Response

The economic justification for the Project to proceed is that the aggregate benefits of the Project to the community is estimated to substantially outweigh the costs, including those associated with environmental, social and cultural impacts - refer to the results of the BCA in the Economic Impact Assessment.

In addition, the Project will provide considerably more direct and indirect jobs to the regional economy than continued use of the land for agriculture. An estimation of jobs lost due to displaced agriculture is provided in Section 5.5.2 of the Economic Impact Assessment. This indicated that in the order of 23 direct and indirect agricultural jobs would be displaced compared to 830 direct and indirect jobs associated with the Project.

The decision by the Department of Education and Communities to place in recess and then to ultimately close the Bylong Upper Public School in 2015 is entirely attributable to the lack of enrolments to the school rather than the Project (Hansen Bailey, 2015). Hence this is not a matter for consideration in the Economic Impact Assessment of the Project.

5.26.9 Key Flaw in the Economic Assessment is the Coal Price Used

Submission Reference: SIG23

Issue

A submission commented that the key flaw in the economic assessment is that it is based on a coal price of over AUD100 which is far higher than the current price of AUD81. Commonwealth Treasury is using a long term coal price forecast of AUD80. The Economic Impact Assessment does not disclose what coal price is used.

Response

It should be noted that it is not current or historic coal prices that are relevant to the analysis but forecast prices during the 23 years of the proposed mining operations, following 2 years of construction. Hence if approval were given today, the relevant coal price is the price from 2018 onwards. The Commonwealth Treasury does not provide a long term coal price forecast in any of its budget papers. Gillespie Economics notes that the reference to the Commonwealth Treasury within this submission appears to relate to a 2014 Treasury Working Paper (Bullen et al, 2014) rather than an official view.

The USD/t price forecasts over the mine life used in the Economic Impact Assessment was from a detailed product marketability report prepared by Wood Mackenzie (2014). Wood Mackenzie is a leading global energy, metals and mining research and consultancy group. Coal price forecasts are proprietary and were provided under a commercial arrangement. It is a breach of this commercial arrangement to publish this information.

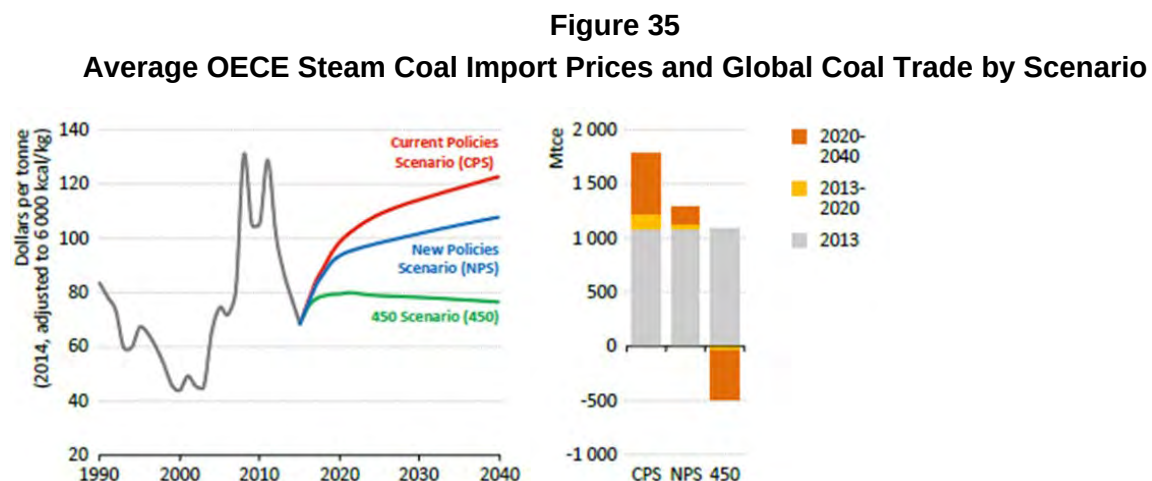
A key finding of Wood Mackenzie is that global thermal coal prices are at multi-year lows due to an enduring oversupply. However, the WoodMackenzie forecasts illustrate that this is likely to end soon. WoodMackenzie expect price recovery over an extended period. These price forecasts together with a USD/AUD exchange rate of 0.84 were used in the Economic Impact Analysis.

It should be noted that recent forecasts of the AUD/USD exchange rate are around 0.72 (Westpac, 2015) and hence all other things being equal, the assumed exchange rate in the Economic Impact Assessment will understate the revenues and hence economic benefits of the Project.

The forecast trend by Wood Mackenzie is supported by the IEA (2015) World Energy Outlook under the Current Policy Scenario and New Policy Scenario. The New Policy Scenario takes account of broad policy commitments and plans that have been announced by countries, including national pledges to reduce greenhouse-gas emissions and plans to phase out fossil-energy subsidies, even if the measures to implement these commitments have yet to be identified or announced. The Current Policy Scenario assumes no changes in policies. Figure 7.3 from IEA (2015) is reproduced as **Figure 35** below and presents a forecast of thermal coal prices increasing rapidly until 2020 followed by divergence in price under the New Policy and Current Policy Scenario. Under the Current Policy Scenario and New Policy Scenario and an exchange rate of 0.72, the thermal coal price in 2020 is AUD102/t and AUD121/t, respectively.

The forecast trend by Wood Mackenzie is also consistent with the thermal coal price assumptions in the NSW 2015-2016 Government budget papers. In these documents, at an assumed exchange rate of 0.72, the price of thermal coal in 2019 is AUD103.

DRE in its submission to the EIS, dated 6 November 2015, suggests the medium to long term export thermal coal price is likely to be between AUD75 and AUD110 a tonne.



Source: IEA (2015), p. 274

What is clearly evident from the above analysis of available forecasts is that the central price assumptions in the Economic Impact Assessment for the Project are reasonable and that those suggested by this submission are at odds with credible forecasts. Notwithstanding, there is some level of uncertainty around the forecast future coal prices and exchange rates. Consequently, the Economic Impact Assessment includes sensitivity testing of +/- 20% changes in the AUD coal price.

In response to a comment from CIE in its peer review, sensitivity testing has now also been undertaken for +/- 30% changes in AUD coal price as described in Table 1 of **Appendix N**.

5.26.10 Project Viability at Lower Prices

Submission Reference: SIG23

Issue

This submission commented that sensitivity testing in the Economic Impact Assessment at a 20% lower coal price is used to claim the project is viable even at lower coal prices

Response

The Economic Impact Assessment (Appendix AE of the EIS) is focused on the economic costs and benefits of the Project to Australia and NSW.

It found that under all scenarios examined, including a 20% reduction in AUD coal price, the Project will have net social benefits to Australia and NSW. It makes no comment on the financial viability or profitability of the Project.

As identified by the DP&E (2015):

"The profitability of the proposal is not a relevant matter for consideration under Section 79C of the EP&A Act."

*International mining companies routinely make investment decisions across their portfolios that on the surface may appear sub-economic, but for other strategic reasons are attractive to the broader business. Even if **the proponent**⁴ does not make a significant profit from the mine, the State would still realise the royalties for each tonne of coal produced, a significant number of people would be employed, and there would be a range of associated flow-on benefits for the regional economy.*

Ultimately, if the mine is truly not economically viable (as claimed in many submissions) the project would be unlikely to proceed. This would result in the claimed benefits of the project not being realised, but would equally mean that none of the impacts of the mine would eventuate either."

Should the Project proceed, under the scenario calculated with 20% lower coal prices, there will be economic benefits to NSW and Australia in the form of royalties. Royalties are paid regardless of the profitability of a Project. They comprise the main economic benefit to NSW under the 20% lower coal price scenario.

⁴ This has been changed to make it generic rather than reference the name of proponent that the NSW DP&E was referring to.

The pseudo-analysis undertaken by this stakeholder in their submission to demonstrate that the Project may not be profitable at 20% lower coal prices is a form of discounted cash flow analysis. However, discounted cash flow analysis does not measure profitability. Profitability analysis requires the consideration of depreciation of capital assets rather than the inclusion of all capital costs in the year that they occur.

5.26.11 Economic Analysis Sensitivity Analysis is Incorrect

Submission Reference: SIG23

Issue

This submission considers that the results of the lower coal price sensitivity testing in the economic analysis are incorrect and it is not clear how the sensitivity analysis calculations were conducted. Its own calculation of royalties uses a 7% royalty rate as it is unclear from the economic assessment how much product coal would be levied at each rate.

Response

The lower coal price sensitivity testing was undertaken by reducing annual revenue over the life of the project by 20%, applying the appropriate royalty rate to the quantity of open cut and underground product coal and estimating the level of company tax payable at these lower prices. The estimate of company tax was based on an actual depreciation schedule of capital rather than the simplistic approach used in the submission. At 20% lower coal prices there is a royalty component and a company tax component to the estimated net benefits to Australia and NSW. The royalty component accords with the calculation in the submission. However, the submission estimates no company tax because it has not undertaken a profit and loss assessment.

In the order of 30% of product coal will be from open cut mining in the early stages of the Project and will attract a higher royalty rate than assumed in the submission.

5.26.12 Corporate Tax Estimate Questionable

Submission Reference: P153, SIG23, SIG18

Issue

These submissions question the estimate of corporate tax arising from the Project, in particular because of recent press regarding international corporations avoiding their tax liabilities to Australia and because KEPCO will be the end user of the coal.

Response

The estimate of taxes from the Project utilised within the Economics Impact Assessment is taken from a detailed financial analysis of the Project as part of the Feasibility Study.

Gillespie Economics notes that in Australia, corporate tax is paid at 30% of taxable income, where taxable income in any particular year is revenue less operating costs and depreciation.

An analysis of Australian Tax Office data by Dr Sinclair Davidson (2014), Professor of Institutional Economics at RMIT University and a Senior Fellow at the Institute of Public Affairs found that the Australian mining industry pays corporate tax at a rate close to 30% of its taxable income.

At the time that the analysis was undertaken, the government had proposed a reduction in this rate to 28.5% of taxable income. The analysis was undertaken on this basis. Therefore, all other things being equal, the analysis will understate the level of company tax generated by the Project. Furthermore, the Economic Impact Analysis assumed that 7% of company tax will accrue to NSW. The recent NSW Government (2015) *Guidelines for the economic assessment of mining and coal seam gas proposals*, suggests that 32% of company tax will accrue to NSW. Consequently, all other things being equal the analysis understates the level of company tax benefit to NSW.

The main driver of company tax estimates is the price of coal. Recognising the uncertainty around assumptions in the Economic Impact Assessment, sensitivity analysis included 20% changes in key variables such as coal prices and operating costs.

One rationale suggested for non-payment of taxes relates to the potential for "transfer pricing" (i.e. where a proponent sells coal to itself at a loss). However, Gillespie Economics notes that transfer pricing is illegal in Australia. Australia's transfer pricing rules require that businesses price international dealings with related parties according to the price that would be expected from independent parties in the same situation.

5.26.13 Impacts if Project Does Not Proceed

Submission Reference: SIG23, P30

Issue

If the project is approved but does not proceed, it can still impose costs on the community. Uncertainty about the future of the mine can impact the local economy and reduce landholders' willingness to invest in their land. An example of this is nearby Cobbora Coal Project.

Response

The land proposed for the Project is predominantly owned by KEPCO. It is currently being managed by KEPCO for agricultural purposes. In the unlikely event that the Project was approved and did not proceed; it will continue to be managed for agricultural purposes by either KEPCO or the new owners of the land. No significant impacts on the community are therefore envisaged.

Comparisons to the Cobbora Coal Project are spurious since it was a NSW Government Project proposing the mining of lower energy value coal, mainly to provide greater long term cost and supply certainty for the domestic electricity generation. It was always identified as a cost recovery project (EMGA Mitchell McLennan Pty Ltd, 2012).

5.26.14 Assumptions Around Mitigation and Offset Measures

Submission Reference: SIG23

Issue

A submission stated "The Economic Assessment assumes that all mitigation and offset measures work perfectly to reduce the external cost of the Project to zero. This is unlikely. In the case of biodiversity offsets, most ecologists doubt the efficacy of such offsets."

Response

Gillespie Economics contends that this statement is incorrect. Agricultural impacts and significant noise impacts are directly included in the analysis via the opportunity cost of land and capital cost of land acquisitions. Water quantity impacts are also directly included via the opportunity cost of holding WALs. Greenhouse gas emissions and historic heritage impacts are included via benefit transfer of social values from other studies. No significant air quality impacts or blasting impacts were identified in the technical assessments.

With respect to moderate noise impacts, ecological impacts, road transport impacts and visual impacts, the analysis assumes that the proposed mitigation and offsets measures reduced effects to the extent that they become immaterial from an aggregate economic efficiency perspective. It does not assume zero impacts.

Any residual impacts after mitigation and offset are dealt with using the threshold value method. This is where the quantified net benefits of the Project provide a threshold value that unquantified residual impacts would need to exceed for the Project to be questionable from an economic efficiency perspective. As identified in the Economic Impact Assessment, p. 41:

"While the major environmental, cultural and social impacts have been quantified and included in the Project BCA, any other residual environmental, cultural or social impacts that remain unquantified would need to be valued at greater than between \$592M and \$757M for the Project to be questionable from an Australian economic perspective."

With regard to biodiversity offsets, the Economic Impact Assessment (Appendix AE of the EIS) states that *"Provided the values held by the community for the offsets are equal or greater than values that would be lost then no additional economic costs warrant inclusion in the BCA apart from the capital and operating costs of providing the offsets."*

At the time of preparing this report, the biodiversity offset strategy was still being refined and negotiated with OEH to ensure that they are sufficient to improve or at least maintain biodiversity values within the bioregion. To the extent that an offset approved by OEH does not offset the ecological values lost then there may be some residual impacts that have not been included in the Economic Assessment. However, sensitivity testing for large changes in the overall Project capital and operating costs (which would include any cost changes associated with a refinement to the required biodiversity offsets) is provided in Section 4.7 of the EIS.

5.26.15 Nonmarket Values of Employment

Submission Reference: SIG23

Issue

Parts of the assessment include a value for nonmarket values of employment. A submission contended that the studies this estimate is based on have been rejected by the NSW Land and Environment Court and the NSW Court of Appeal and that they are based on flawed methodology which results in overstatement of any nonmarket value of employment.

Response

Gillespie Economics states that this is incorrect. The study on which the nonmarket value of employment used in the Economic Impact Assessment is based was in relation to the Bulli Seam Operations which was not considered by the NSW Land and Environment Court or the NSW Court of Appeal.

The NSW Land and Environment Court in its consideration of the Warkworth Extension Project made no comment in relation to the nonmarket values of employment estimated for that Project. The NSW Court of Appeals consideration of the Warkworth Extension Project was in relation to procedural fairness and made no comment on economic methodology.

The methodology on which the nonmarket values of employment for the Project are based is not flawed. Gillespie Economics notes that the inclusion of this value in BCA is supported by economic theory and the results of numerous empirical studies. Appendix 6 of the Economic Impact Assessment (Appendix AE of the EIS) provides a detailed explanation and studies from the literature that have recognised and valued nonmarket employment values using the same methodology.

Notwithstanding, the substantive justification for the inclusion of nonmarket employment values in BCA, the Economic Impact Assessment recognises that this is a new area in economic valuation and that some people may view this as contentious. To allow for this, the results of the BCA for the Project are reported “with” and “without” the nonmarket values for employment being included.

5.26.16 Multiplier Methodology

Submission Reference: SIG1 and SIG23

Issue

A number of submissions indicated that the impact analysis is based on multiplier methodology described as "biased" by the Australian Bureau of Statistics, "abused" by the Productivity Commission and "deficient" by the NSW Land and Environment Court.

Response

The methodology used to assess the regional economic impacts of the Project was input-output (IO) analysis. IO analysis is a cost effective and simple method for estimating the gross market economic activity (i.e. financial transactions and employment, in a specified region that is associated with a project). As identified by World Bank economist Mustafa Dinc (2015), it is one of the most widely used models around the world for regional impact assessment and provides a solid framework to analyse the interdependence of industries in an economy. The methodology is supported by the two peer reviews of the Economic Impact Assessment and the recently released NSW Government (2015) *Guidelines for the economic assessment of mining and coal seam gas proposals*. Gillespie Economics notes that the criticisms of the method referred to are misrepresented.

As identified by CIE (2015, p. 28) in its peer review of the Project *"The IO methodology is reasonable but should be considered an upper bound of the regional effects"*.

Similarly, the BDA Group in its peer review (Appendix AF of the EIS) states:

"The consideration of regional economic benefits, contrary to assessment at the global or national level, requires consideration of second round benefits. Gillespie Economics has done this through drawing on an Input-Output (I/O) analysis (subsequently presented in the report for an examination of regional impacts). This is a useful extension of the economic analysis..... Nonetheless, the model of the regional economy has been built using appropriate datasets, and the 'order-of-magnitude' results provides confidence to support the conclusion that regional economic benefits are substantial."

The NSW Government (2015, p. 23) *Guidelines for the economic assessment of mining and coal seam gas proposals* identifies that *"the Local Area Analysis should include second round effects"*. It also identifies that *"A range of techniques are available for estimating second round or flow-on effects. These include CGE (computable general equilibrium) modelling, input-output (I-O) or multiplier analysis"*.

Gillespie Economics states that the criticism made of IO analysis are misrepresented by extremely selective quotations.

The main concern that economists (e.g. the Productivity Commission, NSW Treasury and ABS) have with IO is its use as a substitute for BCA, not its use for estimating direct and indirect regional economic activity impacts as reproduced below:

- NSW Treasury (2009) “Model based economic impact assessment [such as IO analysis] is not a substitute for a thorough economic analysis of a policy. The appropriate method for analysing policy alternatives is benefit cost analysis (BCA)”. This reference is actually a NSW Treasury Guideline for the use of IO in estimating jobs effects of Government Actions, Programs and Policies;
- The main “abuse” reported by the Productivity Commission (Gretton, 2013) is using IO analysis to “make the case for government intervention” when BCA is the appropriate method for doing this;
- ABS (2015) concerns with IO being “biased” refer to it being a “biased estimator of the benefits or costs of a project”. IO does not estimate benefits and costs but economic activity;
- Concerns of the Warkworth Judgement (Preston 2013) with IO analysis being “deficient” related to the data (industry data from surveys undertaken in 2001 and assumptions used (see next dot point)), but more fundamentally for not “assisting in weighing the economic factors relative to the various environmental and social factors, or in balancing economic, social and environmental factors”. This is an inappropriate criticism of the IO method, since it does not pretend to do this; and
- IO analysis does not depend on the assumption “that there is a ghost pool of highly skilled yet unemployed people” in a region as suggested in the Warkworth Judgement. It allows for labour to come from within or outside the region.

The Economic Impact Assessment of the Project correctly uses IO analysis to consider regional economic activity, not as a substitute for BCA.

5.26.17 Economic Analysis is Biased

Submission Reference: SIG1

Issue

A submission stated “The Economic Impact Assessment data is biased to the extent that the quantification of the main environmental, social and cultural impacts (as included in the cost benefit analysis) is largely subjective: the quantification typically downplays/disregards issues such as climate change and the implications of the approval for such things as renewable energy development in Australia and in the receiver countries to which coal is exported. It may well be that the peer reviewer believes the economic analysis meets the SEARS and relevant NSW Government Guidelines, but these matters are subject to review by the DPE in terms of the Integrated Mining Policy, including the Economic Assessment of Mining and Coal Seam Gas Proposals.

A significant factor leading to the Economic Assessment of Mining and Coal Seam Gas Proposals has been the unacceptable distortions embodied in current practice."

Response

The quantification of the main environmental, social and cultural impacts of the Project in the BCA (Appendix AE of the EIS) is based on the technical assessments in the EIS and addressed in the BCA using well recognised and accepted methods of welfare economics, consistent with the NSW Government (2015) guidelines. The Economic Impact Assessment has been Peer Reviewed by BDA Economics (Appendix AF of the EIS) and CIE on behalf of DP&E. Both Peer Reviews have effectively endorsed the methodology applied within the Economic Impact Assessment. They are not subjective.

Gillespie Economics notes that the BCA explicitly recognises the issue of climate change through the incorporation of a social damage cost of carbon from the Project. The Project is responding to a direct demand for coal from South Korea, as identified above. Approval of the Project has no implications for renewable energy development in Australia or in South Korea the anticipated receiving country for the coal product.

5.26.18 Unquantified Residual Social, Environmental and Cultural Impacts

Submission Reference: SIG1

Issue

A submission stated "Having determined an outcome in terms of the so-called economic efficiency perspective, it is stated that unquantified residual social, environmental and cultural impacts would need to exceed at least \$592 million for the Project to be questionable. This is a neat way of avoiding the fact that much is either unquantified and/or inadequately dealt with. It emphasises the limitations of these cost/benefit analyses."

Response

While the major environmental, cultural and social impacts have been quantified and included in the Project BCA, the Economic Impact Assessment (Appendix AE of the EIS) recognises that there may be some technical disagreements around magnitude of Project impacts and the scope/success of mitigation, offset and compensation measures that are proposed.

Consequently, the Economic Impact Assessment presents the estimated net social benefits of the Project to Australia (i.e. \$592M to \$757M) as a threshold value. Any other residual environmental, cultural or social impacts that remain unquantified or arise during the decision-making process, would need to be valued greater than the threshold value for the Project to be questionable from an Australian economic efficiency perspective.

5.26.19 Predictions Should be Treated with Caution

Submission Reference: SIG1

Issue

A submission stated "Royalties, general profitability and the like are based on production predictions, maintenance of the coal price, and the specifics of contractual arrangements which are largely unrevealed. In view of the collapse in the price of thermal coal, and despite the apparent vertical integration of KEPCO with the power generators in Korea, predictions over the next 25 years should be treated with extreme caution."

Response

The Economic Impact Assessment (Appendix AE of the EIS) is based on a range of predictions, some of which are not able to be published due to their commercial in confidence nature.

It is recognised that there is uncertainty around these and hence Section 4.6 of the Economic Impact Assessment undertakes a sensitivity analysis whereby key assumptions are varied by significant amounts to determine the impact on the Net Social Benefits of the Project to Australia and NSW.

5.26.20 Likelihood of Project Completion

Submission Reference: SIG1

Issue

A submission stated "It could overall be argued that the company is not going to engage in capital investment in the order of \$1.3 billion without being reasonably confident of the benefits it will receive, but three things should be realised: (i) the company's bottom line is a substantially different matter from the predictions given in the economic assessment; (ii) Glencore (Xstrata) has needed to curtail production at some of its mines and Centennial's Angus Place Colliery is under care and maintenance – companies are not immune from substantial changes in the market; and (iii) in the absence of guarantees that the operation will continue for 23 years, the economic benefits become little more than optimised 'hopes'!"

Response

The Economic Impact Assessment (Appendix AE of the EIS) is based on the most reasonable assumptions available at the time of preparation including a detailed product marketability report prepared by Wood Mackenzie.

Wood Mackenzie is a leading global energy, metals and mining research and consultancy group. Current curtailing of production at a number of coal mines is in response to the current market oversupply of coal. However, the price forecasts of the IEA and WoodMackenzie over the life of the Project are positive.

Notwithstanding, the Project is designed to fill a specific strategic need to reduce KEPCO Korea's exposure to global supply and demand fluctuations and to assist in ensuring energy security for South Korea as a whole.

If the Project does not proceed for its full proposed life then there will be a reduction in the economic benefits to Australia and NSW, as well as a reduction in residual environment, social and cultural impacts.

5.27 HAZARDS – BUSHFIRE

5.27.1 Rural Fire Brigade

Submission Reference: P100, P104, P201, P207

Issue

A number of submissions raised the issue that Wollar and Bylong Villages had lost their Rural Fire Brigades, which has increased the threat of unattended fires and road accidents in this area north/east of Mudgee.

Response

The displacement of population has been discussed in **Section 4.2.7** and **Section 5.25.15**.

As included in the SIA (Appendix AC) in the EIS, there has been a net population loss of 10 people (up to April 2015) as a result of the purchase of the properties within the Bylong Valley by KEPCO. This is expected to be offset by Project employees moving into the Bylong Valley once the Project Operations Phase commences.

It is possible that the Project will benefit volunteering in the SIA Study Area in the following ways:

- The potential for additional volunteers as the population grows; primarily through workers' and their partners;
- The introduction of a wider range of skills from the new population to add diversity to volunteering efforts;
- An incoming younger population may be able to improve the rates of volunteerism in Mudgee and reverse the dwindling volunteer labour pool in the Bylong Valley; and
- The potential for mining and resource companies to assist in resourcing volunteer organisations by supporting the release of employees for emergency service activities.

KEPCO is committed to supporting the participation of the Operations Phase workforce in volunteer roles across the MWRC LGA. As outlined in the SIA in the EIS, employee policies that enable emergency services personnel to be released from duties to attend emergency calls and to perform crucial volunteer actions will be developed for all phases of the Project.

Further, new residents will be encouraged to participate in local volunteer roles such as the Bylong RFS by providing information relating to these services, promoting the need for volunteers in the workforce and identifying key contacts in volunteer services. Project staff have already volunteered for the RFS in Bylong.

5.28 CUMULATIVE

5.28.1 Cumulative Impact

Submission Reference: SIG3, SIG8, SIG9, SIG11, SIG24, SIG26, P85, P113_1, P132, P118, P187, P211, P228, P229

Issue

The general comment was made that the cumulative impacts of the Project will be significant and have not been identified or assessed.

Such impacts include loss of significant habitat for a range of threatened species and ecological communities, loss of catchment area and groundwater, increased competition for feeding and breeding resources in remnant vegetation and the adjacent reserve system, increased regional dust & noise pollution, extraction pressure on an over allocated water source, additional impacts on the Goulburn River National Park such as groundwater drawdown and land acquisition.

Response

Cumulative impacts have been included in the technical assessments completed in the EIS, in accordance with specifications outlined in the SEARs. Adequacy of the studies completed through the EIS and hence how the SEAR's are addressed, is discussed in more detail in **Section 5.1.3**.

Cumulative impacts are further discussed for air emissions in **Section 5.10.3**, ecology in **Section 5.5.2.24**, noise in **Section 5.12.7**, and social impacts in **Section 4.2.7**.

Cumulative impacts on surface water, licensing and availability of water are discussed in **Sections 5.7.7, 5.7.8 and 5.9.14**, while impacts on land acquisition are discussed in **Section 4.2.7**.

5.28.2 Sandy Hollow Railway

Submission Reference: SIG24

Issue

SIG24 submission stated that cumulative impact of increased train movements on the Sandy Hollow railway line caused by the Bylong Coal Project has not been adequately assessed.

Response

This is discussed in **Section 5.22.16**.

5.28.3 Water and the Upstream Mines

Submission Reference: SIG11

Issue

SIG11 requested that the cumulative impact of the project on water with the upstream Wilpinjong, Ulan and Moolarben mines be assessed including impact of the mines on the Goulburn River and, downstream, the Hunter.

Response

This is discussed in **Sections 5.7.6 and 5.7.7.**

5.29 WORKFORCE ACCOMMODATION FACILITY

5.29.1 Impacts of the Workforce Accommodation Facility

Submission: SIG11, O3, O4, P16, P33, P51, P214

Issue

A number of submissions were opposed to the construction of a Workforce Accommodation Facility (WAF) due to concerns that there would be very little economic benefit to Mudgee and it's residences as workers will be from out of town and not spend their money locally. Further, concerns were raised that there will be social impacts in the community, such as affects on rental opportunities. It is also not clear if the company is going to attempt to restore vacant houses for accommodation purposes.

Response

This is discussed in **Section 4.2.1 to 4.2.6.**

5.30 GEOLOGY

5.30.1 Hydrogeological Units

Submission Reference: P223

Issue

P223 stated:

"The stratigraphic profile and 'interburden geology' above the longwall panels has not been characterized or adequately assessed. Specifically there is minimal if any detailed characterisation of the Triassic sandstones (Narrabeen Group) and Tertiary basalt hydrogeological units and groundwater inflow to the alluvial system, and contributions to stream baseflows in the valley floor. Predicting the interaction between hydrogeological units, alluvium and surface water resources is speculative without suitable baseline assessment of all groundwater units.

It is entirely possible that the Narrabeen Group hydrogeological units are contributing valuable 'fresh' groundwater flows to the alluvial system in the valley floor."

Response

This is discussed in **Section 5.9.1.3**.

5.31 GEOTECHNICAL STABILITY

5.31.1 Risk Assessment

Submission Reference: SIG11

Issue

SIG11 stated that a risk assessment addressing the possible collapse of the Emplacement Areas, open cut pit and sediment dam located near the river, and the likely consequences for water quality has not been undertaken. This is in regards to the Gateway Panel asking for an analysis of short and long term geotechnical stability risk of waste emplacement.

Response

The recommendations associated with the Conditional Gateway Certificate for the Project have been addressed, as outlined in Table 16, Section 5.4.1 of the EIS.

The stability of the proposed OEA's is discussed in Section 17.15.4 of the EIS. All finished slopes are designed to a safe, geotechnical maximum angle. Geotechnical specialists Pells Sullivan Meynink (PSM) were engaged to provide initial site specific guidelines and input into OEA design to ensure stability of the proposed emplacement areas.

Further, during the mine planning process, a number of options were considered for the location of OEA's, water dams and other associated infrastructure. The Project is highly constrained in terms of available space for emplacement areas. Considerable effort and design was employed to reduce environmental impacts on BSAL and relevant alluvial systems. Ex-pit emplacements targeted natural topography to reduce visual impacts and considered constraints associated with environmental requirements, such as along the rivers, creeks and the alluvial plains. The design aimed to meet approval benchmarks of final rehabilitated landform slopes not exceeding 10°.

The environmental management and monitoring proposed to be implemented to prevent adverse environmental harm is discussed in **Section 5.1.5**.

5.32 MINE PLAN

5.32.1 Underground Mining

Submission Reference: SIG11, SIG27, P11, P17, P43, P132

Issue

A number of submissions stated that if the Project is to proceed, it should involve underground mining only.

Response

A supplementary Open Cut Mine Justification Report has been prepared and is included in **Appendix G**. This supplementary report includes further information and justification in relation to the need for the Project to comprise both open cut and underground mining operations as proposed. Essentially, the initial open cut mining operations will provide the most appropriate storage facility to accommodate the coal processing waste materials from the longer term underground mining activities and will also ascertain the economic viability of the Project. KEPCO considers that an underground only operation is not viable.

The mine alternatives for the Project were discussed in Section 3.17 of the EIS. A number of different mine plan options were considered, including up to seven open cut mining areas and several underground mining domains. These were progressively refined following consideration of social, environmental and economic constraints to achieve the preferred mine plan upon which to base the EIS.

The primary objective of the mine planning was to develop an approvable mine plan that maximises coal recovery whilst minimising the potential for adverse environmental and social impacts.

The 'Underground Mining only' alternative was found to be unsuitable based on economic, resource recovery and environmental grounds. It was proven to be uneconomically appropriate given the extensive costs of developing an underground mine in relation to the limited value of the thermal coal resource. This 'Underground Mining only' alternative would also result in material sterilisation of a NSW Government owned coal resource which can only be safely and economically recovered via open cut mining methods. It also presents environmental constraints relating to the challenges surrounding the disposal and containment of coarse and fine reject material from the CHPP within an appropriate facility (for which the Open Cut void is currently proposed).

The Project, involving limited open cut and more extensive underground mining operations presents a logical solution to coal recovery by maximising the efficient and safe extraction of the coal resource from the Authorisations, while at the same time avoiding significant environmental and social impacts. The Project also avoids the permanent sterilisation of other coal reserves known to occur within the locality.

In particular, there may be the opportunity to extend the life of the underground mining area beyond the currently proposed 25 year mine life if the demand for thermal coal continues as currently projected and the appropriate Government planning and other environmental approvals are obtained.

In the submission received from the DRE dated 6 November 2015, it was concluded that the Project represents a responsible utilisation of the State's coal resources that will generate employment opportunities and bring economic benefits to the local region and the State as a whole.

5.32.2 Re-open Old Mines

Submissions: SIG2, SIG3, SIG8, SIG9, P48_2

Issue

There were a number of submissions that stated it would be better for KEPCO to purchase an existing coal mine or re-open a Mine that has been closed on Care and Maintenance, as opposed to establishing a Greenfield Mine. Some also claimed that benefits to the government would also be greater and reduce cumulative impacts.

Response

KEPCO acquired Authorisations 287 and 342 in December 2010, with the intention of developing a coal mine to recover some of the considerable 'state owned' coal resources that are known to occur within this area.

Since acquiring the Authorisations, extensive exploration and mine planning work has been undertaken to identify the coal resources and to determine the most environmentally and socially responsible and economically viable mine plan to recover these known coal resources.

The Project aims to optimise the social and economic benefits from the extraction of this NSW government owned coal resource. These benefits would otherwise be lost to Australia and NSW, if the resource is not extracted. The Project will provide net production benefits to Australia of approximately \$596 Million (approximately \$315 Million to NSW) and will:

- Maximise the recovery of a thermal coal resource, within the environmental constraints identified, for which there is an increasing global demand;
- Create approximately 830 direct and indirect jobs on a regional basis (MWRC LGA);
- Create approximately 1,496 direct and indirect jobs in NSW;
- Continue and extend financial support to the region, NSW and Australia with taxation and royalty benefits of approximately \$592 Million over the life of the Project; and
- Achieve the most efficient economic use of the land.

It should be noted that KEPCO Korea imported approximately 27 Mt of thermal coal from Australia during 2014. KEPCO is seeking to develop the Project in order to assist in securing its increasing thermal coal demands into the future.

The Project need and justification is discussed in Section 9 of the EIS. A supplementary Mine Plan Justification Report is included in **Appendix G**.

5.33 FUTURE MINE EXPANSION

5.33.1 Project Modifications

Submission Reference: SIG8, SIG11, P318

Issue

Several submissions were concerned that the Project is not well designed or assessed, and therefore the Project is likely to be modified, if it is approved based on the current design.

Response

As discussed in **Section 5.2.3**, the Project has undergone a rigorous mine planning and design process to ensure the proposed Project is approvable and workable, whilst minimising the environmental and social impacts. This has involved consideration of numerous mine plan scenarios, as well as various operational methods and infrastructure designs and alternatives. This process has been ongoing since as early as 2011.

Following the selection of the most appropriate option, a feasibility study was undertaken to confirm with certainty the mine plan design. A scientific and robust EIS was also prepared to identify the potential environmental and social impacts and to propose appropriate mitigation and management measures to minimise any such potential impacts.

Water modelling and availability is discussed in **Sections 5.7** and **5.9** respectively. The reinstatement of BSAL land is discussed in **Section 5.18.1**.

6 REVISED MANAGEMENT AND MONITORING SUMMARY

This section provides a summary of the additional management and monitoring commitments from this RTS.

Following consideration of the submissions received from stakeholders, KEPCO has undertaken additional works as part of this RTS to address the issues raised. **Table 41** provides a consolidated summary of the proposed Project amendments, additional environmental management and monitoring measures included in the RTS and its source.

Table 41
Revised Project Management and Monitoring Measures

Ref	Commitment	Section
Stakeholder Consultation		
1.	In response to the submissions received on the EIS, minor amendments to the Project were assessed in this RTS and include: - Amendment to the size of the Construction Phase 1 workforce from 800 to 665 FTE; - Amendment of description for the WAF, including size and operational time; - Potential shortening of Longwall panel 106 to avoid significant impacts to Cliff 5, based on the results of monitoring subsidence effects during the initial longwall mining operations; - Amendments to the proposed borefield within the alluvium in relation to number and location from 15 to 16 bores (as illustrated on Figure 6); - Construction and operation of the North Link Road as the preferred alternative for the Southern Roads Strategy to provide access for landholders to the south of the Project site; - Readjustment of mine haul roads to facilitate an overpass of the proposed North Link Road; and - Relocation of the proposed Explosives Storage and Reload Facility in light of the alignment of North Link Road.	4.2.1, 4.11.5 and 4.2.9
2.	Continue to consult with DPI Lands in relation to the purchasing of crown reserves, providing alternative access easements and landowner access agreements.	4.5
3.	Consult with and provide required information to EPA during the process of seeking the Environment Protection Licence in relation to effluent irrigation areas that may be identified during the detailed design of the Project.	4.8.16
4.	Consult with NPWS in regard to ongoing access and ensure access is not prevented by the Project to the Goulburn and Wollemi National Parks.	4.11.9
5.	Consult with Forestry Corporation NSW to provide appropriate access arrangements for the public to Bylong State Forest via KEPCO owned land or alternate.	4.9.1
6.	Continue to consult other industry groups to ensure they remain informed of the Project as it proceeds through the Government's assessment and determination process.	5.3

Ref	Commitment	Section
7.	Continue to consult with ARTC in regards to the proposed rail movements for the Project and the implementation of leading practice noise control measures on the rail line.	4.1.2
Subsidence		
8.	Engage with Forestry Corporation NSW during the preparation of the Extraction Plans and implement a monitoring program to evaluate the impacts of subsidence on Forestry Corporation NSW harvesting operations.	4.9.3
9.	Minimise adverse subsidence impacts on Cliff 5 (C5) by potentially reducing the length of Longwall 106 as presented in the EIS (Figure 26). This potential reduction in length of Longwall 106 will be based on monitoring data obtained during the mining of the initial 5 longwalls which will be used to verify and refine the subsidence model and confirm the arrangements to minimise impacts on C5. This will be detailed within the Subsidence and Extraction Plan for Longwall 106.	4.11.5
10.	As part of the Extraction Plans, a PSMP will be prepared for the Bylong Valley Way in consultation with MWRC and will include the following: • Inspections of the existing condition of Bylong Valley Way prior to mining; • Apart from the mining proposed below in Longwall 101 which is predicted to result in a maximum of 450 mm of subsidence, review subsidence monitoring data gathered during the longwall mining operations in earlier panels and refine subsidence model prior to the influence of the proposed longwalls beneath Bylong Valley Way; • Consideration of potential surface water impacts on Bylong Valley Way prior to the influence of the proposed longwalls and implementation of drainage control measures, if required; • Notifications to MWRC and emergency services of the timing and location of the mining of each longwall beneath the Bylong Valley Way; • 24 hour monitoring of the road during critical periods of active subsidence, with repair crews on hand to maintain the integrity of the road; • Temporary repairs of surface cracks and other deformations, as required; and • A post-mining inspection by MWRC and the MSB to review the results of the temporary repair work and determine the extent of permanent repairs required.	4.2.9.11
11.	Where access cannot be obtained via another route, the Project will take reasonable steps to ensure, to the extent it can, the Bylong State Forest is accessible to the public and that any public safety risks are appropriately managed to enable safe access to these areas, including: • Appropriate notifications and consultation with the community; • Erecting warning signs during active subsidence; and • Undertaking repairs where required and as soon as practicable.	4.9.1

Ref	Commitment	Section
Ecology		
12.	BMP will include monitoring of cave-dwelling microbats within the Subsidence Study Area prior to the commencement of the underground component of the Project to collect baseline information.	4.11.6
13.	Implement a monitoring program to be detailed within the BMP and WMP to monitor GDEs throughout the life of the Project (as required) to confirm the level of dependency on groundwater and response to changes in the groundwater system.	4.11.7
14.	Implement a monitoring program to be detailed within the BMP to monitor aquatic biota, including macro-invertebrates throughout the life of the Project.	4.15.11
Surface and Groundwater		
15.	Prepare a WMP as outlined in the EIS (Commitment 12, Table 102) which will include at least: • A long term baseline data series as a result of the ongoing surface water monitoring program; • The groundwater monitoring network is to be expanded to include monitoring of groundwater bores on neighbouring Murrumbo Station (located to the east of the Project) and the properties of "Budden", "Wigelmarr" and "Rothesay" (located to the west of the Project); • Adaptive management procedures for the water management system so operational rules can be varied according to prevailing conditions; and • Detail a monitoring program with procedures to trigger contingency plans which may include expansion of the borefield (subject to approval), temporarily reducing KEPCO's agricultural activities (and temporarily transferring associated entitlements to the Project) and in a worst case scenario, progressively adjusting mining-related activities (such as coal processing) to match the available water supplies.	4.15.12.2, 4.3.7 & 5.9.13
Aboriginal Archaeology and Cultural Heritage		
16.	Undertake sampling and analysis of 'ochre' from the ochre site (OQ0001) in order to contextualise the chemical signature of the site. The results will be compared with ochre noted in the Bylong Valley Way road cutting outcrop to assess whether the numerous sources of ochre in the region are geologically comparable, and thus part of a larger ochre body running through the sandstone.	4.11.15
Historic Heritage		
17.	KEPCO will use all reasonable endeavours to investigate in consultation with the descendants the potential to facilitate the establishment of (and meet the cost of) a memorial.	4.2.13

Ref	Commitment	Section
18.	KEPCO will commission an appropriately qualified person to prepare an Interpretation Plan as part of the Conservation Management Plans to be developed for historic heritage items within the vicinity of the Project.	4.10.3
19.	A Horse Burial Management Plan (HBMP) will be prepared, in consultation with key stakeholders, which will outline appropriate management strategies for the remains of horses buried at Tarwyn Park. Should it be determined that the remains will be relocated, this will be undertaken following the receipt of Development Consent.	5.16.2
Rehabilitation and Final Landform		
20.	As part of the Rehabilitation Strategy (outlined in Commitment 50, Table 102 of the EIS), KEPCO will undertake recording of the original soil type stripped and used in the rehabilitation of BSAL to demonstrate the original inherent fertility ranking of the proposed BSAL material used on rehabilitated mining landforms.	4.4.6.2
21.	KEPCO (or their representative) will seek to participate in the NSW Minerals Council's working group on rehabilitation. The current key objectives of the working group are to: - Decrease the time that disturbed areas are left without final or temporary cover, recognising that different mining operations are at different points in rehabilitation; and - Achieve a consistent level of best practice, quality, and integrated rehabilitation across the Upper Hunter.	5.18.1
Agricultural		
22.	A Farm Management Plan (FMP) will be further enhanced (as outlined in Commitment 53, Table 102 of the EIS) and will include the following: - Detail appropriate sustainable farming and rotational grazing practices; - Estimate pasture coverage and grazing records to enable pasture consumption to be calculated and recorded; - Monitor livestock weight to assist animal performance; and - Compare results against production records from nominated reference sites during mining and rehabilitation.	4.4.7.3
23.	A Monitoring Program to monitor pasture production on rehabilitated lands will be incorporated in the FMP (in consultation with DPI Agriculture) and will be evaluated by a suitably qualified person against: - Appropriateness of rehabilitation and pasture production techniques; - Comparative performance of rehabilitation sites and reference sites; - New techniques of monitoring; and - Improved agronomic and grazing management knowledge, techniques and technologies.	4.4.7.4

Ref	Commitment	Section
24.	Expand the existing groundwater monitoring network as necessary to ensure that no unforeseen environmental impacts occur that may deleteriously affect agricultural activities to neighbours adjacent to the Project Boundary.	5.20.8
Visual		
25.	Should the owner/s of residences located to the south of the Project on Lee Creek Road (Receiver IDs 165, 168, 348 & 350), consider they are experiencing high visual impacts at their residences as a result of the Project, KEPCO will undertake an assessment at the residence and feasible and reasonable mitigation measures will be implemented.	5.21.3.2
Traffic and Land Access		
26.	Conduct road safety audits and dilapidation inspections of the regional road network prior to the commencement of construction activities.	4.2.10
27.	Consult with MWRC, MSC, UHSC, the RMS and other relevant agencies to determine the preferred route for the transport of dangerous goods.	4.12.3
28.	Road maintenance contributions will be in accordance with the agreement with MWRC.	4.2.9.5
Social		
29.	Update the Workforce Accommodation Study as follows: - At the end of PY 2, in consultation with MWRC and DP&E to determine the continuing use of WAF for PY 3 and PY 4; and - In PY 4, prior to the commencement of Construction Phase 2, to inform the need or otherwise for a WAF for Construction Phase 2.	4.2.1.2
30.	Implement measures to reduce the risk of potential negative health and wellbeing issues associated with the construction workforce accommodated in the WAF.	4.2.3
Geochemistry		
31.	Undertake operational mining waste storage kinetic tests at the appropriate time, to complete a more valid comparison with relevant water quality guideline criteria and facilitate further assessment of any potential impacts on downstream biota during the operational phase of the Project.	4.15.12.2

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for
HANSEN BAILEY



Nathan Cooper
Senior Environmental Scientist



James Bailey
Director

7 ABBREVIATIONS

Table 42 provides a list of abbreviations used in this RTS.

Table 42
Abbreviations

Abbreviation	Description
%	Percentage
A	Authorisation
AACHIA	Aboriginal Archaeology and Cultural Heritage Impact Assessment
AACHMP	Aboriginal Archaeology and Cultural Heritage Management Plan
ACA	Australian Coal Association
AECOM	AECOM Australia Pty Limited
AGE	Australasian Groundwater and Environmental Consultants
AHIMS	Aboriginal Heritage Information Management System
AIP	<i>Aquifer Interference Policy</i>
AIS	Agricultural Impact Statement
AQGHGIA	Air Quality and Greenhouse Gas Impact Assessment
ARI	Average Recurrence Interval
ARTC	Australian Rail Track Corporation
AS	Australian Standard
ATO	Australian Tax Office
AUSRIVAS	Australian Rivers Assessment System
Authorisations	Authorisations 287 and 342
BCA	Benefit Cost Analysis
BIBO	Bus-in, bus-out
BSAL	Biophysical Strategic Agricultural Land
CEEC	Critically Endangered Ecological Community
CHPP	Coal Handling and Preparation Plant
CIC	Critical Industry Cluster
CO ₂ -e	Carbon Dioxide Equivalent
CPP	Coal Preparation Plant (a component of the CHPP)
DA	Development Application
dB	decibels
dBA	The peak sound pressure level, expressed as decibels (dB) and scaled on the 'A-weighted' scale, which attempts to closely approximate the frequency response of the human ear

Abbreviation	Description
DIDO	Drive-in, drive-out
DoE	Commonwealth Department of the Environment
DP&E	NSW Department of Planning and Environment
DPI Agriculture	NSW Department of Primary Industries – Agriculture
DPI Fisheries	NSW Department of Primary Industries – Fisheries
DPI Lands	NSW Department of Primary Industries – Lands
DPI Water	NSW Department of Primary Industries – Water
DRE	Division of Resources and Energy
DSC	NSW Dams Safety Committee
EC	Electrical Conductivity
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EMP	Environmental Monitoring Program
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPA	NSW Environment Protection Authority
EP&A Regulation	<i>Environmental Planning and Assessment Regulation 2000</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)</i>
EPL	Environment Protection Licence
ESD	Ecologically Sustainable Development
FCNSW	Forestry Corporation of NSW
FIFO	Fly-in, fly-out
g/m ² /month	Grams per square metre per month
GDE	Groundwater Dependent Ecosystem
GIA	Groundwater Impact Assessment
ha	Hectare
Hansen Bailey	Hansen Bailey Environmental Consultants
Heritage Act	<i>Heritage Act 1977</i>
Heritage Council	Heritage Council of NSW
Hunter Unregulated WSP	<i>Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009</i>
IESC	Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development

Abbreviation	Description
IO	Input-output economic modelling
INP	<i>NSW Industrial Noise Policy 2000</i>
Interim Protocol	<i>Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land</i>
ISO	International Standards Organisation
KEPCO Korea	Korean Electric Power Corporation
KEPCO	KEPCO Bylong Australia Pty Ltd
kg	Kilogram
kL/day	kilolitres per day
km	kilometres
kV	kilovolt
LA ₁	The noise level exceeded for 1% of the time
LA ₉₀	Level exceeded 90% of the time, equivalent to the noise level representing the quietest 10% of the time, and is widely recognised as the background noise level
LA _{eq}	The A-weighted equivalent continuous, or logarithmic average, noise level over a defined time period either measured or predicted at a specific location
LA _{max}	Predicted maximum noise level
LGA	Local Government Area
LH	Local Hire - workforce sourced from inside the one hour commute zone
LoS	Level of Service
LSC	Land and Soil Capability
m ³	Cubic metre
m	Metre
m/s	Metres per second
MIA	Mine Infrastructure Area
MIC	Maximum Instantaneous Charge
Mining Act	<i>Mining Act 1992</i>
ML	Mining Lease
ML	Megalitre
ML/Year	Megalitre per year
mm	Millimetres
MNES	Matters of National Environmental Significance
MOP	Mining Operations Plan
MSC	Muswellbrook Shire Council
MSEC	Mine Subsidence Engineering Consultants

Abbreviation	Description
Mt	Million tonnes
Mtpa	Million tonnes per annum
Mid-Western Regional LEP	<i>Mid-Western Regional Local Environment Plan 2012</i>
MWRC	Mid-Western Regional Council
MWRC LGA	Mid-Western Regional Local Government Area
NAF	Non Acid Forming
NBIA	Noise and Blasting Impact Assessment
NLH	Non Local Hire - workforce sourced from outside the one hour commute zone
NO ₂	Nitrogen dioxide
NO _x	Nitrogen oxides
No WAF	No Workforce Accommodation Facility
NPV	net present value
NPW Act	<i>National Parks and Wildlife Act 1974</i>
NRFS	NSW Rural Fire Service
NSW	New South Wales
NSWMC	NSW Minerals Council
NT Act	<i>Native Title Act 1993</i>
NV Act	<i>Native Vegetation Act 2003</i>
OAS&FS	Office of Agricultural Sustainability and Food Security
OEA	Overburden Emplacement Area
OEH	NSW Office of Environment and Heritage
PAD	Potential Archaeological Deposits
PB	Parsons Brinckerhoff
Project Boundary	The Project Boundary to which this RTS (and EIS) applies
PEL	Pacific Environment Limited
PM	particulate matter
PM _{2.5}	Particulate matter with a diameter less than 2.5 µm
PM ₁₀	Particulate matter with a diameter less than 10 µm
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
PSMP	Property Subsidence Management Plan
PSNLs	Project Specific Noise Levels
PY	Project Year
RAP	Registered Aboriginal Party

Abbreviation	Description
RBL	Rating Background Level
RGS	RGS Environmental
RING	<i>Rail Infrastructure Noise Guideline 2013</i>
RL	Reduced Level
RMS	NSW Roads and Maritime Services
Roads Act	<i>Roads Act 1993</i>
ROM	Run of Mine
RTS	Response to Submissions
SAL	Strategic Agricultural Land
Scott Barnett & Associates	Scott Barnett & Associates Pty Ltd
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SEPP Mining	<i>State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007</i>
SIA	social impact assessment
SIG	Special Interest Group
SLR	SLR Global Environmental Solutions
SO ₂	Sulphur dioxide
SO _x	Sulphur oxides
SRD SEPP	<i>State Environmental Planning Policy (State and Regional Development) 2011</i>
SRLUP	<i>Strategic Regional Land Use Plan – Upper Hunter</i>
SSD	State Significant Development
SWIA	Surface Water Impact Assessment
t	Tonne
TARP	Trigger Action Response Plan
TDS	Total Dissolved Solids
TEC	Threatened Ecological Communities
TEOM	Tapered Element Oscillating Microbalance
the Project	Bylong Coal Project
tph	Tonnes per hour
TSC Act	<i>Threatened Species Conservation Act 1995</i>
TSP	Total Suspended Particulates
TSS	Total Suspended Solids
TTIA	Traffic and Transport Impact Assessment

Abbreviation	Description
UCL	Urban Centre/Locality
µg	Microgram
µg/m ³	Micrograms per cubic metre
VCU	Visual Character Units
VIA	Visual Impact Assessment
VPA	Voluntary Planning Agreement
VWP	Vibrating Wire Piezometers
WAF	Workforce Accommodation Facility
WAL	Water Access Licence
Water Act	<i>Water Act 1912</i>
WHS	<i>Work Health and Safety (Mines and Petroleum Sites) Act 2013</i>
WM Act	<i>Water Management Act 2000</i>
WMP	Water Management Plan
WM Regulation	<i>Water Management (General) Regulation 2011</i>
WRM	WRM Water and Environment
WSP	Water Sharing Plan

8 REFERENCES

- ABS (2015). Catalogue 5209.0.55.001 - Australian National Accounts: Input-Output Tables, 2012-13, retrieved 3 March 2016,
<http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/5209.0.55.001Main+Features12012-13?OpenDocument>
- ABS (2016a). 2001 Census QuickStats at
<http://www.abs.gov.au/websitedbs/censushome.nsf/home/data?opendocument&navpos=200> accessed 1 March 2016.
- ABS (2016b). 2011 Census Quickstats at
<http://www.abs.gov.au/websitedbs/censushome.nsf/home/data?opendocument&navpos=200> accessed 1 March 2016
- ABS (2016c). 2006 Census QuickStats at
<http://www.abs.gov.au/websitedbs/censushome.nsf/home/data?opendocument&navpos=200> accessed 1 March 2016.
- ABS (2006). http://www.dpi.nsw.gov.au/data/assets/pdf_file/0003/471027/equine-profile-upper-hunter-region.pdf
- Adapt NSW (2016). <http://www.climatechange.environment.nsw.gov.au/About-climate-change-in-NSW/NSW-emissions>
- AECOM (2015). *Bylong Coal Project Environmental Impact Assessment Historic Heritage Impact Assessment*, prepared for Hansen Bailey Environmental Consultants.
- AGE (2015). *Bylong Coal Project – Groundwater Impact Assessment*, Australasian Groundwater and Environmental Consultants Pty Ltd, Bowen Hills.
- ANZECC and ARMCANZ (2000). National Water Quality Management Strategy University of Technology, Sydney (2009). *Identifying groundwater dependent ecosystems, A guide for land and water managers*, Author Dr Derek Eamus.
- ARC and Transport and Urban Planning (2012). *Bulga Coal Optimisation Project – Traffic Impact Assessment*, ARC Traffic + Transport and Transport and Urban Planning, December 2012.
- ARC and Transport and Urban Planning, (2012). *Bulga Coal Optimisation Project – Traffic Impact Assessment*, ARC Traffic + Transport and Transport and Urban Planning, December 2012.
- Archaeological Risk Assessment Services (2006). *Moolarben Coal Project: Aboriginal Cultural Heritage Assessment Report*. Report to Moolarben Coal Mines Pty. Ltd.
- Archaeological Risk Assessment Services (2012). *Aboriginal Cultural Heritage Assessment for Mt Penny Coal Project EL 7406*, Report to Mt Penny Coal Pty Ltd.

- Australian and New Zealand Environment Council Guidelines (ANZEC) (1990). *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration*.
- Bell, S. and Driscoll, C. (2014). *Acacia pendula (Weeping Myall) in the Hunter Valley of New South Wales: early explorers' journals, database records and habitat assessments raise doubts over naturally occurring populations*. *Cunninghamia* 14: 179-200.
- Broner, N. (2011). *A simple outdoor criterion for assessment of low frequency noise emission*, *Acoustics Australia* Vol 39.
- Bulga Milbrodale Progress Association Inc v Minister for Planning and Infrastructure and Warkworth Mining Limited (2013). NSWLEC 48.
- Bullen, J., Kouparitsas, M. and Krolkowski, M. (2014). *Long-Run Forecasts Of Australia's Terms Of Trade*, Treasury Working Paper, Commonwealth of Australia, Canberra.
- Centre for International Economics (2015). *Peer review of economic assessment*. Bylong Coal project, CIE, Canberra.
- Chessman, B (2003). *SIGNAL 2 iv A Scoring System for Macroinvertebrates ('water bugs') in Australian Rivers: User Manual*, Department of Environment and Heritage, Canberra.
- Commonwealth of Australia (2013). *House of Representatives Standing Committee on Regional Australia Inquiry into Fly-in, fly-out and drive-in, drive-out workforce practices in Regional Australia*.
- CSIRO (2013). *"Upper Hunter Valley Particle Characterization Study – Final Report"* Available from <http://www.environment.nsw.gov.au/resources/aqms/UHFPCSFinal.pdf>
- Davidson, S. (2014). *Mining Taxes and Subsidies: Official evidence*. A Minerals Council of Australia Background Paper.
- DEC (2005). *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation*.
- DEC (2006). *The Vertebrate Fauna of North-western Wollemi National Park*, Unpublished report funded by the Central Branch Parks and Wildlife Division Biodiversity Survey Priorities Program by NSW Department of Environment and Conservation, Information and Assessment Section, Metropolitan Branch, Environment Protection and Regulation Division.
- DEC (NSW) (2004). *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft)*. New South Wales Department of Environment and Conservation, Hurstville, NSW.

- DECC (NSW) (2007). *Threatened Species Assessment Guidelines: The Assessment of Significance*, Department of Environment and Climate Change (NSW), Sydney South, NSW.
- DECCW (2010). *Code of Practice for Archaeological Investigation of Objects in NSW*.
- DECCW (2011). *Road Noise Policy (RNP)*.
- Department of Environment, Climate Change and Water NSW (DECCW) (2010). *Aboriginal Cultural Heritage Consultation Requirements*.
- Department of Planning and Infrastructure (2012). *Strategic Regional Land Use Policy*. State of NSW.
- Department of State Development (2015). *FIFO Review Report July 2015 An Independent review of existing, predominantly fly-in-fly-out resource projects in Queensland*.
- DEWHA (2010). *Survey guidelines for Australia's threatened bird*, Commonwealth Department of Environment, Water, Heritage and the Arts, Canberra.
- Dinc, M. (2015). *Introduction to Regional Economic Development: Major Theories and Basic Analytical Tools*. Edward Elgar, USA.
- DoE (2013). *Matters of National Environmental Significance. Significant impact guidelines 1.1*. Environment Protection and Biodiversity Conservation Act 1999. Department of the Environment, Canberra.
- DoE (2014). *National Greenhouse Account (NGA) Factors*. Published by the Australian Government Department of the Environment. <http://www.environment.gov.au/climate-change/greenhouse-gas-measurement/publications/national-greenhouse-accounts-factors-dec-2014>
- DoE (2014). *Anthochaera phrygia* in *Species Profile and Threats Database*, Department of the Environment, Canberra.
- DoE (2015). *Lathamus discolor* in *Species Profile and Threats Database*, Department of the Environment, Canberra.
- DoE (2016a). *Brigalow (Acacia harpophylla dominant and co-dominant)* in *Community and Species Profile and Threats Database*, Department of the Environment, Canberra.
- DoE (2016b). *Wollemia nobilis* in *Species Profile and Threats Database*, Department of the Environment, Canberra.
- DoP (2008). *Impacts of underground coal mining on natural features in the Southern Coalfield: strategic review*, NSW Department of Planning, Sydney.
- DP&E (2014). *Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Developments*.

- DPI Agriculture (2013). http://www.dpi.nsw.gov.au/_data/assets/pdf_file/0004/471028/hay-hemp-profile-upper-hunter-region.pdf) June 2013.
- Ecovision Consulting (2008). *Ecological Impact Assessment. Stage 2 of the Moolarben Coal Project*, Ulan, New South Wales. Ecovision Consulting, Charlestown, NSW.
- EMGA Mitchell McLennan Pty Ltd (2012). *Cobbora Coal Project Environmental Assessment*, EMGA Mitchell McLennan Pty Ltd, St Leonards Sydney.
- EMM (2012). *Cobbora Coal Project Environmental Assessment*.
- EMM (2013). *Mangoola Coal Modification 6 Environmental Assessment*.
- enHealth (2010). *Guidance on use of rainwater tanks*, published by Environmental Health Committee (enHealth) of the Australian Health Protection Committee, 2010. ISBN: 978-1-74241-325-9.
- EPA (2000). *Industrial Noise Policy (INP)*.
- EPA (2005). *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*, August 2005.
- EPA (2012). *Technical Report No. 6: Air Emissions Inventory for the Greater Metropolitan Region in NSW. 2008 Calendar Year. Off-Road Mobile Emissions: Results*. August 2012. Available from: <https://www.epa.nsw.gov.au/resources/air/120050AEITR6OffRoadMobile.pdf>
- EPA (2013). *Rail Infrastructure Noise Guideline (RING)*.
- EPA (2015). *Draft Industrial Noise Guideline (ING)*.
- Franks (2012). *Social Impact Assessment of Resource Projects*.
- Franks, DM, Brereton, D, Moran, CJ, Sarker, T and T, Cohen (2010). *Cumulative Impacts - A Good Practice Guide for the Australian Coal Mining Industry*. Centre for Social Responsibility in Mining & Centre for Water in the Minerals Industry, Sustainable Minerals Institute, University of Queensland. Australian Coal Association Research Program. Brisbane.
- Glencore (2016). <http://www.ulancoal.com.au/EN/AboutUs/Pages/HistoryofDevelopment.aspx> access 29 Feb 2016.
- Gretton, P. (2013) *On input-output tables: uses and abuses*, Staff Research Note, Productivity Commission, Canberra.
- Hansen Bailey (2015). *Bylong Coal Project Environmental Impact Statement*.
- Hansen Bailey (2015). *Bylong Coal Project Social Impact Assessment*, prepared for Worley Parsons Services Pty Ltd.

- Infrastructure Planning and Natural Resources Committee (2015). *Queensland Parliamentary Committees Inquiry into fly-in, fly-out and other long distance commuting work practices in regional Queensland*.
- International Energy Agency (2015). *World Energy Outlook*, IEA, France.
- JVP Visual Planning & Design (2015). *Visual Impact Assessment for the Bylong Coal Project*, Report Reference 1402/03, 8 May 2015.
- Kecojevic V & Komljenovic D (2010). *Haul truck fuel consumption and CO2 emissions under various engine load conditions*. Accessed at http://www.researchgate.net/publication/261214668_Haul_truck_fuel_consumption_and_CO2_emission_under_various_engine_load_conditions
- Landscape Institute and the Institute of Environmental Management and Assessment (2002). *Guidelines for Landscape and Visual Impact Assessment* 2nd Edition.
- Lodge, G (1998). *Themes and experimental protocols for sustainable grazing systems (as cited by DPI – Agriculture)*.
- Long, K. and Nelson, J. (2010). *Draft National Recovery Plan for the Spotted-tailed Quoll *Dasyurus maculatus**, Department of Sustainability and Environment, Melbourne.
- Lucas S A, Coombes P J, Planner J and Welchman S (2009). *Rainfall harvesting and coal dust: the potential health impacts of trace elements in coal dust in rainwater*, Air Quality and Climate Change Vol. 43 No. 2 May 2009 pp23-30.
- McKenzie (2004) *Social Sustainability: Towards Some Definitions*, Hawke Research Institute, Working Paper Series No 27, University of South Australia. Magill, South Australia.
- MCO (2015). *Moolarben Coal Heritage Management Plan*, Report to Moolarben Coal Mines Pty Ltd.
- Menkhorst, P., Schedvin, N. and Geering, D. (1999). *Regent Honeyeater (*Xanthomyza phrygia*) Recovery Plan 1999-2003*. Department of Natural Resource and Environment, East Melbourne, VIC.
- Mine Subsidence Engineering Consultants (MSEC) (2015). *Subsidence Ground Movement Predictions and Subsidence Impact Assessments for all Natural Features and Surface Infrastructure* in support of the Bylong Coal Project Environmental Impact Statement.
- NHMRC (2011). *Australian Drinking Water Guidelines* (2011) - Updated March 2015
- Niche Environment and Heritage (2015). *Moolarben Coal Complex UG1 Optimisation Modification Environment Assessment, Appendix G Aboriginal Cultural Heritage Assessment*.
- Noller B (2009). *Community Lead Issues at Camberwell NSW*, Centre for Mined Land Rehabilitation, The University of Queensland, QLD 4072. Prepared on behalf of

- Ashton Coal Pty Ltd, Integra Coal Operations and BHP Billiton Energy Coal Pty Ltd.
June 2009.
- NPI (2001). *Emission Estimation Technique Manual for Mining*. Version 2.3. December 2001.
- NSW Department of Education and Communities (2012). *NSW public school February census enrolment data* at <https://www.det.nsw.edu.au/media/downloads/about-us/statistics-and-research/key-statistics-and-reports/enrolments-feb12.pdf> accessed 2 February 2016
- NSW Department of Education and Communities (2015). *NSW public school February census enrolment data* at <http://www.teach.nsw.edu.au/documents/2015%20-%20DGS14-253-Website%20Enrolment%20Information.pdf> accessed 2 February 2016
- NSW Department of Industry (2015). Bylong Coal Project (SSD 14-6367) *Review of Environmental Impact Statement*, Submission to Bylong Coal Project EIS.
- NSW Department of Planning and Environment (2015). *State Significant Development Assessment Drayton South Coal Project* (SSD 6875) Secretary's Environmental Assessment Report Section 89E of the *Environmental Planning and Assessment Act 1979*
- NSW Government (2015). *Guidelines for the economic assessment of mining and coal seam gas proposals*, NSW Government, Sydney.
- NSW Health (2010). *Respiratory and cardiovascular diseases and cancer among residents in the Hunter*, New England Area Health Service NSW Department of Health, May 2010.
- NSW Health (2015). *Private Water Supply Guidelines*.
- NSW Treasury (2009). *Employment Support Estimates - Methodological Framework*. Secretary.
- O'Brien, D. (2004). *Beltana Mine - A case study on a proactive approach to managing and monitoring the impacts of mine subsidence*. Proceedings of the MSTS Mine Subsidence Technological Society 6th Triennial Conference on Mine Subsidence, Maitland, 31 Oct to 2 Nov 2004, pp 137-150.
- O'Brien, D. (2004). *Beltana Mine - A case study on a proactive approach to managing and monitoring the impacts of mine subsidence*. Proceedings of the MSTS Mine Subsidence Technological Society 6th Triennial Conference on Mine Subsidence, Maitland, 31 Oct to 2 Nov 2004, pp 137-150.
- OEH (2011). *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW*.
- OEH (2011). *The Great Eastern Ranges Initiative: A Report to the NSW Environmental Trust, 2007-2011*. NSW Office of Environment and Heritage.

- OEH (2014a). *Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions*. Offset of Environment and Heritage, Hurstville.
- OEH (2014b). *Regent Honeyeater - profile*. NSW Office of Environment and Heritage, Hurstville.
- OEH (2014c). *Swift Parrot - profile*. Office of Environment and Heritage, Hurstville.
- OEH (2015a). *Hunter Valley Weeping Myall Woodland of the Sydney Basin Bioregion - profile*. Office of Environment and Heritage, Hurstville.
- OEH (2015b). *Swift Parrot - Profile Report (Threatened Species Profile Database)*. NSW Office of Environment and Heritage.
- Pacific Environment (2016). *Bylong Coal Project Noise Assessment Addendum*.
- Pacific Environment (2015). *Bylong Coal Project Noise and Blasting Assessment*.
- Pacific Environment (2015). *Bylong Coal Project – Air Quality and Greenhouse Gas Impact Assessment*. 1 July 2105. Job ID: 05832
- Pacific Environment (2014) *Analysis of odour complaints and Ambient Air Quality in Wollar and Cooks Gap, NSW*. Available from:
https://mscusppegrs01.blob.core.windows.net/mmfiles/files/operations/australia/wilpinjong/2015/epl_e1_ambient%20air%20monitoring%20report.pdf
- PB (2015). *Bylong Coal Project Traffic and Transport Impact Assessment*, Parsons Brinckerhoff, September 2015.
- PB, (2015). *Bylong Coal Project Traffic and Transport Impact Assessment*, Parsons Brinckerhoff, September 2015.
- PBL Netherlands Environmental Assessment Agency (2014). *Trends in Global CO2 Emissions. 2014 Report*. Available from http://edgar.jrc.ec.europa.eu/news_docs/jrc-2014-trends-in-global-co2-emissions-2014-report-93171.pdf
- Peabody Energy (2015). *Wilpinjong Extension Project Social Impact Assessment November 2015* prepared by Elliot Whiteing Social Planning Solutions for Peabody Energy
- Preston, C,J. (2013) *Bulga Milbrodale Progress Associated Inc. v. Minster for Planning and Infrastructure and Warkworth Mining Limited 2013*, NSWLEC 48.
- Productivity Commission (2015). *Trade and Assistance Review, 2013-2014*, Productivity Commission, Canberra.
- Reid, N., Nadolny, C., Banks, V., O'Shea, G. and Jenkins, B. (1997). *'Causes of Eucalypt Tree Decline in the Namoi Valley, NSW'. Final Report to Land and Water Australia on Project UNE 42. Ecosystem Management*. Univeristy of New England, Armidale, NSW.

- Richardson, S., Irvine, E., Froend, R., Boon, P., Barber, S. and Bonneville, B. (2011). *Australian groundwater-dependent ecosystems toolbox part 1: assessment framework*. National Water Commission, Canberra.
- RPS (2015). *Aboriginal Archaeology and Cultural Heritage Impact Assessment*, RPS Australia East Pty Ltd, Report Reference PR113279, March 2015.
- Saunders, D. L. and Tzaros, C. L. (2011). *National Recovery Plan for the Swift Parrot (Lathamus discolor)*. Birds Australia, Melbourne.
- SCT (2015). *Peer Review of Cliff Assessment Section of Finalised MSEC Subsidence Report MSEC708*. SCT Operations Pty Ltd, September 2015.
- Serov, P., Kuginis, L. and Williams, J.P. (2012). *Risk assessment guidelines for groundwater dependent ecosystems, Volume 1 – The conceptual framework*. NSW Department of Primary Industries, Office of Water, Sydney.
- SLR (2014). *Wilpinjong Modification 6 Noise and Blasting Impact Assessment. Report Number 610.10806.00300-R2*.
- Southeast Archaeology (2015). *Wilpinjong Coal Mine, Central Tablelands of NSW – Extension Project: Aboriginal Cultural Heritage Assessment. Report to Wilpinjong Coal Pty. Ltd.*
- Tammetta P (2015). *Estimation of the Change in Hydraulic Conductivity above Longwall Panels Groundwater Vol 53*.
- Turak, E. and Waddell, N. (2001). *New South Wales (NSW) Australian River Assessment System (AUSRIVAS) Sampling and Processing Manual*. NSW EPA, Sydney.
- Umwelt (2008). *Bulga Coal Complex Annual Environmental Management Report 2007*, Umwelt (Australia) on behalf of Bulga Coal Management, April 2008.
- Umwelt (2009). *Bulga Coal Complex Annual Environmental Management Report 2008*, Umwelt (Australia) on behalf of Bulga Coal Management, April 2009.
- Umwelt (2009). *Ulan Coal - Continued Operations Ecological Assessment*. Umwelt (Australia) Pty Limited, Toronto.
- Umwelt (2011). *Ecological Assessment. Modification of Ulan Coal – Continued Operations. North 1 Underground Mining Area, Minor Modifications to Ulan No.3 and Ulan West Mine Plans and Proposed Concrete Batching Plant*. Umwelt (Australia) Pty Limited, Toronto.
- Umwelt (2013). *Response to Submissions and Revised and Amended Project Application Assessment Report – Bulga Optimisation Project*.
- Umwelt, (2008). *Bulga Coal Complex Annual Environmental Management Report 2007*, Umwelt (Australia) on behalf of Bulga Coal Management, April 2008.

- Umwelt, (2009). *Bulga Coal Complex Annual Environmental Management Report 2008*, Umwelt (Australia) on behalf of Bulga Coal Management, April 2009.
- US Energy Information Administration (2015). South Korea Analysis, accessed 1 March 2016, <https://www.eia.gov/beta/international/analysis.cfm?iso=KOR>
- Vanclay F, Esteves AM, Aucamp I, Franks D (2015). *Social Impact Assessment: Guidance for assessing and management the social impacts of projects*, International Association for Impact Assessment
- Western Australian Legislative Assembly (2015). *The impact of FIFO work practices on mental health - Final report*. Education and Health Standing Committee. Report No. 5 June 2015. At [http://www.parliament.wa.gov.au/Parliament/commit.nsf/\(Report+Lookup+by+Com+ID\)/2E970A7A4934026448257E67002BF9D1/\\$file/20150617%20-%20Final%20Report%20w%20signature%20for%20website.pdf](http://www.parliament.wa.gov.au/Parliament/commit.nsf/(Report+Lookup+by+Com+ID)/2E970A7A4934026448257E67002BF9D1/$file/20150617%20-%20Final%20Report%20w%20signature%20for%20website.pdf) accessed 5 March 2016.
- Westpac (2015). *Australia and New Zealand Weekly*, Week beginning 27 April 2015, <https://www.westpac.com.au/docs/pdf/aw/economics-research/WestpacWeekly.pdf>
- Wood Maackenzie (2014). *Bylong feasibility study – Product marketability update*, 16 September 2014, Wood Mackenzie.
- Workcover (2013). *Security Plan for Storage and Handling of Explosives and Security Sensitive Dangerous Substances*, accessed January 2016 at http://www.workcover.nsw.gov.au/data/assets/pdf_file/0015/13830/security-plan-explosives-ssds-4688.pdf
- World Resources Institute/World Business Council for Sustainable Development (2004). *The Greenhouse Gas Protocol – A Corporate Accounting and Reporting Standard* Revised Edition March 2004.
- WRM Water & Environment (2015). *Bylong Coal Project - Surface Water Impact Assessment*. WRM Water & Environment Pty Ltd, Spring Hill.
- WRM, (2015). *Bylong Coal Project – Surface Water and Flooding Impact Assessment*, WRM, June 2015.
- WRM, (2015). *Bylong Coal Project – Surface Water and Flooding Impact Assessment*, WRM, June 2015.
- Zadoks JC, Chang TT, Konzak CF (1974). *A decimal code for the growth stages of cereals*. Weed Research 14, 415–421.

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