



Hume Coal and Berrima Rail Project

Independent Planning Commission Determination Phase Submission

Prepared for Hume Coal Pty Ltd
July 2021

EMM Newcastle
Level 3, 175 Scott Street
Newcastle NSW 2300

T 02 4907 4800
E info@emmconsulting.com.au

www.emmconsulting.com.au

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Independent Planning Commission Determination Phase Submission

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1 Introduction

1.1 Background

Hume Coal Pty Ltd (Hume Coal) proposes to construct and operate an underground coal mine and associated mine infrastructure in the Southern Coalfields of NSW (the Hume Coal Project). The mine will produce metallurgical coal with secondary thermal coal product. Around 50 million tonnes (Mt) of run-of-mine coal (3.5 million tonnes per annum (Mtpa)) will be extracted from the Wongawilli Seam via a non-caving mining system, resulting in approximately 39 Mt of saleable coal over a 23-year project life which encompasses construction, mining and rehabilitation phases.

Hume Coal is also seeking approval in a separate development application for the construction and operation of a new rail spur and loop, known as the Berrima Rail Project. Coal produced by the Hume Coal Project will be transported to port by rail for export or to domestic markets also by rail via this new rail spur and loop.

Approval for both the Hume Coal Project and the Berrima Rail Project is sought under Part 4 Division 4.1 (State significant development) of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The Hume Coal Project and the Berrima Rail Project are adjacent to each other and are linked. Hume Coal has submitted two separate applications; however, the two projects are collectively referred to as 'the project' in this submission.

The project has been designed from the outset to avoid, where practicable, environmental and social impacts. The concept of 'mitigation by design' is a strategic approach to environmental management, which incorporates the avoidance (rather than management) of environmental impacts in the design of the project.

While the formal approval process commenced in 2015, the project design and consultation commenced in 2012. Feedback from initial consultation was included in the project design to allow potential impacts to be avoided and designed out of the project, reducing the need for mitigation and management measures.

Figure 1.1 provides a chronology of events and a culmination of over eight years of rigorous assessment, both by Hume Coal and the many consultants and expert independent peer reviewers engaged to undertake environmental, social and economic assessments of the project, and by the NSW Department of Planning, Industry and Environment (DPIE) and their expert independent peer reviewers.

The project was first referred to the Independent Planning Commission (IPC or the Commission) in 2018, following the preparation of a Preliminary Assessment Report (PAR) by DPIE in December 2018. DPIE recommended refusal of the project in the PAR. The Commission subsequently prepared an independent planning assessment report (dated 27 May 2019) following the NSW Minister for Planning's request under section 2.9(1)(d) of the EP&A Act to conduct a public hearing and assess the merits of the project.

Hume Coal prepared a response to this initial assessment report prepared by the Commission, dated April 2020. This response report addressed and responded to all recommendations made by the Commission in its initial assessment report. The response report is discussed further in Section 1.2.

In June 2021, DPIE issued their final assessment report, again recommending refusal of the project.

A public hearing was held by the Commission for the project on 12 and 13 July 2021. Speakers spoke both in support and against the project.

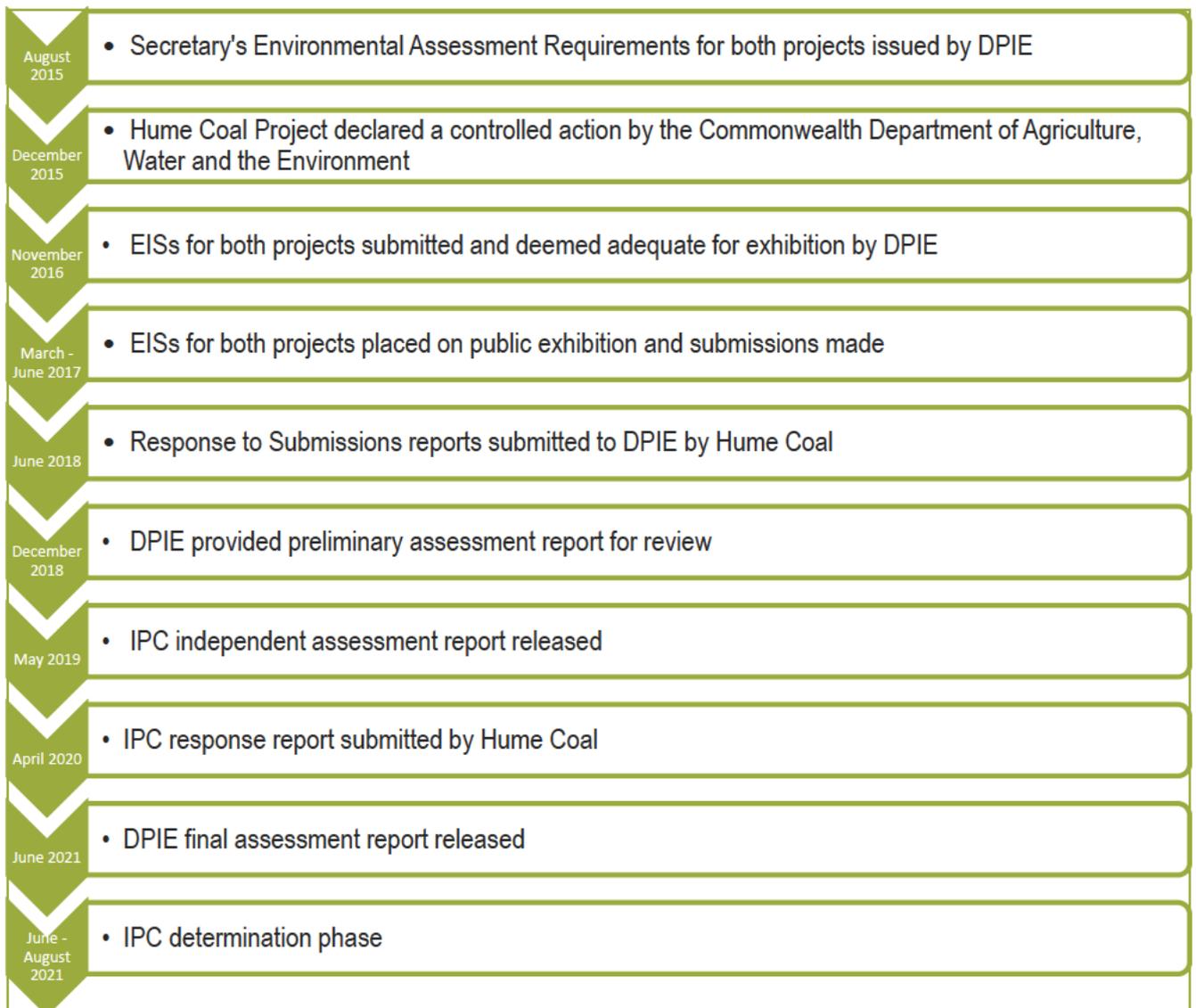


Figure 1.1 The assessment process to date

1.2 Response to the Commission's first report

The initial assessment report prepared by the Commission in 2019 put forward 30 recommendations relating to further assessment and consideration of the project. Hume Coal was proactive in responding to all of the Commission's recommendations, submitting a response report to the Commission in April 2020.

The IPC response report represented the culmination of over eight years of rigorous assessment, both by Hume Coal and the many consultants and expert independent peer reviewers engaged to undertake environmental, social and economic assessments of the Project, and by DPIE and their expert independent peer reviewers.

The purpose of the IPC response report was to respond directly to the findings and recommendations in the IPC assessment report. Specifically, the IPC response report:

1. Summarised the statutory assessment process which the projects are subject to under the EP&A Act, including a detailed description of the IPC assessment phase.
2. Provided a summary project description of the project.

3. Analysed, and where necessary, responded to the 'Material Considered by the Commission' (as described in Section 7.0 of the IPC assessment report) which was referenced, reported, or referred to in the IPC assessment report. This includes excerpts of the (former) NSW Department of Planning and Environment, (now DPIE) PAR and other NSW Government agency submissions and correspondence to the IPC.
4. Addressed and responded to, with the aid of updated and revised technical studies (provided in the appendices of the IPC response report), the findings made by the IPC and all the recommendations within the IPC assessment report directed to the Hume Coal as the applicant of the project.
5. Where necessary, addressed items presented in the IPC assessment report that Hume Coal felt were erroneous, unsubstantiated or were otherwise worthy of response.

1.3 Tahmoor South Project

Between the time that DPIE released its preliminary assessment report and final assessment report on the project, the Commission has favourably determined Tahmoor Coal's application for the Tahmoor South Project. This project is an extension of underground operations at the Tahmoor Colliery which is in the Southern Coalfields about 39 km to the north-east of the project area. Development consent was granted by the Commission on 23 April 2021 following a recommendation from DPIE that the Tahmoor South Project should be approved with conditions.

Where relevant, throughout this report comparisons between the Tahmoor South Project and the project are made.

1.4 Document purpose

This submission has been prepared in response to DPIE's final assessment report, dated June 2021, on the Hume Coal Project (SSD 7172) and associated Berrima Rail Project (SSD 7171) to assist the IPC in the determination phase.

In doing so this submission clarifies and responds to the key reasons put forward by DPIE for recommending refusal of the project.

This submission also provides a response to key matters raised by various speakers at the public hearing.

2 Response to matters raised in DPIE's final assessment report

2.1 Key matters and responses

Hume Coal does not support DPIE's conclusion that the project should not be approved.

The key reasons DPIE has put forward to support their conclusion are summarised under paragraph 325 of the final assessment report (DPIE June 2021) and are reproduced below in Table 2.1, along with Hume Coal's response, and where to find further information based on the numerous technical studies prepared for the project. Where relevant, comparisons are made between the project and the Tahmoor South Project.

DPIE focused on addressing and responding to the recommendations in the IPC report, particularly in relation to groundwater impacts on bores and make good provisions, the mine design and the economic benefits of the project.

Table 2.1 **DPIE key matters raised and summary of Hume Coal's response**

Reference number and aspect	DPIE concern	Hume Coal response	Reference to where additional information can be found
325.1 Groundwater	The predicted groundwater drawdown impacts on a large number of groundwater users' bores is unacceptable, as is the practicability of the proposed make good strategy.	<p>Groundwater drawdown impacts:</p> <ul style="list-style-type: none"> • The predicted number of bores to be impacted is comparable or less than other approved mines [50%ile - 84 bores in total, cumulative effect of other mines such as Tahmoor Mine and Bulli Seam Operations is much greater at over 200 bores]. • The number of bores predicted to be impacted is likely to be conservative and overstated based on the conservatism of groundwater modelling and the AIP 2m drawdown criteria. This conservatism has been demonstrated by Tahmoor Coal at its operations at Tahmoor Mine where only two bores have required make good arrangements compared to 72 predicted to be impacted by modelling. • Predicted groundwater impacts are also less than other mines: <ul style="list-style-type: none"> – the predicted peak annual inflow to Hume Coal mine is equivalent to the average inflow from a group of 29 mines. – the predicted maximum extent of the 2 m drawdown contour at Hume (2 km) is less than half the average 2 m drawdown extent (4.7 km) from a group of 10 mines. – the predicted time for groundwater recovery back to 2 m at the Hume Coal Project is less than a fourth of the average from a group of 15 mines. <p>Make good strategy:</p> <ul style="list-style-type: none"> • it is DPIE's role, rather than a private entity, to provide and govern the make good process, as stipulated in the Government's AIP. Therefore, any shortcoming in the practicability of the process is a matter for the DPIE to address. • DPIE recognises that the process of make good is technically feasible. • A detailed make good strategy, outlining the approach to every identified bore has been developed by Hume Coal. A credible and achievable pathway exists to make good each bore potentially impacted by the project. • The make good strategy is very similar to that of Tahmoor Coal's for its Tahmoor South Project. • Hume Coal is committed to achieving a mutually agreeable make good solution tailored to each bore. 	<p>Further discussion on the comparison of the impacts to bores predicted for the Hume Coal Project to other projects is provided in Section 4.3.2.</p> <p>Further detailed information on predicted groundwater impacts and the make good strategy is provided in <i>Hume Coal and Berrima Rail Project Response to the IPC Assessment Report, Appendix B Updated Water Assessment</i> (EMM April 2020)</p>

Table 2.1 **DPIE key matters raised and summary of Hume Coal’s response**

Reference number and aspect	DPIE concern	Hume Coal response	Reference to where additional information can be found
325.2 Groundwater	Given the very large number of significantly affected groundwater users, the rural-residential and small-scale agricultural land use of the area, and the greenfields nature of the project, the impacts are likely to lead to significant dispute and disruption in the local community, and consequently, the project is not compatible with the rural land uses in the vicinity of the development.	<ul style="list-style-type: none"> • Baseline groundwater monitoring for make good has commenced at approximately 20 boreholes (15% of landowners), as agreed to by the landowner. • By applying the concept of make good for landholder bores, the drawdown effects will be mitigated, and a landholder’s access to water for farming and other purposes will not be compromised. • Approximately 30 bores are likely to require redrilling to facilitate similar flows and quality. • Approximately 30 bores will require payment for electricity costs. • The remaining 30 bores or so will require lowering of pumps in boreholes to ensure that the water maintains similar head. <ul style="list-style-type: none"> • As stated above, the number of bores predicted to be impacted by the Hume Coal Project is comparable or less than other approved mines. • Based on the conservatism of groundwater modelling and the AIP 2 m drawdown criteria, the number of bores predicted to be impacted is likely to be overstated. • While the Hume Coal Project is a new mine, underground coal mining has been occurring in the local area for over 100 years. • The exploration licence held by Hume Coal was first issued by the NSW Government in the mid-1950s. • Hume Coal has put forward a make good strategy that is similar to that of Tahmoor Coal’s. DPIE accepted that the number of bores predicted to be impacted by the Tahmoor South Project alone and cumulatively with other mining operations and potentially requiring ‘make-good’ provisions was manageable and recommended conditions that would ensure any impacts are appropriately monitored, managed and compensated via a well understood, feasible and equitable process. • As noted by the DPIE in Tahmoor South’s FAR when DPIE noted that the drawdown effect “largely go unnoticed by most bore users the existing system”, the existing system is an opt-in system, where Tahmoor only provided make good if and when impacts were noticed by the landholders. This is reflected in the standard Compensatory Water condition of consent, which provides that “equivalent water supply should be provided ... as soon as practicable after the 	<p><i>Hume Coal and Berrima Rail Project, Response to the IPC Assessment Report (EMM April 2020):</i></p> <p>Appendix B Updated Water Assessment</p>

Table 2.1 **DPIE key matters raised and summary of Hume Coal’s response**

Reference number and aspect	DPIE concern	Hume Coal response	Reference to where additional information can be found
325.3 Surface water	There remains unacceptable uncertainty about the potential surface water impacts on Sydney’s drinking water catchment, given the mine design risks and the lack of a contingency strategy in the event that surface water discharge is required.	<p>loss is identified”.¹ If the impacts are “largely unnoticed by most bore users”, the dispute concerns of the DPIE should be ameliorated.</p> <ul style="list-style-type: none"> • The DPIE’s criticism² of lack of make good agreements prior to the development consent being granted is contrary to DPIE’s words to the IPC that such practice is not “standard” and not “normal”³. It is against the rule of law to apply double standards. <hr/> <ul style="list-style-type: none"> • This statement by DPIE is incorrect and misleading. There is not unacceptable uncertainty relating to mine design risks. As described by Bruce Hebblewhite in his submission (refer to Appendix A) “<i>there is a good level of agreement between both Galvin & Associates Pty Ltd and Dr Ismet Canbulat and myself (and Hume) which is an encouraging result that should inform the IPC in their deliberations</i>”. • The Hume Coal Project has been designed as a nil discharge mine. • Notwithstanding, the Goldsim water balance model was used to estimate the length of time it would take for the primary water dam (PWD) to reach capacity (720 ML), in the unlikely event that the option of reinjection of surplus water to underground voids is prevented or unavailable at any time during the mine life. The results of this modelling concluded that: <ul style="list-style-type: none"> – The longest duration for the PWD to reach capacity is estimated to be 16.5 years, if reinjection were to cease in the first mining year. – The shortest duration for the PWD to reach capacity is estimated to be 9.6 years, if reinjection were to cease in the first mining year. • Therefore, there is substantial capacity in the PWD to safely store water in the event that reinjection is unavailable for a period of time. • In the highly unlikely event that the PWD was nearing capacity and water could not be pumped underground, Hume Coal would stop production at the mine. A Trigger Action Response Plan will be developed to establish appropriate triggers and measures to be implemented in this scenario. 	<p><i>Hume Coal and Berrima Rail Project, Response to the IPC Assessment Report</i> (EMM April 2020): Appendix B Updated Water Assessment.</p>

¹ Tahmoor South condition of consent B27.

² Transcript of meeting between DPIE and IPC at page 4

³ Transcript of meeting between DPIE and IPC at page 10

Table 2.1 **DPIE key matters raised and summary of Hume Coal's response**

Reference number and aspect	DPIE concern	Hume Coal response	Reference to where additional information can be found
325.4 Mine design	There remains considerable uncertainty about the mine design, particularly in relation to the stability of the web pillars, with resultant unacceptable risks to workplace health and safety, and potentially to the environment.	<ul style="list-style-type: none"> • This statement by DPIE is incorrect and misleading. There does not remain 'considerable' uncertainty about the mine design and resultant risks to workplace health and safety and the environment. • As described in Appendix A of this submission, all mining experts who have been appointed by both DPIE and Hume Coal are in reasonably close agreement on the vast majority of issues relating to the mine design. • Both Galvin & Associates Pty Ltd (GAPL) and Canbulat have acknowledged that the proposed mining system meets the overall objectives of regional stability and surface subsidence control/management. • They acknowledge that method is extremely flexible and detailed plan dimensions can be readily modified to maintain compliance with project objectives. • They acknowledge that the overall proposed method is safe: <ul style="list-style-type: none"> – Method is amenable to utilising changes in panel and pillar dimensions as engineering controls to "safely deliver target hydrogeological and surface subsidence objectives" (Galvin, 2020). – "majority of issues are being addressed to achieve a layout that is robust and safe" (Canbulat, 2020). • The method is a variation on other partial/secondary extraction methods already in use and will be treated by the NSW Resource Regulator as a secondary extraction system. • Small residual points of disagreement relate to the modelling and issues of local instability: <ul style="list-style-type: none"> – Modelling – may result in minor changes to pillar dimensions BUT do not question the overall regional stability of the mine layout. – Local instability – this issue is not dissimilar to any other form of secondary pillar extraction and will be adequately dealt with through normal risk-based operational management plans, procedures and approvals. – A further, major positive risk control factor is the remote-control nature of the proposed operation, which offers significant safety advantages. In May 2018, in response to questions from the Commission, the NSW Chief Inspector of Mines stated: 	<p><i>Hume Coal and Berrima Rail Project, Response to the IPC Assessment Report</i> (EMM April 2020):</p> <p>Appendix A Mining Method and Safety</p> <p>Appendix A to this submission (Hebblewhite 2021)</p>

Table 2.1 **DPIE key matters raised and summary of Hume Coal’s response**

Reference number and aspect	DPIE concern	Hume Coal response	Reference to where additional information can be found
		<p><i>“The Pine Feather method has not been previously utilised in NSW, however generally replicates the modern Wongawilli method, with the notable addition of “wing pillars”, and significantly deeper plunges.</i></p> <p><i>While previous advice identified some non-specific work health and safety concerns relating to the proposed mining method, it cannot be inferred that the method is unsafe on the basis it has not been previously applied in NSW, or that Hume Coal cannot or would not implement appropriate controls to manage risks to workers arising from implementing this method of mining.</i></p> <p><i>There is no information contained within the Hume Coal submission which suggests to the Resources Regulator that Hume Coal may not possess the necessary expertise and capacity to identify and implement the required controls to manage these risks.</i></p> <p><i>The use of remote controlled mining equipment offers significant safety advantages to underground workers.</i></p> <p><i>The use of high-precision inertial navigation systems to control mining equipment also offers a level of surety regarding roadway and pillar dimensions being formed to design specification.</i></p> <p>...</p> <p><i>Underground mining has inherent risks, regardless of the extraction method or the mineral being mined.</i></p> <p>...</p> <p><i>Inherent risk cannot be the sole determinant as to whether a mining operation will be safe or unsafe. Such a determination must be based on the adequacy of risk controls identified in Principal Hazard Management Plans and implemented by the mine operator to manage these risks as low as reasonably practicable.”</i></p> <ul style="list-style-type: none"> • It is normal practice for any new mine to continue to review and refine the mine design and plan details, as the project proceeds beyond initial approval to detailed design and planning stages. The Hume mine design will be subject to similar future refinements and will then take account of the detailed issues raised by both Galvin and Canbulat. • As demonstrated above, there is no considerable uncertainty as claimed by DPIE. 	

Table 2.1 **DPIE key matters raised and summary of Hume Coal’s response**

Reference number and aspect	DPIE concern	Hume Coal response	Reference to where additional information can be found
		<ul style="list-style-type: none"> • Any mining activity involves a level of inherent or residual risk. The role of the mine management is to ensure such risk is managed to an acceptable and safe level. • The NSW Resources Regulator, through the Chief Inspector of Coal Mines, made the following statements in relation to the Hume proposal (Garvin Burns, 17/05/2019): <ul style="list-style-type: none"> – “it cannot be inferred that the method is unsafe on the basis it has not been previously applied in NSW”; – “There is no information in the Hume Coal submission which suggests to the Resources Regulator that Hume Coal may not possess the necessary expertise and capacity to identify and implement the required controls to manage these risks”; – “Inherent risk cannot be the sole determinant as to whether a mining operation will be safe or unsafe. Such a determination must be based on the adequacy of risk controls identified in Principal Hazard Management Plans...”. • Hume Coal will submit the detailed mine plans to the Resources Regulator under the existing provisions of legislation, as a “high risk activity”, prior to extraction, as occurs with all other mines in NSW. 	
325.5 Amenity	The project would have significant amenity impacts on a number of rural-residential land users in the Medway Road area, including noise and visual impacts, as well as impacts on the cultural landscape.	<p>It is Hume coal’s view that this statement is misleading. While some amenity impacts have been noted within the EISs, the RTS and the response to the IPC’s assessment report, these impacts are not significant and can be easily managed and mitigated in accordance with standard practices.</p> <p><u>Visual</u></p> <p>An Updated Visual Impact Assessment (UVIA) was prepared to provide clarity and context to the findings presented in the EIS and Response to Submission Report related to visual amenity, and to address specific issues raised in the IPC assessment report. The UVIA formed a targeted response that not only addressed perceived visual impacts, but also discussed the Project impacts on the linked matters of visual amenity, cultural landscape, historical heritage and the house and garden at Mereworth.</p>	<p>Hume Coal and Berrima Rail Project, Response to the IPC Assessment Report – EMM April 2020:</p> <p>Appendix C Updated Noise Assessment</p> <p>Appendix E Visual Impact Assessment</p> <p>Appendix F SoHI (specifically cultural landscape Annexure B)</p>

Table 2.1 **DPIE key matters raised and summary of Hume Coal's response**

Reference number and aspect	DPIE concern	Hume Coal response	Reference to where additional information can be found
		<p>The UVIA included additional viewshed analysis; 26 viewpoint assessments (compared with 11 in the EIS) of which 11 have been subjected to photomontage analysis (compared with six in the EIS). This additional assessment and analysis provided a greater robustness to the assessments of both visual and heritage impacts.</p> <p>Medway Road is a local road with low sensitivity (refer Table 2.2 of the UVIA). It provides access westward of the Hume Motorway to Medway Village and the peri-urban properties to the north and urban, peri-urban, agricultural and industry to the east of the motorway. Views to the surface infrastructure area will be possible and the acoustic barrier to be constructed at the intersection of the Hume Motorway and Medway Road would be visible. Based on the DSM, four landholders on Medway Road will experience visual impacts.</p> <p>Views will be effectively screened by planting undertaken by Hume Coal in late 2015 (refer Figure 4.3 of the UVIA).</p> <p>Hume Coal has also conducted screen planting along the northern boundary of the Mereworth property to screen near-field views of the facility from the roadside (refer Figure 4.3 of the UVIA). This planting is in keeping with the character of the landscape and local road character in this locality. Screen planting will eventually block views, with most trees semi-matured by 2021 and reaching full maturity by 2026.</p> <p><u>Noise</u></p> <ul style="list-style-type: none"> • Acoustic impacts are predicted to 11 landholders along Medway Road: <ul style="list-style-type: none"> – 9 dwellings predicted to experience 'marginal' residual noise and entitled to voluntary mitigation under the Voluntary Land Acquisition and Mitigation Policy (VLAMP); and – 2 dwellings predicted to experience 'significant' residual noise levels and are therefore entitled to voluntary mitigation and acquisition (1 of which has already been purchased). 	

Table 2.1 **DPIE key matters raised and summary of Hume Coal's response**

Reference number and aspect	DPIE concern	Hume Coal response	Reference to where additional information can be found
		<p><u>Cultural Landscape</u></p> <p>An updated Statement of Heritage Impacts (SoHI) for the project was prepared for the IPC response report, which was revised in consideration of cultural landscape (Annexure B).</p> <p>The heritage places adjacent or near the Project area and rail loop which lie within the <i>Proposed Berrima, Sutton Forest & Exeter (B, SF&E) Cultural Landscape</i> were assessed as being part of the overall historical narrative and contributing to the aesthetic value of the cultural landscape. There are heritage places which are likely to experience an impact from visibility of part of the surface infrastructure, and with consideration of the locations of the viewpoints, which are generally away from the heritage house and gardens, and the partial visibility of these views, the views were assessed as having a minor or low impact on the heritage significance of the places.</p> <p>The Berrima rail loop and new rail link are unlikely to be seen from the heritage places in the northern cultural landscape. The Old Hume Highway Remembrance Day planting place is closer to the rail line than other heritage places and any view of the rail line would have an impact through this change, however the impact was assessed as low.</p> <p>The impacts of views of parts of the Project surface infrastructure and the Berrima rail loop on the <i>Proposed B,SF&E Cultural Landscape</i> were together assessed as likely to have a low impact on the heritage values of that cultural landscape as a whole. The impacts on the views of landscape at and immediately around the Project surface infrastructure, which are foreground views, were assessed as together to have a low to moderate impact on the heritage values of the whole landscape of that locality.</p> <p>Mitigation of the impacts of the visibility of the project surface infrastructure on the heritage places and the cultural landscape are presented within the SoHI. Mitigation by a range of forms and species of planting, were assessed to likely be moderately effective within approximately five years of plant growth and moderate to highly effective after fifteen years of plant growth.</p> <p>The mitigation measures will substantially reduce the potential impacts on appreciation of the <i>Proposed B,SF&E Cultural Landscape</i> from the public realm viewpoints and routes, and from the tourism, recreation, and social destinations where there may be some view of part of the project surface and rail loop infrastructure.</p>	

Table 2.1 **DPIE key matters raised and summary of Hume Coal’s response**

Reference number and aspect	DPIE concern	Hume Coal response	Reference to where additional information can be found
325.6 Amenity	The residual risks cannot be adequately managed through approval conditions, given the potential impacts and uncertainties.	<p>This statement is incorrect, particularly when considering standard conditions that DPIE regularly impose on other mining operations to manage amenity impacts.</p> <p>Approval conditions are a proven method for addressing residual risk in many jurisdictions.</p> <p>While the project has the potential to cause some adverse impacts, mitigation and/or compensation measures have been developed to address all of these and the net result is that residual impacts are considered to be minor. With all relevant factors considered, the associated benefits outweigh costs and the proposed project is strongly justified.</p>	
325.7 Amenity	Proceeding with the project as proposed would not be consistent with the precautionary principle of ecologically sustainable development, given the identified uncertainties and risks.	<p>A comprehensive assessment of the Project against the principles of ESD as defined within the NSW <i>Protection of the Environment Administration Act 1991</i> has been undertaken by Hume Coal. This assessment builds on the assessment undertaken and presented in the EIS and RTS. This assessment concludes that the project is consistent with the objectives of promoting ESD, including the precautionary principle (the Principle).</p> <p>One of the two condition precedents of the Principle is that there be “high” or “considerable” degree of uncertainty regarding the nature of the serious or irreversible environmental damage.⁴ However, the DPIE’s expert Jim Galvin agreed that the mining method “safely delivers target hydrogeological and surface subsidence objectives”⁵, and any residual concerns “keep falling back to a risk to safety ... and commercial”⁶. Safety and commercial risks are not uncertainty regarding the nature of the environmental damage, and therefore does not satisfy the second condition precedent.</p> <p>Even if the precautionary principle is triggered, it only prevents the proponent from using lack of full scientific certainty as a reason to not implement a mitigation measure, and does not mean the project should be refused⁷. This is because the Court warned that such reasoning will lead to a “paralysing in favour of the status quo”.</p>	

⁴ *Telstra Corporation Limited v Hornsby Shire Council* [2006] NSWLEC 133 (24 March 2006) at [143, 146-7]
⁵ Galvin and Associates, September 2020 page 7
⁶ Jim Galvin private meeting with the IPC 9 July 2021 at page 7
⁷ *Telstra Corporation Limited v Hornsby Shire Council* [2006] NSWLEC 133 (24 March 2006) at [156, 179-180]

Table 2.1 **DPIE key matters raised and summary of Hume Coal's response**

Reference number and aspect	DPIE concern	Hume Coal response	Reference to where additional information can be found
Economics	<p>The Department accepts that the Project as proposed would have a net economic benefit to NSW and a range of benefits to the Southern Highlands region, and that sensitivity analysis indicates that the net present value of the project (as designed) would remain positive even when considering a range of potential economic variables.</p> <p>However, the Department suggests that any required changes to the mine design (eg as result of the identified web pillar stability and mine design issues) has the potential to reduce the coal resources that could be mined and affect the economic benefits of the Project.</p>	<p>The revised Economic Impact Assessment (BAE 2020) addresses the IPC's recommendations to prepare a further economic impact assessment. Many of the concerns and recommendations expressed simply required provision of more detailed information and justification for assumptions.</p> <p>The revised Economic Impact Assessment (BAE 2020) concluded that the Project was expected to generate direct net economic benefits to NSW of \$192 million (or \$290 million, if employment benefits and taxes are included). Additional disposable income of \$28-\$38 million for the Southern Highlands SA3 Region would be available due to combined flow on effects. Each year of the life of the project, an estimated additional 37-51 FTE jobs would be available in the Southern Highlands SA3 Region.</p> <p>As Roderick Campbell from the Australia Institute stated, for the DPIE to "state that there's a net benefit [then] to state that the environmental costs outweigh the estimate of net benefit is [for the DPIE to] actually to double count the environmental costs." Double counting should not be accepted by the IPC, as it distorts the true cost and benefits.</p> <p>The Project is committed to best practice environmental management and mitigation measures. Some of these come at a significant cost, which Hume Coal is committed to, eg:</p> <ul style="list-style-type: none"> • a mining method which does not result in a goaf, rather than longwall mining, to avoid all subsidence; • covered coal wagons to avoid dust emissions from trains; and • underground reject emplacement to reduce surface visual, air quality and noise impacts. <p>On balance the project achieves effective resource recovery with acceptable residual impacts, while still delivering significant economic benefits to the local community.</p> <p>Given the general agreement between mining experts, no further changes are required to the mine design. Hence the coal resources that could be extracted will not be reduced and therefore the Economic Impact Assessment (BAE 2020) and reported net economic benefit associated with the project will not change.</p>	<p><i>Hume Coal and Berrima Rail Project, Response to the IPC Assessment Report</i>, (EMM April 2020):</p> <ul style="list-style-type: none"> • Appendix H economic impact assessment (BAE 2020); and • Appendix I Hume Coal Market Report (Wood Mackenzie 2020).
325.8 Social impact	<p>There is a strong opposition to the project from the local community as well as the local Council, including 97% of the more than 5,000 submissions from the local area objecting to the project, reflecting</p>	<p>The quantum of submissions objecting to the project is noted by Hume Coal. Notwithstanding this, it is also noted that the majority of submissions referenced by DPIE were form letters rather than individual or unique submissions. It should also</p>	<p><i>Hume Coal and Berrima Rail Project, Response to the IPC</i></p>

Table 2.1 **DPIE key matters raised and summary of Hume Coal’s response**

Reference number and aspect	DPIE concern	Hume Coal response	Reference to where additional information can be found
	that the local community does not consider the project has a social licence.	<p>be noted that while there were 929 individual or unique submissions that objected to the project, there were 429 individual or unique submissions that supported the project. The vast majority of the unique submissions that supported the project were from members of the local community.</p> <p>All of the points of objection to the projects were comprehensively addressed in the RTS.</p> <p>In addition, an updated social impact assessment (SIA) was prepared for the IPC response report. The updated SIA was prepared in accordance with the Department’s Social Impact Assessment Guidelines – September 2017 and took into consideration the revised Economic Impact Assessment to ensure consistency between assumptions used in both updated assessments. The updated SIA addressed issues related to relevant excerpts of the Project submissions, health data, and workforce data. The updated SIA also incorporated both the Hume Coal Project and the Berrima Rail Project.</p> <p>Given the proximity to the Project, the residents of the Wingecarribee local government area (LGA) are most likely to experience direct impacts. Accordingly, further investigation was undertaken into the issues and matters raised in the submissions by this community.</p> <p>The potential negative social impacts identified include perceived impacts on water supply and contamination; local industry; air quality; and community cohesion. The main potential positive impacts identified through the SIA process activities included positive impacts on the economy through increased employment opportunities, increased procurement opportunities, increased potential for community development and community investment opportunities.</p> <p>The updated SIA considered the findings from the community engagement activities, submissions, academic research and technical studies to assess the consequences of the Hume Coal Project against the revised baseline study.</p> <p>All the identified social impacts (positive and negative) that were supported by evidence and the perceived impacts were able to be effectively mitigated and managed using established strategies and adoption of transparent community and stakeholder engagement strategies as outlined in the Social Impact Management Plan (see Section 9 of Appendix J of the Hume Coal IPC response report).</p> <p>The Project has social merit. For three of its four phases, there will be significant net positive social outcomes largely due to four management measures: local procurement and workforce recruitment; a social impact management plan to</p>	<p><i>Assessment Report</i> (EMM April 2020):</p> <p>Appendix J Social Impact Assessment (EMM 2020)</p>

Table 2.1 **DPIE key matters raised and summary of Hume Coal's response**

Reference number and aspect	DPIE concern	Hume Coal response	Reference to where additional information can be found
325.9 Social impact	The site is not suitable for a greenfield coal mine given the rural-residential and small-scale agricultural land use of the area, along with the growing tourism and heritage landscape focus, and the predicted impacts on these land users.	<p>ensure effective implementation; a VPA or similar mechanism; and a construction accommodation village for non-local all workers during construction.</p> <p>'Greenfield' site does not exist as an assessment criteria in law. The DPIE conjured a 'greenfield' assessment criteria from a sentence from the NSW Strategic Statement on Coal that related solely to release of new exploration lease areas, which does not apply to the project in any way.</p> <p>Even if it existed, the equitable principle of estoppel should prevent the retrospective application of the 'greenfield' criteria on the basis that it was always a greenfield site. The DPIE should not be allowed to wait until the proponent has spent over \$200M and ten years into developing the project for the DPIE to suddenly raise 'greenfield' as a reason to refuse the project.</p> <p>Nevertheless, the Agricultural Impact Statement (EMM 2017, Appendix G of the EIS) indicates there will be minimal impact on the small-scale agricultural land use in the area as a result of the Project.</p> <p>The updated SIA addresses the concerns relating to land use and tourism, specifically in Section 7.7, as follows:</p> <p>There are a few factors that could potentially impact the livelihood of landholders and other local businesses, which include interruptions to agricultural business due to Hume Coal accessing land. The other most notable factor was the potential for land not being available for agricultural purposes or mining activities keeping tourists away. While some of the community raised concerns there is no evidence to support that mining limits tourism traffic to a region.</p> <p>In contrast the data suggests that Wingecarribee LGA attracts visitors across the country as well as international guests for holiday, visiting friends or family, and business. While some people may be deterred from visiting the area as a result of mining the data indicates that it is not significant.</p> <p>The ongoing need to access private properties for operational reasons was an issue that would impact on the way of life of the largely agricultural landholders potentially causing interruptions to their agricultural businesses. This could cause inconvenience and potentially lead to loss of revenue. This has occurred during the technical assessment process however it was sporadic and infrequent.</p> <p>It is possible that livelihoods of local business are impacted either by the avoidance of mining or the ongoing need to access landholder properties. The consequence would be minor due to the ability to adapt as access is sporadic and short term for landholders and tourism is spread across a range of drivers to visit, with the</p>	<p><i>Hume Coal and Berrima Rail Project, Response to the IPC Assessment Report</i> (EMM April 2020):</p> <p>Appendix J Social Impact Assessment (specifically Section 7.4 and 7.7)</p>

Table 2.1 **DPIE key matters raised and summary of Hume Coal's response**

Reference number and aspect	DPIE concern	Hume Coal response	Reference to where additional information can be found
		<p>majority being to visit friends which is unlikely to change. Therefore, the unmitigated impact on the local landholders and business has been assessed as moderate negative during construction and operation phases of the Project. A summary of the assessment is provided in Table 7.17 of the updated SIA.</p> <p>It is likely that the need to occasionally access a small number of properties will remain during construction and operations. This means that there are still likely to be inconveniences and possible interruptions to agricultural activities thus the likelihood would still be rated as likely when mitigated. Continuing with a communications strategy that helps to keep landholders informed about the process and reasons access is required, will allow for planning around such interruptions and reduce the impact rating to minimal. Continuing to engage agricultural and tourism related businesses to inform them of the low likelihood of negative impacts and to encourage collaboration to advance local industry would allow forward business planning and increased resilience. Successful mitigation would make it unlikely that livelihoods are reduced due to the Project. The consequences would be minor as landholders and businesses would have the capacity to adapted. Therefore, the mitigated impact on the local landholders and business has been assessed as low negative during construction and operation phases of the Project.</p> <p>Section 7.4 of the updated SIA provides an assessment of the unmitigated and mitigated cultural heritage impacts on the local and regional communities as a result of the Project. The mitigated impacts are as follows:</p> <p>The Aboriginal Cultural Heritage Assessment recommended that salvage of the identified artefacts take place and will be salvaged (EMM EIS 2017, Appendix S Aboriginal Cultural Heritage Assessment Report). The successful implementation of this mitigation would make the loss of artefacts rare and the consequences minor due to the low significance of the cultural sites. Therefore, the mitigated impact on the community's local Aboriginal and/or Torres Strait Islander people has been assessed as low negative and long term as a result of the Project.</p> <p>The first workings mining method that is planned for the Project is expected to have no subsidence impacts. Impacts to listed heritage items are not anticipated from groundwater drawdown due to identified heritage items being located above Wianamatta Group shale. Wianamatta Group shale has limited hydraulic connection to the underlying Hawkesbury Sandstone (where groundwater drawdown is predicted to occur). However, the community highly value the heritage gardens and their perception will need to be mitigated to ensure it does not cause</p>	

Table 2.1 **DPIE key matters raised and summary of Hume Coal's response**

Reference number and aspect	DPIE concern	Hume Coal response	Reference to where additional information can be found
325.10 Social impact	Consequently and on balance, the site is not suitable for the mine, and the project is not in the public interest.	<p>unnecessary stress and anxiety. As such the successful implementation of a transparent community and stakeholder engagement strategy (CSES) that informs the community of the mining method and associated impacts will build trust and reduce unnecessary stress and anxiety for community members. The success of the first workings mining method and CSES will mean subsidence that impacts the heritage gardens would be rare. Any consequence would be minimal as they would be small-scale and localised and may require further consideration if there are changes to the mining technique. Therefore, the mitigated impact on the community's local residents has been assessed as low negative during the operation phase the Project.</p> <p>Hume Coal disagree with these statements, particularly based on the responses made previously in this table. As such, Hume Coal is of the opinion that the site is suitable for a mine and the project is in the public's interest.</p> <p>The NSW Government has granted exploration rights for coal on the site since the mid-1950s. These rights confer that the site is suitable for a coal mine provided environmental impacts can be appropriately managed. This has been confirmed through the site's inclusion in the NSW Government's <i>Strategic Statement on Coal Exploration and Mining in NSW</i>. As demonstrated in the EISs, the RTS and the response to the Commissions assessment, environmental impacts are minimal and can be appropriately managed with standard management measures. What is also demonstrated in this report, the environmental impacts are significantly smaller than those of other projects recently approved by the Commission.</p> <p>The site is well served by necessary services and infrastructure, particularly the nearby rail infrastructure which will allow product coal to be transported by rail to Port Kembla.</p> <p>The Southern Coalfields are the only significant source of quality metallurgical coal in NSW. The results of exploration on the site indicate that a coking coal product can be produced which meets export and domestic coking coal specifications.</p> <p>The updated SIA and economic assessment contained within the response to the Commissions assessment report considered the findings from the community engagement activities, submissions, academic research and technical studies to assess the consequences of the Hume Coal Project against the revised baseline study.</p> <p>All the identified social impacts (positive and negative) that were supported by evidence and the perceived impacts were able to be effectively mitigated and</p>	<p><i>Hume Coal and Berrima Rail Project, Response to the IPC Assessment Report</i> (EMM April 2020):</p> <p>Appendix J Social Impact Assessment</p>

Table 2.1 **DPIE key matters raised and summary of Hume Coal's response**

Reference number and aspect	DPIE concern	Hume Coal response	Reference to where additional information can be found
		<p>managed using established strategies and adoption of transparent community and stakeholder engagement strategies as outlined in the Social Impact Management Plan (see Section 9 of Appendix J of the Hume Coal IPC response report).</p> <p>Hume Coal has committed to a range of management and mitigation measures to lessen any negative impacts identified by the community and address any misinformation surrounding misconceptions relating to perceived impacts. Hume Coal has also committed to a range of measures that will help to enhance any positive impacts to ensure the community benefits are maximised (see Section 7 and 8 in the updated SIA for more information).</p> <p>As stated above, the results of exploration on the site indicate that a coking coal product can be produced which meets export and domestic coking coal specifications. Therefore, the project will transform this natural capital (ie coal) into economic and social capital in the form of greater income and employment, and material capital in the form of steel and other products that are essential for everyday life.</p> <p>The project will develop the dormant publicly owned resource of the Wongawilli coal seam, and in doing so will improve social and economic outcomes of the State and local area. This can be done with minimal environmental and social impact as demonstrated in the report. It is therefore considered that the project will serve the public interest.</p>	

3 Response to matters raised by DPIE Water

The following section provides a response to the meetings held between the Commissioner, DPIE and DPIE Water on 19 July 2021, and between the Commission, DPIE and Mr Hugh Middlemis of HydroGeoLogic on 16 July 2021. The response below is based on a review of the meeting transcripts (transcripts of proceedings recorded by Auscript Australasia Pty Ltd).

In general, the Commission's questions to Mr Middlemis of HydroGeoLogic and DPIE Water team were focused on four main topics:

1. Groundwater model assumptions (and appropriateness of the model).
2. Concerns regarding "acceptable" impacts under the Aquifer Interference Policy ("unacceptable" number of private bores predicted to be impacted).
3. Make good provisions, including post-closure considerations / implications.
4. Longevity and integrity of bulkheads and influence on groundwater quality.

Comments from Mr Middlemis (as independent groundwater expert reviewer for DPIE) are consistent with his review comments made on the Hume Coal EIS and RTS groundwater modelling and acknowledges the following:

- DPIE Water have not provided justification for their claim that hydraulic conductivity increases with depth, which is a contradiction of the data available and general hydrogeological understanding.
- The review by Dr Lloyd Townley of GW-SW Pty Ltd (2020) "addressed quite thoroughly" the issues raised in DPIE Water in 2019 and 2020; as well as Mr Middlemis' reviews and responses by EMM.
- The modelling approach is "reasonable and robust" and consistent with approaches for other projects, including Tahmoor South.

Responses in Table 3.1 below are focused on the discussion between DPIE Water and the Commission on 19 July 2021.

Table 3.1 Hume Coal’s response to items raised during meetings between the Commission and DPIE Water, and Mr Middlemis (based on the transcripts)

Page number	Discussions / comments	Hume Coal response	Reference to where additional information can be found
Groundwater model assumptions			
Page 3 of DPIE Water transcript	<p>Range of vertical hydraulic conductivity (Kv) of the Hawkesbury Sandstone used in the groundwater model – concern that it was not tested high enough and statement made that testing a higher Kv “would only have a greater impact than what’s currently presented by the model”.</p> <p>DPIE Water also commented on the model needing to be “better stress tested or...sensitivity tested”.</p>	<ul style="list-style-type: none"> • Sensitivity analysis was conducted on vertical hydraulic conductivity (Kv) of the Hawkesbury Sandstone as part of the EIS (Coffey 2016a). • Modelled Kv was informed by numerous tests (see below) including analysis of a pumping test completed in 2014, and was refined through the calibration and sensitivity process. • Uncertainty analysis was conducted (as part of the RTS) on horizontal and vertical hydraulic conductivity (Kh and Kv) based on the distributions of hydraulic conductivity with depth from aquifer testing within the Hume Coal Project area and the greater Southern Coalfield. Both small and large values of Kh and Kv were generated in the many realisations (model runs) and some were filtered out by failing to fit observed heads during the calibration period. • Independent peer review by Dr Townley states, in reference to differences in predicted heads vs measured heads, that “values of vertical hydraulic conductivities <u>may be much lower than in the model</u>”. This is the opposite to what DPIE Water are stating. • In addition, as part of Mr Middlemis’ (HydroGeoLogic) review of the RTS model, he noted that the Kv is “on the higher side”. • Dr Townley also states that the distributions of hydraulic conductivities in the groundwater model are “conservative, in the sense of over-estimating mine inflows and over-estimating the likelihood of drawdown caused by mining”. • Dr Townley also states that the ratio of Kh to Kv (Kh:Kv) used in the model sensitivity and uncertainty analysis “may be too small”, suggesting $Kh \gg Kv$ and if Kh:Kv were larger, Kv would be much smaller than that simulated, resulting in smaller drawdown impacts on the watertable. • The many reviews of the groundwater model conducted by DPIE’s experts and other industry experts have determined that the Hume Coal groundwater model is fit for the purpose of assessing potential impacts from the proposed project, and that the methodology is best practice. 	<p>Further information on the appropriateness of the groundwater model, calibration, sensitivity and uncertainty analysis is provided in <i>Hume Coal and Berrima Rail Project Response to the IPC Assessment Report, Appendix B Updated Water Assessment</i> (EMM April 2020); including <i>Annexure C to Appendix B (Review of Groundwater Modelling Undertaken for the Hume Coal Project</i> (Townley 2020)).</p> <p>Further information on the EIS groundwater model can be found in Volume 4A (Appendix E) of the <i>Hume Coal Project Environmental Impact Statement</i> (Coffey 2016a)</p> <p>Further information on the uncertainty analysis completed as part of the RTS can be found in Volume 2D, Appendix 2 of the <i>Hume Coal Project and Berrima Rail Project Response to Submissions</i> (Section 7 of <i>Revised Groundwater Modelling for Response to Submissions</i> (HydroSimulations 2018)).</p>

Table 3.1 Hume Coal’s response to items raised during meetings between the Commission and DPIE Water, and Mr Middlemis (based on the transcripts)

Page number	Discussions / comments	Hume Coal response	Reference to where additional information can be found
Page 4 of DPIE Water transcript	Number of field measurements of Kv in the zone above the coal seam – DPIE Water state there were “four field sites, only four samples, that led to that parameter being selected by the modeller” and that there were “many bores that had a Kv >1 m/day”.	<ul style="list-style-type: none"> The zone above the coal seam is the interburden or, where absent, is the base of the Hawkesbury Sandstone. The ‘interburden’ hydrostratigraphic unit (between the Wongawilli Seam and the Hawkesbury Sandstone) is present across a large area of the proposed mine area. 	Further information on test data is provided in <i>Hume Coal and Berrima Rail Project Response to the IPC Assessment Report, Appendix B Updated Water Assessment</i> (EMM April 2020); including <i>Annexure A to Appendix B (DPIE Water report)</i> .
Page 5 of DPIE Water transcript	<p>DPIE Water and the Commission discussed the potential consequences and likelihood of the groundwater model predictions. DPIE Water state that they are unable to comment on the likelihood due to the absence of data.</p> <p>DPIE Water also state that there is no available zone above the coal and “that’s where a lot of the risk is”.</p>	<ul style="list-style-type: none"> As previously reported, Hume Coal have conducted various tests to estimate Kh, Kv and storage parameters, this includes core testing (128 tests at 37 holes), packer testing (28 tests at 4 holes), pumping tests (2 tests at 2 bores) and slug tests (42 tests at 42 bores). Of these tests, estimates of Hawkesbury Sandstone Kv were derived from 26 tests (core and packer tests) at 9 locations and ranged from 1×10^{-7} to 4.9 m/day (geometric mean = 9×10^{-3} m/day) and 3 tests resulted in Kv estimates >1 m/day. Estimates of Kv for the interburden unit were derived from 47 tests (core and packer tests) at 14 locations and ranged from 1.5×10^{-7} to 0.1 m/day (geometric mean = 1×10^{-5} m/day). In addition to the Hume Coal test data, Coffey (2016b) analysed publicly available drawdown and pumping rate information to derive estimates of hydraulic conductivity. This data was available for 125 bore locations, however this estimate method is less reliable (due to limited or no quality assurance) than test data collected by Hume Coal or their representative. As such, Hume Coal have considerably more field data available than only four samples of Kv suggested by DPIE Water. The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) have an explanatory note regarding <i>Uncertainty analysis – Guidance for groundwater modelling within a risk management framework</i> (Middlemis and Peeters 2018). The explanatory note states “risk—involving both the likelihood and consequence of a particular hazard or impact—cannot be assessed without an understanding of uncertainty.” Therefore, the potential risk (as an assessment of likelihood and consequence) associated with the Hume Coal Project on groundwater receptors has been assessed through the thorough predictive uncertainty analysis completed for the project. The potential impact (consequence) has been reported as percentage likelihood of occurrence (as an example, 67th percentile 2 m drawdown 	

Table 3.1 Hume Coal’s response to items raised during meetings between the Commission and DPIE Water, and Mr Middlemis (based on the transcripts)

Page number	Discussions / comments	Hume Coal response	Reference to where additional information can be found
		<p>extent means that in 67% of the 481 realisations (model runs), the predicted drawdown is no larger than 2 m, and represents an outcome that is “unlikely” or “not expected to occur”). As reported, the uncertainty analysis included running simulations through the calibration period, and those that did not meet the necessary calibration criteria were rejected. Therefore, the predictive uncertainty analysis does inform on consequence and likelihood.</p>	
Page 5 of the DPIE Water transcript	“Problems” with geological features that may be able to transmit water to significant depths	<ul style="list-style-type: none"> • The influence of geological structures such as faults and intrusions has been addressed in previous reports, including the review by Dr Townley (2020). • Faults and igneous intrusions can operate as both barriers and conduits to flow on a local scale; however, at a regional scale faults and fractures rarely influence groundwater flow in a significant way. This is consistent with what has been observed for the Hume Coal Project. • At a regional scale, such as a Project impact assessment scale, the influence of structures such as faults and intrusions is minor and groundwater flow is consistent with porous media. 	Further information on the potential influence of geological structures on groundwater flow can be found in <i>Hume Coal and Berrima Rail Project Response to the IPC Assessment Report, Appendix B Updated Water Assessment</i> (EMM April 2020)
Page 8 of the DPIE Water transcript	<p>Statements that the groundwater model is “poorly calibrated”, making the predicted impacts uncertain.</p> <p>DPIE Water also discussed the differences between modelled and actual observed groundwater elevations.</p>	<ul style="list-style-type: none"> • The statements made by DPIE Water is a contradiction of the advice provided by DPIE’s expert reviewer Mr Middlemis and other independent peer reviews including review by Dr Townley in 2019. • Dr Lloyd Townley states that the “calibration methodology is not only consistent with the” Australian Groundwater Modelling Guidelines (Barnett et al 2012), but in the experience of Dr Townley, it is “one of the first times that four separate types of data have been used in a model of a proposed mining project”. • The difference between modelled versus measured groundwater levels has been addressed previously. • The Guiding Principle in Section 7.4 of the Australian Groundwater Modelling Guidelines (Barnett et al 2012) indicates that groundwater models are far more effective at producing differential effects (ie drawdown) rather than absolute value (ie groundwater levels/elevation). The Australian Groundwater Modelling Guidelines state that: ‘It is not unusual for modellers to find that the calibration does not allow all aspects of 	Dr Townley’s review of the groundwater modelling includes a discussion on model calibration in Section 6.8 of his report (<i>Appendix B (Updated Water Assessment) of Hume Coal and Berrima Rail Project Response to the IPC Assessment Report</i> (EMM April 2020); <i>Annexure A and C to Appendix B (Review of Groundwater Modelling Undertaken for the Hume Coal Project</i> (Townley 2020)).

Table 3.1 Hume Coal’s response to items raised during meetings between the Commission and DPIE Water, and Mr Middlemis (based on the transcripts)

Page number	Discussions / comments	Hume Coal response	Reference to where additional information can be found
		<p>historical measurements to be reproduced. Sometimes absolute values of heads are too high or too low, suggesting that hydraulic conductivities and recharge are not in balance, but trends are reasonable, suggesting that the relationship between hydraulic conductivity and storage coefficient is reasonable, or that the relationship between perturbations in recharge and specific yield are reasonable. In such cases calibration may be considered reasonable if differences in heads seem to be reasonable. There may be no theoretical reason to support this conclusion, but sometimes there appears to be no alternative.”</p>	
<p>“Unacceptable” impacts (with reference to the Aquifer Interference Policy)</p>			
<p>Page 6 and 7 of DPIE Water transcript</p>	<p>DPIE Water and the Commission discuss the number of private bores predicted to be impacted by >2 m drawdown and that this number of bores is “unacceptable”.</p> <p>DPIE Water stated the “difference between this project and other projects are the proximity to previously unimpacted groundwater users”.</p> <p>“Many other projects, or other projects that have very significant drawdowns or groundwater impacts, have not had the same interaction with groundwater bores, particularly in a greenfield location.”</p> <p>DPIE Water also provide a comparison to the Tahmoor project, stating: “It is the sheer number of private bores” predicted to be impacted by >2 m drawdown “rather than the size and scale” of the drawdown.</p> <p>“Significantly larger number of private groundwater users that would be impacted than other projects that we’ve seen.”... and concern that once the “sensitivity analysis” is conducted, the predicted impacts “will be greater rather than less”.</p>	<p>Groundwater drawdown impacts:</p> <ul style="list-style-type: none"> • The number of bores predicted to be impacted is comparable or less than other approved mines [50%ile - 84 bores in total, cumulative effect of other mines such as Tahmoor Mine and Bulli Seam Operations is much greater at over 200 bores]. • The number of bores predicted to be impacted is likely to be conservative and overstated based on the conservatism of groundwater modelling and the AIP 2 m drawdown minimal impact consideration criteria. This conservatism has been demonstrated by Tahmoor Coal at its operations at Tahmoor Mine where only two bores have required make good arrangements compared to 72 predicted (by modelling) to be impacted. • DPIE Water’s comment about the number of ‘previously unimpacted bores’ being a concern seems to suggest that cumulative impacts, such as those observed in the Hunter Valley or the Tahmoor Mine area, is more ‘acceptable’ than an area where the cumulative impacts are predicted to be less. It is not appropriate to use the number of ‘previously unimpacted bores’ as a measure for the ‘acceptability’ of the impact. • While the Hume Coal Project is a new mine, underground coal mining has been occurring in the local area for over 100 years. Therefore, the suggestion that this is a greenfield area is not correct. 	<p>Further discussion on the comparison of the impacts to bores predicted for the Hume Coal Project to other projects is provided in Section 4.3.2.</p> <p>Further detailed information on predicted groundwater impacts and the make good strategy is provided in <i>Hume Coal and Berrima Rail Project Response to the IPC Assessment Report, Appendix B Updated Water Assessment</i> (EMM April 2020).</p>

Table 3.1 Hume Coal’s response to items raised during meetings between the Commission and DPIE Water, and Mr Middlemis (based on the transcripts)

Page number	Discussions / comments	Hume Coal response	Reference to where additional information can be found
Make good provisions in the Aquifer Interference Policy			
Page 9 of the DPIE Water transcript	The “scale” of the predicted impact (number of bores) is unprecedented	<ul style="list-style-type: none"> Please see above regarding comparison to the Tahmoor Mine 	
Page 9 of the DPIE Water transcript	DPIE Water state: “make good is something that you need to ensure you have in place for impacts that are predicted for a project”; “Make Good are the things that you need to have planned, agreed, in place before a project can commence, before those impacts happen”... “whereas compensatory order is something that you would need to do if the impacts are worse or there were unforeseen impacts, or there was something you didn’t predict happen, so as to make sure that people aren’t adversely impacted in ways that were unforeseen”	<ul style="list-style-type: none"> DPIE Water’s statement that make good agreements need to be in place prior to project approval is not consistent with how other projects, such as Tahmoor South, have been conditioned. It is not practical to have agreements in place prior to approval. In addition, there are knowledge gaps, such as bore location, depth, use, yield etc, that need to be resolved through field investigations before a make good agreement with a landowner can be established. The Tahmoor South approval allows for the baseline assessment to be completed post-approval, which is required to establish a specific make good for each bore. There will not be a ‘one size fits all’ approach for each landholder or private bore. It is also worth noting that Hume Coal have committed to working with the community and landholders to develop make good agreements in advance of the predicted impact. Which is in direct contrast to the existing practise, of wait for the complaint. 	Further information on make good can be found in Appendix 2 of the <i>Hume Coal Project and Berrima Rail Project Response to Submissions</i> (EMM 2018).
Page 11 of the DPIE Water transcript	Make good provisions will need to “deal with” the “full range of uncertainty” including consideration of post-closure impacts	<ul style="list-style-type: none"> As reported in the RTS, the average predicted time for groundwater levels at a private bore to recovery by 75% (since the impact began), is 20 years. The maximum predicted drawdown does not occur at the same time at all locations. For example, Dr Townley notes that the maximum drawdown over panels W9 and W10 would occur much earlier than the maximum drawdown over panels CW6 and CW7. By the time CW6 and CW7 are mined, significant groundwater level recovery is predicted above panels W9 and W10. Also as reported in the RTS, the majority of private bores predicted to be impacted are expected to experience the drawdown in the first 20 years following commencement of mining. Eight bores are predicted to be impacted by >2 m drawdown between years 20-25 and another eight bores are predicted to be impacted by >2 m drawdown after 25 years. As Mr O’Donoghue and Mr Middlemis point out, if the project is approved, the groundwater model will continue to be updated using groundwater monitoring data (including groundwater levels/pressures and groundwater inflows). As more data is 	Further information on make good can be found in Appendix 2 of the <i>Hume Coal Project and Berrima Rail Project Response to Submissions</i> (EMM 2018) and Dr Townley’s review in <i>Hume Coal and Berrima Rail Project Response to the IPC Assessment Report, Appendix B Updated Water Assessment</i> (EMM April 2020); <i>Annexure C (Review of Groundwater Modelling Undertaken for the Hume Coal Project</i> (Townley 2020)).

Table 3.1 Hume Coal’s response to items raised during meetings between the Commission and DPIE Water, and Mr Middlemis (based on the transcripts)

Page number	Discussions / comments	Hume Coal response	Reference to where additional information can be found
		<p>collected and the model is updated, the model predictions will be refined, and the uncertainty bounds reduced.</p> <ul style="list-style-type: none"> Hume Coal have already committed to working with the community and landholders to develop make good agreements in advance of the predicted impact. This would include establishing make good arrangements with landholders predicted to be impacted post-mining. 	
Potential risks to groundwater quality due to bulkhead integrity			
Page 8 of the DPIE Water transcript	The Commission queried “how accurately” the model predicts groundwater recovery following mining, particularly “re-wetting and reoxidation of any emplaced materials”	<ul style="list-style-type: none"> Please see above regarding predicted groundwater level recovery and appropriateness of the groundwater model predictions. In addition to the above, a conceptual diagram of the mine progression, reject emplacement and water injection for the Hume Coal Project was provided in Hume Coal’s response to the IPC Assessment report in 2020. This diagram (reproduced as Figure 3.1 below, illustrates how the backfilled areas will assist with groundwater level recovery. 	Further information is provided in <i>Hume Coal and Berrima Rail Project Response to the IPC Assessment Report</i> (EMM April 2020).
Page 10 of the DPIE Water transcript	The Commission queried “should some of the bulkheads deteriorate over the long term, what are the potential impacts of groundwater quality, and potentially impact water quality in the bores”; and “If the bulkheads fail there will be groundwater that will enter the system that was not anticipated to enter the system”	<ul style="list-style-type: none"> DPIE Water (Ms D’Hautefeuille) acknowledged that the Hume Coal Project proposal includes “sending back treated water” into sealed bulkhead areas. DPIE Water (Ms D’Hautefeuille) advised that they “were quite satisfied with” the hydrogeochemistry assessment report and that it was “quite thorough”. The potential for water quality effects due to the proposed Hume Coal Project were assessed as part of the EIS and RTS. The assessment included kinetic leach column (KLC) testing and hydrogeochemical modelling. The outcome of the assessment is that project activities (as proposed, with consideration of the documented mitigation measures) will not lower the beneficial use category of the groundwater source beyond 40 m from the mining zone (which is a measurement criteria under the Aquifer Interference Policy). The area behind the bulkhead will include reject material, water that has migrated into the void space from the surrounding lithology and treated water that is reinjected. The bulkheads will not act like a dam wall, which if, removed or damaged, releases a large volume of water. The hydrogeochemical assessment completed for the Hume Coal 	Further information on the water quality assessment can be found in Appendix 2 of the <i>Hume Coal Project and Berrima Rail Project Response to Submissions</i> (EMM 2018)

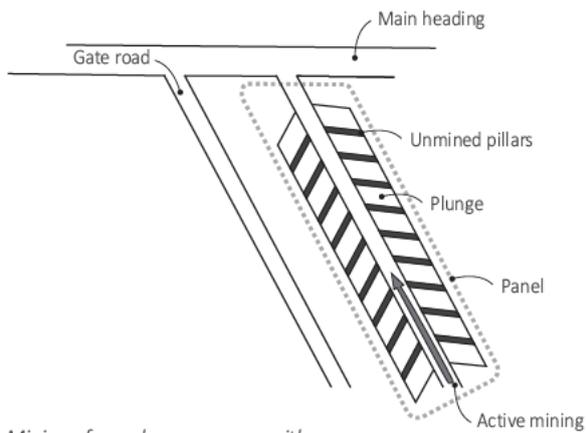
Table 3.1 Hume Coal's response to items raised during meetings between the Commission and DPIE Water, and Mr Middlemis (based on the transcripts)

Page number	Discussions / comments	Hume Coal response	Reference to where additional information can be found
		Project has demonstrated that the water quality risk is low. As such, any water quality risk associated with potential bulkhead failure (albeit unlikely) is low.	

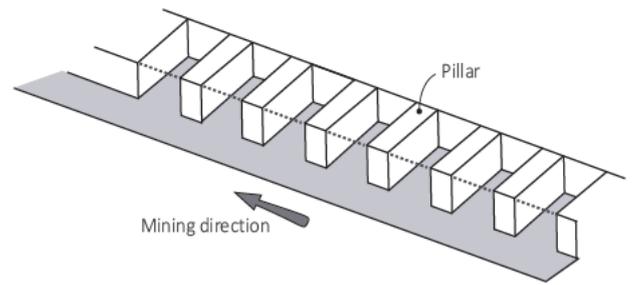
PLAN VIEW

SECTION VIEW

ACTIVE MINING

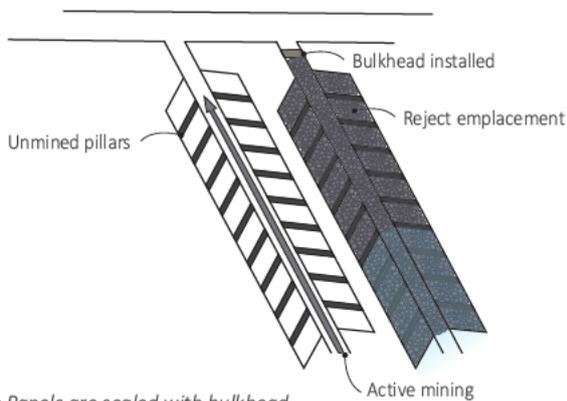


Note: Mining of panels commences with establishing the gate road, then mining in the plunges back to the main heading

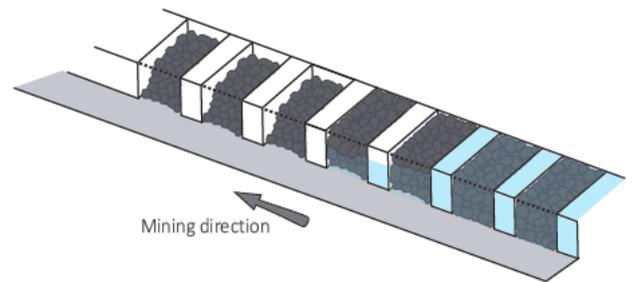


Note: Active dewatering occurring

REJECT EMPLACEMENT

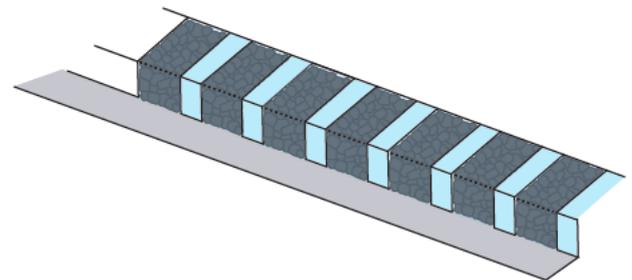
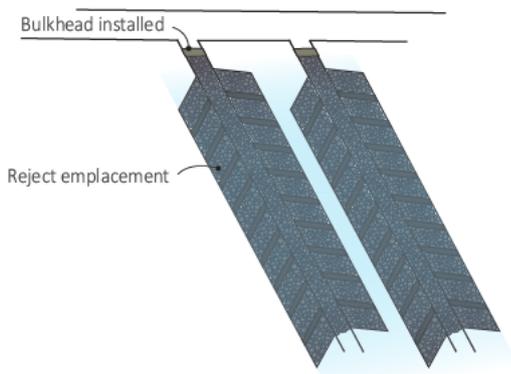


Note: Panels are sealed with bulkhead immediately after rejects are emplaced in mined plunges



Note: Co disposal reject emplacement occurs in previously mined plunges. Excess mine water is pumped into sealed panel and receives natural groundwater inflow

END OF MINING



Note: Void space in panel becomes full and groundwater system becomes fully saturated. In times of water deficit, water in sealed panels may be accessed to meet mine water requirements

NOT TO SCALE

(This is a schematic representation only and does not accurately represent the size or plan for all panels)

Hume Coal mine progression, reject emplacement and water injection

4 Response to matters raised in the public hearing

4.1 Key matters raised in support of the project

A number of presenters spoke in support of the project at the public hearing. A summary of the key issues raised is provided below.

- **High quality coal** - the project will ensure the ongoing supply of high-quality metallurgical coal to domestic and international customers.
- **Port Kembla Coal Terminal** – PKCT recently completed a major refurbishment project on the terminal, investing around \$300 million to ensure it can support customers long into the future. With the recent refusal of the extension to the Dendrobium Mine and the subsequent loss of coal volumes, without sufficient throughput there is a potential that the PKCT could become unviable for the remaining mines that use PKCT. However, with additional volume from the Hume Coal Project, the port's future will be better positioned to remain a viable service into the future.
- **Employment** – The project will create jobs and opportunities for hundreds of local employees and businesses. To date, over 618 people have provided expressions of interest for a future employment once development consent is granted. Some employment benefits have already been realised because of the project, such as the 27 local apprentices and trainees and 35 local businesses that have had the opportunity to benefit from the Hume Coal Apprenticeship Program working in local businesses in the community. Programs like this will re-commence and likely expand if the project went ahead, helping to keep youth, young adults and other eligible participants in the area by providing skills and a pathway to transition into long term careers via apprenticeships and traineeships.
- **Co-existence of land uses** - Coal mining has successfully coexisted in the local area for over 100 years. Compared to the Hunter, where coal is a big part of the economy, it is also the second largest equine stud area in the world with 150 thoroughbred businesses. The Hunter Valley has the second largest wine region in Australia with 8,000 hectares of vineyards, and is one of the largest tourism destinations in NSW. And all these four industries have been working together for the last 100 years, and they all prosper.

4.2 Key matters raised objecting to the project

The matters raised by speakers at the public hearing objecting to the project have been summarised into key themes, as follows:

- groundwater impacts and make good measures;
- surface water impacts;
- mine design and subsidence;
- amenity impacts and compatibility of surrounding land uses;
- social licence to operate;
- climate change, greenhouse gas emissions and demand for coal;
- employment;
- economics; and

- impacts to tourism.

Table 3.1 summaries the main issues raised within these key themes, provides a summary of Hume Coal's response to these matters, and notes where further information can be found supporting Hume Coal's position.

It is also noted that the key themes raised at the public hearing are generally consistent with matters raised in DPIE's assessment report; many of which are addressed in Chapter 2. Where this occurs, a cross reference is provided in Table 3.1 to the relevant information in Chapter 2.

Table 4.1 Key matters raised in the public hearing

Theme	Matter/concern raised	Hume coal response	Further reference
1. Groundwater	<ol style="list-style-type: none"> Concerns relating to the number of bores to be impacted by the project and impacts of this on agricultural users. Inability to make good, and that the process will likely involve arbitration, a process that will be unworkable. Claims that the groundwater model is inadequate, and concerns raised regarding the amount of input data from bores, given many landowners refused access. 	<ol style="list-style-type: none"> 84 privately-owned registered bores are predicted to experience a drawdown in excess of the 2 m drawdown criterion of the AIP, based on 50th percentile results. This is considerably less than those predicted to be cumulatively impacted by nearby approved underground mining operations: Tahmoor South, Tahmoor North and Bulli Seam Operations (BSO). The predicted impact is not therefore 'unprecedented' as has been described about the project. The groundwater model is also highly conservative, and impacts are likely to be less than predicted, as has proven to be the case at other underground mines such as Tahmoor Mine. In relation to potential impacts to agricultural users, Hume Coal has committed to make good any bore where water supply is affected by the mine (see next response). Importantly, the total number of bores predicted to be impacted by greater than 2m will not be impacted at the one time. Hume Coal has developed a detailed make good strategy which is similar to that of another underground mine recently approved by the IPC: Tahmoor Mine. That is, the strategy involves when and if required, paying the costs for extra pumping, lowering pumps within groundwater bores, or providing an improved pump, deepening a bore or drilling a new bore, or providing an alternative water supply. The DPIE's concern of availability of water is an impossibility, given that the long term average annual extraction limit (LTAAEL) is defined as the "estimated sustainable limit"⁸, and the Office of Water issued water access licences at an insignificant volume compared to the LTAAEL, which has been set at 99,568 ML/year⁹. As noted in DPIE's assessment report, the groundwater model for the project has been reviewed by a number of eminent experts. All experts agree that the groundwater model is fit for purpose, and that the geological and hydrogeological data for the project is extensive. DPIE also state that this has been acknowledged by DPIE Water in recent consultation. DPIE Water's Mitchel Isaac's opinion that the groundwater model is not fit for purpose (in the private meeting with the IPC) must be disregarded on the basis that Mitchel Isaacs is not a groundwater modeller, and the person who co-authored the Australian Groundwater Modelling Guidelines has stated that 	<p>This document:</p> <ul style="list-style-type: none"> Table 2.1 – Groundwater. Section 4.3.2 – Groundwater bores and comparison to Tahmoor South. <p><i>Hume Coal Project Response to Submissions – Appendix 2 Revised Water Impact Assessment Report Appendix M Make Good Strategy (EMM 2018)</i></p>

⁸ Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources – Background document, NSW Office of Water, July 2011, p24

⁹ For Sydney Nepean Groundwater Source

Table 4.1 Key matters raised in the public hearing

Theme	Matter/concern raised	Hume coal response	Further reference
2. Surface water	<ol style="list-style-type: none"> 1. If Hume Coal cannot pump rejects underground, then there is a risk of 'toxic mining water' making its way into the Sydney drinking catchment. 2. Pollution of the drinking water catchment from coal dust. 3. Comparisons were made between Hume Coal and Berrima Colliery, and the impacts on water quality that have resulted from this mine. 4. Risks to creeks were raised by Dr Ian Wright, and comparisons were made to the impacts on Redback Creek by Tahmoor Mine (including fracturing and the need for an extensive remediation program), inferring that these impacts would happen at Hume Coal. 	<p>the groundwater model is fit for purpose. In contrast to DPIE's comment regarding Hume Coal's class 2 model, the DPIE had no qualms accepting Narrabri's coal seam gas project's class 1 model as being fit for purpose and recommending it for approval¹⁰, even though class 1 models have "few or poorly distributed existing wells", "no calibration is possible", and that "predicting model time frame far exceeds that of calibration."¹¹</p> <ol style="list-style-type: none"> 1. The mine has been designed as a nil discharge site. In the unlikely scenario that mine water was not able to be pumped underground for storage, the Primary Water Dam (PWD) would be available to store water and has been designed with a substantial capacity (720 ML). As described in Table 2.1, the worst-case scenario for the PWD to reach full capacity is approximately 9.6 years. The mine would cease operation if the PWD was nearing capacity and water could not be pumped underground. The IPC and the DPIE must assess the project as put forward by the proponent, which excludes the possibility of discharging water. 2. As described in Section 15.5 of the Response to Submissions Report (EMM 2018) prepared for the project, the results of the dispersion modelling demonstrate that impacts from both the construction and operation of the project will be well below applicable air quality impact assessment criteria at all surrounding receptors. Predicted coal dust deposition levels from the operational coal mine, illustrated in Figure A5.8 and A5.12 of EMM (2018) are very low beyond the boundary of the project area and would not adversely impact upon the surrounding environment. 3. The Response to Submissions report (EMM 2018) also described the vast differences between Berrima Colliery and Hume Coal, and how they cannot be compared in terms of potential surface water impacts. As described, there is no long-term potential for the mine workings to release mine water to surface waterways from Hume Coal due to the fact that the mine is accessed via drifts, and these drifts are in the form of inclined tunnels down into the ground, rather than horizontal adits off a river bank as is the case at Berrima Colliery. This was clearly illustrated in Figure 8.2 of EMM 2018. Any comparison made by Dr Wright in relation to long-term water management at the project and Berrima Colliery are misleading and incorrect. 	<p>Response to submission Report section 15.5 (air quality) and section 16.1.4 and Figure 8.2 Berrima Colliery comparison) (EMM 2018).</p>

¹⁰ DPIE FAR paragraphs 291 and 292

¹¹ Australian Ground Water Modelling Guidelines pages 20-21

Table 4.1 Key matters raised in the public hearing

Theme	Matter/concern raised	Hume coal response	Further reference
		<p>4. The impacts of Tahmoor Mine on Redbank Creek referred to by Dr Wright are a result of longwall mining and the subsequent subsidence and fracturing of the overlying strata that occurs. Hume Coal is not a proposed longwall mine, and the impacts cannot be compared. The Hume Coal Project has been designed such that negligible subsidence will occur and fracturing of creeks will not result. The mine design was specifically chosen so as to not result in subsidence, avoiding potential impacts to creeks that occur at longwall mining operations like Tahmoor Mine.</p>	
3. Mine design and subsidence	<p>1. Risks of surface damage due to subsidence.</p> <p>2. Concerns relating to waste emplacement underground. No evidence that Hume Coal has conducted trials to confirm it will work. Only two coal mines have considered 100 percent underground emplacement – Metropolitan (after several years of testing) and one of Centennial Coal’s mines in the Lithgow area which didn’t go ahead due to complexity, cost and worker safety.</p>	<p>1. As per the response above, the project has been designed to specifically avoid subsidence by maintaining the strata overlying the mine. There are no material levels of subsidence predicted for the project.</p> <p>2. Underground mine backfill is a technology commonly used in metalliferous and coal mines. Managing these activities in proximity to the other mine activities is routinely done. The review by Galvin and Associates (2017) undertaken on behalf of DPIE (Galvin and Associates, 2017) notes that: “the disposal of coal washery rejects in underground mine workings is also an established mining practice internationally and in NSW that dates back decades”. Section 8.2 ii of the EIS (EMM 2017) states that the co-disposed reject pipeline will be constructed from the surface to the working parts of the mine and will incorporate one or more redundant lines to allow for continuous operation in the case of blockages, and allow for variable coal reject yields while maintaining pipe velocities within. If the co-disposed reject operations are interrupted, reject will be temporarily diverted to the temporary rejects stockpile for later processing.</p> <p>Chapter 16 of the Response to Submissions Report (EMM 2018) discusses the bulkhead design in detail which will contain the rejects.</p>	Rejects – Response to Submissions Report, Section 10.2.3 and Chapter 16 (EMM 2018).
4. Amenity and incompatible land uses	<p>1. Wrong location for a greenfield mine.</p> <p>2. Noise and dust impacts on residents along Medway Road.</p> <p>3. Noise and dust from trains in Robertson.</p> <p>4. Visual amenity impacts will affect the tourism industry and claims that this cannot be mitigated through tree planting.</p> <p>5. Impacts to emergency services and access due to increased trains over railway crossings in the area.</p>	<p>1. The suitability of the site for the project is addressed in detail in Section 6.7 of the Response to Submissions Report (EMM 2018). As described, the suitability of the site for the project is based on a number of factors, including the fact that NSW zoning rules (when considering the order of precedent between SEPP and LEP) permit underground mining in the project area. Approval by the NSW Government has been granted in this area for exploration activities since the mid 1950s. The fact there have been a granting of the right to explore with the intent to develop a coal mine in the area over a long period of time indicates the area is deemed suitable for coal mining activities, provided environmental impacts can be managed and mitigated. The site is well served by necessary services and infrastructure, particularly</p>	Response to Submissions Report (EMM 2018), Section 6.7, 17.6.2

Table 4.1 **Key matters raised in the public hearing**

Theme	Matter/concern raised	Hume coal response	Further reference
		<p>nearby rail infrastructure and associated industries and services in Port Kembla. A range of commitments have been made by Hume Coal to mitigate potential impacts on surrounding land uses. When these commitments are applied, the project is unlikely to have a significant land use impacts. Further, the Southern Coalfield is the only significant source of quality hard metallurgical coal in NSW. The remaining unallocated prime coking coal resources in the Southern Coalfield are in the Bulli and Balgownie seams underlying the Campbelltown-Camden-Picton region, and in the Wongawilli Seam in the southern part of the coalfield. Mine development in much of the Campbelltown-Camden-Picton area is constrained by its closeness to existing and planned urban areas. Conversely, the project area is in a rural area and has the substantial advantage of closeness to rail infrastructure that links directly to the Port Kembla coal terminal. The coal project seeks to draw on these positive features.</p> <p>2. As described in detail in the Response to Submissions Report (EMM 2018), the construction and operation of the mine will result in emissions well below applicable air quality impact assessment criteria at neighbouring sensitive receptors, including all residents along Medway Road.</p> <p>In relation to noise:</p> <ul style="list-style-type: none"> a) eight assessment locations (nine dwellings) within the area modelled are predicted to experience residual noise levels between 3 dB and 5 dB above project-specific noise levels (PSNL) as a result of the coal project and are therefore entitled to voluntary mitigation upon request; b) two assessment locations within the area modelled are predicted to experience residual noise levels greater than 5 dB above PSNLs as a result of the coal project and are therefore entitled to voluntary acquisition upon request; c) one residential location is predicted to be impacted by noise from the operation of trains on the Berrima Branch Line, above the trigger level for voluntary mitigation rights in accordance with VLAMP. <p>The implementation of voluntary mitigation measures or acquisition will be in accordance with the well established procedures under the NSW Government's VLAMP, and will enable impacts to be managed to an acceptable level.</p> <p>3. The noise assessment included network rail operations in the area of Robertson, finding that noise criteria is predicted to be satisfied in that locality at all sensitive receivers. In relation to dust, as the Hume Coal rail wagons will</p>	

Table 4.1 Key matters raised in the public hearing

Theme	Matter/concern raised	Hume coal response	Further reference
5. Social licence to operate	<ol style="list-style-type: none"> 1. No social licence to operate as demonstrated by the strong opposition to the project by the local community. 2. Proposed mine has already had a significant impact to residents of the Wingecarribee Shire. The threat of a new coal mine over 11 years has caused considerable distress to members of the community. 3. Suggested that landholders will refuse consent to Hume Coal to undertake surface activities, for example vent shaft construction. 	<p>be covered, there will be minimal fugitive coal dust emissions released as trains move from the mine site to port. Fugitive coal dust impacts from Hume Coal wagons will therefore be negligible at all locations along the rail corridor, including in the township of Robertson.</p> <ol style="list-style-type: none"> 4. See response below to item 9 – Tourism in this table. 5. As stated in the Response to Submissions Report (EMM 2018), Hume Coal acknowledges the concern of some community members relating to rail crossings. However, the additional delays at level crossings resulting from the extra Hume Coal trains will not lead to a significant increase in the total length of time each day when the affected level crossings will be closed to road traffic. Conversely, the extra delays at the crossings will be minor. <ol style="list-style-type: none"> 1. ‘Social licence’ is not a legal assessment criteria under any of the applicable law. 2. Hume Coal acknowledges the opposition to the project by some members of the local community. However, Hume Coal also acknowledges the support that other members of the community have provided to the project. It should be noted that Hume Coal legally owns a coal exploration licence, issued by the NSW Government, which allows the company to legally explore the viability of winning the coal, not only for the benefit of Hume Coal, but for the benefit of NSW. Based on the successful results of this exploration, Hume Coal has legally applied for development consent from the NSW Minister for Planning (now delegated to the Commission) for the right to win this coal. Hume Coal acknowledges that the Commission must determine the application for the project in accordance with the heads of consideration prescribed under the EP&A Act, which states, among other things, that the project must be in the public interest. As demonstrated in this report and all preceding reports prepared by Hume Coal’s independent experts, the project is considered to be in the interests of the public, despite opposition from some members of the local community. 3. Hume Coal acknowledges the extended approval process that has been, and continues to be, undertaken in seeking development consent for the Hume Coal Project, and the long period of uncertainty necessitated by this process. Hume Coal is seeking approval through the required legal process pursuant to the provisions of the EP&A Act and associated regulations and supporting guidelines. Considerable time has been spent analysing baseline monitoring results and preparing detailed technical studies so as to present a robust and comprehensive EIS, RTS and associated studies for consideration by relevant 	

Table 4.1 Key matters raised in the public hearing

Theme	Matter/concern raised	Hume coal response	Further reference
		<p>stakeholders and government agencies. Also, a significant amount of time has been taken by DPIE to process and assess the application. This process is unavoidable and is the same process that the proponent of any development requiring consent under the EP&A Act has to go through.</p> <p>4. Hume Coal own the majority of land upon which the surface infrastructure is proposed, and has entered into agreements for the rest.</p>	
5. Climate change/greenhouse gas and demand for coal.	<p>1. There is no need for a new thermal coal mine in NSW. NSW cannot afford new investment in fossil fuel supply projects and remain on track to meet greenhouse gas commitments. Need to transition to renewable energy. POSCO have committed to being carbon neutral by 2050 through hydrogen-based steel making.</p>	<p>1. The Hume Coal Project is an important part of the transition to hydrogen-based steel making, and therefore the transition to carbon neutrality. As noted at the public hearing, POSCO has committed to being carbon neutral by 2050, and the Hume Coal Project will enable the demand for coal to be met while the transition to hydrogen-based steel making occurs.</p>	
6. Employment	<p>1. There is a shortage of workers across the Southern Highlands, and therefore Hume Coal will not be able to source locals for employment as proposed.</p> <p>2. The number of workers to be employed by the project is significantly less than those in tourism.</p>	<p>1. Judith Stubbs and Associates (JSA) prepared a detailed report investigating the tourism industry in the region as part of the Response to Submissions Report (JSA 2017). This report was included as Appendix 5 to the Response to Submissions Report (EMM 2018). As described in JSA (2017), job types in the tourism industry generally differ markedly from the mining industry. ABS data on employment shows there are much higher proportions of professionals, technicians and trades workers, and machinery operators and drivers in the coal industry, with higher proportions of managers, community and personal service workers, sales workers, and labourers in the tourism industry (JSA 2017). The different skill sets targeted by the two industries means that they would not be expected to compete with each other for labour.</p> <p>Further, Hume Coal has received over 600 expressions of interest for employment opportunities at the mine – this is more than double needed.</p> <p>2. The results of the JSA analysis estimated a total of 1,510 direct tourism jobs in the Wingecarribee LGA, and 196 at a more local level (ie closer to the Hume Coal Project and Berrima Rail Project) in the Moss Vale-Berrima ABS Statistical Area Level 2 (SA2). By comparison, the Hume Coal Project is expected to provide 300 full time equivalent jobs. These mining jobs are likely to be higher earning, with median individual weekly income in coal mining more than \$2,000 per week compared to \$400-\$599 in tourism industries (JSA 2017a). While the mining jobs are of shorter duration than tourism jobs with an expected life of 19 years during the extraction of coal, this is offset by the greater value of these jobs.</p>	JSA 2017

Table 4.1 Key matters raised in the public hearing

Theme	Matter/concern raised	Hume coal response	Further reference
8. Economics	<ol style="list-style-type: none"> There will be little economic benefit to Australia due to Hume Coal being foreign owned, with profits to go overseas. 	<ol style="list-style-type: none"> The claim that there will be little economic benefit to Australia from the Project due to the foreign ownership of Hume Coal is incorrect. The foreign ownership structure of the project was fully taken into account in completing the economic assessment, as required by the Treasury Guidelines (NSW Government 2015). The net benefits of \$194 million from the project will flow entirely to NSW households. Included in this estimate is the share of any corporate taxes paid in Australia that can be attributed to NSW. Australia has a strict regime governing foreign investment in Australia which is overseen by the Foreign Investment Review Board. The operation of the Board, together with relevant State planning regulations are designed to ensure that foreign owned projects operating in Australia contribute a net benefit to Australians. POSCO Australia, the immediate parent of Hume Coal Pty Ltd, has a practice of re-investing all Australian profits back into other Australian projects, keeping the value within Australia. POSCO Australia's parent company, is the biggest single foreign, non-government entity purchaser of Australian goods. 	
9. Tourism	<ol style="list-style-type: none"> Potential impacts of the project on the tourism industry, which is well established and one of the key economic drivers for the Shire. It was also noted that Berrima won the top tourism town award (town under 5,000 people Berrima) in 2021. If the area becomes associated with coal mining 'it will lose its appeal'. 	<ol style="list-style-type: none"> It is acknowledged that the tourism industry in Berrima is important to the local economy. However, for the Hume Coal Project and Berrima Rail Project to have a significant impact on tourism, the impacts of these projects, and specifically visual and other amenity impacts, would need to be significantly greater than existing industrial uses in the Berrima area, including the substantial operations of Boral Cement at New Berrima and the Ingham feed mill. As mentioned above, JSA (2017) prepared a detailed report investigating the tourism industry in the region and the potential impacts of the project. In relation to visual impacts, the report concluded that it is unlikely visual impacts will adversely affect tourism industries given the spatial separation from tourist uses in the locality (with the exception of the Zen Oasis Vegetarian Restaurant); the generally transient experience of visual impacts by visitors to the locality; the context of the visual impacts in an area with significant man made industrial elements including the Hume Motorway and cement works; and the continued existence of tourism uses in the locality despite the existing visual impacts associated with industrial uses such as the Berrima Cement Works, the Hume Motorway and the Main Southern Railway. In relation to dust, the construction and operation of the mine will result in emissions well below applicable impact assessment criteria at neighbouring sensitive receptors, and therefore not anticipated to effect tourism. 	JSA 2017

Table 4.1 Key matters raised in the public hearing

Theme	Matter/concern raised	Hume coal response	Further reference
		<p>And finally in relation to noise, 12 identified sensitive receivers are predicted to experience noise above the relevant criteria. However, all of these receivers except one, the Zen Oasis Restaurant, are residential properties and not related to the tourism industry. Tourism related properties and facilities are generally remote from the mine site. Under the worst-case adverse weather conditions, Zen Oasis is predicted to experience a moderate noise impact of 3 to 5 dB above the relevant noise criteria, and will therefore be entitled to mitigation measures so that that this impact is mitigated to an acceptable level.</p> <ol style="list-style-type: none"> 2. In relation to the township of Berrima, as described in JSA (2017) and in the visual impact assessment prepared for the Project as part of the EIS (EMM 2017), none of the proposed works will be visible from the town due to intervening topography. With regards to lighting, it is noted that there is existing light pollution from the Boral Cement Works, about 2 km from Berrima. By comparison, the project surface infrastructure area is about 4 km from Berrima, and so could be expected to have a lesser impact than that of the cement works, which operates 24 hours per day, seven days per week. Further, as described by JSA, the large area proximate to Berrima and New Berrima is zoned for General Industrial use and prioritised for future industrial expansion as part of the Moss Vale Enterprise Zone. 3. JSA (2017) investigated the statistical relationship between mining and tourism employment across NSW and Australia to answer the question as to whether coal mining and tourism can co-exist. JSA found that a number of NSW LGAs with active coal mining (open cuts and underground) have significant employment in tourism industries, suggesting that the two uses are not incompatible. This includes the Hunter Valley region, Lake Macquarie, Wollongong and Lithgow. 	

5 Closing

The Hume Coal Project and Berrima Rail Project have been the subject of rigorous assessment for many years, both by the applicant, and the many technical specialists and expert independent peer reviewers engaged to undertake environmental, social, and economic assessments of the projects, as well as by DPIE and its expert independent peer reviewers.

The project has been carefully designed to minimise environmental and social impacts, particularly when compared to other mines and projects within the Southern Coalfields, such as the Tahmoor South Project which was recently approved by the Commission.

5.1 Project benefits

Great care has been taken in planning the project so that its design and operation minimises and mitigates potential environmental and social impacts. In particular, the Hume Coal Project's design includes features that exceed the normal practices used in Australian coal mines and go beyond minimum regulatory standards.

A range of physical, economic, and environmental attributes combine to make the project area suitable for the proposed underground mine and associated infrastructure. The project area is close to rail infrastructure that links directly to the Port Kembla coal terminal, which is currently an under-utilised asset that is ready to accept coal from the Hume Coal Project delivered via the Berrima Rail Project. This point was confirmed in the presentation by the PKCT representative at the public hearing. It is also partly within the Moss Vale Enterprise Corridor, an area established by the Wingecarribee Shire Council to encourage an increase in industrial, employment generating land uses in the area. Furthermore, the surface infrastructure area has been carefully situated on predominantly cleared land to avoid sensitive environmental features and is in an area with limited neighbouring sensitive receivers.

The project will enable the orderly and efficient development of a dormant publicly owned resource – Wongawilli Seam coal – which will be of significant benefit to the local and broader NSW communities. While the project has the potential to cause some adverse impacts, mitigation and/or compensation measures have been developed to address all of these and the net result is that residual impacts are considered to be minor. With all relevant factors considered, the associated benefits are considered to outweigh costs and the project is strongly justified.

The project, if approved, would provide a number of benefits including:

- **Provision of a high quality coking coal:** The Southern Coalfields is the only significant source of quality hard metallurgical or coking coal in NSW. Within the project area, coal deposits have been extensively explored by Hume Coal since 2011, gathering extensive and detailed geological and structural data as well as coal quality which demonstrates that the coal has all the necessary characteristics to produce a product that generally meets export coking coal specifications, and contains some highly attractive qualities such as ultra-low phosphorous.
- **Employment generation:** During construction, the project will employ a peak of 414 workers. At its peak, the mine will employ approximately 300 workers. This will provide substantial flow-on benefits to the region, particularly during the operational phase of the project as the workforce will be a residential workforce, from within a 45 minute commute to the mine site.
- **Economic benefits:** The proposed mine will generate direct and indirect economic benefits of \$290 million for NSW in net present value (NPV) terms at a real discount rate of 7% (or nominally around 9%). Royalty payments to the NSW government will total \$148 million in NPV terms at a real discount rate of 7%. Payroll tax and other state government duties, taxes and levies are additional benefits to NSW.

These benefits can be realised with minimal environmental and social impacts.

5.2 Project justification and evaluation

5.2.1 Significance of the resource

Internationally there is growing demand for coking coal, which is expected to rise from 318 Mt in 2019 to 421 Mt by 2040 (1.3% CAGR). This demand is expected to be driven by India as its population, particularly its middle class, expands and it rapidly urbanises.

Domestically, while the demand for coking coal declined through the 2000s, with imports increasingly displacing domestic supply, investment in the steelworks at Port Kembla and Whyalla is expected to drive an increased demand for metallurgical coal from 4.8 Mt in 2020 to 5.5 Mt in 2040 as output increases and efficiency improvements are made. This demand is expected to increase after the recent refusal of the Dendrobium Extension Project – noting though that this refusal is the subject of a legal appeal. Increased demand is likely to lead to an increase in the price of metallurgical coal. The Southern Coalfields is the only significant source of quality hard metallurgical or coking coal in NSW. Within the project area, coal deposits have been extensively explored and analysed for well over 60 years and particularly since 2011 by Hume Coal. The results show the coal has all the necessary characteristics to meet export coking coal specifications.

The remaining unallocated prime coking coal resources in the Southern Coalfields are in the Bulli and Balgownie Seams underlying the Campbelltown-Camden-Picton region, and in the Wongawilli Seam in the southern part of the coalfields. Further mine development in much of the Campbelltown-Camden-Picton area is constrained by its closeness to existing and planned urban areas. Conversely, the project area is in a rural area and has the substantial advantage of closeness to rail infrastructure that links directly to Port Kembla and the Port Kembla coal terminal. The project seeks to draw on these positive attributes and improve on the utilisation of the infrastructure.

Given its location and commonality with existing coal usage, coal from the Hume Coal Project and associated Berrima Rail Project are well placed to service the Port Kembla steel works when it looks to source new coal supply due to its freight advantage. In addition, the close proximity of the coal to the steel works allows for a timely delivery of product when BlueScope Steel lacks space and operates with a 'just in time delivery' process. BlueScope, the owner and operator of the steelworks at Port Kembla, has publicly warned of the risk to its viability if it cannot access local metallurgical coal for its steelmaking.

Other matters that can be used to determine the resource's importance for NSW are: employment generation, expenditure, including capital investment, and royalty payments to the state government. The resource's importance in light of these factors can be summarised as follows:

- Employment generation: at its operational peak the mine and rail project will provide approximately 300 full time equivalent positions during operations. Although not all of these will be additional because some will replace employment in other industries, the project's job creation effects will still be notable, especially as local residents will fill most operations jobs.
- Expenditure: capital expenditure will be around \$922 million and operating expenditure will be around \$1.65 billion over the life of the mine.
- Royalties: payments to the NSW government will total around \$148 million at today's value.

It is evident the project, which will develop a dormant publicly owned resource – Wongawilli Seam coal – will be of significant benefit to the local and broader NSW communities.

5.2.2 Economic justification

The project is justified economically due to the net economic benefits and the economic stimulus it will provide locally and to NSW.

A project is economically beneficial if its benefits exceed its costs measured in today's values (known as net present value or NPV). The total direct and indirect economic benefit of the Project for NSW is estimated at \$290 million in NPV terms, comprised as follows:

- royalty payments, which are estimated at \$148 million in NPV terms;

- net employment benefits being the additional disposable income that NSW residents will receive, as well as the shares of personal and company income taxes that will go to NSW, that is:
 - \$272 million of net disposable income benefits;
 - \$14 million of the NSW share of personal income taxes;
 - \$45 million of the NSW share of company income taxes; and
- incremental payroll taxes, council rates and various levies, amounting to around \$20 million.

To determine the net or after cost benefit, costs associated with GHG emissions, and the foregone agricultural value added due to land being removed from agricultural production, estimated at \$0.9 million, need to be deducted, giving a net figure of \$290 million.

Further, train operations on the Berrima Branch Line associated with existing rail users represents 59% of the practical operating capacity of the line, or 38% of the maximum line capacity. The additional Hume Coal trains will increase the line's operations to 77% of the practical operating capacity (50% of the maximum line capacity) on the busiest days. The upgrade to the Berrima Junction will enable this increased use of the existing rail infrastructure, including the ARTC-controlled sections of railway, resulting in a higher financial return from this infrastructure.

5.2.3 Social justification

A comprehensive SIA was prepared for the project and documented within the EISs. Notwithstanding this, in accordance with a recommendation from the IPC in its Independent Planning Assessment Report, the SIA was revised to align with guidelines on the preparation of SIAs that DPIE released after the EISs were prepared. Accordingly, the social impacts of the projects have been comprehensively addressed for all four phases of its development and operations.

The first phase covers planning, feasibility and approvals. During this phase positive social impacts outweigh negative ones. There has been a modest increase in local job opportunities of about 17 positions (direct employees of Hume Coal), and some strengthening of the skills base of the local workforce from Hume's apprenticeship and traineeship programs. Up to \$450,000 a year has been spent during the planning and approvals phase on the Hume Coal apprenticeship program and the Hume Coal charitable foundation.

In relation to the potential negative social impacts associated with this initial phase, the revised SIA addresses the generation of stress and anxiety in relation to the projects raised in submissions to DPIE and the IPS. Hume Coal acknowledges the extended approval process that has been, and continues to be, undertaken in seeking development consent for the Hume Coal Project and Berrima Rail Project, and the long period of uncertainty necessitated by this process. Hume Coal is seeking approval through the required legal process pursuant to the provisions of the EP&A Act and associated regulations and supporting guidelines. Considerable time has been spent analysing baseline monitoring results and preparing detailed technical studies so as to present a robust and comprehensive EIS for consideration by relevant stakeholders and government agencies. This process is unavoidable and is the same process that the proponent of any development requiring consent under the EP&A Act has to go through.

During the construction phase positive impacts will also outweigh negative ones. About 414 FTE positions will be created at the mine when the construction workforce is at its peak (in just under a year from the start), and the rail project will create approximately 40 additional FTE positions. Although this will be generally beneficial, the specialised nature of the jobs means that most will not be filled by locals. The potential adverse impacts associated with the influx of construction workers, such as the crowding out of tourist and other short-term accommodation, will be avoided by building an on-site accommodation village for all construction workers.

The operations phase will be the longest and of greatest consequence. The main benefit will be the provision of about 300 FTE long-term jobs at the mine and 16 associated with rail operations, most of which will be filled by locals, and the economic stimulus which will be injected into the area from greater local expenditure on goods and services. Other benefits will be skills improvements through training and continued investments in community facilities from funding provided by Hume Coal through a VPA or similar mechanism. The residual environmental impacts that have not been able to be avoided will be managed and mitigated to achieve the standards specified by regulators and, as such, none will be unacceptable. Notably, and as discussed above, a detailed make good strategy has been prepared and included in this IPC response report which demonstrates that a credible pathway exists to 'make good' each bore that is predicted to be influenced by the project.

The final closure and relinquishment phase is the only one where there will be net social costs overall. This outcome will be caused by the loss of jobs and reduced economic activity in the area, although the Hume Coal Project will leave a legacy of a more skilled workforce and substantially upgraded community facilities as a result of funding via the VPA or similar mechanism.

In summary, the project has social merit. For three of its four phases, there will be significant net positive social outcomes largely due to four management measures: local procurement and workforce recruitment; a social impact management plan to ensure effective implementation; a VPA or similar mechanism; and a construction accommodation village for non-local all workers during construction.

5.2.4 Environmental justification

Great care has gone into planning both the Hume Coal Project and associated Berrima Rail Project so that the design achieves leading practice in most respects. From an environmental perspective, the design avoids most potential environmental impacts. The Hume Coal Project's design has features that exceed the normal practices used in Australian coal mines and go beyond minimum regulatory standards, particularly:

- A low impact underground coal mine that employs a mining method resulting in negligible subsidence. This has the dual benefits of avoiding both surface disturbance and impacts to the groundwater system that are typically associated with underground mining systems that induce caving of the overburden. It thus greatly reduces surface impacts and the volumes of groundwater that would otherwise be intercepted in the active mine workings.
- Progressively sealing panels with bulkheads after extraction and reject backfilling, which allows water to be injected and the early recovery of groundwater levels.
- Rejects will be placed underground, removing the need for a permanent surface emplacement.
- Full and empty coal wagons travelling to and from the mine will be covered.

In summary, the Hume Coal Project design adopts leading practice in the coal industry and avoids most potential environmental impacts, and where unavoidable (or residual) impacts occur they will be effectively managed to meet the applicable regulatory standards. It then follows that no impact deemed unacceptable by a regulatory agency will occur, meaning the project is justified from an environmental perspective.

As previously stated, the Hume Coal Project has minimal environmental impacts, particularly when compared to other projects and mines within the Southern Coalfields, including the Tahmoor South Project which was recently approved by the IPC.

5.2.5 Ecologically sustainable development

A comprehensive assessment of the Project against the principles of ESD as defined within the NSW *Protection of the Environment Administration Act 1991* has been undertaken by Hume Coal and presented in the response to the IPC's Independent Assessment Report. This assessment of ESD concluded that the Hume Coal Project and Berrima Rail Project are consistent with the objectives of promoting ESD, including the precautionary principle.

5.3 Comparison to Tahmoor South Project

While the Hume Coal Project and Berrima Rail Project are justified in their own rights, their justification (particularly the Hume Coal Project) can be supported when considering the justification that DPIE provided for another SSD mining project in the Southern Coalfields – the Tahmoor South Project. However, what is surprising is that while the Hume Coal Project and Berrima Rail Project have significantly less impacts than those of the Tahmoor South Project, DPIE recommended approval of Tahmoor South, but recommended refusal of Hume Coal and Berrima Rail.

There is no doubt that the Tahmoor South Project should have been recommended for approval by DPIE. While it will have a range of potential environmental and social impacts, those impacts are significantly outweighed by the benefits of the Hume Coal project. By comparison though, the potential environmental impacts of the project are considered to be minor compared to those of the Tahmoor South Project. It is the view of Hume Coal and its independent advisors that the benefits of the project significantly outweigh its impacts. Therefore, based on a comparison with the Tahmoor South Project, it is Hume Coal's view that the project should have been recommended for approval by DPIE.

5.3.1 Subsidence

In its assessment report for the Tahmoor South Project, DPIE notes that the maximum total conventional subsidence from extraction of the longwalls is 1,600 mm, with maximum tilts of 10.5 mm/m and conventional strains of around approximately 2.4 mm/m tensile and 4.2 mm/m compressive. It also notes that additional non-conventional ground movement would also likely occur, due to near surface geological conditions, steep topography and valley related movements.

DPIE notes that up to 1,458 houses may experience subsidence related impacts associated with the Tahmoor South Project, including 108 houses which may require minor cosmetic repairs, 28 houses which may require substantial serviceability and structural repairs, and seven houses which may require a re-build.

For comparison, the Hume Coal Project will have imperceptible, if any, subsidence impacts. As described previously, a mining system will be used that specifically avoids subsidence impacts across the project area. The mining method leaves pillars of coal in place so that the overlying strata is supported, rather than collapsing into the mined-out void, and therefore surface subsidence impacts will be negligible. The protection of the overlying strata ensures that overlying aquifers, surface features and houses will be protected.

Accordingly, no houses are expected to experience subsidence related impacts associated with the Hume Coal Project.

5.3.2 Groundwater bores

In its assessment report of the Tahmoor South Project, DPIE notes that 46 privately-owned registered bores would experience a drawdown in excess of the 2 m drawdown criterion of the NSW Aquifer Interference Policy (AIP) as a result of the project alone. It states that of these bores, 22 bores are predicted to experience a 2-5 m drawdown, eight bores are predicted to experience a 5-10 m drawdown and 16 bores are predicted to experience a drawdown of 10 m or greater. DPIE also acknowledges that there are a number of additional bores that could be impacted as a result of cumulative impacts from Tahmoor South, Tahmoor North and other nearby mining operations such as Bulli Seam Operations (BSO). The number of bores impacted by cumulative mining operations is predicted to exceed 200.

When presenting its potential impacts on bores, Tahmoor Coal reported that, while 46 privately-owned registered bores could experience a drawdown in excess of 2 m, in reality, the majority of the bore users would not experience any noticeable impacts. Tahmoor Coal stated that the predicted impacts on groundwater bores were conservative for two reasons – that groundwater modelling is conservative and normally over-predicts potential impacts, and that a drawdown in a bore would not necessarily be noticed by users given the depth of bores and availability of groundwater cover in that bore. Tahmoor Coal stated that while groundwater modelling for operations at Tahmoor North had predicted that over 72 privately-owned registered bores would experience a drawdown in excess of the 2 m drawdown criterion of the AIP, only two of those bores actually required make-good arrangements. Accordingly, based on this risk-based assessment, Tahmoor Coal stated that only 10 privately-owned registered bores have a high risk of requiring make good provisions as result of Tahmoor South.

Of those bores that potentially require make-good, Tahmoor Coal put forward a make-good strategy that is very similar to that of Hume Coal's. This included, where required, paying the costs for extra pumping, lowering pumps within groundwater bores, or providing an improved pump, deepening a bore or drilling a new bore, or providing an alternative water supply.

Overall, DPIE accepted that the number of bores predicted to be impacted by the Tahmoor South Project and potentially requiring 'make-good' provisions was manageable and recommended conditions that would ensure any impacts are appropriately monitored, managed and compensated via a well understood, feasible and equitable process.

For comparison, groundwater modelling undertaken for the Hume Coal Project indicates that 84 privately-owned registered bores would experience a drawdown in excess of the 2 m drawdown criterion of the AIP based on 50th percentile results. Based on 67th percentile results, this would increase to 94 bores. This is considerably less than those predicted to be cumulatively impacted by Tahmoor South, Tahmoor North and BSO, and comparable to those modelled to be impacted by Tahmoor North alone.

Modelling indicates that most of the bores predicted to be impacted (about 79%) by the Hume Coal Project may experience a maximum drawdown of less than 15 m. As with modelling undertaken for the Tahmoor South Project and Tahmoor North, the modelling for the Hume Coal Project is likely to be conservative and overpredict actual impacts. As such, actual impacts on bores are likely to be far less than those predicted by modelling.

As stated above, Hume Coal have put forward a make good strategy that is similar to that of Tahmoor Coal's. That is, when and if required, paying the costs for extra pumping, lowering pumps within groundwater bores, or providing an improved pump, deepening a bore or drilling a new bore, or providing an alternative water supply.

About a third of the bores predicted to be impacted by the project may incur additional operational costs associated with a lower groundwater level and will not require any further measures (ie will not require bore pump intake deepening or replacement). Another third are assessed as potentially needing submersible pump intake depths repositioned for a certain period of time depending on the duration of drawdown. The final third are assessed as potentially requiring bore replacement or an alternative source of supply.

5.3.3 Mine inflows

It was predicted that that there would be a peak of 2,900 megalitres per annum (ML/a) of groundwater flows into operations at the Tahmoor South Project toward the end of the operational life of the project. While Tahmoor Coal currently does not have enough licences to account for this maximum groundwater take, it was able to demonstrate that there is sufficient entitlement to purchase the required water licences from the market.

For comparison, it is predicted that the maximum volume of inflows for the Hume Coal Project is 2,066 ML/a in Year 17 of operations. This is a conservative prediction as it represents the water physically taken from the mine (at the sump for operations), plus water that moves into the sealed and down-dip void areas but remains in the mine workings (void).

As stated before, Hume Coal's mine design is considered a non-caving design tailored to ensure long-term stability of the columns and therefore protect the overlying formations from fracturing, avoid surface subsidence and minimise short-term impacts to the groundwater system, and ensure that in the long-term, the groundwater water levels fully recover.

Hume Coal has already acquired the vast majority (93%) of its groundwater licence requirements. The outstanding volume (7%) equates to approximately 150 ML which would be easily obtainable from the market.

5.3.4 Surface water

The Tahmoor South Project will mine directly below a number of streams and creeks which are tributaries to the Bargo and Nepean rivers. It was estimated that because of subsidence, fracturing may result in the loss of flows in those streams and creeks. Modelling undertaken by Tahmoor Coal indicated that, of the 62 pools within streams located above the proposed longwalls, around 15 pools could be impacted. Tahmoor Mine provided evidence that where streams and creeks are impacted from fracturing and base flow losses, these could be remediated based on successful works undertaken in Myrtle and Redbank creeks.

For comparison, as a result of the mine design and the protection of the overlying strata, the Hume Coal Project will not have any impacts on overlying surface water features such as streams or creeks. The only impact that the project is expected to have is a temporary 0.8% reduction in the catchment area of the Medway Rivulet, in which the surface infrastructure area of the mine will be located.

5.3.5 Mine water discharges

Tahmoor Coal currently discharges water from its operations at a licenced discharge point. Modelling for the Tahmoor South Project indicated that the project would discharge higher volumes of water compared to existing operations at Tahmoor North. As a result, Tahmoor Coal committed to installing and operating a new water treatment plant at the mine to treat and control discharges.

For comparison, the Hume Coal Project has been designed to avoid any discharges from the site. Detailed water balance modelling undertaken for the Project demonstrates that surface infrastructure, such as the primary water dam, has enough capacity to contain all surplus water and treatment and release of water from the dam into surrounding surface water features is not required.

5.3.6 Biodiversity

The Tahmoor South Project is predicted to result in the clearance of 24.3 ha of native vegetation, including 10.1 ha of a vegetation community that is listed as a critically endangered ecological community (CEEC) under both the NSW *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). These impacts will be fully offset by Tahmoor Coal.

For comparison, only 64 paddock trees will be removed by the Hume Coal Project and Berrima Rail Project. In particular, no CEEC would be removed as a result of the projects. In addition, impacts to the trees will be fully offset. A potential offset site has been identified on Hume Coal's land (containing an area of 32 ha) which would meet the offset requirement of the projects.

5.3.7 Greenhouse gas

It is estimated that the Tahmoor South Project would generate a maximum of around 21 Mt of carbon dioxide-equivalent (CO₂-e) Scope 1 and 2 greenhouse gas emissions (GHGEs) over the life of the project.

For comparison, the Hume Coal Project and Berrima Rail Project would generate a maximum of around 1.73 Mt of CO₂-e Scope 1 and 2 GHGEs over the life of the projects.

The Hume Coal Project and Berrima Rail Project will also offset all of its Scope 1 fugitive GHGE by undertaking tree planting on Hume Coal owned land. Hume Coal has already planted about 4,000 trees. The exact rate of planting per year would be determined based on the results of ongoing monitoring of fugitive mine gas from the operational ventilation outlet. However, it is anticipated that a planting rate of between 1 to 2 ha per year would be required to completely offset project Scope 1 fugitive GHGE.

5.3.8 Economics

It is estimated that the Tahmoor South Project would provide wide-ranging benefits for the local and State economies, including ongoing employment of approximately 400 people at Tahmoor Mine for about 10 years, with an additional 50 to 175 people employed during construction. The project is expected to generate NPV benefits to NSW of over \$664.9 million, with a total estimated net benefit of \$137.5 million to local suppliers and employees in the local area. In its assessment report, DPIE stated that the economic benefits of the Tahmoor South Project to the State and region would be significant.

For comparison, the Hume Coal Project and Berrima Rail Project would also provide wide-ranging benefits for the local and State economies, including employment of about 300 people for about 23 years for the mine, with an additional 414 people during construction of both projects. The projects are expected to generate NPV benefits to NSW of \$290 million (if employment benefits and taxes are included), with a total estimated net benefit of \$59 to \$80 million in NPV terms to local suppliers and employees in the local area.

Accordingly, while the quantum of benefits in NPV terms are not as large as those for the Tahmoor South Project, the Hume Coal Project and Berrima Rail Project will still provide significant positive economic benefits to the State and region. It is also important to recognise that environmental benefits come at a cost and direct comparisons are not always easy, which is the purpose of the cost benefit analysis that attempts to enable such analysis by costing the environmental costs. Hume Coal's cost benefit analysis is positive, which means that the benefits outweigh the costs.

5.3.9 Summary

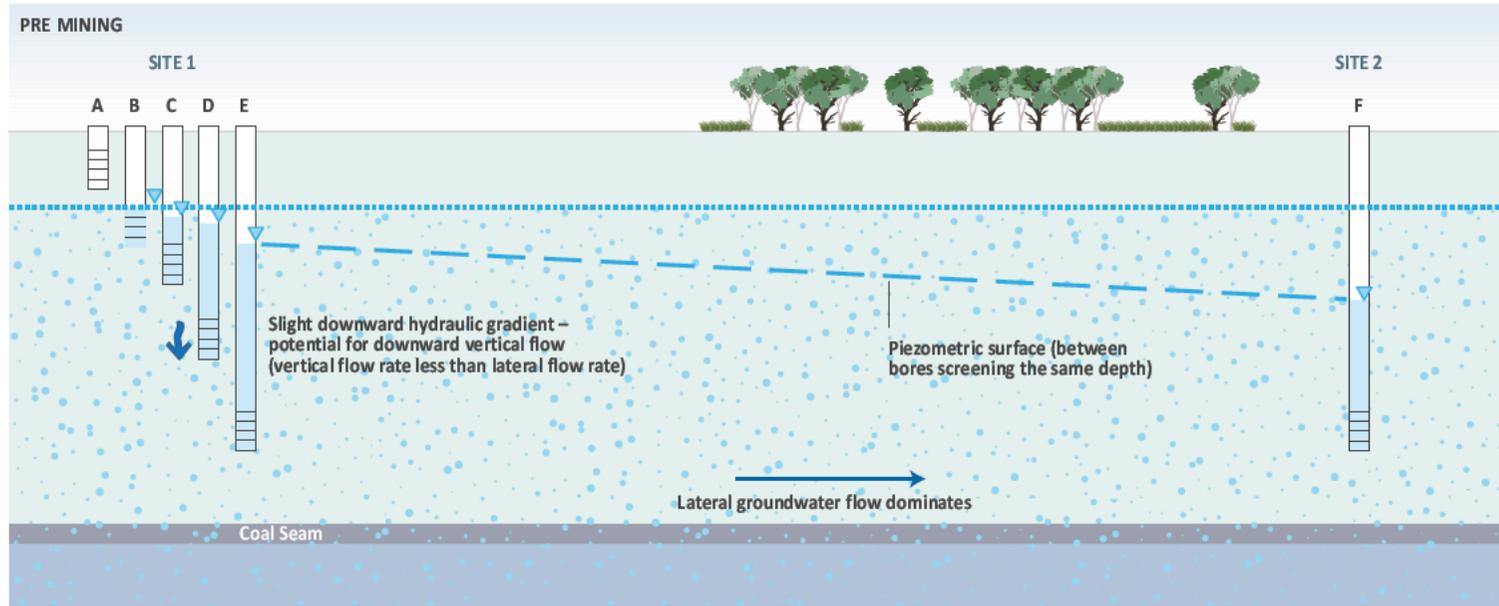
The Hume Coal and Berrima Rail Project would have considerably less impacts than those of the Tahmoor South Project. In particular, the Hume Coal Project would have negligible subsidence and subsidence related impacts compared to those of Tahmoor South, particularly impacts on houses and streams. The Hume Coal and Berrima Rail Project would have less impacts on biodiversity and will generate significantly less Scope 1 and 2 GHGs. In addition, it is expected that all Scope 1 fugitive GHGs from the Hume Project will be offset.

The Hume Coal Project is predicted to have considerably less impacts on privately-owned bores when compared to impacts from cumulative operations at Tahmoor South, Tahmoor North and BSO, and comparable to those modelled to be impacted by Tahmoor North alone. Notwithstanding this, for the same reasons reported by Tahmoor Coal, actual impacts from the Hume Coal Project are likely to be less than those predicted due to the conservative nature of groundwater modelling and the AIP 2 m minimal impact consideration criteria drawdown criteria. As previously stated, while 72 bores were modelled to be impacted at Tahmoor North, Tahmoor Coal has reported that only two bores were required to be made good.

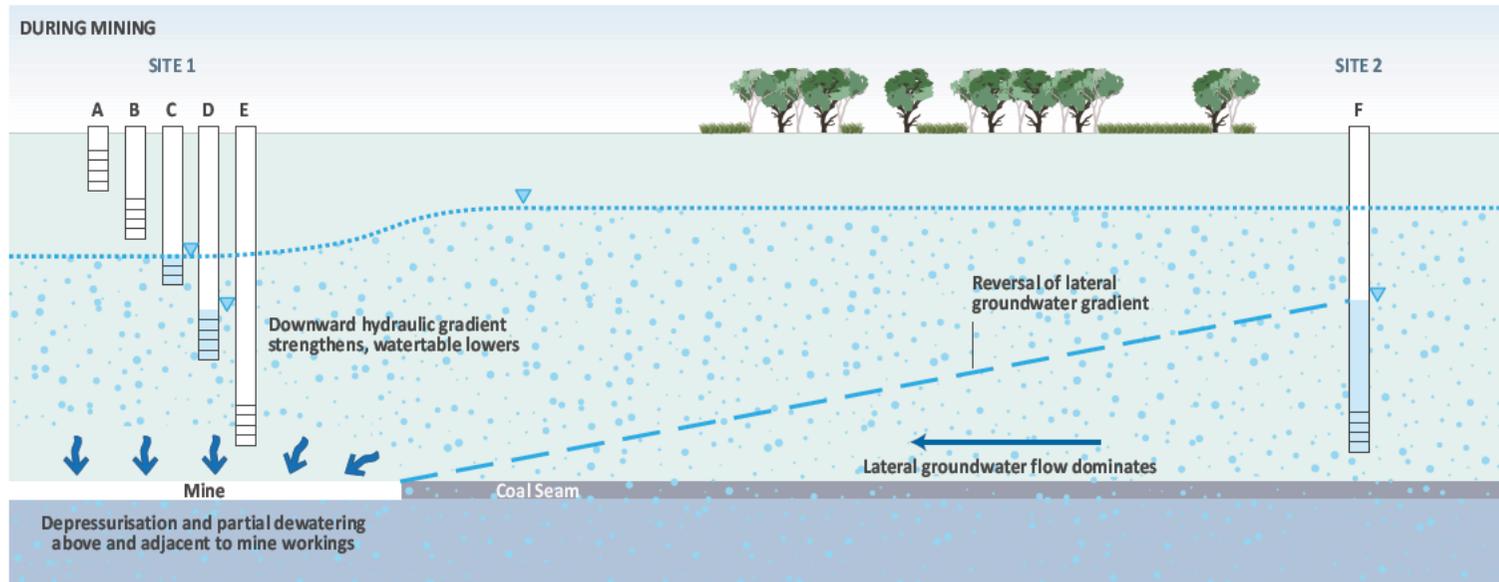
Further, the schematic in Figure 5.1 illustrates the manner in which depressurisation of a groundwater source can occur without dewatering. Although bores above the mine will be depressurised (ie experience drawdown), the formation will remain saturated throughout mining and bores will continue to operate, albeit at a lower pressure head and likely at a lower yield. As observed at Tahmoor and the Berrima Colliery, saturation within the Hawkesbury Sandstone above the mine remains despite mining of a coal seam(s).

The Hume Coal and Berrima Rail Project would provide employment of about 300 people for about 23 years for the mine, with an additional 414 people during construction of both projects compared to the Tahmoor South Project which provide ongoing employment of 390 people at Tahmoor Mine for about 10 years, with an additional 50 to 175 people employed during construction.

Both projects will provide net economic benefits to the local and State economies, although Tahmoor South will provide more. This is directly related to the amount of coal left in the ground at the Hume Coal Project to minimise environmental impacts, particularly the subsidence and subsidence related impacts.



- KEY**
- Hawkesbury Sandstone
 - Saturated ground
 - Watertable
 - Infiltration



Hydraulic head in bores schematic pre-mining and mining
 Hume Coal Project
 Updated water assessment
 Figure 5.1

6 References

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Appendix A

Review of independent expert reports by Bruce Hebblewhite

B.K. HEBBLEWHITE B.E.(Min.) PhD
Consultant Mining Engineer

B K Hebblewhite Consulting
ABN 85 036 121 217

██████████
BALGOWLAH NSW 2093
AUSTRALIA

Mobile: ██████████
Email: ██████████

21st June 2021

Attn: Mr Rod Doyle
Project Manager
Hume Coal Project

Report No. 2008/01.2

Review of Independent Expert Reports by Professors Galvin and Canbulat (Sept/Oct 2020)

1. Scope

As requested by you in your email of 15 June 2021, I have prepared this report, No. 2008/01.2, as a brief, independent summary review of the proposed Hume Coal mine plan and a response to the two reports prepared by Galvin & Associates Pty Ltd (*GAPL*) and Dr Ismet Canbulat, that formed part of the DPIE's Assessment Report (FAR) released in June 2021, prior to a further Hearing on the Hume Coal Project in front of the Independent Planning Commission (IPC) at the end of June 2021. The specific reports are as follows:

- GAPL Letter Report, dated 2 September 2020 (Appendix D1 to FAR);
- Canbulat Report No. DPIE-HUME-2020-2, dated 26 October 2020 (Appendix D2 to FAR).

The above two reports were prepared for the NSW Department of Planning, Industry and Environment (DPIE). These reports were prepared, including a response to the reports of myself (Report No. 2008/01.1) and Dr Russell Frith of Mine Advice (Report No. HUME22/3), dated 21 August 2020 and 22 August 2020 respectively. It appears that these two Hebblewhite and Mine Advice reports had not previously been provided to GAPL and Canbulat at the time that they made their earlier submissions to the IPC. This apparent communication failure has been directly acknowledged, at least by Canbulat, in his most recent report.

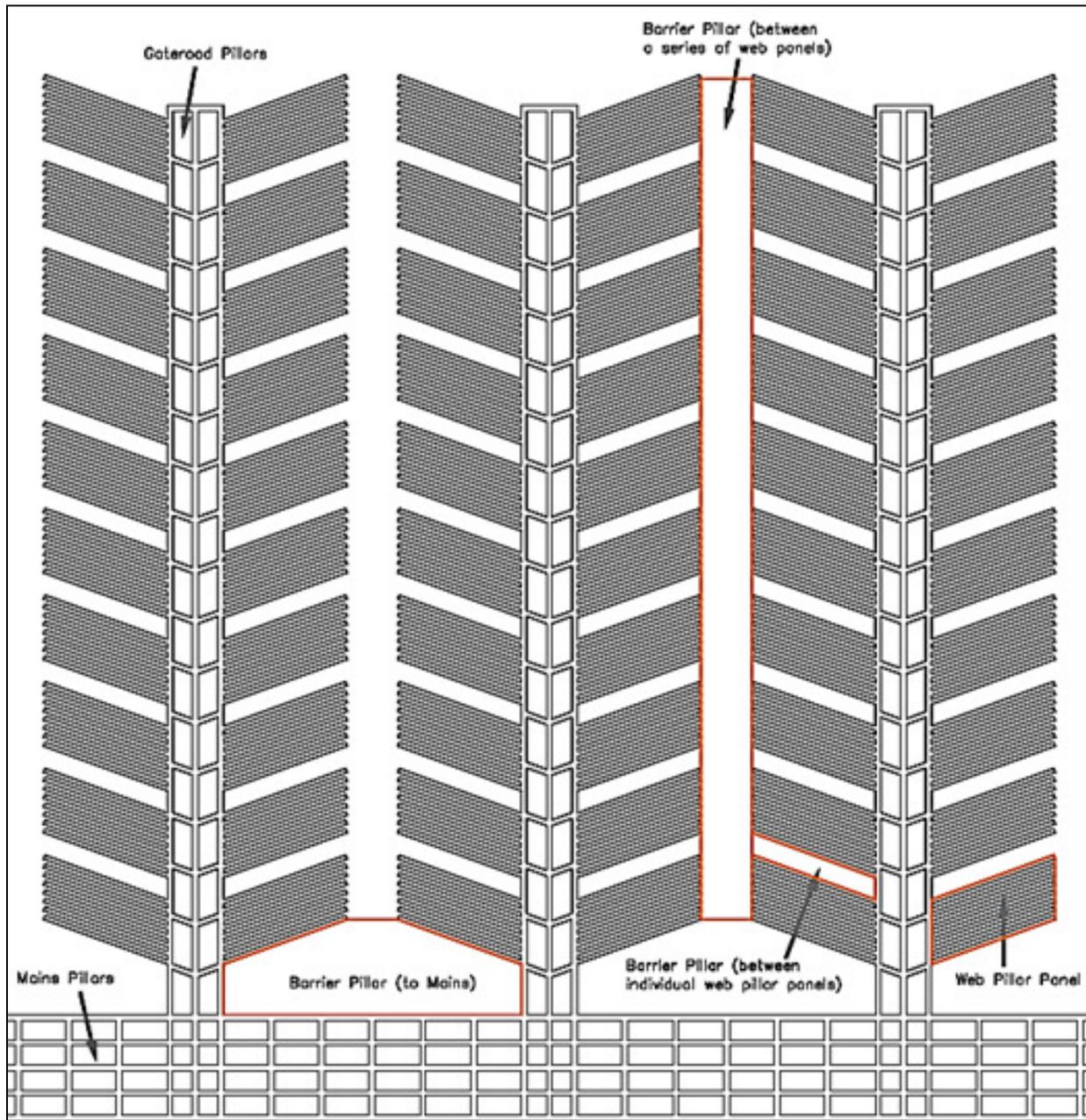
Professors Galvin and Canbulat had previously been retained by DPIE as subject-matter experts to advise on relevant technical (mining-safety) aspects of a project proposal submitted by Hume Coal to DPIE for approval.

The author of this current report, Bruce Hebblewhite, has been retained by Hume Coal as an independent reviewer for the Hume Coal Project (*“the Project”*), in relation to mining/geotechnical issues of the project.

Dr Russell Frith (Mine Advice) has been retained by Hume Coal for the purposes of development of their proposed mine design for the Project (primarily focused on geotechnical issues).

2. Background

The following generic diagram of the proposed pine feather mining method and description details are included here for background context only, including reference to the pillar system naming convention.



The proposed pine feather mining technique is a novel method, involving some innovative aspects of mine design and layout. It has been designed with the objective of minimising surface

subsidence and impact on overlying groundwater aquifers within the overburden. The method has been designed to also provide underground wastewater storage capacity in mined-out areas.

For clarity, the various pillar types referred to by Hume Coal in the pine feather system include the following:

- a) Web pillars – narrow pillars between adjacent parallel roadways within a production web pillar panel;
- b) Intra-Panel Barriers or Barrier Pillars – between each successive web pillar panel;
- c) Inter-Panel Barrier Pillars – solid pillars between each twin series of web pillar panels off a set of central gateroads;
- d) Gateroad Pillars – development pillars between the central three development gateroads;
- e) Mains Barrier Pillar – protective barrier between production panels and main development panel.

3. Summary Review of GAPL and Canbulat Reports

I have structured these summary review comments under the headings of points of general agreement (with the position put forward by Hume Coal, and in particular, with my previous report (Hebblewhite (2020)), and residual points of disagreement.

3.1 Points of General Agreement

There is a good level of agreement between both GAPL and Canbulat and myself (and Hume) which is an encouraging result that should inform the IPC in their deliberations. I note the main areas of agreement below:

- GAPL (page 1) states: *“Professor Hebblewhite (the Proponents review) and I are in reasonably close agreement on many of the issues other than some aspects of the numerical modelling”*.
- GAPL (page 2) states: *“Provided the intra-panel pillars remain stable, web pillar stability is not essential for controlling surface subsidence to manageable levels”*.
- Further to the above point, GAPL had previously noted (in 27 June 2020 report) that: *“intra-panel stability should be able to be effectively controlled by modifying pillar widths at the time to maintain compliance”*.
- In the same June 2020 report, GAPL also noted that: *“the pine-feather mining technique as proposed has flexibility to mine the area and meet the objectives of the proposed plan”*.
- Returning to the current GAPL Report under review, GAPL (page 4) states: *“Professors Hebblewhite, Canbulat and Galvin agreed early on that numerical modelling was required to estimate the load acting on the various coal pillars making up the mine design LaModel was the appropriate code for this purpose”*.
- GAPL Concluding Remarks (page 7) states: *“The proposed mining method is amenable to utilising changes in panel and pillar dimensions as an effective engineering controls for implementing the mining method such that it safely delivers target hydrogeological and surface subsidence objectives. However, these are very likely to have negative implications for resource recovery and financial performance”*.
- Canbulat (page 1) states: *“It is my opinion that the majority of those issues (discussed in previous reports) are being addressed and/or studied by Hume Coal to achieve a layout that is robust and safe”*.
- Canbulat (pages 5 and 6) agrees with the statement by me that all empirical pillar strength formulae and design approaches (including both empirical and numerical) involve some degree of approximation and so are not likely to be 100% accurate.

- Canbulat (page 6) agrees with me that making minor changes to empirical strength calculations within a regional stability modelling exercise is unlikely to result in significant changes in design. He further comments that although regional stability may not change, there may be some safety concerns with local stability.
- Canbulat (pages 6,7) agrees that the numerical modelling, even with the complete removal of one full set of web pillars, demonstrated regional stability.
- Canbulat (page 7) agrees with my statement that: *“The mining system incorporates a high degree of flexibility, whereby, as the need arises, both web pillar widths and intra-panel pillar widths could be increased in localised conditions at the time, and/or plunges eliminated in order to provide effective control”*.
- Canbulat further agrees (page 7) with my statement that: *“Once the project proceeds to more detailed feasibility and design stages, further risk assessments will be conducted which can address geotechnical and other issues in greater detail, leading to the development of appropriate risk-based management plans in order to ensure adequate responses are in place to all perceived risk factors”*, with the proviso that such further risk assessments are not solely reliant on the current modelling results.
- Canbulat (page 9) states: *“I am satisfied with the back-analysis of Berrima having studied the data provided in Mine Advice Report”*. (Note: GAPL has still not fully accepted the use of the Berrima back-analysis as a complete and appropriate means of calibration of the Hume numerical model).
- Canbulat (page 9) states: *“Mine Advice goes on to list a total of five steps to manage the risks associated with the proposed layout. I concur with the proposed steps”*.
- Canbulat (page 10), in his concluding remarks, states: *“I generally concur with the points put forward by Prof. Hebblewhite to seek agreement, and Mine Advice’s proposed steps to manage the risks associated with the proposed layout”*.

3.2 Residual Points of Disagreement

It is clear that the areas of residual disagreement remain as they were discussed in my August 2020 report. They are essentially of a very technical nature, associated with the numerical modelling project undertaken by Hume.

- In particular, the disagreements are associated with, firstly, the choice of pillar strength formula used to derive pillar Factors of Safety.

- The second fundamental area of disagreement is in the use of an elastic-perfectly plastic constitutive law in the modelling study, as opposed to using a strain-softening constitutive law that would allow pillar elements to yield/fail if load exceeds strength.
- Canbulat has agreed above that regional stability (which was the objective of the modelling study) is unlikely to change with minor changes to the modelling parameters as indicated. His and GAPL's major concern is with localised stability issues.
- As noted in the Russell Howarth & Associates Report (April 2020) discussing residual issues of disagreement – concerns over local stability or instability and the impacts of web pillar failures or associated windblasts and other local hazards are not dissimilar to any secondary pillar extraction mining system that takes place at multiple operations in the industry and is managed by robust operational risk management plans.
- One point of error in the GAPL Report is raised here. GAPL reports on p6 that Professor Hebblewhite has advised that "*It is recommended that the modelling be re-run using strain-softening elements to represent the coal seam*". In fact, I did not make such a recommendation. I was reviewing the points made in the earlier Canbulat report and stating the view put forward by Canbulat that such modelling be re-run. I then provided my comments on that view.

4. Concluding Remarks

As indicated above, there is a considerable level of agreement between GAPL/Canbulat and the position put forward by Hume and discussed previously by myself and Mine Advice.

- Both GAPL and Canbulat have acknowledged that the proposed mining system meets the overall objectives of regional stability and surface subsidence control/management.
- Both GAPL and Canbulat agree that the system is inherently a very flexible mining system and has provision for minor changes to the detailed panel and pillar design (either during more detailed planning stages, or in fact, during operations) in order to ensure ongoing compliance with objectives and management of safety.
- It has also been agreed by both that further risk assessments would and should take place, once the project is approved and allowed to proceed beyond the current feasibility stage into more detailed design and development of a rigorous set of operational risk management systems.
- In the same context as further risk assessments should take place, once approval is granted and the project is allowed to move forward to the next stage of development, so too, further detailed design of the mine layout should also take place, using any updated geotechnical data and potentially further geotechnical design studies. It would be the logical and appropriate professional response to the current issues raised, that these issues be given further consideration when this next design stage of the project takes place. It is not considered appropriate to pursue such further detailed design studies, prior to the granting of approval to the project to proceed. This level of further design is typical of any new mining project and normally occurs well after the initial project approval is granted to proceed.
- In relation to specific concerns about localised mine stability and associated safety concerns, such things are of critical importance to Hume Coal as a responsible mine operator, and again, would be driven by appropriate future risk assessments, development of operational management systems including monitoring, supervision and management practices. This detailed level of activity is also under the control of the Resources Regulator, once the project proceeds further. It is significant to note that the Chief Inspector of Mines (Mr Garvin Burns), speaking on behalf of the NSW Resources Regulator, has already indicated that the proposed mining system can be assessed as would any other form of secondary extraction, at the appropriate time.

A handwritten signature in black ink, appearing to read "Bruce Hebblewhite", written in a cursive style.

Bruce Hebblewhite
21st June 2021

APPENDIX A

Attached is a summary Curriculum Vitae for the author of this report, Bruce Hebblewhite. Bruce has worked within the Australian mining industry from 1977 to the present time, through several different employment positions. Throughout this period, he has been actively involved in all facets of mining industry operations. In addition, he has visited and undertaken consulting and contract research commissions internationally in such countries as the UK, South Africa, China, Indonesia, New Zealand and Canada. For the majority of his 17-year employment period with ACIRL Ltd he had management responsibility for ACIRL's Mining Division which included specialist groups working within both the underground and surface coal mining sectors, and the coal preparation industry– actively involved in both consulting and research in each of these areas.

In his most recent permanent employment position with The University of New South Wales, Bruce was involved in academic management, undergraduate and postgraduate teaching and research, and contract industry consulting and provision of industry training and ongoing professional development programs – for all sectors of the mining industry – coal and metalliferous, both national and international.

Both past substantive employment positions required regular visits, inspections and site investigations throughout the Australian mining industry, together with almost daily contact with mining industry management, operations and production personnel.

On his retirement from UNSW at the end of December 2020, Bruce was appointed as a Professor Emeritus to UNSW Sydney (an ongoing honorary appointment).

Throughout his consulting career which continues to the present time, Bruce has maintained contacts with the mining industry and mining profession and an ongoing connection with the School of Minerals & Energy Resources at UNSW Sydney and is involved in a number of ongoing industry research projects.

SUMMARY CURRICULUM VITAE

Bruce Kenneth Hebblewhite

Consultant Mining Engineer & Principal, B K Hebblewhite Consulting

DATE OF BIRTH 1951

NATIONALITY Australian

QUALIFICATIONS

1973: Bachelor of Engineering (Mining) (Hons 1) School of Mining Engineering, Uni. of New South Wales

1977: Doctor of Philosophy, Department of Mining Engineering, University of Newcastle upon Tyne, UK

1991: Diploma AICD, University of New England

PROFESSIONAL MEMBERSHIPS; APPOINTMENTS; AWARDS & SPECIAL RESPONSIBILITIES

Fellow - Australasian Institute of Mining and Metallurgy

Member - Australian Geomechanics Society

Member – Society of Mining and Exploration Engineering (SME), USA

Member - International Society of Rock Mechanics (President – Mining Interest Group (2004 – 2011))

Emeritus Member - Society of Mining Professors (SOMP) (President (2008/09); Council Member (2006 - 2018; 2020 - present); Secretary-General (2011-2018))

Executive Director – Mining Education Australia (July 2006 – December 2009)

Chair, Governing Board – Mining Education Australia (2015)

Member, Branch Committee – AusIMM Sydney Branch (2017-2019)

Expert Witness assisting Coroner: Coronial Inquest (2002-2003): 1999 Northparkes Mine Accident.

Chair: 2007-2008 Independent Expert Panel of Review into Impact of Mining in the Southern Coalfield of NSW (Dept of Planning & Dept of Primary Industries).

Expert Witness assisting NSW Mines Safety Investigation Unit – Austar Mine double fatality, April 2014.

Member (2012 – 2019): Scientific Advisory Board, Advanced Mining Technology Centre, Uni. of Chile.

Trustee (2013 – 2020): AusIMM Education Endowment Fund.

Member (2020 – present): Independent Advisory Panel for Underground Mining, NSW Dept of Planning, Industry & Environment (DPIE).

2012 Syd S Peng Ground Control in Mining Award (SME (USA)) – “*in recognition of his long and distinguished career conducting research, providing instruction and applying practical solutions in the field of ground control*”.

2017 Ludwig Wilke Award (Society of Mining Professors) – “*for his pioneering work as a researcher, his accomplishments as a global educator, and his leadership and vision as Secretary-General of the Society of Mining Professors (SOMP)*”.

2017 Rock Mechanics Award (SME (USA)) – “*for his significant contribution as an educator, researcher and consultant in rock mechanics and ground control*”.

2020 AusIMM Institute Medal – “*for contributions to the mining industry and profession through education, research and training*”.

2021 – Professor Emeritus, University of New South Wales

PROFESSIONAL EXPERIENCE

1995 - present	<u>B K Hebblewhite Consulting</u> Consultant Mining Engineer & Principal
2014 – 2020	<u>University of New South Wales, School of Minerals & Energy Resources Engineering</u> (formerly School of Mining Engineering) Professor of Mining Engineering (p/t)
2003-2014	<u>University of New South Wales, School of Mining Engineering</u> Head of School and Research Director, (Professor, Kenneth Finlay Chair of Rock Mechanics (to 2006); Professor of Mining Engineering (from 2006))
2006 – 2009	<u>Mining Education Australia</u> (a national joint venture between UNSW, Curtin University of Technology, The University of Queensland & The University of Adelaide) Executive Director (a concurrent appointment with UNSW above).
1995-2002	<u>University of New South Wales, School of Mining Engineering</u> Professor, Kenneth Finlay Chair of Rock Mechanics and Research Director, UNSW Mining Research Centre (UMRC)
1983-1995	<u>ACIRL Ltd</u> , Divisional Manager, Mining - Overall management of ACIRL's mining activities. Responsible for technical and administrative management of ACIRL's Mining Division covering both research and consulting activities in all aspects of mining and coal preparation.
1981-1983	<u>ACIRL Ltd</u> , Manager, Mining - Responsibility for ACIRL mining research and commissioned contract programs.
1979-1981	<u>ACIRL Ltd</u> , Senior Mining Engineer - Assistant to Manager, Mining Research for administrative and technical responsibilities. Particularly, development of geotechnical activities in relation to mine design by underground, laboratory and numerical methods.
1977-1979	<u>ACIRL Ltd</u> , Mining Engineer Project Engineer for research into mining methods for Greta Seam, Ellalong Colliery, NSW. Also, Project Engineer for roof control and numerical modelling stability investigations.
1974-1977	<u>Cleveland Potash Ltd</u> , Mining Engineer and <u>Department of Mining Engineering, University of Newcastle-upon-Tyne, UK</u> - Research Associate. Employed by Cleveland Potash Limited to conduct rock mechanics investigations into mine design for deep (1100m) potash mining, Boulby Mine, N Yorkshire (subject of Ph.D. thesis).

SPECIALIST SKILLS & INTERESTS

- Mining geomechanics
- Mine design and planning
- Mining methods and practice
- Mine safety and training
- Mine system audits and risk assessments
- Mining education and training