



Dartbrook Mine

Modification 7
Submission to the Independent Planning Commission

for

Australian Pacific Coal Ltd

April 2019

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DARTBROOK MINE
MODIFICATION 7

SUBMISSION TO THE INDEPENDENT PLANNING COMMISSION

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1 INTRODUCTION

1.1 BACKGROUND

AQC Dartbrook Management Pty Limited (AQC) is the proprietor of the Dartbrook Mine, located in the Upper Hunter Valley of New South Wales (NSW). Dartbrook Mine is authorised by Development Consent DA 231-7-2000 granted under the *Environmental Planning and Assessment Act 1979* (EP&A Act). DA 231-7-2000 was granted on 28 August 2001 and has been modified on six occasions. DA 231-7-2000 allows for underground longwall mining and associated surface activities to be carried out until 5 December 2022. No mining activities have been conducted at Dartbrook Mine since it was placed under care and maintenance by the previous owner in December 2006.

AQC seeks to modify DA 231-7-2000 to authorise an alternative method of underground mining, an alternative coal clearance system and an extension of five years to the approved period of mining (the Modification). The application to modify DA 231-7-2000 is made under the former Section 75W of the EP&A Act.

The Modification has been referred to the Independent Planning Commission (IPC) for determination. The IPC has been provided with the *Dartbrook Coal Mine – Modification 7 Assessment Report* (DP&E, 2019) (Assessment Report) to consider in its determination. The IPC also held a public meeting on 9 April 2019 to further inform its determination.

The NSW Land and Environment Court (LEC) has recently delivered judgments in two cases involving mining proposals:

- *Gloucester Resources Limited vs Minister for Planning*[1] (Rocky Hill Case); and
- *Australian Coal Alliance Incorporated vs Minister for Planning*[2] (Wallarah 2 Case).

Both these judgments were delivered after the completion of the AQC's environmental impact assessments and publication of the Assessment Report.

1.2 EXISTING DEVELOPMENT CONSENT

DA 231-7-2000 currently provides approval for the following activities at Dartbrook Mine:

- Longwall mining operations in the Mt Arthur, Kayuga, Piercefield and Wynn coal seams;
- Extraction of up to 6 million tonnes per annum (Mtpa) of run of mine (ROM) coal;
- Transportation of ROM coal from the mine workings to the East Site using the existing Hunter Tunnel (an underground passageway);
- Processing of ROM coal using the existing Coal Handling and Preparation Plant (CHPP) at the East Site;

[1] [2019] NSWLEC 7
[2] [2019] NSWLEC 31

- Transportation of product coal to Newcastle by rail; and
- Employment of up to 292 full-time equivalent personnel (employees and contractors) during mining operations.

DA 231-7-2000 enables these activities to be undertaken until 5 December 2022.

1.3 THE MODIFICATION

The Modification proposes the following:

- Bord and pillar mining activities within the Kayuga Seam (as an alternative to the approved longwall mining activities in that seam),
- An alternative coal clearance system for transporting ROM coal from the underground mine workings to the East Site; and
- Extending the approval period under DA 231-7-2000 by 5 years (until 5 December 2027).

The alternative coal clearance system involves the haulage of ROM coal from the Kayuga Entry to a new shaft facility located along the Western Access Road. ROM coal will be transported using fully enclosed road registered trucks along existing roads owned by AQC. The shaft facility will deliver coal from the surface to the existing Hunter Tunnel. Conveyors in the Hunter Tunnel will then transfer coal under the New England Highway and Great Northern Railway Line to the East Site.

The components of the Modification are conceptually illustrated in **Figure 1**.

1.4 DOCUMENT PURPOSE AND STRUCTURE

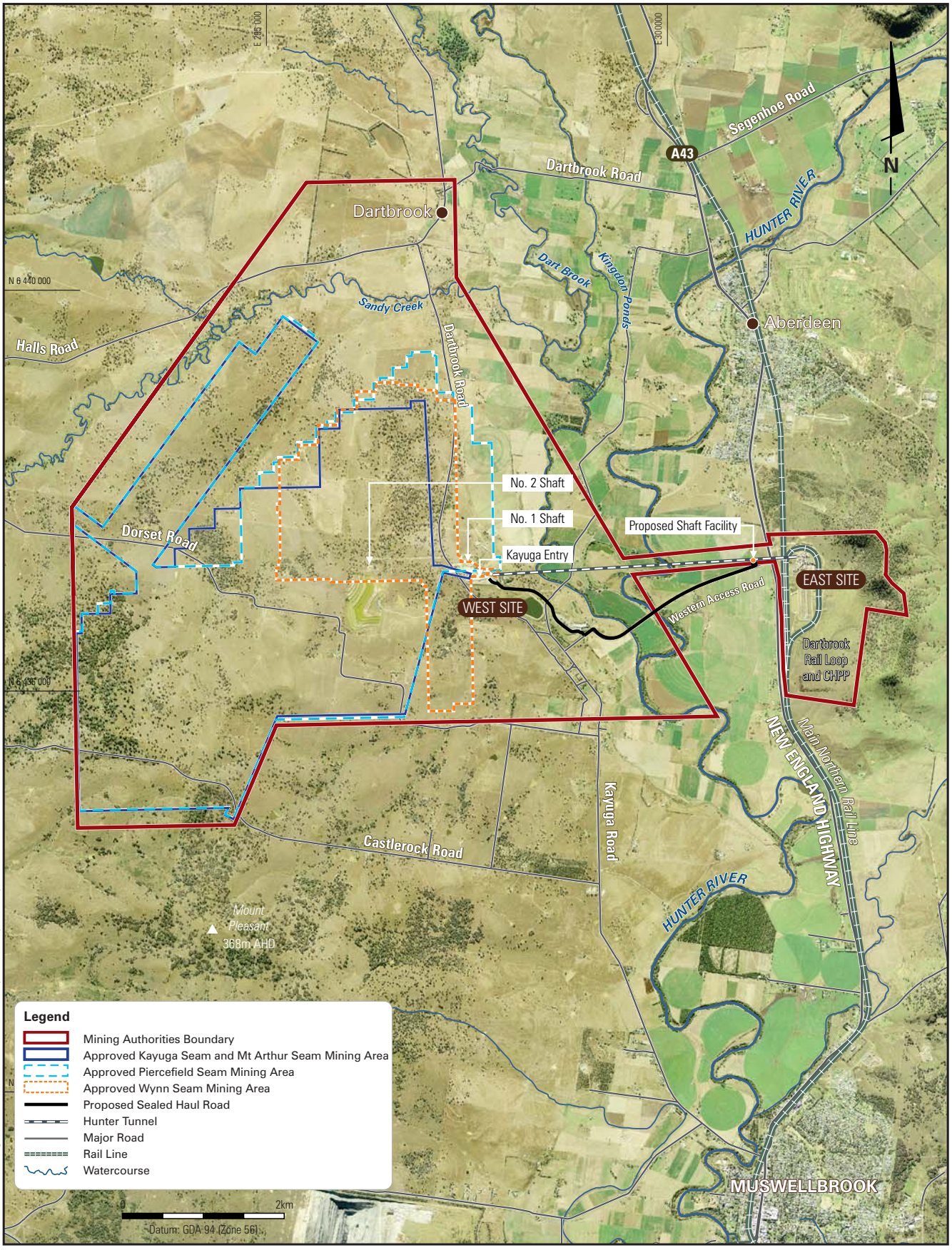
The purpose of this submission is to provide additional information to assist the IPC in its determination of the Modification. This submission clarifies the scope of the Modification and confirms that it is within the ambit of Section 75W of the EP&A Act.

This submission has considered the presentations given by speakers at the public meeting, which included legal and scientific matters. This submission identifies the matters that are relevant to the determination of the Modification having regard to its scope. Responses are provided to the key relevant issues raised in verbal submissions. AQC reserves its right to respond to written submissions, when these are made publicly available.

This submission also considers the recent judgments in the Rocky Hill Case and Wallarah 2 Case in the context of the determination of the Modification.

This document is structured as follows:

- **Section 2** summarises the application process for the Modification to date and defines the scope of the determination decision;
- **Section 3** considers the relevant principles of the Rocky Hill Case and Wallarah 2 Case;
- **Section 4** addresses the relevant issues raised by speakers at the public meeting.



HB DARTBROOK Underground MOD7 Post RTS 1774 F1 Conceptual Development Layout 07 11 2018

DARTBROOK MINE

Conceptual Development Layout

FIGURE 1

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2 APPLICATION PROCESS

This section summarises the assessment process completed to date, defines the scope of the Modification and discusses the appropriate considerations in its determination.

2.1 ASSESSMENT DOCUMENTATION

The Modification is sought under the former Section 75W of the EP&A Act. The application to modify the Development Consent was lodged on 27 February 2018, supported by the *Dartbrook Mine Modification 7 Environmental Assessment* (Hansen Bailey, 2018a) (EA). The EA included experts' reports on the key environmental planning issues relevant to the Modification. The Secretary of DP&E did not notify any Environmental Assessment Requirements in respect of the Modification.

The EA was placed on public exhibition from 28 June to 25 July 2018. During the public exhibition period, a total of 54 submissions were received from regulatory authorities, special interest groups, private enterprises and individuals. The NSW Office of Environment and Heritage (OEH) and Resources Regulator provided submissions after the specified submissions period. Issues raised in submissions were addressed in the *Dartbrook Mine Modification 7 Response to Submissions* (Hansen Bailey, 2018b).

Following extensive testing of the proponent to ensure that the identification and quantification of all of the environmental impacts and socio-economic benefits resulting from the Modification had been conducted in accordance with NSW policies and guidelines, the Secretary of DP&E published an Assessment Report on 23 January 2019. The Assessment Report concluded that:

> *"On balance, the Department considers that the modification's benefit would outweigh its costs and that the modification would improve the overall viability of the mine by enabling underground mining operations to recommence, thereby allowing its potential social and economic benefits to be realised. Importantly, many of the modification's impacts are reduced in comparison to the existing consent".*

The EA, RTS and Assessment Report are before the IPC for its consideration.

2.2 DETERMINATION PROCESS

On 25 January 2019, the Modification was referred to the IPC for determination of the Section 75W application. The IPC held a public meeting on 9 April 2019 to allow interested parties to express their views on the Modification. A total of 45 speakers presented at the public meeting including 5 speakers in support and 40 speakers in opposition. The majority of the objecting speakers were engaged by or affiliated with the horse racing industry, which has a documented history of opposing coal mining developments in the Hunter Valley and Mid-Western Region of NSW.

The IPC, as the determining authority, must be satisfied that the Modification is within the bounds of Section 75W of the EP&A Act. The power under Section 75W has been considered by the LEC in *Billinudgel Property Pty Ltd v Minister for Planning*[3]*, Barrick Australia Ltd v Williams*[4]*,* and *Meriton Property Services Pty Ltd v Minister for Planning and Infrastructure*[5]. These judgments conclude that a change to an approved development that does not 'radically transform' that development is within the bounds of Section 75W.

AQC consulted with DP&E prior to making the modification application and was advised that the appropriate form of application is a request for modification under Section 75W. Section 3.1 of the Assessment Report confirms DP&E's view that the Modification is within the scope of Section 75W.

Section 4.15 of the EP&A Act lists the considerations that are relevant to the determination of a development application. In the case of *Oboodi v Hornsby Shire Council*[6], the LEC held that Section 4.15 of the EP&A Act also applies to proposed modifications.

In *Meriton Property Services Pty Ltd v Minister for Planning and Infrastructure*[7], the LEC stated that "*The test for the resulting development as modified is "Is it acceptable?" It is not something that requires us to seek or endeavour to impose design nirvana."* The relevant merit consideration is whether the modification itself, as well as the modified development, is acceptable.

The Modification consists only of the activities outlined in **Section 1.3**. A detailed description of these activities was provided in Section 4 of the EA.

In *Oboodi v Hornsby Shire Council,* Commissioner O'Neill states that "*The Court must consider the matters under s 4.15 of the EPA Act relevant to the aspects of the development to which the modification application relates (1643 Pittwater [51]). The whole of the original consent is not open to reassessment."* Accordingly, only the impacts of the activities listed in **Section 1.3** are relevant considerations. The impacts of the approved activities are not required to be reconsidered, as was asserted by some presenters at the public meeting.

[3] [2016] NSWLEC 139 and in particular paragraphs 53 to 61

[4] (2009) 74 NSWLR 733; [2009] NSWCA 275

[5] [2013] NSWLEC 1260

[6] [2018] NSWLEC 1512

[7] [2013] NSWLEC 1260, 72.

3 RECENT LEGAL JUDGMENTS

This section considers the principles expressed in the Rocky Hill Case and Wallarah 2 Case and explains whether these are applicable to the Modification.

3.1 ROCKY HILL CASE

3.1.1 Relevance to the Modification

The Rocky Hill Case concerned a development application for a new State Significant Development (SSD) under Division 4.7 of Part 4 of the EP&A Act. The proposal in the Rocky Hill Case was for a new open cut mine. In contrast, the Modification is an application under the former Section 75W of the EP&A Act to modify an existing underground mining development.

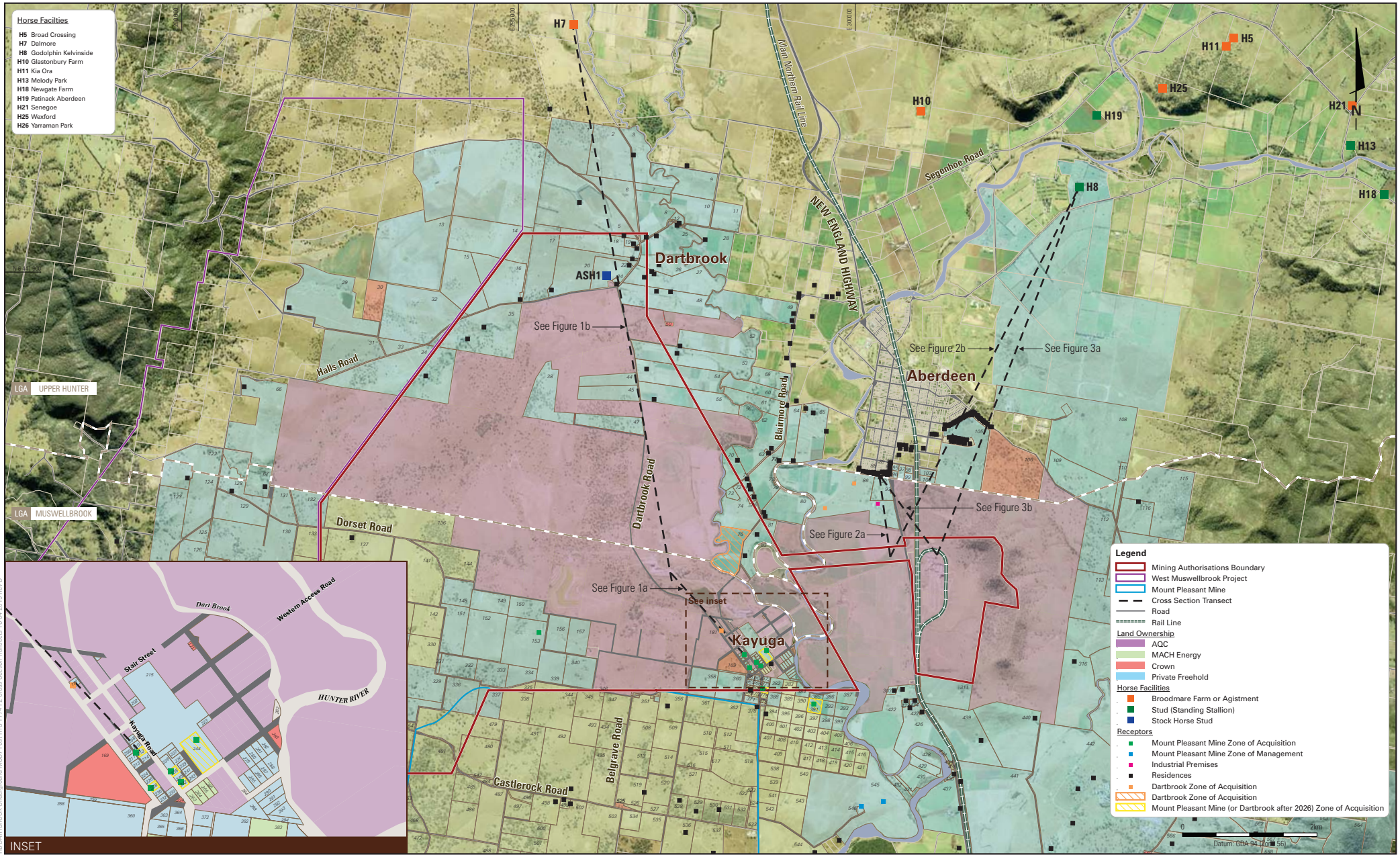
The issues involved in the assessment of the Modification differ materially from those in the Rocky Hill Case. His Honour was required to consider the benefits and detriments of the Rocky Hill Coal Project and determine whether the proposal is, on balance, in the public interest. In determining the Modification, the IPC is required to consider the benefits and detriments of the proposed modification rather than the development as a whole. As explained in *Oboodi v Hornsby Shire Council,* the benefits and detriments of the approved development are not required to be reassessed.

In the Rocky Hill Case, his Honour discussed the applicability of certain environmental effects to the determination of an application under the EP&A Act.

3.1.2 Cumulative Visual Impact

The potential visual effects of the Modification were discussed in Section 2.1.8 of the RTS. Being an underground mine, the visual impact of Dartbrook Mine is limited to surface infrastructure, the majority of which is already extant. The only additional surface infrastructure proposed by the Modification is the proposed shaft facility approximately 200 m west of the New England Highway. The proposed shaft facility will be similar in scale and appearance to agricultural sheds, which are prevalent in the region. The IPC visited the recently constructed Garoka Dairy Shed adjacent to the proposed shaft facility which features and size are similar to the proposed shed enclosure be constructed for the Modification. It is also worth noting that the shed enclosure for the proposed shaft facility will be dwarfed by the neighbouring industrial structures, including the concrete batching facility located north of the Western Access Road.

Visual cross-sections have been prepared to assess the visibility of the components of the Modification from receptors in Aberdeen, Kayuga and the nearest thoroughbred horse breeding establishments. **Figure 2** shows the transects that are being assessed. The cross-sections are presented in **Appendix A.** As shown in cross-sections 2A and 2B, the proposed shaft facility will not be visible from the nearest residences in Aberdeen or the Kelvinside Stud (owned by Godolphin). The proposed shaft facility will be screened from these receptors by intervening topography.



HB DARTBROOK Underground MOD7 Post RTS 1774 F2 Cross Section Transects 16 04 2019 Rev D

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Overview of Cross Section Transects

FIGURE 2

Cross-sections 1A and 1B represent the views of the proposed Kayuga Entry stockpile from Kayuga and Dalmore Stud. These cross-sections show that the proposed stockpile will be screened by natural topography and the existing visual bunds. It should be noted that a similar stockpile was established at the same location during the temporary truck haulage conducted between 2001 and 2004.

Cross-section 3A shows that the existing crushing station at the East Site is not visible from Kelvinside Stud due to intervening topography. Cross-section 3B shows that the existing crushing station is screened from Aberdeen by topography and vegetation, in particular, a 75 ha forestry plantation established in conjunction with Forests NSW between 2003 and 2005. It should be noted that the crushing station is an existing structure and its visual appearance will not be altered as a result of the Modification.

Several verbal submissions at the public meeting suggested that the truck movements along the private haul road may result in significant visual impacts. The worse-case visual impact of these truck movements will be a brief (one to two second) view for motorists travelling along the New England Highway. The magnitude of the impact is mitigated by the speed of motorists (100 km/h) and the existing tree screens along the western side of the highway.

The proposed haul trucks will be similar to road-registered trucks that are prevalent along the region's road network. For context, approximately 2,335 trucks per day travel along the New England Highway near the proposed shaft facility. Of these background movements, approximately 1,613 occur between the hours of 7.00am to 6.00pm, Monday to Friday (RMS 2018).

Dartbrook Mine is located north of Bengalla Mine and Mount Pleasant Mine, and north-west of Muswellbrook open cut mine. Parts of these mines may be visible from certain locations along the New England Highway and Main Northern Rail Line. Accordingly, these mines contribute to 'cumulative visual impacts', as described by the LEC. However, it must be noted that Bengalla Mine, Mount Pleasant Mine and Muswellbrook Coal Mine are open cut mines. Open cut mining involves surface voids and overburden emplacement areas (OEAs), which contrast with the natural landscape. Given that Dartbrook Mine is an underground mine, the Modification will not result in impacts of this nature. Compared to mining voids and OEAs, the proposed 6 m diameter shaft and its shed enclosure will occupy a much smaller proportion of the view and will not contrast with the surrounding landscape. Accordingly, the contribution of the Modification to the cumulative visual impact is negligible.

3.1.3 Cognitive Mapping

The concept of 'cognitive mapping' recognises that some individuals may perceive there to be a visual impact, even if there is no actual direct impact.

The only visual effects of the Modification are the trucks travelling along the private road and the shed enclosure adjacent to the New England Highway. These elements of the Modification will be visible, albeit limited to brief glimpses from the highway. Given that these are actual impacts, cognitive mapping has no applicability to the Modification.

3.1.4 Noise Emergence

In the Rocky Hill Case, his Honour stated that even though a proposed development may comply with the recommended noise criteria, mine-related noise may 'emerge' from the background noise level in certain circumstances. In the Rocky Hill Case, the background noise level for private receivers was less than the minimum assumed background level in the Noise Policy for Industry (EPA, 2017) (NPI). The NPI recommends noise criteria based on a minimum background level of 30 dBA. 'Noise emergence' was an issue in the Rocky Hill Case because background noise levels were very low (<30 dBA). In the area surrounding Dartbrook Mine, the background noise level is influenced largely by traffic noise along the New England Highway (average of 2,335 trucks/day with 1613 trucks/day occurring between the hours of 7.00am to 6.00pm, Monday to Friday).

3.1.5 Greenhouse Gas

In the Rocky Hill Case, Justice Preston explained that the consent authority is required to consider the likely environmental impacts of the proposed development. His Honour held that this requires consideration of not only Scope 1 and 2 greenhouse gas (GHG) emissions but also Scope 3 emissions.

An assessment of the potential Scope 3 GHG emissions associated with the Modification was undertaken by ERM (see **Appendix B**). ERM considered all categories of Scope 3 emissions including upstream emissions generated by production of electricity and fuel, as well as downstream emissions due to coal transportation and combustion.

The following GHG impacts are related to the Modification:

- Emissions associated with bord and pillar mining over the remaining mining period (until 5 December 2027); and
- Emissions associated with longwall mining during the proposed five year extension to the approved project duration (i.e. from 5 December 2022 until 5 December 2027).

ERM considered the scope 3 emissions that may result from longwall mining over the period from 1 January 2021 to 5 December 2027. The assumed start date is the earliest that longwall mining could reasonably be re-instituted at Dartbrook Mine given the lead time required for the requisite mining equipment. Although annual emissions were calculated for this 7 year period, only the emissions during the proposed five year extension are relevant to the Modification. Nevertheless, emissions for the potential duration of longwall mining are presented in **Appendix B** for completeness.

Bord and Pillar Mining

Scope 1 and 2 emissions associated with bord and pillar mining were assessed in Section 8.9.1 of the EA. The total Scope 3 emissions over the duration of the Modification are presented in **Table 1**. Year by year emissions estimates are presented in **Appendix B**.

The values in **Table** 1 are the potential Scope 3 emissions due to coal produced by bord and pillar mining commencing in 2021. The total coal reserve for the bord and pillar mining option is 10 Mt, consistent with the assessments undertaken to date.

Extension of Mining Duration

The GHG impacts associated with the proposed five year extension of mining are the emissions that would occur from 5 December 2022 to 5 December 2027. The worst case impact of the proposed extension is represented by the recommencement of longwall mining. The total Scope 3 emissions associated with the five year extension are presented in **Table 1**. Year by year emissions estimates are presented in **Appendix B**. These calculations have assumed the maximum approved production rate of 6 Mtpa of ROM coal, which would yield approximately 4.5 Mtpa of product coal.

Table 1
Predicted Scope 3 Emissions Associated with the Modification

Activity	Scope 3 Emissions (Mt CO2-e)	
	Bord and Pillar Mining	**Extension of Mining**
Upstream generation of electricity	0.037	0.12
Upstream fuel production	0.002	0.005
Rai transportation of coal	0.032	0.072
Shipping of coal	0.68	1.52
End use of thermal coal*	39.4	88.5
Total Scope 3 Emissions	40.1	90.2
Average Annual Scope 3 Emissions	5.01	18.1

** Emissions from the combustion of thermal coal will constitute Scope 1 emissions for electricity generating developments in the countries that import coal produced by the Modification.*

DA 231-7-2000 authorised the carrying out of longwall mining over a 21 year period. To date, only five years of mining (2001 to 2006) has been carried out under the Development Consent. Even with the five year extension proposed by the Modification, the total duration of longwall mining will be at most 12 years, which is substantially less than the 21 years of mining that was originally approved. Consequently, total coal production from Dartbrook Mine, comprised of completed mining and the Modification, will be within the quantity originally approved under DA 231-7-2000. Therefore, the actual GHG emissions associated with Dartbrook Mine will be substantially less than the total emissions for the approved mine.

Furthermore, the Modification does not involve any change to the approved mining footprint. All of the coal that will be targeted by the Modification is already approved for extraction. As such, the Modification does not result in any additional Scope 3 GHG emissions. The only change attributable to the Modification is the timeframe that these impacts will occur. If Dartbrook Mine had progressed as originally approved, emissions would have been accounted for under with the Kyoto Protocol. Due to the change in timing of emissions, the impacts of the Modification will be assessed having regard to the Paris Agreement.

All nations that are parties to the Paris Agreement are responsible for setting their own commitments, referred to as Nationally Determined Contributions (NDCs). All of the coal produced by the Modification will be exported, with Japan and South Korea being the probable destinations (as at the time of this submission). The importing nation(s) must develop strategies to satisfy their energy demands whilst complying with their NDCs.

The GHG emissions generated by combustion of product coal are accounted for as Scope 1 emissions for the importing nation(s). The Scope 3 emissions associated with the Modification are not attributed to Australia as this would result in 'double counting'.

3.1.6 Economics

In the Rocky Hill Case, the proponent quantified the cost of Scope 1 and 2 GHG emissions and apportioned the cost to NSW based on its share of the global population. His Honour, Justice Preston held that the cost of GHG emissions should be apportioned based on NSW's share of the Australian population rather than the global population.

The CBA is an analysis of the benefits and costs of a proposed development to NSW. The CBA undertaken for the Modification calculated the costs of Scope 1 and 2 emissions based on the global cost of carbon. It is therefore appropriate to apportion the global cost to NSW based on the state's share of the global population. The approach adopted by the LEC in the Rocky Hill Case is only appropriate if the cost of Scope 1 and 2 emissions is calculated based on the Australian cost of carbon.

Justice Preston also explains that *"Under the Climate Change Convention and the Paris Agreement, Australia needs to account for Scope 1 and Scope 2 emissions that occur in Australia but not for any Scope 3 emissions that occur outside of Australia".* The *Technical Notes supporting the Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals* (NSW Government, 2018) (Technical Notes) also state that only Scope 1 and 2 emissions need to be considered in the CBA of a mining proposal. Accordingly, Scope 3 emissions have not been considered in the Economic Impact Assessment for the Modification.

Gillespie Economics has undertaken an assessment to calculate the global cost of the Scope 3 emissions predicted for the Modification (see **Appendix C**). The calculations were conducted using the NSW Government's central estimate of the global social damage cost of GHG emissions based on the forecast European Union Emissions Allowance Unit Price. Based on these unit prices, the global cost of Scope 3 emissions may range from $0.3B to $1.1B (present values). These costs need to be considered in CBAs for the end users of the coal but not the CBA for the Modification. This approach is consistent with the Rocky Hill Case and the Technical Notes.

Whilst not relevant to the Modification, it is worthwhile to note that the CBAs for end users of thermal coal would need to balance the cost of GHG emissions against the economic benefits of electricity production. Preliminary estimates suggest that the market value of electricity would be in the order of $1B (present value) and consumer benefits from electricity in the order of $6B (present value). These estimates are discussed in **Appendix C**.

3.2 WALLARAH 2 CASE

The Wallarah 2 Case was the judicial review of a determination by the (former) Planning and Assessment Commission to grant consent to the Wallarah 2 Coal Project. The Rocky Hill Case was distinguished by Justice Moore:

> "*It is important that I note that these proceedings are entirely different in nature to those leading to his Honour's conclusion set out above. These are Class 4 judicial review proceedings in which I am examining the decision-making process for (and not the decision merits of) the consideration by the PAC of this proposed coal mine and its determination to approve it*." [8]

The Wallarah 2 Case merely provides a description of the material that must be before the determining authority when it makes it merit based decision.

[8] [2019] NSWLEC 31, 36

4 RESPONSE TO PUBLIC SUBMISSIONS

This section provides responses to the pertinent issues raised by speakers at the public meeting in their verbal submissions. Where issues have previously been addressed, references to the EA and RTS are provided.

4.1 OPEN CUT MINING

Several of the verbal submissions at the public hearing asserted that the Modification was a precursor to open cut mining at Dartbrook Mine. These submissions either suggested that the impacts of open cut mining be assessed or raised the likely impact of open cut mining.

In Issue 5 of the *Dartbrook Newsletter* (February 2018, one of nine newsletters published by AQC to date), AQC announced that it was undertaking a pre-feasibility study in relation to potential open cut mining at Dartbrook Mine. This pre-feasibility study, completed in March 2018, concluded that open cut mining at Dartbrook Mine is technically feasible. However, the findings of the study have caused AQC not to undertake any further material work on this proposition since this time (as noted in subsequent disclosures to the Australian Stock Exchange). Issue 9 of the *Dartbrook Newsletter* noted the focus of AQC and its proposed joint venture partner is on the "*recommencement of long-term underground operations at Dartbrook*". AQC's commitment to recommencing Dartbrook as an underground mine is evident by the engagement of key management personnel with significant underground mining expertise at Dartbrook Mine over recent months. If open cut mining is proposed in the future, a new Development Consent under Division 4.7 of Part 4 of the EP&A Act would be required. Such a development application would need to be assessed on its own merits.

The Modification relates to three relatively minor changes to an existing underground mine and its existing surface facilities. Arguments related to open cut mining are not relevant to the determination of the Dartbrook Modification.

4.2 CUMULATIVE IMPACTS

Many of the verbal submissions at the public meeting raised cumulative impacts of mining in the Hunter Valley. Cumulative environmental impacts are relevant considerations to a certain extent. Cumulative air quality and noise impacts have been assessed in the EA and RTS, as required by relevant air quality and noise policies. The DP&E's Assessment Report attests to this. In the Rocky Hill Case, Justice Preston recognised the concept of cumulative visual impacts as being a relevant consideration. Any visual impacts from the very minor modifications proposed on their own are trivial. Discussion of cumulative visual impacts is provided in **Section 3.1.2**.

Several submissions raised the cumulative dust impacts of mining in the Hunter Valley. However, these submissions included evidence of impacts outside of the area that may be affected by Dartbrook Mine. The impacts to air quality resulting from the Modification Application when compared to what is approved are immaterial with any difference most likely immeasurable at private receivers.

As explained in *Meriton Property Services Pty Ltd v Minister for Planning and Infrastructure*, the subject of the determination is the development as modified. Arguments regarding the acceptability of mining (in general) are not relevant considerations as the subject of the determination is the Modification, not the Hunter Coalfields as a whole.

4.3 HUNTER TUNNEL

One of the submissions asserted that the Hunter Tunnel is an integral component of the approved development. This submission argued that foregoing the use of the Hunter Tunnel renders the Modification a new development and therefore beyond the scope of Section 75W of the EP&A Act.

As explained in **Section 1.3**, the overland coal clearance system is proposed as an alternative to, rather than a substitute for, the Hunter Tunnel. The Modification does not seek to remove the Hunter Tunnel as an approved coal clearance system. Indeed, AQC may use this option if it is technically and economically preferable (pending further assessment). Therefore, the Modification does not forego an 'integral component' of the development, as was asserted by the verbal submission at the public meeting.

The appropriate test for determining whether a proposal is within the scope of Section 75W is whether the proposed modification would amount to a *"radical transformation of the terms of the existing development consent"*[9]. As explained in Section 5.1.2 of the EA, the Modification would not amount to a radical transformation of the approved development. Accordingly, the Modification may be determined pursuant to Section 75W of the EP&A Act, as confirmed by DP&E in its Assessment Report.

4.4 AIR QUALITY

Several of the verbal submissions raised concerns regarding the impacts of mining on the air quality of the Upper Hunter. Many of these comments related to the cumulative impacts of the Hunter Coalfield as a whole. Only the cumulative impacts that include some contribution from the Modification are relevant considerations.

The air quality impacts associated with the Modification were predicted using a numerical dust dispersion model (CALPUFF). The area that may experience dust due to the Modification is shown by the contours in Figures 9-1, 9-3, 9-5, 9-8, 9-10 and 9-11 of the Air Quality Assessment Report (Appendix B of the EA). These air quality contours indicate dust generated by the Modification will not affect the air quality at Muswellbrook.

Some of the submissions raised data regarding particulate concentrations at Muswellbrook. The particulate concentrations recorded at Muswellbrook are due to mines located closer to the township. The Modification will not exacerbate particulate concentrations at Muswellbrook. Conversely, the absence of further mining at Dartbrook Mine will not reduce the particulate matter concentrations measured at Muswellbrook.

[9] *Barrick Australia Ltd v Williams* [2009] NSWCA 275, 43.

4.5 WATER MANAGEMENT

4.5.1 Aquifer Interference Approval

Section 91(3) of the WM Act states that an Aquifer Interference Approval is required for specified aquifer interference activities. As explained in Section 3.2.9 of the RTS, there has not been a proclamation which activates the requirement for Aquifer Interference Approvals under Section 91(3) of the WM Act. As such, there is currently no requirement for AQC to obtain an Aquifer Interference Approval. If a proclamation pursuant to Section 88A is made in the future, AQC will re-consider the requirement for an Aquifer Interference Approval.

4.5.2 Water Balance

Some submissions suggested that a climatic-based water balance model should be undertaken for the Modification. These submissions asserted that the reported inflows and outflows for Dartbrook Mine are average values and therefore do not reflect impacts during dry periods.

Dartbrook Mine has an established water management system, which has been effective at minimising extraction from the Hunter River and off-site discharges. AQC has invested in excess of AUD$1.3M over the past 12 months to further monitor water management activities at Dartbrook Mine.

The Modification will not significantly alter the water management practices at Dartbrook Mine. It was appropriate to assess surface water impacts based on predicted changes to recorded inflows and outflows.

The empirical data used in the analysis was from the period 2015 to 2017 (inclusive). The mean annual rainfall recorded at the Bureau of Meteorology's Scone SCS meteorological station is 636 mm. The annual rainfall measured in 2017 (360.3 mm) was substantially less than the long-term mean. Therefore, the empirical data used for the analytical water balance incorporates water inflows and outflows during dry conditions.

4.5.3 Impacts on Water Supplies

Stakeholders associated with the Upper Hunter equine industry were concerned that the Modification will affect the water supplies of their horse breeding operations. Other submissions raised concerns that the Modification will affect Muswellbrook's water supply.

The stakeholders that raised concerns are located outside of the potential zone of groundwater depressurisation. As explained in Section 8.3.3 of the EA, the potential inflows into the proposed Kayuga Seam bord and pillar workings are expected to be very low in magnitude. As such, the extent of groundwater depressurisation is not expected to increase due to the Modification. Groundwater impacts associated with bord and pillar mining will be less than those of the approved longwall mining activities.

The horse breeding operations that raised concerns are located upstream of Dartbrook Mine. As such, there will also be no impact on the quantity or quality of their water supply due to extraction of surface water.

Past experience indicates that Dartbrook Mine has not needed to extract raw water from the Hunter River or discharge water off-site. As explained in Section 8.4.3 of the EA, there are adequate water management strategies (such as use of evaporation ponds and underground water storages) to continue to minimise raw water and discharge requirements. As such, impacts to downstream water users will be minimal.

4.5.4 Water Licensing

Some of the submissions requested further information on AQC's water licences. One submission expressed concern that if AQC utilised its full licensed allocation, there would be water shortages.

AQC holds sufficient water access licences (WALs) under the *Water Management Plan 2000* (WM Act) to account for the water that may be taken by Dartbrook Mine. As explained in Section 2.6.1 of the RTS, the Water Sharing Plans enacted under the WM Act prescribe limits on the total water that can be taken by licence holders. These limits ensure that there is sufficient water retained for environmental flows. AQC will comply with its WALs, thereby ensuring that there is sufficient water for other users and the environment.

Dartbrook Mine will not take more water than is required and past experience has shown that reliance on external water sources has been low. Therefore, it is extremely unlikely that AQC will require its full licensed allocation and the impacts of this maximum take should not be given much weight.

4.6 STRATEGIC AGRICULTURAL LAND

Some submissions raised that there are areas of mapped equine critical industry cluster (ECIC) and biophysical strategic agricultural land (BSAL) located within the mining authorisations for Dartbrook Mine. These stakeholders asserted that impacts to ECIC and BSAL have not been considered.

Although there are areas of mapped ECIC within the mining authorities boundary, these areas are outside of the Infrastructure Study Area (shown on **Figure 1**) and therefore will not be subject to surface disturbance as a consequence of the Modification. A small area of mapped ECIC is located above the Indicative Bord and Pillar Mining Area. As explained in Section 8.5.3 of the EA, subsidence due to bord and pillar mining will be maintained at levels that are imperceptible and thus far less than currently approved.

Although areas of mapped BSAL are located within the mining authorities boundary, only the 2.28 ha within the Infrastructure Study Area will be impacted by the Modification. This land is within the operational area of the Garoka Dairy (which is owned by AQC). The Garoka Dairy will remain operational during mining operations, thereby avoiding any loss of agricultural production. In fact, AQC has discussed various options with the Garoka Dairy Manager for making available further mine owned land to expand the dairying operations.

4.7 CULTURAL HERITAGE

Some submissions noted that although impacts to archaeological sites had been assessed, there also needed to be consideration of impacts to cultural values. One verbal presentation raised the potential existence of a cultural heritage site to the north of Dartbrook Mine.

The information in this presentation indicated that this site is distant from the activities proposed by the Modification. Whilst there may be cultural values associated with this site, the Modification will not diminish these cultural values.

4.8 SOCIAL

4.8.1 Social Impact Assessment

Some submissions asserted that the Social Impact Assessment (SIA) undertaken for the Modification was not in accordance with the *Social Impact Assessment Guideline* (DP&E, 2017) (SIA Guideline). Page 2 of the SIA Guideline outlines its applicability to modification application. The SIA Guideline relevant states:

> *This guideline also applies to applications to modify an approved State significant resource project where:*
>
> - *the application is submitted after the date of publication of this guideline*
> - *the social impacts associated with the proposed modification are new or different (in terms of scale and/or intensity) to those that were approved under the original consent.*

Social impacts can occur when a development involves an increase in workforce that leads to an increase in demand for housing, infrastructure and public services. Impacts to way of life, surroundings and private property, can also occur as a result of project induced changes in background noise levels, air quality or vistas. The Modification does not propose to increase the approved workforce for Dartbrook Mine nor is it predicted to have significant air quality, noise or visual impacts. Therefore, the social impacts of the Modification will not be different in scale or intensity from those of the approved development. Although the SIA Guideline does not necessarily apply to the Modification, the SIA is appropriate for the scale of the Modification and has considered the objectives of the guideline.

4.8.2 Community Engagement

Some submissions asserted that the SIA did not adequately consider community concerns.

The potential social impacts of the Modification were assessed in Section 6 of the SIA (which formed Appendix C of the RTS). The SIA was undertaken following the public exhibition of the EA. The public submissions received during the exhibition period provide a good indication of the community's concerns. These submissions were used to inform the preparation of the SIA and the concerns raised were addressed in Section 6 of the SIA.

The community consultation undertaken by AQC since acquiring Dartbrook Mine was summarised in Section 4.12 of the RTS. AQC convenes meetings of the Community Consultative Committee (CCC) every six months in accordance with Condition 10.1 of DA 231-7-2000. Eight such meetings have occurred to date since AQC acquired the asset. AQC has also published nine issues of the *Dartbrook Newsletter*, which is distributed to neighbouring landowners and businesses in Aberdeen and Muswellbrook. The newsletter has consistently offered face to face briefings with interested persons, and provided contact information for staff that are available to discuss any issues associated with the Modification.

AQC has consulted with residents and business owners in the Upper Hunter region. AQC is aware that more than 550 letters of support have been submitted to the IPC by locals expressing support for plans to reinvigorate the Dartbrook Mine.

4.9 GOVERNMENT POLICIES

4.9.1 Hunter Regional Plan

Some submissions referred the *Hunter Regional Plan 2036* (DP&E, 2016) (HRP) and asserted that the Modification is inconsistent with the objectives of this plan.

The HRP forecasts diversification in the industrial environment of the Hunter Region, including changes in the energy sector. However, the HRP does not preclude mining development in the Upper Hunter. To the contrary, it recognises that mining will continue to be an important industry in future. The HRP states (at p. 24):

> *The Upper Hunter is recognised as a major supplier of coal, energy, wine and thoroughbred horses to national and global markets. These industries have driven investment in transport and energy infrastructure, and will continue to underpin the growth and diversification of the Hunter's economy and employment base.*
>
> *In the coming decades, the growth and diversification of the Hunter's mining and energy industries will be influenced by global and national energy demands and policies. Identifying land and infrastructure requirements that can support the future development of the region's coal and alternative energy resources will enable the Upper Hunter to respond to new and emerging opportunities.*

The HRP promotes diversification and recognises the values of different industries (including coal mining).

4.9.2 Greater Hunter Regional Water Strategy

Some submissions referred to the *Greater Hunter Regional Water Strategy* (DoI, 2018) (GHRWS) and asserted that the Modification poses a risk to the water security of the region.

The GHRWS states (at p. 16):

> *The Commonwealth, state and territory governments recognise the:*
>
> - *continuing national imperative to increase the productivity and efficiency of Australia's water use*

- *need to service rural and urban communities*
- *need to ensure the health of river and groundwater systems.*

As explained in Section 3.2.8 of the EA, the water management system at Dartbrook Mine aims to maximum reuse of mine water. This reduces Dartbrook Mine's demand for raw water from the Hunter River. The water management system includes safeguards to prevent uncontrolled discharges, including storage of water in the underground goaf to maintain sufficient freeboard in mine water dams. The water management system has been proven to be effective, as Dartbrook Mine has rarely needed to source raw water or discharge water offsite.

By maximising reuse of water onsite, Dartbrook Mine has and will continue to be operated with the aim of increasing efficiency of water use. Minimising the take of water from the Hunter River ensures that there are no significant risks to the water security of downstream communities or the environmental flows in the Hunter River catchment. The Modification will not be detrimental to the existing water management system.

4.10 OTHER MINING PROPOSALS

4.10.1 Bickham Coal Project

Some of the submissions referred to the former PAC's refusal of the Bickham Coal Project and used this precedent to assert that mining and equine land uses are incompatible.

The Bickham Coal Project was a proposal for an open cut mine near Scone. In contrast, the Modification proposes minor changes to an existing underground mine. Open cut mining involves significantly greater environmental impacts than underground mining and as such, conclusions about the acceptability of open cut mining do not lead to similar conclusions about the acceptability of a modification to an existing underground mine.

The Bickham Coal Project was a proposal for a greenfield mine, whereas the Modification relates to an existing mine. The surface infrastructure for the Dartbrook Mine was constructed more than 20 years ago and remains in place. Equine enterprises in the Upper Hunter have continued to develop and operate during both the active mining and care and maintenance phases at Dartbrook Mine. The PAC's decision on the Bickham Coal Project reflects the acceptability of a new mine and is therefore not directly applicable to the Modification.

4.10.2 Drayton South Coal Project

Some of the submissions referred to the former PAC's refusal of the Drayton South Coal Project, particularly the recommendation of a buffer from equine enterprises.

In its determination of the Drayton South Coal Project, the PAC (2014) stated:

> *A considerable buffer should be provided to shield the studs from the mine and as a minimum, open cut mining must not extend through the second ridge to the north of the Golden Highway.*

The buffer recommended by the PAC was a constraint on open cut mining. Therefore, the PAC's determination of the Drayton South Coal Project does not provide justification for imposing buffer zones around Dartbrook Mine. The minor changes to the Dartbrook Mine infrastructure proposed by the Modification do not warrant any buffers to other land uses.

4.11 OTHER ISSUES

4.11.1 Coal Price Quality

Some submissions asserted that the coal quality yielded by the Modification did not justify the coal prices assumed in the cost-benefit analysis (CBA). These submissions referenced the 2017 JORC Reserves Statement and claimed that the average ash content of the Kayuga Seam was 26%, which does not conform to the quality requirements for a Newcastle 5500 NAR Export Thermal Product.

This issue was addressed in Section 3.2.4 of the RTS. Table 3-1 of the JORC Reserves Statement provides the raw ash content for each ply of the Kayuga Seam. The raw ash for the four target plies (kya11, kya12, kya21 and kya22) ranges from 9.39-24.48%. These ash contents are well within the parameters for Newcastle 5500 NAR Export Thermal Product.

It should be noted that the mine plan assumed in the 2017 JORC Reserves Statement differs slightly from the proposed mine plan for the Modification. As such, the coal qualities produced by the Modification will differ from the values reported in the 2017 JORC Reserves Statement.

4.11.2 Mine Safety

Some submissions asserted that Dartbrook Mine is unsafe due to high gas levels and water ingress. These submissions mentioned the previous accidents at Dartbrook Mine and suggested that the Modification is a risk to human safety.

Fatalities occurred at Dartbrook Mine in 1997, 2003 and 2004. All three fatalities occurred as a result of falling objects. The 2003 incident occurred on the surface and was caused by failure of a suspended load, whereas the other two incidents were caused by collapsing materials in the underground workings. The investigations into these accidents found that all three fatalities were related to breaches of safety systems and were preventable.

These fatalities, whilst tragic, are not due to any characteristics specific to the Dartbrook Mine. These incidents are not proof of heightened risks associated with water ingress or gas, as was asserted by certain submissions.

Mine safety standards in the industry have improved substantially since Dartbrook Mine was last operational. AQC will comply with relevant safety legislation including the *Work Health and Safety (Mines and Petroleum Sites) Act 2013* and *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*.

For completeness, the Modification proposes mining of the Kayuga Seam, which is stratigraphically higher than the previously mined Wynn Seam. The Kayuga Seam has lower gas content than the Wynn Seam. The Groundwater Assessment has also predicted that groundwater inflows into the Kayuga Seam will be negligible.

One submission suggested that pillar extraction poses safety risks. The Modification does not propose any pillar extraction. In fact, the pillars will be designed to remain stable in the long term.

4.11.3 Proximity to Aberdeen

Some submissions questioned the statement that Dartbrook Mine is located 4.5 km from Aberdeen and asserted that the distance to the nearest residences in Aberdeen is much less.

Figure 3 shows the distances from Aberdeen to the different parts of the Dartbrook Mine. The 4.5 km setback from Aberdeen represents the distance from the centre of Aberdeen to the Kayuga Entry, which is the nearest part of the underground mine. This distance was referenced in the Introduction of the EA and RTS. The purpose of the Introduction is to describe the location of the mine and the distances to town centres are suitable for this purpose. The potential impacts of the Modification have been assessed through scientific studies. The Modification should be evaluated based on the findings of these studies, rather than conclusions based solely on its proximity to townships.

As shown in **Figure 3**, the distances from the nearest residences in Aberdeen to the proposed shaft facility and East Site are 1.1 km and 1.2 km, respectively.

4.11.4 Blasting

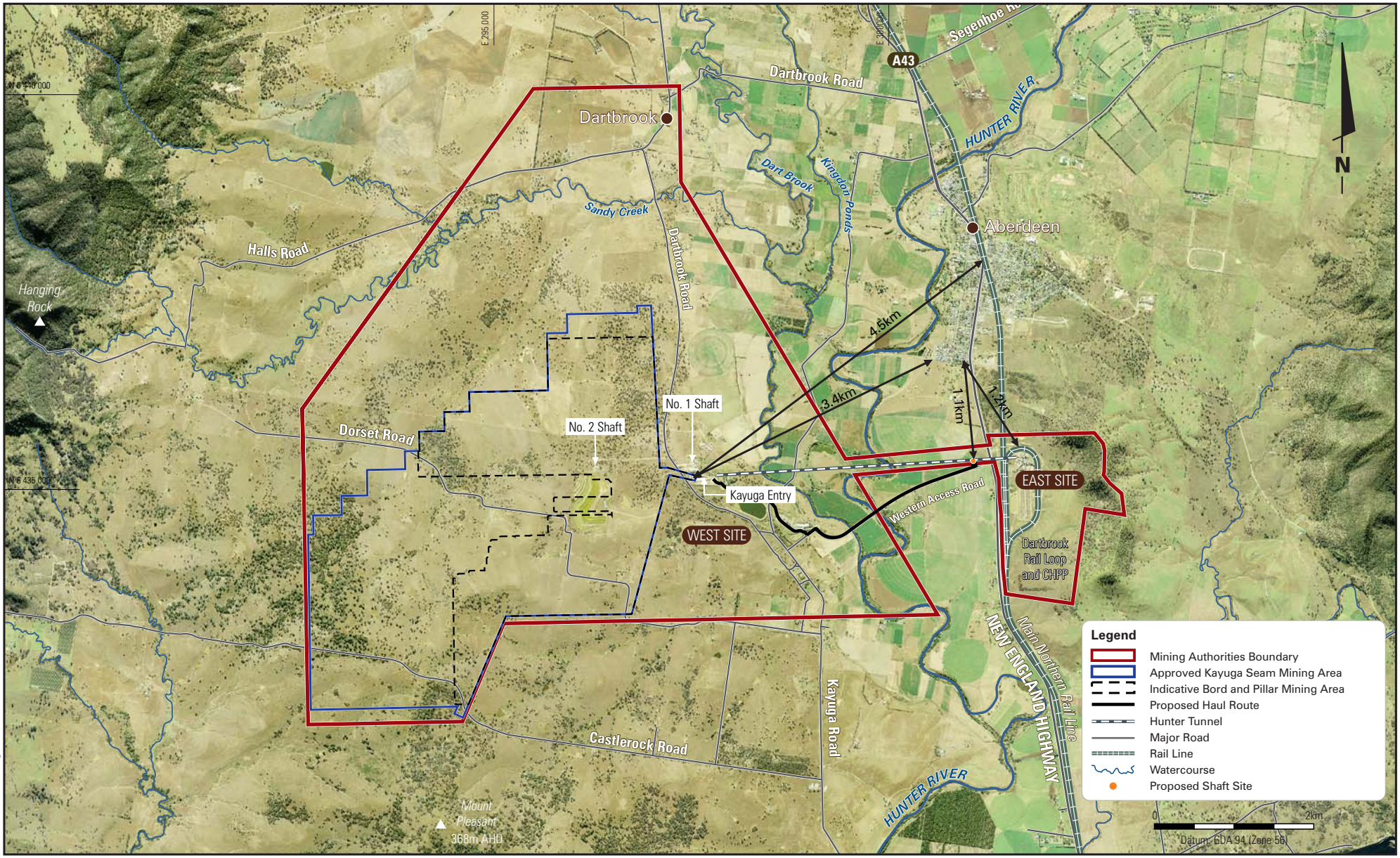
Some submissions at the public meeting asserted that a blasting assessment had not been undertaken. The Modification does not involve any blasting.

4.11.5 Truck Haulage

It was evident from the submissions at the public meeting that there are some misunderstandings about the truck haulage of ROM coal proposed by the Modification. Misunderstanding may have arisen because the EA proposed a partly sealed, partly unsealed haulage route. Due to concerns raised in submissions on EA, Section 2.1.5 of the RTS committed to the sealing of the entire haulage route. Furthermore, truck loads will be covered and the sealed road will be regularly swept to ensure no build-up of mud or other particulates.

One submission noted that the sound power level (SPL) assumed for the haul trucks is lower than the SPL assumed for trucks at Mount Pleasant Coal Mine. This is not an inconsistency as the trucks used at the two mines are materially different. The haul trucks proposed for the Modification will be road-registered trucks, which generate lower SPLs than the enormous off-road trucks used at most open cut mines.

One submission asserted that there is no regulation of diesel emissions from off-road trucks. Again, this issue is not applicable because the haul trucks associated with the Modification are not off-road trucks. Road registered trucks are required to meet strict noise and emissions standards.



HB DARTBROOK Underground MOD7 Post RTS 1774 F3 Setbacks from Aberdeen 12 04 2019

DARTBROOK MINE

Setbacks from Aberdeen

FIGURE 3

Hansen Bailey
ENVIRONMENTAL CONSULTANTS

Australian Pacific Coal

4.11.6 Local Employment

Several submissions asserted that the Modification will not generate employment benefits in the local area, as most mine workers reside outside of the Upper Hunter. The anecdotal evidence raised by these speakers is not supported by the available statistics for mines in the Muswellbrook LGA. As explained in Section 4.10.4 of the RTS, the majority of workers at Mangoola Mine, Mt Arthur Coal Mine and the recently closed Drayton Mine were residents in either the Singleton, Muswellbrook or Upper Hunter LGAs.

One submission asserted that the local area does not have the skilled labour required for an underground mine. In the Upper Hunter, underground mining has recently been undertaken at Wambo, Bulga (Beltana), Integra and Ravensworth Underground Mines. This indicates that there is skilled labour within the local area to support the recommencement of underground mining at the Dartbrook Mine.

For
HANSEN BAILEY

Andrew Wu
Senior Environmental Engineer

James Bailey
Director

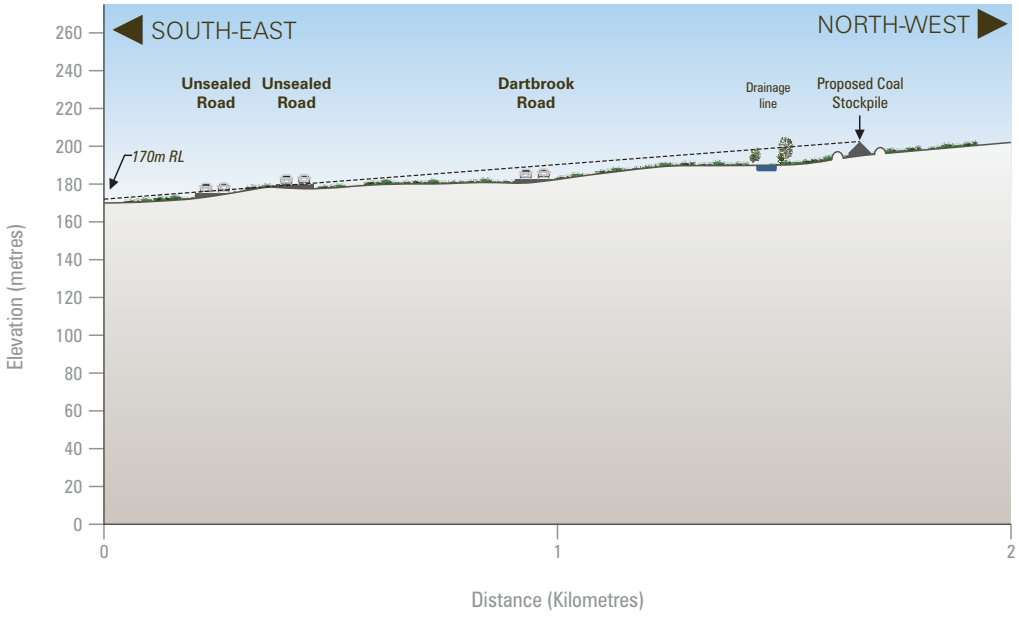
5 ABBREVIATIONS

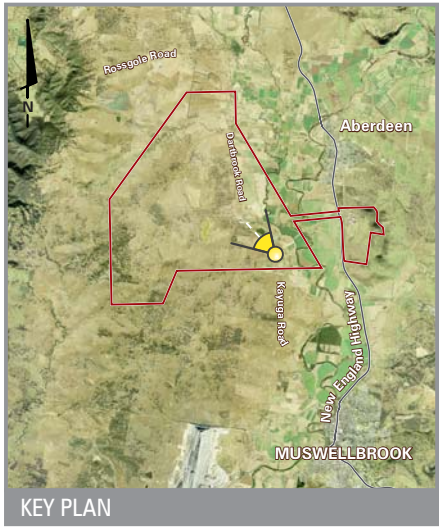
Term	Definition
AQC	AQC Dartbrook Management Pty Limited
BSAL	Biophysical Strategic Agricultural Land
CCC	Community Consultation Committee
CHPP	Coal Handling and Preparation Plant
DA 231-7-2000	The current Development Consent for Dartbrook Mine
dB	Decibels
dBA	The peak sound pressure level, expressed as dB and scaled on the '*A-weighted'* scale
DP&E	NSW Department of Planning and Environment
EA	Environmental Assessment
ECIC	Equine Critical Industry Cluster
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPA	NSW Environmental Protection Authority
GHG	Greenhouse Gas
GHRWS	Greater Hunter Regional Water Strategy
ha	Hectare
HRP	Hunter Regional Plan
IPC	Independent Planning Commission
LEC	Land and Environment Court
LGA	Local Government Area
Mt	Million tonnes
Mtpa	Million tonnes per annum
NPI	*Noise Policy for Industry 2017*
NSW	New South Wales
OEA	Overburden Emplacement Areas
OEH	NSW Office of Environment and Heritage
PAC	Planning Assessment Commission
ROM	Run of Mine
RMS	NSW Roads and Maritime Services
RTS	Response to Submissions
SCS	Soil Conservation Service
SIA	Social Impact Assessment
SSD	State Significant Development
t	Tonne
WAL	Water Access Licence
WM Act	*Water Management Act 2000*
WSP	Water Sharing Plan

6 REFERENCES

- Anglo Coal (2006), *Dartbrook Annual Environmental Management Report*
- Department of Industry (2018), *Greater Hunter Regional Water Strategy.*
- Department of Planning and Environment (2016), *Hunter Regional Plan 2036.*
- Department of Planning and Environment (2017), *Social Impact Assessment Guideline.*
- Department of Planning and Environment (2019), *Dartbrook Coal Mine – Modification 7 Assessment Report.*
- Environmental Protection Authority (2017), *Noise Policy for Industry*.
- Hansen Bailey (2018a), *Dartbrook Mine Modification 7 Environmental Assessment.*
- Hansen Bailey (2018b), *Dartbrook Mine Modification 7 Response to Submissions.*
- NSW Government (2018), *Technical Notes supporting the Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals*
- PAC (2014), *NSW Planning Assessment Commission Determination Report, Drayton South Coal Project, Muswellbrook LGA.*

APPENDIX A
Visual Cross-sections





Legend

- Mining Authorisation Boundary
- Line of Sight

DARTBROOK MINE

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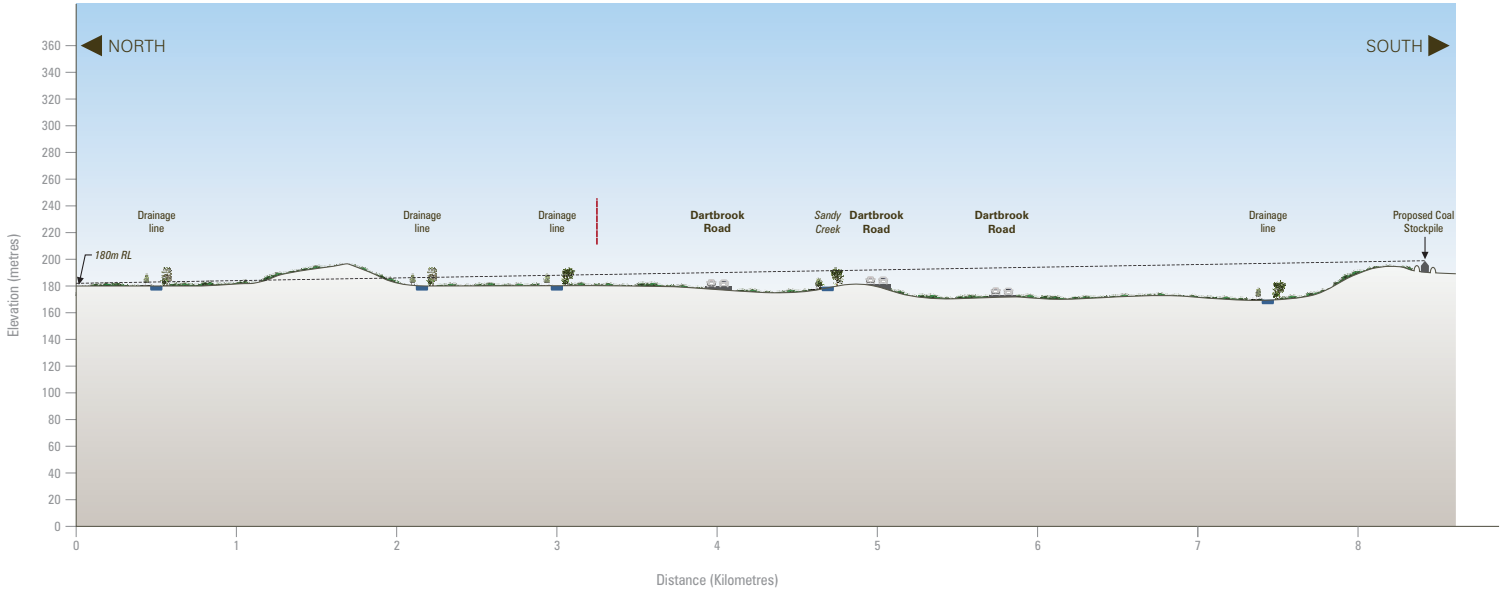
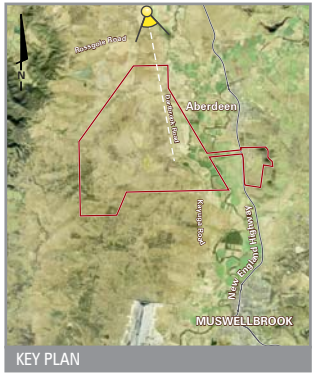
Nearest Private Residences in Kayuga Village to Proposed Coal Stockpiles

FIGURE 1A





Legend

Mining Authorisation Boundary

Line of Sight

HB DARTBROOK Underground MOD7 Post RTS 1774 FZB Godolphin Kelvinside to Proposed New Shaft Site Cross Sections 23 04 2019

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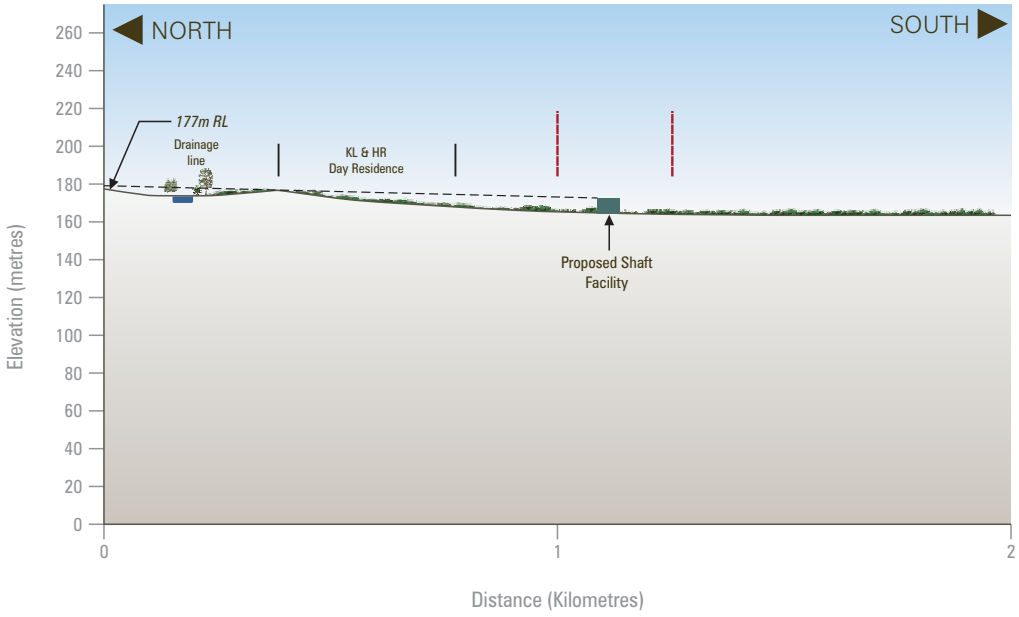
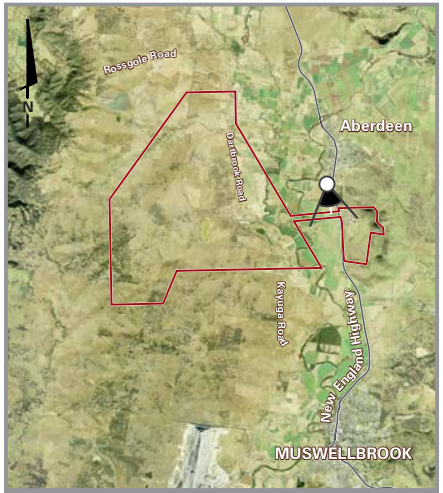
DARTBROOK MINE

Nearest Race Horse Stud towards Proposed Coal Stockpiles

FIGURE 1B





Legend

Mining Authorisation Boundary

Line of Sight

HB DARTBROOK Underground MOD7 Post RTS 1774 F2A Aberdeen to Proposed New Shaft Site Cross Section 16 04 2019

DARTBROOK MINE

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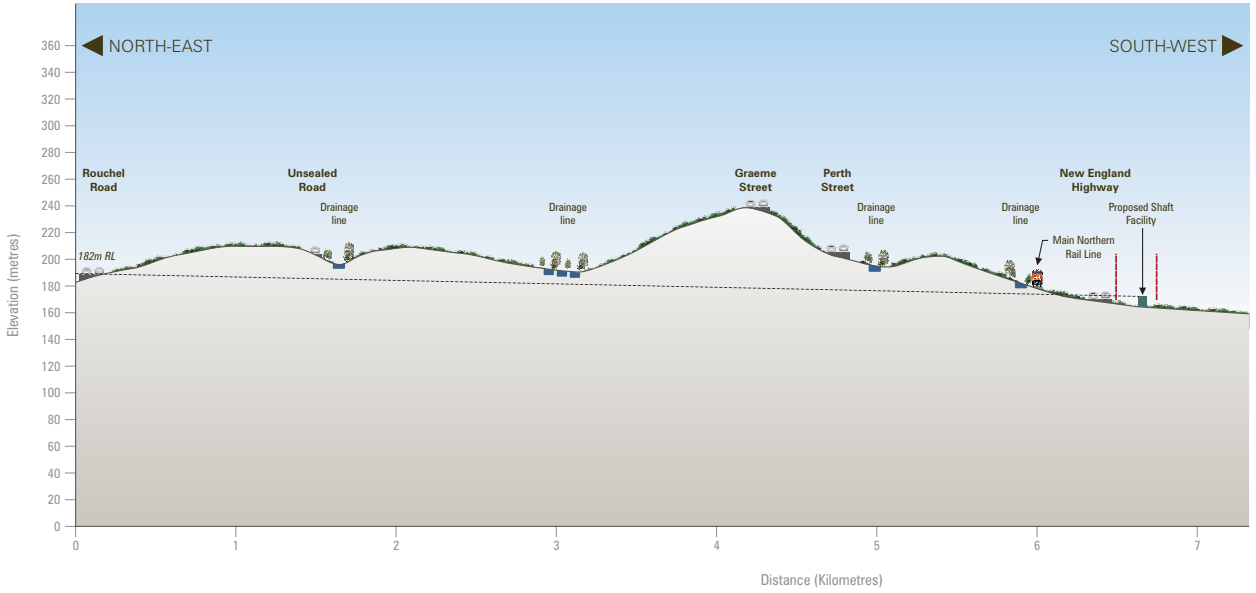
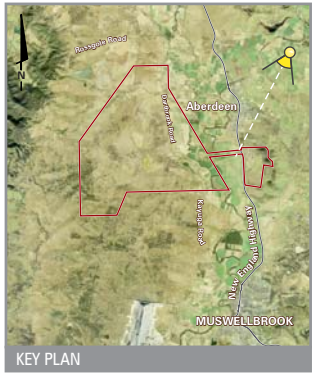
Aberdeen looking towards New Shaft Site

FIGURE 2A





Legend

- Mining Authorisation Boundary
- Line of Sight

HB DARTBROOK Underground MOD7 Post RTS 1774 F2B Godolphin Kelvinside to Proposed New Shaft Site Cross Sections 16 04 2019

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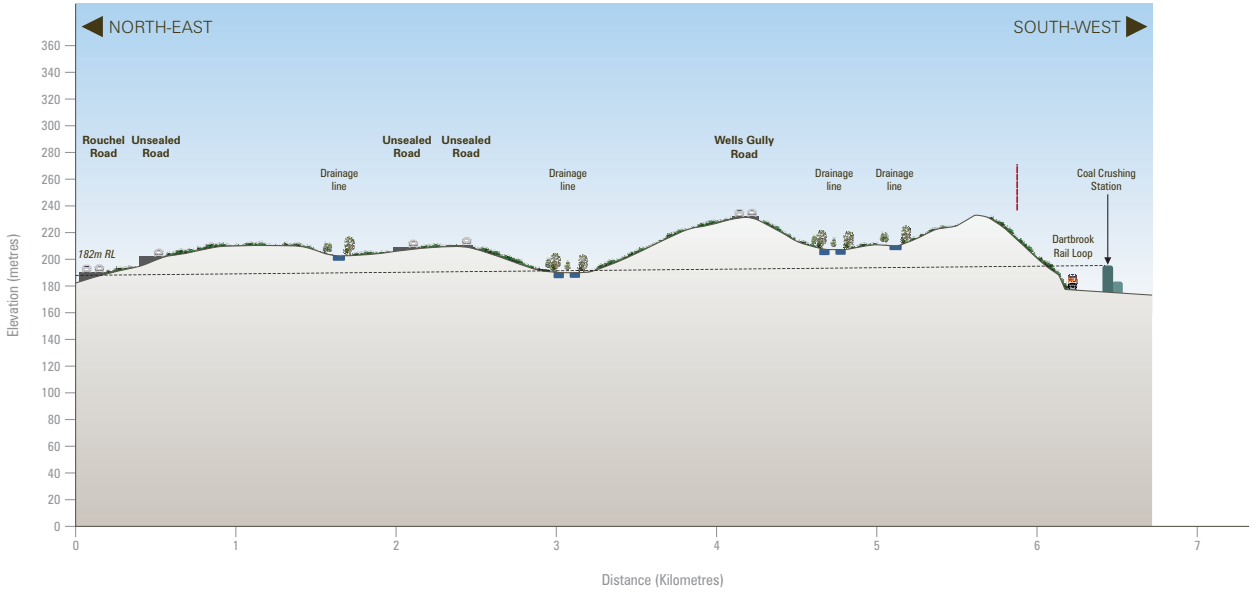
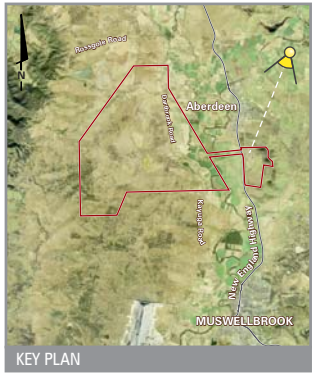
DARTBROOK MINE

Godolphin Kelvinside to Proposed New Shaft Site Cross Section

FIGURE 2B





Legend

Mining Authorisation Boundary

Line of Sight

HB DARTBROOK Underground MOD7 Post RTS 1774 F3A Godolphin Kelvinside to Coal Crushing Station Cross Sections 23 04 2019

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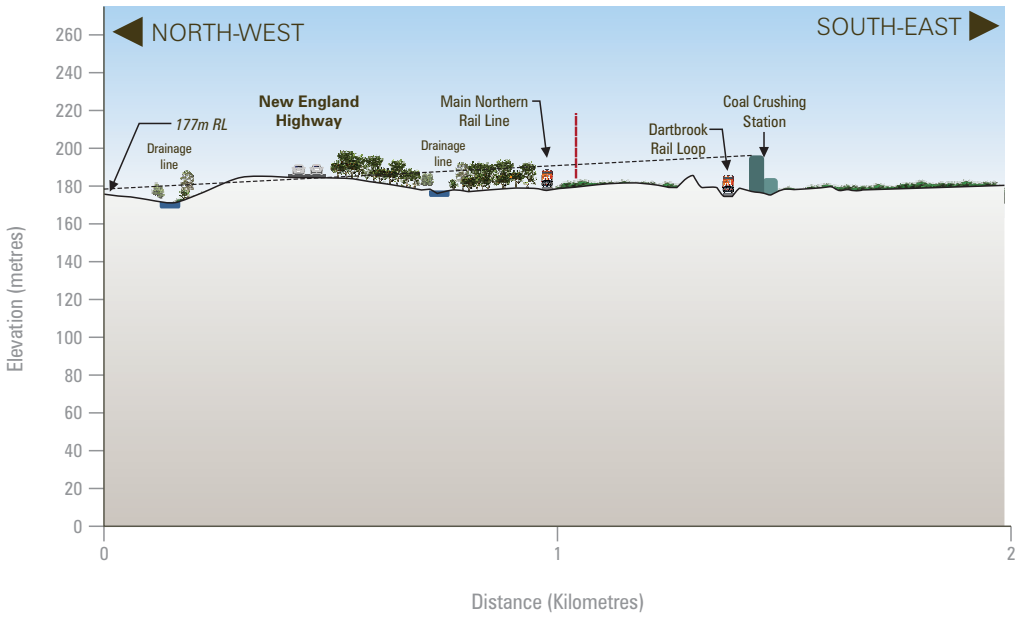
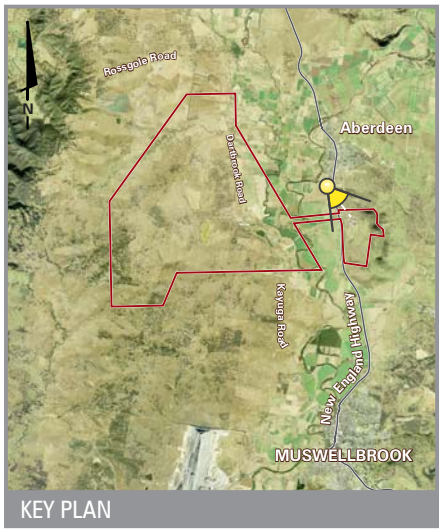
DARTBROOK MINE

Godolphin Kelvinside to Coal Crushing Station Cross Section

FIGURE 3A





Legend

Mining Authorisation Boundary

Line of Sight

HB DARTBROOK Underground MOD7 Post RTS 1774 F3B Aberdeen to Coal Crushing Station Cross Section 23 04 2019

DARTBROOK MINE

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Aberdeen looking towards Coal Crushing Station

FIGURE 3B

APPENDIX B
Scope 3 Greenhouse Gas Emissions

ERM

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16 April 2019

Reference: 0505945

Dear Andrew

Subject: Dartbrook Mine Modification 7 - Scope 3 Greenhouse Gas Emissions

1 Introduction

AQC Dartbrook Management Pty Ltd (AQC) has engaged ERM to undertake an assessment of the potential Scope 3 greenhouse gas (GHG) emissions associated with the proposed modification to Dartbrook Mine. This assessment has been undertaken to provide the Independent Planning Commission (IPC) with the relevant information to assist its determination of the Modification.

Dartbrook Mine is managed in accordance with Development Consent DA 231-7-2000 granted under the Environmental Planning and Assessment Act 1979 (EP&A Act). DA 231-7-2000 allows for underground longwall mining and associated surface activities to be carried out until 5 December 2022.

The Modification proposes the following:

- Bord and pillar mining activities within the Kayuga Seam (as an alternative to the approved longwall mining activities in that seam).
- An alternative coal clearance system for transporting ROM coal from the underground mine workings to the East Site.
- Extending the approval period under DA 231-7-2000 by 5 years (until 5 December 2027).

These activities are proposed as alternatives to, rather than substitutes for, the approved activities at Dartbrook Mine.

The GHG impacts relevant to the Modification are the emissions associated with the following coal resources:

- Scenario 1 – 1.25 Million tonnes per annum (Mtpa) run-of-mine (ROM) coal extracted via bord and pillar mining over the remainder of the project duration (i.e. until 5 December 2027). For the purposes of this assessment the period 2020 to 2027 (inclusive) has been assessed as this equates to 10Mt of coal extracted as per the Modification.
- Scenario 2 – 6 Mtpa ROM Coal extracted via longwall mining during the proposed five-year extension to the approved project duration (i.e. from 5 December 2022 until 5 December 2027). For the purposes of this assessment the period 2021 to 2027 (inclusive) has been assessed, however only emissions from the period 2023-2027 are relevant to

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the Modification. Given the lead-time to re-establish a longwall operation, including all necessary equipment, a first coal date has been assumed as January 2021 (ie 18 months from present day).

- The two scenarios considered in this assessment represent the impacts of these aspects of the Modification. With regard to the latter, longwall mining is currently approved to be undertaken until 5 December 2022. As such, only the impacts of longwall mining in the proposed five-year extension are deemed to be impacts of the Modification.

2 Scope 3 emission calculations

2.1 Introduction

Scope 3 greenhouse gas emissions from Dartbrook Mine have been estimated based upon the methods outlined in the following documents:

- The Corporate Value Chain (Scope 3) Accounting and Reporting Standard (Scope 3 Standard)
- The World Resources Institute/World Business Council for Sustainable Development (WRI/WBCSD) Greenhouse Gas Protocol *The Greenhouse Gas Protocol – A Corporate Accounting and Reporting Standard Revised Edition* (WRI/WBCSD, 2004) (hereafter referred to as the GHG Protocol);
- *National Greenhouse and Energy Reporting (Measurement) Determination 2008*; and
- The Australian Government Department of Climate Change and Energy (DCCE) *National Greenhouse Accounts* (NGA) *Factors 2018* (DCCE, 2018).

The GHG Protocol establishes an international standard for accounting and reporting of GHG emissions. The GHG Protocol has been adopted by the International Standard Organisation, endorsed by GHG initiatives (such as the Carbon Disclosure Project) and is compatible with existing GHG trading schemes. The GHG Protocol Corporate Accounting and Reporting Standard classifies corporate GHG emissions into three 'scopes'. Scope 1 emissions are direct GHG emissions from operations that are owned or controlled by the reporting company. Scope 2 emissions are indirect emissions from the generation of purchased energy consumed by a company. Scope 3 emissions are all other indirect emissions (not included in scope 2) that occur in the value chain of the reporting company.

The Scope 3 Standard allows companies to assess their entire value chain emissions impact and identify where to focus reduction activities. It divides scope 3 emissions into upstream and downstream emissions, based on the financial transactions of the reporting company:

- Upstream emissions are indirect GHG emissions related to purchased or acquired goods and services;
- Downstream emissions are indirect GHG emissions related to sold goods and services.

The Scope 3 Standard further categorises scope 3 emissions into fifteen distinct categories, as detailed in Table 2.1. Those included in this assessment are in **bold font**.

Table 2.1: List of Scope 3 categories

Upstream or downstream	Scope 3 category
Upstream scope 3 emissions	1. Purchased goods and services
	2. Capital goods
	3. Fuel- and energy-related activities (not included in scope 1 or scope 2)
	4. Upstream transportation and distribution
	5. Waste generated in operations
	6. Business travel
	7. Employee commuting
	8. Upstream leased assets
Downstream scope 3 emissions	**9. Downstream transportation and distribution**
	10. Processing of sold products
	11. Use of sold products
	12. End-of-life treatment of sold products
	13. Downstream leased assets
	14. Franchises
	15. Investments

Source: Table 5.3 WRI/WBCSD (2004).

Scope 3 emissions are defined as those emissions that are a consequence of the activities of an entity, but which arise from sources not owned or controlled by that entity. Some examples of scope 3 activities provided in the GHG Protocol are extraction and production of purchased materials, transportation of purchased fuels, and use of sold products and services.

In the case of Dartbrook Mine, scope 3 emissions are indirect emissions outside of AQC's operational control. As part of this assessment these include:

- Indirect emissions from the consumption of purchased electricity at Dartbrook Mine
- Indirect emissions from the extraction, processing and transport of diesel used at Dartbrook Mine
- Indirect emissions from the transportation and combustion of product coal.

2.2 Scope 3 emission factors

The Scope 3 emission factors applied to the assessment are summarised in Table 2.2.

Table 2.2: Summary of Scope 3 greenhouse gas emission factors

Emission Source	Emission factor		Source
Diesel - on-site transport activities	3.6	kg CO_2-e/GJ	Table 40 (DCCE, 2018)
	38.6	GJ/kL	Table 3 (DCCE, 2018)
	138.96	kg CO_2-e/kL	Calculated
Electricity	0.10	kg CO_2-e/kWh	Table 41 (DCCE, 2018)
Rail transport	12.3	g CO_2-e/tonne.km	QR Network Access (2002)
Fuel oil (ship transport)	0.00354	kg CO_2-e/tonne.km	UK Government (2018)[(a)]
Burning coal	2.97	kg CO_2-e/tonne (Japan)	IEA,WEO, 2018
	4.90	kg CO_2-e/tonne (Republic of Korea)	Enerdata (2018)[(b)]

Notes:
(a) Average of bulk carrier conversion factors
(b) Calculated from Republic of Korea coal and lignite consumption/CO_2 emissions

2.3 Indirect emissions

2.3.1 Introduction

As Dartbrook Mine has been in care-and-maintenance since 2006, the most recent greenhouse gas calculations for the site were presented in the 2006 Annual Environmental Management Report (AEMR) (Anglo Coal, 2006).

The greenhouse emissions[1] reported in the 2006 AEMR that are relevant to this assessment are:

- CO_2 emissions from fuel (diesel) = 4,184 tonnes $CO_{2\text{-}e}$
- CO_2 emissions from electricity = 39,201 tonnes $CO_{2\text{-}e}$

In 2006, Dartbrook Mine extracted 1,181,399 tonnes of Run-of-Mine (ROM) coal.

[1] For this assessment, we have used CO_2 emissions as reported in Anglo Coal, 2006

As detailed below, these data were used in combination with the relevant emission factors (and for diesel usage, energy content) sourced from the then Australian Greenhouse Office (AGO) AGO Factors and Methods Workbook for 2006 (AGO, 2006) to estimate the diesel and electricity usage for the two scenarios being assessed:

- Diesel fuel
    - 2006 Energy content for automotive diesel oil = 39.6 GJ/kL
    - 2006 Scope 1 emission factor for automotive diesel oil

      = 69.4 kg $CO_{2\text{-}e}$/GJ

      = 2,748 kg $CO_{2\text{-}e}$/kL
    - Diesel usage = 1,289 kL/Mt ROM
- Electricity
    - 2006 Scope 2 emission factor = 0.893 kg $CO_{2\text{-}e}$/kWh
    - Electricity usage = 37,160,566 kWh/Mt ROM

2.3.2 Diesel consumption

Upstream greenhouse gas emissions from diesel consumption were estimated using the following equation:

$$E_{CO_2-e} = \frac{Q \times EF}{1000}$$

where:

$E_{CO2\text{-}e}$	=	Emissions of GHG from diesel combustion	(t CO_2-e)
Q	=	Estimated combustion of diesel	(GJ)
EF	=	Emission factor (scope 3) for diesel combustion	(kg CO_2-e/GJ)

The quantity of diesel consumed (kL/y) for each mine year, for each scenario was calculated based on the information provided in Section 2.1 and the emission factors in Table 2.2.

The quantity of diesel consumed in gigajoules (GJ) (Q) is calculated using an energy content factor of 38.6 gigajoules per kilolitre (GJ/kL) per NGA, 2018.

The estimated annual and total GHG Scope 3 emissions from diesel usage are presented in Table 2.3 (Scenario 1) and Table 2.4 (Scenario 2). Scenario 1 involves transportation of ROM coal via haul trucks. Haulage of ROM coal was not undertaken in 2006 so the projected diesel consumption for this activity (approximately 536.9 kL/year) was added to the diesel combustion calculated from the 2006 data.

Table 2.3: Scope 3 emissions from diesel usage – Scenario 1

Year	ROM (Mt/y)	Usage (kL/y)	Scope 3 emission factor (kg CO_{2-e}/kL)	Scope 3 emissions (t CO_{2-e})
2020	1.25	2,148	138.96	298
2021	1.25	2,148	138.96	298
2022	1.25	2,148	138.96	298
2023	1.25	2,148	138.96	298
2024	1.25	2,148	138.96	298
2025	1.25	2,148	138.96	298
2026	1.25	2,148	138.96	298
2027	1.25	2,148	138.96	298
Total	**10.00**	**17,182**		**2,388**

Note: Totals may differ to the sum of the columns due to rounding to significant figures.

Table 2.4: Scope 3 emissions from diesel usage – Scenario 2

Year	ROM (Mt/y)	Usage (kL/y)	Scope 3 emission factor (kg CO_{2-e}/kL)	Scope 3 emissions (t CO_{2-e})
2021	6.0	7,732	138.96	1,074
2022	6.0	7,732	138.96	1,074
2023	6.0	7,732	138.96	1,074
2024	6.0	7,732	138.96	1,074
2025	6.0	7,732	138.96	1,074
2026	6.0	7,732	138.96	1,074
2027	6.0	7,732	138.96	1,074
Total	**42.0**	**54,124**		**7,521**

Note: Totals may differ to the sum of the columns due to rounding to significant figures.

2.3.3 Electricity consumption

The Scope 3 emissions associated with the electricity consumption for Modification were estimated using the following equation:

$$E_{CO_2-e} = Q \times EF$$

Where:

E_{CO2-e}	=	Emissions of GHG from electricity consumption	(t CO_2-e)
Q	=	Quantity of electricity	(MWh)
EF	=	Emission factor for electricity consumption	(kg CO_2-e/kWh)

The quantity of electricity consumed (kWh/y) for each mine year, for each scenario was calculated based on the information provided in Section 2.1 and the emission factors in Table 2.2.

The total estimated GHG emissions from electricity consumption are provided in Table 2.5 (Scenario 1) and Table 2.6 (Scenario 2).

Table 2.5: Scope 3 emissions from electricity usage – Scenario 1

Year	ROM (Mt/y)	Usage (kWh/y)	Scope 3 emission factor (kg CO_{2-e}/kWh)	Scope 3 emissions (t CO_{2-e})
2020	1.25	46,450,708	0.10	4,645
2021	1.25	46,450,708	0.10	4,645
2022	1.25	46,450,708	0.10	4,645
2023	1.25	46,450,708	0.10	4,645
2024	1.25	46,450,708	0.10	4,645
2025	1.25	46,450,708	0.10	4,645
2026	1.25	46,450,708	0.10	4,645
2027	1.25	46,450,708	0.10	4,645
Total	**10.00**	**371,605,662**	**-**	**37,161**

Note: Totals may differ to the sum of the columns due to rounding to significant figures.

Table 2.6: Scope 3 emissions from emissions from electricity usage – Scenario 2

Year	ROM (Mt/y)	Usage (kWh/y)	Scope 3 emission factor (kg CO_{2-e}/kWh)	Scope 3 emissions (t CO_{2-e})
2021	6.0	222,963,397	0.10	22,296
2022	6.0	222,963,397	0.10	22,296
2023	6.0	222,963,397	0.10	22,296
2024	6.0	222,963,397	0.10	22,296
2025	6.0	222,963,397	0.10	22,296
2026	6.0	222,963,397	0.10	22,296
2027	6.0	222,963,397	0.10	22,296
Total	**42.0**	**1,560,743,781**	**-**	**156,074**

Note: Totals may differ to the sum of the columns due to rounding to significant figures.

2.4 Direct emissions

2.4.1 Transportation by rail

Product coal is transported via rail to the Port of Newcastle for shipment overseas.

Emissions associated with product coal transportation have been estimated based on an emission factor for loaded trains of 12.3 grams per net tonne per kilometre (QR Network Access, 2002).

Emission factors were not available for unloaded trains so the factor for loaded trains is conservatively applied for the return trip. The return rail trip to the port of Newcastle is estimated to be 260 km.

For Scenario 1, the coal is not washed and therefore all ROM coal (1.25 Mtpa) is transported. For Scenario 2, the coal is assumed to be washed, yielding 4.5 Mtpa of product coal to be transported.

The total estimated Scope 3 GHG emissions from rail transport of product coal for Scenario 1 and Scenario 2 are provided in Table 2.7 and Table 2.8.

Table 2.7: Scope 3 emissions from product coal rail transportation – Scenario 1

Year	Product coal (Mtpa)	Scope 3 emission factor (g $CO_{2\text{-}e}$/tonne/km)	Scope 3 emissions (t $CO_{2\text{-}e}$)
2020	1.25	12.3	3,998
2021	1.25	12.3	3,998
2022	1.25	12.3	3,998
2023	1.25	12.3	3,998
2024	1.25	12.3	3,998
2025	1.25	12.3	3,998
2026	1.25	12.3	3,998
2027	1.25	12.3	3,998
Total	**10.0**	**-**	**31,980**

Note: Totals may differ to the sum of the columns due to rounding to significant figures.

Table 2.8: Scope 3 emissions from product coal rail transportation – Scenario 2

Year	Product coal (Mtpa)	Scope 3 emission factor (g CO_{2-e}/tonne/km)	Scope 3 emissions (t CO_{2-e})
2021	4.5	12.3	14,391
2022	4.5	12.3	14,391
2023	4.5	12.3	14,391
2024	4.5	12.3	14,391
2025	4.5	12.3	14,391
2026	4.5	12.3	14,391
2027	4.5	12.3	14,391
Total	**31.5**	**-**	**100,737**

Note: Totals may differ to the sum of the columns due to rounding to significant figures.

2.4.2 Transportation by Ship

There will also be emissions associated with the shipping of the product overseas. It is assumed 50% of the coal will be shipped to Japan and 50% to Republic of Korea.

An emission factor of 0.00354 kg CO_{2-e}/tonne/km was sourced from the UK Government (2018). Greenhouse gas reporting: conversion factors for 2018. The average value for bulk carriers was applied.

Table 2.9 presents a summary of assumed coal destination and return shipping distances from the Port of Newcastle.

Table 2.9: Port of Newcastle coal destinations and distances

Country	Port	Product coal (Mtpa)		Return distance (km)
		Scenario 1	Scenario 2	
Japan	Matsue	0.625	2.25	19,039
Republic of Korea	Busan (Pusan)	0.625	2.25	19,116

Source: www.ports.com

Estimated Scope 3 GHG emissions from the sea transportation of the coal are provided in Table 2.10 (Scenario 1) and Table 2.11 (Scenario 2).

Table 2.10: Scope 3 emissions from product coal sea transportation – Scenario 1

Year	Product coal to Republic of Korea (Mtpa)	Product coal to Japan (Mtpa)	Scope 3 emission factor (kg CO2-e/tonne/km)	Scope 3 emissions (t CO2-e)
2020	0.625	0.625	0.00354	84,418
2021	0.625	0.625	0.00354	84,418
2022	0.625	0.625	0.00354	84,418
2023	0.625	0.625	0.00354	84,418
2024	0.625	0.625	0.00354	84,418
2025	0.625	0.625	0.00354	84,418
2026	0.625	0.625	0.00354	84,418
2027	0.625	0.625	0.00354	84,418
Total	**5.0**	**5.0**	**-**	**675,342**

Note: Totals may differ to the sum of the columns due to rounding to significant figures.

Table 2.11: Scope 3 emissions from product coal sea transportation – Scenario 2

Year	Product coal to Republic of Korea (Mtpa)	Product coal to Japan (Mtpa)	Scope 3 emission factor (kg $CO_{2\text{-}e}$/tonne/km)	Scope 3 emissions (t $CO_{2\text{-}e}$)
2021	2.25	2.25	0.00354	303,904
2022	2.25	2.25	0.00354	303,904
2023	2.25	2.25	0.00354	303,904
2024	2.25	2.25	0.00354	303,904
2025	2.25	2.25	0.00354	303,904
2026	2.25	2.25	0.00354	303,904
2027	2.25	2.25	0.00354	303,904
Total	**15.75**	**15.75**	**-**	**2,127,327**

Note: Totals may differ to the sum of the columns due to rounding to significant figures.

2.4.3 *Use of Product Coal*

All product coal from Dartbrook Mine will be sold as thermal coal. It is assumed all product coal is combusted in a power station to generate electricity.

The Scope 3 emissions associated with the combustion of product coal were estimated using the following equation:

$$E_{CO_2-e} = \frac{Q \times EC \times EF}{1000}$$

Where:

E_{CO2-e}	=	Emissions of GHG from coal combustion	(t CO_2-e)
Q	=	Quantity of product coal burnt	(GJ)
EC	=	Energy Content Factor for black / coking coal	(GJ/t)
EF	=	Emission factor for black / coking coal combustion	(kg CO_2-e/GJ)

The quantity of thermal coal burnt in Mtpa is converted to GJ using an energy content factor for black coal of 27 GJ/t (NGA, 2018).

The Scope 3 greenhouse gas emission factors were sourced as follows:

- Japan - International Energy Agency World Energy Outlook (IEA WEO, 2018).
- South Korea - Enerdata Global Energy Statistical Yearbook 2018 (Enerdata, 2018).

The emissions associated with the use of the product coal are presented in **Table 2.12**.

Table 2.12: Scope 3 emissions from use of product coal – Scenario 1

Year	Product coal combusted in Republic of Korea (Mtpa)	Product coal combusted in Japan (Mtpa)	Scope 3 emission factor (kg CO_2-e/t coal)		Scope 3 emissions (t CO_2-e)
			South Korea	Japan	
2020	0.625	0.625	4.9	2.97	4,918,750
2021	0.625	0.625	4.9	2.97	4,918,750
2022	0.625	0.625	4.9	2.97	4,918,750
2023	0.625	0.625	4.9	2.97	4,918,750
2024	0.625	0.625	4.9	2.97	4,918,750
2025	0.625	0.625	4.9	2.97	4,918,750
2026	0.625	0.625	4.9	2.97	4,918,750
2027	0.625	0.625	4.9	2.97	4,918,750
Total	**5.0**	**5.0**	**-**	**-**	**39,350,000**

Note: Totals may differ to the sum of the columns due to rounding to significant figures.

Table 2.13: Scope 3 emissions from use of product coal – Scenario 2

Year	Product coal combusted in Republic of Korea (Mtpa)	Product coal combusted in Japan (Mtpa)	Scope 3 emission factor (kg CO_{2-e}/t coal)		Scope 3 emissions (t CO_{2-e})
			South Korea	Japan	
2021	2.25	2.25	4.9	2.97	17,707,500
2022	2.25	2.25	4.9	2.97	17,707,500
2023	2.25	2.25	4.9	2.97	17,707,500
2024	2.25	2.25	4.9	2.97	17,707,500
2025	2.25	2.25	4.9	2.97	17,707,500
2026	2.25	2.25	4.9	2.97	17,707,500
2027	2.25	2.25	4.9	2.97	17,707,500
Total	**15.75**	**15.75**	**-**	**-**	**123,952,500**

Note: Totals may differ to the sum of the columns due to rounding to significant figures.

2.5 Summary of Scope 3 emissions

Table 2.14 summarises greenhouse gas emissions from all sources.

Table 2.14: Scope 3 summary – Scenario 1 and Scenario 2 (Mt CO_{2-e})

Scenario	Upstream		Downstream			Scope 3 emissions total (Mt CO_{2-e})	Scope 3 emissions per year (Mt CO_{2-e})
	Electricity	Diesel	Rail transportation	Ship Transportation	Electricity generation		
Scenario 1	0.04	0.002	0.032	0.7	39.4	40.1	5.01
Scenario 2 (all years)	0.16	0.008	0.101	2.1	124.0	126.3	18.1
Scenario 2 (Modification 2023 - 2027)	0.12	0.005	0.072	1.5	88.5	90.2	18.1

Note: Totals may differ to the sum of the columns due to rounding to significant figures.

All of the scope 3 emissions for Scenario 1 are attributable to the Modification, as these emissions are due to the proposed bord and pillar mining.

Scenario 2 reflects the emissions from longwall mining (if undertaken). Longwall mining is currently approved until 5 December 2022, so the estimated emissions for 2021 and 2022 are impacts of the approved project rather than the Modification. Only the emissions in years 2023-2027 (i.e. the proposed 5 year extension) are impacts of the Modification. Of the total scope 3 emissions for Scenario 2, approximately 90.2 Mt CO_2-e are attributable to the Modification.

3 Consideration of the Paris Agreement

3.1 Introduction

At COP[2] 21 in Paris, on 12 December 2015, Parties to the United Nations Framework Convention on Climate Change (UNFCCC) reached a landmark agreement to combat climate change and to accelerate and intensify the actions and investments needed for a sustainable low carbon future. The Paris Agreement was entered into force on 4 November 2016, and at the time of writing 185 of 197 Parties to the Convention had ratified the Agreement.

The central aim of the Paris Agreement is to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius. Additionally, the agreement aims to increase the ability of countries to deal with the impacts of climate change, and at making finance flows consistent with a low GHG emissions and climate-resilient pathway.

At the heart of the Paris agreement are nationally determined contributions (NDCs) which embody efforts by each country to reduce national emissions and adapt to the impacts of climate change. NDCs are submitted every five years with the next round (new or updated) to be submitted by 2020 and every five years thereafter.

The following sections discuss the intended NDCs and energy policies for Australia, and the assumed destination countries, Japan and Republic of Korea.

3.2 Australia

Australia's NDC under the Paris Agreement is to reduce GHG emissions by between 26 to 28% below 2005 levels by 2030[3]. This translates into a range of 435-447 Mt $CO_{2\text{-}e}$ per annum (including land use. Land-use change, and forestry - LULUCF) allowed emissions in 2030[4].

Product coal from Dartbrook Mine is proposed to be used in Japan and Republic of Korea. The GHG emissions generated by the use of thermal coal (which form the largest component of Scope 3 emissions) will be accounted for by the end user (i.e. Japan and Republic of Korea) and not by Australia. If thermal coal is used in the Japan or Republic of Korea, the GHG emissions from that end use will count towards their NDC.

As outlined in Australia's NDC, the Australian Government's mechanisms for achieving its 2030 target are its Emissions Reduction Fund (ERF) and Renewable Energy Target. The ERF provides incentives for businesses to implement emissions reduction initiatives. Businesses that take positive steps to reduce their GHG emissions are granted carbon credit units, which can either be sold back to the government or to other businesses that need to offset their emissions.

Since its launch in 2015, the ERF has contracted 438 projects against a cost of A$2.28 billion (US$1.75 billion) to deliver a total of 191 Mt $CO_{2\text{-}e}$ of emissions abatement over 2015–2029. With a total size of A$2.55 billion (US$1.96 billion), about 90 percent of the ERF has been allocated. In the first year of compliance under the ERF Safeguard Mechanism (2016–17), facility operators surrendered around 448,000 Australian Carbon Credit Units to offset emissions above their baselines. Following a review of climate change policies in 2017, the Australian government is

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[2] Conference of the Parties

[3] https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Australia%20First/Australias%20Intended%20Nationally%20Determined%20Contribution%20to%20a%20new%20Climate%20Change%20Agreement%20-%20August%202015.pdf

[4] https://climateactiontracker.org/countries/australia/pledges-and-targets/

currently consulting with industry on potential changes to the ERF Safeguard Mechanism to bring baselines up-to-date with current circumstances and make it fairer and simpler. The government is planning to have any changes made to the Safeguard Mechanism take effect in the 2018/19 compliance year. In its review of climate change policies, the government also stated its in-principle support for the use of international units to meet emission reduction targets. The final decision on international units will be made by 2020 (World Bank Group, 2018). On 25 February 2019 the Australian Government announced the Climate Solutions Fund, providing an additional $2 billion to continue the momentum towards reaching Australia's 2030 emissions reduction target. This will bring the total investment in the Emissions Reduction Fund to $4.55 billion and deliver around another 100 million tonnes of emission reductions by 2030.

Mitigation and management measures to minimise GHG emissions will be described within the Air Quality Management Plan to be prepared to the satisfaction of NSW Department of Planning and Environment (DP&E). The mitigation and management measures proposed are consistent with the primary objective of the Emissions Reductions Fund to reduce GHG emissions.

3.3 Japan

According to IEA, Japan is a major consumer and importer of energy, and a recognised leader in energy technology development. Recently, Japan's energy policy has heavily focused on efforts to overcome the devastation of the 2011 earthquake and the subsequent Fukushima nuclear incident. The accident led to the gradual shutdown of all nuclear power plants, which has resulted in a significant rise in use of fossil fuels, increased fuel imports and rising CO_2 emissions, bringing electricity prices to unsustainable levels.

In the face of these challenges, the Japanese government has revised its energy policy to focus on further diversifying its energy mix (reduced use of fossil fuels, greater reliance on renewable energy, restarting nuclear plants when declared safe) in order to curb carbon emissions. Building on this plan, Japan's NDC (including LULUCF) to the Paris Agreement is to reduce GHG emissions by 26% between 2013 and 2030 (resulting in approximately 1,042 Mt $CO_{2\text{-}e}$ per year by 2030)[5].

This emissions reduction target will require balance between energy security, economic efficiency, environmental protection and safety. The IEA highlights three areas critical to its success: energy efficiency, increasing renewable energy supply and restarting nuclear power generation. The IEA encourages Japan to increase low-carbon sources of power supply. It also recognises that the restoration of nuclear power will only be possible provided the highest safety standards are met, and the critical issues following the Fukushima accident are addressed, including decontaminating areas affected by the radioactive release and restoring public trust.

The Scope 3 emissions from the combustion of coal from Dartbrook Mine to generate electricity in Japan were estimated to be 1.9 Mt $CO_{2\text{-}e}$ per year for Scenario 1, 6.7 Mt $CO_{2\text{-}e}$ per year for Scenario 2. This represents between 0.2% and 0.6% of Japan's 2030 target.

These emissions would be counted as Scope 1 or Scope 2 emissions for Japan in their greenhouse gas reporting. Japan's national policy will dictate how they achieve their NDC.

3.4 Republic of Korea

Republic of Korea (South Korea) is an energy-intensive nation and according to the IEA, it is the world's thirteenth-largest economy and seventh-largest exporter. In 2008, the Republic of Korea

[5] https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Japan%20First/20150717_Japan's%20INDC.pdf

implemented a long-term “green growth” strategy to foster economic development using low-carbon technologies and clean energy. Since then, the government has implemented many policies to support these goals.

The Korean Emissions Trading System (KETS) was introduced on 1 January 2015, making it East Asia’s first nationwide mandatory ETS and the second-largest carbon market after the EU ETS. The ETS covers 591 of the country’s largest emitters, which account for approximately 68% of national GHG emissions. It covers direct emissions of six Kyoto gases, as well as indirect emissions from electricity consumption. Robust energy efficiency policies have been developed to complement the emissions-reduction target. The Republic of Korea has made efforts to increase energy security by taking measures to diversify its energy mix, reduce the usage of fossil fuels and foster the development of renewable energy, in addition to expanding the nuclear energy programme.

The purpose of the KETS was to play an essential role in helping to meet Republic of Korea’s 2030 NDC target of 37% below business-as-usual (BAU) emissions. The BAU case forecasts that GHG emissions will continue to increase until 2030 due to growing energy demand. The NDC target for 2030 is total GHG emissions of 850.6 Mt $CO_{2\text{-}e}$[6].

The Scope 3 emissions from the combustion of coal from Dartbrook Mine to generate electricity in Republic of Korea were estimated to be 3.1 Mt $CO_{2\text{-}e}$ per year for Scenario 1, and 9.1 Mt $CO_{2\text{-}e}$ per year for Scenario 2. This represents between 0.4% and 1.3% of Republic of Korea’s 2030 target.

These emissions would be counted as Scope 1 or Scope 2 emissions for the Republic of Korea in their greenhouse gas reporting. The Republic of Korea’s national policy will dictate how they achieve their NDC.

Yours sincerely

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[6] https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Republic%20of%20Korea%20First/INDC%20Submission%20by%20the%20Republic%20of%20Korea%20on%20June%2030.pdf

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APPENDIX C
Consideration of Scope 3 Emissions in Economic Impact Assessment

Dartbrook Modification 7

Consideration of Scope 3 Emissions in Economic Impact Assessment

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April 2019

Executive Summary

Introduction

- AQC Dartbrook Management Pty Limited (AQC) is seeking to modify its existing development consent to facilitate an alternate mining method and an extension of time to extract part of an already approved to be mined coal resource at Dartbrook Mine.

- The Modification Application is currently being considered for determination by the Independent Planning Commission (IPC).

- AQC's assessment documentation for the Modification has addressed the potential impacts of Scope 1 and 2 greenhouse gas (GHG) emissions.

- A recent judgment of the NSW Land and Environment Court in its Class 1 merits review jurisdiction considered Scope 3 GHG emissions (from the end use of the coal) in determining a coal mining project in NSW.

- This report provides additional information to the IPC regarding the economic assessment of Scope 3 GHG emissions for the Modification, to facilitate an appropriate level of consideration of Scope 3 emissions when making its determination of the Modification Application.

Project Scope

- Only the costs and benefits associated with the Modification Application for which approval is sought i.e. continued mining and rail of product coal to the port of Newcastle for sale to the export market, are relevant to a cost benefit analysis (CBA) of the Modification.

- NSW Government (2018) *Technical Notes supporting the Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals* confirm that only Scope 1 and Scope 2 GHG emissions of a project should be included, consistent with the accounting framework under the *UN Framework Convention on Climate Change*.

Standing in Cost Benefit Analysis

- The NSW Government (2015) *Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals* identify that the relevant community for assessing the public interest of a proposal using CBA is the collective public interest of households in NSW. NSW Treasury (2017) *NSW Government Guide to Cost-Benefit Analysis* also makes it clear a CBA should focus on impacts (costs and benefits) to the NSW community.

- Hence, only the impacts of Scope 1 and 2 GHG emissions, from the identified project (coal mining and delivery to Port), on the households in NSW should be included in a CBA of a mining project in NSW.

Apportionment of Scope 1 and Scope 2 GHG Emissions in Cost Benefit Analysis of a Coal Mining Project

- Consistent with the Technical Notes (NSW Government 2018), global social damage cost estimates of Scope 1 and 2 GHG emissions of the Modification therefore need to be apportioned to **NSW only**.

- The approach taken in the Economic Impact Assessment of the Dartbrook Modification 7 was apportionment of the global damage costs of Scope 1 and 2 GHG emissions based on NSW's share of the global population, an approach supported by the NSW Department of Planning and Environment (2017)[1].

Scope 3 Greenhouse Gas Emissions Associated with the Dartbrook Modification

- Scope 3 GHG emissions are associated with upstream and downstream activities, including the burning of coal overseas.

- In economic analysis, the burning of coal overseas constitutes a separate project that has its own set of costs and benefits including the benefits of electricity generation. Hence, from an economic perspective any consideration of Scope 3 emissions, from the burning of NSW coal, also requires consideration of all the other costs and benefits associated with the burning of the coal. In most cases, these costs and benefits occur overseas in the coal importing country and the consideration of these costs and benefits (including GHG emissions from the burning of that coal) falls to that country.

- Total Scope 3 emissions, associated with the burning of Modification coal in South Korea or Japan to generate electricity, are estimated at in the order of 39.4 Mt CO2-e.

- The **global** social damage cost of these emissions using the same assumption as used in the CBA of the Modification is $0.3B to $1.1B, present value (using a 7% discount rate). The lower figures use the NSW Government's (2018) proposed central estimate of the global social damage cost of GHG emissions.

- To put this in some perspective, the gross market value of electricity generated from burning all the Modification coal in South Korea would be in the order of $1B (present value using a 7% discount rate). Consumer surplus benefits from electricity production from burning the Modification coal would be in the order of $6B.[2] There may also be a range of other costs and benefits to South Korea that would be included in a CBA of the burning of coal to produce electricity.

Long-term Coal Requirements and Substitution Effects

- The demand for coal is a derived demand arising from the demand for electricity. The absence of a supply of coal from one source (e.g. Australia) to fulfil this demand will result in coal being obtained from a substitute source. If the substitute source is lower quality coal, this will lead to poorer environmental outcomes.

[1]NSW Department of Planning and Environment (2017) Residual Matters Report: State Significant Development Wallarah 2 Coal Project (SSD 4974).

[2] Estimated using the approach outlined in the Asian Development Bank (2013) *Cost-Benefit Analysis for Development: A Practical Guide*, Mandaluyong City, Philippines: Asian Development Bank, 2013 and assuming static base electricity production of 497 TWh (South Korea Ministry of Trade, Industry and Energy 2017,The 8th Basic Plan for Long-term Electricity Supply and Demand 2017 - 2031), 1 tonne of coal generates 1,507 KWh of electricity (https://www.quora.com/How-many-units-of-electricity-are-produced-from-1-ton-of-coal-in-thermal-plant), base price of electricity of USD0.11/KWh (https://www.globalpetrolprices.com/South-Korea/electricity_prices/), AUD:USD exchange rate of 0.75 and a price elasticity of demand of -0.272 (Tingwen Liu, 2015. "The Residential Demand for Electricity in South Korea," International Journal of Economics and Empirical Research (IJEER), The Economics and Social Development Organization (TESDO), vol. 3(2), pages 73-85, February).

Sovereign Approaches to Meeting Paris Agreement Commitments

- Under the Paris Agreement, Scope 3 emissions associated with the burning of coal from the Modification are the responsibility of the importing countries. South Korea and Japan have the sovereign right to determine how they will meet their Paris Agreement commitments.

Contents

1.0 Introduction

AQC Dartbrook Management Pty Limited (AQC) is the proprietor of the Dartbrook Mine, located in the Upper Hunter Valley of NSW. AQC is a wholly owned subsidiary of Australian Pacific Coal Limited. Dartbrook Mine is managed in accordance with Development Consent DA 231-7-2000 granted under the *Environmental Planning and Assessment Act 1979* (EP&A Act). DA 231-7-2000 allows for longwall mining operations to be carried out until 5 December 2022. Dartbrook Mine has been under care and maintenance since 2006. AQC is seeking to modify DA 231-7-2000 to facilitate an alternate mining method and an extension of time to extract part of an already approved to be mined coal resource at Dartbrook Mine.

The Modification Application is currently being considered for determination by the Independent Planning Commission (IPC).

AQC's approvals documentation for the Modification has addressed the potential impacts of Scope 1 and 2 greenhouse gas (GHG) emissions.

The NSW Land and Environment Court (2019) in its Class 1 merits review jurisdiction delivered its judgment in *Gloucester Resources Limited v Minister for Planning* (the Judgment), which related to whether to grant development consent for a mining project in New South Wales. In making its decision, the Court had regard to Scope 3 greenhouse gas (GHG) emissions.

This report provides additional information regarding the economic assessment of Scope 3 GHG emissions associated with the Modification.

2.0 Scope of Cost Benefit Analysis of a Project

CBA can be undertaken for any type of project or policy. The definition of the project for which approval is being sought has important implications for the identification of the costs and benefits of a project. Only the costs and benefits associated with the defined project are relevant. For coal mining projects, typically the project scope is the mining of coal and delivery to the Port for export or to domestic users. This represents the project for which approval is being sought. Hence, only the costs and benefits from mining the coal and delivering it to the Port for export or to domestic users, are relevant. In this context, Scope 1 and Scope 2 emissions are relevant to a CBA of a coal mining proposal.

This is confirmed by the NSW Government (2018) *Technical Notes supporting the Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals*. The Technical Note for addressing greenhouse gas emissions in CBA "*sets out the preferred approach for estimating and costing GHG emissions*" (NSW Government 2018, p.44) and specifically states that "*for the purposes of this analysis, only Scope 1 and Scope 2 emissions need to be reported, along with energy use and activity estimates used to derive these estimates*" (NSW Government 2018, p. 45).

The Technical Notes (p. 45) further state that "*the Scope 3 accounting framework is inconsistent with established national accounting rules established under the UN Framework Convention on Climate Change*[3]*, and could potentially result in 'double counting' of emissions when applied in conjunction with Scope 1 and*

[3] See United Nations Framework Convention on Climate Change, http://unfccc.int/national_reports/annex_i_ghg_inventories/reporting_requirements/items/2759.php (accessed 8 February 2018).

2 because emissions 'ownership' would be attributed to both the producer and end-user of a product, service or fuel".

3.0 Standing in Cost Benefits Analysis

CBA includes the consideration of costs and benefits to all members of society i.e. consumers, producers and the broader society as represented by the government.

"Standing" in CBA relates to the definition of society and hence whose benefits and costs count. The most inclusive definition of society includes all people, no matter where they live or to which government they owe allegiance to (Boardman et al. 2001). In practice most analysts define society at the national level based on the notion that the citizens of a country share a common constitution that sets out fundamental values and rules for making collective choices and that the citizens of other countries have their own constitutions that make them distinct societies (Boardman et al. 2001).

The NSW Government (2015) *Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals* adopt an even narrower definition of society than Boardman et al. (2001). This guideline identifies that the relevant community for assessing the public interest of a proposal using CBA is the collective public interest of households in NSW. This is confirmed in the Judgment (at paragraph 558). NSW Treasury (2017, p.iii) *NSW Government Guide to Cost-Benefit Analysis* also makes it clear a CBA should focus on impacts (costs and benefits) to the NSW community.

4.0 Apportionment of Scope 1 and Scope 2 GHG Emission Impacts in Cost Benefit Analysis of a Coal Mining Project

For a CBA of a coal mining project only the social damage costs of GHG emissions from that project i.e. Scope 1 and 2 emissions, on the households of NSW should be included.

As a starting point for the estimation of the impact of GHG emissions, the Technical Notes (NSW Government 2018) refer to the European Union Emissions Trading System (EU ETS) as a source of estimated **global** costs of carbon. The **global** costs of carbon are the present value of additional economic damages now and in the future caused by an additional tonne of CO2-e emissions. It is the cost of carbon emissions to the population of the whole world.

Consequently, the Technical Notes (NSW Government 2018) state that "*project proponents should provide an analysis of:*

- *their business-as-usual (BAU) GHG emission output (central estimate) and the expected emissions profile of this central estimate (Scope 1 and 2); and*
- *Estimate the economic impact of GHG emission output to **NSW only** (emphasis added).*"

This necessarily requires some apportionment of global impacts to NSW. See Gayer and Viscusi (2016) [4] for a discussion of the need to apportion global impacts of GHG to match the "standing" used in CBA.

[4] As discussed in Gayer, T. and Viscusi, W.K. (2016) Determining the Proper Scope of Climate Change Policy Benefits in U.S. Regulatory Analyses: Domestic versus Global Approaches, Review of Environmental Economics and Policy Volume 10, Issue 2, Pages 245–263.

The approach taken in the Economic Impact Assessment of the Dartbrook Modification 7 was apportionment of global damage costs based on NSW's share of the global population, an approach supported by the NSW Department of Planning and Environment (2017)[5].

5.0 Scope 3 Greenhouse Gas Emissions from Burning of Coal from the Dartbrook Modification

Scope 3 emissions are associated with the burning of coal overseas. In economic analysis, the burning of coal overseas constitutes a separate project that has its own set of costs and benefits including the benefits of electricity generation. Hence, from an economic perspective any consideration of Scope 3 emissions, from the burning of NSW coal, also requires consideration of all the other costs and benefits associated with the burning of the coal. In most cases, these costs and benefits occur overseas in the coal importing country and the consideration of these costs and benefits (including GHG emissions from the burning of that coal) falls to that country.

Total Scope 3 emissions, associated with the burning of Modification coal in South Korea or Japan to generate electricity, are estimated at in the order of 39.4 Mt CO2-e.

The **global** social damage cost of these emissions using the same assumption as used in the CBA of the Modification is $0.3B to $1.1B, present value (using a 7% discount rate). The lower figure uses the NSW Government's (2018) proposed central estimate of the global social damage cost of GHG emissions based on the forecast European Union Emissions Allowance Unit Price. The upper figure uses the United States Environmental Protection Agency estimates.

To put this in some perspective, the gross market value of electricity generated from burning all the Modification coal in South Korea would be in the order of $1B (present value using a 7% discount rate). In addition, consumer surplus benefits from electricity production would be in the order of $6B.[6] There may also be a range of other costs and benefits to South Korea that would be included in a CBA of the burning of coal to produce electricity.

If the coal were exported to Japan instead of South Korea, the benefits of electricity would likely be of a similar order of magnitude.

6.0 Long-term Coal Requirements & Substitution Effects

The demand for coal is a derived demand. In relation to thermal coal, what is actually demanded is electricity. The absence of a supply of coal from one source will result in a substitute source being found in order to meet the demand for coal, given the significant invested infrastructure in coal-fired power

[5]NSW Department of Planning and Environment (2017) Residual Matters Report: State Significant Development Wallarah 2 Coal Project (SSD 4974).

[6] Estimated using the approach outlined in the Asian Development Bank (2013) *Cost-Benefit Analysis for Development: A Practical Guide*, Mandaluyong City, Philippines: Asian Development Bank, 2013 and assuming static base electricity production of 497 TWh (South Korea Ministry of Trade, Industry and Energy 2017,The 8th Basic Plan for Long-term Electricity Supply and Demand 2017 - 2031), 1 tonne of coal generates 1,507 KWh of electricity (https://www.quora.com/How-many-units-of-electricity-are-produced-from-1-ton-of-coal-in-thermal-plant), base price of electricity of USD0.11/KWh (https://www.globalpetrolprices.com/South-Korea/electricity_prices/), AUD:USD exchange rate of 0.75 and a price elasticity of demand of -0.272 (Tingwen Liu, 2015. "The Residential Demand for Electricity in South Korea," International Journal of Economics and Empirical Research (IJEER), The Economics and Social Development Organization (TESDO), vol. 3(2), pages 73-85, February).

generating facilities. If South Korea and/or Japan are required to obtain alternative coal supplies this is likely to come from countries such as Indonesia and would have a higher ash and sulphur content. Burning of lower quality coal to generate electricity would result in poorer environmental outcomes.

7.0 Sovereign Approaches to Meeting Paris Agreement Commitments

The Paris Agreement is not prescriptive about how its signatories are to achieve its objective. Each nation is responsible for setting its own emissions target and developing systems for reducing GHG emissions. That is, each nation is responsible for managing its own Scope 1 and 2 emission profiles to fit its own targets aligned with the Paris Agreement. From an economic perspective, reducing GHG emissions is a complex and not costless process. The most efficient approach is via first choosing the lowest cost alternatives. For individual countries this may or may not be via changes in the electricity sector and importantly it is up to each country to determine this given the complexities involved.

In this respect, in 2015 South Korea commenced an Emissions Trading Scheme (KETS). Such schemes allow the economy to adjust in a least cost way. South Korea also recently announced a proposal to increase its share of renewable electricity generation. However, coal fired electricity will continue to have a central role in electricity generation in South Korea. Based on the Korean Government's '8th Basic Plan for Electricity Supply and Demand' published at the end of last year, coal-fired power plant capacity will increase 8% from current levels by 2030. This indicates an ongoing reliance on coal-fired power, despite increases in generation from other power sources.

As part of its commitment to the Paris Agreement, Japan has pledged to reduce its emissions by 26 percent by 2030 (against a 2013 baseline). The government is currently developing a long-term strategy that is expected to explain how it intends to achieve this.