APPENDIX O REVISED ECONOMIC IMPACT ASSESSMENT

Angus Place Mine Extension Project
Economic Assessment

Centennial Angus Place Pty Limited

October 2019

AIGISGROUP

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Executive Summary

- This report forms part of the State Significant Development (SSD) application for the Angus Place Mine Extension Project (the Project). Section 4.12 (formerly Section 78A) of the *Environmental Planning and Assessment Act 1979* (EP&A Act), requires that an Environmental Impact Statement (EIS), in respect of State Significant development must include an Economic Assessment (EA), which is presented in this document.
- Angus Place Colliery is owned by Centennial Coal as a joint venture with SK Kores Australia Pty Ltd (50%-50% joint venture). The Angus Place Colliery has been operated by Centennial Angus Place Pty Limited (Centennial Angus Place), on behalf of the joint venture participants since 2002. Centennial Angus Place Pty Limited is the nominal proponent for the Project. A project description is presented in Section 1.2.
- The economic assessment compares outcomes estimated to result from the proposed Project, with the alternative base or 'business-as-usual' (BAU) case. The BAU case is essentially that the consent is not granted and mining ceases on exhaustion of the nearby Centennial Coal Springvale Mine, with Angus Place Colliery not resuming production from its current status of operating on 'care and maintenance'. Comparisons of outcomes in respect of the range of economic effects under both scenarios are presented throughout this economic assessment. It is noted that a key assumption is that Angus Place will be sequenced with the currently operating Springvale Mine, therefore commencing production as Springvale comes to the end of its productive life.
- The mine's principal customer will be Mount Piper Power Station (MPPS), owned and operated by EnergyAustralia, as is currently the case with Springvale Mine. The proximity of the mine to MPPS permits delivery of coal to the power station by existing overland conveyor infrastructure. This is considered as a significant advantage when compared to sourcing fuel from alternative suppliers, which would entail greater socioeconomic and environmental costs in terms of alternative transport requirements. Furthermore, MPPS is designed for use of locally sourced coal, to improve operational efficiencies and emissions requirements.
- The Cost Benefit Analysis (CBA) presented in the document is based on measures that are most relevant to the community of NSW and the region, as required in the guidelines issued by the Department of Planning and Environment (DPE, now DPIE) in 2015 and 2017. Centennial Coal has a longstanding policy of excluding certain material that is addressed in the guidelines, on the bases of commercial confidentiality and/or corporate accounting policies that aggregate measures such as corporate taxes to whole-off-company level.
- Taking into account the exclusions noted above, royalties returned to the state and employee benefit are the major sources of public economic benefit generated by the project. These are valued at approximately $139 million (royalties) and $23 million (employee benefit) over the life of the Project.
- An assessment of environmental impacts and their associated social implications was undertaken, to determine which of these impacts were suitable for quantitative (monetised) valuation. In aggregate, these valuations amounted to $36.4 million over the life of the Project. It is noted that these valuations may not fully reflect the values placed on these environmental assets and the predicted effects on them by some stakeholders. In

recognition of this, the CBA and the Local Effects Analysis (LEA) include more detailed discussion of the qualitative aspects of these impacts, which augment the monetised values estimated.

- Quantitatively, the largest of these quantified effects is Scope 1 and Scope 2 greenhouse gas emissions. Qualitatively, a second area of potentially significant effect is on certain swamps that will be undermined and are predicted to be affected by subsidence. This involves the potential for other effects such as on water resources. As part of the approach to avoiding, managing or mitigating effects, Centennial Angus Place will sterilise approximately 9.8Mt of coal (with foregone royalties of approximately $25 million (NPV), conduct ongoing monitoring of the relevant swamps and contribute offsets valued at $14 million.
- In terms of effects on other industries, as the Project effectively involves a continuation of activity at similar levels to existing activity at Centennial's Springvale Mine, there are unlikely to be significant distortionary effects in terms of existing aspects of the state and regional economies, such as labour markets, and the performance of other businesses.
- The assessed net economic valuation of the Project is a benefit of approximately $125 million (NPV over Project life). A Cost Benefit Ratio was also calculated at 4.4 (benefit to cost).
- The LEA reports on internal (survey-based) research at Springvale Mine (2016), which provides a description of the demographic and socioeconomic characteristics of that workforce (which is largely expected to migrate to Angus Place under the proposed sequencing approach). That research clearly established that the workforce is essentially locally and/or regionally based. As such, the majority of economic benefit associated with employee benefit should be assessed as accruing to the regional community.
- Based on the total employee benefit and a survey derived assessment of average take-home pay spent in the local/regional economy, it is assessed that $17 million of employee benefit is estimated to accrue locally/regionally.
- An assessment of internal commercial data indicates that a further $43 million a year in non-labour expenditure is likely to be disbursed in the regional economy by Centennial Angus Place.
- Certain environmental impacts that were quantified in the CBA and others that were qualitatively valued will have particular effect at local level. These include air quality, noise and traffic impacts, which entail highly localised effects. With respect to these localised impacts, 16 residential receptors (residences) were identified in assessing the scope of air quality and noise impacts. The specialist assessments of these effects indicate that these are within permissible levels and will not be of significant measured effect. That notwithstanding that this will be subject of continuous monitoring, as such effects may still be perceived as impacting on stakeholders in some circumstances.
- The conclusion of the LEA is that the Project will have an overall positive effect on the local/regional economies and communities. Conversely, the BAU case will have a range of enduring, negative effects, both economically and socially. This includes direct effects on employees and their households, and on firms which are currently direct suppliers of goods and services to Springvale Mine, and would continue to do so under the Project. These effects are assessed as likely to cause hardship at the household and regional economic level.

- From the State's perspective, there would also be impacts under the BAU scenario, although these would be less discernible, given the scale of the NSW economy. However, in essence, the Project represents a significantly more beneficial socioeconomic solution to delivering and ensuring continuity of supply of fuel to Mount Piper Power Station.
- A range of recommendations, largely predicated on those proposed by specialist consultants, are proposed and or endorsed in this report, to support avoidance, management and mitigation of impacts to the extent possible.
- On balance, the Project is assessed as being likely to produce a beneficial outcome for NSW and the regional and local communities. The Project represents a significantly more favourable socioeconomic outcome than does the alternative BAU case.

Contents

Abbreviations[1]

ABS	Australian Bureau of Statistics
C&M	Care and maintenance
CBA	Cost Benefit Analysis
CERD	Centre for Economic and Regional Development
DIIS	Department of Industry, Innovation & Science (Australian Government)
DPE	Department of Planning and Environment[2]
DPC	Department of Premier and Cabinet
EA	Economic Assessment
EIS	Environmental Impact Statement
FTE	Full Time Equivalent
GRP	Gross Regional Product
GVA	Gross Value Added
Ha	hectare/s
LCC	Lithgow City Council
LEA	Local Effects Analysis
LGA	Local Government Area
LOM	Life of Mine
MPPS	Mount Piper Power Station
Mtpa	Million tonnes per annum
MWRC	Mid-Western Regional Council
RBA	Reserve Bank of Australia
ROM	Run of Mine
SA3	Statistical Area Level 3 (ABS)
SSD	State Significant Development
THPSS	Temperate Highland Peat Swamps on Sandstone

[1] Some other abbreviations are derived from specialist consultant reports and are presumed to be accessible to, and understood by, the consent authority and are not included in this list in the interests of brevity.
[2] Currently DPIE, Department of Planning, Industry and Environment

1 PART A - INTRODUCTORY MATERIAL

1.1 Introduction

1.1.1 Purpose of this report

This report forms part of the State Significant Development (SSD) application for the Angus Place Mine Extension Project (the Project). Section 4.12 (formerly Section 78A) of the *Environmental Planning and Assessment Act 1979* (EP&A Act), requires that an Environmental Impact Statement (EIS), in respect of State Significant development must include an Economic Assessment (EA). The assessment is required to be prepared in accordance with the NSW Government Department of Planning and Environment (DPE) *Guidelines for the economic assessment of mining and coal seam gas proposals* (December 2015) and the supplementary *Technical Notes supporting the Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals* (April 2018)[3]. This EA is prepared to comply with the guidelines to the extent that these may be practicably applied, in the context of certain information that is excluded from this report as required by the proponent. Such exclusions are noted at the relevant points of this EA. Broadly, this EA includes the requisite Cost Benefit Analysis (CBA) and Local Effects Analysis (LEA) components and supporting material and analyses.

1.1.2 The Proponent

Angus Place Colliery is owned by Centennial Coal as a joint venture with SK Kores Australia Pty Ltd (50-50% joint venture). The Angus Place Colliery has been operated by Centennial Angus Place Pty Limited (Centennial Angus Place), on behalf of the joint venture participants since 2002.

Centennial Angus Place Pty Limited is the nominal proponent for the Project.

1.1.3 Project overview

Angus Place Colliery is an existing underground coal mine producing high quality thermal coal for domestic markets, predominantly to the Mount Piper Power Station (MPPS). It is located 15 kilometres to the northwest of the regional city of Lithgow and 120 kilometres west-northwest of Sydney in New South Wales.

The mine's current project approval (Project Application 06_0021) was granted in September 2006 under the now repealed Part 3A of the *Environmental Planning and Assessment Act 1979*. The current project approval will expire in August 2024 and a new State Significant Development consent is required to ensure Angus Place Colliery is operational beyond this date.

The components of Angus Place Colliery's existing operations are an underground longwall mine, accessed via the Angus Place pit top, and supporting surface infrastructure within the pit top area and on Newnes Plateau, within the Newnes State Forest.

Centennial Angus Place proposes to extend its mining operations, using longwall mining techniques, to the east of its existing workings at Angus Place Colliery. A State significant development (SSD

[3] Referred to jointly hereafter as 'the guidelines' except were specific references to either document may be required.

5581) application in relation to the Angus Place Mine Extension Project was submitted in April 2014 and the supporting Environmental Impact Statement (EIS) was exhibited in May 2014. Centennial Angus Place is proposing to amend the Project in an Amendment Report.

1.1.4 Coal supply to MPPS

MPPS is owned and operated by EnergyAustralia. Energy Australia's webpage for MPPS states that '*Mt Piper power station is fuelled using black coal sourced from mines in the local area. The power station's furnaces are designed to utilise the characteristics of the locally available coal to improve its efficiency and help keep the power station's emissions below statutory requirements*'[4]. As is discussed subsequently in this report, there are also significant efficiencies relating to the proximity of Angus Place Mine to MPPS and the use of existing overland conveyor infrastructure as the delivery medium from mine to power station. These are clearly key advantages in respect of the proposed Project.

1.2 Project description

The Project, as amended will, in general, include all currently approved operations, facilities and infrastructure of the Angus Place Colliery, except as otherwise indicated below:

- Extend the life of the mine to 31 December 2053.
- Increase in Project Application Area from 10,460 hectares (ha) to 10,551 ha.
- Increase in full time equivalent (FTE) personnel from 300 to 450.
- Increase the extraction up to 4.5 million tonnes per annum (Mtpa) of run of mine (ROM) coal from the Lithgow Seam underlying the Project Application Area.
- Continued development of new roadways to enable access to the proposed 1000 panel longwall mining area.
- Extraction of existing approved longwall 910.
- Development and extraction of 15 longwalls (LW1001-1015) with void widths of 360 metres.
- Development of underground roadway connections between the Angus Place Colliery underground mine workings and the Springvale Mine underground mine workings.
- Transfer up to 4 Mtpa of run-of-mine (ROM) coal to the Angus Place pit top for processing and handling before being transported off site in accordance with the Western Coal Services Project development consent (SSD 5579).
- Transfer up to 4.5 Mtpa of ROM coal by underground conveyor to the Springvale Mine pit top via proposed new underground connection roadways for handling and processing in accordance with the Springvale Mine Extension Project development consent (SSD 5594).

[4] https://www.energyaustralia.com.au/about-us/energy-generation/mt-piper-power-station

- Enlargement of the ROM coal stockpile at the Angus Place Colliery pit top from 90,000 tonnes to 110,000 tonnes capacity.
- Construction of the approved but not yet constructed 4.5 metre shaft at the Angus Place Ventilation Facility (APC-VS2) on the Newnes Plateau.
- Installation and operation of the ventilation fan at the Angus Place Ventilation Facility (APC-VS2) on the Newnes Plateau.
- Construction and operation of one additional downcast shaft and mine services boreholes within the proposed Angus Place Ventilation Facility (APC-VS3) on the Newnes Plateau to support mining in the 1000 panel area.
- Construction and operation of additional dewatering facilities and associated infrastructure on the Newnes Plateau to support mining in the 1000 panel area to facilitate the transfer of mine water into the Springvale Delta Water Transfer Scheme (SDWTS).
- Transfer of mine inflows from the existing and proposed workings at Angus Place Colliery to the Springvale Water Treatment Project (SSD 7972) for treatment and beneficial reuse at MPPS.
- Operation of the Angus Place Colliery 930 Bore and associated infrastructure for raw mine water transfer from the SDWTS to the underground mining area.
- Connection to the Lithgow City Council main sewer line prior to the commencement of longwall extraction (subject to a separate development application through Lithgow City Council).

1.3 Alternatives to the proposal – 'base case'

The guidelines stipulate that 'the without project case is termed the 'base case'' (2015:7). This may also be referred to as the business-as-usual or 'BAU' case. With respect to the Project, the BAU case entails two elements, which would overlap in terms of projected timing for the modification, but which would result in a significant cumulative effect from the perspective of Centennial Coal and more broadly for NSW and the region, in economic terms. The BAU case, as defined by these two elements is:

- Withholding of consent for the Project. This would effectively lead to cessation of ongoing care and maintenance (C&M) work on the site. Centennial Coal would essentially be obliged to commence decommissioning, rehabilitation and ultimately cessation of all works on the site.
- Given that the approach adopted by Centennial Coal is essentially to sequence the resumption of production at Angus Place off the end of production at Springvale Mine, failure to obtain consent would result in closure of both mines, at the expiration of Springvale Mine's consent (31 December 2028)[5].

[5] Including time allowed for decommissioning and rehabilitation activity.

1.3.1 Negative effects of BAU case

A summary of the potentially negative economic effects of this combination of outcomes of the BAU case is:

- All direct, contract and derived employment associated with operation of the mine/s would cease, with related negative effects in the local and regional economies.
- All commercial transactions with local, regional and NSW-based businesses would cease, depriving suppliers of goods and services to the mine of this source of business.
- Supply of coal to MPPS from the mine/s would cease. This would in likelihood result in EnergyAustralia, operator of MPPS, being obliged to source fuel from other, more distant mines. This would necessitate, *inter alia*, increased costs for MPPS, which may ultimately be passed on to customers in the form of higher prices;
- This in turn may increase the need for supply by rail (which is the most plausible alternative) or road. This would result in increased impacts such as traffic, air quality and greenhouse gas emission effects, when compared with the comparatively less impactful and less emissions-intensive supply by overland conveyor from Springvale and subsequently, Angus Place, due to their proximity to MPPS.
- As is noted in Section 1.1.4, this would also have potentially negative impacts on the operating efficiency of MPPS, based on statements published by EnergyAustralia.

In addition to these direct effects that would result under the BAU case, there are likely to be a range of economic impacts, particularly at local and regional level, that would be likely to negatively affect entities across those economies. The potential for localised effects is addressed in greater detail in the LEA forming part of this assessment.

1.3.2 Positive effects of BAU case

The potential for positive economic effects from the BAU case can be summarised as the avoidance of the range of environmental effects assessed in Table 4. Economic assessments of the extent of these effects are valued to the extent practicable in the CBA. However it is noted that, as provided for in the guidelines, qualitative assessment is more appropriate for certain effects, either in lieu of, or complementary to quantitative assessments. Such analyses are reported where appropriate in the CBA and also in the LEA.

2 PART B: COST-BENEFIT ANALYSIS (CBA)

2.1 Withholding of certain information from the economic assessment

It is advised that, consistent with the longstanding approach of Centennial Coal with respect to economic assessments, Centennial Angus Place maintains that the internal financial appraisal process and its outputs in respect of the Project are highly commercially sensitive. Furthermore, the output of this modelling is of no consequence to consideration or assessment of third-party or externalised economic effects of the Project, which are those of interest in a public assessment process and those which are addressed in the guidelines. The publication of such information has the potential to jeopardise commercial negotiations and outcomes in which Centennial Angus Place may be involved either at the time of publication of this information or subsequently. This is particularly relevant in respect of sales to domestic customers, most notably electricity generators. Publication of this information may also be prejudicial to the commercial interests of relevant

Centennial customers. As such, this material is considered by Centennial Angus Place as being unsuitable for presentation in a document which is intended for public exhibition. This information is excluded from this economic impact assessment on that basis, but has been prepared and can be made available to the consent authority as required. It is noted that in the context of the guidelines, the exclusion of this material equates to exclusion of 'net producer surplus' calculation from the assessment. It is also relevant that the joint venture ownership of Angus Place Colliery is overseas based. As such, no material element of net producer surplus would accrue to NSW.

It is also advised that due to corporate reporting arrangements within Centennial Coal, in part relating to the aggregated reporting of group financial performance for the purpose of corporate income tax assessments, the assessment of economic benefit excludes specific provision for such taxes. The bases for this treatment are explained in greater detail in Annexure 1. The annexure also discusses the exclusion of certain state-levied taxes. It is also noted that the guidelines (2015:10) stipulate exclusion of, for example, payroll taxes. The guidelines indicate that these should be included in the reporting of costs, which is excluded from this report on the basis described above.

2.2 Assessment of economic benefit of the Project

As is provided for in the guidelines (2015:1), the collective public interest of households in NSW and the economic benefit of the Project to the NSW community are the foci of the CBA. The assessments reported below have been developed in this context and that of the discussion on exclusion of material presented in Section 2.1. The principal or central estimates provided in these assessments assume are Present Values (PV) and Net Present Values (NPV) at the discount rate of 7%, with sensitivity testing at 4% and 10% (DPE 2015:4).

2.2.1 Royalties

The assumptions adopted for calculation of royalties are presented in Annexure 2, and the assessment presented in Tables 1 and 1a. Royalties are of primary interest to the community, as they represent the return to government for licensing Centennial Angus Place to mine the resource. The application of royalty revenues to the provision of state-provided infrastructure, goods and services, is the practical return to the community.

2.2.2 Economic benefit to workers

The definition of economic benefit to workers presented in the guidelines (2015:13) forms the basis of the estimate presented in Table 1. The method for calculating this estimate is presented in Annexure 2. The upper and lower bound estimates are based on the two 'labour surplus' estimates calculated in the annexure.

2.2.3 Aggregate economic benefit

The estimates described in Sections 2.2.1 and 2.2.2 are presented severally and in aggregate in Table 1. Two forms of sensitivity analysis, based on DPE/Treasury recommended discount rates and on Monte Carlo analysis output (including confidence intervals as upper and lower bounds), are presented in Table 1a[6].

[6] The analyses reported in this document were conducted as lower and upper bounded, 1000 iteration simulations.

Table 1: Estimate of economic benefit

Economic Benefit	Estimation assumptions	Modification effects
NSW Government royalties	Refer to Annexure 3	Assessed PV ≈$138.8 million
Employee benefit – all positions	Refer to Annexure 2	Assessed PV ≈ $22.6 million
Other Federal, State and Local government taxes, rates etc.	Refer to Annexure 1	Not quantitatively estimated
Total economic benefit PV		**≈ $161.4 million**

Table 1a: Sensitivity analyses, economic benefit

	Discount rate ($ million)		
	4%	**7% (central)**	**10%**
Royalties	193.4	**138.8**	102.4
Employee benefit	30.0	**22.6**	17.6
Total economic benefit	223.4	**161.4**	120.0
	Monte Carlo ($ million)		
	95% CI lower[7]	**Simulation mean**	**95% CI upper**
Royalties	138.7	**139.1**	139.4
Employee benefit	22.5	**22.6**	22.7
Total economic benefit	161.2	**161.7**	162.1
	Monte Carlo high & low discount rate results ($ million)		
	95% CI lower[8]	**Simulation mean**	**95% CI upper**
Royalties	151.3	**153.3**	154.3
Employee benefit	24.8	**25.1**	25.5
Total economic benefit	176.1	**178.4**	179.8

The assumed outcomes is based on DPE's central discount rate and results in a total assessed economic benefit of approximately $161 million. Sensitivity testing conducted using the full range of alternative discount rate outcomes indicates that the economic benefit may be in the range of $176.1 million to $179.8 million.

2.3 Assessment of the economic cost of the Project

2.3.1 Explanatory material on cost assessments

Taking into account the matters disclosed in Section 2.1, from the perspective of NSW and the community in the locality (SA3)[9], the quantitative or monetised assessment of costs essentially

[7] Confidence interval.
[8] Confidence interval.
[9] ABS Lithgow Mudgee Statistical Area Level 3.

relates to valuations of environmental and related effects and their associated social aspects, that can be validly calculated. These are relevant for consideration from the perspectives of both the CBA and the LEA.

In assessing the impacts, the listing of effects to be considered in the guidelines was adopted as the basis. However, as the Project does not involve any additional surface infrastructure that is not subject of an existing approval, or which requires expansion of the existing surface footprint of the mine, assessments for certain effects provided for in the guidelines, such as biodiversity effects and visual amenity, are not assessed.

Those effects that can be monetised are presented in Table 2. The method employed for valuations is benefit transfer, as described in the Technical Notes (DPE 2019:10), which also describes the limitations of the method. Those limitations were taken into consideration in determining which effects could be valued and the appropriate existing studies that could be applied with adequate validity. Detail of the reports and other assumptions used in valuations are included in Annexure 4, however brief outlines of relevant assumptions are presented in Table 2.

In the context of the scale of the Project demonstrated by the estimates presented in Table 1, it is evident that some of these assessments may not be considered as material when considered individually. For the purposes of ensuring that this interpretation of these effects is taken into account, the sum of valuations can be considered as material in magnitude. Furthermore, the qualitative aspects of these effects may alter the materiality of potential impacts, particularly in relation to the views of some stakeholders. These aspects are outlined in Table 4, and discussed in the LEA (Part C).

Sensitivity analysis outputs based on discount rate adjustments are presented in Table 2a. Assessments based on Monte Carlo analyses which were calculated for economic benefit, were not prepared for two of the lower value economic costs (surface water and heritage estimates) as these were assessed using only one benefit transfer assessment, thus precluding generation of the lower and upper bound estimates required to support such analyses.

Table 2: Assessment of environmental, social and transport costs

Description of impact	Assessment assumptions	Assessment outcome
Aboriginal Cultural Heritage[10]	9 Aboriginal cultural heritage sites within angle of draw (one considered as at risk of subsidence impact): $8.15 per capita p.a. for each 1,000 places protected); SA3 population (46,612) assumed (as the locality)[11]	PV = $32,024 (2020-2053, effects notionally assumed from commencement of full operations 2025).
Groundwater	Qualitative assessment. Some elements of assessment of surface water impacts are interrelated.	-
Surface water	Total principal area of impact 2km + 0.2km (drainage line 6) ∴ 2.2km. 6,000 households assumed as per methodology described in Annexure 4.	PV = $176, 090 (assumed for full Project assessment period 2020 – 2053)[12].
Air quality	$PM_{2.5}$ emissions (1.976 tonnes per year); unit damage cost $29,000/tonne, operational stage.	PV = $439,753 (underestimate, as this excludes pre and post-production stages).
GHG	Refer to Table 4 (t CO_2-e) volumes; Annexure 5 (pricing/cost assumptions)	PV =$35,768,481 (underestimate, as this excludes pre and post-production stages).
Noise & vibration	*Not quantitatively assessed*	-
Traffic	*Not quantitatively assessed*	-
Aquatic ecology & stygofauna	*Not quantitatively assessed*	-
Subsidence	Impacts accounted for in assessments for Aboriginal cultural heritage, groundwater and surface water	-
TOTAL ASSESSMENT		**PV = $36,433,960 (≈ $36.4 million)**

Table 2a: Sensitivity analyses, economic costs

	Discount rate ($ million)		
	4%	**7% (central)**	**10%**
Assessed cost	51.5	**36.4**	26.7

2.3.2 Net public infrastructure costs

Angus Place Colliery has been operated on a care and maintenance basis since 2014. As an existing mine with established infrastructure, no increase in public infrastructure costs are likely to be imposed on the NSW community. In the BAU case however, there is a high likelihood of costs being imposed on state-owned and/or operated infrastructure. This is particularly in respect of transport

[10] The Cultural Heritage Impact Assessment reported no historical heritage objects/sites in the Study Area.
[11] Sources: Niche (2019); Allen Consulting Group (2005); ABS (2019).
[12] Initial method/finding was based on willingness to pay (WTP) over 5 years.

infrastructure, as alternative fuel sources for MPPS would need to be sourced from more distant producers. Alternatively sourced fuel would most likely be transported by rail, with a lesser, yet relevant, likelihood of some component of road transport, with resultant imposts on infrastructure capacity and related maintenance. Given its proximity to MPPS, certain settlements in the Local Government Area (LGA), particularly Lidsdale and Wallerawang, would be most exposed to such effects given the potential likely increase in movements and unloading of trains, as may communities in the near vicinity of alternative source mines. This is particularly salient in the context of the capability for overland conveyor transport of coal sourced from Angus Place Colliery under the proposed Project, which significantly reduces the need for such activity.

As was identified in the Project description (Section 1.2) one element of the Project is the *connection to the Lithgow City Council main sewer line prior to the commencement of longwall extraction (subject to a separate development application through Lithgow City Council).* Related works would be at the expense of Centennial Angus Place. Part of assessment of an application is presumed to involve the assessment of capacity of the system to meet this additional demand. However, on the available evidence, it appears likely that no public infrastructure cost would be imposed on Council and by association, the community.

2.3.3 Loss of surplus to other industries

This aspect of the Project is discussed in detail in the LEA, as potential effects would be most apparent at the local and regional levels. Briefly, there is unlikely to be any material change in relation to commercial activity between Centennial Coal operations and the NSW and regionally based businesses with which it trades, for a significant period of time under the Project scenario. Table 3 summarises the simultaneous activity at Angus Place Colliery and Springvale Mine, which will result in approximate continuity of the prevailing situation for more than 20 years, and will consequently have no material effect on the activities of other industries during that time period.

Table 3: Simultaneous operations under the Project proposal, Centennial Coal mines

	2019 - 2021	2021-2024	2025-2042	2043 -2053
Angus Place	Care & maintenance	Preliminary works	Operating	Decommissioning and rehabilitation
Springvale	Operating	Operating	Decommissioning & rehabilitation	-

The BAU scenario, being effective immediate closure of Angus Place and no large-scale operations subsequent to closure of Springvale Mine, would have severe consequences for other industries, most clearly those in the mines' supply chains and most particularly such industries and firms located in the region, which are dependent to some extent on mine-related work in sustaining viability. This is also further discussed in the LEA.

There may also be some marginal, derived loss of surplus to businesses across NSW in the BAU scenario as a consequence of increased wholesale and retail electricity pricing, resulting from increased fuel procurement costs at MPPS potentially being passed on to industrial consumers. Based on the information published by EnergyAustralia (Section 1.1.4), there may also be economic

effects on the company and on MPPS specifically, due to the potential for negative efficiency impacts relating to the design of the power station for use of locally sourced coal.

2.3.4 Distributional impacts

Taking into account the economic effects of the sequencing of eventual cessation of operations at Springvale Mine and the proposed reactivation of Angus Place proposed under the current Project application (Table 3), it is unlikely that there will be any material change in respect of distributional impacts, if consent for the Project is granted.

Conversely, as is the case for consideration of effects on public infrastructure and on other industries, the BAU case would have distributional effects across the NSW economy, in terms of the eventual loss of all supply chain business formerly generated by the operation of the Centennial mines. As was discussed in Section 2.3.3, there may also be some broad effects relating to the necessity for MPPS to source fuel from alternative, more distant suppliers, with necessarily less efficient delivery methods, infrastructure and consequent cost impacts. Given the relative scale of Angus Place to the NSW economy, it is likely that any effect would be absorbed, notwithstanding that individual businesses may be affected more acutely.

Clearly, however, distributional impacts under the BAU scenario would have greatest effect on the regional economy, and particularly that of the Lithgow LGA. The regional economic strategy for Lithgow in particular, provides unequivocal evidence of the relative scale and importance of coal mining in the local and regional economies. Although the strategy document has a clear view on an eventual transition away from the mining industry as a current, integral foundation of the economy, it is evident that this is perceived as being a matter which Lithgow City Council (LCC) and other relevant planning bodies have some time in which to prepare for this eventuality. If the Project did not proceed (i.e. the BAU scenario), it is highly likely that the regional economy would be ill-prepared for this near-term shock and would thus be severely affected.

It is noted that the Productivity Commission (PC), in its report *Transitioning Regional Economies* (2017), found, *inter alia*, that 'governments should avoid providing ad hoc financial assistance to regions because it is rarely effective' (2017:2); that 'generally available welfare, training and employment measures promote fairness and equity and are usually the most effective means for facilitating transition' (2017:37); and, that 'central responsibility for regional development resides with State and Territory governments, supported by local governments' (2017:2). In the context of the BAU case, it is evident that beyond existing 'safety net' mechanisms, the federal view is that the onus would likely be on the NSW government to address the impacts. This would potentially necessitate the reallocation of some public resources, resulting in distributional impacts across NSW generally.

Table 4: Summary of environmental/biophysical effects assessments				
Impact	**Environmental Assessment Commentary**	**Social and Economic Benefits**	**Social & Economic Costs/impacts**	**Description of Environmental Controls & Mitigation Measures**
Angus Place Colliery extended operations economic impacts **Consultant: Aigis Group**	The project will result in an overall positive economic contribution at a State, regional and also to the local community level.	Assumed that the majority of the Springvale Mine workforce at the time of commencement of operations will transfer to Angus Place. Employment of up to 450 FTE workers (direct employees and contractors). Assessed PV of 'labour surplus': ≈ $23 million Indicatively, approximately $383 million spent with regional suppliers and $1,664 million with NSW-based suppliers over the productive life of the mine, supporting further employment and economic activity. NSW Government royalty income from extended mining LOM: PV ≈ $139 million Economic importance of mining in local economy recognised by LCC/MWRC. Continuity of employment for ex-Springvale Mine workers will permit these households to remain in the region, thus maintaining social contributions to the regional community and economy.	No material effects in local labour market anticipated, as the majority of the directly employed workforce will transfer from Springvale Mine. Contractor workforce will be sourced on similar basis to existing arrangements. A reduction in transactions with suppliers of approximately 12% (regional) and approximately 9% (NSW) may be anticipated, as C&M at Angus Place and production at Springvale will no longer be simultaneous.	Nil required

Impact	Environmental Assessment Commentary	Social and Economic Benefits	Social & Economic Costs/impacts	Description of Environmental Controls & Mitigation Measures
Subsidence **Consultant: MSEC**	Natural and built features have been identified within or in the vicinity of the Study Area including the Wolgan River, Carne Creek, drainage lines, cliffs, minor cliffs, pagodas, steep slopes, rock outcrops, swamps, the Gardens of Stone National Park, unsealed tracks, Aboriginal heritage sites and survey control marks. There is also mining-related infrastructure that is located within the Study Area. (MSEC 2019:2) Observations from MSEC 2019:3-5 [Executive Summary]): Features assessed as unlikely to be adversely affected: Wolgan River; Carne Creek; unnamed drainage lines post mining; cliffs, minor cliffs and pagodas; Japan Swamp (Trail 6) and those in Carne Creek catchment; Wolgan River swamps; Gardens of Stone National Park. Features assessed as potentially impacted: Steep slopes and rocky outcrops; Tri Star Swamp; Twin Gully Swamp. Unsealed roads and tracks and existing and proposed mine-owned infrastructure will be able to be maintained in safe and serviceable condition. One Aboriginal heritage site, Site Ref. 45-1-0084 may be affected. Some survey reference points may be affected.	The potential impacts on surface water, groundwater and ecology are discussed by the other specialist consultants on the project. 1.The mining layout has been designed such that the majority of the cliffs and pagoda complexes are located outside the 26.5° angle of draw from the extents of the proposed longwalls (MSEC 2019:73). 2. The longwall series is proposed to be extracted towards the National Park which allows for an adaptive management approach, allowing an ongoing review of the observed versus predicted movements. (MSEC 2019:92) 9.8MT of the reserve will not be mined due to the conservative mine plan intended to reduce subsidence and other related impacts such as ground and surface water. The foregone value of royalties to NSW is assessed at ≈$24.9 million. Offsets valued at $14 million to be procured by Centennial Coal in respect of subsidence related effects, particularly in relation to THPSS.	The potential impacts on surface water, groundwater and ecology are discussed by the other specialist consultants on the project (MSEC 2019:4). Accordingly, quantified/ monetised and qualitative assessments are presented in the relevant sections of this table and Table 3.	The longwall series is proposed to be extracted towards the National Park which allows for an adaptive management approach, allowing an ongoing review of the observed versus predicted movements. The potential for adverse impacts in the National Park could then be avoided with the implementation of suitable strategies, described in Section 5.1.4, MSEC 2019:92 It may be necessary on the completion of the proposed longwalls, when the ground has stabilised, to re-establish any state survey control marks that are required for future use (MSEC 2019:5)

Impact	Environmental Assessment Commentary	Social and Economic Benefits	Social & Economic Costs/impacts	Description of Environmental Controls & Mitigation Measures
Groundwater **Consultant: Jacobs**	(1): Predicted impacts on groundwater users (Jacobs 2019a:93) identified 14 groundwater bores. One is decommissioned (relating to Springvale Mine). All third-party bores (i.e. note identified with Centennial) are assessed as being 'unlikely to be impacted'. (2). From Table 5.7; AIP Minimal Impact Considerations (Jacobs 2019a:104) (2). Water table – Level 1: does not meet; water level decline greater than a 10% cumulative variation in the water table is predicted at THPSS, a high priority groundwater dependent ecosystem. (2b) Water table level 2: Refer Section 5.4.2.1 & Table 5.7. (Jacobs 2019a) (4) Water pressure: Level 1 – acceptable; No significant pressure declines are anticipated at any water supply works. (5) Water quality: Level 1 – acceptable; No detrimental change in water quality is anticipated	During mining the Project will meet the requirements of the State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011 for neutral or beneficial effect on water quality for a continuing development. From 2020, Angus Place will cease discharge of mine water (raw or treated) to the Coxs River catchment. From 2020 all mine inflows from existing workings will be transferred to the Springvale Water Treatment Project for desalination and beneficial reuse at the Mount Piper Power Station' (Section 5.8, Neutral or Beneficial Impact; Jacobs 2019a:103). Swamp monitoring ≈ $650,000 p.a. Offsets valued at $14 million to be procured by Centennial Coal in respect of subsidence related effects, particularly in relation to THPSS.	Drawdowns resulting from mine dewatering and subsidence are predicted to impact on the Temperate Highland Peat Swamps on Sandstone. Given the predicted impacts to a high priority groundwater dependant ecosystem, the project does not meet the Level 1 Minimal Impacts Considerations of the NSW Aquifer Interference Policy. However, it is the intention of Centennial to offset the predicted impacts via the environmental offset facility of the EPBC Act (Jacobs 2019a:1).	1.'If the predicted water level declines eventuate (for THPSS) and have a detrimental impact on swamp health and ecosystem functionality, Centennial Angus Place intend to offset those impacts through the use of the environmental offset facility of the EPBC Act. An assessment of potential offsetting liabilities is provided under the Ecological Impact Assessment' (Jacobs 2019a:104). Offsets estimated at ≈$14 million. 2. Swamp monitoring 3.Develop a Trigger Action Response Plan (TARP) for the swamps, based on the ground, visual, surface water and groundwater monitoring programs. (MSEC 2019:89). 4. Further measures described in Section 7, Monitoring and Management (Jacobs 2019a:108); Section 5.11.5 (MSEC 2019:89).

Impact	Environmental Assessment Commentary	Social and Economic Benefits	Social & Economic Costs/impacts	Description of Environmental Controls & Mitigation Measures
Noise and vibration Consultant: EMM	Operational noise emissions from the APMEP are predicted to result in negligible residual noise impacts at all assessment locations. Predicted maximum noise levels from the APMEP are below the maximum screening criteria and generally consistent with the results of previous noise compliance monitoring. Given the significant separation distance between likely locations of construction activity and residential assessment locations (minimum of 4 km) the likelihood of construction noise impacts at these locations is negligible Off-site road traffic noise levels are predicted to satisfy the relevant noise limits at the nearest residential locations for both construction and operational APMEP-related traffic. (EMM 2019b:34). 16 sensitive receptors (EMM2019b:6)	Since the mine is currently in care and maintenance it was not possible to validate the adopted sound power levels or the relevance (or not) of modifying factors to account for annoying noise characteristics. Hence, Centennial Angus Place has made a commitment to limit evening and night operations until sound power levels of on-site plant and equipment and off-site noise emissions can be verified. Full operation of the site will not be undertaken during evening and night-time periods until compliance with relevant noise limits can be demonstrated (EMM 2019b:34).	Effects not quantitatively assessed on the basis of materiality. Qualitative discussion of potential for effects presented in LEA.	Noise emissions from the mine including the APMEP will continue to be managed in accordance with the existing NMP, which describes the monitoring program for the mine including both attended and real-time, unattended noise monitoring. The NMP will be updated upon approval of the APMEP (EMM 2019b:34).

Impact	Environmental Assessment Commentary	Social and Economic Benefits	Social & Economic Costs/impacts	Description of Environmental Controls & Mitigation Measures
Surface water **Consultant: Jacobs**	Jacobs (2019) identifies potential significant impacts on Tri Star Swamp, Trail Six/Japan Swamp and Birds Rock Swamp, and potential moderate impact on Twin Gully Swamp. Cardno (2019) identifies drainage lines 2a and 2b as flowing through Tri Star Swamp, drainage lines 3a and 3b flowing through Twin Gully Swamp and drainage line 6 flowing through Birds Rock Swamp (no specific drainage lines identified in respect of Trail Six/Japan Swamp). MSEC (2019) identifies the affected portions of the drainage lines being those directly above the proposed mining area. The drainage lines and their respective affected lengths are: 2a (0.7km); 2b (0.5km); 3a (0.7km) and 3b (0.1km). Total principal area of impact is 2km. Drainage line 6 (beyond angle of draw = 0.2km). Total used for assessment is 2.2km	The reduced groundwater contribution to baseflow will also have a corresponding reduction in predicted surface flow. The reduced flows are not of sufficient magnitude to impact on downstream surface water users (Jacobs 2019b:1). Overall the water and salt balance shows a net beneficial impact on the Coxs River catchment in terms of salt loads being released to the environment through discharge at LDP001 (Jacobs 2019b:57). Given that the change to flow in the Coxs River is negligible, and there is no change to surface water quality due to the Amended Project, the Project will satisfy the Neutral or Beneficial Effect on Water Quality test. (Jacobs 2019b:75). During mining the Project will meet the requirements of the State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011 for neutral or beneficial effect on water quality for a continuing development. From 2020 all mine inflows from existing workings will be transferred to the Springvale Water Treatment Project for desalination and beneficial reuse at the Mount Piper Power Station with the exception of up to 1.8 ML/day average discharges occurring from Springvale Mine's LDP001. (Jacobs 2019b:77). Offsets valued at $14 million to be procured addressing subsidence related effects, particularly in relation to THPSS.	The reduced groundwater contribution to baseflow will also have a corresponding reduction in predicted surface flow. The reduced flows have the potential to have cascading impacts for aquatic ecology and swamp flora and fauna (Jacobs 2019b:1). Quantified/monetised estimate; PV ≈ $176K (assumed for full Project assessment period 2020 – 2053 to account for potential residual effect).	Refer to Section 7, *Monitoring & Management* (Jacobs, 2019b:81). Offsets valued at $14 million to be procured by Centennial Coal in respect of subsidence related effects, particularly in relation to THPSS.

Impact	Environmental Assessment Commentary	Social and Economic Benefits	Social & Economic Costs/impacts	Description of Environmental Controls & Mitigation Measures
Cultural Heritage **Consultant: Niche Environment and Heritage (Niche)**	A total of 12 Aboriginal stakeholders (including groups and individuals) registered as having an interest in participating in the consultation process for the APMEP (Niche 2019: i). A total of 49 Aboriginal cultural heritage sites were identified within the Project Application Area, with no newly recorded sites identified during field surveys. Nine Aboriginal cultural heritage sites are located within 600 metres of the proposed longwall mining areas. Two shelter sites (AHIMS ID#45-1-0084 and AHIMS ID#45-1-0137) are within the angle of draw, with only one of those sites (site AHIMS ID#45-1-0084) considered to be at risk of subsidence impact based on Mine Subsidence Engineering Consultants (MSEC, 2019) subsidence predictions. Of the 9 Aboriginal cultural heritage sites located within 600 metres of the proposed longwall mining areas, one site has been assessed to have high scientific significance (AHIMS ID#45-1-2756/2757), one site has been assessed to have moderate scientific significance (AHIMS ID#45-10084) and all other sites have been assessed to have low scientific significance. The remaining six sites were assessed to have low scientific significance (Niche 2019: i-ii). There were no Historical Heritage sites located within the Project Application Area (Niche 2019: ii)	Centennial Angus Place has retained Niche to engage with Aboriginal communities and 'Present the views of those Aboriginal people regarding the likely impact of the APMEP on their cultural heritage, including a copy of any submissions received and a response as necessary' (Niche 2019:13). The Amended Project has sought to avoid areas of high potential for Aboriginal cultural heritage sites such as cliff lines and the areas surrounding the Wolgan River in order to minimalise potential subsidence and surface impacts (Niche 2019:76).	One Aboriginal cultural heritage site assessed as being of moderate scientific significance AHIMS ID#45-1-0084 considered to be at risk of subsidence impact. Quantitative/monetised assessment as per Table 3: PV ≈ $32K (2020-2053, effects notionally assumed from commencement of full operations 2025 and continued over assessment period to allow for residual effects).	Refer to Section 9.3 *Mitigation for Aboriginal Site Identification, Monitoring and Management* (Niche 2019:81) and Section 10.3 *Recommendations* (Niche 2019: 85).

Impact	Environmental Assessment Commentary	Social and Economic Benefits	Social & Economic Costs/impacts	Description of Environmental Controls & Mitigation Measures
Air quality **Consultant: EMM**	The results of the modelling show that the predicted concentrations and deposition rates for incremental particulate matter (TSP, PM_{10}, $PM_{2.5}$ and dust deposition) were below the applicable impact assessment criteria at all assessment locations. The cumulative results showed that compliance with applicable NSW EPA impact assessment criteria was predicted at all assessment locations for all pollutants and averaging periods. A comparison of the background dataset used (Bathurst AQMS) against Project HVAS data showed that the cumulative assessment was highly conservative. A construction dust assessment was completed to assess the potential of dust impacts on assessment locations. The assessment found that there would be no human receptors impacted by construction dust. It showed that there was a medium to low potential of dust impacts to ecological receptors in the area. (EMM 2019a:ES1). 16 sensitive receptors (EMM 2019a:40).	The cumulative results showed that compliance with applicable NSW EPA impact assessment criteria was predicted at all assessment locations for all pollutants and averaging periods (EMM 2019a:ES1). Cessation of production operations at Springvale Mine (2025) contributes to maintaining limited cumulative impacts.	Quantified/monetised assessment of operations stage $PM_{2.5}$ emissions: PV ≈$440K. As the above estimate is for the operational period only, it is likely to be an underestimate, as it does not provide for emissions in the preliminary and decommissioning/ rehabilitation stages of the Project. PM_{10} emissions 13.594 tonnes per annum; TSP emissions 55.34 tonnes per annum.	Refer to Section 6.4 *Management Measures* (EMM 2019a:38); Section 8.5 *Mitigation and significance of risk* (construction stage dust assessment) (EMM 2019a:54).

Impact	Environmental Assessment Commentary	Social and Economic Benefits	Social & Economic Costs/impacts	Description of Environmental Controls & Mitigation Measures
GHG **Consultant: EMM**	EMM reports activity data (Table 9.2) and emissions by activity/fuel (Table 9.3) [2019a:57-58] Annual emissions: Scope 1, 64,901 (t CO_2-e); Scope 2, 39,360 (t Co_2-e); Scope 3, 370,255 (t CO_2-e) [Table 9.3, EMM 2019a:58]. Annual average total GHG emissions (Scope 1, 2 and 3) generated by the Project represent approximately 0.368% of total GHG emissions for NSW and 0.089% of total GHG emissions for Australia, based on the National Greenhouse Gas Inventory for 2017 (EMM 2019a:58).	Nil of significance/materiality	Quantified/monetised cost of emissions: PV ≈ $35.8 million during operations stage 2025 – 2043. As the above estimate is for the operational period only, it is likely to be an underestimate, as it does not provide for emissions in the preliminary and decommissioning/ rehabilitation stages of the Project. This is unlikely to be of significant magnitude, as fugitive emissions (Scope 1) and electricity consumption (Scope 2) in particular will be greatly reduced.	**Prospective Controls:** 1.Cost effective measures to improve energy efficiency. 2. Regular maintenance of plant and equipment to minimise fuel consumption. 3. Consideration of energy efficiency in plant and equipment selection phase.

Impact	Environmental Assessment Commentary	Social and Economic Benefits	Social & Economic Costs/impacts	Description of Environmental Controls & Mitigation Measures
Traffic Consultant: EMM	Due to the temporary nature of project-related construction activities, no long-term significant impacts on the assessed road network during construction are anticipated (EMM 2019c:39). Daily light vehicle movements during operations will contribute to a 209.2% increase in traffic on Wolgan Road. The width and condition of this section of Wolgan Road is still considered to be generally compliant and acceptable as the anticipated daily traffic volumes (EMM 2019c:39). Threshold bands for all other assessed roads will remain unchanged during operations and, therefore, road width assessments remain generally compliant with the relevant Austroads design standard (EMM 2019c:39). All delays at assessed intersections are considered negligible and are likely to be unnoticeable to the existing road users. All assessed intersections will remain at LOS A during operations (EMM 2019c:40). The project is not anticipated to create a high demand for public transport services, pedestrian and cycling activities (EMM 2019c:40). The existing pit top car park is anticipated to be adequate to accommodate the maximum shift changeover period demand for parking during operations (EMM 2019c:40).	Potential for impacts associated with operations-related rail and heavy road vehicle movements largely mitigated by use of overland conveyor system for delivery of coal from Angus Place to MPPS.	Effects not quantitatively assessed on the basis of materiality. Notional and actual quantified/monetised costs to community captured in air and GHG emissions estimates.	It is recommended that a CTMP and Driver Code of Conduct be prepared prior to commencement of construction and incorporate the road maintenance program and other traffic control measures to be implemented throughout the project's construction on the unsealed road network. The project-related workforce should also be made aware of a number of traffic-related safety matters prior to commencement of their employment, including: varying speed limits on sealed and unsealed roads; general road safety rules (e.g. do not drive under the influence of alcohol and medication); be aware of driving on dirt road in severe weather condition; and fatigue management measures (EMM 2019c:40).

Impact	Environmental Assessment Commentary	Social and Economic Benefits	Social & Economic Costs/impacts	Description of Environmental Controls & Mitigation Measures
Aquatic ecology & stygofauna **Consultant: Cardno**	No threatened aquatic species are considered likely to occur within the Study Area (Cardno 2019:iii) Sampling of stygofauna in groundwater bores within the Study Area and from other nearby mine areas indicate that stygofauna are present within shallow perched aquifers associated with swamps and in the underlying shallow regional groundwater aquifer both located above the proposed longwalls (Cardno 2019:iii). Overall, impacts to watercourses and stygofauna associated with the Project, while relatively severe at the scale of individual watercourses and swamps, are relatively minor in the context of the wider catchment. None of the watercourses that would be affected directly appear to support threatened species or habitat of specific conservation value (Cardno 2019:iv).	Nil of significance or materiality	Not quantitatively or qualitatively assessed due to effects assessed by the consultant being interpreted as immaterial in the context of the regional environment	A recommended comprehensive monitoring plan to assess the potential impacts of mine subsidence on aquatic habitat and biota within watercourses of the Study Area should be implemented. Specifically, it is recommended that further assessment of the genetic diversity of stygofauna within and adjacent to the Study Area be undertaken using environmental DNA (eDNA) techniques. This will help to identify the conservation value of stygofauna assemblages that may be impacted by extraction of the proposed longwalls (Cardno 2019:iv).

2.4 Net economic cost/benefit of the Project

Combining the outputs of Tables 1 and 2, the Net Present Value (NPV) for the CBA element of the Project is presented in Table 5. The table also reports the Cost-Benefit Ratio (CBR) for these project assessments.

Table 5: CBA Estimate of net economic cost/benefit ($ million)

Economic Benefit	PV @ 4%	PV @ 7% (central)	PV @ 10%
Assessed benefit	223.4	**161.4**	120.0
Assessed cost	51.5	**36.4**	26.7
Project CBA NPV	171.9	**125.0**	93.3
Project CBR	4.3	**4.4**	4.5

At each discount rate, the direct benefits of the Project to NSW are significantly greater than the assessed costs. It is noted that certain cost assessments, particularly that for greenhouse gas emissions, are identified in Tables 2 and 4 as being considered as low estimates, given that the periods over which they were assessed excluded pre-and post-operational periods. An assessment addressing this limitation is presented in the sensitivity analyses presented in Table 6.

2.5 Sensitivity testing – alternative benefit and cost assumptions

The guidelines indicate a series of additional sensitivity testing parameters, which essentially test the central assumptions of the CBA based on adjustment of operating outcomes (DPE, 2015:18). On the basis of the exclusion from this economic assessment of certain elements of economic benefit in particular (refer to Section 2.1 and Annexure 1), adjustments relating to corporate taxes are not applied. As net public infrastructure costs are unlikely to be imposed on the state, these are similarly not assessed. It is noted that in terms of major benefit estimates, discount rate-based and bounded Monte Carlo analyses are presented in Table 1a. Similarly, the major cost estimate (GHG emissions) was also derived on the basis of Monte Carlo analysis, and further analysed using the mandated discount rates.

Tables 2 and 4 report that certain effects assessed by specialist consultants (air quality and GHG) related to production periods only, which is likely to have resulted in underestimated economic valuations. A separate sensitivity scenario is presented below, which increases these costs while holding assessed benefits constant. This scenario assumes adoption of the 'high' case proposed in the guidelines (DPE 2015:18) with a +3.4% adjustment (all years). The adjustment parameter was determined by the ratio between output[13] during the 'shoulder' or ramp-up period, and average annual output in full production forecast for Angus Place. The adjustment was applied across all years of the assessment period, to permit calculation of a conservative (i.e. highest cost) estimate.

[13] Output was presumed as a proxy for assessing impacts.

Table 6: Sensitivity analysis – adjusted performance assumptions

ID	Economic Benefit	PV @ 4%	PV @ 7% (central)	PV @ 10%
1	Assessed benefit royalties -25%	184.7	**133.6**	99.5
2	Assessed benefit royalties +25%	271.8	**196.1**	145.6
3	Assessed cost (low)	47.1	**33.4**	24.4
4	Assessed cost (high)	55.9	**39.6**	28.9
5	Assessed cost high (adjusted)	57.8	**41.0**	29.9
6	High (2-3)	224.7	162.7	121.2
7	Low (1-4)	128.8	94.0	70.6
8	Adjusted low (1-5)	126.9	92.6	69.6

Sensitivity analyses based on price adjustments, with the objective of producing a zero NPV are not presented in this assessment. This is on the basis of the relationship between such adjustments and sensitive information with respect to costs and revenues that such analyses may expose. This material is excluded on the same basis as is described in Section 2.1. In any event, in terms of quantitative assessments, the magnitude of the outcomes of the various sensitivity analyses presented in this report indicate that from the public interest perspective in respect of royalty revenues, the likelihood of a zero NPV outcome cannot be considered as material.

3 PART C: LOCAL EFFECTS ANALYSIS (LEA)

3.1 Spatial area and community demographic profiling

The general demographic profile for the local and regional communities is presented in the Social Impact Assessment (SIA, Hansen Bailey 2019) and is consequently not replicated in this economic assessment. For the purposes of this LEA, spatial and population parameters are based on the locality defined in the guidelines as the SA3. However, given the concentration of the presumptive workforce in the Lithgow LGA, it is also relevant to focus on that population in respect of certain indicators discussed.

3.2 Regional economic profile

Recently released regional economic strategy documents for LCC and Mid-Western Regional Council (MWRC) provide detailed information on the structure and function of these regional economies. Relevant parts of these documents are presented in this section, as the basis of the regional economic profile.

A key assumption in respect of profiling the regional economy, and the balance of likely effects between the LCC and MWRC LGAs (which form the Lithgow – Mudgee SA3), is that production at Angus Place will ramp up as that at Springvale Mine begins to wind down. Consequently, it is anticipated that the large proportion of the Springvale Mine workforce will transfer to Angus Place and continue in employment with Centennial Coal. The residential distribution of this workforce is detailed in Section 3.4. In summary, however, the significant majority of the current Springvale workforce (≈77%) is resident in the Lithgow LGA, and this is assumed as remaining relevant for resumption of full operations at Angus Place.

3.2.1 Role of mining in the LCC economy: LCC REDS 2018

The Centre for Economic and Regional Development (CERD) within the Department of Premier and Cabinet (DPC) has partnered with regional councils to prepare Regional Economic Development Strategies (REDS) specific to each LGA. Relevant sections of the LCC REDS 2018-2022 and the REDS Supporting Analysis documents are presented in the following sections, as these substantiate the role of the mining industry in the LGA, as interpreted by Council and the relevant state government agency for regional development.

3.2.2 Value generated by Lithgow's industry sectors

Figure 1 provides summary information drawn from the LCC REDS (2018:10) on the contribution to regional gross value added (GVA) of the largest industry sectors in the Lithgow LGA. Figure 2 is extracted from the REDS Supporting Analysis document (2018:27). The two figures demonstrate that the mining industry is the largest single industrial contributor to the regional economy by a significant margin, and on the basis of all of the three measures discussed (GVA, largest exporter and largest importer). The regional role of coal mining is also emphasised by the status of electricity generation as the second largest regional exporting industry. Angus Place Colliery's operations will be the principal source of fuel to MPPS during the proposed duration of mining operations. The link between these two key regional industries is discussed in some detail in the REDS documents.

Figure 1

Industry	Gross Value Added ($m)	Proportion of the Economy
Mining	241	23%
Public Administration and Safety	83	8%
Tourism [41]	~62	~6%
Electricity, Gas Water and Waste Services	61	6%
Construction	60	5%
Healthcare and Social Assistance	57	5%
Manufacturing	53	5%
Education and Training	50	5%
Transport Postal and Warehousing	50	5%
Financial and Insurance Services	48	5%

Source: Lithgow REDS 2018 – 2022 Supporting Analysis (2018:10)

Figure 2

The Centre for Economic and Regional Development (CERD) has produced an Input Output table for the Lithgow regional economy based on the ABS Input Output (IO) Tables for New South Wales.[39] The Gross Regional Product (GRP) of the Lithgow regional economy is estimated at $1.1 billion for the 2015-16 period, which represents approximately 0.2% of NSW Gross State Product (GSP) and $52,157 GRP per capita.

Lithgow is a net importer, with exports out of the region estimated at $578 million and imports into the Region estimated at $708 million. Using the Input Output industry classifications, the largest exporting industries by value are Mining ($321m), Electricity Generation ($211m) and Agriculture ($16m). Conversely, the largest importing industries in the region also include Mining ($170m), Construction ($54m) and Manufacturing ($51m). This is because capital intensive industries tend to be high importers of goods into a region.

In terms of value added, the top nine industries account for two thirds of Lithgow regional economy. The Mining industry has the highest value added, equal to approximately 23 per cent of the Lithgow regional economy.[40] While the Finance and Insurance Services industry is not one of the top ten employers in the region, it has a relatively high Gross Value add due to higher wages associated with this industry.

Source: LCC REDS Supporting Analysis (2018:27)

3.2.3 Employment by industry - LCC LGA

Complementing the data on economic contribution, the REDS documents also identify the significance of mining as a regional employer. The capital intensiveness of mining, construction and manufacturing as the three largest regional importers, is noted in Figure 2. The extent to which these capital imports to the region drive employment is substantiated by Figure 3. Mining is the second largest industry by employment; construction and manufacturing also feature among the 10 largest industries on this measure, although all three have declined in relative share of total employment over the period reported. Despite the presence of two large manufacturing businesses in the LGA (Ferrero and Thales), which are reported as having stable or growing workforces between 2011 and 2016, the REDS documents observe that '*community consultation suggested that the decline in Manufacturing jobs could be associated with a reduction in job numbers in small to medium enterprises supplying the Mining sector* ' (REDS Supporting Analysis, 2018:29). This reiterates the significant reliance of the regional economy on the mining industry.

Figure 3

Table 7. Employed Persons in the Lithgow LGA (2016 compared to 2011)

Industry	Employment Share 2016	Employment Share 2011
Public Administration and Safety	12.2%	9.7%
Mining	11.1%	14.9%
Healthcare and Social Assistance	10.5%	10.8%
Retail Trade	9.3%	9.7%
Accommodation and Food Services	8.8%	8.6%
Education and Training	7.4%	7.3%
Construction	5.3%	6.8%
Manufacturing	4.8%	5.1%
Transport Postal and Warehousing	4.2%	4.9%
Electricity, Gas and Water	4.1%	4.7%
Other	22.3%	17.6%

Source: LCC REDS Supporting Analysis (2018:29)

3.2.4 Employment by occupation – Lithgow region

The data presented in Table 7 are based on Australian Bureau of Statistics (ABS) Census data for the LGA, statistical areas and NSW. The data for the regional mining industry (Mining LCC in Table 7) are drawn from LCC industry and employment data (2016).

Table 7: Comparison of mining & local/regional occupational groups 2016 Census

Occupation	Mining LCC %	LCC %	SA2 %	SA3 %	NSW %
Managers	5.7	9.4	11.6	12.8	13.5
Professionals	7.6	12.2	11.9	12.7	23.6
Technicians & Trades Workers	31.0	17.5	17.2	17.1	12.7
Community & Personal Services Workers	0.4	12.9	13.0	11.1	10.4
Clerical & Administrative Workers	3.2	13.2	12.8	11.4	13.8
Sales Workers	0.0	8.4	7.2	8.7	9.2
Machinery Operators & Drivers	49.5	12.5	13.4	12.4	6.1
Labourers	2.3	12.1	11.2	12.1	8.8

Data source: ABS 2016 Census

Relevant observations on these data are:

- As may be expected given the nature of the industry, technicians and trades workers, and machinery operators and drivers are over-represented in the Lithgow mining-specific employment category, when compared with general workforce data for the larger populations.
- At LGA, SA2 and SA3 levels, employment structure is relatively consistent, particularly compared with NSW, which has a distinctively different structure, featuring a much larger proportion of professionals and comparatively low proportions of the mining-related

occupations noted above. In this respect, the influence of the mining industry on regional occupational structure is apparent.

- The relatively small proportion of labourers working in the mining industry demonstrates that mining-related employment generally involves skilled labour.

3.3 Role of mining in the MWRC economy – MWRC REDS 2018-2022

Mining in the MWRC LGA is dominated by open cut mines north of the regional centre of Mudgee (which lies approximately 120km by road from Angus Place Colliery). Mining is in an expansionary stage in MWRC whereas the LCC REDS emphasises the eventual transition to a post mining/coal-fired power station economy. Significant economic indicators for the MWRC mining industry are:

- The Mining industry is Mid-Western's largest value adding industry. It accounts for 23% of the value-added produced by all industries in the region (2018:10).
- Coal mining employed 1,582 people, or 16% of the Region's workforce in 2016, as well as jobs in exploration and other mining support services (2018:6).
- Coal mining is the largest employer and is clearly critical to the economy. Importantly, heavy and civil engineering construction is an emerging industry and is captured in enhancing the local provision of goods and services to the mining sector (2018:9).

As is the case with the LCC LGA, mining of itself is a significant contributor to regional economic strength. When this is combined with the additional economic activity supported or generated by mining, this significance is amplified for both regional LGAs.

3.4 Socioeconomic profile of current Springvale Mine workforce

The 'sequencing' of eventual cessation of operations at Springvale Mine and the resumption of operations at Angus Place Colliery proposed under the current Project have been discussed previously in this report. As has also been disclosed in Table 4, the company's expectation is that this will result in the majority of the Springvale Mine workforce transferring to Angus Place.

Consequent to the suspension of production at Springvale Mine in 2015, due to legal action over consent approvals, a detailed internal survey was conducted in 2016[14] on the effects of this 'stand down' on the workforce. Along with a direct, descriptive characterisation of those short-term effects, a workforce demographic/socioeconomic profile was developed, which enables insights into the socioeconomic interactions of the workforce within the Lithgow region in particular. Relevant data from that report are presented in the following sections.

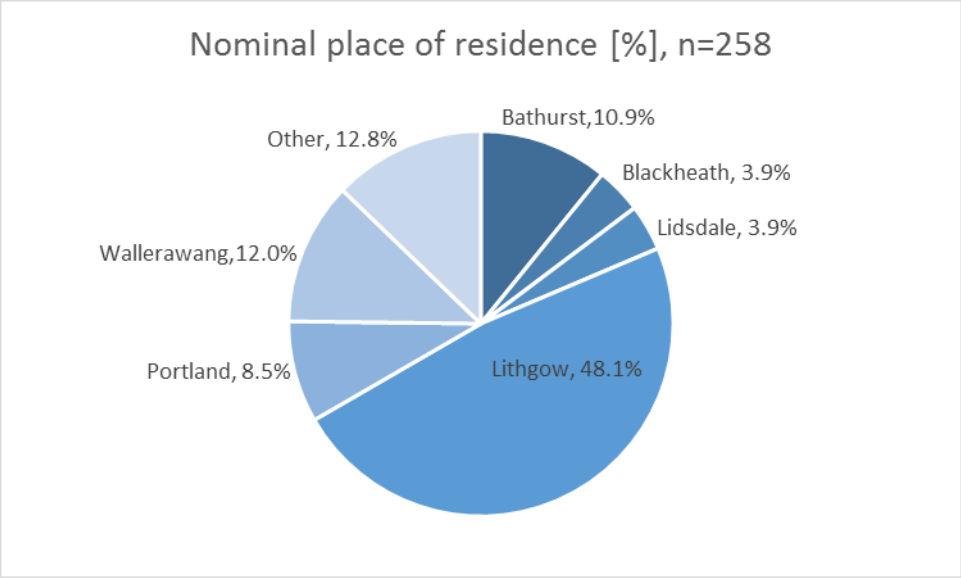
Although over time there are likely to be some changes due to natural workforce attrition (retirements etc.), it is considered that the material presents a valid representation of the likely structure of the Angus Place Colliery workforce under the Project.

[14] The report was finalised in 2017.

3.4.1 Workforce demographics

3.4.1.1 Place of residence

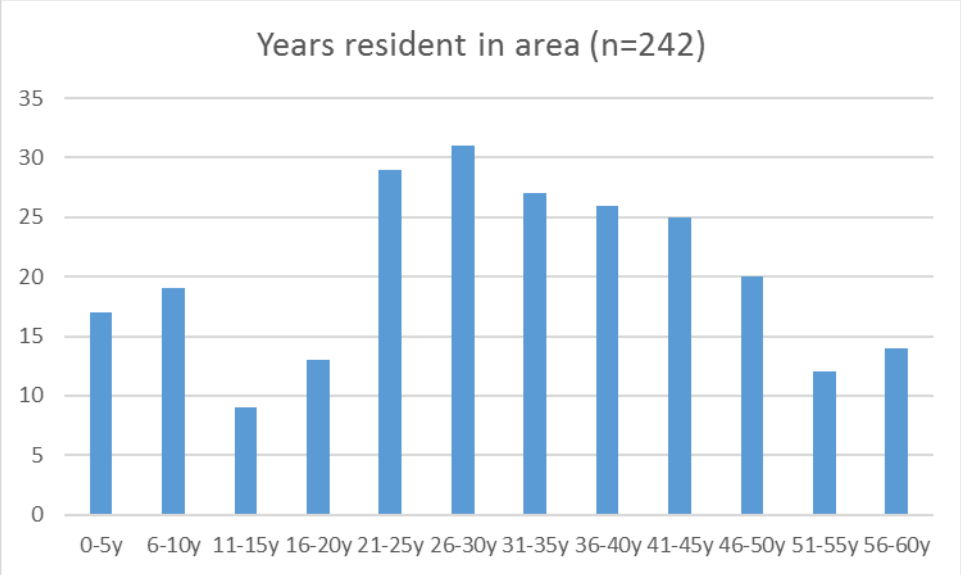
Figure 4



77% of the workforce resided within 15km of the mine. The entire workforce resided within 67km of the mine.

3.4.1.2 Duration of residence in region

Figure 5



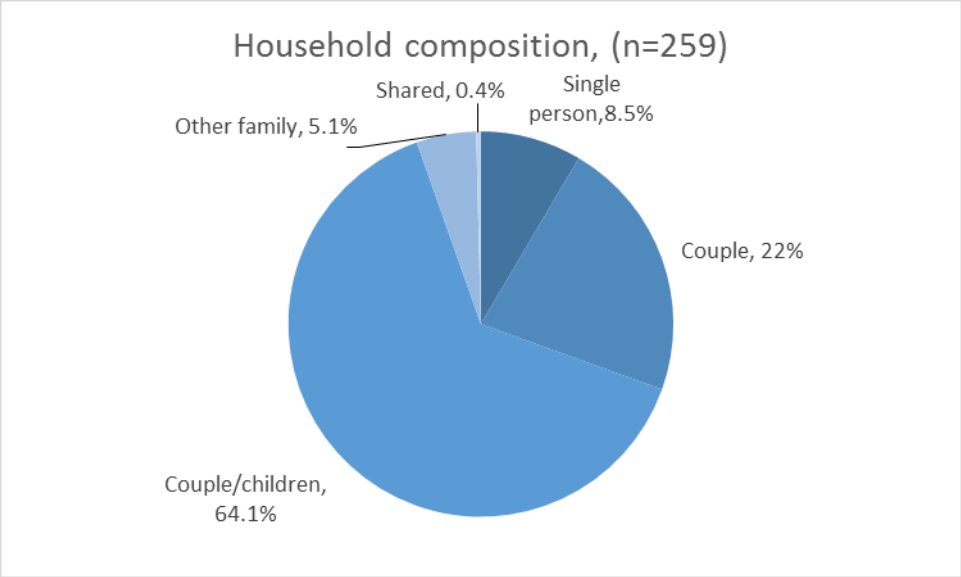
Based on years resident in the area surrounding Springvale Mine, it is apparent that the workforce must be considered as genuinely resident. 24% of the workforce has been resident for up to 20 years, 46.7% between 21 and 40 years and 29.3% between 41 and 60 years.

A number of the invalid responses to this question stated 'all my life' or similar responses. It is apparent from comparing these data and household composition data, that this is the case for a

significant number of respondents in the valid response data above. Average time resident in the area is 31 years.

3.4.1.3 Household composition

Figure 6



The majority of employees lived in family (couple with children or couple) households (86.6%). There were 849 people nominated as living in Springvale employees' households. The nominal count of persons per employee household was approximately 3.3. This is higher than the 2016 Census estimate for the SA3 (2.4 people per household), however this is likely to be a consequence of the large number of households within the workforce comprising couples and children, whereas the general population would be expected to include, for example, more older households comprising couples and singles only, with lower workforce participation.

3.4.2 Employee households' engagement in the regional economy

3.4.2.1 Household local expenditure

In response to a question in respect of the proportion (%) of take-home pay spent in their local area, the average employee response was 73% (n= 236).

3.4.2.2 Housing tenure and investment in region

92.7% of employee households either fully owned or were purchasing their current place of residence. Distribution of home ownership/purchasing was broadly consistent with workforce geographic distribution. However, those employee households that were renting were more likely to reside further from the mine, with 47% of these households living in the farthest locations identified in the survey (e.g. Bathurst, Katoomba, Blackheath).

Table 8: Housing status

Housing status	% of respondents
Fully owned	20.0 %
Buying (mortgaged)	72.7%
Renting	7.3%

N= 260

3.4.3 Social engagement & volunteering in the community

161 respondents (approximately 62 percent of respondents) reported a total of 288 involvements with various service, community, sports, social and cultural organisations in the areas in which they reside. Salient groups identified in this analysis and participation in these are presented in Table 9.

Table 9: Workforce participation in community & other groups

Group	Number of responses	% of responses (161)	% of sample (261)
RFS; NSWFR; SES, Mines Rescue	31	19	12
Service & charitable organisations (e.g. Lions; Camp Quality)	15	9	6
Sports clubs/associations	210	130[15]	80
Cultural & community organisations (e.g. music groups etc.)	9	6	3

3.4.4 Comment on workforce survey findings

The research findings indicate a number of significant considerations for assessment of the current Project. Briefly, these are:

- Given the expected composition of the Angus Place workforce, it is highly probable that the majority of the workforce will be long-term resident in the region, with the attendant implications for economic and social connections and engagement.
- There is a comparatively large group of dependents living in employee households, many of whom are children[16], which expands the scale and reach of economic and social activity.
- A majority of workforce members are likely to have invested in homes in the area, indicating long term commitment to the area.
- The workforce is also likely to spend a significant proportion of its disposable income in the regional economy.

On these bases, it is submitted that the majority of economic benefit in relation to employee incomes in particular, is likely to accrue to the regional economy and as such should be assessed accordingly.

[15] *On average* each party with recorded responses was involved in 1.3 sports activities, as a consequence of respondents reporting multiple activities, as was provided for in the survey instrument.
[16] This is based on age data also produced in the survey, but which are not presented in this report for sake of brevity.

3.5 Regional and local employment effects

Section 3.4 presents primary research material that supports a strongly founded assumption that the workforce will be residentially based in Lithgow and/or the surrounding regions. The assessment of 'labour surplus' in the CBA (Section 2) and the method of its calculation (Annexure 2) are predicated on this assumption.

3.5.1 Employment positions and residential origin

Section 1.2 includes as one of the elements of the Project an '*increase in full time equivalent (FTE) personnel from 300 to 450*'. Although the currently approved Angus Place workforce is nominally 300, if the Project is approved, the presumed transfer of the majority of the current Springvale Mine workforce (450 FTE) would result in no material change in employment, from the perspective of economic assessment.

It is noted that the currently approved 450 FTE workforce at Springvale Mine includes contractors. However, based on internal contractor data, the majority of contractor work (by number of engagements and hours worked) is carried out by locally and/or regionally based contractors. As such, any material contractor component of the workforce is also likely to be resident in the Lithgow and surrounding regions. Table 10 presents alternative scenarios which assume that 10% and 20% of the workforce may originate beyond the region. This should be viewed in the context of the actual Springvale Mine survey result (Section 3.4.4.1), that the entire workforce resided within 67km of that mine (situated approximately 8km by road from Angus Place Colliery), which is effectively the base or default assumption.

Table 10: Alternative workforce residential scenarios

	100% in SA3	90% in SA3	80% in SA3
Resident in SA3/ LGA	450	405	360

The low probability of a material increase or decrease in employment resulting from the Project if approved would naturally entail no material effects on the regional labour market and given its relative scale, no discernible effect on the NSW labour market. Conversely, the BAU scenario would precipitate some likelihood of a comparatively significant effect on the regional labour market. The LCC economic profile (.id consulting, 2019) FTE data for 2017/18[17], includes total FTE positions in the LGA at 6,907. The loss of 450 FTE positions under the BAU scenario would entail a reduction of 6.5% on this assessment of FTEs. In addition to, in the least, an increase in frictional unemployment, the entry of potentially more highly skilled workers into the labour market may produce other distortions, such as displacement of workers from other industries and businesses, in preference for employment of available, possibly more skilled, workers. Alternatively, these skills and those of other members of some employee households may be lost to the region, as former employees and their families are forced to out-migrate in search of alternative employment. Other outcomes such as underemployment or unemployment for retrenched workers may also be considered as potentially more probable outcomes, given that a reasonable proportion of the workforce is likely to be older and have been in the coal mining industry for a significant time. This may in fact hinder

[17] https://economy.id.com.au/lithgow/employment-by-industry-fte

attempts to find alternative employment of suitable security and quality, or may force former employees into other undesirable outcmoes (such as enforced early retirement) that may also result in negative economic, social and wellbeing outcomes (IRRC 2018:22-23). In the context of the NSW labour market, although a more perceptible effect would result from the BAU case, as with the Project approval scenario, the results would likely be negligible at that level.

3.5.2 Effect of employee incomes

3.5.2.1 Contextual comparison with broader local incomes

The central estimate of 'labour surplus' as a proxy for the additional disposable income available for disbursement by employee households was estimated in the CBA at approximately $138 million over the life of the Project. The method on which the assessment was made is presented in Annexure 2. This demonstrates that the assessment takes into account consideration of alternative employment outcomes, represented by inclusion of the reservation wage and transfer payments (typically unemployment benefits) in the model. Table 11 summarises relevant inputs and outputs of the model and compares these with ABS[18] median and mean wage and salary incomes for the LGA, noting that corresponding data is prepared by ABS at SA4 level only, under the main statistical geographic area structure, precluding direct comparison with SA3 data.

Table 11: Comparison of employment income data

Income measure	Estimate
Wage assumption	$135,000
Median reservation wage	$125,087
Mean 'labour surplus'	$9,914
Median employee income Lithgow LGA (2017)	$46,628
Adjusted median employee income Lithgow LGA (2017)	$46,623

These data provide a robust indication of the extent to which mine employee incomes can be reasonably assumed to contribute to the local and regional economies, in comparison with those of other employees resident in the LGA. Evidently, mining employees have greater capacity for discretionary expenditure, and consequently the withdrawal of these incomes from the regional economy under the BAU scenario may result in relatively greater impacts than would eventuate for a comparable loss of FTE positions in other regional industries.

3.5.2.2 Alternative assessment of incomes

An additional sensitivity assessment of employee incomes is presented in Table 12. This assumes the total assessments of employee benefit presented in Table 1a at the various discount rates as the upper bound of potential contribution. The average reported expenditure in the local/regional economy from the Springvale workforce survey (73%) [Section 3.4.2.1] is presented as a central estimate and an arbitrary 50% as the lower bound. The outputs of a Monte Carlo simulation are also

18 https://itt.abs.gov.au/itt/r.jsp?RegionSummary&region=14870&dataset=ABS_REGIONAL_LGA2018&geoconcept=LGA_2018&maplayerid=LGA2018&measure=MEASURE&datasetASGS=ABS_REGIONAL_ASGS2016&datasetLGA=ABS_REGIONAL_LGA2018&regionLGA=LGA_2018&regionASGS=ASGS_2016

reported. Bearing in mind that as such analyses regress to the mean by definition, the simulation mean will approximate the reported survey output in the context of the assumed upper and lower bounds.

Table 12: Labour surplus sensitivity analysis

	7%	10%	4%
100% employee benefit	$22,624,478	$17,620,562	$29,982,818
73% employee benefit	$16,515,868	$12,863,010	$21,887,457
50% employee benefit	$11,312,239	$8,810,281	$14,991,409
	Monte Carlo outputs		
Sim. mean employee benefit	**22,621,982**	17,625,386	29,951,250
95% CI Lower	**22,497,394**	17,530,603	29,785,320
95% CI Upper	**22,685,545**	17,673,743	30,035,906

The various sensitivity analyses indicate the workforce employed on the Project is likely to make a significant contribution to the life of the project over its duration. In the lowest likely scenario, benefit to the local economy would remain positive, between $8.8 million and $15 million.

3.5.3 Non-labour activity in the regional and NSW economies

An approximation of the proportion and scale of expenditure with regionally and NSW based businesses for the most recently available financial year for Springvale Mine is presented in Table 13[19]. This is adopted as a proxy for the Project, on the bases of the sequencing described in relevant preceding sections. The data demonstrate that there is a significant level of non-labour commercial activity transacted annually by the mine in the regional and state economies, and this would continue under the proposed Project. It is also essential to recognise the data reported in the LCC REDS in particular (Section 3.2), which identified the mining industry as the largest contributor to GRP, and both the largest exporting and importing industry operating in the LGA.

Table 13: Non labour spend, SA3 and NSW (1 year)[20]

	Firms	% total firms	Spend (≈ $ million)	% total spend
Regional (SA3)	92	17.3	43	20.3
NSW	472	88.7	200	94.9
Total	532	-	210	-

As is the case with other quantitatively and qualitatively assessed economic measures, in the event of the BAU case, the NSW economy would seamlessly absorb the impacts. In the instance of the region, the effects would be pronounced and may result in hardship for businesses reliant on continued mining to ensure commercial and financial resilience. As the available broad economic data (e.g. ABS Census) indicate, there is no apparent alternative industry that has the capacity to absorb such a significant reduction in business activity. Consequently, the effects of such an outcome may be sustained over a period of time.

[19] Adjustments have been made to expenditure figures to maintain commercial confidentiality.
[20] FY 2018.

3.5.4 Indicative economic flow-on effects

As is recognised in the guidelines '*second round effects can be extremely important for local communities*' (2015:23). The guidelines also propose a range of techniques for providing an indicative assessment of the scale of such effects, and identify broad limitations in respect of several of these. For the purposes of providing an indicative analysis, implied multipliers derived from the NSW Minerals Council NSWMC report '*NSW Mining Industry Expenditure Impact Survey 2016/17'* (2018) are reported in Table 14.

Table 14: NSWMC Mining Expenditure Impact Survey 2016-2017 implied multipliers – Central West LGAs

LGA	Value Added	Employment
Lithgow	1.204	24.007
Mid-Western Regional	1.185	20.337

As an indication of the application of these multipliers, for the Lithgow LGA, the expenditure of an additional $1 million in the regional economy would result in an additional $204,000 of value and 24 jobs created, or supported. Based on the $43 million spend reported in Table 13 for an indicative financial year, this would result in total value-added of $51.8 million, and 1,032 jobs created, or perhaps more accurately, supported, in the regional supply chain economy.

3.5.5 Effects on other industries

Section 2.3.3. in the CBA presented a discussion of the propensity of the Project to affect the surpluses, or performance, of other industries. The discussion concluded that as the Project broadly represents a continuation of current levels of economic activity associated with Centennial's mining operations in the area, no material effects should be anticipated. This conclusion is also appropriate in the regional context.

The CBA discussion also stated that the BAU case, however, would result in negative effects, potentially severely so for some supporting industries and businesses, particularly at the local and regional levels. This conclusion is also relevant in the context of regional industrial effects.

3.6 Environmental and social impacts on the community

3.6.1 Environmental impacts

Those environmental impacts which are suitable for quantitative analysis were assessed in the CBA. In addition, a discussion of qualitative effects of the various environmental aspects of the Project was reported in Table 4. The qualitative implications for these environmental impacts are particularly relevant at the regional level, but most particularly at the level of certain residents or other land users in close proximity to the mine and its operations. Recreational activity by occasional visitors and environmental 'use' must also be taken into account, particularly in some instances. The environmental considerations, and those most susceptible to any effects in relation to these, which are discussed in the following sections, are those considered to be most salient for communities and households within the region.

The qualitative assessments of impacts presented in this section are an integral part of assessing the scope and scale of potential impacts. These assessments seek to take into account the perceptions and the potential for experienced impacts of relevant stakeholders. Although these elements of social, and to some extent economic, impact are subjective, they provide for consideration of aspects of localised impacts that may not be adequately expressed in the quantitative assessments reported in the CBA and in various parts of the LEA. Those quantified valuations may not equate with stakeholder values in respect of environmental effects, for example. The SIA (Hansen Bailey 2019) presents further, detailed discussion of these elements and the appropriate mechanisms for assessing and addressing these.

3.6.1.1 Attribution of quantitatively estimated environmental effects

Table 15 presents an assessment of the local or regional distribution of those environmental impacts quantified in the CBA.

Table 15: Regional distribution of quantified environmental effects

Environmental effect	Basis of attribution	Assessed effects[21]
Aboriginal cultural heritage	100%	PV ≈ $32K, local/regional Aboriginal communities (potentially 2,625 residents of the SA3 [ABS Census 2016], 5.6% of regional population).
Air quality	100%	PV ≈ $440K, immediate area, including 16 sensitive receptors (7 residential, therefore potentially 17 residents)[22]
GHG	SA3/NSW population	Share of total PV ≈ $223K, 46,612 residents (ABS Census 2016).
Surface water	Refer to Annexure 4	PV ≈ $2,230, 76 households, 183 residents.

3.6.1.2 Water resources

Jacobs (2019) concluded that other ground and surface water users directly drawing on the resources in the area, are unlikely to be materially affected by the activities of the mine, in the context of the Water Access Licences (WALs) held by Centennial Angus Place. The quantitative assessment reported in Table 15 relates to an estimate of specific water uses in relevant parts of the catchment, and does not account for actual or perceived costs of all alternative uses. Among these alternative uses, the reuse of mine water by MPPS is identified as meeting the 'neutral or beneficial effect test' in respect of water quality.

The effect on the community of environmental 'use' of water resources is the most apparent negative impact. In this context, this relates to the potential for effects on THPSS and may be considered as having social impact aspects that may be more broadly distributed. The specialist analyses indicate that although the potential for effects is spatially limited in the context of the significant extent of similar environmental assets and values in the surrounding areas, the localised effects are prospectively likely to be of considerable duration, which may increase the overall interpretation of the extent of impacts. In order to mitigate the extent of effects, the conservative

[21] PVs at 7% discount rate.
[22] Based on 2.4 people per household for the SA3 and LGA (ABS Census 2016).

mine plan will result in 9.8Mt of the reserve being sterilised (i.e. not mined). The objective is to reduce potential subsidence-related impacts. The effect of this is foregone state royalty income of approximately $24.9 million. This risk avoidance planning is also relevant to the potential for other effects, including on Aboriginal cultural heritage, and aquatic ecology and stygofauna. Centennial Coal will also procure offsets in regard to these impacts, which are nominally valued at approximately $14 million.

3.6.1.3 Noise impacts

As is reported in Table 4, 16 specific sensitive receptor sites were identified in the vicinity of Angus Place Colliery[23]. Although the assessment conducted by EMM (2019) concluded that effects would be within permissible criteria, and as such physical effects such as sleep disturbance should not create ongoing issues, it was also noted that reassessment should be carried out should the Project be approved.

3.6.1.4 Air quality

As is the case for noise impacts, 16 sensitive receptor sites are in the vicinity of the mine. Assessment by the specialist consultant, EMM (2019) indicates that with the adoption of recommendations in respect of dust management in particular, impacts on relevant stakeholders can be managed to the extent that relevant criteria are met, and risk of cumulative effects minimised.

3.6.1.5 Aboriginal cultural heritage

The extent of interest in the Project of regional Aboriginal representative bodies and individuals is reported in Table 4. The heritage assessment (Niche 2019) identified one Aboriginal cultural site that may be susceptible to damage due to subsidence. Notwithstanding that the site was identified of being of moderate scientific significance, it may remain important to, or of particular significance for some people. Niche (2019) has provided recommendations in respect of managing such potential effects.

3.6.1.6 Traffic

The Traffic Impact Assessment (EMM 2019) concluded in the context of the volume of traffic that will be generated by operations at Angus Place, and the current use and capacity of relevant roads, that effects under the Project should be manageable. However, the increase in vehicle movements on certain roads near the mine, particularly Wolgan Road, on which the mine access is located, are an obvious impact on residents or other land users on or in proximity to those roads in terms of concentrations of vehicle movements around shift changeover times.

3.6.1.7 Management of local environmental and social impacts

Table 4 reports the mitigation and management recommendations in respect of each of these impacts. Implementation of these should contribute to alleviating the extent of these effects, particularly in respect of the localised impacts. The SIA (Hansen Bailey, 2019) forming part of the EIS for the Project, recognises that notwithstanding actual effects and the reduction in these associated with mitigation and management strategies, some stakeholders may continue to perceive or

[23] These sensitive receptors are also those adopted for assessment of air quality effects.

experience effects. The SIA includes recommendations in respect of ongoing engagement and consultation mechanisms for stakeholders that offer the best means for managing such potential circumstances.

3.7 Summary of quantified local effects

Table 16 presents a summary of those quantified, localised effects that are assessed as being attributable to the region.

Table 16: Summary of quantified regional effects

Effect	Assessment (SA3)	High	Low
Assessed benefits			
Employee benefit (PV $million)[24]	22.6	30.0	17.6
Employment (FTE)	450	-	-
Non-labour expenditure ($million/p.a.)	43	-	-
Assessed externality costs			
Aboriginal cultural heritage (PV $K)	32	-	-
Air quality (PV $K)	440	-	-
GHG (PV $K)	223	-	-
Surface water (PV $K)	2.2	-	-

4 Part D: Conclusions and recommendations

4.1 Conclusions

4.1.1 CBA

Based on quantitative analyses of central assumptions and a variety of alternative scenarios, the conclusion of the CBA is that the Project represents a robust economic outcome, on a number of bases. Returns to the NSW community, chiefly expressed in this report as royalty revenues, remain positive in the various scenarios presented. In addition, employee incomes and the associated benefits of maintaining employment levels from both state and regional perspectives, are also positive.

A number of derived effects were also assessed in the CBA, particularly in qualitative terms. The clear conclusion of these analyses is that the Project will play a critically important part in ensuring ongoing security of supply of fuel to MPPS, through the most socioeconomically efficient means possible. Proximity between Angus Place Colliery and MPPS is the basis of a conclusion of greatest economic efficiency. Statements published by EnergyAustralia also indicate that continued supply from a local mine such as Angus Place will result in operational efficiencies and optimal emissions management outcomes for MPPS. Alternative solutions under the BAU outcome would be less economically efficient and also result in a high likelihood of less desirable social impacts.

4.1.2 LEA

The LEA explicitly demonstrates the crucial economic contribution of coal mining at the local and regional levels. The most obvious measures of these contributions are through employment and derived benefit associated with employees and their households, and the significant commercial

[24] Based on Monte Carlo sensitivity analysis, Table 1a.

interrelationships between mining and its regional supply chains. As is noted throughout the economic assessment, these beneficial outcomes of the Project are based on an assumption of continuity between current operations at Springvale Mine, and eventual transition to continuing operations at Angus Place Colliery. Although regional economic strategies make it evident that local and state government are aware of the implications of an eventual economic transition in terms of coal mining and power generation for the Lithgow LGA, there is no sound social or economic case for that eventuality to be precipitated at present. This would be the effect of the BAU alternative.

The Project would result in a number of environmental effects which are likely to most directly affect regional and local communities and/or specific elements of those communities. Notwithstanding that some stakeholders may perceive these effects as being of greater or lesser significance, the magnitude of effects identified by specialist consultants and assessed in this report is comparatively limited, in the context of the interests of the community more broadly, and the broader, similar environs in which affected areas are situated. Recommended mitigation and management strategies for each category of effect are presented as part of specialist assessments. Adoption of these will minimise the effects of the Project to the greatest extent possible, while conserving those environmental assets that can be protected and simultaneously supporting the broader socioeconomic interests of the regional community.

4.1.3 Economic assessment

The conclusion of this economic assessment is that, on balance, the economic effects of the Project at state and regional levels are robustly positive. The Project represents the most economically and socially efficient option for maintaining supply of fuel to MPPS over the duration of the proposed Project. This has broad socioeconomic implications, for government, industry and households at state and regional levels.

The economic assessment recognises that there are some costs associated with the Project. It is submitted that these are quantitatively of lesser magnitude and would be likely to be considered as qualitatively tolerable by the broader NSW community, which the Project would indirectly serve. However, some effects may be experienced more acutely by some stakeholders, particularly those living in close proximity to the mine.

The BAU alternative would result in social and economic hardship for the region, and would also have broader, although less onerous, effects across the state. Essentially, the BAU case would result in a direct loss of a regionally important business, effectively in favour of a socially and economically less efficient alternative outcome. From this perspective, the Project is clearly the best available solution for NSW in terms of ongoing energy security and can be justifiably approved on this basis.

4.2 Recommendations

Consequent to the analyses presented in this economic assessment, the following recommendations are proposed. These are intended to maximise the benefits of the proposed Project and minimise the socioeconomic costs to the extent possible.

1. The Angus Place Mine Extension Project should be approved.

2. The recommendations proposed by specialist consultants in respect of addressing environmental effects should be employed to the extent practicable.
3. Centennial Angus Place execute the appropriate environmental offset strategy as proposed, to further mitigate predicted effects.
4. Centennial Angus Place continue its programs of community consultation and engagement, with local and regional stakeholders in particular.
5. Recommendations from the Social Impact Assessment (Hansen Bailey 2019) in respect of managing such impacts be employed by Centennial Angus Place, should those be supplementary to existing initiatives.

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Annexure 1

Treatment of economic effects of taxation components

As discussed in Section 3.4.1, a comparative assessment of the economic contribution of various Federal, State and Local government taxes, rates and charges is excluded from this analysis. The reasons for this approach essentially relate to changes in methodological assumptions, some of which are necessitated by clarifications provided in the DPE guidelines. In essence, the guidelines in particular indicate that tax components be treated separately, whereas they were previously presented on the basis of a combined internal estimate. These are described below.

Corporate taxes (Federal)

The DPE guidelines include provision for reporting of federally levied corporate income taxes as a component of the economic benefit of projects[25], which has necessitated a review of method in terms of estimation of assessment of notional tax liability. Tax liability in respect of Centennial Angus Place comprises part of tax assessment by Centennial Coal Pty Ltd at aggregate level for the entire company, and not on the basis of individual operations. Therefore, Centennial Angus Place does not report corporate taxes as a stand-alone operation. Furthermore, given the extent of Centennial Coal's portfolio of operations and their varied performance in any given year, a proportional estimate of entire group tax liability cannot be validly attributed to individual operations. Even less so can a reliable assessment of taxes be made over the life of an individual project in the context of this volatility. As a result, corporate tax is not reported in this assessment. The necessary exclusion of this material will contribute to a conservative estimate of benefit, as ordinarily some component of tax paid by Centennial Coal would be returned to NSW.

NSW State Government taxes and Local Government rates, local authority charges etc.

The treatment of State-levied taxes varies. The DPE guideline notes '*that a new mine will also pay other taxes, such as payroll tax and personal income tax. The majority of these taxes will have been generated without the project, as people would have been employed elsewhere*'. As it is recognised in the EA that some proportion of the new workers may represent a reallocation of the existing regional labour pool, DPE's assumption is apposite to the current assessment. Accordingly, these taxes are excluded from the analysis in the EA. Other state taxes and local government rates and charges are not anticipated to change as a result of the modification, as consent boundaries etc. remain unchanged.

The combined effect of the exclusion of these items does not negate the fact that they comprise part of the beneficial outcomes of the Modification. Rather, their exclusion should be considered as resulting in a conservative estimate, albeit in the form of a relatively small change.

[25] Calculated as a population-based proportional return to NSW.

Annexure 2

Estimation of net economic benefit to workers

Internal data on the residential status of Angus Place Colliery employees and FTE contractors indicates that the workforce is largely resident in the immediate region (refer to Table 9). As a result, mobility in terms of alternative employment may be somewhat constrained, as transaction costs associated with relocation may be a barrier (e.g. Coulson and Fisher 2009). Furthermore, recent internal research into Centennial Coal Company's nearby Springvale Mine, from which the core of the proposed Angus Place Colliery workforce is expected to transfer, indicates that there is a range of significant personal, family and social ties to the region, based on the long time in residence that is typical for that workforce. This further detracts from any simplified expectation that employees can leave the area and find alternative work without incurring significant financial/economic and social costs.

This being the case, attempts to apply more generalised assumptions to a regional area in relation to which suitable alternative employment is not geographically convenient are problematic and may not effectively capture the full range and scale of the effects of these factors. The assessment method presented below permits calculation of the residual or surplus economic contribution (labour surplus) of employees of Angus Place Colliery, taking into account alternative employment outcomes. The approach taken is to adopt a 'reservation wage' and compare this to the assumed wage level for ongoing employment, producing an estimate of 'labour surplus'. The reservation wage is derived as:

$$\mathbf{RW = (1 - p)AW + pB}$$

Where:
RW = reservation wage;
p = probability of a worker remaining unemployed and thus claiming unemployment (Newstart Allowance) benefit. The Australian Government Job Outlook website[26] was referenced to obtain information to inform an assumption on this probability. Findings for relevant occupations are included in Table A2.

[26] Information current at August 2019.

Table A2: Job outlook information

Identifier	Occupation	Unemployment	Employment growth	$/week (median)	$ annualised
1	Drillers, Miners & Shot Firers	lower	stable	2,500	130,000
2	Mine Deputies[27]	lower	stable	2,812	146,224
3	Mining Engineers	lower	decline	3,118	162,136
4	Other Construction and Mining Labourers	average	moderate	1,683	87,516
5	Geologists, Geophysicists & Hydrogeologists	lower	very strong	2,192	113,984
6	Production Managers	lower	moderate	2,258	117,416
7	Earthmoving Plant Operators	lower	stable	1,491	77,532

Based on internal information, the workforce comprises ≈90% operations (mining) personnel and ≈10% staff/management personnel. Category 1 was assumed as the median wage for operations (mining) personnel ($130,000). The average of categories 2,3 and 5 were assumed for staff ($141,000). These estimates were then used as a basis for assessing the assumed alternative wage, which is calculated as $131,100. Incidence of unemployment is assumed as average, therefore, the unemployment rate for NSW may be considered as reflecting the likelihood of a displaced employee being unable to find work. At November 2019, the unemployment rate for NSW was 4.3% (the Commonwealth Department of Employment reported the rate for the Central West SA4 as 4.0%, which is comparable to the NSW rate). Adopting this rate can be considered as conservative, as it does not allow for the constraints on employee mobility discussed above. It also does not recognise the inherently low labour mobility in the black coal industry reported by the Productivity Commission (1998), which found that voluntary labour turnover rates were less than half the average for all industries, thus indicating scarcity of alternative employment positions. For the purposes of recognising the higher level of unemployment in the immediate area, an estimate is also provided based on the unemployment rate for Lithgow, reported at March 2019, of 7.17%[28].

AW = assumed alternate wage. In this instance the alternate wage is assumed as the median wage for the mining sector, adjusted for the structure of the workforce as determined in the preceding material ($131,100 annualised).
B = Newstart Allowance. The benefit is assumed at partnered level, $504.70 per fortnight (each)[29] annualised ($26,244). Therefore, the reservation wage would be alternatively:

(0.957 x $131,100) + (0.043 x $26,244) ∴
$125,463 + $1,128 = **$126,591**
OR
(0.9283 x $131,100) + (0.0717 x $26,244) ∴
$121,700 + $1,882 = **$123,582**

[27] Included in the occupational group 'Other Building and Engineering Technicians'.
[28] LCC economic profile produced by .id consulting pty ltd.
[29] Australian Government Department of Human Services website (2019). Partnered rate assumed as this is consistent with internally generated workforce demographic data, applied for one partner. Allowance updated 20 September 2019.

The assumed wage rate at the time of preparation of the economic impact assessment was the budgeted 2020 forecast (average) employee income for Springvale Mine (as a proxy for Angus Place Colliery)[30], which is approximately **$135,000**[31]. Consequently, the difference, and the labour surplus value assumed for estimation of the employment effects in the Lithgow & MWRC LGAs is **$8,409 (Estimate 1)** and **$11,418 (Estimate 2)**.

To permit comparison of the relative effect of these mining wages in the local and regional economy, the corresponding calculation was made for the median wage for the Lithgow LGA[32]. This was $47,863.

(0.957 x $47,863) + (0.043 x $26,244) ∴
$45,805 + $1,128 = **$46,933**

OR

(0.9283 x $47,863) + (0.0717 x $26,244) ∴
$44,431 + $1,882 = **$46,313**

[30] Refer to Section 4 re the planned redeployment of the Springvale workforce to Angus Place.
[31] Estimate based on information as at September 2019.
[32] ABS Data by Region. Most recent estimate (2017).

Annexure 3

Assumptions adopted for assessment of mining royalties

Table A3.1: Estimation assumptions

Description	Assumption adopted
Royalty rate	7.2% (other underground coal)
Deductions (beneficiation allowance and other levies)	$4.50/tonne
Prices	Based on independent projections, as per Table A3.2. Outyears calculated using pricing in final year provided. KPMG consensus final year estimate is identified as the long-term assumption. Average of these two prices used as core pricing assumption.
Exchange rate (USD:AUD)	RBA long-term average exchange rate 31 January 2000 to 31 July 2019; AUD 1 = USD 0.7821 (0.78 assumed).
Discount Rate	7% (DPE guidelines)
Sensitivity testing	By discount rates at 4% and 7% (DPE guidelines); By bounded Monte Carlo-style random number test of 1000 iterations, producing simulation mean and 95% confidence intervals.

Table A3.2: Pricing assumptions

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	
World Bank	115.4	110.8	106.4	102.3	98.2	94.2	90.8	87.3	83.8	83.8	80.4	76.9	2031 price assumed for outyears
KPMG Consensus	114.1	103.2	102.6	97.4	92.9			2024 price nominated as long-term price for outyears					
Average	114.7	107.1	104.5	99.9	95.6	93.6	91.9	90.1	88.5	86.7	85	85	Averaged 2031 price assumed for outyears

Note: DIIIS (Australian Government)[33] pricing data was also reviewed. However prices were only projected to 2021 and were therefore not used. It is noted that these were relatively consistent with KPMG Consensus estimate.

[33] Department of Industry, Innovation and Science, Resources and Energy Quarterly June 2019. Australian Government, Canberra.

Annexure 4 – assumptions supporting economic assessments of water resources effects

Surface water

Assumption	Source	Comments/derived estimate
Valuation	DPE Technical Notes 2018 (Mazur & Bennett) *Healthy Waterways*	$0.84 to $1.10 per household per year for 5 years for each kilometre
Extent of affected waterways	MSEC (2019); Cardno (2019); Jacobs (2019a; 2019b) Jacobs (2019) identifies potential significant impacts on Tri Star Swamp, Trail Six/Japan Swamp and Birds Rock Swamp, and potential moderate impact on Twin Gully Swamp. Cardno (2019) identifies drainage lines 2a and 2b as flowing through Tri Star Swamp, drainage lines 3a and 3b flowing through Twin Gully Swamp and drainage line 6 flowing through Birds Rock Swamp (no specific drainage lines identified in respect of Trail Six/Japan Swamp). MSEC (2019) identifies the affected portions of the drainage lines being those directly above the proposed mining area. The drainage lines and their respective affected lengths are: 2a (0.7km); 2b (0.5km); 3a (0.7km) and 3b (0.1km). Total principal area of impact is 2km. Drainage line 6 (beyond angle of draw = 0.2km). Total used for assessment is 2.2km	Jacobs (2019) identifies potential significant impacts on Tri Star Swamp, Trail Six/Japan Swamp and Birds Rock Swamp, and potential moderate impact on Twin Gully Swamp. Cardno (2019) identifies drainage lines 2a and 2b as flowing through Tri Star Swamp, drainage lines 3a and 3b flowing through Twin Gully Swamp and drainage line 6 flowing through Birds Rock Swamp (no specific drainage lines identified in respect of Trail Six/Japan Swamp). MSWC (2019) identifies the affected portions of the drainage lines being those directly above the proposed mining area. The drainage lines and their respective affected lengths are: 2a (0.7km); 2b (0.5km); 3a (0.7km) and 3b (0.1km). **Total principal area of impact is 2km.**
% contribution of Coxs River to domestic (household use) and town water supply in Sydney Catchment	Audit of the Sydney Drinking Water Catchment 2007, Report to the Minister for Climate Change, Environment and Water, DECC, December 2007.	7ML of 85ML licensed to be extracted for domestic use in SDWC (i.e. 8.2%) + 70ML of 22,819ML for town water supply (i.e. 3.1%) ∴ total 77/22,904 ≈ 0.34%
Count of households	ABS 2016 Census data	1,744,928 households ∴ @ 0.34% ≈ 5,866 households, ≈6,000 households assumed. Domestic use, Upper Coxs River (1/22,904) x 1,744,928 ≈ 76 households

During mining the Project will meet the requirements of the State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011 for neutral or beneficial effect on water quality for a continuing development.

From 2020, Angus Place will cease discharge of mine water (raw or treated) to the Coxs River catchment. From 2020 all mine inflows from existing workings will be transferred to the Springvale Water Treatment Project for desalination and beneficial reuse at the MPPS.

Following mine closure and cessation of pumping in 2053, potential seepages resulting from mine void water level recovery may not meet the requirement for a neutral or beneficial effect on water quality. A detailed assessment of potential seepage volumes, water quality and mitigation and management measures will be undertaken at the mine closure planning stage

Air quality

Assumption	Source	Comments/derived estimate
Valuation	PAE Holmes (2013): Methodology for valuing the health impacts of changes in particle emissions – final report. Prepared for NSW Environment Protection Authority (EPA).	Unit damage cost, Lithgow SUA (ABS Significant Urban Area) $29,000 damage cost/tonne of $PM_{2.5}$.

Aboriginal cultural heritage

Assumption	Source	Comments/derived estimate
Valuation	Allen Consulting Group (2005): Valuing the Priceless: The Value of Heritage Protection in Australia, Research Report 2, Heritage Chairs and Officials of Australia and New Zealand, Sydney. < http://www.heritage.nsw.gov.au/docs/Research_ValuingthePriceless_2005.pdf >	9 Aboriginal cultural heritage sites within angle of draw (one considered as at risk of subsidence impact): $8.15 per capita p.a. for each 1,000 places protected); SA3 population (46,612) assumed (as the locality)[34]

[34] Sources: Niche (2019); Allen Consulting Group (2005); ABS (2019).

Annexure 5: Carbon pricing assumptions

Table A5.1

Assumption	Source	Comments/derived estimate
Exchange rate AUD:USD	RBA (long term average 2000-2019)	AUD 1 = USD 0.78 (per table A3.1)
Exchange rate AUD:EUR	RBA (long term average 2010-2019)	AUD 1 = EUR 0.695
Carbon price (lower bound) EU ETS @12/2025	European Emissions Exchange futures	EUR 28.50 = AUD 41.00
Carbon price (upper bound) Canada from 2022	World Bank Group State and Trends of Carbon Pricing report 2019	USD 38.00 = AUD 48.71
Central price	Aigis Group 2019	1,000 iteration bounded Monte Carlo Simulation of NPVs calculated as above (results in Table A5.2)
Carbon equivalent emissions	EMM Consulting 2019	As per Table 4

Table A5.2 Monte Carlo Simulation Outputs

	7%	10%	4%
Simulation Mean	**35,768,481**	**26,206,976**	**50,536,348**
Simulation Standard Deviation	1,785,560	1,336,988	2,485,560
95% Confidence Interval (lower)	35,657,811	26,124,108	50,382,292
95% Confidence Interval (upper)	35,879,152	26,289,843	50,690,405

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