



ECONOMIC IMPACT ASSESSMENT OF THE INTEGRA UNDERGROUND MINE

THE INTEGRA UNDERGROUND LONGWALL EXTENSION MODIFICATION

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General reliance restriction

This report is prepared for HV Coking Coal Pty Limited. The purpose of this report is to provide an economic impact assessment of the Integra Underground Modification Project to NSW and to the local community. You should not use the advice for any other purpose. This report should not be used or relied upon by anyone else and we accept no duty of care to any other person or entity. Due to the uncertain nature of economic data, Cadence Economics does not warrant the completeness or accuracy of the analysis or estimates provided in this report.

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Executive summary

HV Coking Coal Pty Limited (HVCC) is applying to modify the Project Approval (PA 08_0101) for Integra Underground (the Modification), located in the Hunter region of NSW, under Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

HVCC is a wholly owned subsidiary of Glencore Coal Pty Limited (Glencore).

The Modification will facilitate the continuation of longwall mining of the Middle Liddell Seam further to the north of the currently approved longwall panels. The Modification will increase saleable coal production by approximately 7.14 million tonnes (Mt). Most of this coal, 6.0 Mt, is high quality hard coking coal with the remainder being semi-soft coking coal.

Production of this additional coal is scheduled to begin in 2018 and continue to 2023, with production peaking in 2020.

The Modification has a relatively low capital requirement and is within an established mining area with the necessary rail transport linkages already in place.

This report provides an Economic Impact Assessment (EIA) for the Modification and follows the economic assessment framework set out in the *Guidelines for the economic assessment of mining and coal seam gas proposals* (the Guidelines) released by the New South Wales (NSW) Government in December 2015.

Consistent with these guidelines, the EIA includes a Cost Benefit Analysis (CBA) and a Local Effects Analysis (LEA). The CBA provides an estimate of the net benefits of the Modification to NSW. The LEA is based on analysis for the Lower Hunter region (as defined by the Australian Bureau of Statistics SA3 10601 region).

Results of the CBA

Based on the CBA methodology outlined in the Guidelines, and information provided by HVCC, the Modification is estimated to provide a net benefit to NSW. This net benefit is estimated to be \$205.5 million in net present value (NPV)¹ terms, as shown in Figure 1. This is comprised of \$80.9 million and \$124.6 million in direct and indirect benefits respectively. Indirect costs of the project are negligible.

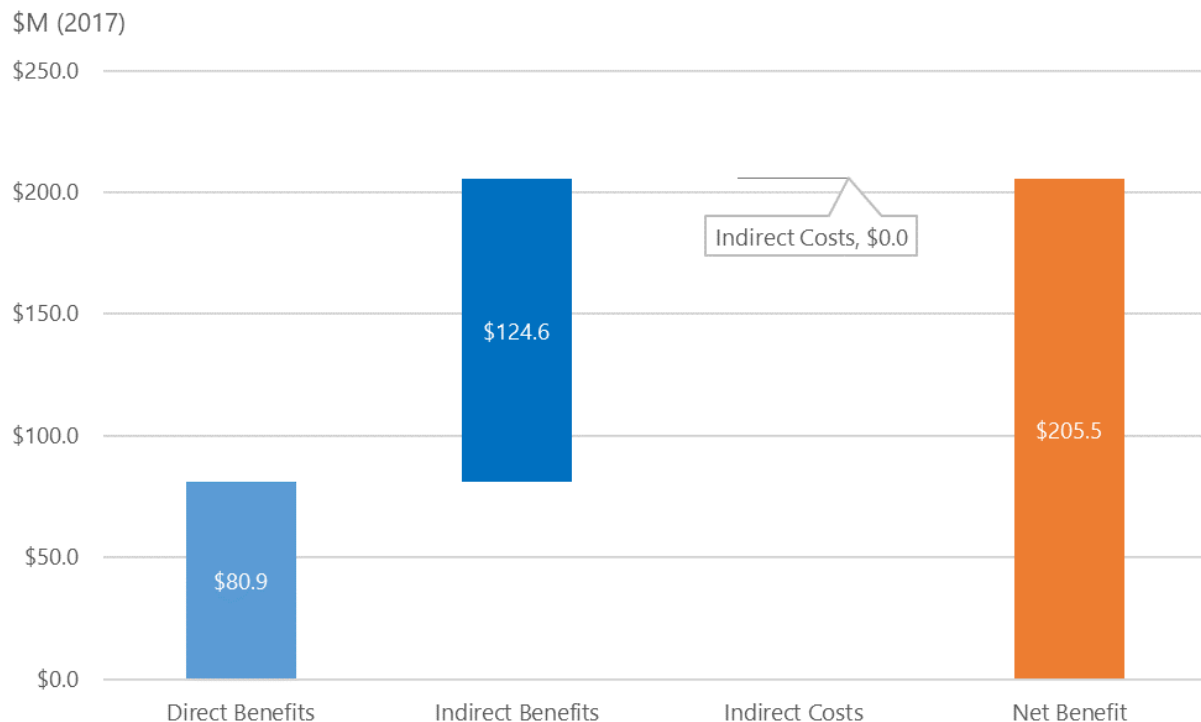
These estimates are based on central case assumptions in relation to the proposed \$79.9 million capital expenditure (undiscounted) and average coal prices of \$164 per tonne and \$115 per tonne for hard coking coal and semi-soft coking coal respectively.

The **direct benefits** of the Modification are a function of its profitability which, in turn, depends on the prevailing coal price. The analysis shows that the combination of relatively high value of coking coal and relatively low capital, extraction and processing costs underpins the economic viability of the Modification. As a result, the Modification is predicted to generate:

¹ All NPV figures reported are in 2017 Australian dollars based on a 7 per cent real discount rate (unless otherwise stated).

- Total corporate taxes of \$79.1 million in NPV terms for Australia, of which \$25.3 million is attributed to NSW; and
- \$55.6 million in other government revenue for NSW in NPV terms, the largest component of this being royalties of \$49.0 million with council rates and land taxes of \$1.4 million and payroll taxes contributing \$5.3 million.

Figure 1: CBA summary of the Modification under central case assumptions (NPV*)



* Net Present Value in 2017 Australian dollars calculated over the period 2018 to 2023 using a 7 per cent real discount rate.

Source: Cadence Economics estimates based on the EIS, and information provided by HVCC.

The **indirect benefits** of the Modification are related to the linkages that it will have to the NSW economy through both the labour market and suppliers. The analysis shows that of the \$124.6 million in estimated indirect benefits:

- Worker benefits are predicted to amount to \$54.1 million in NPV terms attributable to an average employment of 148.5 Full Time Equivalent (FTE) workers over the period of the Modification, which peaks at 246 FTE workers in 2020; and
- Supplier benefits are predicted to amount to \$70.5 in NPV terms based on total supplier inputs over the life of the Modification of \$350 million.

Consistent with the Guidelines, systematic sensitivity analysis of the estimated net benefits is undertaken in this report. This sensitivity analysis shows that the estimated net benefits are **robust** in the sense that they remain (strongly) positive after testing all key assumptions underpinning the analysis.

In isolation, the estimated net benefit of the Modification is most sensitive to the coal price assumptions underpinning the analysis, but even assuming coal prices are 25 per cent lower than under the central case assumptions the net benefits are estimated at \$176.6 million in NPV terms.

The lower bound estimate of net benefits, which takes the most pessimistic assumptions around coal prices, capital expenditure, operational expenditure as well as worker and supplier benefits, yields an estimated net benefit of \$153.6 million in NPV terms. The upper bound estimate of net benefits, based on the most optimistic assumptions, is \$249.1 million in NPV terms.

Two other points to note in the analysis are:

1. The results are relatively insensitive to the choice of discount rate chosen due to the relatively short timeframe of the Modification. The NPV of the estimated net benefits range from between \$185.2 million and \$229.0 million under real discount rates of 10 and 4 per cent respectively.
2. Greenhouse gas emissions are the only **indirect costs** estimated for the Modification, although these are relatively small (\$33,384 in NPV terms under the central case assumptions). This is based on attributing the total greenhouse gas emission cost of \$31.7 million back to NSW on a population basis. The report estimates that this cost may be as high as \$108,914 in NPV terms based on OECD estimates of potential economic damages associated with climate change (when attributed to NSW).

Results of the LEA

The LEA considers the costs and benefits of the Modification on residents of the Lower Hunter region of NSW. The analysis shows an estimated net benefit of \$78.7 million to the Lower Hunter region in NPV terms. This is driven largely by:

- Benefits to local workers of \$51.4 million in NPV terms based on the assumption that 95 per cent of the mine's direct employees continue to be drawn from the region;
- Benefits to local suppliers of \$26.5 million in NPV terms which is based on information from HVCC that approximately 37.5 per cent of the inputs to production are from the region; and
- The payment of local council rates totalling \$0.8 million in NPV terms.

Again, the report shows that the estimated local effects are **robust** under the sensitivity analysis conducted with a lower bound estimate of net benefits of \$62.8 million and upper bound estimate of \$85.3 million in NPV terms.

Economy-wide modelling of the Modification

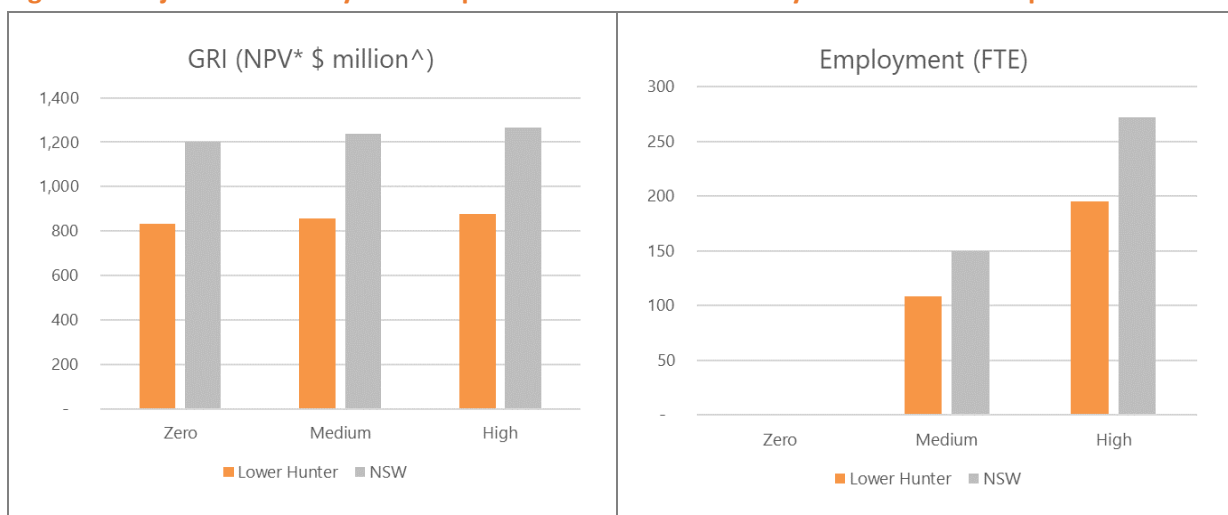
The economic analysis in this report is augmented by an estimation of the economy-wide impacts of the Modification on the Lower Hunter region of NSW and NSW as a whole. This analysis is based on an application of a computable general equilibrium (CGE) model. The Cadence Economics General Equilibrium Model (CEGEM) is a large scale, dynamic, multi-region, multi-sector model of the global economy, with an explicit representation of the economies of the Lower Hunter SA3 region and the rest of NSW. CEGEM is based on a substantial body of accepted microeconomic theory.

CGE modelling is the preferred technique for assessing the impacts of large projects as they are based on a more detailed representation of the economy, including the complex interactions between different sectors of the economy. As a CGE model is able to analyse the impacts of the Modification in a comprehensive, economy-wide framework that captures:

- Direct increases in demand associated with the proposed investments (short term construction activity) as well as the assumed increases in expenditure attributable to continued operation of the mine.
- Indirect increases in demand, or flow-on effects associated with increased economic activity relating to both the construction and operational phase of the Modification.
- Labour market displacement caused by the direct increase in demand from the Modification on other sectors of the economy by bidding up wages and 'crowding out' other sectors of the economy.
- Revenue leakage associated with the expropriation of profits from the mine to overseas interests (in this case, Glencore).

A summary of the projected economy-wide impacts of the Modification generated by the CGE model is shown in Figure 2 under three separate labour market response assumptions. The zero response assumption is consistent with the CBA assumptions underpinning this analysis. This is equivalent to assuming that the Lower Hunter and NSW economies are operating at full employment and, therefore, no new workers are available to service the proposed expansion. That is, workers are drawn from their existing jobs through the offer of higher wages.

Figure 2: Projected economy-wide impacts of the Modification by labour market response



Source: Cadence Economics estimates based on the EIS, and information provided by HVCC. ^ Real 2017 Australian dollars. * Net Present Value in 2017 Australian dollars calculated over the period 2018 to 2023 using a 7 per cent real discount rate.

Under the other scenarios, the Lower Hunter and NSW economies are operating at below capacity, as evidenced for example by higher unemployment or underemployment, and it is more realistic to assume a relatively more 'elastic' labour supply whereby potential workers are encouraged into the workforce, again through increased wages.

In terms of specifying the elasticity of labour supply, the choice of elasticities are 0.15 under 'Medium' settings and 0.3 under the 'High' scenario which is consistent with recent analysis conducted by the Commonwealth Treasury.

Under each scenario the Modification is projected to increase gross regional income (GRI), which is a measure of economic welfare, in both the Lower Hunter region and NSW broadly. In NPV terms, the projected increase in GRI in the Lower Hunter region ranges from \$834 million under the zero labour supply response to \$876 million under the high labour response assumption. The increase in projected economic welfare is related to the projected employment which averages 195 FTE workers under the high labour response assumption (109 FTE workers under the medium assumption).

The economic benefits of the Modification accrue to the broader NSW economy. In NPV terms, the projected increase in GRI in NSW ranges from \$1,201 million under the zero labour supply response to \$1,268 million under the high labour response assumption. The associated employment effects are 272 FTE workers under the high labour response assumption (150 FTE workers under the medium assumption).

1. Introduction

Cadence Economics was commissioned by Hansen Bailey on behalf of HV Coking Coal (HVCC) to undertake an Economic Impact Assessment (EIA) of the Integra Underground Longwall Extension Modification. HVCC is a wholly owned subsidiary of Glencore Coal Pty Limited (Glencore).

This EIA is based on a cost benefit analysis (CBA) and local effects analysis (LEA) prepared under the framework established in the *Guidelines for the economic assessment of mining and coal seam gas proposals* (the Guidelines) released by the New South Wales (NSW) Government in December 2015.²

The CBA is presented in Chapter 2 and measures the net benefits of the Modification to the NSW community. The LEA, which focusses on the benefits accruing to the region (the Lower Hunter Statistical Area, as defined by the Australian Bureau of Statistics), is presented in Chapter 3. As shown in Figure 3, the Lower Hunter region is located to the north west of the Newcastle local region and includes the regional centres of Singleton and Cessnock.

Figure 3: Lower Hunter SA3



Legend:

□ Statistical Area Level 3 (SA3)

Source: Australian Bureau of Statistics, MapData Services, stat.abs.gov.au/itt/r.jsp?ABSMAPS

² New South Wales Government (2015).

In addition to the CBA and LEA, the report also contains an assessment of the economic impacts of the Modification on the region based on computable general equilibrium (CGE) modelling. This modelling is presented in Chapter 4.

Description of the Modification

HVCC operates the Integra Underground Mine in the Hunter region of New South Wales (NSW). HVCC is a wholly owned subsidiary of Glencore Coal Pty Limited (Glencore).

Hansen Bailey is currently preparing an application on behalf of HVCC to modify Integra Underground's Project Approval (PA 08_0101). This modification application will be made under Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

HVCC is seeking approval to continue longwall mining of the Middle Liddell Seam further to the north of the currently approved longwall panels. The Modification also involves the construction and operation of ancillary surface infrastructure.

The Modification includes the following components:

- Adjustments to the approved mine plan for the Middle Liddell Seam including:
 - Realignment and extension of the main headings further to the north-west;
 - Increases to the dimensions of the approved longwalls (LWs) 15-17; and
 - Mining of additional longwall panels (LWs 18-19 or LWs 18-20).
- Construction and use of additional surface infrastructure including:
 - Surface auxiliary fans and associated shafts down to the longwall maingates to assist in the efficient ventilation of the longwall mining area;
 - Additional electricity transmission lines and distribution lines;
 - Additional dewatering boreholes and associated infrastructure;
 - Additional gas drainage boreholes to ensure the safety of underground operations;
 - Increased usage of the currently approved gas flares; and
 - Relocation and upgrade of the existing store facility and the construction and use of an additional access road off Middle Falbrook Road.
- Use of the C4 Dam to store raw water from Glennies Creek.

The proposed mining activities and ancillary surface infrastructure associated with the Modification are conceptually illustrated in Figure 4.

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Integra Underground is located adjacent to the Mount Owen Complex (MOC) which is also owned by Glencore. The Modification does not involve any alterations to the Development Consent for the MOC; however, the proposed mining activities and infrastructure development will be undertaken within the approved project boundary of MOC.

A summary of the key elements under the Modification are presented in Table 1. In undiscounted terms, a capital expenditure of \$79.9 million is required. This expenditure is aimed at lengthening and widening LW15-17 and mining of additional longwall panels (LW 18-20), which is expected to produce an additional 9.9 million tonnes of run-of-mine (ROM) coal output, yielding a total of 7.14 million tonnes (Mt) of saleable coal. Hard Coking Coal (HCC) accounts for 6.0 Mt with the remainder of 1.14 Mt being Semi-Soft Coking Coal (SSCC).

Table 1: Summary of operations under the Modification

Description of operations	
Run-of-Mine Coal	9.9 Mt
Product Coal	7.7 Mt of Product Coal
	6.0 Mt of Hard Coking Coal and 1.14 Mt of Semi-Soft Coking Coal
Capital Expenditure	In 2017 dollars, the total capital requirement is \$70.3 million (in net present value terms using a real 7% discount rate) or \$79.9 million undiscounted
Mining Methods	Underground Longwall Mining
Mining Rate	Predicted maximum production of 3.2 Mt of ROM in 2020, although Integra Underground is approved to extract up to 4.5 Mtpa of ROM coal per year
Modification Duration	2018 to 2023
Operational Workforce	Approximately 250 FTE employees

Source: Based on information provided by HVCC, Hansen Bailey and from various consultants' reports

2. Cost-Benefit Analysis

The Guidelines released by the NSW Government in December 2015 set out the cost-benefit analysis (CBA) framework to measure the net benefits to the NSW community. This approach has been adopted in the economic analysis outlined in this report. Table 2 provides a summary of how these net benefits are measured.

Table 2: Cost Benefit Analysis framework as defined in the Guidelines

Direct Benefits	Indirect Benefits	Indirect Costs
The net benefits that accrue to NSW from the direct operations of the proposed mine	The net benefits that are generated for parties that economically interact with the proposed mine	Social costs generated by the proposed mine, borne by the NSW community
Includes:	Includes:	Includes:
- Net producer surplus attributable to NSW - Royalties payable - Company tax attributable to NSW	- Net economic benefits to landowners - Net economics benefits to NSW employees - Net economic benefits to NSW suppliers	- Net environmental, social and transport-related costs - Net public infrastructure costs - Loss of surplus to other industries

Source: NSW Government (2015).

The direct benefits are those that accrue to the proponent and payments made to government. The indirect benefits are those that accrue to economic agents that engage with the project proponent. These include employees, suppliers and land owners. The indirect costs are the costs borne by the community of NSW, through environmental and social impacts or public infrastructure costs.

The data inputs for the analysis presented in this report are derived primarily from:

- The Environmental Assessment prepared by Hansen Bailey
- Various environmental consultant reports including the *Air Quality and Greenhouse Gas Assessment* undertaken by Jacobs and the *Integra Longwall Extension Modification – Acoustics* report completed by Bridges Acoustics;
- *Energy & Metals Consensus Forecast*, October 2017, Consensus Economics – NSW; and
- Data provided by the proponent (HVCC).

Cadence Economics has not verified the information in these studies.

A major emphasis of the Guidelines is on transparency of assumptions made. The remainder of this section describes in detail the assumptions underpinning the CBA.

Baseline

The starting point for any CBA is the baseline, or counterfactual. This scenario considers all costs and benefits if the Modification does not proceed. The Integra Underground Mine currently has approval to mine the smaller layouts of LW15-17. As such, the economic benefits and costs associated with

development of these longwall panels (as currently approved) have been excluded for the purposes of this assessment.

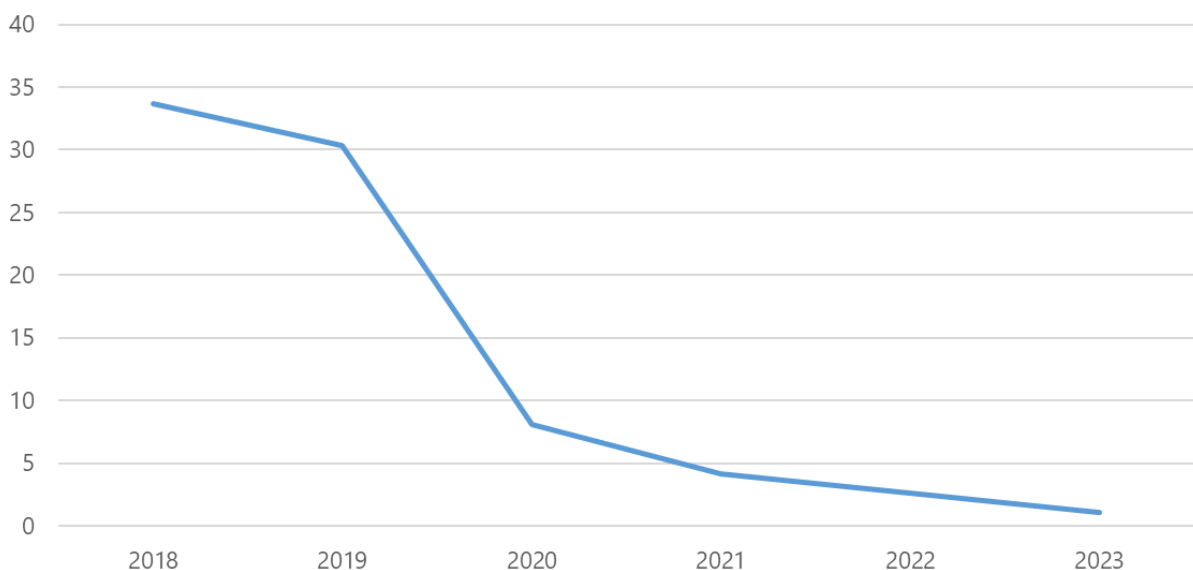
Modification – central case assumptions

The following analysis sets out the financial assumptions underpinning the Modification, including the capital expenditure, the output and price assumptions and the operating cost assumptions, including labour input costs and intermediate inputs. These assumptions are used to estimate the direct and indirect benefits to NSW, and also form the basis of the LEA presented later in the report.

Capital costs

HVCC provided Cadence Economics with the capital expenditure profile of the Modification which is summarised in Figure 5. As shown, the bulk of the planned investment is scheduled to take place in 2018 and 2019, which corresponds with the large capital outlays for surface and underground infrastructure. Over the life of the Modification, the total capital expenditure is \$79.9 million in 2017 dollars undiscounted. In net present value (NPV) terms, the total real capital expenditure is \$70.3 million in NPV terms in 2017 dollars (based on a 7 per cent real discount rate).³

Figure 5: Real capital expenditure under the Modification (2017 dollars)



Source: Data provided by HVCC

The underground infrastructure includes bleeder shafts in the maingate of each longwall panel to assist in the ventilation of the underground mine workings. The surface infrastructure includes surface auxiliary fans, additional electricity transmission and distribution lines, dewatering and gas drainage boreholes, relocation of an existing store facility and a new access road. The Modification also uses already approved assets within the mine site including gas flares and transportation linkages.

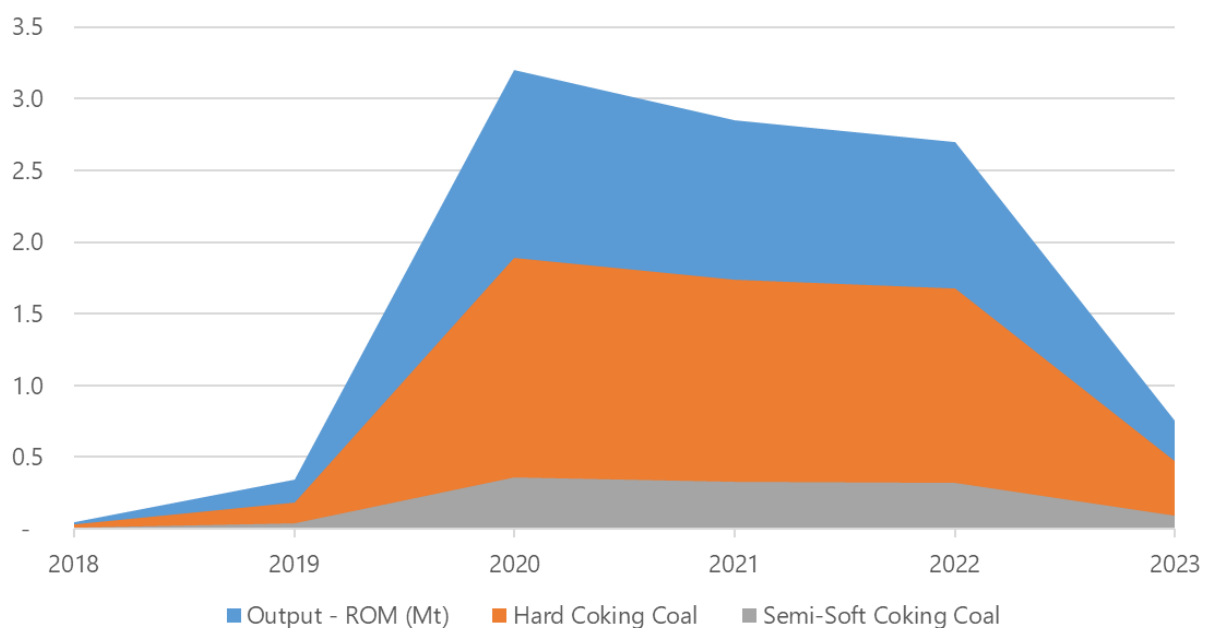
³ All NPV figures reported are in 2017 Australian dollars based on a 7 per cent real discount rate (unless otherwise stated).

Production assumptions

HVCC provided Cadence Economics with the production figures under the Modification which are summarised in Figure 6. Production under the Modification is expected to be an additional 9.9 Mt of ROM over the six-year period from 2018 to 2023. Production is planned to commence in late 2018 with 50,000 tonnes of ROM output in that year and peak at 3.2 Mt of ROM in 2020. At its peak, the Modification is expected to yield 1.89 Mt of HCC and 0.36 Mt of SSCC.

The Modification is largely based on the production of HCC. Over the life of the Modification, HCC is expected to account for 6.0 Mt of the saleable coal output, with SSCC accounting for 1.14 Mt.

Figure 6: Key production figures under the Modification (Mt)



Source: Data provided by HVCC

Price assumptions

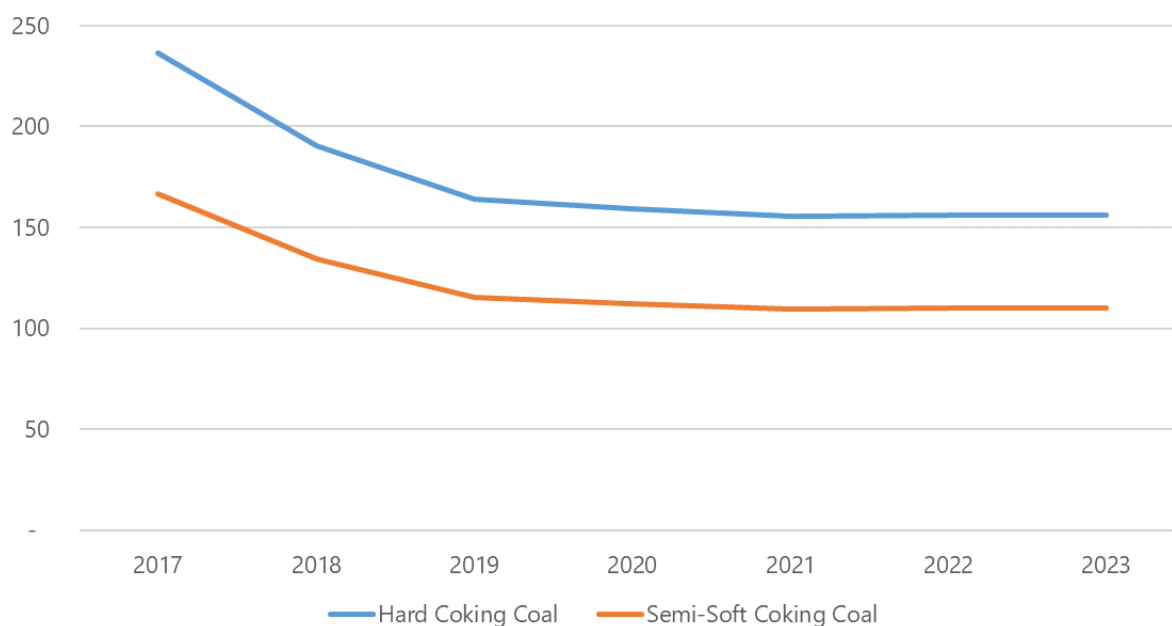
HVCC did not provide Cadence Economics with its internal price forecasts for HCC and SSCC (due to the commercial sensitivity of this information). Instead, Cadence Economics have drawn on the latest price forecasts from Consensus Economics and other information, in order to produce a coal price forecast for both HCC and SSCC.

Consensus Economics (2017) publish a HCC price forecast in nominal US dollars out to 2026. This figure is converted to real Australian dollars using the exchange rate and inflation rate forecasts produced by the Office of the Chief Economist Department of Innovation and Science Resources and Energy (2017).

Over the life of the Modification, the HCC coal price in real 2017 Australian dollars ranges from \$191 per tonne in 2018 to \$155 per tonne in 2022, see Figure 7. Over the period 2020 to 2022, where a bulk of the HCC is produced, the average HCC price is \$160 per tonne.

Over the same period the average SSCC price is estimated to be \$112 per tonne (real 2017, Australian dollars). Given its lower quality, SSCC is assumed to only fetch 70 per cent of the price of HCC. The price discount of SSCC to HCC is determined based on information published by KPMG (2017) in its latest forecast of coal prices.

Figure 7: HCC and SSCC price assumptions, real 2017 Australian dollars



Source: Cadence Economics estimates

Projected revenue and project financials

Based on the production assumptions outlined in Figure 6 and the real price assumptions in Figure 7, the Modification is expected to generate real revenue of just over \$1,070 million over the six years in undiscounted 2017 Australian dollars. This equates to \$816.1 million real revenue in NPV terms based on a 7 per cent real discount rate as shown in Table 3. In the context of this analysis, these are deemed to be **central case assumptions**, and subject to sensitivity analysis.

Table 3: Central case assumptions – coal production, real prices[^] and total revenue

	Total	2018	2019	2020	2021	2022	2023
Production (Mt)							
Hard Coking Coal	6.00	0.03	0.19	1.89	1.74	1.68	0.48
Semi-Soft Coking Coal	1.14	0.01	0.04	0.36	0.33	0.32	0.09
Real price (2017 Australian dollars)							
Hard Coking Coal		191	164	159	155	156	156
Semi-Soft Coking Coal		134	116	112	110	110	110
Total Revenue	816.1*	5.9	34.5	341.4	306.4	297.3	84.2

Source: Cadence Economics estimates [^] Real prices in 2017 Australian dollars. * NPV in 2017 Australian dollars based on a 7 per cent real discount rate.

Based on information provided by HVCC, the operating costs under the Modification are summarised in Table 4. Operating costs are estimated to be \$475.5 million in NPV terms, with decommissioning costs at just over \$10 million in NPV terms. This yields net revenue of \$330.5 million in NPV terms. In terms of other costs:

- Depreciation is calculated using the straight line method, assuming zero residual cost of capital (which is consistent with the standard HVCC treatment).
- Royalties are based on standard NSW Government royalty rates of 6.2 per cent *ad valorem* for underground mines below 400 metres. A discount of \$3.50 per ROM tonne is applied for washing as is allowed by the NSW Government.
- The estimated council rates and land taxes data was provided by HVCC.

Based on this data, the Modification is estimated to generate \$220.8 million in profit in NPV terms. These are deemed to be **central case assumptions**, and subject to sensitivity analysis

Table 4: Central case assumptions – project financials (\$ million[^])

	Total (NPV [*])	2018	2019	2020	2021	2022	2023
Operational revenue	816.1	5.9	34.5	341.4	306.4	297.3	84.2
Asset Sales Revenue							
Residual Value of Capital							
Total Revenue	816.1	5.9	34.5	341.4	306.4	297.3	84.2
Operating Costs (\$m) ^{^ ^}	475.5	9.0	61.6	177.2	171.8	144.2	52.3
Biodiversity - Offsets							
Other mitigation costs							
Decommissioning Costs	10.1	-	-	-	-	-	15.1
Net revenue (\$m)	330.5	-3.1	-27.2	164.1	134.7	153.2	16.8
Depreciation	59.3	-	6.7	14.3	17.0	19.1	22.8
Royalties	49.0	0.4	2.1	20.5	18.4	17.8	5.1
Council rates and land tax	1.4	0.3	0.3	0.3	0.3	0.3	0.3
Total Profit	220.8	-3.7	-36.2	129.0	99.0	115.9	-11.3

Source: Cadence Economics estimates based on information provided by HVCC. [^] Real 2017 Australian dollars. ^{^^} Includes intermediate inputs, labour costs, Govt. levies and payroll taxes paid * NPV in 2017 Australian dollars based on a 7 percent real discount rate.

Direct Benefits

Based on the Guidelines, the direct benefits to NSW of the Modification are derived from three sources:

- The net producer surplus generated by the Modification that is attributable to NSW (estimated using cash outlays and revenues).
- The share of company tax payments that are attributable to NSW.
- Other tax payments such as royalties and payroll tax that are paid to the NSW and local government.

Net producer surplus attributable to NSW

Consistent with the Guidelines, the net producer surplus of the Modification represent the private benefit, or operating surplus, generated that is attributable to NSW.

Based on the financial information summarised in Table 4 above, and the capital costs of \$70.3 million in NPV terms, the Modification is estimated to generate an operating surplus of \$209.8 million in NPV terms (estimated using cash earnings and cost). Out of this surplus, \$79.1 million in NPV terms is payable in the form of corporate taxes, leaving a net producer surplus of \$130.8 million in NPV terms.

In this case, the net producer surplus that is attributable to NSW is assumed to be zero, see Table 5. This is because is 100 per cent owned by Glencore Coal Pty Ltd which is a foreign company (listed on the London, Hong Kong and South African exchanges). While it is possible that NSW residents have some ownership of these shares, it is not possible to ascertain the level of this ownership (which is, in all likelihood, relatively small).

Table 5: Central case - estimate of net producer surplus attributable to NSW (\$ million[^])

Key data	NPV*
Total revenue	816.1
Operating costs (\$m)	475.5
Biodiversity - offsets	-
Other mitigation costs	-
Decommissioning costs	10.1
Net revenue (\$m)	330.5
Capital costs	70.3
Royalties	49.0
Rates	1.4
Operating surplus	209.8
Company tax ^{^^}	79.1
Net Producer Surplus	130.8
NSW share of Project ownership	0%
Value of net producer surplus attributable to NSW	-

Source: Cadence Economics estimates based on information provided by HVCC. [^] Real 2017 Australian dollars. ^{^^} Based on a 30 per cent company tax rate. * NPV in 2017 Australian dollars based on a 7 per cent real discount rate.

Company tax attributable to NSW

Consistent with the Guidelines, the company tax payments made to the Australian Government are levied on the profits generated under the Modification as summarised in Table 6. A company tax rate of 30% is used to estimate the tax payments made to the Australian Government under the assumption that all the profit generated by the mine is subject to company tax in Australia (for example, ignoring financing costs).

Consistent with the Guidelines, company tax is attributable to NSW is based on the State's share of the national population, which is 32 per cent.

As summarised in Table 6, it is estimated the Modification will generate \$220.8 million in total profit in NPV terms over the period 2018 to 2023. At a company tax rate of 30 percent, the company tax estimate is \$79.1 million in NPV terms, of which \$25.3 million is attributable to NSW.

Table 6: Central case - company income tax attributable to NSW (\$ million[^])

Company tax attributable to NSW	NPV*	2018	2019	2020	2021	2022	2023
Net revenue	330.5	-3.1	-27.2	164.1	134.7	153.2	16.8
Depreciation	59.3	-	6.7	14.3	17.0	19.1	22.8
Royalties	49.0	0.4	2.1	20.5	18.4	17.8	5.1
Council rates and land tax	1.4	0.3	0.3	0.3	0.3	0.3	0.3
Total profit	220.8	-3.7	-36.2	129.0	99.0	115.9	-11.3
Company tax ^{^^}	79.1	-	-	38.7	29.7	34.8	-
NSW Share ^{^^^}	25.3	-	-	12.4	9.5	11.1	-

Source: Cadence Economics estimates based on information provided by HVCC. [^] Real 2017 Australian dollars. ^{^^} Based on a 30 per cent company tax rate. ^{^^^} Based on a 32 per cent population share. * NPV in 2017 Australian dollars based on a 7 per cent real discount rate.

Payments to the State and the local Council

Under the Modification, various payments will be made to NSW Government and the Singleton Shire Council to extract and process coal in the State.

These are made up of three types of payments: coal mining royalties and payroll tax paid to the NSW Government and council rates paid to the Singleton Council. Over the life of the Modification, a total of \$55.6 million in payments are made, in NPV terms, see Table 7. This is made up of \$49.0 million of royalty payments and \$5.3 million in payroll tax. A further \$1.4 million is paid in the form of council rates and land taxes. The Mine Rescue Levy and the Mine Subsidence Levy are excluded from this analysis.

Table 7: Central case - total payments to State government and local Council (\$ million[^])

Corporations tax paid to NSW	NPV*
Total Revenue	816.1
Revenue for royalties (including allowable discounts)	789.7
Total Royalties paid	49.0
Payroll tax	5.3
Council rates and land tax	1.4
Total Payments	55.6

Source: Cadence Economics estimates based on information provided by HVCC. [^] Real 2017 Australian dollars. * NPV in 2017 Australian dollars based on a 7 per cent real discount rate.

Summary of direct benefits to NSW

Based on the central case assumptions, revenue and cost data described above, the Modification is estimated to generate \$80.9 million in total direct Benefits to NSW in NPV terms, as outlined in Table 8.

These benefits are comprised of \$25.3 million in company tax attributable to NSW and \$55.6 million in NPV terms paid to the State government and Singleton Shire Council, in the form of coal royalties, payroll tax, council rates and land taxes.

Table 8: Central case - summary of the direct benefits of the Project (\$ million^)

Net financial benefit	NPV*
Net producer surplus attributable to NSW	-
Company income tax attributable to NSW	25.3
Payments to the NSW and local Government	55.6
Total financial benefit attributable to NSW	80.9

Source: Cadence Economics estimates based on information provided by HVCC. ^ Real 2017 Australian dollars. * NPV in 2017 Australian dollars based on a 7 per cent real discount rate.

Indirect Benefits to NSW

Based on the Guidelines, the indirect benefits to NSW of the Modification are derived from three sources:

- The net economic benefit to workers in NSW.
- The net economic benefit to suppliers in NSW.
- Any land owner premiums attributable to the project.

Benefit to workers

Consistent with the Guidelines, a key factor in determining the benefit to workers are defined as the:

- Wages earned in the mine.
- Minus the opportunity cost of labour for working in the mining sector, that is compared to working in non-mining sectors (or being unemployed).
- Minus the wage difference due to skills and the disutility to work in the mining industry.

HVCC provided Cadence Economics with information relating to the overall level of employment under the Modification but not the average wages paid per employee (which is typical for mining companies undertaking this process). Over the period of the Modification, 2018 to 2023, an average of 148.5 FTE workers will be employed, which peaks at 246 FTE workers in 2020 (Table 9).

According to Payscale Research, the average wage for a full time coal mining employee is currently \$120,513 per annum which is assumed to be constant in real terms over the life of the Modification. The **total of wages paid** to employees is estimated at \$96.4 million in NPV terms.

Table 9: Central case – wages paid to those employed under the Modification

Employees	NPV*	2018	2019	2020	2021	2022	2023
Employment (FTEs)		41	147	246	227	168	62
Average wage (\$ per annum^)		\$120,513	\$120,513	\$120,513	\$120,513	\$120,513	\$120,513
Total wages paid (\$ million^)	96.4	5.58	20.19	33.86	31.21	23.11	8.50

Source: HVCC, Payscale Research and Cadence Economics estimates. ^ Real 2017 Australian dollars. * NPV in 2017 Australian dollars based on a 7 per cent real discount rate.

To measure the **opportunity cost** compared to the non-mining sector, the average wage for mining employment was compared to the average wage paid on average in NSW. This implies that should the Modification not go ahead, those who would have been employed by HVCC would find alternative work at the average wage paid in NSW. The average wage across NSW is \$67,174 per annum based on the 2016 Census data (updated to 2017 dollars).

Assuming no disutility of working in mining, this results in an estimated worker benefit of \$54.1 million, in NPV terms, over the life of the Modification. As shown in Table 10, this calculation is the difference between the total wages paid at mining average wages less the total wages that **would** be paid under the average wage prevailing in NSW.

Table 10: Central case – estimated NSW worker benefit

Employees	NPV*	2018	2019	2020	2021	2022	2023
Average NSW wage (\$ per annum^)		67,174	67,174	67,174	67,174	67,174	67,174
Mining wage (\$ per annum^)		120,513	120,513	120,513	120,513	120,513	120,513
Total mining wages paid (\$ million^)	96.4	5.6	20.2	33.9	31.2	23.1	8.5
Total wages based on average wage (\$ million^)	42.4	2.5	8.9	14.9	13.7	10.2	3.7
Estimated worker benefit (\$ million^)	54.1	3.1	11.3	19.0	17.5	13.0	4.8

Source: Glencore, ABS (Table W17) Census (2016) Occupational Total Personal Income (Weekly) by Hours Worked, NSW, Payscale Research and Cadence Economics estimates. ^ Real 2017 Australian dollars. * NPV in 2017 Australian dollars based on a 7 per cent real discount rate.

In terms of the estimated worker benefits calculated in Table 10, it is important to note that there is no disutility assumed for working in mining.

As shown, there is a significant premium incorporated in mining wages compared with the average wage paid in NSW. There are a number of likely reasons for this premium that might be explained by relative skill and productivity levels. In relation to the latter, mining employees are more productive than workers in other industries as they operate with higher levels of capital (for example, based on capital stock figures produced by the ABS, miners work with over 10 times the amount of capital than average employees across Australia).

Any metrics around the disutility of working in mining are very difficult to ascertain in both an absolute (mining specific) or relative (compared with other industries) way. One source of information considered in this analysis was any documented 'hardship' allowances recognised in mining awards. However, these allowances appear to be relatively minor. For example, the Black Coal Mining Industry Award 2010 does provide for the payment of an Underground allowance (Electrical/ Mechanical) of 0.23% per day or shift (above the standard rate/ reimbursement) to an adult employee who works underground on any shift. In addition, there is a Confined space allowance of 0.08% and a Dirty work allowance of 0.23%, that may apply to underground workers. To put this into context, First Aid Officer Allowance is 0.76% per day or shift above the standard rate.

Given the minor allowances for working in an underground mine and the measurement difficulties associated with measuring these disutilities, we have assumed the disutility for workers under the Modification case is zero. However, disutility has been considered in the sensitivity analysis discussed below.

Benefit to suppliers

Consistent with the Guidelines, the economic benefit to suppliers is estimated as a producer surplus generated from goods and services provided from NSW firms under the Modification. As summarised in Table 11, based on the input cost data provided by HVCC, the Modification is estimated to require \$349.6 million in intermediate inputs over its life-cycle in NPV terms.

The estimated economic benefit to suppliers (producer surplus) is based on the Cadence Economics Regional Input-Output Model (CERIOM). This model was customised to generate a NSW-specific Input-Output table so as to not include benefits generated in other Australian states.

The producer surplus estimates are based on Type I multipliers which limit the benefit to direct value added generated by NSW suppliers. This methodology does not account for second round, nor induced consumption effects that are captured within the CGE modelling. Using this relatively conservative technique, the total supplier benefits are estimated to be \$70.5 million in NPV terms.

Table 11: Central case – estimated supplier benefits

Indirect benefits –suppliers	NPV*
Total intermediate inputs (\$ million [^])	349.6
Gross operating surplus ratio	0.202
Total benefits to suppliers (NPV*)	70.5

Source: Cadence Economics estimates based on information provided by HVCC. [^] Real 2017 Australian dollars. * NPV in 2017 Australian dollars based on a 7 per cent real discount rate. * NPV in 2017 dollars based on a 7 percent real discount rate.

Summary of indirect benefits to NSW

Consistent with the Guidelines, the Indirect Benefits of the Project that are predicted to accrue to workers, suppliers and land owners are summarised in Table 12. The total indirect benefits are estimated to be \$124.6 million in NPV terms. The main source of these benefits is the \$70.5 million in benefits to suppliers and \$54.1 million in benefits to employees in NPV terms. There are no anticipated benefits to land owners as a result of the Modification.

Table 12: Summary of indirect benefits (\$ million[^])

Indirect benefits	NPV*
Net economic benefit to workers	54.1
Net economic benefit to suppliers	70.5
Land owner premiums (land sales made above market rates)	-
Total indirect benefit	124.6

Source: Cadence Economics estimates based on information provided by HVCC. [^] Real 2017 Australian dollars. * NPV in 2017 Australian dollars based on a 7 per cent real discount rate. * NPV in 2017 dollars based on a 7 percent real discount rate.

Indirect Costs to NSW

Consistent with the Guidelines, the indirect costs of the Modification are classified as:

- Net public infrastructure costs,
- Estimated loss of surplus to other industries,
- Net environmental, social and transport-related costs,
- Net environmental costs.

Net public infrastructure costs

Based on information provided by HVCC, there are no anticipated impacts to any off-site infrastructure. As outlined above there are a number of infrastructure upgrades required within the Modified Project Boundary, including additional electricity transmission lines and distribution lines and an additional access road off Middle Falbrook Road. These are being funded by HVCC.

Loss of surplus to other industries

There are several business operations that use land adjacent or within the Modified Project Boundary that may be impacted from the Modification. As outlined in the subsidence report *Integra Underground Mine: Subsidence Assessment for Modification to PA 08_0101* by Strata Control Technology, most of the land that is predicted to experience subsidence is owned by Glencore (or its subsidiary companies) and this land is primarily used for mining purposes. A small area of the Ravensworth State Forest adjacent to the MOC North Pit is owned by the NSW State Government.

There are no anticipated impacts to the mining extraction and processing operations owned and managed by Glencore's subsidiaries, but there may be some relatively small impacts to the forestry operations within the Ravensworth State Forest.

Net environmental, social and transport-related costs

Table 13 provides a summary of the environmental impacts predicted by the technical assessments undertaken for the Modification. The bulk of these environmental impacts have been deemed to be negligible as a result of the relative isolation of the Modification away from population centres.

Table 13: Summary of environmental impacts

Scope of environmental costs	Assessment type	Discussion
Greenhouse gas emissions	Quantitative	Based on scope 1 and 2 emissions
Air quality	Qualitative	As a result of the relatively small increases in particulate matter and the isolated nature of this development, the air quality impacts have been assessed in a qualitative manner and are expected to be small.
Residual value of land	Qualitative	Given the mining activity above the underground operations it is expected that the Modification does not impact on alternate uses for the land above the underground mine.
Biodiversity impact	Qualitative	The biodiversity offset requirements of the Modification are relatively minor.
Transport/ traffic impacts	Qualitative	The Modification will result in very minor quantities of additional traffic during the construction phase. Traffic movements during the operational phase will be unchanged.
Ambient noise impact	Qualitative	Noise impacts generated by the Modification are predicted to be minor (within the relevant noise criteria).
Visual amenity	Qualitative	Given the mining activities in the region, it is expected that the Modification will not generate significant impacts to visual amenity.
Water impact	Qualitative	The Modification will generate some surface water impacts including some ponding of water after rain, these are not expected to generate significant impacts.
Aboriginal cultural heritage	Qualitative	Some Aboriginal heritage sites have been identified within the Assessment Boundary. The Modification is not expected to significantly impact these sites.
Non-Aboriginal heritage	Qualitative	Nil impacts

Source: Based on information provided in the EIS and various consultant reports.

Greenhouse gas emissions

The greenhouse gas assessment is outlined in the *Air Quality and Greenhouse Gas Assessment* (Air Quality Assessment) undertaken by Jacobs and is used to estimate the indirect costs shown in Table 14.

The Air Quality Assessment states that the Modification will generate approximately 4 million tonnes of Scope 1 and tonnes of Scope 2 greenhouse gas (GHG) emissions during the construction and operational phases. The real economic cost per tonne of these emissions has been priced at \$9.41 and \$10.99 which is the Forecast European Union Emission Allowance Units price as set out in Workbooks to the Guidelines.

On a global basis, the total estimated GHG cost is \$31.5 million in NPV terms. To maintain consistency with the CBA methodology, this figure needs to be attributed to NSW specifically noting that the economic impacts of climate change are a global phenomenon. It is widely acknowledged that climate change is a global issue and a global externality. Different parts of Australia and the world are predicted to experience

different levels of impacts. As a result, apportioning all the costs of climate change impacts associated with the Modification's greenhouse gas emissions overstates the cost of these impacts to NSW.

One method for calculating the cost to NSW, which is broadly consistent with the Guidelines, is to attribute GHG costs based on the ratio of NSW population to the global population. This method results in an attributed GHG cost of \$33,384 to NSW in NPV terms.

These costs may be as high as \$108,914 in NPV terms based on OECD (2015) estimates of potential economic damages associated with climate change (when attributed to NSW).

Table 14: Greenhouse gas emissions

	Total	2018	2019	2020	2021	2022	2023
Tonnes of GHG							
Construction	3,994	1,681	1,517	402	207	133	55
Operations	4,007,671	20,106	138,404	1,296,294	1,154,995	1,091,957	305,916
Total	4,011,665	21,787	139,921	1,296,697	1,155,202	1,092,089	305,970
Price Path (\$ per tonne [^])		9.41	9.73	10.04	10.36	10.67	10.99
Global Impact (\$ million [^])	31.5*	0.21	1.36	13.02	11.97	11.66	3.36
NSW (\$ million [^])	0.033*	0.000	0.001	0.014	0.013	0.012	0.004

Source: Cadence Economics estimated based on information provided in the Air Quality Assessment. [^] Real 2017 Australian dollars. * NPV in 2017 Australian dollars based on a 7 per cent real discount rate.

Air quality

The air quality assessment is based on information contained in the Air Quality and Greenhouse Gas Assessment undertaken by Jacobs. The main conclusion of the Air Quality Assessment is that the Modification does not pose any risks during the construction phase (provided mitigation measures are undertaken) and the operations would not cause adverse air quality impacts.

For the operational phase, the Air Quality Assessment estimates the Modification will emit 99,688 kg of total suspended particulates per annum, 37,925 of PM10 and 3,024 kg of PM2.5 per annum. In addition, the assessment concludes that given the other generators of particulate matter in the region, the Modification will not be a significant contributor to local emissions.

Given the relatively isolated location of the mine and the relatively small level of particulate matter generated, it not expected the Modification will generate significant air quality impacts.

Residual value of land

The residual value of land captures its economic value in its alternate use, and the value placed on that use by society. In its current form, the majority of land above the underground development is part of the MOC open cut operations. A small portion of the Modification is located below the Ravensworth State Forest which is owned by the NSW State Government.

In the absence of additional approvals, and as a result of the mining activities above the Modification, it is unlikely that further approvals will impact the residual value of land. As such, we have assumed the residual value of land to be zero.

Biodiversity and ecological impacts

A biodiversity assessment has been carried out by Cumberland Ecology entitled *Integra Underground – Longwall Extension Modification Ecological Impact Assessment*. The biodiversity assessment concludes that no threatened flora and fauna species have been recorded within the assessment boundary of the Modification.

In addition, the biodiversity assessment outlines that within the assessment boundary some vegetation will be cleared for the construction of surface infrastructure. The Modification is predicted to result in disturbance to approximately 2.02 ha of Central Hunter Swamp Oak Forest, 1.80 ha of Central Hunter Bulloak Forest and 1.59 ha of rehabilitation.

Transport/traffic impacts

The construction phase for the Modification is expected to generate a small amount of additional traffic (up to 14 vehicles/hour during peak construction periods). These additional traffic movements are not expected to measurably affect the performance of the local road network. The Modification does not increase the operational workforce at Integra Underground. As such, no additional traffic will be generated during the operational phase.

Visual amenity

The Modification will involve some additional surface infrastructure to support the proposed underground mining activities. The area of the Modification is surrounded by other mining activity and is relatively isolated from private residences and transportation routes. As such, the Modification will have no significant impact on visual amenity.

Ambient noise impact

An Ambient noise impact, *Integra Longwall Extension Modification - Acoustics* has been undertaken by Bridges Acoustics. The assessment has been undertaken to consider the acoustic impacts of construction and operational noise may have on private receivers. The Bridges Acoustic assessment includes a number of conservative assumptions, including assuming that noise-generating infrastructure, including auxiliary fans, are located in within the Modification Area closest to privately owned properties.

The Acoustic assessment concludes that the Modification would produce noise levels within the construction noise criteria and operational noise limits. While the Modification will see relatively small increases of noise over the Baseline case, these are not likely to be significant.

Surface Water and Groundwater impact

The subsidence report *Integra Underground Mine: Subsidence Assessment for Modification to PA 08_0101* conducted by SCT Operations also includes an assessment to ground and surface water. The subsidence caused by the Modification is expected generate some surface water impacts including:

- Some ponding of water following heavy rain within Bettys Creek drainage lines; and,
- Some additional ponding within the natural dams on the Project site.

Given the minor surface water impacts as outlined in the Subsidence Assessment, it not expected the Modification will generate significant surface water impacts.

The Groundwater Impact Assessment undertaken by Australasian Groundwater and Environmental Consultants (AGE) utilised modelling to predict the potential impacts on aquifer systems. The groundwater model predicted that the Modification may result in additional mine inflows of up to 257 ML/year. This water is taken from the hardrock aquifer, which is not suitable for irrigation or human consumption. Impacts on alluvial aquifers are predicted to be negligible.

The Surface Water Impact Assessment determined that there is sufficient capacity in the Greater Ravensworth Area Water Sharing Scheme (GRAWSS) to accommodate the additional mine inflows that are predicted to be experienced at Integra Underground. The Modification will not require any additional raw water to be taken from Glennies Creek.

Aboriginal Cultural and Historical heritage

OzArk EHM have undertaken a detailed Heritage Assessment, outlined in the *Aboriginal and Historic Heritage Impact Assessment*. The Heritage Assessment identified five Aboriginal sites and one historical site located within the assessment boundary.

A summary of the Aboriginal heritage impacts is outlined in Table 15. In general, the Heritage Assessment concludes the Modification will have a minimal to partial impact to Aboriginal cultural heritage. Only one site, 37-3-1194 (an isolated find), may be directly impacted by the construction of surface infrastructure. However, the proposed powerline will be aligned to avoid this site (if practicable). The other sites may be subject to subsidence, but impacts associated with subsidence are expected to be minimal.

Table 15: Summary of the Aboriginal Heritage Assessment

Site	Type	Type of impact	Degree of impact
37-3-1173 (MOCO IF-4)	Isolated mudstone flake	Indirect (subsidence related)	Minimal
37-3-1175 (MOCO IF-6)	Isolated mudstone flake	Indirect (subsidence related)	Minimal
37-3-0294 (MORL 2)	Low density artefact scatter	Indirect (subsidence related)	Minimal
37-3-0612 (Bettys Creek 22)	Isolated mudstone broken flake	Indirect (subsidence related)	Minimal
37-3-1194 (MOCO OS-6)	Isolated finds	Direct if powerline built to the east of the access road, no impact if built to the west of the access road	Partial if powerline built to the east of the access road, no impact if built to the west of the access road

Source: *Aboriginal and Historic Heritage Impact Assessment Longwall Extension Modification Integra Underground Mine*, OzArk EHM

The Heritage Assessment also outlined a number recommended measures to ensure impacts to Aboriginal heritage are avoided, including the alignment of powerlines to minimise the impact to 37-3-1194.

Only one historical heritage site is located within the assessment boundary. This site, MOH6, is a former house that includes a concrete slab footing with the remnants of a single brick wall. The Historical Heritage Assessment concludes that this site has no historical heritage. As a result, the Modification is not expected to impact upon historical heritage values.

Net Benefits Analysis results

Consistent with the Guidelines, the CBA is based on comparing the net direct and indirect benefits and subtracting the indirect costs of the Modification compared against the baseline scenario where the Modification does not occur. The results are summarised in Table 16.

Based on the CBA methodology outlined in the Guidelines, and information provided by HVCC, the Modification is estimated to provide a net benefit to NSW. This net benefit is estimated to be \$205.5 million in net present value (NPV)⁴ terms. This is comprised of \$80.9 and \$124.6 million in direct and indirect benefits respectively. Indirect costs of the Modification are negligible.

Table 16: Central case - estimated net benefits of the Modification (\$ million[^])

Benefits	NPV*	Costs	NPV*
Direct benefits		Direct costs	
1. Net producer surplus attributed to NSW	-		
2. Royalties, payroll tax and Council rates	55.6		
3. Company income tax apportioned to NSW	25.3		
Total direct benefits	80.9	Total direct costs	-
Indirect benefits		Indirect costs	
1. Net economic benefit to landholders	0.0	1. Air quality	-
2. Net economic benefit to NSW workers	54.1	2. Greenhouse gas emissions	-0.033
3. Net economic benefit to NSW suppliers	70.5	3. Visual amenity	-
		4. Transport impact	-
		5. Net public infrastructure cost	-
		6. Surface water impact [^]	-
		8. Residual value of land	-
		7. Biodiversity impact [^]	-
		8. Noise impact	-
		9. Loss of surplus to other industries	-
		10. Water [^]	-
		11. Aboriginal cultural heritage	-
		12. Historical heritage	-
Total indirect benefits	124.6	Indirect Costs	-0.0
Total Project economic benefit	205.6	Incremental Indirect Cost	-0.033
NPV of project - (\$m)	205.5		-

Source: Cadence Economics estimated based on information from various sources. [^] Real 2017 Australian dollars. * NPV in 2017 Australian dollars based on a 7 per cent real discount rate.

⁴ All NPV figures reported are in 2017 Australian dollars based on a 7 per cent real discount rate (unless otherwise stated).

These estimates are based on central case assumptions in relation to the proposed \$70.9 million capital expenditure and average coal prices of \$164 per tonne and \$115 per tonne for hard coking coal and semi-soft coking coal respectively.

The **direct benefits** of the Modification are a function of its profitability which, in turn, depends on the prevailing coal price. The analysis shows that the combination of relatively high value of coking coal and relatively low capital, extraction and processing costs underpins the economic viability of the Modification. As a result, the Modification is predicted to generate:

- An overall net producer surplus of \$130.8 million in NPV, of which **zero** is attributed to NSW as Glencore is assumed to be 100 per cent foreign owned;
- Total corporate taxes of \$79.1 million in NPV terms for Australia, of which \$25.3 million is attributed to NSW; and
- \$55.6 million in other government revenue for NSW in NPV terms, the largest component of this being royalties of \$49.0 million with council rates and land taxes of \$1.4 million and payroll taxes contributing \$5.3 million.

The **indirect benefits** of the Modification are related to the linkages that it will have to the NSW economy through both the labour market and suppliers. The analysis shows that of the \$124.6 million in estimated indirect benefits:

- Worker benefits are predicted to amount to \$54.1 million in NPV terms attributable to an average employment of 148.5 Full Time Equivalent (FTE) workers over the period of the Modification, which peaks at 246 FTE workers in 2020; and
- Supplier benefits are predicted to amount to \$70.5 in NPV terms based on total operational expenditure over the life of the Modification of \$350 million.

The Modification is expected to result in minor incremental indirect costs on the NSW community through greenhouse gas emissions. The indirect cost of these emissions is valued at \$33,384 which is through the costs of greenhouse gas emissions.

Net Benefits – Sensitivity analysis

Consistent with the Guidelines, this section outlines a summary of the systematic sensitivity analysis undertaken for the Modification. The sensitivity analysis considers all key areas of the CBA, particularly coal prices, key costs (both capital expenditure and operating costs) as well as worker benefits. Where there are considered to be higher levels of uncertainty with the figures, a range of plus/minus 25 per cent is used. In areas where the figures are deemed more certain, a range of plus/minus 10 per cent is used. The sensitivity analysis is comprised of the following:

- Revenue sensitivity
 - Higher price assumptions, where coal prices are increased by 25 per cent over the central case assumptions for the life of the Modification
 - Lower price assumptions, where coal prices are decreased under the central case assumptions by 25 per cent

- Cost-base sensitivity
 - Higher operational expenditure (increased by 10 per cent over the central case)
 - Lower operational expenditure (decreased by 10 per cent under the central case)
 - Higher capital expenditure (increased by 10 per cent over the central case)
 - Lower capital expenditure (decreased by 10 per cent under the central case)
- Worker and Supplier assumptions
 - Increased disutility of mining wage premium by 25 per cent on central case assumptions
 - Reduced supplier benefits of 10 per cent from central case assumptions
- Discount rate sensitivity, using a 4% and a 10% real discount rate (see Appendix A).

The sensitivity analysis does not consider changes to the predicted environmental impacts, as the indirect costs of these impacts are minor under the Central Case assumption.

In addition, upper and lower bound estimates are undertaken which assume:

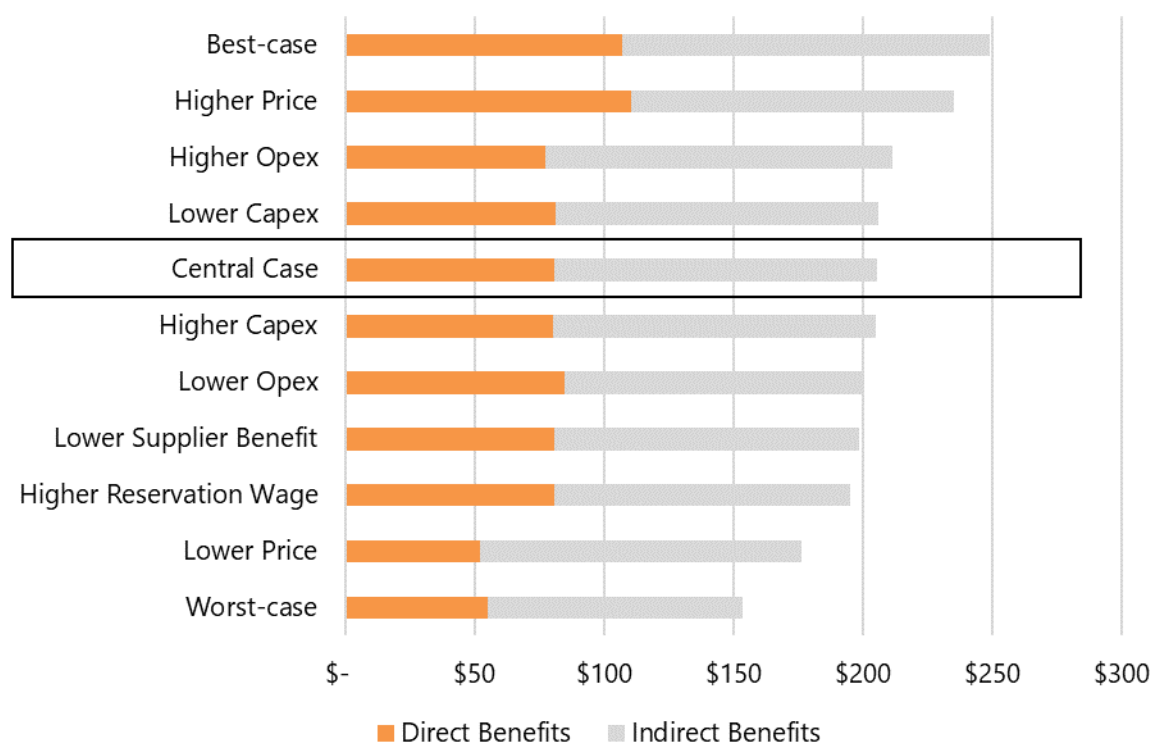
- **'Worst-case' scenario**, the coal price is reduced by 25 per cent, operational and capital expenditure are increased by 10 per cent, the disutility of the mining wage premium is set to 25 per cent and supplier benefits are lowered by 10 per cent compared with central case assumptions.
- **'Best case' scenario**, the coal price is increased by 25 per cent, operational and capital expenditure are decreased by 10 per cent, the disutility of the mining wage premium is set to zero and supplier benefits are increased by 10 per cent compared with central case assumptions.

Results of sensitivity analysis

The results of the systematic sensitivity analysis are summarised in Figure 7. This sensitivity analysis shows that the estimated net benefits are **robust** in the sense that they remain (strongly) positive after testing all key assumptions underpinning the analysis.

In isolation, the estimated net benefit of the Modification is most sensitive to the coal price assumptions underpinning the analysis, but even assuming coal prices are 25 per cent lower than under the central case assumptions, the net benefits are estimated to be \$176.6 million in NPV terms.

The lower bound, or worst-case, estimate of net benefits, which takes the most pessimistic assumptions around coal prices, capital expenditure, operational expenditure as well as worker and supplier benefits, yields an estimated net benefit of \$153.6 million in NPV terms. The upper bound, or best-case, estimate, based on the most optimistic assumptions, is \$249.1 million in NPV terms.

Figure 8: Systematic sensitivity analysis of the CBA to key assumptions (NPV*, \$ million[^])

Source: Cadence Economics estimated based on information from various sources. [^] Real 2017 Australian dollars. * NPV in 2017 Australian dollars based on a 7 per cent real discount rate.

The robustness of the results to the sensitivity analysis is a reflection of the relatively high value coal extracted under the Modification, the relatively low capital costs required to extract the resource and the relatively low level of indirect costs (externalities) attributable to NSW.

It can also be inferred from the sensitivity analysis how large the non-quantified negative externalities would need to be before the project is no longer a net benefit to the NSW community. Using the most conservative estimate, the worst-case assumptions, these externalities would need to be \$153.6 million in NPV terms before the Modification would return a net negative return to NSW.

Given the relatively short time frame of the Modification (2018 to 2023), the net benefits are not particularly sensitive to the discount rate used for the analysis. Under the Central case assumptions the Modification is expected to generate \$205.5 million of net benefit using a 7% discount rate. Using a 4% discount rate increases the net benefit to \$229.0 million, conversely a 10% discount decreases the net benefit to \$185.2 million.

3. Local Effects Analysis

Consistent with the Guidelines, the local effects analysis (LEA) uses a similar framework to the CBA presented in the previous section, but is focussed on the net economic impacts to the local community. The Guidelines refer to the local area as being consistent with the relevant Statistical Area (SA3) as defined by the Australia Bureau of Statistics. In the case of this Modification the Lower Hunter SA3 area is used for the LEA.

The Lower Hunter region

As shown above, the Lower Hunter region is located to the north west of the Newcastle local region. The SA3 local area includes the regional centres of Singleton and Cessnock. The Integra Underground Mine is located in the central west part of the SA3, in a sparsely populated area. In addition, Integra Underground is located within a region that has a long history of coal mining and includes mines such as MOC, which conducts open cut operations above the Integra Underground, and the Ravensworth Complex.

Regional characteristics

The region is heavily reliant on the coal mining sector to underpin the Lower Hunter economy. Of the residents in the region almost 12 per cent work within the coal mining sector, as outlined in Table 17, compared to 0.6 per cent in NSW and 0.4 per cent Australia-wide.

As a result, a high proportion of workers in the region are in occupations that are typically found within both the coal mining sector and industries that supply that sector. Technicians and trades workers make up 18.2 per cent of the Lower Hunter labour force compared to 13 per cent in NSW and machinery operators and drivers account for 14.2 per cent of the regional economy compared to 6.2 per cent state-wide.

These occupation outcomes are also reflected in the educational outcomes within the region. 27.7 per cent of residents report certificate level III and IV as their highest educational attainment, compared to 17 per cent in NSW.

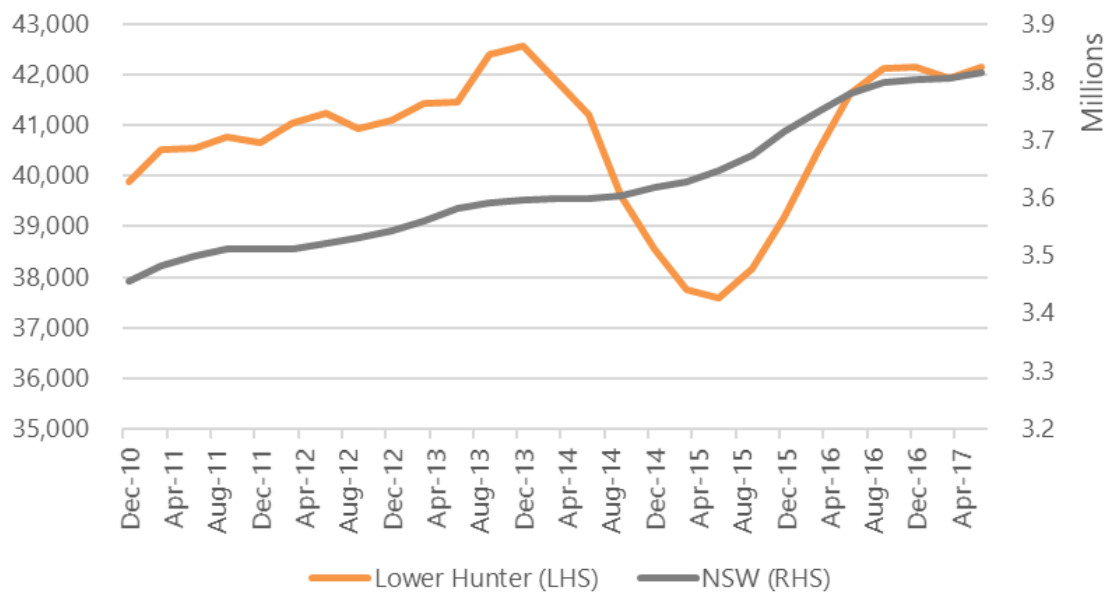
Table 17: Education and employment characteristics

	Lower Hunter	New South Wales	Australia
Level of highest educational attainment	%	%	%
Advanced Diploma and above	18.5	37.3	35.5
Certificate III and IV	27.7	17.0	18.1
Year 10 to 12	38.0	34.8	36.2
Other	15.8	10.9	10.2
Occupation	%	%	%
Technicians and Trades Workers	18.2	12.9	13.8
Machinery Operators and Drivers	14.2	6.2	6.4
Labourers	12.7	9.0	9.6
Professionals	12.1	24.1	22.6
Community and Personal Service Workers	11.5	10.6	11.0
Clerical and Administrative Workers	11.4	14.1	13.8
Managers	10.5	13.7	13.2
Sales Workers	9.3	9.4	9.5
Industry of employment, top responses	%	%	%
Coal Mining	11.9	0.6	0.4
Aged Care Residential Services	2.6	2.0	2.0
Takeaway Food Services	2.5	1.7	1.8
Hospitals (except Psychiatric Hospitals)	2.5	3.5	3.9
Supermarket and Grocery Stores	2.3	2.2	2.4

Source: 2016 Census QuickStats, Australian Bureau of Statistics

Employment outcomes

Employment and employment outcomes in the Lower Hunter region are also highly variable, in part impacted by coal mining activity. Figure 9 shows total employment in the Lower Hunter SA3 and the NSW economy. Employment in the region peaked in December 2013 at almost 42,600, yet fell sharply to about 37,600 by June 2015 a decrease of 5,000 workers or 12 per cent in an 18-month period.

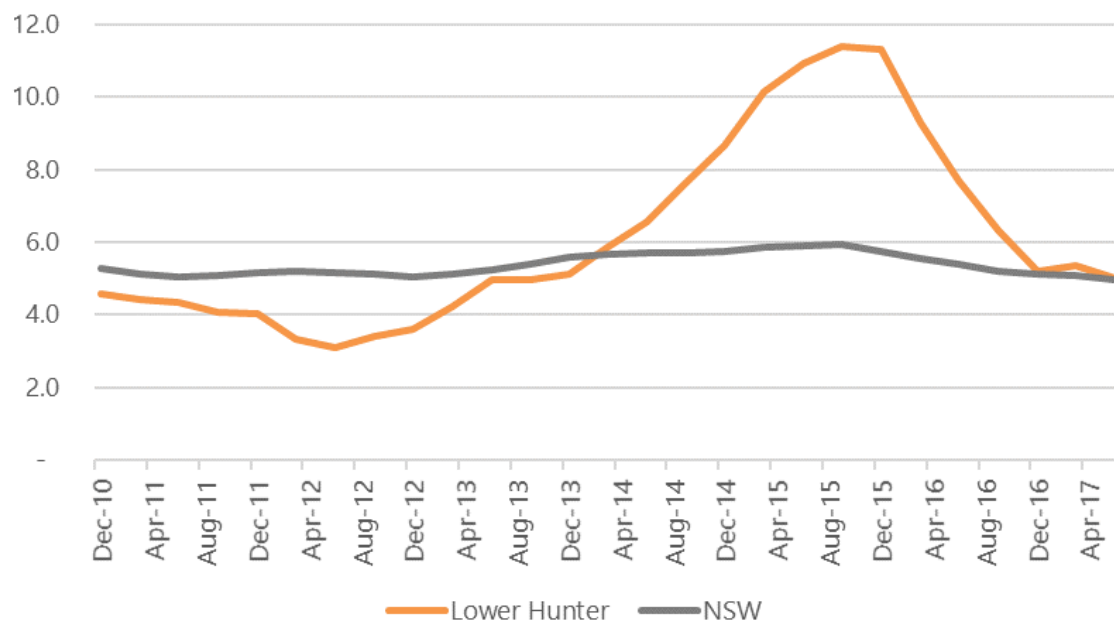
Figure 9: Employment, Lower Hunter SA3 and New South Wales

Source: SA2 Data tables – Small Area Labour Markets – June quarter 2017 Department of Employment (October 2017)

This period was characterised as a challenging one for the coal mining sector, facing relatively low coal prices and a strong Australian Dollar, thus impacting profitability. Some operators suspended coal operations or reduced output impacting on regional employment outcomes.

As a result of this large decrease in regional employment, the unemployment rate in the Lower Hunter increased significantly during this period. As shown in Figure 10, unemployment in the region increased from 5.1 per cent in December 2013 to 10.9 per cent in June 2015 and peaked at 11.4 per cent in the following September quarter.

Employment conditions in the region have since improved. As at June 2017 employment has almost recovered to the December 2013 peak and the unemployment rate in the region has fallen to about the state average.

Figure 10: Unemployment rate (per cent), Lower Hunter SA3 and New South Wales

Source: SA2 Data tables – Small Area Labour Markets – June quarter 2017 Department of Employment (October 2017)

Local Effects Analysis

The LEA accounts for the economic benefits to the Lower Hunter region only. It does not include any economic benefits that may accrue to the major regional centres that are located adjacent, including Maitland and Newcastle or the broader Hunter region.

Given the nature of coal operations and export ports located in Newcastle, many of the inputs may be supplied from the broader Hunter region. In addition, HVCC has advised that over the life of the Modification 50 per cent of the inputs will be supplied from the Newcastle and Hunter region. As a result, this Modification may generate economic benefits to these regions.

Underpinning the LEA are the assumptions that:

- No net producer surplus accrues to the region.
- No company income tax accrues to the Lower Hunter SA3 region.
- Based on information supplied by HVCC, we have assumed for the purposes of the LEA that 95 per cent of the workforce requirement of the Modification and 37.5 per cent of intermediate inputs will be supplied from the SA3 region.
 - As a result of these assumptions, it is expected the Modification will generate indirect benefits to local suppliers and employees of \$26.5 million and \$51.4 million respectively in NPV terms over the baseline case, as outlined in Table 18.
- Indirect costs associated with the Modification are minor, including GHG emissions.

Based on these assumptions, the Modification is estimated to confer a net benefit on the Lower Hunter SA3 region of \$78.7 million in NPV terms.

Table 18: Estimated Local Effects Analysis of the Modification (\$ million^)

Benefits	NPV*	Costs	NPV*
Direct benefits		Direct costs	
1. Net producer surplus attributed to NSW			
2. Royalties, payroll tax and Council rates	0.8		
3. Company tax			
Total direct benefits	0.8	Total direct costs	-
Indirect benefits		Indirect costs	
1. Net economic benefit to landholders	0.0	1. Air quality	-
2. Net economic benefit to NSW workers	51.4	2. Greenhouse gas emissions	
3. Net economic benefit to NSW suppliers	26.5	3. Visual amenity	
		4. Transport impact	
		5. Net public infrastructure cost	
		6. Surface water impact	
		8. Residual value of land	
		7. Biodiversity impact^	
		8. Noise impact	
		9. Loss of surplus to other industries	
		10. Water^	
		11. Aboriginal cultural heritage	
		12. Historical heritage	
Total indirect benefits	77.9	Indirect Costs	0
Total Project economic benefit	78.7	Incremental Indirect Cost	0
NPV of project - (\$m)	78.7		

Source: Cadence Economics estimated based on information from various sources. ^ Real 2017 Australian dollars. * NPV in 2017 Australian dollars based on a 7 per cent real discount rate.

Sensitivity analysis

As outlined above the LEA relies on a number of modelling assumptions. Consistent with the Guidelines, Figure 11 provides a summary of the systematic sensitivity analysis undertaken for the Modification. The sensitivity analysis tests the same assumptions outlined in the CBA.

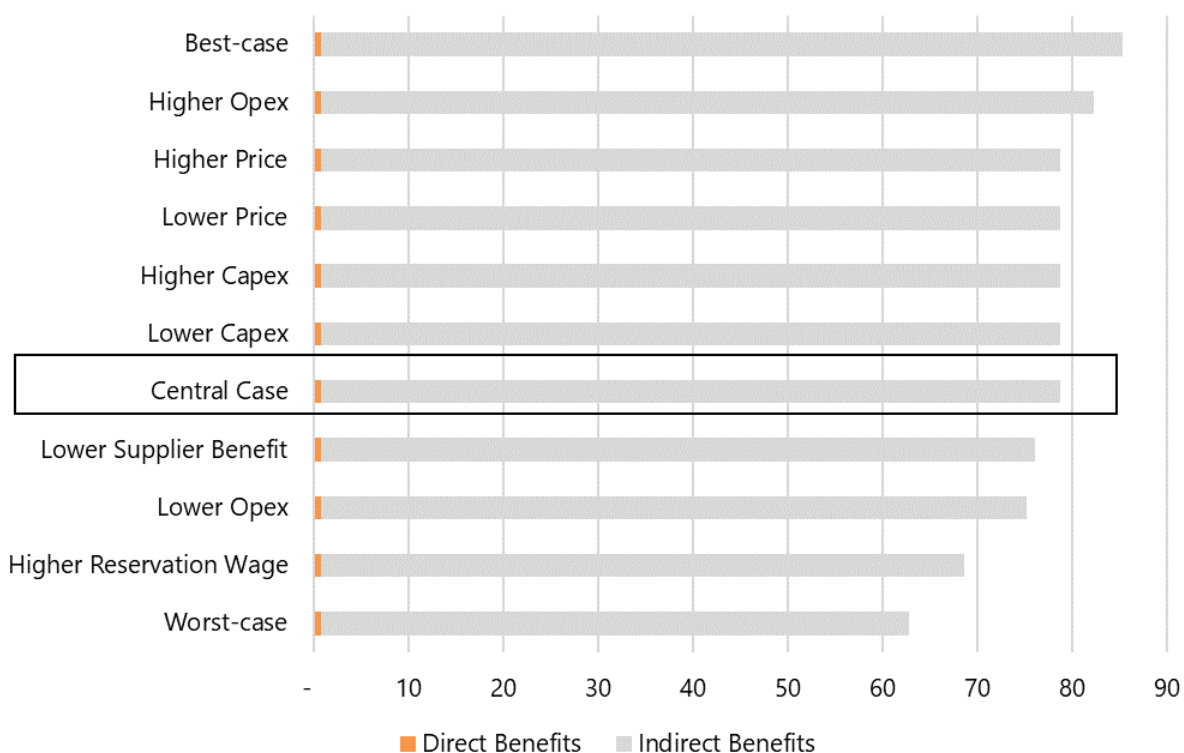
The main drivers for the regional impact are the supplier and employee benefits. Those sensitivities that change the supplier benefits through lower operational costs, lower supplier benefit or employee benefit have the greatest impact on the regional net benefit.

The results of the systematic sensitivity analysis are summarised in Figure 11. This sensitivity analysis shows that the estimated net benefits are **robust** in the sense that they remain (strongly) positive after testing all key assumptions underpinning the analysis. Full detail of the sensitivity analysis is presented in Appendix A.

The lower bound, or worst-case, estimate of net benefits, which takes the most pessimistic assumptions around coal prices, capital expenditure, operational expenditure as well as worker and supplier benefits,

yields an estimated net benefit of \$62.8 million in NPV terms. The upper bound, or best-case, estimate based on the most optimistic assumptions, is \$85.3 million in NPV terms.

Figure 11: Systematic sensitivity analysis of the LEA to key assumptions (NPV*, \$ million[^])



Source: Cadence Economics estimated based on information from various sources. ^ Real 2017 Australian dollars. * NPV in 2017 Australian dollars based on a 7 per cent real discount rate.

4. CGE modelling framework

The economy-wide impacts of the Modification has been undertaken using a computable general equilibrium (CGE) model of the regional and NSW economy.

The ultimate aim of an economic impact study based on applied CGE modelling is to estimate the net benefit of the Modification on economic activity and the living standard of those residing within the Lower Hunter SA3 and in NSW.

CGE modelling is the preferred technique to assess the impacts of large projects as they are based on a more detailed representation of the economy, including the complex interactions between different sectors of the economy.⁵ As a CGE model is able to analyse the impacts of the Modification in a comprehensive, economy-wide framework, the modelling captures:

- **Direct increases in demand** associated with the Modification (short term construction activity) as well as the assumed increases in output attributable to increased coal production.
- **Indirect increases in demand**, or flow-on effects associated with increased economic activity relating to both the construction phase of development and additional coal production.
- **Labour market displacement** caused by the direct increase in demand from a project of this nature (and the associated investment) on other sectors of the economy through bidding up wages and 'crowding out' other sectors of the economy.
- **Revenue leakage** associated with the expropriation of profits from the mine to overseas interests (in this case, HVCC which is owned by Glencore).

About Cadence Economics' CGE model

The estimates are based on the Cadence Economics General Equilibrium Model (CEGEM). CEGEM is a large scale, dynamic, multi-region, multi-sector model of the global economy, with an explicit representation of the Lower Hunter SA3 and the NSW economy. CEGEM is based on a substantial body of accepted microeconomic theory.

The model projects change in macroeconomic aggregates such real gross state product (real GSP) which is an output measure of the NSW economy, real gross state income (real GSI) which is a welfare measure for NSW residents. At a regional level the model projects change in real gross regional product (real GRP) and real gross regional income (real GRI). The model also projects state-wide and regional employment, export volumes, investment and private consumption. At the sectoral level, detailed results such as output, exports, imports and employment are also produced. A brief description of the model is presented in Box 1.

Importantly, in terms of interpreting the results as well as for consistency with the CBA analysis, real GSI represents the preferable welfare measure to the commonly reported change in real GSP (a measure of

⁵ See for example the Policy & Guidelines Paper produced by the NSW Treasury (2009).

production). As a measure of income, Pant et al (2000) shows how the change in real GSI is a good approximation to the **equivalent variation** welfare measure in global CGE models such as CEGEM. This measure is widely used by practitioners and can also be decomposed into various components to assist in the analysis of results. Real GSI is computationally more convenient than an equivalent variation, and a more familiar concept to explain to decision makers (Layman, 2004).

As noted by Pant et al (2000), in considering welfare results in global CGE such as CEGEM, the main components are the change in: output (measured by real GSP); terms of trade; and payments to foreign entities. Of particular relevance in the discussion around estimating the net benefits of the Modification are the terms of trade effects. These can be closely linked to changes in labour market conditions because any increase in real wages as a result of higher levels of coal exports will result in an improvement in the terms of trade and, hence, welfare.

Box 1: An overview of CEGEM

CEGEM is a multi-commodity, multi-region, dynamic model of the world economy. Like all economic models, CEGEM is based on a range of assumptions, parameters and data that constitute an approximation to the working structure of an economy. Its construction has drawn on the key features of other economic models such as the global economic framework underpinning models such as GTAP and GTEM, with state and regional modelling frameworks such as Monash-MMRF and TERM.

Labour, capital, land and a natural resource comprise the four factors of production. On a year-by-year basis, capital and labour are mobile between sectors, while land is mobile across agriculture. The natural resource is specific to mining and is not mobile. A representative household in each region owns all factors of production. This representative household receives all factor payments, tax revenue and interregional transfers. The household also determines the allocation of income between household consumption, government consumption and savings.

Capital in each region of the model accumulates by investment less depreciation in each period. Capital is mobile internationally in CEGEM where global investment equals global savings. Global savings are made available to invest across regions. Rates of return can differ to reflect region specific differences in risk premiums.

The model assumes labour markets operate in a model where employment and wages adjust in each year so that, for example, in the case of an increase in the demand for labour, the real wage rate increases in proportion to the increase in employment from its base case forecast level.

CEGEM determines regional supplies and demands of commodities through optimising behaviour of agents in perfectly competitive markets using constant returns to scale technologies. Under these assumptions, prices are set to cover costs and firms earn zero pure profits, with all returns paid to primary factors. This implies that changes in output prices are determined by changes in input prices of materials and primary factors.

That noted, real GSI does not capture some non-market effects that can impact on the living standards of NSW residents. These could include noise impacts for residents or pollution as considered in the detailed CBA above.

CEGEM is a recursive dynamic model that solves year-on-year over a specified timeframe. The model is used to project the relationship between variables under different scenarios over a predefined period. A typical scenario is comprised of a reference case projection (or the Base case scenario) that forms the basis of the analysis. In this instance, the reference case assumes that the Modification is not undertaken (with no additional investment or coal output). Set against this scenario is the policy scenario (or the Project case) under consideration.

Overview of scenarios

All scenarios outlined in the modelling below are based on the two key central case assumptions summarised in Table 5 above, including;

- capital expenditure of \$70.3 million in NPV terms; and
- coal revenue of \$816.1 million in NPV terms.

In addition we have also factored into our scenarios the benefits that flow from the Modification outside of the Lower Hunter Region and the NSW economy. This includes, the repatriation of profits out of the region to foreign shareholders, along with the payments out of the region for royalties to the NSW Government and corporations tax to the Australian Government. It has been assumed that these royalty payments accrue to the rest of NSW.

The central consideration across the scenarios relates to the responsiveness of the NSW labour market to the increase in expenditure (the labour supply response⁶). To test the responsiveness, three labour market assumptions have been incorporated into the modelling, as discussed below.

Conceptually, if the NSW economy is operating at full employment and, therefore, no new workers were available to service the increase in expenditure (demand) associated either with the construction of the Modification or the associated increase in coal output, the Modification would not create a single additional job. That is, workers would be drawn from their existing jobs via the new project offering higher wages. Similarly, if a new project required very specific highly trained and skilled workers and there were none readily available, the project would not create a single additional job. We replicate this type of world by applying an 'inelastic' – or Zero -labour supply elasticity.

On the other hand, in a world where the economy is operating at below capacity, as evidenced for example by higher unemployment and slower growth, it is more realistic to assume a relatively more 'elastic' labour supply whereby potential workers are encouraged into the workforce, again through increased wages. In terms of specifying the elasticity of labour supply, the Australian Treasury recommends a labour supply elasticity assumption of 0.15 under 'Medium' settings, which indicates a relatively 'inelastic' response from workers. This means workers are slow to respond to changes in wages because (it is assumed that) the economy is close to full employment or the project under consideration requires highly skilled workers.

⁶ In economic jargon, the assumed labour supply elasticity.

To further test the results to the responsiveness of the NSW labour market, under the 'High' scenario, a labour supply elasticity of 0.3 is assumed, which is relatively more 'elastic' and means that workers respond more readily to marginal changes in the wage rate.

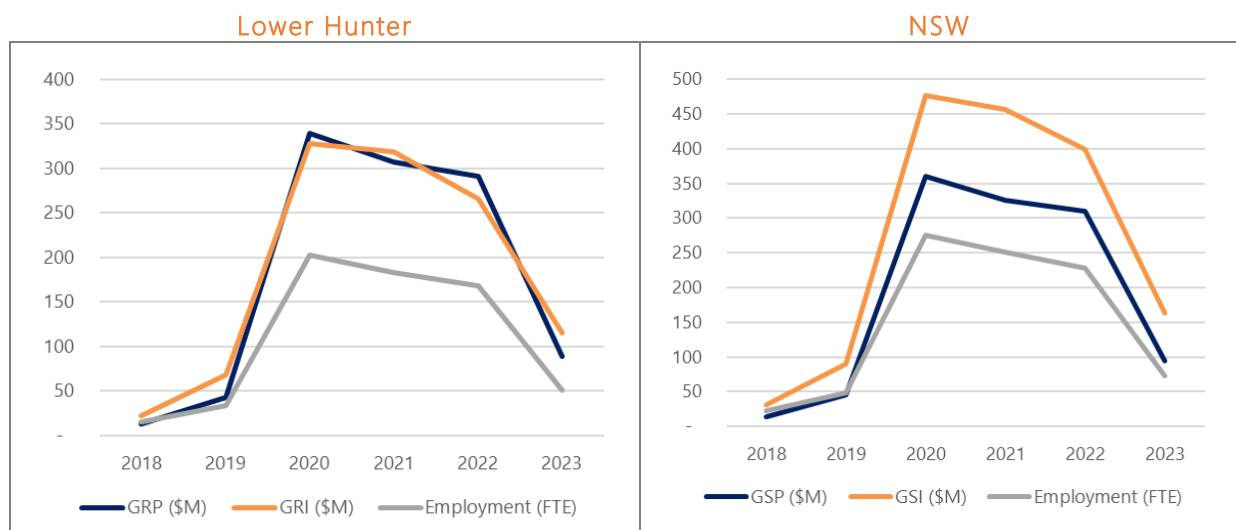
Economy-wide modelling of the Modification

Given the number of possible scenarios under consideration, this section focusses on annual impacts of the medium labour supply scenario based on the Modification using a labour supply elasticity of 0.15.

A summary of the key macroeconomic variables projected under the core scenario is shown in Figure 12. The results are reported as deviations from the reference case and represent the change in a particular variable as a result of investing in and operating under the Modification assumptions. The results for the Lower Hunter are outlined on the left hand side of the figure and NSW on the right (NSW includes the Lower Hunter).

The annual results from the CGE model generally move in-line with the Modification capital expenditure and production activity. Real GRP for the Lower Hunter is projected to peak at \$339 million higher than the reference case in 2020, coinciding with peak saleable output from the proposed Modification. This increase in real GDP is a function of the higher levels of activity within the region associated with output at the mine and the flow-on benefits of purchasing inputs to operate the mine. Real GRI is also projected to peak in 2020 at \$328 million. The increase in GRI is driven by the twin factors of higher wages for local workers and the repatriation of profits out of the region to the foreign owners of the mine, the company tax outflows and the royalty payments to the rest of NSW.

Figure 12: Projected economy-wide impacts of the Modification (\$ million[^])



Source: Cadence Economics estimates based on the EIS, and information provided by HVCC. ^ Real 2017 Australian dollars.

The net increase in employment within the region is expected to peak at 202 FTE workers. These results are driven by the direct employment within the region, the flow-on impacts from local inputs and any of the crowding out of employment in other sectors.

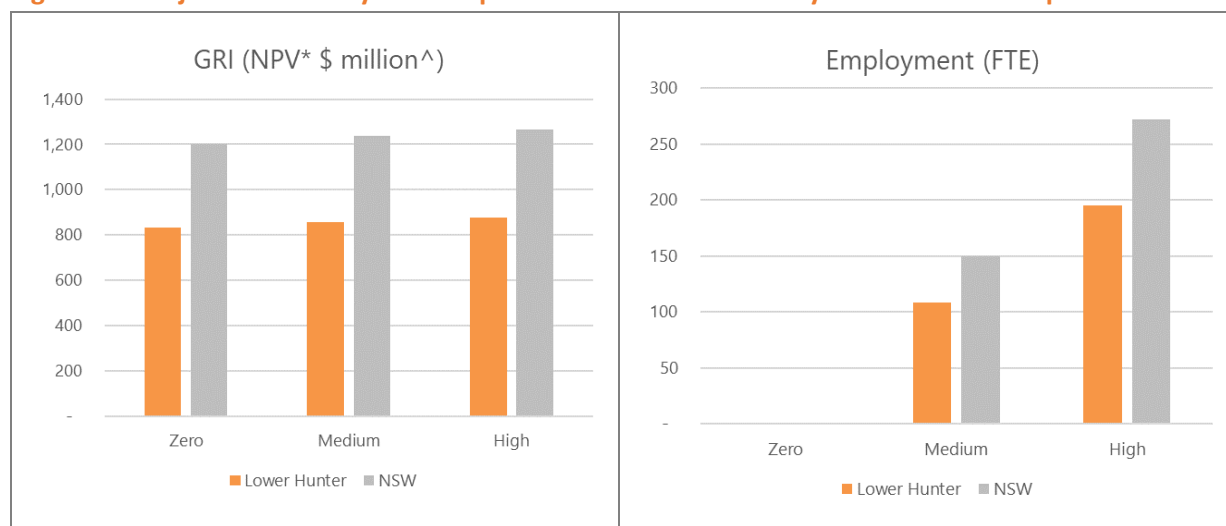
Moving to the state-wide results, real GSP for NSW is projected to peak at \$360 million higher than the reference case in 2020, coinciding with peak saleable output from the Modification. In the same year real GSI will peak at \$476 million and employment of 275 FTE workers.

Overall summary

A summary of the projected economy-wide impacts of the Modification generated by the CGE model are summarised in Figure 13 under three separate labour market response assumptions.

Under each scenario the Modification is projected to increase gross regional income (GRI), which is a measure of economic welfare, in both the Lower Hunter and NSW broadly. In NPV terms, the projected increase in GRI in the Lower Hunter ranges from \$834 million under the zero labour supply response to \$876 million under the high labour response assumption. The increase in projected economic welfare is related to the projected employment which averages 195 FTE workers under the high labour response assumption (109 FTE workers under the medium assumption).

Figure 13: Projected economy-wide impacts of the Modification by labour market response



Source: Cadence Economics estimates based on the EIS, and information provided by HVCC. ^ Real 2017 Australian dollars. * Net Present Value in 2017 Australian dollars calculated over the period 2018 to 2023 using a 7 per cent real discount rate.

The economic benefits of the Modification accrue to the broader NSW economy. In NPV terms, the projected increase in GSI in NSW ranges from \$1,201 million under the zero labour supply response to \$1,268 million under the high labour response assumption. The associated employment effects are 272 FTE workers under the high labour response assumption (150 FTE workers under the medium assumption).

The zero response assumption is consistent with the CBA and LEA assumptions underpinning this analysis. This is equivalent to assuming that the Lower Hunter and NSW economy are operating at full employment and, therefore, no new workers are available to service the proposed expansion. That is, workers are drawn from their existing jobs through the offer of higher wages.

Under the other scenarios, the Lower Hunter and NSW economies are operating at below capacity, as evidenced for example by higher unemployment or underemployment, and it is more realistic to assume a relatively more 'elastic' labour supply whereby potential workers are encouraged into the workforce, again through increased wages.

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APPENDIX A: SENSITIVITY ANALYSIS – CBA AND LEA

Table 19: Sensitivity analysis of the net benefits of the Modification (NPV*, \$ million)**

	Central Case	Higher Price	Lower Price	Higher Opex	Lower Opex	Higher Capex	Lower Capex	Higher Reservation Wage	Lower Supplier Benefit	Worst-case	Best-case	Central Case (4%)	Central Case (10%)
Direct Benefits	\$80.9	\$110.4	\$52.0	\$77.3	\$84.6	\$80.6	\$81.3	\$80.9	\$80.9	\$55.3	\$107.0	\$90.5	\$72.7
1. Net producer surplus	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
2. Royalties, payroll tax and Council rates	\$55.6	\$68.3	\$43.0	\$55.6	\$55.6	\$55.6	\$55.6	\$55.6	\$55.6	\$43.0	\$68.3	\$62.2	\$50.0
3. Company income tax apportioned	\$25.3	\$42.1	\$9.0	\$21.7	\$28.9	\$24.9	\$25.7	\$25.3	\$25.3	\$12.3	\$38.7	\$28.3	\$22.7
Indirect Benefits	\$124.6	\$124.6	\$124.6	\$134.1	\$115.1	\$124.6	\$124.6	\$114.0	\$117.6	\$98.4	\$142.1	\$138.5	\$112.6
1. Net economic benefit to existing landholders	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
2. Net economic benefit to Local workers	\$54.1	\$54.1	\$54.1	\$54.1	\$54.1	\$54.1	\$54.1	\$43.5	\$54.1	\$43.5	\$54.1	\$59.7	\$49.1
3. Net economic benefit to Local suppliers	\$70.5	\$70.5	\$70.5	\$80.0	\$61.0	\$70.5	\$70.5	\$70.5	\$63.5	\$54.9	\$88.1	\$78.8	\$63.4
Indirect (Environmental costs)	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Net Benefits	\$205.5	\$235.0	\$176.6	\$211.4	\$199.7	\$205.2	\$205.9	\$194.9	\$198.5	\$153.6	\$249.1	\$229.0	\$185.2

Source: Cadence Economics estimated based on information from various sources. * Estimated as the benefits of the Project case less the Baseline case. ** NPV in 2017 dollars based on a 7 percent real discount rate.

Economic impact assessment –
Integra Underground Mine

Table 20: Sensitivity analysis of the net regional benefits of the Modification (NPV*, \$ million)**

	Central Case	Higher Price	Lower Price	Higher Opex	Lower Opex	Higher Capex	Lower Capex	Higher Reservation Wage	Lower Supplier Benefit	Worst-case	Best-case	Central Case (4%)	Central Case (10%)
Direct Benefits	\$0.8	\$0.8	\$0.8	\$0.8	\$0.8	\$0.8	\$0.8	\$0.8	\$0.8	\$0.8	\$0.8	\$0.9	\$0.7
1. Net producer surplus	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
2. Royalties, payroll tax and Council rates	\$0.8	\$0.8	\$0.8	\$0.8	\$0.8	\$0.8	\$0.8	\$0.8	\$0.8	\$0.8	\$0.8	\$0.9	\$0.7
3. Company income tax apportioned	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Indirect Benefits	\$77.9	\$77.9	\$77.9	\$81.4	\$74.3	\$77.9	\$77.9	\$67.8	\$75.2	\$62.0	\$84.4	\$86.4	\$70.5
1. Net economic benefit to existing landholders	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
2. Net economic benefit to Local workers	\$51.4	\$51.4	\$51.4	\$51.4	\$51.4	\$51.4	\$51.4	\$41.3	\$51.4	\$41.3	\$51.4	\$56.7	\$46.7
3. Net economic benefit to Local suppliers	\$26.5	\$26.5	\$26.5	\$30.1	\$23.0	\$26.5	\$26.5	\$26.5	\$23.9	\$20.7	\$33.1	\$29.6	\$23.8
Indirect (Environmental costs)	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Net Benefits	\$78.7	\$78.7	\$78.7	\$82.3	\$75.1	\$78.7	\$78.7	\$68.6	\$76.0	\$62.8	\$85.3	\$87.3	\$71.3

Source: Cadence Economics estimated based on information from various sources. * Estimated as the benefits of the Project case less the Baseline case. ** NPV in 2017 dollars based on a 7 percent real discount rate.

