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Rix's Creek Continuation Project – Economic Assessment

Report prepared for
Rix's Creek Pty. Limited

9 July 2015

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Glossary

ABS	Australian Bureau of Statistics
ATO	Australian Taxation Office
Benefit Cost Ratio (BCR)	The ratio of the present value of total benefits to the present value of total costs.
CBA	Cost Benefit Analysis
CGE	Computable General Equilibrium
CHPP	Coal Handling and Processing Plant
EIRR	Economic Internal Rate of Return
Employment	The total number of people employed (full time and part time) in the economic impact analysis presented in Section 4, percentage changes in employment refer to hours worked.
ERP	Estimated Resident Population
GHG	Greenhouse gas
Gross Regional Product (GRP)	A measure of the total value-added of goods and services produced in the regional economy over a period of time.
Gross State Income (GSI)	A measure of the contribution to economic welfare in New South Wales focusing on that part of income generated by production in Australia and overseas that accrues to Australian citizens. It is a measure of income, rather than production, and for an economy such as Australia that relies on access to foreign capital, GSI is an indicator of economic welfare for New South Wales citizens.
Gross State Product (GSP)	A measure of the total value added of industry in New South Wales plus indirect tax income to government. GSP is a measure of production activity in the economy, but does not account for the destination or the nationality of those accruing income.
IO	Input-Output
Internal Rate of Return (IRR)	The discount rate at which the present value of costs equals the present value of benefits (i.e. the breakeven point).
LGA	Local Government Area
ML	Mining Lease
Mt	Million tonnes
Mtpa	Million tonnes per annum
Net Present Value (NPV)	The difference between the present value of the total benefits and the present value of the total costs
NSW	New South Wales
ROM	Run-of-Mine
Value added by industry	A measure that captures the return to an industry's labour and capital and other fixed factors. It is calculated as the outputs of the industry less the goods and services from other industries including imports, and is therefore the industry components of Gross State Product (GSP) (except for indirect tax payments). By excluding goods and services inputs from other industries and imports, 'value added' avoids double counting as it does not include the value added from other industries.

Executive Summary

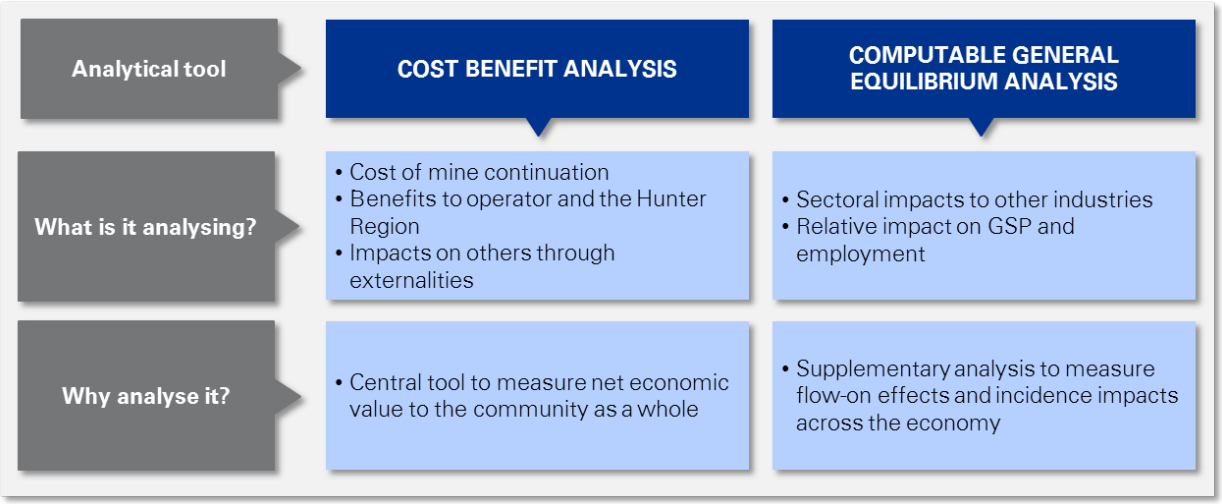
Background

Operated by The Bloomfield Group[1], Rix's Creek is an open cut coal mine located five kilometres northwest of Singleton in the Hunter Valley, New South Wales (NSW). Rix's Creek Pty Limited proposes to continue the mining operations past the current cessation date in 2019.

The purpose of this report is to provide an assessment of the economic implications of the proposed Rix's Creek Continuation Project (the Project). The assessment forms part of the broader Environmental Impact Statement (EIS) of the Rix's Creek continuation. The EIS addresses a number of criteria set under the Director-General's environmental assessment requirements (DGRs). This report seeks to fulfil a number of the DGRs including:

- potential direct and indirect economic benefits of the development for local and regional communities and the State; and
- a detailed assessment of the costs and benefits of the development as a whole, and whether it would result in a net benefit for the NSW community.

To fulfil these requirements, the economic appraisal brings together user and non-user benefits and costs to assess the social, economic and environmental merits of the proposed continuation. Two economic appraisal tools were used in the economic analysis, namely cost benefit analysis (CBA) and computable general equilibrium (CGE) modelling:



Source: KPMG

The purpose of the CBA is to estimate the direct costs and benefits of the proposed Rix's Creek Continuation Project to the broader community. The CGE modelling complements the CBA, and estimates the economy-wide linkages between the Project and the rest of the economy by examining the sectoral impacts to other industries. The economic appraisal tools utilised in this report are consistent with the guidelines outlined in the NSW Economic evaluation in Environmental Impact Assessment draft guidelines[2].

[1] The Bloomfield Group is an Australian resident taxpayer company with all shareholders currently domiciled in Australia.

[2] Planning NSW, Economic evaluation in Environmental Impact Assessments, EIA Guideline series (Draft), May 2003.

Scope

KPMG has been engaged to conduct the:

- Economic appraisal of the Project including:
  - assessment of the direct economic benefits of the development;
  - identification of any adverse impacts of the development; and
  - detailed assessment of the costs and benefits of the development as a whole, and whether it would result in a net benefit for the NSW community.
- Regional economic impact assessment to estimate the indirect economic benefits of the Project for the local (Hunter Valley region) and state (NSW) economies.

Existing environment

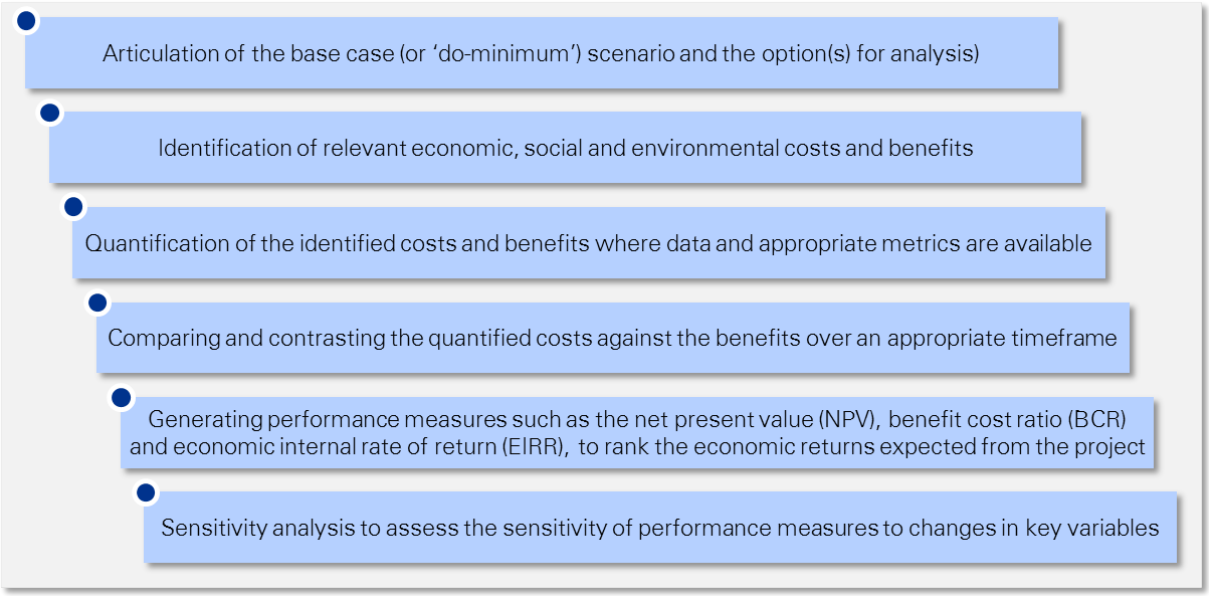
The Hunter Valley region has a diverse and changing economy with mining and tourism activity growing and overtaking the regions traditional agricultural base. The population of the region is growing in line with state level growth but has a higher proportion of residents aged over 50 years. This has the potential to diminish the regional workforce, particularly over the next decade.

The Hunter Valley region has experienced strong labour force growth over the last five years and lower than average rates of unemployment. However, employment growth has slowed slightly over the last two years and unemployment has increased as a result.

The mining sector in NSW contributed $14.8 billion in value-added in 2012-13 (over 3 per cent of the NSW total) and currently employs over 35,000 people. Over 40 per cent of all mining sector employees in NSW are employed in the Hunter Valley, Newcastle and Lake Macquarie region. Over the last 10 years, the mining sector has experienced above average employment growth. However, employment in the mining sector has declined over the last few years.

Cost Benefit Analysis

Consistent with the relevant guidelines and best practice, preparation of the CBA involves the following:



Identification of the base case for the proposed Rix's Creek Continuation Project is required to enable identification and measurement of the incremental costs and benefits. For the purpose of this analysis, the base case is:

- continuation of existing operations until 2019 when current approval expires;
- cessation of activity in 2019 and rehabilitation of land; and

- land being returned to its next best use (i.e. agricultural production).

The proposed Project option involves:

- continuation of operations beyond the current mine plan in current approval in a north-westerly direction;
- use of existing mine access, coal handling and processing plant (CHPP), coal stockpiling and rail facilities;
- extraction of up to 4.4 Mtpa of run of mine (ROM) coal; and
- progressive replacement of equipment fleet to enable improving mining efficiencies.

At the end of the proposed Project, land would be returned to grazing land.

The costs and benefits of the Rix's Creek Project are outlined below:

Cost / Benefit	Bearer / Beneficiary	Description
Costs		
Capital expenditure	Rix's Creek Pty Limited	Capital expenditure associated with operation and fleet replacement over the life of the Project. Over the life of the Project, the cost associated with capital investment in fleet replacement is expected to be $110.5 million (in present value terms). There is not expected to be any fleet replacement under the base case with the remaining life of mining operations to use existing assets.
Operating and maintenance expenditure	Rix's Creek Pty Limited	Expenditure associated with operations including labour, administration, transportation, remediation activities and maintenance. Over the life of the Project, the incremental operating costs (project case less base case) are expected to be $705.4 million (in present value terms).
Environmental externalities	Rix's Creek Pty Limited / Environment / Community	Key environmental assessment issues associated with the project include air quality, noise and vibration. The scope of the analysis of environmental externalities for the purpose of the CBA is limited to the activities associated with the extraction and processing of coal at Rix's Creek. The analysis excludes any consideration of the environmental externalities associated with end-use of the coal outputs such as electricity generation from coal-fired power stations. The majority of the environmental externalities were investigated qualitatively. The impact of the project on GHG emissions were quantified and were estimated to be $4.5 million in PV terms over the life of the Project.
Opportunity cost of land use	Community	The Project involves use of former agricultural land for mining purposes. Accordingly, the land is no longer available for agricultural purposes and the associated farming income is foregone. Over the life of the Project, the expected incremental cost associated with foregone agricultural production is expected to be $0.2 million (in present value terms).
Benefits		
Revenue	Rix's Creek Pty Limited	The Project involves continuation of current mining activities through the use of similar mining methods to extract coal from remaining seams. Based on forecast coal prices[3], the incremental revenue benefit (project case less base case) is estimated to be $997.5 million (in present value terms).

[3] Forecast Australian coal export prices sourced from the World Bank, *Price Forecasts, Australian Coal Prices*.

Cost / Benefit	Bearer / Beneficiary	Description
Worker wages	Employees and Community	The average weekly earnings for mining industry workers in NSW was more than double the average for all industries. Based on the higher average weekly earnings in the mining sector and the total employment associated with the Project, the total incremental wage premium over the life of the project is estimated to be $104.3 million (in present value terms).
Residual value of land	Rix's Creek Pty Limited	Following the completion of the Project, the Project area will be returned to grazing. The residual value of the land at the end of the Project life is estimated to be $0.4 million in present value terms.
Contribution to local community	Hunter Valley regional communities	Rix's Creek make a number of contributions to the local community through partnerships and sponsorships. Closure of Rix's Creek would likely result in a cessation of these contributions.

In accordance with the *NSW Treasury Guidelines for Economic Appraisal,* economic costs and benefits are quantified where market values are available.

The project was compared against the base case using discounted cash flow technique on the basis of a real discount rate 7 per cent in accordance with relevant guidelines.

The total incremental cost (project less base case) of the project is estimated to be $820.6 million over the life of the project. The total incremental benefit associated with the project is estimated to be $1,072.2 million over the life of the project.

Overall, the project is expected result in a NPV of $251.6 million over the life of the project. The BCR associated with the project is 1.3.

Evaluation results	PV @ 7 per cent ($ million)
Incremental Costs	**820.6**
Incremental Benefits	**1,072.2**
NPV ($ million)	**251.6**
BCR	**1.3**

Source: KPMG analysis

Sensitivity analysis was undertaken to determine the sensitivity of results to changes in assumptions. The results of the sensitivity analysis highlight that the economic evaluation results for the project remain positive even when costs are increased or benefits are reduced by 15 per cent.

Economic assessment – economic impact analysis

The economic impact of the higher mining activity resulting from the Project was simulated using CGE modelling techniques. The following scenarios were modelled:

- **Baseline scenario:** This scenario assumes that the Project does not proceed.
- **Project scenario:** This scenario assumes that the Rix's Creek Project proceeds as proposed and models a higher level of mining activity and exports.

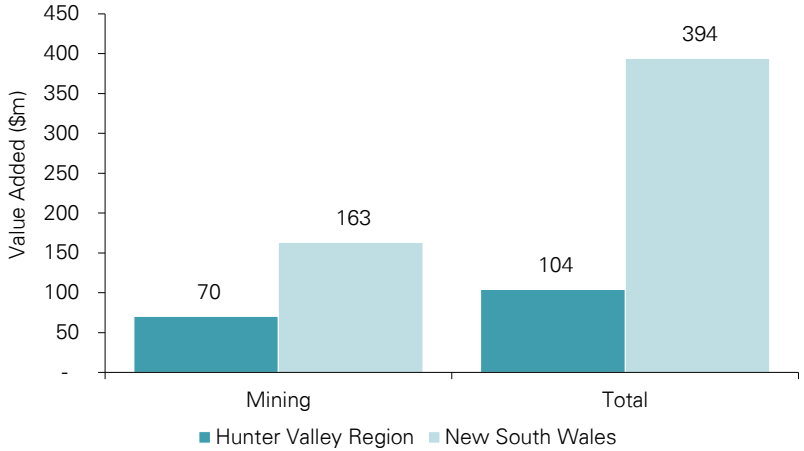
The estimated economic impacts were determined by calculating the differences in economic outcomes between the Project and baseline scenario for the Hunter Valley region and NSW economies. The net impact of the Project on economic activity and employment in the state and regional economies are illustrated in the charts below.

Modelling estimates that the increase in coal exports (relative to the base case) increases NSW real GSP by 0.04 per cent (equivalent to $394 million in 2013-14) and real GRP by 0.26 per cent (equivalent to $104 million in 2013-14). As expected, significant proportion of this value added impact is generated within the mining industry ($163 million in NSW and $70 million in the Hunter Valley region).

In addition to boosting industry gross value added, continuation of mining activity associated with the Project is expected to support employment in the NSW and regional economies. Total average annual employment supported by the Project is estimated to be over 375 jobs within the Hunter Valley region.

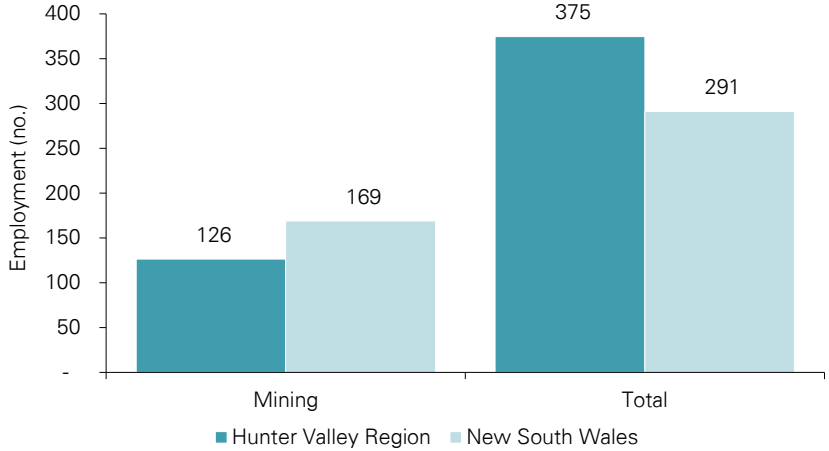
The impact of the Project is predominantly concentrated in the mining industry. However, other sectors upstream and downstream of the mining sector are also impacted by the project. Sectors that support the mining sector through its supply chain are stimulated by additional demand from the mining industry. For example, the Property and Business Services sector grows due to an increase in demand for services, raising gross value added in that sector. Consumer oriented industries, such as Retail Trade, also grow due to the Project as employment raises the overall level of consumption and stimulates demand.

Value added impact, Hunter Valley and NSW



Source: KPMG analysis based on information provided by Rix's Creek Pty Limited

Employment impact, Hunter Valley and NSW



Source: KPMG analysis based on information provided by Rix's Creek Pty Limited

1 Introduction

Operated by The Bloomfield Group, Rix's Creek is an open cut mine which produced its first coal in 1990. The Bloomfield Group is an Australian resident taxpayer company with all shareholders currently domiciled in Australia. The site is located five kilometres northwest of Singleton in Hunter Valley, New South Wales (NSW). The Rix's Creek mine (the Mine) currently produces approximately 1.5 million tonnes per annum (Mtpa) of coal from its existing operations[4]. The Mine has operated on the site for over 20 years and employs 130 mining, administrative and maintenance personnel.

Rix's Creek Pty Limitedis seeking approval for continuation of mining at Rix's Creek (the Project). The continuation relates to the existing mining operations relating to Pit 3 and other related activities across the mine. If approved, the proposed Project will continue the operations of the open cut mine currently accessed and serviced by the existing infrastructure and facilities in the area.

1.1 Rix's Creek continuation of mining

1.1.1 Overview

The proposed continuation of mining operations at the Mine involves the expansion of operations beyond the current approved mine plan. The expansion of the mining operations will continue operations in a north-westerly direction, requiring a modification to the Mining Lease (ML) 1432 for an out of pit dump. The project will continue to utilise the existing Coal Handling Processing Plant (CHPP), existing mine access and rail facilities[5].

1.1.2 Proposed development

The proposed continuation of existing operations at Rix's Creek includes the following elements:

- extending open cut mining operations northwards of Pit 3 to recover an additional 32 million tonnes per annum (Mtpa) of saleable coal over a period of 21 years;
- increasing the extraction rate of run-of-mine (ROM) coal from 2.5 Mtpa to 4.5 Mtpa;
- extending the western boundary of the existing mining lease to accommodate the proposed out of pit overburden dump;
- increasing the hours of operation of the CHPP from 4.5 days per week to seven days per week;
- transporting up to 2.7 Mtpa of saleable coal via rail;
- continued use of existing tailings emplacements;
- an additional cut and cover under the New England Highway; and
- progressive rehabilitation of the site.

1.2 Purpose of the report

The purpose of this report is to provide an assessment of the economic implications of the proposed continuation at Rix's Creek. The assessment forms part of the broader Environmental Impact Statement (EIS) of the Rix's Creek continuation. The EIS addresses a number of criteria set under the Director-General's environmental assessment requirements (DGRs). This report seeks to fulfil a number of the DGRs including:

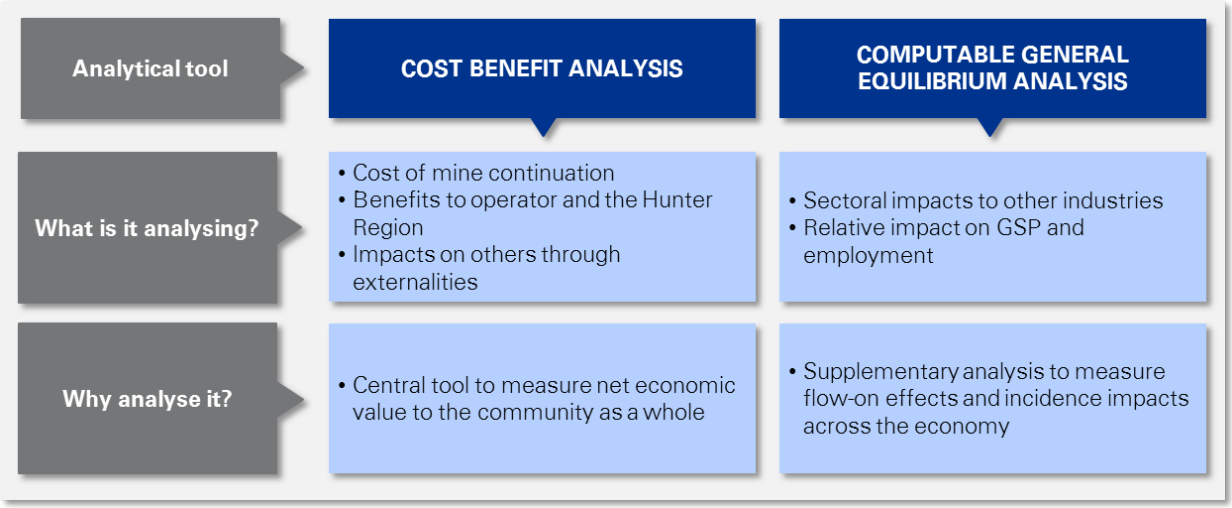
[4] AECOM 2013, *Preliminary Environmental Impact Assessment* – Rix's Creek Continuation of Mining Project.

[5] The construction of the rail loop has been approved but, for the purpose of this report, continued use of current loop is assumed.

- potential direct and indirect economic benefits of the development for local and regional communities and the State; and
- a detailed assessment of the costs and benefits of the development as a whole, and whether it would result in a net benefit for the NSW community.

The objective of this economic analysis is to quantify the impacts to the local community of the proposed Rix's Creek continuation. To fulfil the DGRs, the economic appraisal brings together user and non-user benefits and costs to assess the social, economic and environmental merits of the proposed continuation. As illustrated in Figure 1-1, two economic appraisal tools were used in the economic analysis, namely cost benefit analysis (CBA) and computable general equilibrium (CGE) modelling.

Figure 1-1: Economic appraisal tools



Source: KPMG

The purpose of the CBA is to estimate the direct costs and benefits of the proposed Rix's Creek continuation development to the broader community. The CGE modelling complements the CBA, and estimates the economy-wide linkages between the Project and the rest of the economy by examining the sectoral impacts to other industries. The economic appraisal tools utilised in this report are consistent with the guidelines outlined in the NSW Economic evaluation in Environmental Impact Assessment draft guidelines[6].

1.3 Scope of services

Big Ben Holdings Pty Limited (ultimate holding company of The Bloomfield Group and Rix's Creek Pty Limited), engaged KPMG to prepare an economic impact assessment of the Rix's Creek Continuation Project as a part of a broader EIS. Specifically, the scope of services includes:

- CBA of the Project including:
    - assessment of the direct economic benefits of the development;
    - identification of any adverse impacts of the development; and
    - detailed assessment of the costs and benefits of the development as a whole, and whether it would result in a net benefit for the NSW community.
- Regional economic impact assessment to estimate the indirect economic benefits of the Project for the local (Hunter Valley region) and state (NSW) economies.

[6] Planning NSW, Economic evaluation in Environmental Impact Assessments, EIA Guideline series (Draft), May 2003.

1.4 Report structure

The remainder of the report is structured as follows:

- Section 2 describes the methods used to perform the economic assessment;
- Section 3 outlines the current socio-economic characteristics of the Hunter Valley Region; and
- Section 4 discusses the results of the economic impact assessment.

2 Methodology

The following section outlines the method of analysis used in undertaking the economic impact assessment of the proposed Rix's Creek continuation. Specifically, this section includes:

- an overview of the legislation and economic assessment guidelines applicable to the analysis;
- a description of the area under assessment; and
- the methods of analysis.

2.1 Requirements of the analysis

The approach and parameters specified in the economic impact assessment are consistent with relevant guidelines, as follows:

- the State Significant Development (SSD) provisions of the *Environment Planning and Assessment Act, (1979);*
- the *NSW Government Guidelines for Economic Appraisal*[7]; and
- Planning NSW, draft guidelines for economic evaluation in EIAs[8].

A description of each of these guidelines is outlined in Table 2-1.

Table 2-1: Relevant guidelines for the economic analysis

Guideline	Description
State Significant Development provision	Assessment of SSD project includes consideration of the likely impacts of the development, including: • environmental impacts on the natural and built environment; • social impacts in the locality; and • economic impacts in the locality.
Guidelines for Economic Appraisal	The *NSW Government Guidelines for Economic Appraisal* provide a framework for approaching economic appraisal for the assessment of significant projects and proposals. The guidelines outline the reporting requirements and structure of appraisal required.
Economic evaluation in Environmental Impact Assessments	The draft economic evaluation guidelines form part of the broader EIA guidelines and outlines approaches to assessing the economic effects and significances of development proposals.

2.2 Study area

Rix's Creek is located in the Hunter Valley in NSW. The economic impact assessment considered the impact on the Hunter Valley regional economy and the state economy of NSW. For the purpose of the analysis, the Hunter Valley region is defined as:

- Muswellbrook local government area (LGA);
- Singleton LGA;
- Upper Hunter Shire;
- Cessnock LGA;
- Lake Macquarie LGA;
- Maitland LGA;
- Newcastle LGA; and
- Port Stephens LGA.

[7] NSW Treasury 2007, *NSW Government Guidelines for Economic Appraisal,* May.

[8] Planning NSW 2003, *Economic evaluation in Environmental Impact Assessment,* EIA Guidelines Series, May.

The location of Rix's Creek and the Hunter Valley region is illustrated in Figure 2-1.

Figure 2-1: Hunter Valley region and Rix's Creek

Source: AECOM 2013, Preliminary Environmental Impact Assessment – Rix's Creek Continuation of Mining Project.

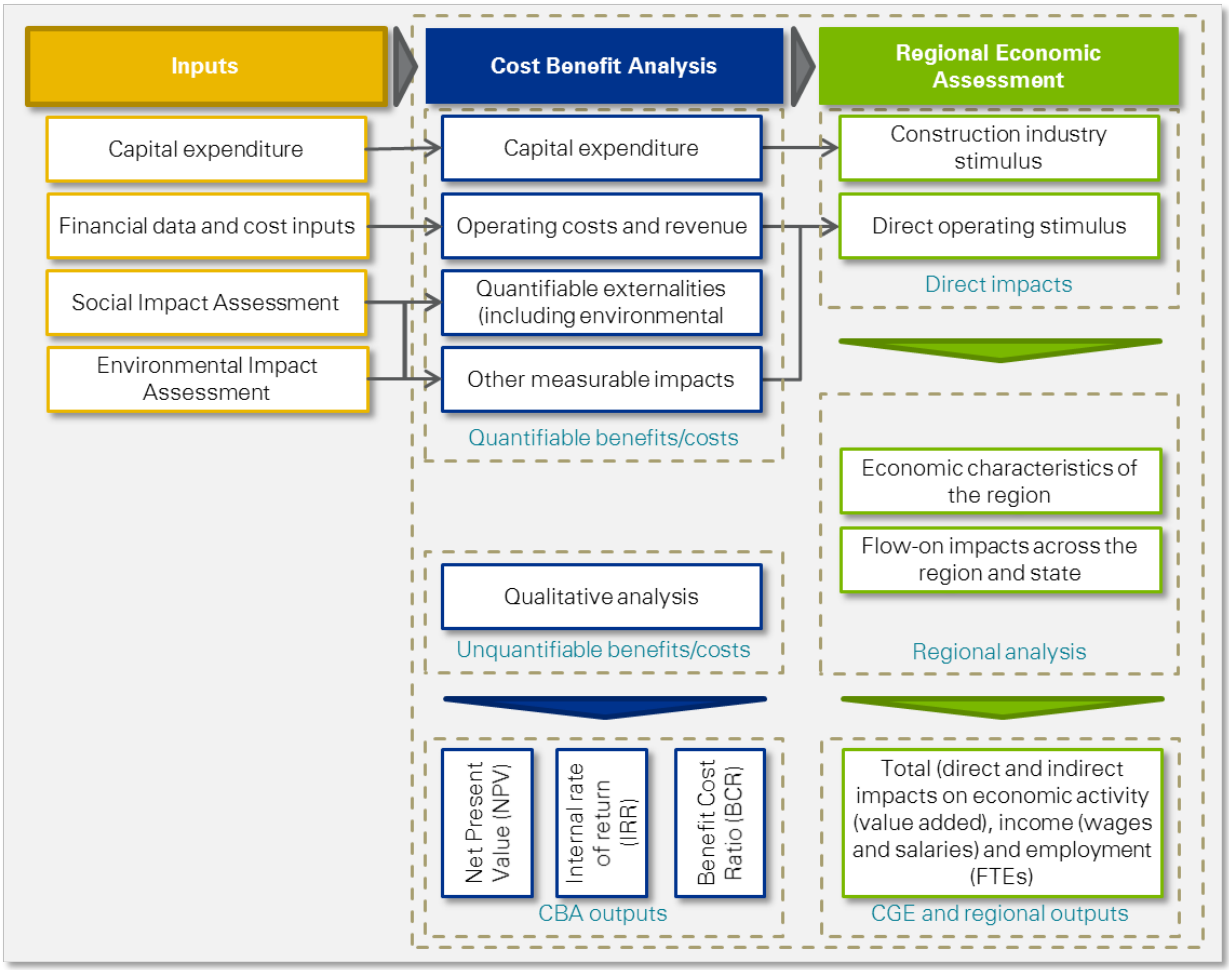
2.3 Method of impact assessment

The following section outlines the method used to assess the impacts of the Rix's Creek Continuation Project. Preparation of the economic impact assessment involves three stages, namely:

- a baseline analysis;
- the CBA; and
- a regional economic assessment.

The relationship between these stages is illustrated in Figure 2-2. The approach taken for each stage of the analysis is outlined below.

Figure 2-2: Economic impact assessment of the proposed Rix's Creek continuation



Source: KPMG

2.4 Baseline analysis

The baseline analysis involved extensive desk-top research to develop an in-depth understanding of:

- the existing economic environment that may be affected by the proposed development;
- the existing economic base and activity in the region;
- the demographic and community profile of the region; and
- current local and regional economic trends.

The baseline analysis relied on data sourced from third-party sources, including:

- the Australian Bureau of Statistics (ABS);

- the Australian Taxation Office (ATO); and
- the Department of Planning (NSW); and
- the Department of Employment (Commonwealth).

2.5 Cost benefit analysis

2.5.1 Approach

The approach and parameters specified in the CBA are consistent with relevant economic appraisal guidelines as outlined in the previous section.

Consistent with the relevant guidelines and best practice, preparation of the CBA involves the following:

- articulation of the base case (or 'do-minimum') scenario and the option(s) for analysis;
- identification of relevant economic, social and environmental costs and benefits;
- quantification of the identified costs and benefits where data and appropriate metrics are available;
- comparing and contrasting the quantified costs against the benefits over an appropriate timeframe;
- generating performance measures such as the net present value (NPV), benefit cost ratio (BCR) and economic internal rate of return (EIRR), to rank the economic returns expected from the project; and
- sensitivity analysis to assess the sensitivity of performance measures to changes in key variables.

The performance measures described above are defined as follows:

- *NPV* – the difference between the present value of the total benefits and the present value of the total costs;
- *BCR* – ratio of the present value of total benefits to the present value of total costs; and
- *EIRR* – is the discount rate at which the present value of costs equals the present value of benefits (i.e., the breakeven point).

Projects that yield a positive NPV indicate that the benefits of the project exceed the costs over the evaluation period.

A BCR greater than one indicates that project benefits exceed project costs over the evaluation period, however, a higher BCR is usually required to ensure contingency against unforeseen increases in capital costs, project delays or scope expansion.

Under the *NSW Government Guidelines for Economic Appraisal*, the recommended real discount rate is 7 per cent. As such, the guidelines suggest that "a project is potentially worthwhile if the EIRR is greater than the test discount rate". Key parameters used in the economic evaluation are summarised in Table 2-1.

Table 2-2: Economic evaluation assumptions

Item	Assumption
Discount rate (real)	A 7 per cent per annum real discount rate is applied in the evaluation to calculate present values of costs and benefits.
Price Year	All costs and benefits in the evaluation are presented in 2015 Australian prices.
Evaluation period	The full evaluation period is for 25 years from 2015 to 2039.
Economic evaluation	The economic evaluation considers the Project from a community perspective and considers the costs and benefits that are both internal and external to the Project, including government organisations, private sector enterprises, individuals and the environment. Some of these impacts are not directly quantified in market-based monetary terms, including externalities environmental and other, and changes in employment.

Source: KPMG

"Do minimum" base case and project option

The CBA considers two potential options as follows:

- **Base case ("do minimum"):** This option measures the impact of the current operations at the Rix's Creek mine and assumes that current operations will cease under the current contractual agreements.
- **Option ('project operation'):** This option assumes that the Project will be approved and identifies the costs and benefits associated with the continuation of the mine to the Hunter Valley region and broader community as a whole.

2.6 Economic impact assessment

To estimate the economic impact of the proposed Rix's Creek continuation, the analysis employed a comparative static, Computable General Equilibrium (CGE) model. The modelling method is described in further detail in this section.

2.6.1 Why use a CGE model?

To model the economic impacts beyond those that directly relate to the proposed Rix's Creek continuation and the mining sector, it is necessary to employ a modelling technique that incorporates information about the linkages of the sector within the broader economic context. Input-output (IO) tables published by the ABS provide detailed information on the upstream and downstream linkages of each industry in the economy.

Upstream linkages refer to the sources of inputs to the resources sector. These linkages may be the use of intermediate inputs produced by other domestic industries, imported intermediate inputs, labour and other factors of production. For example, the extraction and export of minerals would require inputs such as labour, machinery, fuel and services from the transport industry. This can be thought of as information regarding the cost-side of the resource sector.

Downstream linkages refer to those economic agents that purchase outputs produced by the resource sector. For example, a construction business might purchase construction materials (e.g. sand) and other material inputs, and employs labour and capital to build houses. Consequently, downstream linkages include sales to other industries that use the output of the resources sector as an intermediate input to their own production process or final users of the product such as households, the government or foreigners. This can be thought of as information regarding the sales-side of the resource sector.

An IO table is a useful tool as a snapshot of the economic flows in the economy. An IO table can be used to provide simplified estimates of the sensitivity of the size of the economy and its components (measured by employment and value added) to small shocks within industries. This sort of analysis can be used at the industry-wide level to estimate IO multipliers – that is, the total economy-wide impact on employment or output resulting from a change in one industry, taking into account the change in demand for the outputs of other industries.

An IO table in itself is not an economic model, and IO multipliers are raw and ad hoc in nature. A major limitation of the use of IO multipliers when used to conduct an impact analysis is that the relationship between industry inputs and outputs (the coefficients) are fixed, implying that industry structure remains unchanged by the shock to the industry (for example, a change in demand or prices). Furthermore, IO analysis imposes no resource constraints and so industries (and indeed, the entire economy) can access unlimited supplies of inputs at fixed costs. In reality, scarcity of inputs (e.g. skilled labour, mineral deposits etc.) mean that these inputs are affected by and respond to changes in prices (e.g. wages) driven by supply and demand adjustments. For example, higher prices/wages driven by the increase in demand for labour to expand mineral extraction will, at the margin, increase costs in other sectors and reduce demand for labour by some other parts of the economy.

In IO analysis, where all adjustments relate only to quantities produced, this type of feedback response is not factored to occur, and it is assumed that sectors can access infinite amounts of inputs at fixed

costs. Consequently, an IO model can result in an overstatement of the impacts on the economy. For these reasons, while the ABS did for some time publish IO multipliers, it has ceased publishing these estimates in recent years over concerns about their validity.

A computable general equilibrium (CGE) model makes use of the economic multipliers in IO tables in the construction of its database, but is extended to make more sophisticated economic and behavioural assumptions including:

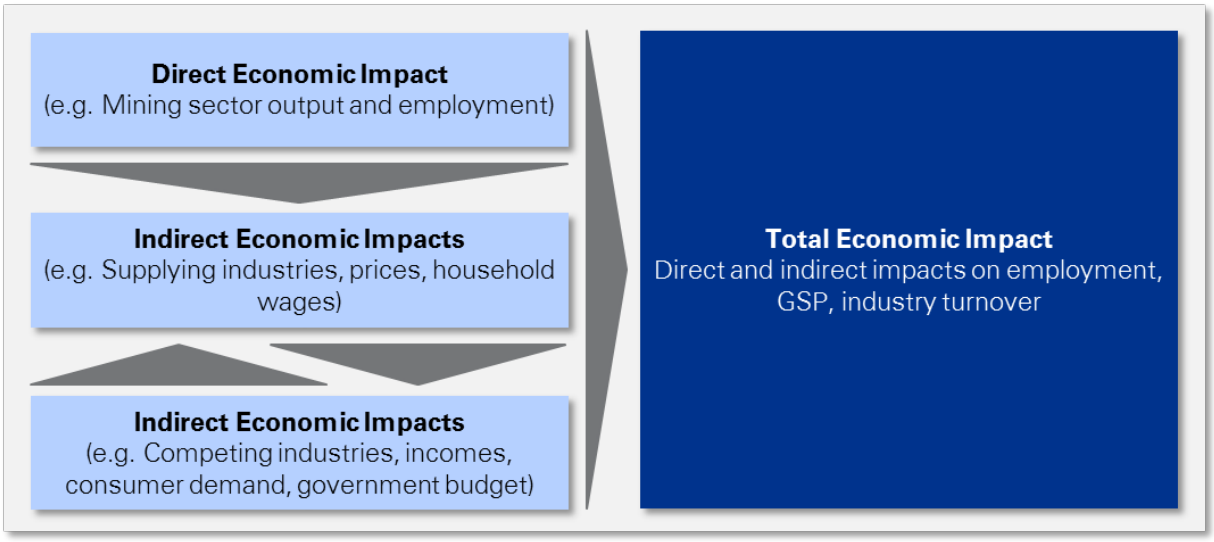
- recognising resource constraints and economic responses of businesses and workers through adjusting prices/wages – this is particularly important for this study given the resource constraints and limitations that have been prevalent in the sector;
- capturing employment/capital (and other factors inputs) substitution for example, by responding to higher wages by increasing the use of capital;
- capturing a much wider set of economic impacts such as behavioural responses to price changes of consumers, investors, foreigners etc.; and
- can include the effects of such things as technological change and shifts in consumer preferences.

By introducing these additional economic variables and constraints, CGE models are able to:

- model beyond the first round impact of an event or policy
- account for resource scarcity; and
- understand behavioural response to economic variables.

This added sophistication means that a CGE model allows for feedback responses by producers, consumers, investors and foreigners and so the results are less likely to be overstated particularly over the medium to long term. This concept is summarised in Figure 2-3 below.

Figure 2-3: Direct and first and second order impacts in a CGE model



Source: KPMG

2.6.2 CGE model structure and assumptions

A CGE model is constructed as a complex system of equations that represent behavioural assumptions informed by economic theory, "accounting" relationships that quantify the components of the economy, and the imposition of (for example) market-clearing (i.e. supply=demand) and zero-pure-profit (i.e. costs=revenue at the margin) assumptions that anchor aspects of economic behaviour in the longer term.

The database can be many millions of data-points, constructed from various sources including input-output tables, national accounts and international trade data, and represents a "snap-shot" of the economy at a point in time.

The database for the model used in this study was constructed from 2007-08 data. Fully consistent data (and, in particular, IO tables) are not released annually, and so lags inevitably occur in data availability. The ABS has recently released a 2009-10 IO table, but concerns about how this table effectively represented the "normal", long run average state of the Australian economy (due to the proximity to the global financial crisis and its immediate to medium term impacts) have led us to a different method of updating the data. The model is used to incorporate other data, more specifically, sectoral outputs, exports and macro-level aggregates, and is used to "forecast" a piece of history for which this data is available. In doing so, the model produces a new updated database that includes model consistent estimates of those data not available during this time.

Particular attention was given to accuracy in key resource-sector related variables in using this method to generate a 2011-12 database for the model. For the resources sector, key areas of attention in the database include sectoral cost structures (particularly value added shares) and the export share of sales.

Key parameter assumptions, such as export demand elasticities, were made in line with widely accepted values based on empirical studies and qualitative assessments of cost and sales structures in sectors. In cases where parameter values are particularly important (again, take export demand elasticities), conservative assumptions were adopted when empirical evidence was unclear.

2.6.3 Modelling Scenarios

To estimate the economic impact of the proposed Rix's Creek continuation, a modelling scenario that changes the mining sector activity and its flow on effects was implemented.

- **Baseline scenario:** This scenario models the state and regional economy, assuming that the Project does not go ahead and the mine ceases operations. The CBA informed the scenario design by providing a realistic 'do nothing' baseline for comparison.
- **Project scenario:** This scenario models the incremental economic contribution of the annual activity associated with the operation of the proposed Rix's Creek Continuation Project and associated export activity.

Results from the operational scenario are compared with the baseline scenario to show the average annual impacts of the project once the development reaches peak production.

The increased mining industry activity (under the Project scenario) is expected to stimulate additional activity in other industries as extra inputs are supplied. The employment associated with the Project is also expected to have a positive impact on consumer spending in the region.

Results of the economic modelling cover:

- key economic aggregates such as GSP, investment, employment, the real wage, exports and imports; and
- the "spill-over" effects of the Project on a detailed set of related industries, including the impact on employment and production.

Results of the state and regional modelling will cover employment by industry and value-added by industry.

3 Existing Environment

To understand the impact of the proposed Rix's Creek continuation, it important to first understand the characteristics of the region in which it is based. Thus, this section outlines the economic factors in the region – the economic baseline – that may be impacted by the continuation of the Rix's Creek operations.

The mine's economic catchment falls within the Singleton LGA and the broader Hunter Valley region in NSW. The economic baseline is based on information from publicly available third-party sources. The data relied upon has not been prepared specifically for the purpose of this report.

The Hunter Valley is a region of New South Wales that extends 120 kilometres to 310 kilometres north of Sydney. In recent years, the economic base of the Hunter Valley has become more diverse, with increased mining and tourism activity overtaking the region's traditional agricultural employment base.

This section provides a broad socioeconomic profile of the region in terms of population, labour force, industry distribution and incomes. To help interpret and provide greater context for these socio-economic indicators, each indicator is discussed and compared to NSW averages. This section also outlines the economic contribution the mining sector makes to the Hunter Valley region and NSW as a whole.

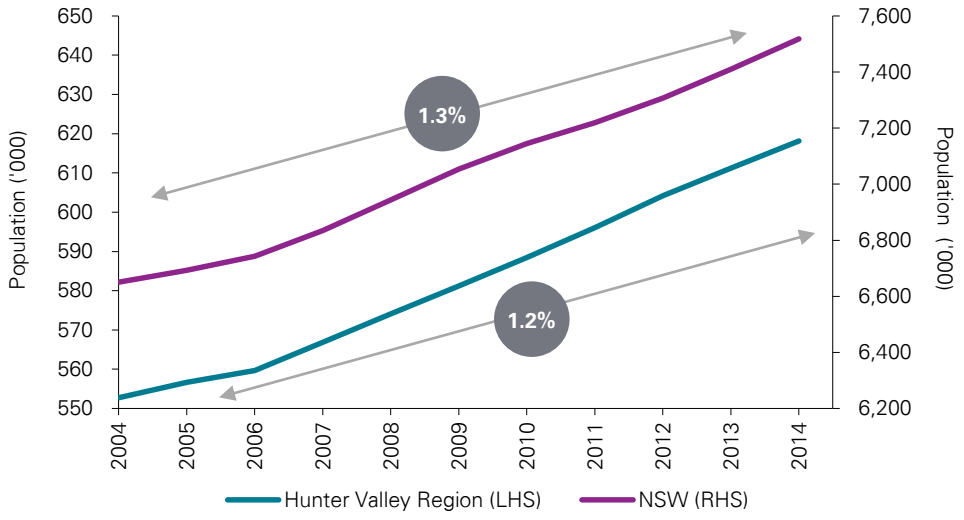
3.1 Socio-economic profile of the Hunter Valley region

3.1.1 Demographic profile

This section provides descriptive and comparative statistics of key demographic characteristics relevant to the Hunter Valley region. The key demographic characteristics include most recent annual data on estimated resident population (ERP), births, deaths and population age structure.

As illustrated in Chart 3-1, the population in the Hunter Valley region has grown at a similar rate to the state as a whole over the last decade.

Chart 3-1: Estimated resident population, Hunter Valley and NSW



Source: Australian Bureau of Statistics 2015, Regional Population Growth Australia, Cat. No. 3218.0, Canberra.

Over the last decade, the estimated resident population in the Hunter Valley region increased by almost 7,000 people to just over 618,000 persons. This represents an average annual growth rate of 1.2 per cent, slightly less than the state average growth rate over the same period (1.3 per cent per annum).

Population growth rates varied across the region over the last decade. The highest annual rate of growth were in Maitland (2.4 per cent), Cessnock (1.6 per cent) and Port Stephens (1.4 per cent). The lowest annual rates of growth were in Lake Macquarie (0.8 per cent), Singleton (0.9 per cent) and Newcastle (1.0 per cent)[9].

Compared to the state average, the Hunter Valley region has a slightly lower proportion of working age population and higher proportion of older residents. The population age distribution is illustrated in Chart 3-2.

Chart 3-2: Population age distribution, Hunter Valley and NSW, 2013

Source: Australian Bureau of Statistics 2014, Population by Age and Sex, Regions of Australia*, Cat. No. 3235.0, Canberra.*

The age demographic varies throughout the region. Relative to the region as a whole, there are a higher proportion of children in Muswellbrook (22 per cent) and Maitland (22 per cent). The working age population share is larger in Muswellbrook (67 per cent) and Singleton (68 per cent) and lower in Upper Hunter (62 per cent) and Port Stephens (60 per cent). The proportion of older residents is higher in Lake Macquarie (19 per cent) and Port Stephens (21 per cent).

Overall, the share of the working age population in the Hunter Valley region is 65 per cent, marginally lower than the state-wide share of 66 per cent. The demographic statistics signal an ageing workforce, contributing to issues associated with the availability of labour and skills over the medium term, and consequently, future economic activity. However, as noted above, the working age population in the Singleton area, where the Rix's Creek Project is located, is the highest of all areas within the region.

Consistent with the higher proportion of children in the Hunter Valley region relative to NSW as a whole, the fertility rate is slightly higher in the region (as outlined in Table 3-1). The death rate in the region is also higher than the state as a whole. This is consistent with the higher proportion of older residents in the region.

Table 3-1: Birth rates and death rates, 2012

	Fertility rate [a]	Death rate [b]
Hunter Valley region	2.1	6.5
New South Wales	1.9	5.8

[a] Births per woman.

[b] Deaths per 1,000 persons in the population

Source: Australian Bureau of Statistics 2013, Deaths, Australia, 2012, *Cat. No. 3302.0, November and Australian Bureau of Statistics 2013*, Births, Australia, 2012, *Cat. No. 3301.0, October.*

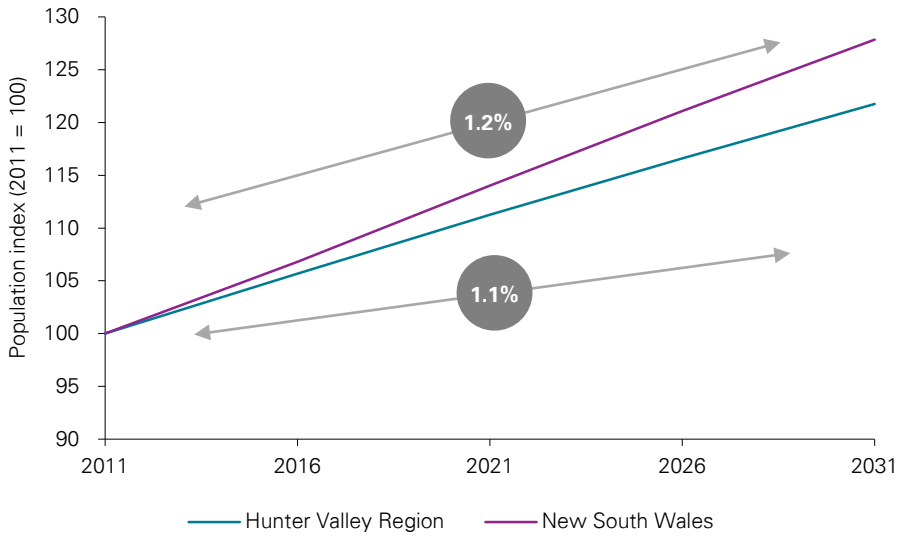
[9] Australian Bureau of Statistics 2015, Regional Population Growth Australia, Cat. No. 3218.0, Canberra.

Population projections for the Hunter Valley region and NSW were obtained from the NSW Department of Planning. These projections are based on assumptions regarding fertility, mortality and migration. The projections for the period 2011 to 2031 are illustrated in Chart 3-3.

The population for the Hunter Valley region is forecast to increase by an average of 1.1 per cent per annum over the 20 years to 2031. This rate of growth is lower than the forecast state-wide growth rate of 1.2 per cent per annum.

The forecast increase in the population in the Hunter Valley region over the forecast period is mainly driven by an increase in the elderly population by 63 per cent (71,900) compared to a working age population increase of 7 per cent (28,200) and a child population increase of 9 per cent (10,800). The lower than average projected population is consistent with the aging population and higher death rate in the Hunter Valley region and despite the higher birth rate.

Chart 3-3: Population projections, Hunter Valley and NSW



Source: Department of Planning 2009, *New South Wales Statistical Local Area Population Projections, 2006-2036*, Sydney.

Within the Hunter Valley region, annual population growth is expected to be highest in Maitland (1.8 per cent), Port Stephens (1.4 per cent) and Cessnock (1.2 per cent). Lower than average annual population growth is forecast for Lake Macquarie (0.5 per cent), Upper Hunter (0.5 per cent), Muswellbrook (0.8 per cent) and Singleton (0.8 per cent)[10].

3.1.2 Labour market

Labour market characteristics for the Hunter Valley region and NSW as a whole are presented in the following section and include:

- labour force[11];
- employment growth[12];
- unemployment rate[13]; and

[10] Department of Planning 2009, *New South Wales Statistical Local Area Population Projections, 2006-2036*, Sydney.

[11] Total number of employed and unemployed persons.

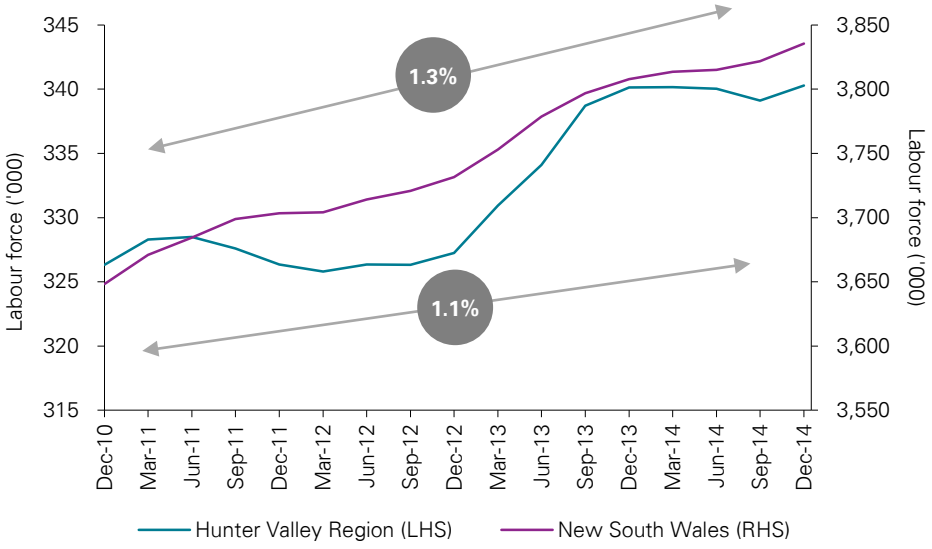
[12] Change in the number of part time and full time employed persons.

[13] The number of unemployed persons expressed as a percentage of the total labour force.

- participation rate[14].

As illustrated in Chart 3-4, the number of persons in the labour force in the Hunter Valley region increased by 1.1 per cent per annum on average over the last four years. This is slightly below the average annual growth rate for the state as a whole (1.3 per cent). Currently, there are over 340,000 persons in the labour force in the Hunter Valley region. This represents 9 per cent of the total NSW labour force.

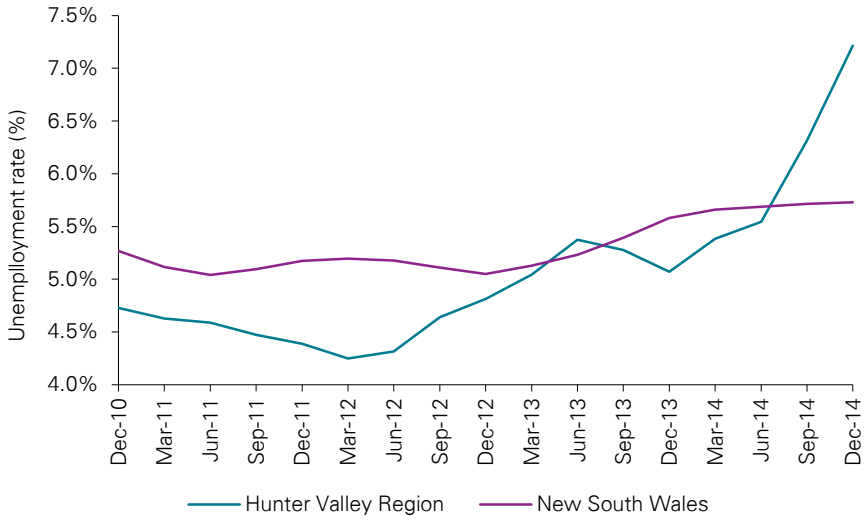
Chart 3-4: Labour force, Hunter Valley and NSW



Source: Department of Employment 2015, *Small Area Labour Markets, December quarter 2014*, March

The number of unemployed persons in the Hunter Valley region increased significantly recently. Over the last year, the number of unemployed persons in the Hunter Valley region increased by over 40 per cent. For the state as a whole, the number of unemployed persons increased by 3 per cent over the same period. This increase in regional unemployment is reflected in the higher than average unemployment rate in the Hunter Valley region (as illustrated in Chart 3-5).

Chart 3-5: Unemployment rate, Hunter Valley and NSW



Source: Department of Employment 2015, *Small Area Labour Markets*, December quarter 2014, March

[14] The total labour force as a proportion of the working age population (persons aged 15 to 64).

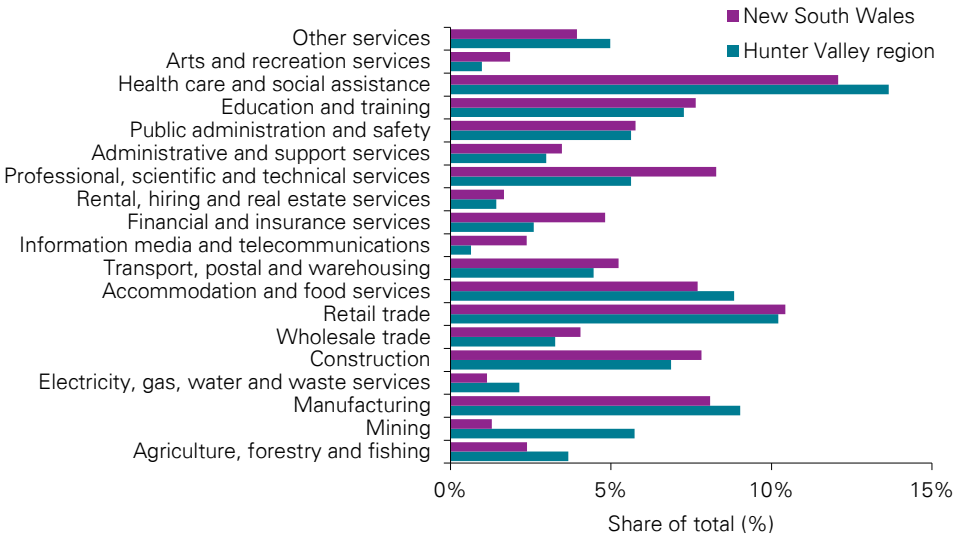
As illustrated in Chart 3-5, the unemployment rate in the Hunter Valley region was historically generally lower than the state-wide rate of unemployment in recent years. The lower unemployment rate was due to a larger increase in employment in the Hunter Valley region compared to NSW as a whole and increases in labour force participation. Employment growth in the Hunter Valley region has slowed slightly over the last two years and the unemployment rate has increased accordingly.

As illustrated in Chart 3-6, employment in the Hunter Valley region is concentrated in:

- health care and social assistance (14 per cent);
- retail trade (10 per cent);
- manufacturing (9 per cent);
- accommodation and food services (9 per cent);
- education and training (7 per cent);
- construction (7 per cent); and
- mining (6 per cent).

Compared to NSW as a whole, the Hunter Valley region has a significantly higher share of employment in mining; agriculture, fisheries and forestry; health care and social assistance; accommodation and food services; and manufacturing sectors.

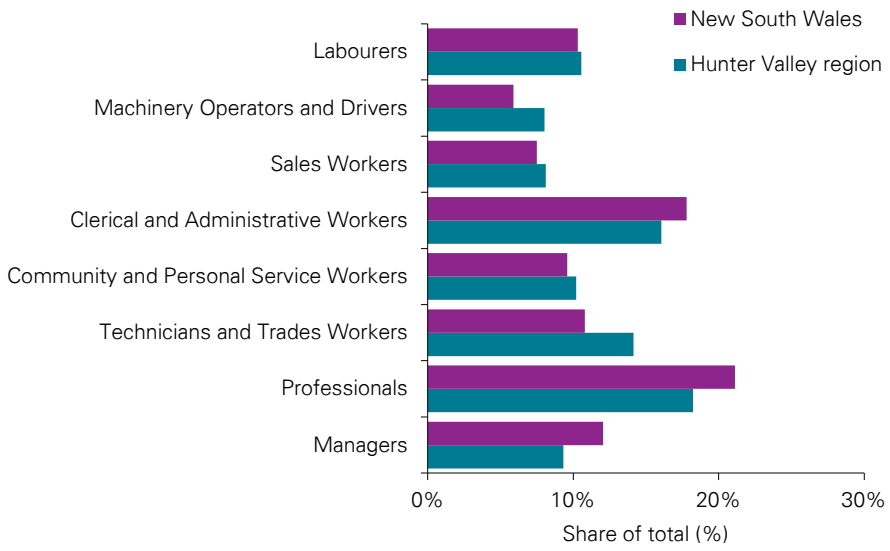
Chart 3-6: Industry of employment, Hunter Valley region and NSW, 2014



Source: Australian Bureau of Statistics 2015, *Labour Force, Australia, Detailed, Quarterly, Feb 2015*, Cat. No. 6291.0.55.003, Canberra.

The most common occupation in both the Hunter Valley region and NSW is professionals. The Hunter Valley region has a higher share of technicians and trade workers and labourers relative to NSW as a whole. This is expected considering that manufacturing, agriculture, forestry and fishing and mining have high levels of employment in the Hunter Valley region.

Chart 3-7: Occupation profile Hunter Valley region and NSW, 2011



Source: Australian Bureau of Statistics 2011, *National Regional Profile*, Cat. No. 1379.0.55.001, Canberra.

The income of households in the Hunter Valley region is an important indicator of their socio-economic status. As outlined in Table 3-2, the proportion of taxable individuals in the Hunter Valley region is similar to the state as a whole.

Table 3-2: Taxable individuals and taxable income in the Hunter Valley region and NSW

	2006-07	2007-08	2008-09	2009-10	2010-11
Hunter Valley region					
Proportion of taxable individuals	77%	77%	74%	73%	74%
Mean taxable income - nominal ($)	49,375	50,876	54,744	57,571	61,039
New South Wales					
Proportion of taxable individuals	78%	78%	74%	73%	74%
Mean taxable income - nominal ($)	54,746	56,301	59,788	62,467	66,029

Source: Australian Taxation Office 2014, *Taxation Statistics 2006-07 to 2010-11*.

The mean taxable income in the Hunter Valley region was consistently lower than the state average over the five year period[15]. However, over the last five years, average taxable income of Hunter Valley residents increased by 6 per cent, slightly higher than the state wide increase in average incomes (5 per cent).

3.1.3 Key findings

The Hunter Valley region has a diverse and changing economy with mining and tourism activity growing and overtaking the regions traditional agricultural base. The population of the region is growing in line with state level growth but has a higher proportion of residents aged over 50 years. This has the potential to diminish the regional workforce, particularly over the next decade. This aging population is partially offset by a higher than average fertility rate in the region relative to the rest of NSW.

The Hunter Valley region has experienced strong labour force growth over the last five years and lower than average rates of unemployment. However, employment growth has slowed slightly over the last two years and unemployment has increased as a result.

[15] Taxable income represents the amount remaining after deducting all allowable deductions under the Income Tax Assessment Act 1936 from assessable income. Taxable income is the amount to which tax rates are applied.

The average income earned by Hunter Valley residents was consistently lower than the state average over the last five-years. There is a higher degree of reliance on salaries and wages among Hunter Valley residents and less income earned from other sources such as from investments.

3.2 Agricultural activity

Agriculture is an important source of economic activity and livelihood in the Hunter Valley region. As such, there are particular sensitivities involved when proposing to develop mining operations in the region. This report addresses these sensitivities by providing an analysis of the impact of the Rix Creek Continuation Project on the agricultural sector

The project is located five kilometres from the township of Singleton. A recent soil and land capability statement undertaken for the project area indicated that the majority of the land and soil within the area is only marginally suitable for grazing, with low to very low productivity and is not suitable for cultivation[16]. Analysis of the production potential of the Rix's Creek Continuation Project site suggests that the potential annual gross agriculture value is approximately $30,000 per annum[17].

3.3 Economic contribution of the mining sector

The mining sector is a major contributor to the NSW and Hunter Valley economies. It generates income for residents and makes direct investments across a range of industries. The following section outlines the economic contribution the mining sector makes to economic activity in NSW and the Hunter Valley region in particular.

Specifically, this section outlines the following:

- contribution of the mining sector to the NSW economy;
- contribution of the mining sector to total NSW employment;
- distribution of mining sector economic activity; and
- distribution of mining sector employment across NSW.

In addition to state economic activity, the mining sector has a major impact on regional communities; supporting growth, development of infrastructure, services and employment. The following section also outlines the regional contribution, including:

- reliance on mining sector employment in the Hunter Valley region; and
- the economic contribution of the mining sector to the Hunter Valley community.

The direct economic contribution of the mining sector excludes the upstream and downstream activity generated in other industries. Accordingly, the direct contribution only represents part of the total economic activity generated by the mining sector.

3.3.1 Gross value added contributions by the mining sector

The size of the mining sector is typically measured in terms of the value of goods produced (commodities extracted and processed and services in mining related construction). An alternate point of comparison and a more direct measure of contribution to GSP, is industry value added.

Value added is measured by assessing the value of goods and services produced in the mining sector, less the value of inputs from other domestic industries and from imported goods and services. Value added is therefore the **additional net contribution** of the mining sector to the economy through its various activities including exploration, development and operations. This value added is the income to labour (wages) and the owners of capital (profits and/or interest). Value added, when summed over all

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[16] SLR Consulting Australia Pty Ltd 2014, Rix's Creek *Biophysical Strategic Agricultural Land Verification Assessment,* report prepared for Rix's Creek Pty Limited, August.

[17] Neil Nelson Agvice Pty Ltd.

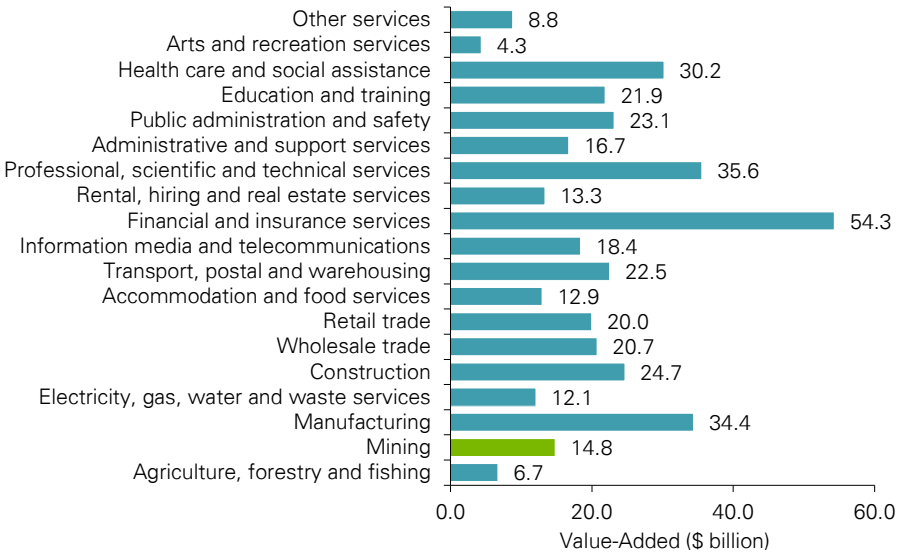
industries in the New South Wales economy and combined with indirect tax payments, generates a measure of GSP. Figure 3-1 below describes this concept.

Figure 3-1: Mining sector value added

Source: KPMG

Industry sector gross value added (GVA) contributions to GSP in NSW are illustrated in Chart 3-8.

Chart 3-8: Industry sector GVA contribution to NSW GSP, 2012-13 ($ billion)



Source: Australian Bureau of Statistics 2013, *Australian National Accounts: State Accounts, 2012-13*, Cat. No. 5220.0, Canberra, November.

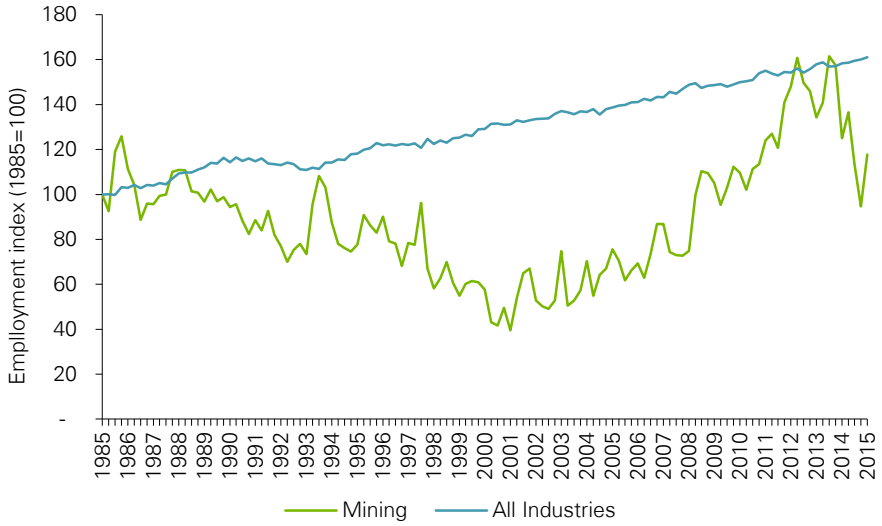
The mining sector contributed $14.8 billion in value-added in 2012-13 (over 3 per cent of the NSW total). It should be noted that some of the activities in other industries, such as professional, scientific and technical services, will also be dedicated to servicing the needs of the NSW mining sector. An example of this might be those employed in professional firms with specialist mining sector expertise supporting the various legal and technical requirements of investing in the mining sector.

3.3.2 Composition of NSW employment

The mining sector in NSW currently employs over 35,000 people. As illustrated in Chart 3-9, mining sector employment has fluctuated over the last 25 years. Over the last 10 years, the mining sector has experienced above average employment growth. However, employment in the mining sector has declined over the last few years.

The mining sector also contributes to the employment of people in other areas such as professionals, administrative services, other construction and education and training through upstream production linkages.

Chart 3-9: Industry employment growth, NSW

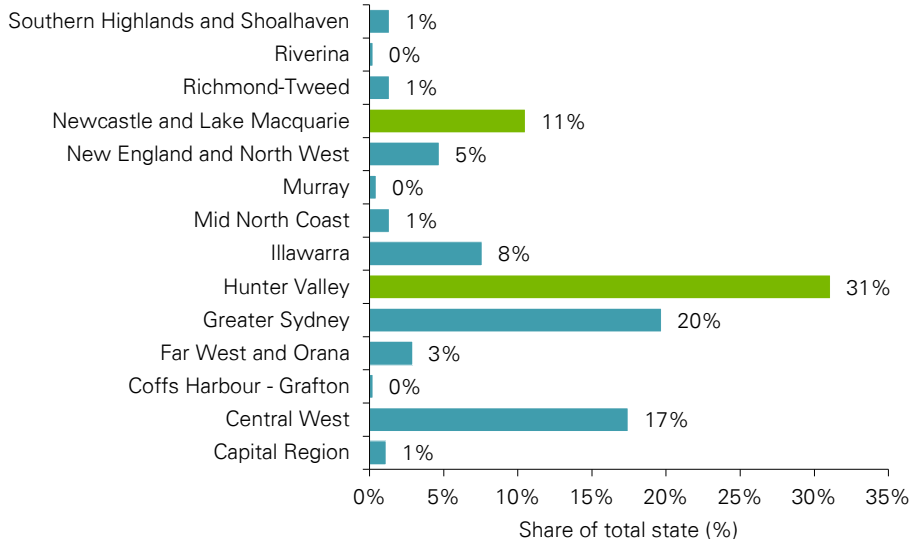


Source: Australian Bureau of Statistics 2015, *Labour Force, Australia, Detailed, Quarterly*, Cat. No. 6291.0.55.003, Canberra.

3.3.3 Regional distribution of the mining sector

The regional distribution of NSW mining industry employment, illustrated in Chart 3-10, highlights that the Hunter Valley region is a significant source of mining sector employment.

Chart 3-10: Distribution of employment in the mining sector, 2014



Source: Department of Employment 2015, *Small Area Labour Markets, December quarter 2014*, March

The largest share of NSW mining sector employees are located in the Hunter Valley and surrounding regions. Over 40 per cent of all mining sector employees in NSW are employed in the Hunter Valley, Newcastle and Lake Macquarie region (Chart 3-10).

3.3.4 Regional reliance on the mining sector

A number of regions in NSW are significantly reliant on the mining sector to support local employment and the community. Direct employment in the mining sector accounts for 6 per cent of total employment in the Hunter Valley region. Further, there is employment in these regions in downstream industries (e.g. transport, health and other services) as a result of the presence of the mining sector, adding to the regional importance of the mining industry.

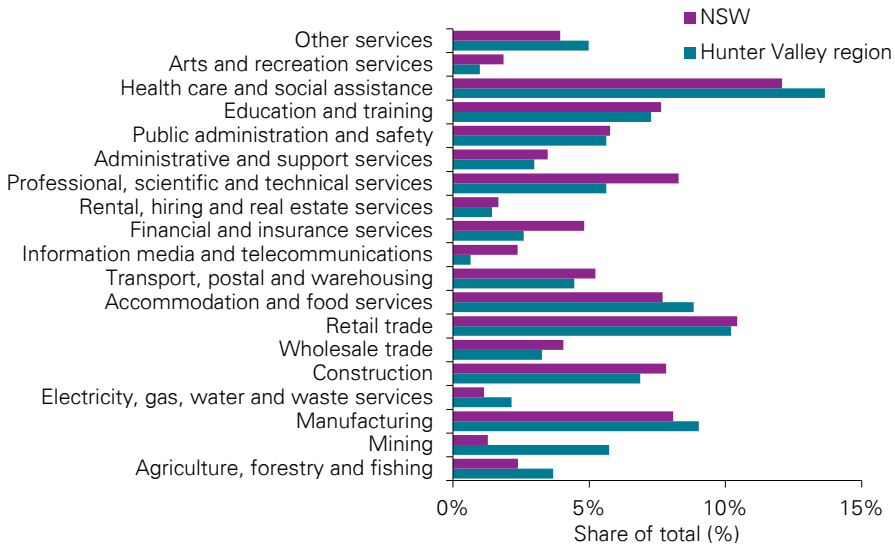
The following chart compares the share of total employment by industry for the Hunter Valley region and NSW as a whole. Compared to the state, the Hunter Valley region has a greater share of employment in a number of industries, including:

- Health care and social assistance;
- Accommodation and food services;
- Mining; and
- Agriculture, forestry and fishing.

The region has a lower share of employment in a number of industries, including:

- Arts and recreation services;
- Professional, scientific and technical services;
- Financial and insurance services;
- Information, media and telecommunications;
- Transport, postal and warehousing;
- Wholesale trade; and
- Construction.

Chart 3-11: Major industries, employment, 2013



Source: Australian Bureau of Statistics 2013, *Labour Force, Australia, Detailed, Quarterly*, Cat. No. 6291.0.55.003, Canberra.

3.3.5 Contribution to the Hunter Valley community

In February 2013, KPMG undertook an analysis of the demographic profile of mining regions in Australia. The analysis found that increased mining sector activity has created employment opportunities in mining regions. This has translated into higher incomes and higher levels of educational attainment in mining regions relative to the regional Australian average. Strong growth in employment in the mining sector between 2006 and 2011 (51 per cent) may explain the above average increase in high income earners in the Hunter Valley region.

The mining sector also contributes to the Hunter Valley region through community investments by individual mining companies. For example:

- community investments and grants;
- projects creating training, employment and contracting opportunities; and
- active community partnerships that contribute to local social infrastructure projects.

4 Impact assessment

The following section outlines the findings of the impact assessment of the Project including the results of the CBA and CGE analysis. The assessment focuses on the impact of the Rix's Creek Continuation Project relative to a baseline of a cessation of mining at Rix's Creek.

4.1 Cost benefit analysis

This section outlines the CBA of the Project, including the:

- specification of the base case and Project options considered;
- costs and benefits associated with each Project option;
- results of the analysis; and
- sensitivity analysis of the results.

4.1.1 Base case and project options

Identification of the base case for the proposed Rix's Creek Continuation Project is required to enable identification and measurement of the incremental costs and benefits. For the purpose of this analysis, the base case is:

- continuation of existing operations until 2019 when current approval expires;
- cessation of activity in 2019 and rehabilitation of land; and
- land being returned to its next best use (i.e. agricultural production).

The proposed Project includes:

- continuation of operations beyond the current mine plan in current approval in a north-westerly direction;
- use of existing mine access, CHPP, coal stockpiling and rail facilities;
- extraction of up to 4.4 Mtpa of ROM coal; and
- progressive replacement of equipment fleet to enable improving mining efficiencies.

At the end of the proposed Project, it is assumed the land would be returned to grazing land, however it is noted that the land may be suitable for other developments (e.g. industrial park).

4.1.2 Identification and quantification of relevant costs and benefits

The costs and benefits of the Project are outlined in Table 4-1 below. The costs associated with the Project include:

- capital expenditure;
- operating and maintenance expenditure;
- environmental externalities;
- rehabilitation costs;
- other environmental externalities; and
- opportunity cost of land use (agricultural production).

The benefits associated with the Project include:

- revenue;
- regional contribution;
- employment; and
- residual value of assets.

In accordance with the *NSW Treasury Guidelines for Economic Appraisal,* economic costs and benefits are quantified where market values are available. Other economic costs and benefits are discussed qualitatively.

Table 4-1: Costs and benefits of the Rix's Creek Continuation Project

Cost / Benefit	Bearer / Beneficiary	Description	Quantified
Costs			
Capital expenditure	Rix's Creek Pty Limited	Capital expenditure associated with operation and fleet replacement over the life of the Project.	Yes
Operating and maintenance expenditure	Rix's Creek Pty Limited	Expenditure associated with operations including labour, administration, transportation, remediation activities and maintenance.	Yes
Environmental externalities	Rix's Creek Pty Limited /Environment/Community	Key environmental assessment issues associated with the project include air quality, noise and vibration.	Partially (Greenhouse Gas emissions)
Opportunity cost of land use	Community	Value of revenue that could potentially be generated if land was used for next best use (agricultural production).	Yes
Benefits			
Revenue	Rix's Creek Pty Limited	Revenue generated from operational activities over the life of the project.	Yes
Worker wages	Employees and Community	Wage premium paid to workers relative to wages they would earn elsewhere.	Yes
Residual value of land	Rix's Creek Pty Limited	Value of the land at the end of the Project.	Yes
Contribution to the local community	Hunter Valley regional communities	Social and community contribution through partnerships and sponsorships.	No

Source: KPMG

4.1.2.1 Capital expenditure

The Project involves continuation of existing operations using infrastructure already established. Over the life of the Project, capital investment in fleet replacement will be required, including:

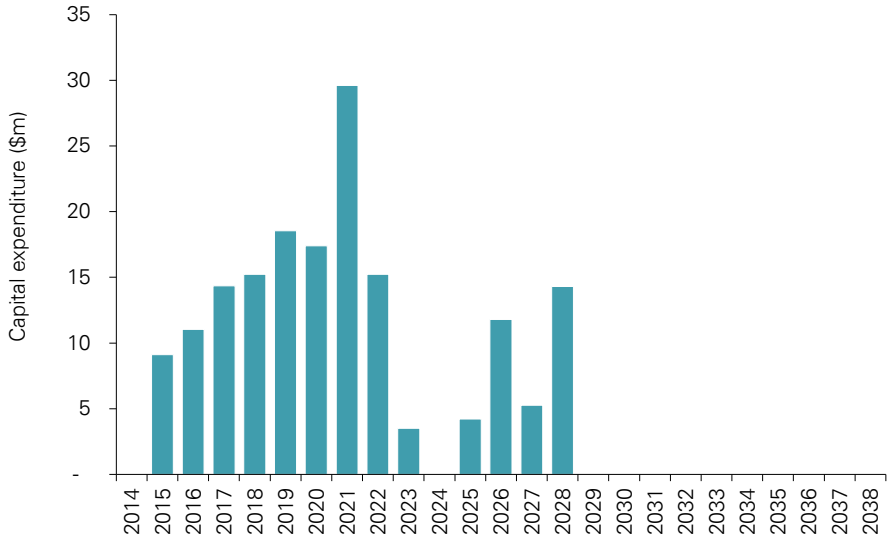
- excavators;
- trucks;
- dozers;
- graders;
- loaders; and
- drills.

In addition to fleet replacement, the Project requires construction of a new cut and cover tunnel crossing of the New England Highway. The estimated cost of constructing the tunnel is estimated to be $8 million[18].

The capital costs associated with the acquisition of additional assets for the Project are presented in Chart 4-1.

[18] Based on information provided by Rix's Creek Pty Limited.

Chart 4-1: Fleet replacement ($million 2014)



Source: Rix's Creek Pty Limited

Over the life of the Project, the cost associated with capital investment in fleet replacement and construction of the cut and cover tunnel is expected to be $110.5 million (in present value terms). Investment in fleet replacement is expected to cease 10-years prior to the end of the Project. Accordingly, the residual value of the capital is expected to be minimal and is not captured in the analysis.

There is not expected to be any fleet replacement nor requirement for construction of the cut and cover tunnel under the base case with the remaining life of mining operations to use existing assets.

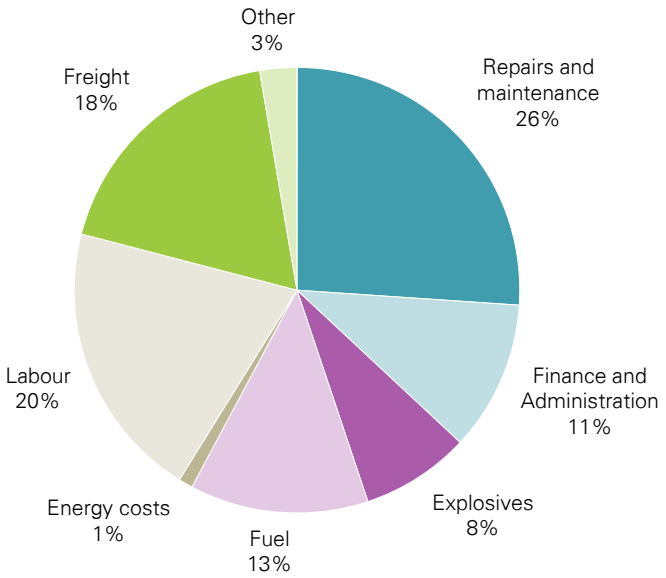
4.1.2.2 Operating and maintenance expenditure

Operating and maintenance costs associated with current mining operations at Rix's Creek include:

- selling and distribution expenditure (excluding royalties);
- overburden expenditure;
- washing plant expenditure;
- ROM coal expenditure;
- direct mining expenses; and
- rehabilitation costs.

Over the life of the Project, the incremental operating costs (project case less base case) are expected to be $705.4 million (in present value terms). The distribution of these costs, by cost type, are illustrated in Chart 4-2.

Chart 4-2: Operating costs by type



Source: Rix's Creek Pty Limited

4.1.2.3 Environmental externalities

The environmental externalities associated with the Project were identified and assessed by AECOM. The scope of the analysis of environmental externalities for the purpose of the CBA is summarised Box 4-1.

Box 4-1: Scope of the analysis of environmental externalities

The scope of the analysis of environmental externalities for the purpose of the CBA is limited to the activities associated with the extraction and processing of coal at Rix's Creek. The analysis excludes any consideration of the environmental externalities associated with end-use of the coal outputs such as electricity generation from coal-fired power stations. Some economic analyses include the marginal cost of environmental emissions from coal-fired power stations relative to the next likely energy source (e.g. Gas). However, as the coal from Rix's Creek is exported outside Australia and the energy generation mix in destination country is unlikely to be impacted by any changes in Rix's Creek production, these impacts were excluded from the analysis.

The key environmental issues identified as potentially having impacts on the environment are outlined in Table 4-2 below.

Table 4-2: Environmental externalities

Externality	Issues
Air quality	The Project has the potential to produce air pollutants while in operation which may impact on the local air shed. The sources of pollutant include: • dust from earthworks; • vehicle emissions; and • potential nitrogen emissions.
Ecology	The Project is likely to impact the local vegetation directly through clearance methods. The 185 hectare project area is the addition to the lease area as current consent allows for impact over the whole of the current lease area. It is estimated that approximately 230 ha of vegetation in the existing lease and lease continuation areas will be cleared resulting in potential impacts on the local habitat for common flora and fauna. The

Externality	Issues
	impact of the removal to the 230ha of vegetation will be offset under the requirements of the Upper Hunter Biodiversity Plan by contributing to the offset fund.
Noise and vibration	The Project will require a large amount of vegetation to be removed and a key environmental impact will be the use of large equipment to conduct the removal and ongoing overburden blasting. The impact of traffic and transport and cumulative noise impacts from the operation of the Project and ongoing operations to the local area will be considered.
Soils and geology	Ongoing operations have the potential to increase soil erosion and sedimentation as result of mining activities.
Surface water	Any continuation of mining operations would be considered in the context of existing on site activities. The impact of the Project would be considered as follows: • drainage and catchment modifications; • changes to the site water balance, water treatment, potential surface run off and operational discharge; and • erosion, sedimentation or contamination resulting from ground disturbance.
Groundwater	Any impacts to groundwater will relate to the potential impacts on local bore users associated with: • ongoing mining activities; • ongoing open cut mining; and • mine closure and rehabilitation.
Heritage	Potential impact to historic heritage items.
Traffic and transport	Potential increase in heavy vehicle for the initial site preparation. There may be additional light vehicle traffic due to personnel travelling to and from the site. The New England highway is the main road beside the mine and may be impacted by blasting and increased traffic volume.
Visual amenity and landscape	Disturbance to the existing topography is likely to occur as a result of the Project affecting the visual landscape.
Hazard and risk	The issues for consideration include: • storage of hazardous goods; • bushfire; and • risks from blasting.
Greenhouse gases	Potential emissions from the Project are considered and may include: • CHPP plant operations; • onsite and offsite fuel burning; • clearance of vegetation; • embodied energy and carbon materials; • gas management; and • end-use of the coal mine at the facility.
Land use	The land surrounding the location of the continuation of the mine is grazing land and consideration of rehabilitation of this land is required.
Waste	Operational waste generated by the Project.
Rehabilitation	Continued mining will remove land from grazing or other rural capabilities.

Source: AECOM

A number of these environmental externalities were investigated in detail and are considered in further detail in the following sub-sections.

Air Quality Impacts

An assessment of the air quality impacts of the Project was undertaken based on the years in which maximum impact is likely to occur. The assessment found that the Project has limited its mining rate, footprint and activity to ensure particulate impacts are maintained within acceptable levels. In addition, the assessment found that best practice mitigation and management measures would likely ameliorate any potential adverse air quality impacts[19].

The Project is estimated to generate annual greenhouse gas (GHG) emissions of 0.047Mt $CO_{2\text{-}e}$ per annum compared to 0.06.Mt $CO_{2\text{-}e}$ per annum in 2013-14. The variation is due to the substantial decrease in production levels in the later part of the project. As outlined in Box 4-1, the emissions relate to the extraction and processing of coal at Rix's Creek and exclude any downstream activities. As outlined in Table 4-4, there are a number of approaches to quantifying the cost of carbon emissions.

Table 4-3: Approaches to quantifying the cost of carbon emissions

Approach	Description
Social Cost of Carbon	The full global cost of an incremental unit of carbon (or equivalent amount of other greenhouse gases) summing to the full global cost of the damages imposed over the whole of its time in the atmosphere. The social cost of carbon provides an indication of the amount society should be willing to pay now to avoid future damage caused by carbon emission.
Market Price of Carbon	The value of carbon emission rights to those in the market given the constraints on supply of these rights to emit imposed by current policy.
Marginal Abatement Cost	The cost of reducing emissions (rather than the damage imposed by creating emissions).

Under certain assumptions, the three measures of the cost of carbon are consistent at the margin. The market price and marginal abatement cost would be expected to be broadly equal if the carbon market covers all emissions and is competitive. From an economic optimisation perspective, the optimal carbon concentration level is where the social cost of carbon is equal to the marginal abatement cost required to achieve this level. If the marginal abatement cost is below the social cost of carbon, it is cost effective to abate further. If the marginal abatement cost is above the social cost of carbon, lower abatement targets could be considered.

The value of GHG emissions assumed for the analysis is equivalent to the shadow carbon price modelled for the Independent Expert Panel reviewing the (RET) scheme. The shadow carbon price is based on the long-term spot market price for European permits and is approximately $9.50 per tonne of carbon, escalating at 3 per cent in real terms[20]. The shadow carbon price was applied to the expected annual emissions associated with the project. The total incremental cost associated with the GHG emissions over the life of the Project are estimated to be $4.5 million in present value terms.

Ecology

Ecological assessment of the area found that the Project will likely have negligible impacts. The assessment identified two threatened communities, one threatened fauna species and no threated plants. The impacts on the threatened entities were determined to be manageable and acceptable[21].

[19] Todoroski Air Sciences 2015, *Air Quality and Greenhouse Gas Assessment – Rix's Creek Continuation of Mining Project*, draft report prepared for Rix's Creek Pty Limited, March.

[20] Acil Allen 2014, *RET Review Modelling Results,* prepared for the RET Review Panel, August.

[21] Bell, S.A.J. 2014, *Ecology Report for the Continuation of Rix's Creek Mine, Singleton LGA,* Unpublished DRAFT Report v3 to Rix's Creek Pty Limited, August 2014. Eastcoast Flora Survey.

Noise impacts

Analysis of the noise impact of the Project found that noise levels are expected to be similar to current operations. Over time the noise impact is expected to diminish over time as a result of the existing equipment being replaced with attenuated equipment[22].

Soils and geology

A Biophysical Strategic Agricultural Land (BSAL) Verification Assessment was undertaken and found that there is no qualifying BSAL within the Rix's Creek area[23].

Surface water

A water management system has been developed for the Project to manage any potential surface water issues. The system includes:

- a mine water management system to collect and use water that may have high salt content;
- a tailings water management system eliminating the need for a permanent tailings disposal facility;
- a sediment and erosion management system to manage runoff;
- a clean water management system; and
- a contaminated water management system.

Analysis of the effectiveness of these systems found that the Project will not impact off site water quality associated with spillages from the mine dams[24].

Groundwater

A groundwater impact assessment was undertaken to determine the cumulative impacts of the Project with other existing and proposed mining operations, as well as the incremental impacts that are directly attributable to the Project. The findings of the assessment are as follows:

- there are no identified Groundwater Dependent Ecosystems in the vicinity of the Project;
- there is no cumulative drawdown impact within the regolith/alluvium predicted outside the coal lease boundary;
- there is a drawdown impact in the Permian hard rock to the north of the Project; and
- water quality impacts are considered negligible[25].

Visual amenity and landscape

Analysis of the proposed Project found that it will likely have an acceptable landscape character and visual impact on the surrounding locality and region[26].

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[22] Global Acoustics 2015, *Rix's Creek Coal Mine – Continuation of Mining Project Environmental Noise Assessment,* report prepared for Rix's Creek Pty Limited, March.

[23] SLR Global Environmental Solutions 2014, *Rix's Creek Biophysical Strategic Agricultural Land Verification Assessment,* report prepared for Rix's Creek Pty Limited, July.

[24] JP Environmental 2014, *Surface Water Study for Rix's Creek Continuation of Mining,* report prepared for Rix's Creek Mine, November.

[25] RPS Aquaterra Pty Ltd 2014, *Rix's Creek Continuation of Mining Project Groundwater Impact Assessment,* report prepared for Bloomfield Collieries Pty Ltd, July.

[26] RPS Australia East Pty Ltd 2014, *Landscape Character and Visual Impact Assessment for Rix's Creek Continuation of Mining Project,* report prepared for Rix's Creek Pty Limited, August.

4.1.2.4 Opportunity cost of land (foregone agricultural production)

The Project involves use of former agricultural land for mining purposes. Accordingly, the land is no longer available for agricultural purposes and the associated farming income is foregone. Analysis of the potential agricultural value of the land was undertaken based on the value of livestock production (weaner production) from the area impacted by the Project. Assessment of the value of the land, in terms of agricultural production is outlined in Table 4-5.

Table 4-4: Assessment of value of agricultural production

Year	Enterprise	Stock sold (no.)	Value of production
2014	Weaner production	46 – 65	$22,598 - $31,475
2015	Weaner production	46 – 65	$32,767 - $45,639

Source: Neil Nelson Agvice Pty Ltd

The range in stock sold reflects the potential range in stocking rates on the land. Over the last 12 months, there has been an upward trend in cattle prices, accordingly to total value of foregone production is expected to be higher. The 2014 value of production is more consistent with the long term average prices. Accordingly, the analysis assumes the value of foregone production is consistent with the upper estimate for 2014 ($31,475 per annum).

Over the life of the Project, the expected incremental cost associated with foregone agricultural production is expected to be $0.2 million (in present value terms).

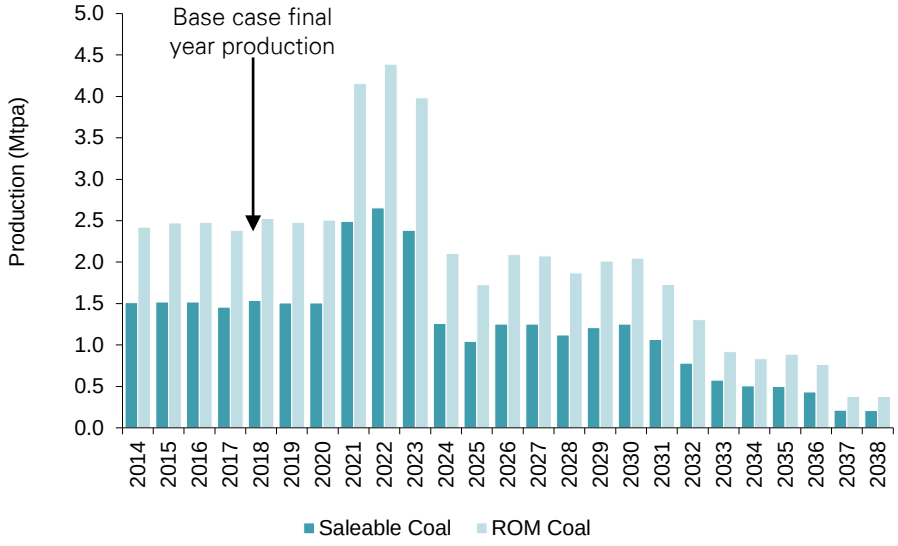
4.1.2.5 Revenue

The Project involves continuation of current mining activities through the use of similar mining methods to extract coal from remaining seams. Approval is sought for extraction of up to 4.5 Mtpa of run-of-mine (ROM) coal. Production will capitalise on the remaining coal resource at the mine, estimated to contain around 32 million tonnes of saleable coal.

Bloomfield currently has long-standing thermal and semi-soft coking supply contracts with Japan, with production at Rix's Creek contributing to meeting these contracts. If approved, the continuation of the Rix's Creek Project would enable continued supply under these contracts.

The indicative production rates associated with the Project are illustrated in Chart 4-3.

Chart 4-3: Indicative production rates over project life



Source: Rix's Creek Pty Limited and KPMG analysis

Under the base case, the final year of production is 2019 and production is assumed to be zero in subsequent years. Under the Project case, production continues from 2020 onwards, peaking in 2021 to 2023 and following a declining trend in subsequent years.

Revenue associated with this production was estimated based on coal prices forecast by the World Bank. These forecasts are outlined in Table 4-5.

Table 4-5: Forecast coal prices

	Nominal US dollars	Real 2010 US dollars
2012	96.4	
2013	84.6	79.7
2014	77.0	72.4
2015	79.0	74.1
2016	80.9	74.8
2017	82.8	75.5
2018	84.8	76.2
2019	86.8	76.8
2020	88.9	77.4
2021	91.0	78.1
2022	93.2	78.7
2023	95.4	79.3
2024	97.7	79.9
2025	100.0	80.4

Source: World Bank, *Price Forecasts, Australian Coal Prices*

Based on forecast coal prices, the incremental revenue benefit (Project case less base case) is estimated to be $997.5 million (in present value terms).

4.1.2.6 Mine worker wage premium

As outlined by the NSW Government, one of the benefits associated with mining projects is the wages paid to mining sector employees[27].

The average weekly earnings of workers across industries are outlined in Table 4-6. Average weekly earnings in the mining industry were $2,518 in 2014, more than double the average for all industries ($1,129 per week). Over a twelve month period, this wage premium equates to over $70,000 (in current terms) per worker.

Table 4-6: Average weekly earnings in NSW, 2014

	Average weekly earnings
Mining	2,518
Manufacturing	1,269
Electricity, Gas, Water and Waste Services	1,707
Construction	1,508
Wholesale Trade	1,243
Retail Trade	670
Accommodation and Food Services	514

[27] Department of Planning and Infrastructure 2012, *Guideline for the use of Cost Benefit Analysis in mining and coal seam gas proposals,* November.

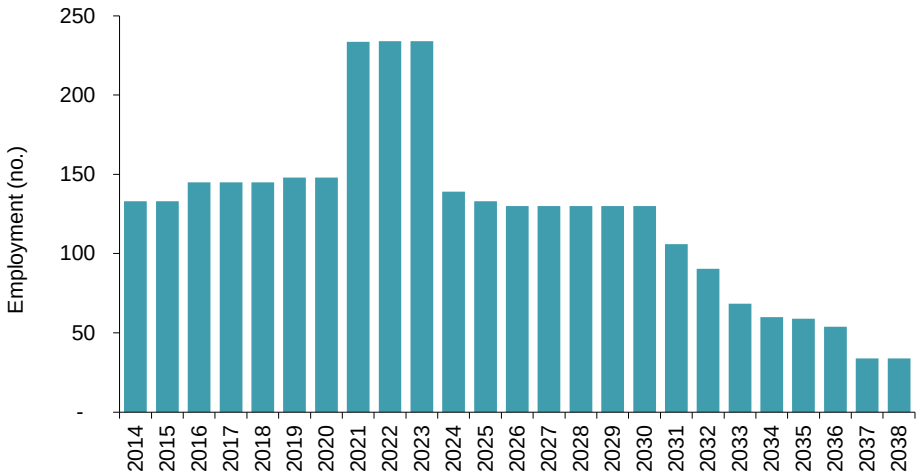
	Average weekly earnings
Transport, Postal and Warehousing	1,359
Information Media and Telecommunications	1,437
Financial and Insurance Services	1,483
Rental, Hiring and Real Estate Services	1,065
Professional, Scientific and Technical Services	1,569
Administrative and Support Services	931
Public Administration and Safety	1,355
Education and Training	1,117
Health Care and Social Assistance	1,003
Arts and Recreation Services	711
Other Services	841
All Industries	1,129

Source: Australian Bureau of Statistics 2015, Average Weekly Earnings, Australia, Nov 2014, Cat. No. 6302.0, February.

Total direct employment generated by the Project is illustrated in Chart 4-4.

The total worker wage premium was quantified based on the average wage premium per week and the total direct employment associated with the Project.

Chart 4-4: Indicative employment over the project life



Source: Rix's Creek Pty Limited

Based on the higher average weekly earnings in the mining sector and the total employment associated with the Project, the total incremental wage premium over the life of the project is estimated to be $104.3 million (in present value terms).

4.1.2.7 Residual value of land and remediation

Following the completion of the Project, the Project area will be returned to grazing. As per advice from Rix's Creek Pty Limited, the cost associated with remediation of the land is included in operational cost. To residual value, the value of the land at the end of the project life was included in the analysis.

The residual value was estimated based on the total Project area (185 hectares) and the average value of grazing land in the area (approximately $10,000 per hectare)[28].

4.1.2.8 Contribution to the local community

Rix's Creek Pty Limited makes a number of contributions to the Hunter Valley community through sponsorships and partnerships. The broader Bloomfield Group has established *The Bloomfield Group Foundation* to provide financial support to local organisations. The foundation also encourages employees to contribute through participation in charitable and community events. Since 2006, the foundation has donated over $2.5 million through sponsorship programs[29].

Under the base case, Rix's Creek would cease operations, accordingly it is expected that these contributions would not continue. Under the Project case, operations would continue in the region and the contribution to the regional community is expected to continue.

4.1.2.9 Assessment of net benefits

The Project was compared against the base case using discounted cash flow technique on the basis of a real discount rate 7 per cent in accordance with relevant guidelines. The results of the economic evaluation are summarised in Table 4-7.

The total incremental cost (project less base case) of the Project is estimated to be $820.6 million (in present value terms) over the life of the project. The largest incremental cost is that associated with operational and maintenance expenditure. As outlined in the following section, a significant proportion of this expenditure is undertaken in the Hunter Valley region through the purchase of goods and employment of local labour.

The total incremental benefit associated with the Project is estimated to be $1,072.2 million (in present value terms) over the life of the project. The largest benefit is associated with the revenue from sale of the coal outputs from the Project.

Overall, the Project is expected result in a NPV of $251.6 million over the life of the project. The BCR associated with the project is 1.3.

Table 4-7: Economic evaluation results (PV @ 7% $ million 2015)

	Evaluation results (PV @ 7 per cent)
Incremental Costs	
Capital expenditure	110.5
Operating and maintenance expenditure	705.4
Environmental externalities	4.5
Opportunity cost of land use	0.2
Total Incremental Costs	**820.6**
Incremental Benefits	
Revenue	997.5
Wage premium	104.3
Residual value of land	0.4
Total Incremental Benefits	**1,072.2**

[28] Based on information provided by Rix's Creek Pty Limited.

[29] Umwelt (Australia) Pty Ltd 2014, *Rix's Creek Extension Social Impact and Opportunity Assessment,* draft report prepared for Bloomfield Mines Pty Ltd, August.

	Evaluation results (PV @ 7 per cent)
Summary Results	
NPV ($ million)	**251.6**
BCR	**1.3**

NOTE: Totals may not sum due to rounding.

Source: KPMG analysis based on sources outlined above.

4.1.3 Sensitivity analysis

Sensitivity analysis was undertaken to determine the sensitivity of results to changes in assumptions. The results of the analysis were tested to highlight the impact of changes in the assumed discount rate and to test the implications of proportional changes in the total value of costs and benefits. The results of the sensitivity analysis are summarised in Table 4-8.

Table 4-8: Sensitivity analysis results

	NPV ($ million)	BCR
Discount rate		
4 per cent	361.6	1.3
7 per cent	251.6	1.3
10 per cent	178.0	1.3
Costs		
15 per cent lower	527.1	1.5
15 per cent higher	196.1	1.1
Benefits		
15 per cent lower	141.9	1.1
15 per cent higher	581.3	1.5

Source: KPMG analysis based on sources outlined above.

The results of the sensitivity analysis highlight that the economic evaluation results for the project remain positive even when costs are increased or benefits are reduced by 15 per cent.

4.2 Economic impact analysis

The following section outlines the findings of the economic impact analysis undertaken for the Rix's Creek Continuation Project, including:

- a description of the scenarios for analysis;
- an outline of the economy-wide impact on economic activity and living standards; and
- a description of the industry level impact on value added and employment.

4.2.1 Scenarios for analysis

To simulate the economic impact of the higher mining activity resulting from the Project, the following scenarios were modelled:

- **Baseline scenario:** This scenario assumes that the Project does not proceed.
- **Project scenario:** This scenario assumes that the Rix's Creek Continuation Project proceeds as proposed and models a higher level of mining activity and exports.

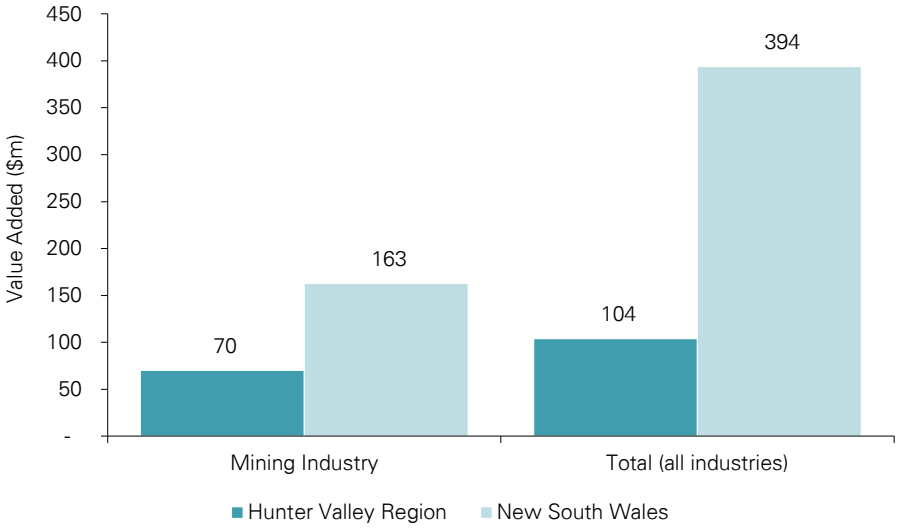
The estimated economic impacts were determined by calculating the differences in economic outcomes between the Project and baseline scenario for the Hunter Valley and NSW economies.

Economic impacts were estimated based on average mining activity undertaken for the first five years of the Project (commencing in 2019).

4.2.2 Value added impacts

The Project involves extraction and export of coal equivalent to approximately $150 million per annum over the first five years of operation (based on current prices). The results show that the exports associated with the Project have a positive net impact on economic activity in the NSW and Hunter Valley economies (illustrated through GSP). Modelling estimates, summarised in Chart 4-5, that the increase in coal exports (relative to the base case) increases NSW real GSP by 0.04 per cent (equivalent to $394 million in 2013-14) and real Hunter Valley regional GRP by 0.26 per cent (equivalent to $104 million in 2013-14 terms). As expected, significant proportion of this value added impact is generated within the mining industry ($163 million in NSW and $70 million in the Hunter Valley region).

Chart 4-5: Value added impact, Hunter Valley and NSW

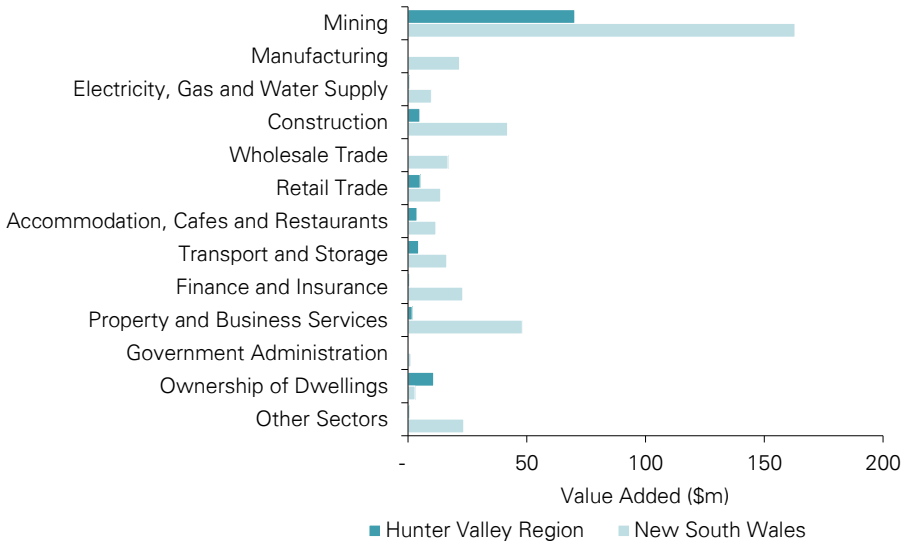


Source: KPMG analysis based on information provided by Rix's Creek Pty Limited

Higher mining activity has positive flow-on impacts on other industries. Industries that supply the mining sector with inputs, such as trade, manufacturing and professional services are likely to experience additional activity as demand for inputs supplied is boosted by the mining sector. The distribution of industry impacts is illustrated in Chart 4-6.

The impact of the Project is predominantly concentrated in the mining industry. However, other sectors upstream and downstream of the mining sector are also impacted by the project. Sectors that support the mining sector through its supply chain are stimulated by additional demand from the mining industry. For example, the Property and Business Services sector grows due to an increase in demand for services, raising gross value added in that sector. Consumer oriented industries, such as Retail Trade, also grow due to the Project as employment raises the overall level of consumption and stimulates demand.

Chart 4-6: Industry distribution of value added impact



Source: KPMG analysis based on information provided by Rix's Creek Pty Limited

4.2.2.1 Employment impacts

In addition to boosting industry gross value added, continuation of mining activity associated with the Project is expected to support employment in the NSW and regional economies. As outlined in the previous section, the mining sector accounts for 6 per cent of the total workforce in the Hunter Valley region. However, employment growth in the region has been weaker than the state average in recent years and the unemployment rate has recently increased.

Total average annual employment supported by the Project is estimated to be over 375 jobs within the Hunter Valley region. A recent survey of suppliers to the existing Rix's Creek site highlighted the extent of regional employment that is supported by the mines operation, including:

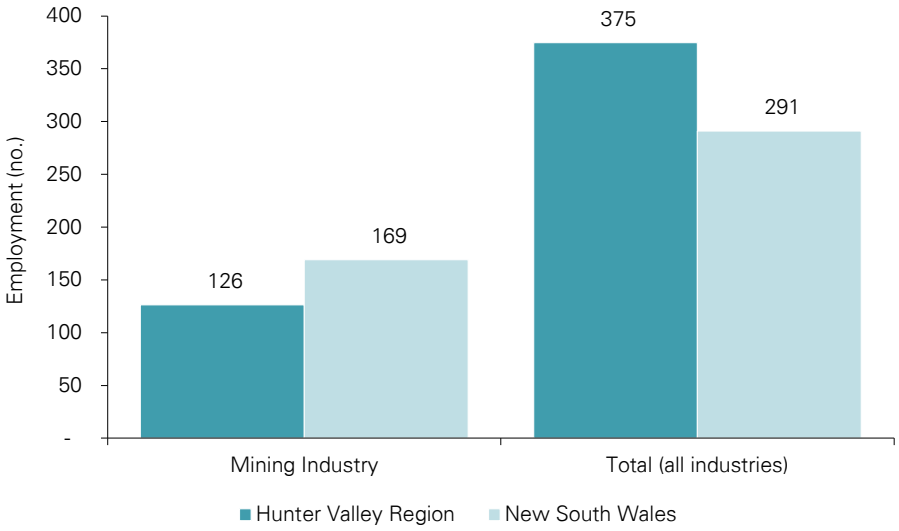
- employees of the broader Bloomfield Group (approximately 500 in total, including employees of Rix's Creek and excluding external contractors); and
- employees of local suppliers to Rix's Creek.

Given the strong supply chain linkages and the reliance on the Rix's Creek operations, there is potential that these jobs could be lost if operations were to cease.

The increase in coal exports may result in an increase in demand for labour and associated wage levels. In addition, the export activity potentially results in an appreciation of the Australian dollar. This has a slightly negative impact on labour intensive industries via their costs, and on export-dependent and import-competing sectors in terms of competitiveness. Sectors that are labour intensive and trade exposed, such as manufacturing, have a negative employment impact as a result.

Similar to the estimated gross value-added impacts, the majority of employment impacts are concentrated in the mining sector. However, other sectors upstream and downstream of the mining sector are also positively impacted by the capital expenditure. Consistent with the gross value added estimates, sectors that support the mining sector through its supply chain are stimulated by additional demand from the mining industry.

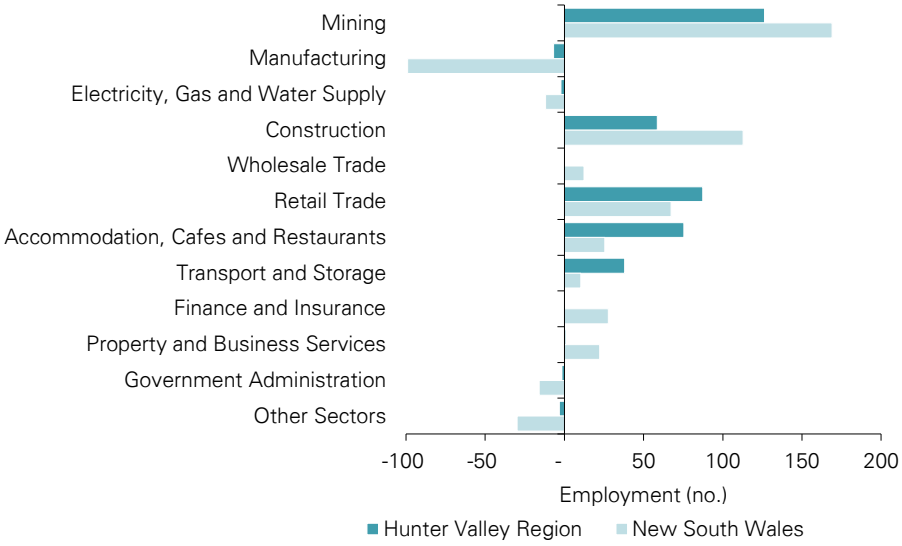
Chart 4-7: Employment impact, Hunter Valley and NSW



Source: KPMG analysis based on information provided by Rix's Creek Pty Limited

The industry distribution of employment impacts is illustrated in Chart 4-8.

Chart 4-8: Industry distribution of employment impact



Source: KPMG analysis based on information provided by Rix's Creek Pty Limited

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